## SIEMENS

## SINUMERIK

## SINUMERIK 828D, SINAMICS S120 Machine data

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Applies to:
SINUMERIK 828D
CNC software version 4.8 SP3

## Legal information

## Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

## $\triangle$ DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.

## WARNING

indicates that death or severe personal injury may result if proper precautions are not taken.

## CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

## NOTICE

indicates that property damage can result if proper precautions are not taken.
If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

## Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

## Proper use of Siemens products

Note the following:

> WARNING
> Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

## Trademarks

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## Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

## Preface

## SINUMERIK documentation

The SINUMERIK documentation is organized into the following categories:

- General documentation/catalogs
- User documentation
- Manufacturer/service documentation


## Additional information

You can find information on the following topics at the following address (https:// support.industry.siemens.com/cs/de/en/view/108464614):

- Ordering documentation/overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)

If you have any questions regarding the technical documentation (e.g. suggestions, corrections), please send an e-mail to the following address
(mailto:docu.motioncontrol@siemens.com).

## mySupport/Documentation

At the following address (https://support.industry.siemens.com/My/ww/en/documentation), you can find information on how to create your own individual documentation based on Siemens' content, and adapt it for your own machine documentation.

Training
At the following address (http://www.siemens.com/sitrain), you can find information about SITRAIN (Siemens training on products, systems and solutions for automation and drives).

FAQs
You can find Frequently Asked Questions in the Service\&Support pages under Product Support (https://support.industry.siemens.com/cs/de/en/ps/faq).

## SINUMERIK

You can find information about SINUMERIK at the following address (http://www.siemens.com/ sinumerik).

## Target group

This documentation is intended for project engineers, commissioning engineers, machine operators and service and maintenance personnel.

## Benefits

The intended target group can use the Parameter Manual to test and commission the system or the plant professionally and safely.
Utilization phase: Installation and commissioning phase

## Standard scope

This documentation only describes the functionality of the standard version. Additions or revisions made by the machine manufacturer are documented by the machine manufacturer.

Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

For the sake of simplicity, this documentation does not contain all detailed information about all types of the product and cannot cover every conceivable case of installation, operation, or maintenance.

## Note regarding the General Data Protection Regulation

Siemens observes standard data protection principles, in particular the principle of privacy by design. That means that
this product does not process / store any personal data, only technical functional data (e.g. time stamps). If a user links this data with other data (e.g. a shift schedule) or stores personal data on the same storage medium (e.g. hard drive) and thus establishes a link to a person or persons, then the user is responsible for ensuring compliance with the relevant data protection regulations.

## Technical Support

Country-specific telephone numbers for technical support are provided in the Internet at the following address (https://support.industry.siemens.com/sc/ww/en/sc/2090) in the "Contact" area.

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## Fundamental safety instructions

### 1.1 General safety instructions

## 1. WARNING

Danger to life if the safety instructions and residual risks are not observed
If the safety instructions and residual risks in the associated hardware documentation are not observed, accidents involving severe injuries or death can occur.

- Observe the safety instructions given in the hardware documentation.
- Consider the residual risks for the risk evaluation.


## WARNING

Malfunctions of the machine as a result of incorrect or changed parameter settings
As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.


### 1.2 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. Application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

### 1.3 Industrial security

## Note

## Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement - and continuously maintain - a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.
Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit:

Industrial security (http://www.siemens.com/industrialsecurity)
Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at:

Industrial security (http://www.siemens.com/industrialsecurity)

Further information is provided on the Internet:
Industrial Security Configuration Manual (https://support.industry.siemens.com/cs/ww/en/ view/108862708)

## WARNING

## Unsafe operating states resulting from software manipulation

Software manipulations (e.g. viruses, trojans, malware or worms) can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Protect the drive against unauthorized changes by activating the "know-how protection" drive function.


## Explanation of the machine/setting data

### 2.1 Structure of the data tables

## Standard table

The standard table contains all the important information about the data.

| MD number | Identifier |  |  | Display filter | Reference |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Units | Name |  | Data type | Activation |  |  |
| Attributes |  |  |  |  |  |  |
| System | Dimension | Default value <br> (LIN/RED) | Minimum value <br> (LIN/RED) | Maximum value <br> (LIN/RED) | Protection | Class |

## Expanded table

The expanded table includes data from the standard table plus additional rows with systemspecific values.

| MD number | Identifier |  |  | Display filter | Reference |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Units | Name |  |  | Data type | Activation |  |
| Attributes |  |  |  |  |  |  |
| - | Dimension | Default value <br> (LIN/RED) | Minimum value (LIN/RED) | Maximum value (LIN/RED) | Protection | Class |
| <System 1> | - | Default value | - | - | -/- |  |
| <System 2> | - | - | - | - | -1/- |  |

A minus sign "-" in a field means that the same value as for <System $1>$ applies for the specified system.
Example:

2.1 Structure of the data tables

| 828d-gce62 |  | 1.0 | 0.5 | 3.0 | $3 / 0$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828d-gce82 | 1.0 | 0.5 | 3.0 | $3 / 0$ | M |  |
| 828d-gse42 |  | 1.0 | 0.5 | 3.0 | $0 / 0$ | S |
| 828d-gse62 | 1.0 | 0.5 | 3.0 | $3 / 0$ | M |  |
| 828d-gse82 | 1.0 | 0.5 | 3.0 | $3 / 0$ | M |  |

### 2.2 Meaning of table fields

MD number
The "MD number" field contains the machine data number. This number is displayed in the data lists on the user interface of the control.

## Identifier

The "Identifier" field contains the unique alphanumeric identifier of the machine data. The machine data is, for example, addressed by means of this identifier (with an additional label) for programming in the part program.

This identifier is displayed in the data lists on the user interface of the control.

## Reference

As a cross reference to the functional description of the data, the "Reference" field contains the short designation of the corresponding submanual of a function manual.

Reference is made to the following submanuals:

- Function Manual Basic Functions, submanuals: A2, A3, B1, B2, F1, G2, H2, K1, K2, N2, P1, P3, P4, R1, S1, V1, W1, Z1
- Function Manual Extended Functions, submanuals: A4, B3, H1, K3, K5, M1, M5, N3, N4, P2, R2, S3, S7, T1, W3, W4, Z2
- Function Manual Special Functions, submanuals: F2, G1, K6, K7, K8, K9, M3, R3, S9, T3, T4, TE01, TE02, TE1, TE3, TE4, TE6, TE7, TE8, TE9, V2, W5, W6, Z3
- Function Manual Safety Integrated, FBSI
- Function Manual Tool Management, FBWsI
- Function Manual Synchronous Actions, FBSY
- Function description, ISO Dialects for SINUMERIK, FBFA
- Programming Manual, PG
- Programming Manual Job Planning, PGA


## Units/system of units

Depending on MD10240 \$MN_SCALING_SYSTEM_IS_METRIC, the physical units differ as follows:

| MD10240 $=\mathbf{1}$ | MD10240 $=0$ |
| :--- | :--- |
| mm | inch |
| $\mathrm{mm} / \mathrm{min}$ | inch $/ \mathrm{min}$ |
| $\mathrm{m} / \mathrm{sec}^{2}$ | inch $/ \mathrm{sec}^{2}$ |
| $\mathrm{~m} / \mathrm{sec}^{3}$ | Inch $/ \mathrm{sec}^{3}$ |
| $\mathrm{~mm} / \mathrm{rev}$. | inch $/ \mathrm{rev}$. |

If the MD is not based on any physical unit, the field is marked with "-".

## Note

The default setting is MD10240 \$MN_SCALING_SYSTEM_IS_METRIC = 1 (metric).

## Name

The "Name" field contains the name of the data in plain text.

## Activation

The "Activation" field contains the action that must be performed by the user in order for a change in the data to be activated.

| Activation <br> User action |  | User action |
| :---: | :---: | :---: |
| po | POWER ON | Otherwise: <br> - "Reset(po)" softkey <br> - Switch voltage off/on |
| cf | NEW_CONF | Alternative: <br> - Softkey: "Activate MD" <br> Note: Axis-specific machine data <br> A changed value will not be activated until all the channels of the mode group to which the axis belongs to are in the "Reset" state. <br> - Command: NEWCONF <br> Note: Axes/spindles <br> On axes and position-controlled spindles, a changed value is not activated until the respective axis/spindle is stopped. <br> On spindles that are not position-controlled a changed value is activated immediately. |
| re | RESET | Otherwise: <br> - "Reset(po)" softkey <br> - Program end reset (M02/M30) <br> - <RESET> key |
| <so | IMMEDIATELY | After entering the value |

The activation levels are listed according to their priority.

- po = highest priority
- so = lowest priority


## Protection

The "Protection" field contains the access levels for reading or writing a date:
Reading/writing.

The first parameter specifies the access level for reading.
The second parameter specifies the access level for writing.

## Example:

"ReadOnly" in the table field means:
Reading with access level "Manufacturer" is possible/ writing with access level "Manufacturer" is not possible.

| Access level | Type |
| :--- | :--- |
| ReadOnly | Read-only access |
| 0 | Siemens (System) |
| 1 | Manufacturer |
| 2 | Service |
| 3 | User |
| 4 | Key-operated switch position 3 |
| 5 | Key-operated switch position 2 |
| 6 | Key-operated switch position 1 |
| 7 | Key-operated switch position 0 |

## Class

The "Class" field contains the data class to which the control-relevant data is assigned.
The data class attributes of machine, setting and option data are normally derived from the write rights of the corresponding data.

The data are divided into the following four data classes:

| Data class | Write rights | Access right |
| :--- | :--- | :--- |
| S (System) | System | Access level 0 <br> (Password: System) |
| M (Manufacturer) | Manufacturer/ <br> Service | Access levels 1 and 2 and ReadOn- <br> ly <br> (Password: Service) |
| I (Individual) <br> Note: <br> Individual machine data are grouped in this data <br> class, e.g. the leadscrew error compensation <br> values. <br> Depending on the contents, these are accessi- <br> ble via different access levels. | Manufacturer/ <br> Service <br> or | Access level 1 and 2 <br> (Password: Service) <br> or <br> Access level 3 <br> (Password: User) |
| U (User) | User | Access level 3 <br> (Password: User) <br> Access level 4 and 7 <br> (Keyswitch) |

## Display filter

The "Display filter" field contains the identifier of the data filter setting that enables the data to be seen. Using the filter setting, the exact data areas required at a given time can be selected for display.

| ID | Data area |
| :--- | :--- |
| EXP | Expert mode |
| Drive machine data |  |
| D00 | Display signals |
| D01 | Controller data |
| D02 | Monitoring/limiting functions |
| D03 | Message data |
| D04 | Status data |
| D05 | Motor/power unit |
| D06 | Measuring system |
| D07 | Safety Integrated |
| D08 | Standard machine |
| General machine data |  |
| N01 | Configuration/scaling |
| N02 | Memory configuration |
| N03 | PLC machine data |
| N04 | Drive control |
| N05 | Status data/diagnostics |
| N06 | Monitoring/limiting functions |
| N07 | Auxiliary functions |
| N08 | Corrections/compensations |
| N09 | Technological functions |
| N10 | I/O configuration |
| N11 | Standard machine |
| N12 | NC language, ISO dialect |
| Channel-specific machine data |  |
| C01 | Configuration |
| C02 | Memory configuration |
| C03 | Initial states |
| C04 | Auxiliary functions |
| C05 | Velocities |
| C06 | Monitoring/limiting functions |
| C07 | Transformations |
| C08 | Corrections/compensations |
| C09 | Technological functions |
| C10 | Standard machine |
| C11 | NC language, ISO dialect |
| Axis-specific machine data |  |
| A01 | Configuration (including memory) |
|  |  |


| ID | Data area |
| :--- | :--- |
| A02 | Measuring system |
| A03 | Machine geometry |
| A04 | Velocities / accelerations |
| A05 | Monitoring/limiting functions |
| A06 | Spindle |
| A07 | Controller data |
| A08 | Status data |
| A09 | Corrections/compensations |
| A10 | Technological functions |
| A11 | Standard machine |
| A12 | NC language, ISO dialect |
| Displaying machine data |  |
| H01 | ShopMill |
| H02 | ShopTurn |
| H03 | ManualTurn |
| H04 | Access levels |
| H05 | Standard machine |

## System

In the "System" field, the control system is specified for which the data with the correspondingly entered values applies.

The following entries are possible:

- If the system is not listed, the entered default values apply.
- If the system is listed, the deviations are entered in the following table cells.


## Milling technology (milling export)

828d-me42 PPU 24x
828d-me62 PPU 26x
828d-me821 PPU 28x
828d-me822 PPU 28x adv.

## Turning technology (turning export)

828d-te42 PPU 24x
828d-te62 PPU 26x
828d-te821 PPU 28x
828D-te822 PPU 28x adv.

# Cylindrical grinding technology (cylindrical grinding export) 

828d-gce42 PPU 24x
828d-gce62 PPU 26x
828d-gce82 PPU 28x adv.

## Surface grinding technology (surface grinding export)

828d-gse42 PPU 24x
828d-gse62 PPU 26x
828d-gse82 PPU 28x adv.

## Dimension

The "Dimension" field contains the number of elements of a data field.

## Default value

The "Default value" field contains the value that is used to preset the machine data. If default values for the channels differ, this is indicated by a forward slash " / ".
Some machine data is preset with different default values, depending on the NCU that is used.

## Note

When input via the user interface, the limitation is 10 digits plus comma and sign.

In the bracket "LIN/RED" the linear axis or rotary axis value is specified.

## Minimum/maximum value

The "Minimum value" and "Maximum value" fields contain the lower limit and upper limit, respectively, of the permissible range of the data.

If the "Minimum value" and "Maximum value" fields contain the string "**", an explicit range is not defined for this data. In this case, the range is determined by the specified data type.

In the bracket "LIN/RED" the linear axis or rotary axis value is specified.

## Data type

The "Data type" field contains the following data types:

| Data type | Range of values |
| :--- | :--- |
| BOOLEAN | false, true |
| BYTE | -128 to +127 |
| UBYTE | 0 to +255 |
| DWORD | $-2,147,483,648$ to $+2,147,483,647$ |
| UDWORD | 0 to $+4,294,967,295$ |


| Data type | Range of values |
| :--- | :--- |
| DOUBLE | $-1.7^{* 1} 10^{308}$ to $+1.7^{* 1} 10^{308}$ |
| STRING | Sequence of characters ( $\rightarrow$ UBYTE) with any arbitrary/specified length. |

## Attributes

The "Attributes" field contains additional attributes of the data:

| Attribute | Meaning |
| :--- | :--- |
| NBUP | No Back UP: The data is not backed up as part of the data backup. |
| ODLD | Only DownLoaD: The data can only be written via an INI file to an archive, or <br> from the part program. |
| NDLD | No DownLoaD: The data can only be written to via the user interface. |
| SFCO | SaFety COnfiguration: Component of the "Safety Integrated" function. |
| SCAL | SCaling ALarm: Scaling data; when changed, alarm 4070 is displayed. |
| LINK | LINK description: The data describes a link cluster. <br> Component of the "NCU Link" function. |
| CTEQ | ConTainer EQual: The data must be the same for all the axes of an axis con- <br> tainer. <br> Component of the "Axis container" function. |
| CTDE | ConTainer description: The data describes an axis container. <br> Component of the "Axis container" function. |

### 2.3 Overview of the data

## Machine and setting data (SINUMERIK)

The machine and setting data are divided into the following areas:

| Range | Designation |
| :--- | :--- |
| from 9000 to 9999 | Displaying machine data |
| from 10000 to 18999 | General NC machine data |
| from 19000 to 19999 | Reserved |
| from 20000 to 28999 | Channel-specific machine data |
| from 29000 to 29999 | Reserved |
| from 30000 to 38999 | Axis-specific machine data |
| from 39000 to 39999 | Reserved |
| from 41000 to 41999 | General setting data |
| from 42000 to 42999 | Channel-specific setting data |
| from 43000 to 43999 | Axis-specific setting data |
| from 51000 to 51299 | General configuration machine data |
| from 51300 to 51999 | General cycle machine data |
| from 52000 to 52299 | Channel-specific configuration machine data |
| from 52300 to 52999 | Channel-specific cycle machine data |
| from 53000 to 53299 | Axis-specific configuration machine data |
| from 53300 to 53999 | Axis-specific cycle machine data |

## Data Identifiers

The identifier specified in the data description is displayed on the user interface. However, if the data is addressed in the part program, for example, the identifier of the relevant data area must precede the data identifier.

| Identifier | Data area |
| :--- | :--- |
| \$MM_ | Displaying machine data |
| \$MN_/ \$SN_ |  |
| \$MNS_/ \$SNS_ | General machine/setting data |
| \$MC_/ \$SC_ <br> \$MCS_/ \$SCS__ |  |
| \$MA_/ \$SA_ <br> \$MAS_/ \$SAS_ | Channel-specific machine/setting data |


| Characters | Meanings |
| :--- | :--- |
| $\$$ | System variables |
| M | Machine data (first letter) |
| S | Setting data (first letter) |


| Characters | Meanings |
| :--- | :--- |
| M, N, C, A, D | Subarea (second letter) |
| S | Siemens data (third letter) |

## Note

Axis-specific data can also be addressed with the axis name as an index. The internal axis identifier (AX1, AX2, AX3, ...) or the identifier specified in MD10000 \$MA_AXCONF_MACHAX_NAME_TAB can be used as the axis name.

## Example: \$MA_JOG_VELO[Y1]=2000

The JOG velocity of axis Y 1 is $2000 \mathrm{~mm} / \mathrm{min}$.

## Example: \$MA_FIX_POINT_POS[0,X1]=500.000

The value 500 is assigned to the first fixed point position on axis 1.

## Examples:

\$MN_AUXFU_GROUP_SPEC[2]='H41'
If the contents of a machine data is a STRING (e.g. X1) or a hexadecimal value (e.g. H41), the contents must lie between " ' " (e.g. 'X1' or 'H41').

Output instant in time of the auxiliary functions of the 3rd auxiliary function group.
\$MN_AXCONF_MACHAX_NAME_TAB[0]='X1'
String $X 1$ is assigned as the name for the first machine axis.
\$MA_REFP_SET_POS[0,X1]=100.00000
A value of 100 mm is assigned to the first reference point of axis X1.

## Examples:

Assignment to channel-specific machine data:

```
CHANDATA(1) ; Selection of the first channel
$MC CHAN NAME='CHAN1' ; Name of the first channel
$MC_AXCONF_GEOAX_NAME_TAB[1]='Y' ; Name of the 2nd geometry axis
    ; of the first channel 'Y'
R10=33,75 ; R10 of the first channel
```


## Display machine data

| 9006 | DISPLAY_SWITCH_OFF_INTERVAL | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Time for screen saver | DWORD | PowerOn |  |  |  |
| - | - | 15 | 0 | 30 | $7 / 3$ |  |$]$ M

Description:
This machine data specifies the duration in minutes after which the screen automatically switches to dark if no key has been pressed on the keyboard in the meantime.
The value 0 disables automatic light/dark switching.
Note:
The screen is only switched light/dark automatically if the NC/PLC interface signal DB1900 DBX5000.1 (screen dark) $=0$.

| 9009 | KEYBOARD_STATE |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Keyboard shift behavior at booting |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 2 | 0 | 2 | 7/3 | M |
| Description: | This machine date define Basic configuration of <br> 0: SW-CAPSLOCK OFF <br> 2: SW-CAPSLOCK ON | if | $\overline{S W-C A F}$ <br> he key | $f \text { th }$ |  |


| 9032 | HMI_MONITOR |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Define PLC data for HMI screen info |  | STRING | PowerOn |  |
| - |  |  |  |  |  |
| - | - - | - | - | $7 / 1$ | M |

Description: Pointer, with offset, to a PLC data block. This is required to report HMI monitor information to the PLC, e.g active HMI task.
Format: PLC-specific format for specifying a data block with byte offset, e.g. DB60. DBB10 for data block 60, byte 10 .

The monitor information reported by the HMI has a maximum length of 8 bytes.


## Description:

Rotation cycle time in the alarm display:
<500: no rotation in the alarm line
500 - 10000: cycle duration of alarm rotation in milliseconds
If a valid cycle time has been set, all alarms are displayed in the alarm line one after the other.
Each alarm is displayed for the specified time until it is replaced by the next alarm. If no alarm is present, cycle alarms or program messages are displayed, if required. However, these do not rotate.

| 9057 | ENABLE_CHANNEL_MSG_FILTER |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Filter program messages channel specifically |  | BOOLEAN | PowerOn |  |
| - |  |  |  |  |  |
| - | 1 | - | - | 7/3 | M |
| Description: | $0:$ The program messages of all channels are displayed in the alarm/message line. With multiple NCUs, the alarms and messages of all NCUs are displayed by default. The display can be restricted to the current NCU by the setting ServerMode Enabled=false in slaesvcconf.xml. |  |  |  |  |


| 9100 | CHANGE_LANGUAGE_MODE | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Language selection mode | BYTE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1 | 1 | 2 | $7 / 3$ |  |  |

Description: Language selection mode is defined:
$1=$ directly via selection list
2 = via setting of the 1st and 2nd language

| 9102 | SHOW_TOOLTIP | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display tooltip | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | 1 | $7 / 3$ |  |

Description: If the MD has been set to 1, tooltips will be displayed.

| 9103 | TOOLTIP_TIME_DELAY | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s |  |  |  |  |  |  |
| - | Time delay tooltip display | BYTE | Immediately |  |  |  |
| - | - | 1 | 0 | 60 | $7 / 3$ |  |

Description: Time delay for display of the tooltips in seconds.

| 9104 | ANIMATION_TIME_DELAY | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s |  |  |  |  |  |  |
| - | Time delay before animation of help screens | BYTE | Immediately |  |  |  |
| - | - | 10 | 5 | 60 | $7 / 3$ |  |

$\begin{array}{ll}\text { Description: } & \text { Time delay until the start of animation of help screens in seconds. } \\ & \text { The setting is not active for help screens that are exclusively animated. }\end{array}$

| 9105 | HMI_WIDE_SCREEN | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Display of the HMI as wide screen with OEM area always visible | BYTE | PowerOn |  |  |
| - | - | 0 | 1 | $7 / 2$ | M |
| - | - | 0 | 1 |  |  |

Description: Display of the HMI as wide screen. Above the HMI there is a separate application field that is designed by the machine manufacturer.

| 9106 | SERVE_EXTCALL_PROGRAMS | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Process EXTCALL calls | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1 | 0 | 3 | $7 / 3$ |  |  |

```
Description: 0-3: Type of processing of external programs
0: HMI ignores EXTCALL instructions and selection via PLC.
1: HMI processes EXTCALL instructions and selection via PLC.
2: HMI processes EXTCALL instructions and ignores selection via PLC.
3: HMI ignores EXTCALL instructions and processes selection via PLC.
```

| 9107 | DRV_DIAG_DO_AND_COMP_NAMES |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Expanded drive diagnostics: DO and components |  |  |  |  |  | BYTE | Immediately |
| - | - | 3 | 0 | 3 | $7 / 3$ |  |  |  |
| - | - |  |  |  |  |  |  |  |

Description: 0: DO and component type names
1: Real DO names and component type names
2: DO type names and real component names
3: Reale DO names and real component names


Description: If the machine data has been set to 1, the SINUMERIK Integrate softkey appears as the operating area.

| 9112 | HMI_SKIN | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Design of the operator panel (skin) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | 10000 | $7 / 1$ |  |

Description:
Design of the operator panel. The number of the skin is stated.
0 = Skin 0 (traditional)
1 = Skin 1 (new)


Description: Diagnostics and correction support for easyXML scripts
0 = No diagnostics active
1 = Syntax check active

| 9114 | SIDESCREEN |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | SINUMERIK Operate Sidescreen |  |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | 1 | 7/1 | M |
| Description: | $\begin{aligned} & \text { Activatic } \\ & 0=\text { Sides } \\ & 1=\text { Sides } \\ & 2=\text { SINUM } \end{aligned}$ | SINUMERI <br> deactiv <br> activat <br> Operate | Si |  |  |  |


| 9115 | SAVE_CREDENTIALS | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Back up access authorizations for network drives | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $7 / 1$ |  |

## Description:

Back up access authorizations for network drives when archiving
0 = Dialog hidden
1 = No dialog, access authorizations are not backed up
2 = No dialog, access authorizations are always backed up

| 9900 | MD_TEXT_SWITCH |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Plaintexts instead of MD identifier | BOOLEAN | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - | U |  |  |  |  |

Description: If the MD has been set to 1, clear text is displayed on the operator panel instead of the machine data identifiers.

| 9990 | SW_OPTIONS | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Enable HMI software options | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | - | - |  |  |

Description:
Here you can enable the HMI software options

### 4.1 General NC machine data

| 10000 | AXCONF_MACHAX_NAME_TAB | N01, N11 | K2, F1, G2, F2, K5, M1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Machine axis name | STRING | PowerOn |  |  |  |
| - | 31 | X1, Y1, Z1, A1, B1, C1, <br> U1, V1 | - | - | M |  |

Description:
List of the machine axis identifiers
The name of the machine axis is entered in this MD.
In addition to the fixed, defined machine axis identifiers "AX1", "AX2" ..., userdefined identifiers for the machine axes can also be assigned in this data.
The identifiers defined here can be used parallel to the fixed, defined identifiers for addressing axial data (e.g. MD) and machine axis-related NC functions (reference point approach, axial measurement, travel to fixed stop).

Special cases:

- The input machine axis name must not conflict with the names and assignments of the geometry axes (MD20060 \$MC_AXCONF_GEOAX_NAME_TAB, MD20050
\$MC_AXCONF_GEOAX_ASSIGN_TAB) and channel axes (MD20080 \$MC_AXCONF_CHANAX_NAME_TAB, MD20070 \$MC_AXCONF_MACHAX_USED).
The input machine axis name must not conflict with
Names for Euler angles (MD10620 \$MN_EULER_ANGLE_NAME_TAB)
Names for path-relevant orientations (MD10624 \$MN_ORIPATH_LIFT_VECTOR_TAB)
Names for normal vectors (MD10630 \$MN_NORMAL_VECTOR_NAME_TAB)
Names for direction vectors (MD10640 \$MN_DIR_VECTOR_NAME_TAB)
Names for rotation vectors (MD10642 \$MN_ROT_VECTOR_NAME_TAB)
Names for intermediate vector components (MD10644 \$MN_INTER_VECTOR_NAME_TAB)
Names for intermediate circle point coordinates for CIP (MD10660 \$MN_INTERMEDIATE_POINT_NAME_TAB)
Names for interpolation parameters (MD10650 \$MN_IPO_PARAM_NAME_TAB).
- The input machine axis name must not include any of the following reserved address letters:
D Tool offset
(D function)
E Reserved
F V Feedrate
( $F$ function)
G Path condition

H Auxiliary function (H function)
L Subroutine call
M Miscellaneous function (M function)
N Subblock
P Subroutine number of passes
R Arithmetic parameters
$S$ Spindle speed $\quad$ T function) Tool (T function)
The name must not include any keywords (e.g. DEF, SPOS etc.) or pre-defined identifiers (e.g. ASPLINE, SOFT).
The use of an axis identifier consisting of a valid address letter (A, B, C, I, J, K, Q, U, V, W, X, Y, Z), followed by an optional numerical extension (1-99) gives slightly better block change times than a general identifier.
If no identifier is assigned to a machine axis, the predefined name ("AXn") applies to the nth machine axis).
Related to....

MD20060 \$MC_AXCONF_GEOAX_NAME_TAB (geometry axis name in the channel [GEOAxisno.]
MD20080 \$MC_AXCONF_CHANAX_NAME_TAB (channel axis name in the channel [Channelaxisno.]

| 10002 | AXCONF_LOGIC_MACHAX_TAB | N01 | B3, K2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Logical NCK machine axis image | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 31 | AX1, AX2, AX3, AX4, <br> AX5, AX6, AX7, AX8... | - | - | M |  |

## Description:

List of machine axes available on an NCU. (Logical NCK machine axis image)
MD10002 \$MN_AXCONF LOGIC_MACHAX_TAB creates another NCK global, logical layer between the channel axis layer and the machine axes in an NCU or NCU grouping. This layer is called the "Logic NckMachineAxImage", abbreviation: LAI ).

Axes can only be assigned between different NCUs via this new intermediate layer! The entry MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[ n] = NCj_AXi assigns the machine axis $i$ on the NCU j to the axis index " $\bar{n}$ " in the LAI.
This makes the following assignments possible:

1. Local axes (default setting: AX1, AX2 ... AX31)

The entry MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[n] = AX3 assigns the local axis AX3 to axis index $n$. (Default setting $A x 3$ is present for $n=3$. Thus there is compatibility in software version 5 for MD blocks for software versions up to 4).
2. Link axes (axes that are physically connected to another NCU). The entry MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[n] = NCj_AXi assigns axis AXi (link axis) on NCU j to axis index $n$.

Limits:
n Machine axis address (of the local NCU) 1 ... 31
j NCU number 1 ... 16
i Machine axis address (of the local/remote NCU) 1 ... 31
3. Axis container in which there are once again either local or link axes. The entry MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[n] = CTr_SLs assigns container $r$ and slot $s$ to axis index $n$.

Limits:
n Machine axis address (of the local NCU) 1 ... 31
r Container number 1 ... 16
s Slot number (location) in the container 1 ... 32
The channel layer is formed via the related machine data \$MD20070
\$MC_AXCONF_MACHAX_USED and no longer points (small P5) directly to the machine axes but to the new LAI layer.
MD20070 \$MC_AXCONF_MACHAX_USED [k]=n assigns the LAI axis number "n" to the axis index "k" in the channel layer.
The machine axis and the corresponding NCK can then be determined from the LAI axis number.

If a number of NCUs point to the same machine axis in the cluster as a result of MD10002 \$MN AXCONF LOGIC MACHAX TAB, then the axial machine data MD30554
\$MA_AXCONF_ASSIGN_MASTER_NCU must define which NCU generates the master NCU and the setpoint values for the position controller after startup.

Related to:
MD12... \$MN_AXCT_AXCONF_ASSIGN_TABi (make entries in containers i)

| 10010 | ASSIGN_CHAN_TO_MODE_GROUP | N01, N02, N11 | K1, K5 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Channel valid in mode group | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $1,0,0,0,0,0,0,0 \ldots$ | 0 | 10 |  |  |
| $7 / 2$ | M |  |  |  |  |  |

Description:
This MD assigns the channel to a mode group

Entry value 1 => Assigned to 1st mode group
Entry value 2 => Assigned to 2nd mode group
etc.
From software version 4, it is permissible not to assign a mode group number to individual channels.
Channel gaps are allowed, in order to favor uniform configuration in similar types of machines. In this case, the number 0 is assigned to the channel instead of assigning a mode group number equal to or greater than 1 . The channel is not activated, however it is handled like an active channel when counting the channels.
E. 9 .

ASSIGN_CHAN_TO_MODE_GROUP[0] = 1
ASSIGN_CHAN_TO_MODE_GROUP[1] = 1
ASSIGN_CHAN_TO_MODE_GROUP[2] = 0 ; gap
ASSIGN_CHAN_TO_MODE_GROUP[3] = 1
Application example:
Select desired channel via HMI and enter with MD10010 \$MN_ASSIGN_CHAN_TO_MODE_GROUP = 1 .

Note:
This MD must still be entered even when only one mode group is present.


| 10061 | POSCTRL_CYCLE_TIME | N01, N05 | G3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| s | Position control cycle | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.0 | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |

Description: Position controller cycle time:
Display of the position controller cycle time

| 10062 | POSCTRL_CYCLE_DELAY | N01, N05 | G3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Position control cycle offset |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.000 | 0.008 |  |  |  |  |

Description:
For PROFIdrive only:
Only relevant to operation with PROFIBUS drives.
Position controller cycle offset in relation to the PROFIBUS DP cycle.
Offsets that exceed the set DP cycle or are smaller than the maximum Tdx, are automatically corrected to a substitute value half the size of the DP cycle. MD10062 \$MN_POSCTRL_CYCLE_DELAY > 0: Default for position controller offset MD10062 \$MN_POSCTRL_CYCLE_DELAY = 0: Automatic determination of the position controller offset with max. Tdx from STEP7 project
Tdx_max is determined through all equidistant buses.
The actually active offset value is displayed in MD 10063[1]
\$MN_POSCTRL_CYCLE_DIAGNOSIS.
Note:
MD10062 \$MN_POSCTRL_CYCLE_DELAY > 0 can reduce MD10050 \$MN_SYSCLOCK_CYCLE_TIME to the automatic correction of this $M D$ that cannot be undone by a subsequent increase.
Recommendation:
In this case set the original value or default value once again.


## Description:

Diagnostic data related to the PROFIBUS/PROFINET cycle.
[0]: Latest time at which the actual values should be available (Tdx)
[1]: Actually active position controller cycle offset (Tm)
[2]: Latest time at which the setpoints were output by the position controller
[3]: Time at which the setpoint transfer to the drive via DMA was started for Soc-based modules
[4]: Time at which the setpoint transfer to the drive via DMA was finished for SOCbased modules.
[5]: 'Worst case' time since voltage on, at which the setpoint transfer to the drive via DMA was finished for SOC-based modules.

Diagnostic data are initialized with ZERO with each NCK power up

| 10064 | POSCTRL_CYCLE_DESVAL_DELAY | N01, N05 | G3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Clock skew of the DMA for the setpoints |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.000 | 0.008 |  |  |  |  |

Description:
For SINAMICS-Integrated only:

Only relevant to operation with SINAMICS-Integrated drives on SOC modules.
Offset of the output of the setpoints via DMA in relation to the PROFIBUS DP cycle. Modification of MD10064 POSCTRL_CYCLE_DESVAL_DELAY requires a warm restart of the NCK and drive.

Offsets that exceed the set DP cycle are automatically corrected to a substitute value. MD10062 \$MN_POSCTRL_CYCLE_DESVAL_DELAY > 0: Default setpoint offset
MD10062 \$MN_POSCTRL_CYCLE_DESVAL_DELAY = 0: Automatic determination of the setpoint offset on the basis of the hardware transfer rates

The actually active offset value is displayed in MD10063
\$MN_POSCTRL_CYCLE_DIAGNOSIS[4].
Note:
MD10064 \$MN POSCTRL CYCLE DESVAL DELAY > 0 can reduce MD10050 \$MN SYSCLOCK CYCLE TIME to the automatic correction of this MD, which cannot be undone by a subsequent increase.

Recommendation:
In this case, set the original value or default value again.

| 10070 | IPO_SYSCLOCK_TIME_RATIO | N01, N05, N11 | G3, R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Factor for interpolation cycle | DWORD | PowerOn |  |  |  |
| SFCO |  |  |  |  |  |  |
| - | - | 4 | 1 | 100 | $7 / 2$ |  |

Description: The interpolator cycle is stated as a multiple of the time units of the system basic cycle MD10050 \$MN_SYSCLOCK_CYCLE_TIME.
Only integer multiples of the position control cycle can be set. Values that are not an integer multiple of the position control cycle are automatically increased to the next integer multiple of the position control cycle before they become active (on next power up).
This is accompanied by alarm 4110 "IPO cycle changed to [ ] ms".

| 10071 | IPO_CYCLE_TIME |  |  |  |  |  | N01, N05, N11 | G3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Interpolator cycle | DOUBLE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | ReadOnly |  |  |  |

Description:
Interpolation time
Display of the interpolator cycle time

| 10072 | COM_IPO_TIME_RATIO |  |  |  |  |  | N01, N05 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Division ratio between IPO and communication task | DOUBLE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | 100.0 |  |  |  |  |

Division ratio between IPO and communication tasks. A value of 2 means, e.g., that the communication task is only processed in every second IPO cycle. This makes more time available for the other tasks. Overlarge values slow down the communication between the HMI and NCK.

Numerical values less than 1 downscale the IPO cycle. This value is adjusted so that only runtimes that are a multiple of the position controller time are possible for the communication task. A call period of about 10 ms is practical for the communication task.

| 10088 | REBOOT_DELAY_TIME | EXP | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| s | Reboot delay | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.2 | 0.0 | 1.0 |  |  |
| $2 / 2$ | M |  |  |  |  |  |

Description:
The reboot following PI "_N_IBN_SS" is delayed by the time MD10088 \$MN_REBOOT_DELAY_TIME.
The suppressable NOREADY alarm 2900 is triggered immediately by PI "_N_IBN_SS". If MD10088 \$MN_REBOOT_DELAY_TIME falls below the MD36620 \$MA_SERVO_DISABLE_DELAY_TIME value of an axis, the axis is decelerated during MD10088 \$MN_REBOOT_DELAY_TIME. The servo enable is then disabled. That is, the full MD36620 \$MA_SERVO_DISABLE_DELAY_TIME is NOT waited.

Alarm 2900 does not become active if MD10088 \$MN_REBOOT_DELAY_TIME $=0.0$, and there is no reboot delay.
The NCK waits beyond the stated delay time until the PI has been able to be acknowledged to the HMI. The total delay time may be as much as 2 s .

| 10089 | SAFE_PULSE_DIS_TIME_BUSFAIL | N01, N06 | FBSI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| s | Delay time pulse suppr. for bus failure | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.0 | 0 | 0.8 |  |  |

## Description:

Time after a communication failure with the drive at which safe pulse disable takes place. The drive can still respond autonomously to the bus failure during this time (see extended stop and retract)
In the following cases, this time is not allowed to elapse before disabling pulses:

- On selection of an external Stop A or a test stop
- If SBH is active or on selection of SBH
- If an $S G$ level is active or on selection of an $S G$ level for which an immediate pulse disable is parameterized in MD36961 \$MA_SAFE_VELO_STOP_MODE or MD36963 \$MA_SAFE_VELO_STOP_REACTION.
Note:
This value is transferred to the drive parameter p9580 with the copy function of the SI-MD and compared in the data cross-check. This general machine data is contained in the axis-specific checksum calculation of the safety-related machine data (MD36998 \$MA_SAFE_ACT_CHECKSUM, MD36999 \$MA_SAFE_DES_CHECKSUM).

| 10090 | SAFETY_SYSCLOCK_TIME_RATIO |  |  | N01, N06 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Factor for monitoring cycle |  |  | DWORD | Pow |  |
| SFCO |  |  |  |  |  |  |
| - | 3 |  | 1 | 50 | 7/1 | M |

## Description:

Ratio between the monitoring cycle and the system clock cycle. The monitoring cycle is the product of this data and MD10050 \$MN_SYSCLOCK_CYCLE_TIME.

The monitoring cycle is checked during power on:

- It must be an integer multiple of the position-control cycle
- It must be $<25 \mathrm{~ms}$

The factor is rounded down to the next possible value if the conditions are not fulfilled. The actual set monitoring cycle is displayed by MD10091 \$MN_INFO_SAFETY_CYCLE_TIME.
A new value is also generated for the cross-check cycle, which is displayed by data MD10092 \$MN_INFO_CROSSCHECK_CYCLE_TIME.
Note:
The monitoring cycle defines the monitoring response time. It must be noted that the CPU load increases as the monitoring cycle becomes shorter.

```
Related to:
MD10050: $MN_SYSCLOCK_CYCLE_TIME
MD10091: $MN_INFO_SAFETY_CYCLE_TIME
MD10092: $MN_INFO_CROSSCHECK_CYCLE_TIME
```



| 10092 | INFO_CROSSCHECK_CYCLE_TIME |  | N01, N06, N05 | FBSI |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| S | Display of cycle time for cross-checking |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | - 0.0 | - | - | ReadOnly | S |

## Description: Display data:

Maximum cross-check cycle in seconds.
Derived from MD10091 \$MN_INFO_SAFETY_CYCLE_TIME and the number of data to be crosschecked. (This may vary depending on the enabled functionality of the individual axes.) The data value is recalculated as soon as one of the following data are changed:
MD10090 \$MN_SAFETY_SYSCLOCK_TIME_RATIO,
MD10060 \$MN_POSCTRL_SYSCLOCK_TIME_RATIO,
MD10050 \$MN_SYSCLOCK_CYCLE_TIME
The new value does not become active until after the next power-on.
Related to:
MD10090: \$MN_SAFETY_SYSCLOCK_TIME_RATIO
MD36992: \$MA_SAFE_CROSSCHECK_CYCLE

| 10094 | SAFE_ALARM_SUPPRESS_LEVEL |  |  |  |  |  | EXP, N06, N05 | FBSI |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Alarm suppress level |  |  |  |  |  | BYTE | PowerOn |
| - | - | 2 | 0 | 113 | $7 / 2$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: Affects the display of safety alarms. The monitoring channels NCK and drive or NCK and PLC display alarms with the same meaning in several situations.
To reduce the volume of the alarm display, this MD is set to define whether safety alarms with the same meaning are to be hidden or not. This does not affect the dualchannel stop response.
0 = Dual-channel triggered alarms are displayed in full

- Dual-channel display of all axis-specific safety alarms
- Alarm 27001, error code 0 is displayed
- Alarms 27090, 27091, 27092, 27093, and 27095 are dual-channel and are displayed several times.

1 = Alarms with the same meaning are only displayed once.
The following alarms can be affected by this:
$27010=C 01707$
$27011=\mathrm{C} 01714$
$27012=\mathrm{C} 01715$
$27013=C 01706$
$27020=C 01710$
$27021=C 01709$
$27022=C 01708$
$27023=C 01701$
$27024=C 01700$
In the case of these alarms, only one of the alarms listed (270xx or C01xxx) is triggered.
The alarm of the monitoring channel that triggers the alarm with the same meaning at a later time is no longer displayed.

Furthermore, alarm 27001 with error code 0 is suppressed. This alarm is triggered as a result of drive alarm c01711. In this case, drive parameters r9710[0,1], r9711[0,1], r9735[0,1], r9736[0,1], r9737[0,1], r9738[0,1], r9739[0,1] provide further information about the cause of the error.

2 = Default setting
In addition to the functionality with MD value = 1, the alarms from SPL processing (27090, 27091, 27092, 27093, and 27095) are displayed in one channel and only once. This also applies to the alarms for PROFIsafe communication (27250 and following).
3 = Axis-specific alarms 27000 and A01797 are replaced by alarm message 27100 for all axes / drives. Alarm 27040 is replaced by alarm 27140 for all axes/ drives.
12 = The alarms are prioritized beyond the functionality with MD value $=2$. Obvious subsequent alarms are no longer displayed or are automatically cleared from the display.
The following alarms can be affected by this:
27001, 27004, 27020, 27021, 27022, 27023, 27024, 27091,
27101, 27102, 27103, 27104, 27105, 27106, 27107
13 = The alarms are prioritized beyond the functionality with MD value = 3 (as with MD value 12).
1 xx (100 digit set) = Axis-specific checksum alarms of the NCK (27032, 27035, and 27060) are displayed in SPL setup mode (MD11500 \$MN_PREVENT_SYNACT_LOCK[0,1] = 0) by alarm 27135 for all axes.
This machine data must be set to 0 to create an acceptance log, so that the triggering of all alarms can be logged.

| 10095 | SAFE_MODE_MASK |  |  |  |  |  | EXP, N06 | FBSI |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | 'Safety Integrated' operating modes | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | $0 \times 00000000$ | $0 \times 0000001 \mathrm{E}$ | $7 / 2$ |  |  |  |

Description:
Bit $1=0$ : The "Modular PROFIsafe I/O connection" function is not active.
Bit $1=1:$ The "Modular PROFIsafe I/O connection" function is active.
Bit $2=0$ : The reduced language scope for SAFE.SPF is only activated during run-up in the case of automatic startup (MD20108 \$MC_PROG_EVENT_MASK bit 5)
Bit 2 = 1: The reduced language scope for SAFE.SPF is also activated if the CALL command is used to call SAFE.SPF.

Bit 3 = 0: All PROFIsafe drivers in one IPO cycle
Bit 3 = 1: PROFIsafe drivers distributed over a number of IPO cycles
Bit 4 = 0: In "SINUMERIK Safety Integrated (SPL)" safety mode, NC axes cannot be linked to the drive monitoring functions via SIC/SCC
Bit 4 = 1: In "SINUMERIK Safety Integrated (SPL)" safety mode, NC axes can be linked to the drive monitoring functions via SIC/SCC

Related to:
Bit 1:
MD13302: \$MN_PROFISAFE_IN_ENABLE_MASK
MD13303: \$MN_PROFISAFE_OUT_ENABLE_MASK
Bit 2:
MD20108: \$MC_PROG_EVENT_MASK, Bit 5

| 10096 | SAFE_DIAGNOSIS_MASK | EXP, N06, N05 | FBSI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | 'Safety Integrated' diagnostics functions | UDWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | $0 \times 000 \mathrm{~F}$ | $7 / 2$ |  |

SGE differences between NCK and drive monitoring channels are not displayed
Bit $0=1$ :
Default setting: SGE differences between NCK and drive monitoring channels are displayed. Differences between the following SGEs are displayed (the bit numbers stated refer to the axis-specific map of the SGEs; they correspond to the assignment of the axis-specific VDI interface:
Bit 0: DB31, ... DBX22.0 (SBH/SG deselection)
Bit 1: DB31, ... DBX22.1 (SBH deselection)
Bit 3: DB31, ... DBX22.3 (SG selection: Bit 0)
Bit 4: DB31, ... DBX22.4 (SG selection: bit 1)
Bit 12: DB31, ... DBX23.4 (activate SE 2)
Bit 28: DB31, ... DBX33.4 (SG correction: bit 0)
Bit 29: DB31, ... DBX33.5 (SG correction: bit 1)
Bit 30: DB31, ... DBX33.6 (SG correction: bit 2)
Bit 31: DB31, ... DBX33.7 (SG correction: bit 3)
The differences are displayed by message alarm 27004.
Bit $1=0$ : Default setting: Display of a non-executed SPL start after expiration of the time set in MD13310 \$MN_SAFE_SPL_START_TIMEOUT with alarm 27097
Bit 1 = 1: Display of alarm 27097 is suppressed
Alarm 27097 indicates that despite the SPL configuration an SPL start has not been executed after expiration of the time set in MD13310 \$MN_SAFE_SPL_START_TIMEOUT. Alarm description 27097 explains why.
Bit 2 = 0: Default setting: Communication errors are displayed with SFC error codes in alarm 27354
Bit 2 = 1: Display of alarm 27354 is suppressed
Bit 3 = 0: Default setting: alarm 27038 is displayed if an unknown bit is set in drive parameter r474.
Bit 3 = 1: Display of alarm 27038 is suppressed

| 10097 | SAFE_SPL_STOP_MODE |  | N01, N06 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Stop reaction for SPL errors |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 3 | 3 | 4 | 7/2 | M |

### 4.1 General NC machine data

Description: Selection of the stop response when errors are detected in the NCK / PLC SPL crosscheck.

3: Stop D
4: Stop E
Entering the value 4 in this MD (Stop E), without external Stop E being enabled in all axes with SI function enable (MD36901 \$MA_SAFE_FUNCTION_ENABLE not equal to 0), results in alarm 27033 with a reference to this MD.
As a remedy, either Stop $D$ must be parameterized again, or bits 4 and 6 must be set in MD36901 \$MA_SAFE_FUNCTION_ENABLE for all affected axes.
If this MD is set to 4, the PLC signal DB18 DBX36.1 (Stop E) must also be set to 1 to make this parameterization known to the PLC. Different parameterization results in alarm 27090.

| 10098 | PROFISAFE_IPO_TIME_RATIO | N01, N10 | FBSI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Factor for PROFIsafe communication | DWORD | PowerOn |  |  |  |
| SFCO |  |  |  |  |  |  |
| - | - | 1 | 1 | 25 | $7 / 1$ |  |

Description:
Ratio between PROFIsafe communication and interpolator cycle. The actual PROFIsafe communication cycle is the product of this data and MD10071 \$MN_IPO_CYCLE_TIME, and is displayed in MD10099 \$\$MN_INFO_PROFISAFE_CYCLE_TIME. The OB40 on the PLC side is triggered from the NCK sī̄${ }^{\text {d }}{ }^{-}$this cycle to run the communication between $F$ master and $F$ slaves.
The PROFIsafe communication must not exceed 25 ms .

| 10099 | INFO_PROFISAFE_CYCLE_TIME |  | N01, N10, N05 | FBSI |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | PROFIsafe communication cycle time |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | 0.0 | - | - | ReadOnly | S |

## Description: Display data:

Displays the maximum time frame within which communication is performed between the F master and $F$ slave. In this time frame, PROFIsafe communication is operated on the PLC via OB40.
The value is derived from the interpolator cycle and MD10098
\$MN_PROFISAFE_IPO_TIME_RATIO.
If the selected communication cycle is exceeded in cyclic operation, this is also displayed here.
In the case of a parameterization error (communication cycle exceeds the maximum value of 25.0 ms ), the maximum value that can be set is displayed.

| 10100 | PLC_CYCLIC_TIMEOUT |  | EXP, N01, N06 | P3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Maximum PLC cycle time |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | 0.1 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

Description:
Cyclical PLC monitoring time.
This machine data specifies the maximum monitoring time after which the PLC must have
incremented its sign of life. Incrementing takes place within the interpolation cycles.

| 10110 | PLC_CYCLE_TIME_AVERAGE |  | N01, N07 | B1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Average PLC acknowledgment time |  | DOUBLE | Pow |  |
| - |  |  |  |  |  |
| - | 0.05 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

Description: Time information for the CNC about the OB1 cycle time. During this cycle time, it is guaranteed that the auxiliary functions will be acknowledged.

By means of the MD, the status transitions:
"channel operates/ channel in RESET/ channel failure --> channel interrupted" can be delayed for the PLC in case of a RESET. With the output "channel interrupted", the NCK waits at least the time indicated in the MD +1 IPO cycle.
With the time indication, the path feedrate during path control operation in case of an auxiliary function output during motion is controlled in a way to ensure that the minimum travel time corresponds to the time information. This ensures a uniform velocity behavior which is not disturbed by waiting for the PLC acknowledgment. The internal incrementation is performed in the interpolation cycle.
For the auxiliary function output in the continuous-path mode, the MD is also relevant for the FM357 and 802/802s systems. With SW 5.1 and higher, the other systems are parameterized directly via the PLC.

| 10120 | PLC_RUNNINGUP_TIMEOUT |  |  |  |  |  | EXP, N01, N06 | H2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Monitoring time for PLC power up |  |  |  |  |  | DOUBLE | PowerOn |
| - | - | 50.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Power up PLC monitoring time
This machine data specifies the maximum monitoring time within which the PLC must report its first sign of life to the NCK. During the power up routine, the monitoring function has the task of verifying that the PLC has properly assumed cyclic operation. If the PLC does not issue a message within this time, the NC issues an alarm message when it powers up; NC-READY is not set. The incrementing takes place within the interpolation cycles.

| 10125 | EES_NC_NAME |  |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | NCU name for the generation of unique NC program names in <br> EES mode | STRING | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | - | - | $7 / 2$ | M |  |  |  |  |

Description: The user can assign a unique NCU name to each NCU with MD10125 \$MN_EES_NC_NAME. Similarly to \$P_CHANNO, this can then be used to generate unique NCU program names in EES mode.
Example: \$MN_EES_NC_NAME="NC1"
DEF STRING[31] FILENAME
FILENAME = "MYFILE_" << \$MN_EES_NC_NAME << "_" << \$P_CHANNO << ".SPF"
The variable FILENAME is then given the value "MYFILE_NC1_1.SPF" in the first channel on the NCU "NC1".
Background:
In EES mode, the part program memory can be located on a network drive which is accessed by multiple NCUs. Conflicts could be generated with the part program commands WRITE and DELETE if unique file names are not used. The generation of unique NCU program names in the user program is supported by MD10125 \$MN_EES_NC_NAME.

| 10127 | EES_MOUNT_FILE | EXP | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Path and name of the file with the mounted drives | STRING | PowerOn |  |  |
| - | - | /user/sinumerik/mnt/ <br> devices.Ist | - | ReadOnly | S |

[^0]

| 10131 | SUPPRESS_SCREEN_REFRESH | EXP | A2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Screen refresh response under overload | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $7 / 2$ |  |

Description: There are part programs in which the main run (HL) has to wait until the pre-processing (VL) makes new blocks available.

The pre-processing and display update compete for NC computing time. The MD defines how the $N C$ is to respond when the pre-processing is too slow.
0 : When the VL of a channel is too slow, the updating of the display is suppressed in all channels.

1: When the VL of a channel is too slow, the updating of the display is suppressed only in the time-critical channels in order to gain time for the pre-processing. 2: The updating of the display is never suppressed.

| 10132 | MMC_CMD_TIMEOUT | EXP, N01, N06 | PA, M4 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Monitoring time for HMI command in the part program |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 100.0 | $7 / 2$ | M |  |  |  |

## Description:

Monitoring time in seconds until the HMI acknowledges a command from the part program.
The following times are monitored:

- In the case of an HMI command without acknowledgment: time from triggering the transfer of the command string until successful transmission to the HMI
- In the case of an HMI command with synchronous and asynchronous acknowledgment: time from triggering the transfer of the command strings until receipt of the acceptance acknowledgment from the HMI
- For EXTCALL command and execution from external drives: time between the transmission triggering of the command string and the successful sending to the HMI.

| 10133 | START_LOCK_TIMEOUT |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Monitoring time for channel-specific start disable and WRITE lock |  |  |  |  |  |  |  |
| DOUBLE |  |  |  |  |  |  |  |  |
| - |  | PowerOn |  |  |  |  |  |  |
| - | - | 0.0 | 3.0 | ReadOnly | S |  |  |  |

Description: MD10133 \$MN_START_LOCK_TIMEOUT is evaluated in two situations:

1. If an NC channel is started in AUTO mode (NC Start key) with channel-specific start disable set (not program-specific start disable), then the start is executed if the start disable is reset within the waiting time configured in MD10133 \$MN_START_LOCK_TIMEOUT.
2. If an NC program, for which a Write lock has been set (e.g. by the HMI Editor), is to be processed in EES mode (Execution from External Storage), then the processing is stopped with alarm 14007 after expiry of the waiting time configured by MD10133 \$MN_START_LOCK_TIMEOUT.


Description:
Possible number of simultaneous HMI communication partners with which the NCU can exchange data.
This value affects then number of communication orders that the NCK can manage. The higher the value, the more HMIs that can be simultaneously connected to the NCK without leading to communication problems.
DRAM is made available for this function in the NCU corresponding to the input in the machine data. The inputs for changing the memory areas have to be taken into account. The unit of MD10134 \$MN_MM_NUM_MMC_UNITS is a "resource unit".
A standard HMI needs 1 resource unit, an HMIIO0/103 needs 2 . OEM variants may need more or less resources.

- If the value is set lower than would be needed for the number of connected HMIs, this is not inevitably problematical. Actions may not function sporadically during multiple, simultaneous, communication-intensive operations (e.g. loading a program): Alarm 5000 is displayed. The operation then has to be repeated.
- If the value is et higher, more dynamic memory is occupied than necessary. The value should be reduced appropriately if the memory is required for other purposes.
References: /FB/, S7, "Memory Configuration"

| 10136 | DISPLAY_MODE_POSITION | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display mode for actual position in the Work | DWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 1$ |  |$]$ M

Description:

Defines how the position and the distance to go are displayed in the Work.
0: Display as in software version 5 and earlier
1: At end of block, the actual value display is in principle the same as the programmed end point, irrespective of where the machine actually is (e.g. as a result of the tool radius compensation). The distance to go is the same as the actual distance to be traversed. This means that the displayed actual postion has to be the same as the displayed end position minus the distance to go, irrespective of the actual machine position. If the block end points are changed by chamfers, radii, contour definitions, splines or SAR in comparison to the NC programm, then these changes are reflected in the display as if thay had been programmed. This does not apply to changes resulting from tool radius compensation or smoothing.

| 10156 | TASK_SLEEP_TIME |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Average time transfer per cycle | EXP | - |  |  |
| NBUP |  |  |  |  |  |
| - | - | 0 | DWORD | Immediately |  |
| Description: | Only relevant to simulation systems <br> The unit of the machine data is the microsecond. |  |  |  |  |

In the simulation environment, a machining run designates execution of the tasks Server, IPO, and PREP, which are not interrupted
This machine data now specifies the average time that is allocated to the operating system of the simulation host system per machining run.
As it is not usually possible to allocate times in the microsecond range in the operating system of the simulation host system, the times are calculated over multiple cycles, and then the default time set by the operating system (typically between 10 15 milliseconds) is allocated. A number of cycles are therefore run without delay, and there is correspondingly longer wait later, so that the time set in the MD is allocated as an overall average. The value 0 deactivates the time allocation.
E.g.: If MD10156 \$MN_TASK_SLEEP_TIME is set to the value 50 (microseconds), and the minimum allocated time defined $\bar{b} y$ the operating system is 10 milliseconds ( $=10000$ microseconds), there will be a delay of 10 milliseconds every 200 cycles (10000/50).

| 10160 | PREP_COM_TASK_CYCLE_RATIO | EXP, N01 | ECO |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Factor for communication with HMI | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 3 | 1 | 50 | M |  |  |  |

## Description:

This machine data specifies the division ratio used for activating the communication task in the non-cyclic time level. This allows the time share of preparation in the non-cyclic time level to be increased, which reduces block change times. This slows down external communication (file transfer), especially during program execution (group-by-group reload).

| 10185 | NCK_PCOS_TIME_RATIO | EXP, N01 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\%$ | Processing time share NCK | DOUBLE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 90.0 | 90.0 | 95.0 | $7 / 2$ |  |  |

## Description:

This machine data defines the maximum proportion of CPU time given to the NC kernel in the entire system. The division specified by the user is implemented as well as possible.
When implementing the specification, the system takes into account limiting values for the absolute proportion of CPU time that must not be exceeded or undershot.
Adaptations are made without generating an alarm.

| 10190 | TOOL_CHANGE_TIME | N01 | BA |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| s | Tool changing time for simulation | DOUBLE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |  |

Description: This data defines how much time is estimated for a tool change (only relevant for a simulation).

| 10192 | GEAR_CHANGE_WAIT_TIME | N01 | S1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| s | Gear stage change waiting time | DOUBLE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 10.0 | 0.0 | $1.0 e 5$ | 7/2 |  |  |

Description:
External events which trigger reorganization, wait for the end of a gear stage change. GEAR_CHANGE_WAIT_TIME now determines the waiting time for the gear stage change. Time unit in seconds.
When this time expires without the gear stage change having been terminated, the NCK reacts with an alarm.

Among others, the following events will cause reorganization:
User ASUB

Mode change
Delete distance-to-go
Axis replacement
Activate user data


Description: This MD defines the number of internal increments per millimeter.
The accuracy of the input of linear positions is limited to the calculation accuracy by rounding the product of the programmed value and the calculation accuracy to an integer.
In order to keep the executed rounding easily understandable it is useful to use powers of 10 for the calculation accuracy.

| 10210 | INT_INCR_PER_DEG |  | N01 | G2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Calculation resolution for angular positions |  | DOUBLE | Pow |  |
| LINK |  |  |  |  |  |
| - | - $\quad 1000.0$ | 1.0 | 1.0e9 | 7/2 | M |

## Description:

This MD defines the number of internal increments per degree.
The accuracy of the input of angular positions is limited to the calculation accuracy by rounding the product of the programmed value and the calculation accuracy to an integer.
In order to keep the executed rounding easily understandable it is useful to use powers of 10 for the calculation accuracy.


Machine data

| 4 Linear acceleration | $1 \mathrm{~m} / \mathrm{s}^{2}$ | $1 \mathrm{inch} / \mathrm{s}^{2}$ |
| :--- | :--- | :--- |
| 5 Angular acceleration | $1 \mathrm{rev} / \mathrm{s}^{2}$ | $1 \mathrm{rev} / \mathrm{s}^{2}$ |
| 6 Linear jerk | $1 \mathrm{~m} / \mathrm{s}^{3}$ | 1 inch $/ \mathrm{s}^{3}$ |
| 7 Angular jerk | $1 \mathrm{rev} / \mathrm{s}^{3}$ | $1 \mathrm{rev} / \mathrm{s}^{3}$ |
| 8 Time | 1 s | 1 s |
| 9 Position-controller servo gain | $1 / \mathrm{s}$ | $1 / \mathrm{s}$ |
| 10 Revolutional feedrate | $1 \mathrm{~mm} / \mathrm{rev}$ | $1 \mathrm{~mm} / \mathrm{rev}$ |
| 11 Compensation value linear pos. | 1 mm | 1 mm |
| 12 Compensation value angular pos. | 1 degree | 1 degree |
| 13 Cutting speed | $1 \mathrm{~m} / \mathrm{min}$ | 1 feet $/ \mathrm{min}$ |

Example:
SCALING_USER_DEF_MASK =?H3?; (Bit nos. 0 and 1 as hex values)
The scale factor defined in the associated MD10230 \$MN_SCALING_FACTORS_USER_DEF[n] is activated for linear and angular positions.

If this machine data is changed, a power on is required as otherwise the associated machine data that have physical units would be incorrectly scaled.
Proceed as follows:

- MD changed manually

First start up and then enter the associated machine data with physical units.

- MD changed via machine data file

First start up and then reload the machine data file so that the new physical units are taken into account.
If the machine data are altered, alarm 4070 "Scaling machine data altered" is output. Application example: Input/output of linear velocities is to be in $\mathrm{cm} / \mathrm{min}$ :

SCALING_USER_DEF_MASK $=0 \times 4$ (bit no. 2 as hex value)
SCALING FACTORS USER DEF[2] = 0.166666667 (10/60)
[Related to:
MD10230 \$MN_SCALING_FACTORS_USER_DEF[n] (scaling factors of the physical variables)


The scaling factor of a physical variable that has a unit other than the default unit setting (set bit in MD10220 \$MN_SCALING_USER_DEF_MASK) is entered in this MD. The factor must refer to the unit used internally for the physical variable in question. The scaling factor is assigned to the physical variable using the index [0...12]. If this machine data is changed, a startup is required because otherwise the associated machine data that have physical units would be incorrectly scaled.

Proceed as follows:

- MD changed manually

First start up and then enter the associated machine data with physical units.

- MD changed via machine data file

First start up and then reload the machine data file so that the new physical units are taken into account.

If the machine data are altered, alarm 4070 "Scaling machine data altered" is output. Application example(s):
Input/output of angular speeds is to be in new degree/min: MD10220 \$MN_SCALING_USER_DEF MASK = 'H8'; (bit no. 3 as hex value) MD10230 \$MN_SCALING_FACTORS_USER_DEF[3] = 0.01851852; (400/360/60)
[3]: Index for angular speed.
Related to:
MD10220 \$MN_SCALING_USER_DEF_MASK (activation of scaling factors).

| 10240 | SCALING_SYSTEM_IS_METRIC |  | N01 | G2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Basic system metric |  | BOOLEAN | Pow |  |
| SCAL |  |  |  |  |  |
| - | TRUE | FALSE | TRUE | 7/2 | M |

## Description:

The MD defines the basic system used by the control for scaling length-dependent physical variables for data input/output.

All corresponding data are stored internally in the basic units of 1 mm , 1 degree and 1 sec .
In the case of access from the interpreter (part program and download), from the operator panel (variable service) or through external communication, scaling takes place in the following units:
MD10240 \$MN_SCALING_SYSTEM_IS_METRIC = 1: scaled in:
$\mathrm{mm}, \mathrm{mm} / \mathrm{min}, \mathrm{m} / \mathrm{s} 2$, $\mathrm{m} / \mathrm{s} 3, \mathrm{~mm} /$ rev.
MD10240 \$MN_SCALING_SYSTEM_IS_METRIC = 0: scaled in:
inch, inch/min, inch/s2, inch/s3, inch/rev.
The selection of the basic system also defines the interpretation of the programmed $F$ value for linear axes:

|  | metric | inch |
| :--- | :--- | :--- |
| G94 | mm/min | inch $/ \mathrm{min}$ |
| G95 | $\mathrm{mm} / \mathrm{rev}$. | inch/rev. |

If this machine data is changed, a startup is required because otherwise the associated machine data that have physical units would be incorrectly scaled.
Proceed as follows:

- MD changed manually

First start up and then enter the associated machine data with physical units.

- MD changed via machine data file

First start up and then reload the machine data file so that the new physical units are taken into account.
If the machine data are altered, alarm 4070 "Scaling machine data altered" is output.
Application example(s):
Setup is in the metric system and then changed over to the inch system.

Special cases:

| 10260 | CONVERT_SCALING_SYSTEM | EXP | ,- G2, B3, K3, N3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Enable basic system conversion | BOOLEAN | PowerOn |  |  |  |
| LINK |  |  |  |  |  |  |
| - | - | FALSE | FALSE | TRUE |  |  |

Description: Determines the handling of MD10240 \$MN_SCALING_SYSTEM_IS_METRIC.
0: Inch/metric behavior conforms to SW1-SW4
1: Inch/metric behavior from SW5
Inch/metric functionality of SW5:

1. Switch over the systems of units with HMI softkey
2. New G codes G700/G710
3. Data backup with system of unit recognition INCH/METRIC
4. Automatic data conversion on change of system of units

- All zero point offsets
- Compensation data (EEC, QEC)
- Tool offsets
- etc.

The change from MD10260 \$MN_CONVERT_SCALING_SYSTEM leads to alarm 4070!
This alarm is designed to indicate that data which remain active after a POWERON are not subjected to automatic conversion from SW1-SW4 and SW5 formats.

| 10270 | POS_TAB_SCALING_SYSTEM | N01, N09 | T1, N3, G2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | System of units of position tables | BYTE | Reset |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 2$ |  |  |$]$ M

Description: Defines the measuring system for the positional data for the following machine data
MD10910 \$MN_INDEX_AX_POS_TAB_1
MD10930 \$MN_INDEX_AX_POS_TAB_2
SD41500 \$SN_SW_CAM_MINUS_POS_TAB_1
SD41501 \$SN_SW_CAM_PLUS_POS_TAB_1
SD41502 \$SN_SW_CAM_MINUS_POS_TAB_2
SD41503 \$SN_SW_CAM_PLUS_POS_TAB_2
SD41504 \$SN_SW_CAM_MINUS_POS_TAB_3
SD41505 \$SN_SW_CAM_PLUS_POS_TAB_3
SD41506 \$SN_SW_CAM_MINUS_POS_TAB_4
SD41507 \$SN_SW_CAM_PLUS_POS_TAB_4

0: metric
1: inch
This machine data is only evaluated for MD10260 \$MN_CONVERT_SCALING_SYSTEM = 1 .
Related to:
MD10260 \$MN_CONVERT_SCALING_SYSTEM
MD10910 \$MN_INDEX_AX_POS_TAB_1
MD10930 \$MN_INDEX_AX_POS_TAB_2
SD41500 \$SN_SW_CAM_MINUS_POS_TAB_1
SD41501 \$SN_SW_CAM_PLUS_POS_TAB_1
SD41502 \$SN_SW_CAM_MINUS_POS_TAB_2
SD41503 \$SN_SW_CAM_PLUS_POS_TAB_2

```
SD41504 $SN_SW_CAM_MINUS_POS_TAB_3
SD41505 $SN_SW_CAM_PLUS_POS_TAB_3
SD41506 $SN_SW_CAM_MINUS_POS_TAB_4
SD41507 $SN_SW_CAM_PLUS_POS_TAB_4
```

| 10280 | PROG_FUNCTION_MASK |  | EXP, N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Bit mask to parameterize various part program commands |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0x0 | 0 | 0x1F | 7/2 | M |

Description:
Bit mask to parameterize various part program commands
Bit Hexadec. Meaning with bit set
Value
0: 0x1 Comparison commands ">" and "<" are processed as with SINUMERIK 840D:
Part program data of the type REAL are mapped internally in the IEEE 64 bit
format. This mode maps decimal numbers inaccurately if this format's 52-bit wide mantissa is inadequate to map the number in binary notation. To solve this problem, all comparison commands ( $==,\langle>,>=,<=,>$ and $<$ ) are checked for relative equality of 1E-12.

This procedure is deactivated for greater than (>) and less than ( < ) comparisons by setting bit 0. (Compatibility setting for SINUMERIK 840D) 1: $0 x 2$ Programming the channel names from machine data MD20000 \$MC_CHAN_NAME By setting bit 1, the channel name stored in machine data MD20000 \$MC_CHAN_NAME can be programmed in the part program. The channel name can thus also be programmed instead of a numerical value for the channel number in programming coordination commands such as (START(), INIT(), WAIT() etc.)

| 2: | $0 \times 4$ | Reserved |
| :--- | :--- | :--- |
| 3: | $0 \times 8$ | Convert illegal ASCII characters into blanks |

By setting bit3, the previous behavior is activated when interpreting a part program block. This means that all invalid ASCII characters in a part program block are handled internally as blank.

4: 0x10 The wait time G4 F<wait time> is rounded off as a multiple integer of an IPO cycle.

This means that a G4 F0.001 only takes one cycle, for an IPO cycle of 1 msec .

| 10284 | DISPLAY_FUNCTION_MASK |  | EXP, N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Behavior of various display variables |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0x0 | 0 | 0x7FFFFFFF | 7/2 | M |

Description: Bit mask for parameterizing various display variables:
BitNo. Hexadec. Meaning with bit set
value
Bit0: 0x1
Parameters are assigned to the OPI variable lastBlockNoStr in the SPARP and SPARPP blocks.

Bit1: 0x2
Concerns the OPI variable cmdSpeed in the SPARPP block. If the bit is set, the variable returns the programmed speed even if the spindle is at a standstill or in another mode (positioning mode, axis mode).
Bit2 0x4
Concerns the OPI variable cmdSpeed in the SPARPP block. (reserved for constant cutting speed)
Bit8: 0x100

Servotrace manages larger numerical values internally. Overruns in data format are avoided. The accuracy may be reduced with large numerical values.

| 10285 | TASK_TIME_AVERAGE_CONFIG |  | EXP, N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Period for task runtime mean value generation |  | DOUBLE | Pow |  |
| - |  |  |  |  |  |
| - | - 1.0 | 0 | 86400 | $7 / 2$ | M |

Description: Period in seconds for which the respective mean value of the task runtimes is generated.

For the value 0, the current actual value is provided as mean value.
This mean value can be read via the OPI variable aveCycleTimeNet.

| 10290 | CC_TDA_PARAM_UNIT | N09 | G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Physical units of tool data for compile cycles | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 64 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 9 | $2 / 2$ |  |

## Description: <br> Physical units for the user-defined tool-specific data:

0 ; No unit
1 ;Linear position [ mm ; inch ]
2 ;Angular position [ degree ; degree ]
3 ; Linear velocity [ mm/min ; inch/min ]
4 ;Angular speed [ rpm ; rpm ]
5 ; Linear acceleration [ m/s ${ }^{2}$; inch/s ${ }^{2}$ ]
6 ;Angular acceleration. [ rev/s 2 ; rev/s 2 ]
7 ;Linear jerk [ m/s ${ }^{3}$; inch/s ${ }^{3}$ ]
8 ;Angular jerk [ rev/s ${ }^{3}$; rev/s ${ }^{3}$ ]
9 ;Revolutional feedrate [ mm/rev ; inch/rev ]
Only available if bit $2(0 x 4)$ is set in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK

| 10291 | CCS_TDA_PARAM_UNIT |  |  | N09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Physical units of SIEMENS-OEM tool data |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - |  |  |  | 9 | 2/2 | M |

Description: Physical units for application-specific tool-specific data:
0: No unit
1: Linear position [ mm; inch ]
2: Angular position [ degree ; degree ]
3: Linear velocity [ mm/min ; inch/min ]
4: Angular speed [ rpm ; rpm ]
5: Linear acceleration [ m/s ${ }^{2}$; inch/s $\left.{ }^{2}\right]$
6: Angular acceleration [ rev/s ${ }^{2}$; rev/s ${ }^{2}$ ]
7: Linear jerk [ m/s ${ }^{3}$; inch/s ${ }^{3}$ ]
8: Angular jerk [ rev/s ${ }^{3}$; rev/s ${ }^{3}$ ]
9: Feedrate per revolution [ mm/rev; inch/rev]
Only available if Bit $2(0 \times 4)$ is set in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK.
Related to:
MD18204 \$MN_MM_NUM_CCS_TDA_PARAM

| 10292 | CC_TOA_PARAM_UNIT | N09 | G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Physical units of cutting edge data for compile cycles | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 64 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 9 | $2 / 2$ |  |

Description: Physical units for the user-defined cutting edge data:
0 ; No unit
1 ;Linear position [ mm ; inch ]
2 ;Angular position [ degree ; degree ]
3 ;Linear velocity [ mm/min ; inch/min ]
4 ;Angular speed [ rpm ; rpm ]
5 ; Linear acceleration [ $\mathrm{m} / \mathrm{s}^{2}$; inch $\left./ \mathrm{s}^{2}\right]$
6 ;Angular acceleration. [ rev/s 2 ; rev/s ${ }^{2}$ ]
7 ; Linear jerk [ m/s ${ }^{3}$; inch/s ${ }^{3}$ ]
8 ; Angular jerk [ rev/s ${ }^{3}$; rev/s ${ }^{3}$ ]
9 ;Revolutional feedrate [ mm/rev ; inch/rev ]
Only available if bit $2(0 \times 4)$ is set in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK

| 10293 | CCS_TOA_PARAM_UNIT | N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Physical units of SIEMENS-OEM cutting edge data | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 9 | $2 / 2$ |  |

Description: Physical units for application-specific cutting data:
0 : No unit
1 : Linear position [ mm ; inch ]
2 : Angular position [ degree ; degree ]
3 : Linear velocity [ mm/min ; inch/min ]
4 : Angular speed [ rpm ; rpm ]
5 : Linear acceleration $\quad\left[\mathrm{m} / \mathrm{s}^{2}\right.$; inch $\left./ \mathrm{s}^{2}\right]$
6 : Angular acceleration [ rev/s ${ }^{2}$; rev/s ${ }^{2}$ ]
7 : Linear jerk [ m/s ${ }^{3}$; inch $\left./ \mathrm{s}^{3}\right]$
8 : Angular jerk [ rev/s ${ }^{3}$; rev/s ${ }^{3}$ ]
9 : Feedrate per revolution [ mm/rev; inch/rev]
Only available if Bit $2(0 \times 4)$ is set in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK. Related to:
MD18206 \$MN_MM_NUM_CCS_TOA_PARAM

| 10300 | FASTIO_ANA_NUM_INPUTS |  | N10 | A4, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of active analog NC inputs |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 8 | 7/2 | M |

Description:
This machine data defines the number of usable analog NC inputs on the control.
Only these analog NC inputs can be addressed by the NC part program or assigned by NC functions.

If more analog $N C$ inputs are defined with the machine data than are available in the hardware of the control, the binary analog actual value is set to zero in the control for the inputs that do not exist in the hardware. The NCK value can be altered by the PLC.
Note:

CPU computing time on the interpolation level is required for processing the digital and analog NC I/Os. The number of active NC I/Os should therefore be limited to the demands of the machine so that the interpolation cycle time is not unnecessarily loaded.

| 10310 | FASTIO_ANA_NUM_OUTPUTS | N10 | A4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of active analog NC outputs | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 8 | $7 / 2$ |  |

Description:
This machine data defines the number of usable analog $N C$ outputs on the control.
Only these analog NC outputs can be addressed by the NC part program or assigned by NC functions.
If more analog $N C$ outputs are defined with the machine data than are available in the hardware of the control, no alarm is triggered. The analog values specified by the part program can be read by the PLC.
Note:
CPU computing time on the interpolation level is required for processing the digital and analog NC I/Os. The number of active NC I/Os should therefore be limited to the demands of the machine so that the interpolation cycle time is not unnecessarily loaded.

| 10320 | FASTIO_ANA_INPUT_WEIGHT | N10 | A4 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Weighting factor for analog NC inputs | DWORD | PowerOn |  |  |
| - | 8 | $\begin{array}{l}10000,10000,10000, \\ 10000,10000,10000, \\ 10000,10000\end{array}$ | 1 | 10000000 | $7 / 2$ |$]$| M |
| :--- |
| - |

## Description:

A weighting factor can be defined with this MD for each analog NC input [n] to enable adaptation to the various analog-to-digital converters (depending on the I/O module).

The value to be entered in this machine data is the value that is to be read in the part program with the command $x=\$ A \_I N A[n]$ if the associated analog input [n] is set to the maximum value or the value +32767 is defined for this input via the PLC interface.

The value read from the analog-to-digital converter or the PLC interface is multiplied by the factor (FASTIO_ANA_INPUT_WEIGHT / 32767) before it can be read in the part program with the system variable \$A_INA[n].
Use of the weighting factor for "Analog NC inputs without hardware": with a weighting factor of 32767 , the values defined by the part program and the PLC are numerically identical (1:1 communication between part program and PLC). This is advantageous when the analog NC inputs/outputs are used purely as PLC inputs/outputs without analog hardware.
Note:
The comparator threshold values SD41600 \$SN_COMPAR_THRESHOLD_1 and SD41601
\$SN_COMPAR_THRESHOLD_2 are also normalized to MD10 $\overline{3} 20$ \$MN_FASTIO_ANA_INPUT_WEIGHT corresponding to their assignment to an analog input.
The CC access to analog values is not affected by FASTIO_ANA_INPUT_WEIGHT.
Related to:
NC/PLC interface signal DB10, DBB148-163 (PLC setting value for analog NC inputs)


Description:
A weighting factor can be defined with this MD for each analog NC output [n] to enable adaptation to the various digital-to-analog converters (depending on the I/O module used).
[hw] = Index (0 to 7) for addressing the external analog outputs
The value $x$ to be entered in this machine data is the value that is to effect the maximum set value of the associated analog output [n] when programming \$A_OUTA[n] $=x$ in the part program or is to generate the value +32767 in the PLC interface for this output.
Use of the weighting factor for "Analog NC outputs without hardware": With a weighting factor of 32767, the values defined by the part program and the PLC are numerically identical (1:1 communication between part program and PLC). This is advantageous when the analog NC outputs are used purely as PLC outputs without analog hardware.
Related to:
NC/PLC interface signal DB10, DBB170-185 (PLC setting value for analog NC outputs) NC/PLC interface signal DB10, DBB210-225 (Setpoint for analog NC outputs)


Description:

The number of bytes of the digital NC inputs that can be used on the control are defined in this machine data.
These digital NC inputs can be read directly by the part program. Moreover, the signal state at the HW inputs can also be changed by the PLC.
If more digital NC inputs are defined in the machine data than are available in the control hardware, a signal status of 0 is set in the control for the inputs that do not exist in the hardware. The NCK value can be altered by the PLC.
Related to:
NC/PLC interface signal DB10 DBBO (Disable the digital NC inputs 1-8);
NC/PLC interface signal DB10 DBB122,124,126,128 (Disable the external digital inputs 9-40)
NC/PLC interface signal DB10 DBB1 (PLC setting for digital NC inputs 1-9)
NC/PLC interface signal DB10 DBB123,125,127,129 (PLC values for external digital inputs 9-40)
NC/PLC interface signal DB10, DBB60, DBB186 (Actual value for digital NC inputs)

| 10360 | FASTIO_DIG_NUM_OUTPUTS | N10 | A4, TE8 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of active digital NC output bytes | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 5 | $7 / 2$ |  |$]$ M

Description: The number of bytes for digital NC outputs that can be used on the control are defined in this machine data.
These digital NC outputs can be set directly by the part program. The PLC is able to

- set the digital outputs to "0" in a defined way with NC/PLC interface signal DB10, DBB4, DBB130 (Disable the digital NC outputs).
- alter the NCK value with NC/PLC interface signal DB10, DBB5, DBB131 (Overwrite mask for digital NC outputs).
- specify a PLC value with NC/PLC interface signal DB10, DBB7, DBB133 (Setting mask for digital NC outputs).
If more digital NC outputs are defined in the machine data than are available in the control hardware, no alarm is triggered. The signal states specified by the part program can be read by the PLC.
Special cases:
Digital NC outputs 5 to 8 can be processed only by the PLC (no hardware outputs). Related to:

NC/PLC interface signal DB10, DBB4, DBB130 (Disable the digital NC outputs)
NC/PLC interface signal DB10, DBB5, DBB131 (Overwrite mask for digital NC outputs) NC/PLC interface signal DB10, DBB6, DBB132 (PLC setting value for digital NC outputs)

NC/PLC interface signal DB10, DBB7, DBB133 (Setting mask for digital NC outputs)
NC/PLC interface signal DB10, DBB64, DBB190 (Setpoint for digital NC outputs)

| 10361 | FASTIO_DIG_SHORT_CIRCUIT | N10 | A4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Short circuit of digital inputs and outputs | UDWORD | PowerOn |  |  |  |
| - | 10 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7$ FFFFFFF |  |  |

Description: Defined short circuits between digital output and input signals of the high-speed NC I/Os are realized by linking the signals read in from the high-speed NC I/Os or the PLC interface to defined output signals.

The output signals always remain unchanged by the link, the inputs that have to be taken into account internally arise from the read inputs and the link. If a plurality of output bits are specified for one input bit in overwrite mode, the last defined assignment in the list determines the result.

The definition of non-existent or non-activated inputs/outputs is ignored without an alarm.

Bits 0-7: Number of the input byte to be written ( 1 - 5 )
Bits 8-15: Bit number within the input byte ( 1 - 8 )
Link:
The type of link is selected by adding a hexadecimal number to the input bit number:
00 Overwrite input identically to output
A0 Input is AND-gated to the read input with the status of the stated output
B0 Input is OR-gated to the read input with the status of the stated output
Bits 16-23: Number of the output byte to be used ( 1 - 5 )
Bits 24-31: Bit number within the output byte ( 1 - 8 )
Example:
MD10361 \$MN_FASTIO_DIG_SHORT_CIRCUIT[ 0 ] = 0x04010302
Input: 3rd bit of the 2 nd byte
Output: 4th bit of the 1st byte ( = 4th onboard NCU output )
The input status is overwritten by the specified output
MD10361 \$MN_FASTIO_DIG_SHORT_CIRCUIT[ 1 ] = 0x0705A201
Input: 2nd bit of the 1st byte ( = 2nd onboard NCU input )
Output: 7th bit of the 5th byte
The input status is AND-gated with the specified output
MD10361 \$MN_FASTIO_DIG_SHORT_CIRCUIT[ 2 ] = 0x0103B502
Input: 5th bit of the 2nd byte

Output: 1st bit of the 3rd byte
The input status is OR-gated with the specified output
Related to:
MD10350 \$MN_FASTIO_DIG_NUM_INPUTS,
MD10360 \$MN_FASTIO_DIG_NUM_OUTPUTS.
References: /FB/, A4, "Digital and Analog NC I/Os"



Description:
For PROFIBUS/PROFINET:
1st +2 nd byte indicate the logical start address of the I/O slot on the PROFIBUS/ PROFINET:

Value 0000 means NO active slot
Values 0001.. 0100 are reserved for the PLC process image (the value of input slots can be read by the NCK without errors; however, output slots are forbidden in this range, and cause an alarm on power up)

1st byte $=$ LowByte of the logical start address
2nd byte $=$ HighByte of the logical start address
3rd byte $=0=$ without meaning
4 th byte $=5=$ segment no. for PROFIBUS/PROFINET

```
The individual bytes are explained in MD10366 $MN_HW_ASSIGN_DIG_FASTIN.
Related to:
MD10366 $MN_HW_ASSIGN_DIG_FASTIN
MD10368 $MN_HW_ASSIGN_DIG_FASTOUT
MD10362 $MN_HW_ASSIGN_ANA_FASTIN
```

| 10366 | HW_ASSIGN_DIG_FASTIN |  | N10 | A4, TE1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Hardware assignment of external digital NC inputs |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | $10 \quad$$0 \times 01000000$, <br> $0 \times 01000000$, <br> $0 \times 01000000$, <br> $0 \times 01000000$, <br> $0 \times 01000000,0 \times 01 \ldots$ | 0x01000000 | 0x060003FF | 7/2 | M |

Description: For PROFIBUS/PROFINET:

1st +2 nd bytes indicate the logical basis address of the I/O slot on the PROFIBUS/ PROFINET:
Value 0000 means NO active slot
Values $0001 . .0100$ are reserved for the PLC process image (the value of input slots can be read by the NCK without errors; however, output slots are forbidden in this range, and cause an alarm when powering up)

1st byte $=$ LowByte of the logical basis address
2nd byte $=$ HighByte of the logical basis address
3rd byte $=0=$ without meaning
4 th byte $=5=$ segment no. for PROFIBUS/PROFINET
Module no.: 1 ... MD_MAXNUM_SIMO611D_AXES:
Number of the logical slot in which the terminal block with the external I/Os is inserted.
1st +2 nd bytes give the logical basis address of the I/O slot on the PROFIBUS
1st byte $=$ low byte
2nd byte = high byte
Value 0000 means NO active slots
Values 0001..007F are reserved for the PLC (NCK can also read the value for input slots without error, but output slots are forbidden in this range and lead to an alarm when powering up)
Values 0080..02FF are valid
Values > 02FF are invalid
Example:
HW_ASSIGN_DIGITAL_FASTIN[3] = '05000302'
1st + 2nd byte: 0302 (hex) = logical basis address 770 (decimal)
3rd byte: $00=$ no significance
4th byte: $05=$ ID for PROFIBUS/PROFINET
Corresponds with:
MD10368 \$MN_HW_ASSIGN_DIG_FASTOUT
MD10362 \$MN_HW_ASSIGN_ANA_FASTIN
MD10364 \$MN_HW_ASSIGN_ANA_FASTOUT



Description: Definition of the PROFIsafe address of the $F$ master NCK/PLC. Used for unique assignment between $F$ master and $F$ slave. This parameter must be entered in accordance with the parameter "F_source_address" set in S7-ES for the $F$ slaves. An attempt to establish communication is only made with $F$ slaves for which this address has been entered.
Format: 0s 00 aaaa
s: Bus segment ( $5=I / O$ connection on the PLC side)
aaaa: Hexadecimal PROFIsafe address of the $F$ master

| 10386 | PROFISAFE_IN_ADDRESS |  |  | N01, N10 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | PROFIsafe address input module |  |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 48 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 0x0502FFFF | 7/2 | M |
| Description: |  | ination address aaaa <br> (5 = I/O connec ddress <br> e: 0... 2 <br> s the $F$ user dat the F user data | an on sig ig | side) |  |  |

$\mathrm{x}=2$ adresses the F user data signals 65...96
aaaa: Hexadecimal PROFIsafe address of the $F$ module

| 10387 | PROFISAFE_OUT_ADDRESS |  |  | N01, N10 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | PROFIsafe-address output module |  |  | UDWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 48 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 0x0502FFFF | 7/2 | M |

Description: PROFIsafe destination address of an output module Format: 0s 0x aaaa
s: Bus segment ( $5=I / O$ connection on the PLC side)
$x$ : Sub-slot address
Value range: 0... 2
$\mathrm{x}=0$ addresses the F user data signals 1...32
$\mathrm{x}=1$ addresses the F user data signals $33 . .64$
$\mathrm{x}=2$ addresses the F user data signals $65 . .96$
aaaa: Hexadecimal PROFIsafe address of the $F$ module

| 10388 | PROFISAFE_IN_ASSIGN | N01, N10 | FBSI |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Input.assignment \$A_INSE to PROFIsafe module |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 48 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 192192 |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |

Description: Assignment between external SPL interface \$A_INSE and PROFIsafe input module
The PLC area is specified in decimals in aaa bbb format
where aaa $=$ area limit 1, SPL signal \$A_INSE[aaa]
bbb = area limit 2. SPL signal \$A_INSE[bbb]
Example:
\$MN_PROFISAFE_IN_ASSIGN[0] = 001004 or alternatively 004 001:
The system variables \$A_INSE[1...4] are assigned the state of the input terminals of the PROFIsafe module that was parameterized in MD10386 \$MN_PROFISAFE_IN_ADDRESS[0] and selected in MD13300 \$MN_PROFISAFE_IN_FILTER[0].

| 10389 | PROFISAFE_OUT_ASSIGN | N01, N10 | FBSI |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Outp.assignment \$A_OUTSE to PROFIsafe module | DWORD | PowerOn |  |  |  |  |
| - | $7 / 2$ |  |  |  |  |  | M |
| - | 48 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 192192 | $7 / 2$ |  |  |

Description: Assignment between external SPL interface \$A_OUTSE and PROFIsafe output module
The SPL area is specified in decimals in aaa bbb format
where aaa $=$ area limit 1. SPL signal \$A_OUTSE[aaa]
b.bb $=$ area limit 2. SPL signal \$A_OUTSE[bbb]

Example:
PROFISAFE_OUT_ASSIGN[0] = 064061 or alternatively 061 064:
The states of the system variables \$A_OUTSE[61...64] are assigned to the output terminals selected in MD13301 \$MN_PROFISAFE_OUT_FILTER[0] of the PROFIsafe module specified in MD10387 \$MN_PROFISAFE_OUT_ADDRESS[0].



| 10395 | PLCIO_LOGIC_ADDRESS_IN | N10 | A4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Start addr. of the directly readable input bytes of the PLC I/Os | DWORD | PowerOn |  |  |  |
| - | - | 0 | 0 | 16383 | $7 / 2$ |  |

## Description:

Starting from this address, the PLC hardware must configure a number of bytes in MD10394 \$MN_PLCIO_NUM_BYTES_IN for direct use by the NC. These bytes are not transmitted by the PLC $\bar{C}$ user $\bar{p}$ rogram, but directly via an interrupt of the PLC operating system. The access delay is less than 0.5 ms . The bytes can be read by the part program and from synchronized actions with the system variables:
\$A_PBB_IN,
\$A_PBW_IN,
\$A_PBD_IN,
\$A_PBR_IN
.
Notice:
The machine data MD10394 \$MN_PLCIO_NUM_BYTES_IN and MD10395
\$MN_PLCIO_LOGIC_ADDRESS_IN must be consistent with the PLC-side configuration.
Related to:
MD10394 \$MN_PLCIO_NUM_BYTES_IN

| 10396 | PLCIO_NUM_BYTES_OUT |  |  |  | N10 | A4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of directly writable output bytes of the PLC I/Os |  |  |  | BYTE |  |  |
| - |  |  |  |  |  |  |  |
| - | - |  | 0 | 0 | 32 | 7/2 | M |
| Description: | The number of PLC I/O output bytes that can be written directly by the NC. <br> These bytes are not transmitted by the PLC user program but via an interrupt of the PLC operating system. <br> The access delay is less than 0.5 ms . <br> The bytes can be written by the part program and from synchronized actions with the system variables: <br> \$A_PBB_OUT, <br> \$A_PBW_OUT, <br> \$A_PBD_OUT, <br> \$A_PBR_OUT <br> on the NC side. <br> Attention: <br> The machine data MD10396 \$MN_PLCIO_NUM_BYTES_OUT and MD10397 <br> \$MN_PLCIO_LOGIC_ADDRESS_OUT must be consistent with the configuration by the PLC, otherwise other PLC output signals will be overwritten. |  |  |  |  |  |  |


| 10397 | PLCIO_LOGIC_ADDRESS_OUT | N10 | A4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Start addr. of the directly writable output bytes of PLC I/O | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 16383 | $7 / 2$ |  |  |$]$ M

Description:
Starting from this address, the PLC hardware must configure a number of MD10396 \$MN_PLCIO_NUM_BYTES_OUT for direct use by the NC.
These bytes are not transmitted by the PLC user program, but directly via an interrupt of the PLC operating system.
The access delay is less than 0.5 ms .
The bytes can be written by the part program and from synchronized actions with the system variables:
\$A_PBB_OUT,
\$A_PBW_OUT,
\$A_PBD_OUT,
\$A_PBR_OUT
.
Notice:
The machine data MD10396 \$MN_PLCIO_NUM_BYTES_OUT and MD10397
\$MN_PLCIO_LOGIC_ADDRESS_OUT must be consistent with the PLC-side configuration.
Related to:
MD10396 \$MN_PLClO_NUM_BYTES_OUT


Description: Specification of the time span during which the data of the PLC I/Os directly readable via \$A_PBx_IN system variables are updated.
This time span is rounded up internally to the next-higher multiple of the time predefined by the IPO cycle.

| 10399 | PLCIO_TYPE_REPRESENTATION |  | N10 | A4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Little/Big Endian for PLCIO |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 1 | 7/2 | M |
| Description: | Little/big-Endian format for PLC I/Os directly co Value $=0$; the system Value = 1 ; the system As a rule, the PLC I/Os 1). For compatibility re format (value $=0$ ). |  | \$A_PBx <br> d in <br> d in <br> led in <br> fault | A_PBx <br> e-En <br> ndia <br> -End <br> is | em variable <br> at <br> t (value = <br> -Endian |


| 10400 | CC_VDI_IN_DATA |  |  |  |  |  | EXP, N02 | OEM |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of input bytes for compile cycles | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1024 | $7 / 1$ |  |  |  |$]$ M

Description:
The compile cycle user can freely define data within a data block on the PLC user interface. As the user, he determines the size of the interface from PLC to NCK. This machine data describes the length of the area on the VDI interface in bytes which defines the NCK input interface. The sum of this and MD10410 \$MN_CC_VDI_OUT_DATA must not exceed 400 for software version 1.

| 10410 | CC_VDI_OUT_DATA |  |  |  |  |  | EXP, N02 | OEM |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of output bytes for compile cycles | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1024 |  |  |  |  |

Description:
The compile cycle user can freely define data within a data block on the PLC user interface. As the user, he determines the size of the interface from PLC to NCK. This machine data describes the length of the area on the VDI interface in bytes which defines the NCK output interface. The sum of this and MD10400 \$MN_CC_VDI_IN_DATA must not exceed 400 .

| 10420 | CC_ASSIGN_FASTOUT_MASK |  | EXP, N10 | OEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Reservation of external outputs for compile cycles |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 0x7FFFFFFF | 7/2 | M |

Description: Reservation of high-speed hardware outputs for CC applications
Bit $0(L S B)-14:$ Mask of the digital output bytes reserved for the CC application
Bits 16-30: Mask of the analog outputs reserved for the CC application
The hardware outputs reserved here are included in the multiple assignment monitoring routine when the system is powered up. We recommend that you register all the hardware outputs used by CC applications here.
Bit 15: Suppresses power-up alarm 4275 (multiple assignment of digital output)
Bit 31: Suppresses power-up alarm 4275 (multiple assignment of analog output)

| 10430 | CC_HW_DEBUG_MASK |  | EXP | OEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Hardware debug mask for compile cycles |  | UDWORD | Pow |  |
| NBUP, NDLD |  |  |  |  |  |
| - | 0 | 0 | 0x7FFFFFFF | 7/1 | M |

Description: Setting of special responses to peripheral HW interfaces for NCK debug

For practical debugging of NCK software, among other things, the response of peripheral units to the loss of the NCK sign of life must be suppressed when the NCK software has run to a breakpoint.
Bit 0 (LSB) - 3 :
For practical debugging of NCK software, among other things, the response of peripheral units to the loss of the NCK sign of life must be suppressed when the NCK software has run to a breakpoint.
Meaning of set bits:
Bit 0:
Drive modules ignore the loss of the NCK sign of life
Bit 1:
Terminal blocks ignore the loss of the NCK sign of life
Bit 3:
PLC ignores the loss of the NCK sign of life
Bit 4:
Recording of internal and external control commands. Recording the control sequences and storing them in a file in the passive file system. One can trace the exact sequence between the incoming hardware signals of the PLC interface and the internal sequences with the aid of the recording file.
Bit 5:
Servotrace: Enable physical addresses without access control
Bit10:
Test for measuring function. If this bit is set, one can use the GUD variables CHAN INT MEA_TASK and CHAN INT MEA_COUNTER to transfer the inverse transformation of the measured values into cyclical and non-cyclical tasks.

Bit11:
No EMERGENCY STOP alarm on loss of PLC sign of life. If the PLC sign of life is not obtained within the time defined in MD10100 \$MN_PLC_CYCLIC_TIMEOUT, an alarm is not issued, merely the axis releases are withdrawn. (Application case: debugging the PLC user program)
Bit15:
Reserved for gantry setup help.

| 10450 | SW_CAM_ASSIGN_TAB | N09 | N3 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Assignment of software cams to machine axes | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 32 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 31 | $7 / 2$ |  |  |

Description: This machine data allows one machine axis to be assigned to each of the 16 possible cam pairs (each is comprised of one minus and one plus cam).
If a "O" is entered, the corresponding cam is not processed.
The cam signal output is activated via the axial NC/PLC interface signal DB31, ... DBX2.0 (Cam activation)

Index [n] of the machine data addresses the cam pair: $\mathrm{n}=0,1, \ldots, 15$ correspond to cam pairs 1, 2, ... , 16
Related to:
NC/PLC interface signal DB31, ... DBX2.0 (Cam activation)
Example:
Cam pair 1 is to be assigned to machine axis 3, and cam pair 3 to machine axis 4 . Cam pair 2 is not to be assigned to an axis.
MD10450 \$MN_SW_CAM_ASSIGN_TAB[0]= 3
MD10450 \$MN_SW_CAM_ASSIGN_TAB[1]=0
MD10450 \$MN_SW_CAM_ASSIGN_TAB[2]= 4

| 10460 | SW_CAM_MINUS_LEAD_TIME | N09 | N3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Lead or delay time at minus cams 1-16 | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 32 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

## Description:

A lead or delay time can be assigned in this machine data to each minus cam 1-16 to compensate for delay times.
The switching edge of the associated cam signal is advanced or delayed by the time value entered.
Positive value: --> Lead time Negative value: --> Delay time
Serves to compensate for the constant proportion of the internal delay time between actual value acquisition and signal output.

Index [n] of the machine data addresses the cam pair:
$\mathrm{n}=0,1, \ldots, 15$ correspond to cam pairs $1,2, \ldots, 16$
This machine data is added to the setting data SD41520 \$SN_SW_CAM_MINUS_TIME_TAB_1[n] and SD41522 \$SN_SW_CAM_MINUS_TIME_TAB_2[n].
Related to:
SD41520 \$SN_SW_CAM_MINUS_TIME_TAB_1[n] (lead or delay time on minus cams 1-8)
SD41522 \$SN_SW_CAM_MINUS_TIME_TAB_2[n] (lead or delay time on minus cams 9-16)


Description: A lead or delay time can be assigned in this machine data to each plus cam $1-16$ to compensate for delay times.
The switching edge of the associated cam signal is advanced or delayed by the time value entered.
Positive value: --> Lead time
Negative value: --> Delay time
Serves to compensate for the constant proportion of the internal delay time
between actual value acquisition and signal output.
Index [n] of the machine data addresses the cam pair:
$\mathrm{n}=0,1, \ldots, 15$ correspond to cam pairs $1,2, \ldots, 16$
This machine data is added to the setting data SD41521 \$SN_SW_CAM_PLUS_TIME_TAB_1[n] and SD41523 \$SN_SW_CAM_PLUS_TIME_TAB_2[n].
Related to:
SD41521 \$SN_SW_CAM_PLUS_TIME_TAB_1[n] (lead or delay time on plus cams 1-8)
SD41523 \$SN_SW_CAM_PLUS_TIME_TAB_2[n] (lead or delay time on plus cams 9-16)

| 10470 | SW_CAM_ASSIGN_FASTOUT_1 |  |  |  |  |  | N09 | N3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Hardware assignment for output of cams 1-8 to NC I/Os | UDWORD | PowerOn |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 7$ FFFFFFFF | $7 / 2$ |  |  |  |

Description: The cam signal status can be output to the NC I/Os as well as to the PLC.
The hardware assignment of the minus and plus cam signals to the digital output bytes used for the $N C$ I/Os is made in this machine data for cam pairs 1 - 8.
The assigned output signals can also be inverted with this machine data.

The MD is coded as follows:

| Bits 0-7: | No. of 1st HW byte used with digital outputs |
| :--- | :--- |
| Bits 8-15: | No. of 2nd HW byte used with digital outputs |
| Bits 16-23: | Inversion mask for writing 1st HW byte used |
| Bits 24-31: | Inversion mask for writing 2nd HW byte used |
|  | Bit=0: |
|  | Bit=1: |

If both HW bytes are specified, the 1st byte contains the minus cam signals and the 2nd byte the plus cam signals.
If the 2 nd byte is not specified ( $=\|0\|$ ), then the 8 cams are output as an AND operation of the minus and plus cam signals via the 1st HW byte using the 1st inversion mask.

The status of the non-inverted output signal for linear axes and for rotary axes with "plus cam - minus cam < 180 degrees" is:
"1" between minus and plus cams "O" outside this range

The status of the non-inverted output signal for rotary axes with "plus cam - minus cam >= 180 degrees" is:
"O" between minus and plus cams "1" outside this range
The following must be specified as the byte address for the digital outputs: 1: for on-board byte 2 - 5: for external bytes


Description:
The cam signal status can be output to the NC I/Os as well as to the PLC.
The hardware assignment of the minus and plus cam signals to the digital output bytes used for the NC I/Os can be made in this machine data for cam pairs 9 - 16. The assigned output signals can also be inverted with this machine data.

The MD is coded as follows:
Bits 0-7: No. of 1st HW byte used with digital outputs
Bits 8-15: No. of 2nd HW byte used with digital outputs
Bits 16-23: Inversion mask for writing 1st HW byte used
Bits 24-31: Inversion mask for writing 2nd HW byte used

| Bit=0: | Do not invert |
| :--- | :--- |
| Bit=1: | Invert |

If both HW bytes are specified, the 1 st byte contains the minus cam signals and the 2nd byte the plus cam signals.

If the 2nd byte is not specified (= "O"), then the 8 cams are output as an AND operation of the minus and plus cam signals via the 1st HW byte using the 1st inversion mask.
The status of the non-inverted output signal for linear axes and for rotary axes with
"plus cam - minus cam < 180 degrees" is:
"1" between minus and plus cams
"0" outside this range
The status of the non-inverted output signal for rotary axes with "plus cam - minus cam >= 180 degrees" is:
"0" between minus and plus cams

```
"1" outside this range
The following must be specified as the byte address for the digital outputs:
1: for on-board byte
2 - 5: for external bytes
```

| 10472 | SW_CAM_ASSIGN_FASTOUT_3 | N09 | N3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Hardware assignment for output of cams 17-24 to NC I/Os | UDWORD | PowerOn |  |  |  |
| - | - | 0 | 0 | $0 \times 7$ FFFFFFF |  |  |

Description: The cam signal status can be output to the NC I/Os as well as to the PLC.
The hardware assignment of the minus and plus cam signals to the digital output bytes of the NC I/Os used can be made in this machine data for cam pairs 17 - 24. The assigned output signals can also be inverted with this machine data.

The MD is coded as follows:
Bits 0-7: Number of 1 st $H W$ byte used with digital outputs
Bits 8-15: Number of 2nd HW byte used with digital outputs
Bits 16-23: Inversion mask for writing 1st HW byte used
Bits 24-31: Inversion mask for writing 2nd HW byte used
Bit=0: Do not invert

Bit=1: Invert
If both HW bytes are specified, the lst byte contains the minus cam signals and the 2nd byte the plus cam signals.
If the 2nd byte is not specified ( $=$ " 0 "), then the 8 cams are output as an AND operation of the minus and plus cam signals via the 1st HW byte using the 1st inversion mask.
The status of the non-inverted output signal for linear axes and for rotary axes with "plus cam - minus cam < 180 degrees" is:

$$
\begin{aligned}
& \text { "1" between minus and plus cams } \\
& \text { "0" outside this range }
\end{aligned}
$$

The status of the non-inverted output signal for rotary axes with "plus cam - minus cam >= 180 degrees" is:

```
"0" between minus and plus cams
"1" outside this range
```

The following must be specified as the byte address for the digital outputs:
1: for on-board byte
2 - 5: for external bytes


$$
\begin{array}{ll}
\text { Bit }=0: & \text { Do not invert } \\
\text { Bit=1: } & \text { Invert }
\end{array}
$$

If both HW bytes are specified, the 1 st byte contains the minus cam signals and the 2nd byte the plus cam signals.
If the 2 nd byte is not specified ( $=$ " 0 "), then the 8 cams are output as an AND operation of the minus and plus cam signals via the 1st HW byte using the 1st inversion mask.
The status of the non-inverted output signal for linear axes and for rotary axes with "plus cam - minus cam < 180 degrees" is:

$$
\begin{aligned}
& \text { "1" between minus and plus cams } \\
& \text { "0" outside this range }
\end{aligned}
$$

The status of the non-inverted output signal for rotary axes with "plus cam - minus cam >= 180 degrees" is:

> "0" between minus and plus cams
> "1" outside this range

The following must be specified as the byte address for the digital outputs:
1: for on-board byte
2-5: for external bytes


## Description:

A timer-controlled output to the 4 on-board outputs of the NC I/Os can be selected in this machine data for 4 cam pairs.
In this case, the minus and plus signals of a cam pair are "EXCLUSIVE OR'd" for output as one signal.

Meaning for set bit:
Associated cam (minus and plus cam signals "EXCLUSIVE OR'd") is output via a timer interrupt at one of the 4 on-board outputs of the NCU.

The on-board outputs are assigned in order of increasing machine axis numbers (with assigned cam pairs).
Example:
Machine axis 3 = cam pair 1 --> on-board output 3
Machine axis 1 = cam pair 2 --> on-board output 1
Machine axis 7 = cam pair 3 --> on-board output 4
Machine axis 2 = cam pair 4 --> on-board output 2
If a plurality of cam pairs are set for one machine axis, then this axis is assigned
in ascending order of the cam pairs.
Example:
Machine axis 3 = cam pair 1 --> on-board output 2
Machine axis 3 = cam pair 2 --> on-board output 3
Machine axis 7 = cam pair 3 --> on-board output 4
Machine axis 2 = cam pair 4 --> on-board output 1
This function works independently of the assignment set in MD10470
\$MN_SW_CAM_ASSIGN_FASTOUT_1 or MD10471 \$MN_SW_CAM_ASSIGN_FASTOUT_2.
Note:
The on-board byte must not be used more than once.
If there is more than one signal change in the IPO cycle for the cam pairs specified in the MD, then the cam pair with the lowest number determines the instant of output. The other signals change at the same time.


| 10490 | SW_CAM_COMP_NCK_JITTER |  | N09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Cam jitter compensation |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | - $\quad 0$ | 0.0 | 0.0001 | 7/2 | M |

Description: The compensation value reduces system-related time inaccuracies during output of highly precise cam signals. The default time encumbers the cyclic time level of the control, and should therefore be selected as short as possible. We recommend that you return a cam signal to a measuring input of the control and increase the compensation value until the scatter of the measured positions cannot be reduced any further. Currently only active when MD10485 \$MN_SW_CAM_MODE Bit0 = 0 .

| 10500 | DPIO_LOGIC_ADDRESS_IN |  |  |  |  | N10 | A4 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Logical slot address of the PROFIBUS/PROFINET I/Os | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 32 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 16383 |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |

Description: Logical slot address of the PROFIBUS/PROFINET I/Os usable by the NCK.

| 10501 | DPIO_RANGE_LENGTH_IN | N10 | A4 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Length of the PROFIBUS/PROFINET I/O range | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 32 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 128 |  |
| $7 / 2$ | M |  |  |  |  |

Description: Length of the PROFIBUS/PROFINET I/O range in bytes consistently usable for the NCK. This range must be defined in STEP 7, hardware configuration.
0 : only the first data slot is used.
$x$ : length of the consistent PROFIBUS/PROFINET I/O range in bytes
Note: in PROFINET, it is not possible to combine several slots in one area.


## Description:

Attributes of the PROFIBUS/PROFINET I/Os
Bit 0: Little/Big Endian format of the system variable \$A_DPx_IN[n,m]
0 : Little Endian format
1: Big Endian format
Bit 1: (reserved)
Bit 2: Read input data
0 : Read possible through system variable and CC binding (increased performance requirements)

1: Read only possible for CC binding (low performance requirements)
Bit 3: Slot sign-of-life alarms
0: Slot sign-of-life alarms are output
1: Slot sign-of-life alarms are suppressed
Bit 4...7: (Reserved for expansions)
Bit 8...31: Reserved for the assignment to compile cycle functions (see documentation of the CC function)

| 10510 | DPIO_LOGIC_ADDRESS_OUT | N10 | A4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Logical slot address of the PROFIBUS/PROFINET I/Os | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 32 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 16383 |  |  |
| $7 / 2$ | M |  |  |  |  |  |

Description: Logical slot address of the PROFIBUS/PROFINET I/Os usable by the NCK.
Note: the logical slot address must lie outside the PLC process image.

| 10511 | DPIO_RANGE_LENGTH_OUT | N10 | A4 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Length of the PROFIBUS I/O range | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 32 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 128 | $7 / 2$ |

Description: Length of the PROFIBUS I/O range consistently usable for the NCK in bytes. This range must be defined in STEP 7, hardware configuration.
0 : only the first data slot is used.
x : length of the consistent PROFIBUS I/O range in bytes
Note: in PROFINET it is not possible to combine several slots to form one area.


| 10520 | PLCINTERN_LOGIC_ADDRESS_IN |  |  | N10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Logical basis address for HW-PLC access to input slots internal PROFIBUS |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 64 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 16383 | $7 / 2$ | M |

Description: Logical basis address of the PROFIBUS I/O available with the PLC hardware at the internal PROFIBUS. Only relevant for HW-PLC.

| 10525 | PLCINTERN_LOGIC_ADDRESS_OUT | N10 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Logical basis address for HW-PLC access to output slots internal <br> PROFIBUS | DWORD | PowerOn |  |  |
| - | 64 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 16383 | $7 / 2$ |

Description: Logical basis address of the PROFIBUS I/O available with the PLC hardware at the internal PROFIBUS. Only relevant for HW-PLC.


Description: This MD assigns analog inputs 1 to 8 to a bit number of comparator byte 1. This input bit of the comparator is set to "1" if the comparison between the applied analog value and the associated threshold value (SD41600 \$SN COMPAR THRESHOLD 1 fulfills the condition parameterized in (MD10540 \$MN COMPAR TYPE 1).

An analog input can be assigned to a plurality of comparator input bits.
The following generally applies to comparator byte 1:
COMPAR ASSIGN ANA INPUT 1 [b] = n
with index: $\mathrm{b}=$ number of comparator input bit (0 to 7) $\mathrm{n}=$ number of analog input (1 to 8)

Example:

$$
\begin{aligned}
& \text { COMPAR_ASSIGN_ANA_INPUT_1[0] }=1 \\
& \text { COMPAR_ASSIGN_ANA_INPUT_1[1] }=2 \\
& \text { COMPAR_ASSIGN_ANA_INPUT_1[2] }=1 \\
& \text { COMPAR_ASSIGN_ANA_INPUT_1[3] }=3 \\
& \text { COMPAR_ASSIGN_ANA_INPUT_1[4] }=3 \\
& \text { COMPAR_ASSIGN_ANA_INPUT_1[5] }=1 \\
& \text { COMPAR_ASSIGN_ANA_INPUT_1[6] }=1 \\
& \text { COMPAR_ASSIGN_ANA_INPUT_1[7] }=1
\end{aligned}
$$

Analog input 1 affects input bits 0,2 , 5, 6 and 7 of comparator byte 1
Analog input 2 affects input bit 1 of comparator byte 1
Analog input 3 affects input bits 3 and 4 of comparator byte 1
Related to:
MD10540 \$MN COMPAR TYPE 1
MD10541 \$MN_COMPAR_TYPE_2

| 10531 | COMPAR_ASSIGN_ANA_INPUT_2 | N10 | A4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Hardware assignment of analog inputs for comparator byte 2 | BYTE | PowerOn |  |  |  |
| - | 8 | $0,0,0,0,0,0,0,0$ | - | - |  |  |
| $7 / 2$ | M |  |  |  |  |  |

Description:
This MD assigns analog inputs 1 to 8 to a bit number of comparator byte 2 . This input bit of the comparator is set to "1" if the comparison between the applied analog value and the associated threshold value (SD41601 \$SN COMPAR THRESHOLD 2 fulfills the condition parameterized in (MD10541 \$MN_COMPAR_TYPE_2).
An analog input can be assigned to a plurality of comparator input bits.
The following generally applies to comparator byte 2:

> COMPAR_ASSIGN_ANA_INPUT_2 $[\mathrm{b}]=\mathrm{n}$ with index:b $\begin{aligned} & =\text { number of comparator input bit }(0 \text { to } 7) \\ \mathrm{n} & =\text { number of analog input }(1 \text { to } 8)\end{aligned}$

Example:
COMPAR ASSIGN ANA INPUT 2[0] = 1
COMPAR_ASSIGN_ANA_INPUT_2[1] = 2
COMPAR ASSIGN ANA INPUT 2[2] = 1
COMPAR ASSIGN ANA INPUT 2[3] = 3
COMPAR_ASSIGN_ANA_INPUT_2[4] = 3
COMPAR_ASSIGN_ANA_INPUT_2[5] = 1

```
COMPAR_ASSIGN_ANA_INPUT_2[6] = 1
COMPAR_ASSIGN_ANA_INPUT_2[7] = 1
Analog input 1 affects input bits 0, 2 , 5, 6 and 7 of comparator byte 2
Analog input 2 affects input bit 1 of comparator byte 2
Analog input 3 affects input bits 3 and 4 of comparator byte 2
Related to:
MD10540 $MN_COMPAR_TYPE_1
MD10541 $MN_COMPAR_TYPE_2
```



## Description:

This MD can be used to make the following settings for the individual output bits (0 to 7) of comparator byte 1:

- Bits 0 to 7: Comparison type mask (for comparator output bits 0 to 7)

Bit $=1$ : output bit $=1$ if analog value $>=$ threshold value Bit $=0$ : output bit $=1$ if analog value < threshold value (Threshold value defined by SD41600 \$SN_COMPAR_THRESHOLD_1)

- Bits 8 to 15: Not used (defined to be set to 0)
- Bits 16 to 23: Assignment of a HW output byte for outputting the comparator states (statement of the byte address) Byte $=0$ : No output via digital NC outputs Byte = 1: Output via digital onboard NC outputs (1 to 4) Byte $=2$ : Output via external digital NC outputs 9 to 16 Byte = 3: Output via external digital NC outputs 17 to 24 Byte $=4:$ Output via external digital NC outputs 25 to 32 Byte $=5$ : Output via external digital NC outputs 33 to 40
- Bits 24 to 31: Inversion mask for the output of the comparator states (bits 0 to 7)

$$
\begin{array}{ll}
\text { Bit }=0: & \text { Output bit is not inverted } \\
\text { Bit }=1: & \text { Output bit is inverted }
\end{array}
$$

Related to:
MD10530 \$MN_COMPAR_ASSIGN_ANA_INPUT_1
MD10531 \$MN_COMPAR_ASSIGN_ANA_INPUT_2
SD41600 \$SN_COMPAR_THRESHOLD_1
SD41601 \$SN_COMPAR_THRESHOLD_2
MD10360 \$MN_FASTIO_DIG_NUM_OUTPUTS


Description: This MD can be used to make the following settings for the individual output bits (0 to 7) of comparator byte 2:

- Bits 0 to 7: Comparison type mask (for comparator output bits 0 to 7)

Bit = 1: output bit = 1 if analog value >= threshold value Bit $=0$ : output bit $=1$ if analog value $<$ threshold value (Threshold value defined by SD41601 \$SN_COMPAR_THRESHOLD_2)

- Bits 8 to 15: not used (defined to be set to 0)
- Bits 16 to 23: Assignment of a HW output byte for outputting the comparator states (statement of the byte address)
- Byte $=0:$ no output via digital NC outputs

| Byte $=1:$ | output via digital onboard NC outputs (1 to 4$)$ |
| :--- | :--- | :--- |
| Byte $=2:$ | output via external digital NC outputs 9 to 16 |
| Byte $=3:$ | output via external digital NC outputs 17 to 24 |
| Byte $=4:$ output via external digital NC outputs 25 to 32 |  |
| Byte $=5:$ output via external digital NC outputs 33 to 40 |  |

- Bits 24 to 31: Inversion mask for the output of the comparator states (bits 0 to 7)

Bit $=0: \quad$ Output bit is not inverted
Bit $=1: \quad$ Output bit is inverted
Related to:
MD10530 \$MN_COMPAR_ASSIGN_ANA_INPUT_1
MD10531 \$MN_COMPAR_ASSIGN_ANA_INPUT_2
SD41600 \$SN_COMPAR_THRESHOLD_1
SD41601 \$SN_COMPAR_THRESHOLD_2
MD10360 \$MN_FASTIO_DIG_NUM_OUTPUTS

| 10600 | FRAME_ANGLE_INPUT_MODE |  | EXP, N01, N09 | K2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Sequence of rotation in FRAME |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 1 | 1 | 2 | 7/2 | M |

FRAME ANGLE INPUT MODE sets how the rotations (ROT and AROT) around the three geometry axes āre defined íf more than one rotation is programmed in a block. The order in which these rotations are programmed within the block is irrelevant.
The rotations can be set to be calculated according to:

- Euler angle with FRAME_ANGLE_INPUT_MODE $=2$

The rotations are calculated according to the Euler angle in the following order:

1. Rotation around $Z$
2. Rotation around X
3. Rotation around Y

- RPY with FRAME_ANGLE_INPUT_MODE = 1

The rotations are calculated according to the Euler angle in the following order:

1. Rotation around Z
2. Rotation around $Y$
3. Rotation around X

| 10602 | FRAME_GEOAX_CHANGE_MODE |  | EXP, N01, N09 | K2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Frames when changing geometry axes |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 5 | 7/2 | M |

Description: Geometry axes can be switched over in the following states:

- Selection and deselection of transformations
- Switchable geometry axes GEOAX()

The current total frame is then defined as follows:
0: The current total frame is canceled.
1: The current total frame is recalculated when geometry axes are switched over. Translations, scaling and mirroring for the new geometry axes become active. The rotations of the old geometry axes still apply.

2: The current total frame is recalculated when geometry axes are switched over. Translations, scaling and mirroring for the new geometry axes become active. If rotations were active before switching over to the current base frames, current settable frame or programmable frame, switchover is canceled with an alarm.
3: The current total frame is deleted when selecting and deselecting transformations. When the GEOAX() command is entered, the frame is recalculated and transaction, scaling and mirroring for the new geometry axes become active. The rotations of the old geometry axes still apply.

| 10604 | WALIM_GEOAX_CHANGE_MODE |  | EXP, N01, N09 | A3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Working area limitation by changing geometry axes |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 0 | 1 | $7 / 2$ | M |
| Description: | This machine dat remain active af Meaning of the = 0 Working are = 1 Working area | ata specifies whether after geo axis replace MD values: <br> rea limitation will be ea limitation will rema | ly active wo hether it wil <br> ed when repla ted when repl | king be ing | itation will ed. |


| 10610 | MIRROR_REF_AX |  |  |  |  |  | EXP, N01, N09 | K2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Reference axis for mirroring | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 3 | M |  |  |  |

0: Mirroring always takes place in the stated axis, without scaling.
The mirroring of a geometry axis can always be related to a defined
reference axis.
1: x is the reference axis
Mirroring of the $x$ axis is unique.
Mirroring of the $y$ axis is mapped on:
a mirroring of the $x$ axis and
a rotation of the $z$ axis through 180 degrees.
Mirroring of the $z$ axis is mapped on:
a mirroring of the $x$ axis and
a rotation of the $x$ axis through 180 degrees and
a rotation of the $z$ axis through 180 degrees
2: y is the reference axis
Mirroring of the $x$ axis is mapped on:
a mirroring of the $y$ axis and
a rotation of the $z$ axis through 180 degrees.
Mirroring of the $y$ axis is unique.
Mirroring of the $z$ axis is mapped on:
a mirroring of the $y$ axis and
a rotation of the $x$ axis through 180 degrees
3: z is the reference axis
Mirroring of the $x$ axis is mapped on:
a mirroring of the $z$ axis and
a rotation of the $z$ axis through 180 degrees and
a rotation of the $x$ axis through 180 degrees
Mirroring of the $y$ axis is mapped on:
a mirroring of the $z$ axis and

```
a rotation of the x axis through 180 degrees.
Mirroring of the z axis is unique.
```



## Description:

Mirror toggle function.
1: Programmed axis values are not evaluated. Toggle switching behavior.
0: Programmed axis values are evaluated.
The axes are mirrored in the case of values not equal to 0 if they are not already mirrored. Mirroring is disabled if the value is 0.

| 10613 | NCBFRAME_RESET_MASK | EXP | K2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Active NCU global base frames after reset | UDWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0xFFFF | 0 | $0 x F F F F$ |  |  |

Description: Bit mask for the reset setting of the NCU global base frames which are included in the channel.

The following applies:
When MD20110 \$MC_RESET_MODE_MASK bit0 = 1 and bit14 = 1
The entire base frame is derived on reset from the linking of the NCU global base frame field elements whose bit in the bit mask is 1.
When MD20110 \$MC_RESET_MODE_MASK bit0 = 1 and bit14 = 0
The entire base frame is deselected on reset.

| 10615 | NCBFRAME_POWERON_MASK |  |  |  |  |  | EXP, N12 | K2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Reset global base frames after power on | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 x F F F F$ |  |  |  |  |

Description: This machine data defines whether global base frames are reset in the data management on Power On.

That is

- Offsets are set to 0,
- Scalings are set to 1 .
- Mirroring is disabled.

The individual base frames can be selected separately.
Bit 0 means base frame 0, bit 1 base frame 1 etc.
Value=0: Base frame is retained on Power On
Value=1: Base frame is reset in the data management on Power On.
Related to:
MD24004 \$MC_CHBFRAME_POWERON_MASK

| 10616 | MAPPED_FRAME_MASK | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Enable frame mapping | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 3001$ | 0 | $0 \times 00007$ FFF | $7 / 2$ |  |

[^1]| Bit $0:$ | \$P_SETFR | System frame for actual value setting and scratching |
| :--- | :--- | :--- |
| Bit 1: | \$P_EXTFR | System frame for external work offset |
| Bit 2: | \$P_PARTFR | System frame for TCARR and PAROT |
| Bit 3: | \$P_TOOLFR | System frame for TOROT and TOFRAME |
| Bit 4: | \$P_WPFR | System frame for workpiece reference points |
| Bit 5: | \$P_CYCFR | System frame for cycles |
| Bit 6: | \$P_TRAFR | System frame for transformations |
| Bit 7: | \$P_ISO1FR | System frame for ISO G51.1 Mirror |
| Bit 8: | \$P_ISO2FR | System frame for ISO G68 2DROT |
| Bit 9: | \$P_ISO3FR | System frame for ISO G68 3DROT |
| Bit 10: | \$P_ISO4FR | System frame for ISO G51 Scale |
| Bit 11: | \$P_RELFR | System frame for relative coordinate systems |
| Bit12: | \$P_CHBFR | Channel-specific basic frames |
| Bit13: | \$P_UIFR | Settable frames |
| Bit14: | \$P_GFR | Grinding frames |


| 10617 | FRAME_SAVE_MASK | EXP | K2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Behavior of frames in SAVE subroutines | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 7$ | $7 / 2$ |  |$]$ M

Description: This machine data is used to define which frames are restored with SAVE attribute at return from a subprogram.
Bit 0: Settable frames G54 through G599
Value = 0 :
If the same $G$ code is active at subprogram return and subprogram call, the active settable frame is maintained. If not, the settable frame is reactivated when the subprogram is called.

Value = 1:
At subprogram return, the settable frame is reactivated when the subprogram is called.
Bit 1: Basic frame
Value = 0:
The active basic frame is not changed at subprogram return. This is also the case if a basic frame change is carried out in the subprogram by an operation or by an implicit frame deselection (possibly through TRAFOOF).
Value = 1:
At subprogram return, the basic frame is reactivated when the subprogram is called. Bit 2: Grinding frames GFRAMEO through GFRAME100
Value = 0:
If the same $G$ code is active at subprogram return and subprogram call, the active grinding frame is retained. If not, the grinding frame is reactivated when the subprogram is called.
Value = 1:
At subprogram return, the grinding frame is reactivated when the subprogram is called.

| 10618 | PROTAREA_GEOAX_CHANGE_MODE | EXP, N01, N09 | A3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Protection range on change of geometry axes | UBYTE | PowerOn |  |  |  |
| - | - | $0 \times 0$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ |  |

Description:
This machine data is used to define whether any active protection zones will remain active after a transformation change or geo axis replacement, or whether they will be deactivated.

The machine data is bit-coded with the following meanings:
Bit $0=0$
Protection zones deactivated on transformation change.
Bit $0=1$
Active protection zones remain active after transformation change.
Bit $1=0$
Protection zones deactivated on geo axis replacement.
Bit $1=1$
Active protection zones remain active after geo axis replacement.

| 10619 | COLLISION_TOLERANCE |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Tolerance for collision check |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 1 | 0.001 | 1000.0 |  |  |  |  |

## Description:

This parameter is used to set the required collision check accuracy. This means: If the distance between two protection zones is smaller than this value, a collision of those two protection zones may be signalled. But: Two protection zones that overlap by less than this value cannot be classified as colliding.

| 10620 | EULER_ANGLE_NAME_TAB |  |  |  |  |  | N01, N09 | F2, TE4 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Name of Euler angle | STRING | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 3 | A2, B2, C2 | - | - | 7/2 |  |  |  |

## Description:

- The name entered must not conflict with the designation and assignment of machine and geometry axis names.
- The name entered must not conflict with channel axis names in the channel (MD20080 \$MC_AXCONF CHANAX_NAME TAB), names for directional vectors (MD10640 \$MN_DIR VECTOR NAME TAB), names for intermediate point coordinates for CIP (MD10660 \$MN_INTERMEDIATE_POINT_NAME_TAB) or the names for interpolation parameters (MD10650 \$MN_IPO_PARAM_NAME_TAB).
- The name entered must not contain the following reserved address letters:
- D Tool offset (D function)
- E Reserved
- F Feedrate (F function)
- G Preparatory function
- H Auxiliary function (H function)
- L Subprogram call
- M Special function (M function)
- N Subblock
- P Number of subroutine repetitions
- R Arithmetic parameter
- S Spindle speed (S function)
- T Tool ( $T$ function)
- Nor are keywords (e.g. DEF, SPOS etc.) or predefined identifiers (e.g. ASPLINE, SOFT) allowed.
- An angle identifier consists of a valid address letter (A, B, C, I, J, K, Q, U, V, $W, X, Y, Z)$ followed by an optional numerical extension (1-99).

| 10621 | COLLISION_PREP_CALC_TIME | EXP | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Maximum computation time of the preparative collision check. |  |  |  |  | DOUBLE | NEW CONF |
| - | - | 0.0 | 10.0 | $1 / 1$ |  |  |  |
| - | - | 0.0 | M |  |  |  |  |

Description:
The maximum computing time of the preparatory collision check is set with this machine data.
$>0$ : After the set time, the preparatory collision check of the current block is interrupted. That makes computing time available to the external communication.

0 : The preparatory collision check is not interrupted. That does not make any computing time available to the external communication during the collision check. A communication failure may occur between $H M I$ and NCK in extreme cases.

A value of 0.5 s is recommended.

| 10622 | COLLISION_SAFETY_DIST | EXP | - |  |
| :--- | :--- | :--- | :--- | :--- |
| mm | Safety distance for collision check <br> - <br> - <br> Description:If the distance between two protection zones becomes smaller than this safety <br> distance, this is regarded as a collision. This machine data is globally effective for <br> protective zone pairs for which no special safety distance was specified (s. function <br> COLLCHECK). |  |  |  |


| 10624 | ORIPATH_LIFT_VECTOR_TAB | N01, N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Name of retraction vector for path-relative orientation. | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | A8, B8, C8 | - | - | 7/2 |  |

Description:

List of identifiers for components of the retraction vector during reorientations for path relative interpolation of the tool orientation.
The rules for axis identifiers as described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers. The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, normal vectors, direction vectors, conical interpolation vectors, interpolation parameters, intermediate point coordinates).

| 10626 | ORIPATH_LIFT_FACTOR_NAME |  | N01, N09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Name of relative safety clearance with ORIPATH |  | STRING | Pow |  |
| - |  |  |  |  |  |
| - | ORIPLF | - | - | 7/2 | M |

Description: Identifier for relative factor for determining a safety clearance for the retracting movement during reorientations for path relative interpolation of the tool orientation.

The rules for axis identifiers as described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers. The identifiers must be selected so thāt they do not cause any conflicts with other identifiers (axes, normal vectors, direction vectors, conical interpolation vectors, interpolation parameters, intermediate point coordinates).

| 10630 | NORMAL_VECTOR_NAME_TAB | N01, N09 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Name of normal vectors | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 6 | A4, B4, C4, A5, B5, C5 | - | - | 7/2 |  |

[^2]
### 4.1 General NC machine data

List of identifiers for the normal vector components at the beginning and end of the block.

The rules for axis identifiers described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, direction vectors, interpolation parameters, intermediate point coordinates).

| 10640 | DIR_VECTOR_NAME_TAB | N01, N09 | F2, TE4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Name of direction vectors | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 6 | A3, B3, C3, AN3, BN3, <br> CN3 | - | - |  |  |

Description:
List of identifiers for the direction vector components. (A3 to C3)
List of identifiers for the vector components perpendicular to the direction vector (AN3 to CN3)
The rules for axis identifiers described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers.
The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, normal vectors, interpolation parameters, intermediate point coordinates).

| 10642 | ROT_VECTOR_NAME_TAB | N01, N09 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Name of rotation vectors | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | A6, B6, C6 | - | - |  |  |

Description: List of identifiers for the rotation vector components in taper direction
The rules for axis identifiers as described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, normal vectors, interpolation parameters, intermediate point coordinates).

| 10644 | INTER_VECTOR_NAME_TAB |  | N01, N09 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Name of intermediate vector components |  | STRING | Pow |  |
| - |  |  |  |  |  |
| - | 3 A7, B7, C7 | - | - | 7/2 | M |

## Description:

List of identifiers for the intermediate vector components
The rules for axis identifiers described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers.
The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, normal vectors, interpolation parameters, intermediate point coordinates).

| 10646 | ORIENTATION_NAME_TAB | N01, N09 | F2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Identifiers for programming a 2nd orientation path |  |  |  |  |  | STRING | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 3 | XH, YH, ZH | - | - |  |  |  |  |

Description: List of identifiers for programming of the 2 nd space curve for tool orientation The rules for axis identifiers as described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers.

The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, normal vectors, interpolation parameters, intermediate point coordinates).


Description: Identifier for the opening angle for orientation interpolation
The rules for axis identifiers as described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers.
The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, normal vectors, direction vectors, intermediate point coordinates).



Description: Identifier list of interpolation parameters for convex threads
When selecting identifiers, the rules for axis identifiers described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply.
The identifiers must be selected so that there is no conflict with other identifiers (axes, Euler angle, normal vector, direction vector, intermediate point coordinate).
Corresponds with:
MD10650 \$MN_IPO_PARAM_NAME_TAB
MD10660 \$MN_INTERMEDIATE_POINT_NAME_TAB


Description:
List of identifiers for the intermediate point coordinates
The rules for axis identifiers described in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB apply to the selection of identifiers. The identifiers must be selected so that they do not cause any conflicts with other identifiers (axes, Euler angles, normal vectors, direction vectors, intermediate point coordinates).

### 4.1 General NC machine data

```
Related to:
MD10650 $MN_IPO_PARAM_NAME_TAB
MD10651 $MN_IPO_PARAM_THREAD_NAME_TAB
References: /PG/, Programming Guide: Fundamentals
```

| 10670 | STAT_NAME |  |  |  |  |  |  | N01, N09 | F2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Name of state information | STRING | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | STAT | - | - |  |  |  |  |  |

Description: Identifier for position information for solving ambiguities in
Cartesian PTP travel.
An identifier must be chosen that does not conflict with other identifiers (e.g. axes, Euler angles, normal vectors, direction vectors, intermediate point coordinates).


Description: Identifier for position information of axes for solving ambiguities in
Cartesian PTP travel.
An identifier must be chosen that does not conflict with other identifiers (e.g. axes, Euler angles, normal vectors, direction vectors, intermediate point coordinates).

| 10674 | PO_WITHOUT_POLY | N01 | F2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Polynomial programming programmable without G function POLY BOOLEAN |  |  |  |  |  | PowerOn |
| - |  |  |  |  |  |  |  |
| - | - | FALSE | FALSE | TRUE |  |  |  |

## Description:

Until now, the $G$ function POLY has always had to be active during polynomial programming with $P O[x x]=(x x)$,
otherwise an alarm was output.
If MD10674 \$MN_PO_WITHOUT_POLY is set to TRUE, no alarm is output with POLY inactive during polynomial programming. The end point of the polynomial is then approached with the linear interpolation G1.
There is no polynomial interpolation if POLY is inactive.

| 10682 | CONTOUR_SAMPLING_FACTOR | N01, EXP | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Contour sampling factor | DOUBLE | Reset |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | $1.0 \mathrm{E}+301$ | $1 / 1$ |  |  |

Description:
This factor defines the maximum time interval in which a curved contour is sampled in the interpolator.
The maximum sampling time results from the set interpolation cycle
(see MD10071 \$MN_IPO_CYCLE_TIME),
the factor set with this data, and the tolerance set for the geometry axes in MD33100 \$MA_COMPRESS_POS_TOL[].

| 10700 | PREPROCESSING_LEVEL | N01, N02 | V2, K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Program preprocessing level | UBYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 25$ | 0 | $0 \times 7 F$ | $2 / 2$ |  |

```
Description: Bit 0= 0:
    No preprocessing
    Bit 0= 1:
    The call description of the cycles is formed during control power on. All the programs
    in the directories _N_CUS_DIR, _N_CMA_DIR and _N_CST_DIR can be called in the part
    program without EXTERNAL declaration. If the parameter interface of a cycle is changed
    in the control, then this change does not become active until after Power On.
    Bit 1=1:
    During control power on, all cycles in the directories _N_CUS_DIR, _N_CMA_DIR and
    _N_CST_DIR are preprocessed to form a process-optimizing compilation. These cycles are
    then processed more quickly. Changes to the cycle programs do not become active until
    after the next Power On.
    Bit 2=1:
    During control power on, the Siemens cycles in the directory _N_CST_DIR are
    preprocessed to form a process-optimizing compilation (from SW }\overline{3}.5)\mathrm{ ..
    Bit 3=1:
    During control power on, the user cycles in the directory _N_CUS_DIR are preprocessed
    to form a process-optimizing compilation (from SW 3.5).
Bit 4=1:
Preprocessing the user cycles in the directory _N_CMA_DIR
Bit 5=1:
All files marked with PREPRO in the PROG statement line are preprocessed (from SW 6.4)
Bit 5=0:
During control power on, all cycles in the directories activated by bits 1 to 4 are
preprocessed. This also applies to programs that are not marked with PREPRO.
Bit 6=1:
The compilation is stored in SRAM if there is inadequate space in DRAM (from SW 7.1).
    Memory space is required for preprocessing cycles. Better utilization of memory can
be achieved by selective setting of the preprocessing:
The runtime-critical cycles are brought together in one directory. The remaining cycles are in the other directory.
References:
/PG/, "Programming Guide Fundamentals" (EXTERNAL declaration)
```

| 10702 | IGNORE_SINGLEBLOCK_MASK | N01 | K1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Prevents stopping at specific blocks in single block mode | UDWORD | PowerOn |  |  |  |
| - | - | 0 | 0 | $0 x 1$ FFFF | $7 / 2$ |  |

This machine data prevents stopping at certain blocks with
single block.
Single block stop can be prevented with the following bits of the mask:
Bit0 $=1$
Means that there is no stop in any internal ASUB block. Exception: The single block stop has been explicitly activated by the SBLON command.
There are three different internal ASUBs that are triggered by different events.

- Repos: In the case of the events: change of operating mode to a manual mode (JOG,

JOGREF, etc.) unless MODESWITCH_MASK is not set, switch skip block on and off,
activate machine data, switch-on overstore, axis replacement, subroutine level cancelation, switch-on single block, switch dry run feedrate on and off, alarm with compensation block.

- Return: Delete distance-to-go, switchover after TEACH-IN (if available), or deselection of MDI with corresponding MODESWITCH_MASK.
- _N_PROG_EVENT_SPF: Parameterizing MD 20108 \$MC_PROG_EVENT_MASK parameterizes the events whereby _N_PROG_EVENT_SPF is executed.
Bit1 = 1
Means that there is no stop in any user ASUB block. Exception: The single block stop has been explicitly activated via the SBLON command.

User ASUBs are linked to an interrupt by the part program command SETINT or via the PI- _N_ASUP__. The interrupt is then activated via PLC or the high-speed inputs, and the user ASUBs are retracted.

This disables machine data MD20117 \$MC_IGNORE_SINGLEBLOCK_ASUP. The NCK behavior corresponds to the machine data assignment MD20117 \$MC_IGNORE SINGLEBLOCK_ASUP= FFFFFFFF.

Bit2 = 1
Means that there is no stop in any intermediate block. Intermediate blocks are generated at, among other events, tool change, ADIS and complicated geometry. Bit3 = 1

Means that there is no stop in the block search pickup block. The block search pickup block is the 1st block that is loaded into the main run at the start after the search target has been found in the program.
Bit4 = 1
Means that there is no stop in the INIT blocks. INIT blocks are generated from reset immediately after a part program start.
Bit5 = 1
Means that there is no stop in any subprogram block with the parameter DISPLOF. Bit6 = 1
Means that there is no stop in any block in which the NCK cannot reorganize.
Reorganize is an internal procedure that is needed for mode change after JOG/ JOGREF..., switch skip block on and off, activate machine data, axis replacement, switch on overstore, switch on single block, switch dry run feedrate on and off, subroutine level cancelation, user ASUBs delete distance-to-go, switchover after TEACHIN (if available). Reorganize is never needed in Reset state.

Example blocks in which reorganize is impossible:

- Tool change
- 1st block after the Repos procedure
- Block after an ASUB from JOG/canceled

Bit7 = 1
Means that there cannot be a stop in any block in which repositioning is impossible.
Reposition is an internal procedure that is needed for mode change after JOG/ JOGREF..., switch skip block on and off, activate machine data, axis replacement, switch on overstore, switch on single block, switch dry run feedrate on and off, subroutine level cancelation, and possibly user ASUBs. Reposition is never needed in Reset state.

Example blocks in which reposition is impossible:

- G33 + blocks in which reorganize is impossible.

Bit8 = 1
Means that there is no stop in a residual block that does not contain traversing information.
Bit9 $=1$
Means that there is no stop in a run in/main run synchronization block (e.g.STOPRE, \$Variable) that is repeated because of an interruption with Reorg (e.g. mode change). Bit10=1
Means that there is no stop in a "tool selection block". "Tool selection block" only occurs with tool management (magazine management or TMMG) active. This block gives the corresponding tool change command to the PLC.

This block is generally generated by $T$ programming from the part program.

Example block "N1010 T="Drill" M6 D1"
Depending on machine data, the "tool selection block" can be held in the interpolator until the PLC has acknowledged the corresponding tool change (see MD20310 \$MC_TOOL_MANAGEMENT_MASK). However the program status remains in "run".
Bit11= 1
The control has to automatically generate implicit GET blocks for the axis replacement function (axis replacement: 2 or more channels control one axis alternately) if no explicit GET(D) has been programmed and the following block wants to traverse the axis. (The other channel had previously used this axis).
An explicitly programmed GET may appear as follows "getd(x1,y1,z1) or get(x1,y1,z1)". There is no stop at explicit or implicit GET blocks in the single block with this bit 11.

Bit12= 1
There is no stop in the single block type 2 in the SBLON block.
Bit13= 1
If an axis is pulled out in the middle of a block and possibly assigned to another channel, then there is no stop at the PREMATURE end of this block. This block follows a REPOSA in order to traverse it to the end, there is no stop until this end has been reached.
Bit14=1
In a part program line, in which a substitution subroutine is called due to NC language replacement, only one stop is performed under the condition that the subroutine includes PROC attribute SBLOF. It is irrelevant whether the subroutine is called at block start and/or end or whether it is exited with M17 or RET.
Bit15=1
Means that there is no stop in any user ASUB block. Exception: The single block stop has been explicitly activated via the SBLON command.
There are three different internal ASUBs that are triggered by different events.

- Repos: In the case of the events: change of operating mode to a manual mode (JOG, JOGREF,...) unless MODESWITCH_MASK is not set, switch skip block on and off, activate machine data, switch-on overstore, axis replacement, subroutine level cancelation, switch-on single block, switch dry run feedrate on and off, alarm with compensation block.
- Return: Delete distance-to-go, switchover after TEACH-IN (if available), or deselection of MDI with corresponding MODESWITCH_MASK.
Bit16=1
Activating SERUPRO (search run via prog test) prevents stopping at single blocks. Related to:
MD20117 \$MC_IGNORE_SINGLEBLOCK_ASUP


Machine data

## NOTICE:

However, the function does not become active until a "later" block in the program execution and this is with the next (implicit) StopRe block.
Related to:
SD42100 \$SC_DRY_RUN_FEED


Description:
If SLASH_MASK $=0$, skip block can only be activated when stopped at the end of the block
If SLASH_MASK = 1, skip block can also be activated during program execution.
NOTICE!
After activating skip block, the axes are stopped for the duration of the reorganization process.
If SLASH_MASK = 2 , skip block can be activated in every phase.
Notice!
However, the function does not become active until a "later" block in the program execution, and this is with the next (implicit) StopRe block.

| 10707 | PROG_TEST_MASK | N01 | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Program test mode | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 11$ | 0 | $0 \times 1 F$ | $7 / 2$ |  |

## Description:

Bit-coded mask for program test
Bit $0=1 \quad$ Program test cannot be deselected in 'Stopped' program status.
Bit 1 == 1 Enable to activate the program test using the PI command _N_NCKMOD
Bit $2=1$ Activation of program test with accelerated feed in normal program processing. If the bit is set, the program test is active in all channels with accelerated feed via the VDI signal in the first channel. The VDI signal has no effect in all other channels as long as the bit is set. The value in \$MC_SERUPRO_SPEED_FACTOR of the first channel is used as the feed. Only released for test purposes.
Bit $3=1$ Activation of program test with accelerated feed in the simulation. Bit 4 == 1 Activation of accelerated program test takes place in synchronized multichannel mode.
Bit 5..31 As yet unused.
Program test with normal processing is always activated via the VDI interface.
Program test in simulation is always activated via the NCKMode PI.
Program test block search is always activated via the Find-Pi.

| 10708 | SERUPRO_MASK |  | N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Block search modes |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 0 | 0x3f | 7/2 | M |

## Description:

Bit-coded mask for block search via program test (abbr. SERUPRO).
SERUPRO block search is activated with the PI service _N_FINDBL mode parameter == 5 .
SERUPRO means SEarchRUn by PROgram test; in other words, proceed under program test
from start of program to search target. Note: Program test does not move any axes.
Bit $0=0$
There is a stop at M0 during the search phase.
Bit $0==1$

There is no stop at M0 during the search phase.
Bit $1=0$
Alarm 16942 cancels the search phase on part program command START.
Bit $1==1$
Alarm 16942 is switched off.
NOTICE:
A start program command might actually start the other channel!
Bit $2=0$
Switches the function "Group SERUPRO" off
Bit 2 == 1
Switches the function "Group SERUPRO" on.
"Group SERUPRO" enables a search routine in which the start part program command is changed into a search routine for the other channel.
Bit $3=0$
Forces all channels that have started SERUPRO to end SERUPRO simultaneously unless they are canceled via Reset or the channel reaches M30 without finding the search target. In other words, all channels that find the search target (including selfacting SERUPRO) terminate SERUPRO simultaneously.
Bit $3=1$
Switches this function off
Bit $4=0$
Take external override into account in SERUPRO.
Bit 4 == 1
An external override (sent via PLC signal or MCP) is ignored during SERUPRO.
Bit $5=0$
With SERUPRO, complex path calculations are made.
Bit $5=1$
With SERUPRO, calculation is made with simple, computing-time-optimized algorithms.
Bit 6 .. 31
As yet unused.

| 10709 | PROG_SD_POWERON_INIT_TAB | EXP, N01 | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Setting data to be initialized | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 30 | $43200,43202,0,0,0$, <br> $0,0,0 \ldots$ | - | - | M |  |

Description:
Setting data to be initialized:
The values of the programmable $S D$ indicated in this MD are set to their initial values on control power up.
Only the setting data listed in the table below, however, can be initialized. If invalid setting data numbers are configured, then the alarm 4009 is output at the next run-up of the control. The alarm shows the index used for configuring the invalid setting data. The alarm can only be eliminated by changing the invalid setting data, i.e. by entering either a valid number or zero!

| SD42000 \$SC_THREAD_START_ANGLE | (GCODE) |
| :--- | :--- |
| SD42010 \$SC_THREAD_RAMP_DISP | SF |
| SD42125 \$SC_SERUPRO_SYNC_MASK |  |
| SD42400 \$SC_PUNCH_DWELLTIME | PDELAYON |
| SD42402 \$SC_NIBPUNCH_PRE_START_TIME |  |
| SD42404 \$SC_MINTIME_BETWEEN_STROKES |  |


| SD42800 | \$SC_SPIND_ASSIGN_TAB | SETMS |
| :---: | :---: | :---: |
| SD43200 | \$SA_SPIND_S | S wih G94,G95,G97,G971,G972 |
| SD43202 | \$SA_SPIND_CONSTCUT_S | S with G96,G961,G962 |
| SD43210 | \$SA_SPIND_MIN_VELO_G25 | G25 S |
| SD43220 | \$SA_SPIND_MAX_VELO_G26 | G26 S |
| SD43230 | \$SA_SPIND_MAX_VELO_LIMS | LIMS |
| SD43235 | \$SA_SPIND_USER_VELO_LIMIT |  |
| SD43300 | \$SA_ASSIGN_FEED_PER_REV_SOURCE | FPRAON |
| SD43350 | \$SA_AA_OFF_LIMIT |  |
| SD43420 | \$SA_WORKAREA_LIMIT_PLUS | G26 |
| SD43430 | \$SA_WORKAREA_LIMIT_MINUS | G25 |
| SD43600 | \$SA_IPOBRAKE_BLOCK_EXCHANGE |  |
| SD43610 | \$SA_ADISPOSA_VALUE |  |
| SD43700 | \$SA_OSCILL_REVERSE_POS1 | OSP1 |
| SD43710 | \$SA_OSCILL_REVERSE_POS2 | OSP2 |
| SD43720 | \$SA_OSCILL_DWELL_TIME1 | OST1 |
| SD43730 | \$SA_OSCILL_DWELL_TIME2 | OST2 |
| SD43740 | \$SA_OSCILL_VELO | FA |
| SD43750 | \$SA_OSCILL_NUM_SPARK_CYCLES | OSNSC |
| SD43760 | \$SA_OSCILL_END_POS | OSE |
| SD43770 | \$SA_OSCILL_CTRL_MASK | OSCTRL |
| SD43780 | \$SA_OSCILL_IS_ACTIVE | OS |
| SD43790 | \$SA_OSCILL_START_POS |  |


| 10710 | PROG_SD_RESET_SAVE_TAB | EXP, N01 | A3, V1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Setting data to be updated | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 30 | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |

Description:
Setting data to be backed up
The values of the SDs listed in this table are stored in non-volatile memory, i.e. they remain valid after power ON. The setting data whose HMI numbers were entered in the backup list are written into the (buffered) active file system after the description of the part program on reset.
Programmable setting data are:
(GCODE)
SD 42000 \$SC THREAD START ANGLE
SF
SD 42010: \$SC_THREAD_RAMP_DISP
DITS/DITE
SD 42400 \$SC_PUNCH_DWELLTIME
SD 42800 \$SC_SPIND_ASSIGN_TAB
SD 43200: \$SA_SPIND_S
SD 43202: \$SA_SPIND_CONSTCUT_S
SD 43210 \$SA_SPIND MIN_VELO G25
SD 43220 SSA_SPIND_MAX VELO G26 G26 S
SD 43230 \$SA_SPIND_MAX_VELO_LIMS LIMS
SD 43300 \$SA_ASSIGN_FEED_PER_REV_SOURCE FPRAON
SD 43420 \$SA_WORKAREA_LIMIT_PLUS G26
SD 43430 \$SA_WORKAREA_LIMIT_MINUS G25
SD 43700 \$SA_OSCILL_REVERSE_POS1 OSP1
SD 43710 \$SA_OSCILL_REVERSE_POS2 OSP2

| SD 43720 | \$SA_OSCILL_DWELL_TIME1 | OST1 |
| :---: | :---: | :---: |
| SD 43730 | \$SA_OSCILL_DWELL_TIME2 | OST2 |
| SD 43740 | \$SA_OSCILL_VELO | FA |
| SD 43750 | \$SA_OSCILL_NUM_SPARK_CYCLES | OSNSC |
| SD 43760 | \$SA_OSCILL_END_POS | OSE |
| SD 43770 | \$SA_OSCILL_CTRL_MASK | OSCTRL |
| SD 43780 | \$SA_OSCILL_IS_ACTIVE | OS |
| The values of D43420 \$SA_WORKAREA_LIMIT_PLUS (working area limitation plus) and SD43430 \$SA_WORKAREA_LIMIT_MINUS (working area limitation minus) are to be stored in the buffered RAM after every RESET, M02, M30 or M17. $\begin{array}{ll} --> & \text { PROG_SD_RESET_SAVE_TAB[0] }=43420 \\ --> & \text { PROG_SD_RESET_SAVE_TAB[1] }=43430 \end{array}$ <br> See also: 'REDEF: change attributes of NC language elements', setting data/PRLOC |  |  |
|  |  |  |
|  |  |  |
|  |  |  |


| 10712 | NC_USER_CODE_CONF_NAME_TAB | EXP, N01, N12 | TE1, B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | List of reconfigured NC codes | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 200 | - | - | - | $2 / 2$ |  |

Description: List of identifiers of the NC codes reconfigured by the user.
The list is to be structured as follows:
Even address: Identifier to be changed
Subsequent odd address: New identifier
The following three types of $N C$ codes can reconfigured:

1. G codes e.g.: G02, G64, ASPLINE...
2. NC addresses e.g.: RND, CHF, ...
3. Pre-defined subprograms e.g.: CONTPRON, ...


Description:
The M functions defined by MD10713 \$MN_M_NO_FCT_STOPRE perform an implicit preprocessing stop.

That is, the interpretation of the next part program line will be stopped until the block with the $M$ function defined in that way has been processed completely (PLC acknowledgment, motion, etc.).


```
MD10715 $MN_M_NO_FCT_CYCLE,
MD20094 $MC_SPIND_RIGID_TAPPING_M_NR,
MD22254 $MC_AUXFU_ASSOC_M0_VALUE
MD10814 $MN_EXTERN_M_NO_MAC_CYCLE,
MD10804 $MN_EXTERN_M_NO_SET_INT
MD10806 $MN_EXTERN_M_NO_DISABLE_INT,
MD10800 $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
MD10802 $MN_EXTERN_CHAN_SYNC_M_NO_MAX
MD20095 $MC_EXTERN_RIGID_TAPPING_M_NR
MD26008 $MC_NIBBLE_PUNCH_CODE
```

| 10715 | M_NO_FCT_CYCLE |  |  |  |  |  |  | EXP, N12, N07 | H2, K1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | M function to be replaced by a subroutine | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 30 | $-1,-1,-1,-1,-1,-1,-1$, <br> $-1 .$. | - | - |  |  |  |  |  |

Description:
M number with which a subprogram is called.
The name of the subprogram is stated in MD10716 \$MN_M_NO_FCT_CYCLE_NAME[n]. If the M function defined in MD10715 \$MN_M_NO_FCT_CYCLE[n] is programmed in a part program block, the subprogram defined in $\bar{M} D 1 \overline{0} 716$ \$MN_NO_FCT_CYCLE_NAME[n] will be started at the end of the block. If the $M$ function is programmed again in the subprogram, no further substitution is performed by a subprogram call. Other substitutions configured in MD10715 \$MN_M_NO_FCT_CYCLE are not performed in the subprogram either. MD10715 \$MN_M_NO_FCT_CYCLE[n] is effective both in Siemens mode G290 and in external language mode G291.
The subprograms configured with MD10716 \$MN_M_NO_FCT_CYCLE_NAME[n] and MD10717 \$MN_T_NO_FCT_CYCLE_NAME must not be active simultaneously in one block (line of a part program). This means that no more than one $M / T$ function replacement can be active in any one block. Neither an M98 nor a modal subprogram call may be programmed in a block with the $M$ function replacement.
Subprogram return and end of part program are also not permitted. Alarm 14016 is output in the event of a conflict.
Restrictions:
M functions with a fixed meaning and configurable $M$ functions are checked for conflicting settings. A conflict is reported with an alarm.
The following $M$ functions are checked:

- M0 to M5,
- M17, M30,
- M19,
- M40 to M45,
- M function for spindle/axis mode switchover according to MD20094 \$MC_SPIND_RIGID_TAPPING_M_NR (default: M70),
- M functions for nibbling/punching as configured in MD26008 \$MC_NIBBLE_PUNCH_CODE if activated by MD26012 \$MC_PUNCHNIB_ACTIVATION.
- M19, M96-M99 for applied external language (MD18800 \$MN_MM_EXTERN_LANGUAGE).

Exception: The M functions for the tool change defined by MD22560
\$MC_TOOL_CHANGE_M_CODE.

| 10716 | M_NO_FCT_CYCLE_NAME | EXP, N12, N07 | K1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Subroutine name for M function replacement | STRING | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 30 | - | - | - | $7 / 2$ |  |  |$]$ M

## Description:

The machine data contains the name of the cycle. This cycle is called if the $M$ function has been programmed from MD10715 \$MN_M_NO_FCT_CYCLE.
If the $M$ function is programmed in a motion block, the cycle is executed after the motion.

MD10715 \$MN M NO FCT CYCLE is active in both Siemens mode G290 and in external language mode G2 $\overline{9} 1$.
If a $T$ number is programmed in the call block, then the programmed $T$ number can be polled in the cycle under the variable \$P_TOOL.
$M$ and $T$ function replacements must not be programmed simultaneously in one block. This means that not more than one $M$ or $T$ function replacement may be active in any one block. Neither an M98 nor a modal subprogram call may be programmed in a block with M function replacement.
Moreover, neither subprogram return nor part program end are allowed.
Alarm 14016 is issued if there is a conflict.
Related to:
MD10715 \$MN_M_NO_FCT_CYCLE,
MD10717 \$MN_T_NO_FCT_CYCLE_NAME

| 10717 | T_NO_FCT_CYCLE_NAME |  |  |  |  |  | EXP, N12, N07 | K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Name of tool-changing cycle for T function replacement | STRING | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | - | - | $7 / 2$ | M |  |  |  |

Description:
Cycle name for tool change routine on call-up with a $T$ function.
If a $T$ function is programmed in a part program block, the subprogram defined in T_NO_FCT_CYCLE_NAME is called at the end of the block.

The $T$ number programmed can be polled in the cycle via system variables \$C_T / \$C_T_PROG as a decimal value and via \$C_TS / \$C_TS_PROG as a string (only with tool management). MD10717 \$MN_T_NO_FCT_CYCLE_NAME is active both in Siemens mode G290 and in external language mode G291.

MD10716 \$MN_M_NO_FCT_CYCLE_NAME and MD10717 \$MN_T_NO_FCT_CYCLE_NAME must not be active in one block à the same time, i.e. no more than one $M / \bar{T}$ function replacement can be active per block. Neither an M98 nor a modal subprogram call can be programmed in a block with a $T$ function replacement. Furthermore, neither subprogram return nor part program end are allowed.
Alarm 14016 is output in the event of a conflict.
Related to:
MD10715 \$MN_M_NO_FCT_CYCLE,
MD10716 \$MN_M_NO_FCT_CYCLE_NAME


Description: If an M function replacement was configured with MD10715 \$MN_M_NO_FCT_CYCLE[n] /
MD10716 \$MN M NO FCT CYCLE NAME [n], a parameter transfer via system variable can be specified for one of these $M$ functions using MD10718 \$MN_M_NO_FCT_CYCLE_PAR, in the same way as $T$ function replacement. The parameters stored in the system variables always refer to the part program line where the $M$ function to be replaced was programmed.
The following system variables are available:
\$C_ME : Address extension of the replaced M function
\$C_T_PROG : TRUE if address $T$ was programmed
\$C_T : Value of address T ( Integer )

```
$C_TE : Address extension of address T
$C_TS_PROG : TRUE if address TS was programmed
$C_TS : Value of address TS (string, only with tool management )
$C_D_PROG : TRUE if address D was programmed
$C_D : Value of address D
$C DL PROG : TRUE if address DL was programmed
$C DL : Value of address DL
```

| 10719 | T_NO_FCT_CYCLE_MODE |  |  |  |  |  |  | EXP, N12, N07 | K1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Setting of T function substitution |  |  |  |  |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 7$ |  |  |  |  |  |

Description:
This machine data parameterizes the execution of the replacement subprogram for the tool and tool offset selection.

Bit $0=0$ :
D or DL number is transferred to the replacement subprogram (default value)
Bit $0=1$ :
The D or DL number is not transferred to the replacement subprogram if the following conditions are fulfilled: MD22550 \$MC TOOL CHANGE MODE = 1 Programming D/DL with $T$ or $M$ function with which the tool change cycle is called, in a part program line.
Bit $1=0$
Execution of the replacement subprogram at end of block (default value)
Bit $1=1$
Execution of the replacement subprogram at block start
Bit $2=0$ :
Execution of the replacement subprogram according to the settin of bit 1
Bit 2 = 1 :
Execution of the replacement subprogram at block start and at end of block.

| 10720 | OPERATING_MODE_DEFAULT | N01 | H2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Setting of mode after power ON | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 10 | $7,7,7,7,7,7,7,7 \ldots$ | 0 | 12 |  |

Description: Default modes of the mode groups after power ON.
If no mode is selected by the PLC, all the channels associated with mode group $n$ are
in the mode preset by OPERATING_MODE_DEFAULT[ n -1 ] after power ON:
$0=$ Automatic mode
1 = Automatic mode, submode REPOS
2 = MDI mode
3 = MDI mode, submode REPOS
4 = MDI mode, submode Teach In
5 = MDI mode, submode Reference point approach
6 = JOG mode
7 = JOG mode, submode Reference point approach
8 = AUTO mode, submode Teach In
9 = AUTO mode, submode Teach In, submode Reference point approach
10 = AUTO mode, submode Teach In, submode Repos
11 = MDI mode, submode Teach In, submode Reference point approach
12 = MDI mode, submode Teach In, submode Repos

NOTICE! Depending on the machine data MD10721 \$MN_OPERATING_MODE_EXTENDED, the mode set here might not be adopted after power ON

| 10721 | OPERATING_MODE_EXTENDED |  |  | N01 | H2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Extended setting of mode after power ON |  |  | BYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | 10 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | 7/2 | M |

Description: Extended setting of an operating mode of the operating mode groups after power on: $0=$ Selection of the operating mode according to MD10720 \$MN_OPERATING_MODE_DEFAULT $1=$ Selection of the JOG mode if the PLC signal "Retract data available" (DB21-30 DBX377.5) is set in at least one channel of the operating mode group

| 10722 | AXCHANGE_MASK |  |  |  |  |  | EXP, N01 | K5 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Parameterization for axis replacement behavior | UDWORD | PowerOn |  |  |  |  |  |
| - | - | 0 | 0 | 0xFFFF | $7 / 2$ |  |  |  |

Description:
The axis replacement behavior can be changed with this
machine data.
Bit0 $=1$
Means that there is an automatic axis replacement via channels even if the axis has been brought into a neutral state by Waitp.
Bit1 = 1
Means that an AXCTSWE fetches all the axis container axes that can be assigned to the channel by means of implicit GET or GETD, and an axis replacement is not permitted again until after the axis container rotation.
Bit2 $=1$
Means that, in the case of a GET, an intermediate block without preprocessing stop is generated, and whether a reorganization is needed is not checked until main run. Bit3 $=1$ means, that the $N C$ carries out an axis replacement request for the VDI interface only for:

- an axis exclusively controlled by the PLC (MD30460 \$MA_BASE_FUNCTION_MASK

Bit 4 == 1)

- a permanently assigned PLC axis (MD30460 \$MA_BASE_FUNCTION_MASK Bit 5 == 1)

For such axes, the VDI interface signal 'Axis replacement possible' is always
1.

For all other axes, the VDI interface signal 'Axis replacement possible' is
always 0.
For permanently assigned PLC axes, an axis replacement is possible only from neutral axis to PLC axis
or from PLC axis to neutral axis.
Bit3 $=0$ means that an axis replacement can be requested by the PLC for each axis.
For permanently assigned PLC axes, an axis replacement is only possible from neutral axis to PLC axis
or from PLC axis to neutral axis.



Enables JOG in automatic.
JOG is enabled in automatic when all channels in the mode group are in the RESET state and no channel of the DRF mode group has been selected. The mode group changes internally to JOG with the +/- key and the handwheel, and the axis moves. After the JOG motion has ended, a change back to AUTO is also made internally.

Bit 1:
Position with AxFrame.
The function 'JOG to position' considers all axial frames and, in the case of an axis configured as geometry axis, the tool length offset.

Bit 2:
Travel in opposite direction.
The functions 'JOG to position' and 'Approach machine fixed point manually' allow travel in opposite direction, i.e. away from the specified position.
Bit 3:
Tool radius offset.
MD21020 \$MC_WORKAREA_WITH_TOOL_RADIUS is active with JOG motions of the geometry axes. Bit 4:

Alarm suppression operating range limit in the basic coordinate system in JoG.
Alarms that would be output in JOG when an operating range limit is reached in the basic coordinate system, are suppressed.
Bit 5:
Alarm suppression operating range limit in the workpiece coordinate system in JoG. Alarms that would be output in JOG when an operating range limit is reached in the workpiece coordinate system, are suppressed.

Bit 6, 7:
JOG of circles:
Bit 7 and bit $6=0$ traversing the 2 nd geometry axis of the active plane to PLUS for radius increase, traversing to MINUS for radius decrease independently of inner or outer machining being active.

Bit $7=1$ and bit $6=0$ : traversing the 2nd geometry axis of the active plane to PLUS always travels in the direction of the limiting circle. This means that the radius is increased on inner machining and decreased on outer machining.

Bit $7=1$ and bit $6=1$ : traversing the 2nd geometry axis of the active plane to MINUS always travels in the direction of the limiting circle. This means that the radius is increased on inner machining and decreased on outer machining.
Bit 8 :
Bit $8=0$ If there is a JOG retract movement, the retraction axis can only be jogged in the plus direction.

Bit $8=1$ If there is a JOG retract movement, the retraction axis can only be jogged in the plus and minus direction.

Bits 9-31:
Currently unassigned.

| 10750 | SPRINT_FORMAT_P_CODE |  |  |  |  |  | N12 | PGA |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | String coding of the SPRINT format \%P | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $7 / 2$ |  |  |  |

## Description:

Description:
Specification of the character or punched tape code used to code the string which the SPRINT command generates with format control character \%P:
0 : ASCII
1: ISO (DIN66024)
2. EIA (RS-244)

| 10751 | SPRINT_FORMAT_P_DECIMAL |  |  |  |  |  | N12 | PGA |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Parameterization of the SPRINT format \%P | DWORD | PowerOn |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 2$ |  |  |  |

Description: Description:
Parameterization of the format description $\%$ n.mP of the SPRINT command
Value range:
0 : The format specification \%n.mP generates a string from a transfer parameter of type REAL or INT consisting of an integer with $n+m$ places. The first $n$ places represent the integer places and the following $m$ places the decimal places of the transfer parameter. Missing decimal places are filled with 0 . If there are more than m decimal places, the number is rounded. Missing integer places are filled with spaces.
1: The format specification on.mP generates a string from a transfer parameter of type REAL or INT that consists of a decimal number with up to $n$ integer places, the decimal point and m decimal places, which are filled with 0 or rounded as necessary.

| 10760 | G53_TOOLCORR | N12 | FBFA |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Method of operation of G53, G153 and SUPA |  |  |  |  |  | UDWORD | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 3$ |  |  |  |  |

## Description:

With this MD you define whether tool length offset and tool radius offset are also to be suppressed with language commands G53, G153 and SUPA
The machine data is bit-coded.
Bit $0=0$ : G53, G153 and SUPA cause block-by-block suppression of work offsets. The active tool length offset and tool radius offset remain active.
Bit $0=1:$ G53, G153 and SUPA cause block-by-block suppression of work offsets, active tool length offset and tool radius offset. The tool length behavior can be modified with bit 1 .
Bit 1 is only evaluated, if the value of bit 0 is 1.
Bit1 $=0$ : with bit 0 set, the tool length is always suppressed with G53, G153 and SUPA.
Bit1 = 1: with bit 0 set the tool length is only suppressed with G53, G153 and SUPA, if a cutting edge is not selected in the same block (this can also be the cutting edge that is already active).

| 10800 | EXTERN_CHAN_SYNC_M_NO_MIN |  | EXP, N12 | H2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | 1st $M$ function for channel synchronization |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | -1 | - | - | 7/2 | M |

To avoid conflicts with standard $M$ functions the lowest permissible value is 100 . If you enter a value between 0 and 99, alarm 4170 will be issued.

| 10802 | EXTERN_CHAN_SYNC_M_NO_MAX | EXP, N12 | H2 |  |
| :---: | :---: | :---: | :---: | :---: |
| - | Last M function for channel synchronization | DWORD | Pow |  |
| - |  |  |  |  |
| - | -1 | - | $7 / 2$ | M |

Description: M number of the last $M$ function which can be used to perform a channel (program) synchronization in ISO2/3 mode.
In combination with MD10800 \$MN_EXTERN_CHAN_SYNC_M_NO_MIN, the machine data defines an $M$ number range reserved for channel synchronization. This range may be a maximum of 10 times the number of channels as only 10 WAIT marks may be set for each channel. Alarm 4170 is output if a value is entered between 0 and 99 or less than MD10800 \$MN_EXTERN_CHAN_SYNC_M_NO_MIN.

| 10804 | EXTERN_M_NO_SET_INT |  | EXP, N12 | H2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | M function to activate ASUB |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 96 | - | - | 7/2 | M |

Description: M function number used to activate an interrupt program (ASUB) in ISO2/3 mode. The interrupt program is always started by the lst high-speed input of the numerical control.
The $M$ number defined in the machine data replaces M96 in external language mode. Restrictions: Refer to MD10715 \$MN_M_NO_FCT_CYCLE
Related to:
MD10714 \$MN_M_NO_FCT_EOP,
MD10715 \$MN_M_NO_FCT_CYCLE,
MD20094 \$MC_SPIND_RIGID_TAPPING_M_NR,
MD22254 \$MC_AUXFU_ASSOC_M0_VALUE
MD10814 \$MN_EXTERN_M_NO_MAC_CYCLE,
MD10804 \$MN_EXTERN_M_NO_SET_INT
MD10806 \$MN_EXTERN_M_NO_DISABLE_INT,
MD10800 \$MN_EXTERN_CHAN_SYNC_M_NO_MIN,
MD10802 \$MN_EXTERN_CHAN_SYNC_M_NO_MAX
MD20095 \$MC_EXTERN_RIGID_TAPPING_M_NR
MD26008 \$MC_NIBBLE_PUNCH_CODE

| 10806 | EXTERN_M_NO_DISABLE_INT | EXP, N12 | H2, K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | M function to deactivate ASUB | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 97 | - | - |  |  |

Description: $M$ function number used to deactivate an interrupt program (ASUB) in ISO2/3 mode.
The M number defined in the machine data replaces M97 in external language mode.
Restrictions: refer to MD10715 \$MN_M_NO_FCT_CYCLE
MD10714 \$MN_M_NO_FCT_EOP,
MD10715 \$MN_M_NO_FCT_CYCLE,
MD20094 \$MC_SPIND_RIGID_TAPPING_M_NR,
MD22254 \$MC_AUXFU_ASSOC_MO_VALUE
MD10814 \$MN_EXTERN_M_NO_MAC_CYCLE,
MD10804 \$MN_EXTERN_M_NO_SET_INT

```
MD10806 $MN_EXTERN_M_NO_DISABLE_INT,
MD10800 $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
MD10802 $MN_EXTERN_CHAN_SYNC_M_NO_MAX
MD20095 $MC_EXTERN_RIGID_TAPPING_M_NR
MD26008 $MC_NIBBLE_PUNCH_CODE
```




## Description:

This machine data defines the assignment of measurement inputs 1 and 2 to the P numbers programmed with G31 P1 ( - P4). The machine data is bit-coded. Only bits 0 and 1 are evaluated. For example, if bit $0=1$ in MD10810 \$MN_EXTERN_MEAS_G31_P_SIGNAL[1], the 1st measurement input is activated with G31 P2. If MD10810 \$MN_EXTERN_MEAS_G31_P_SIGNAL[3]=2, the 2nd measurement input is activated with G31 P4. Bit 0: $=0$, Do not evaluate measurement input 1 with G31 P1 (- P4) Bit 0: $=1$, Activate measurement input 1 with G31 P1 (- P4)
Bit 1: $=0$, Do not evaluate measurement input 2 with G31 P1 (- P4)
Bit 1: = 1, Activate measurement input 2 with G31 P1 (- P4)

| 10812 | EXTERN_DOUBLE_TURRET_ON |  | EXP, N12 | FBFA |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Double turret with G68 |  | BOOLEAN | PowerOn |  |
| - |  |  |  |  |  |
| - | FALSE | FALSE | TRUE | 7/2 | M |

Description: $\quad$| This machine data is used to determine whether double-slide machining (channel |
| :--- |
| synchronization for lst and 2nd channel) is to be started using G68 or whether the |
| second tool of a double turret (= two closely-linked tools at a distance defined in |
| the MD42162 SC_EXTERN_DOUBLE_TURRET_DIST) is to be activated. |
| FALSE: |
| Channel synchronization for double-slide machining |
| TRUE: |
| Load 2nd tool of a double turret (that is, activate \$SC_EXTERN_DOUBLE_TURRET_DISTANCE |
|  |
| as additive work offset and mirroring around $Z$ axis) |

| 10814 | EXTERN_M_NO_MAC_CYCLE |  |  | EXP, N12 | H2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Macro call via M function |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 30 | $\begin{aligned} & -1,-1,-1,-1,-1,-1,-1, \\ & -1 \ldots \end{aligned}$ | - | - | 7/2 | M |

A macro is called with this $M$ number.
The name of the subprogram is stated in MD10815 \$MN_EXTERN_M_NO_MAC_CYCLE_NAME[n]. If the M function specified with MD10814 \$MN_EXTERN_M_NO_MAC_CYCLE[n] is programmed in a part program block, the subprogram defined in MD10815 \$MN_EXTERN_M_NO_MAC_CYCLE_NAME[n] is started. All addresses programmed in the block are written into the corresponding variables.
If the $M$ function is programmed again in the subprogram, there is no longer a replacement by a subprogram call.

MD10814 \$MN_EXTERN_M_NO_MAC_CYCLE[n] is only active in the external language mode G291. The subprograms configured with MD10815 \$MN_EXTERN_M_NO_MAC_CYCLE_NAME[n] must not be active simultaneously in a block (part program line), i.e. only one $M$ function replacement can become active in any one block. Neither an M98 nor a modal subprogram call may be programmed in the block with the $M$ function replacement.

Subprogram return and the part program end are also not permitted. Alarm 14016 is issued in case of a conflict. Restrictions: see MD10715 \$MN_M_NO_FCT_CYCLE
Related to:
MD10714 \$MN_M_NO_FCT_EOP,
MD10715 \$MN_M_NO_FCT_CYCLE,
MD20094 \$MC SPIND RIGID TAPPING M NR,
MD22254 \$MC_AUXFU_ASSOC_M0_VALUE
MD10814 \$MN_EXTERN_M_NO_MAC_CYCLE,
MD10804 \$MN_EXTERN_M_NO_SET_INT
MD10806 \$MN_EXTERN_M_NO_DISABLE_INT,
MD10800 \$MN_EXTERN_CHAN_SYNC_M_NO_MIN,
MD10802 \$MN_EXTERN_CHAN_SYNC_M_NO_MAX
MD20095 \$MC_EXTERN_RIGID_TAPPING_M_NR
MD26008 \$MC_NIBBLE_PUNCH_CODE

| 10815 | EXTERN_M_NO_MAC_CYCLE_NAME |  |  |  |  |  |  | EXP, N12 | H2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Name of subroutine for M function macro call | STRING | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 30 | - | - | - | M |  |  |  |  |

Description: Name of the subprogram started by a call via the M function defined by MD10814 \$MN_EXTERN_M_NO_MAC_CYCLE[n].


| 10817 | EXTERN_G_NO_MAC_CYCLE_NAME |  |  | EXP, N12 | FBF |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Name of subroutine for G function macro call |  |  | STRING | Pow |  |
| - |  |  |  |  |  |  |
| - | 50 | - | - | - | 7/2 | M |

Description:
Name of the subprogram started by call via the $G$ function defined by MD10816 \$MN_EXTERN_G_NO_MAC_CYCLE[n].

| 10818 | EXTERN_INTERRUPT_NUM_ASUP |  |  | EXP, N12 | FBF |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Interrupt number for ASUB start (M96) |  |  | BYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | 1 | 1 | 1 | 8 | 7/2 | M |

Description:
Number of the interrupt input starting an asynchronous subprogram activated in ISO mode. (M96 <program number>)

| 10820 | EXTERN_INTERRUPT_NUM_RETRAC |  |  |  |  |  | EXP, N12 | FBFA |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Interrupt number for rapid retraction (G10.6) |  |  |  |  |  | BYTE | PowerOn |
| - | - | 1 | 8 | $7 / 2$ | M |  |  |  |
| - | - | 2 |  |  |  |  |  |  |

Description: Number of the interrupt input triggering rapid retraction to the position programmed with G10.6 in ISO mode.

| 10830 | EXTERN_PRINT_DEVICE |  |  |  |  |  | EXP, N12 | FBFA |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Output device for ISOPRINT | STRING | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | - | - | - | $7 / 2$ |  |  |  |

[^3]

| 10850 | MM_EXTERN_MAXNUM_OEM_GCODES | EXP, N01, N12 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Maximum number of OEM G codes |  |  |  |  |  | DWORD | PowerOn |
| - | - | 0 | 0 | 1000 | $1 / 1$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: This machine data is used to define the number of $G$ codes implemented for an external language via an OEM application.


Description: Definition of the external CNC system whose part programs are to be executed on the SINUMERIK control in addition to SINUMERIK code (ISO_1):
1: ISO_21: System Fanuc0 milling (5.1 and higher)
2: ISO_31: System Fanuc0 turning (P5.2 and higher)
3: External language via OEM application (P6.2 and higher)
4: ISO_22: System Fanuc0 Milling (P7 and higher)
5: ISO_32: System Fanuc0 Turning (P7 and higher)

| 10881 | MM_EXTERN_GCODE_SYSTEM | N01, N12 | FBFA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | ISO_3 Mode: GCodeSystem | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $7 / 2$ |  |

Description: Definition of the GCodeSystem to be actively executed in ISO_3 Mod (turning):
Value $=0$ : ISO_3: Code system B
Value = 1 : ISO_3: Code system A
Value $=2$ : ISO_3: Code system C


Description: List of $G$ commands of external NC languages which have been reconfigured by the user.

The implemented $G$ commands are to be taken from the current Siemens documentation for this programming language.
The list is structured as follows:
Even address: G command to be changed
Subsequent odd address: New G command
Only G codes can be reconfigured, e.g.: G20, G71.


| 10886 | EXTERN_INCREMENT_SYSTEM |  |  |  |  |  | N12 | FBFA |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Incremental system in external language mode |  |  |  |  |  | BOOLEAN | PowerOn |
| - | - | FALSE | FALSE | TRUE | 7/2 |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description:
This machine data is active for external programming languages,
that is if MD18800 \$MN_MM_EXTERN_LANGUAGE = 1 .
This machine data specifies which incremental system is active:
0 : Incremental system $I S-B=0.001 \mathrm{~mm} /$ degree

$$
=0.0001 \text { inch }
$$

1: Incremental system $I S-C=0.0001 \mathrm{~mm} /$ degree

$$
=0.00001 \text { inch }
$$

Related to:
MD10884 \$MN_EXTERN_FLOATINGPOINT_PROG


| 10889 | EXTERN_DIGITS_OFFSET_NO | N12 | FBFA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Digits for offset number in ISO mode | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 8 | $7 / 2$ |  |$]$ M

## Description:

This machine data is only active when MD10880 \$MN MM EXTERN CNC SYSTEM == 2.
Number of digits of the offset number in the programmed $T$ word.
From the programmed $T$ word, the number of leading digits specified in MD10889
\$MN_EXTERN_DIGITS_OFFSET_NO are interpreted as the offset number.
The following digits address the tool number.

| 10890 | EXTERN_TOOLPROG_MODE | N12 | FBFA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Tool change programming for external language | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 0$ | 0 | $0 x 7 F F F F F F F$ | $7 / 2$ |  |

Description: Configuration for programming the tool change in an external programming language: Bit0=0:

Only active for the ISO mode turning: The tool number and offset number are programmed in the $T$ word. \$MN_DIGITS_TOOLNO defines the number of leading digits, which form the tool number.
Example:
\$MN_DIGITS_TOOLNO = 2
$\mathrm{T}=1234$; tool number 12, ; offset number 34
Bit0=1:
Only active in the ISO mode turning: Only the tool number is programmed in the $T$ word. Offset number == tool number. \$MN_DIGITS_TOOLNO is irrelevant.
Example:
$\mathrm{T}=12$; tool number 12
; offset number 12
Bit1=0:
Only active in the ISO mode turning:
If the number of digits programmed in the $T$ word is the same as the number defined in MD10888 \$MN_EXTERN_DIGITS_TOOL_NO, then leading 0 s are added
Bit1=1:
Is only active for the ISO mode turning:
If the number of digits programmed in the $T$ word is the same as the number of digits specified in MD10888 \$MN_EXTERN_DIGITS_TOOL_NO, the programmed number is the offset number and tool number
Bit2=0:

Is only active for the ISO mode turning: ISO $T$ offset selection only with D (Siemens cutting edge number)

Bit2=1:
Is only active for the ISO mode turning: ISO $T$ offset selection only with $H$ (\$TC_DPH[t,d])
Bit6=0:
The offset memories for the tool length and tool radius are linked so
that tool length and tool radius are always selected when either $H$ or $D$ is programmed. Bit6=1:

The offset memories for the tool length and tool radius are not linked, so that the number of the tool length value is selected when $H$ is programmed, and the number of the tool radius value is selected when $D$ is programmed.
Bit7=0:
Is only active for the ISO mode turning. If $T$ substitution ( MD10717
\$MN_T_NO_FCT_CYCLE_NAME ) is active, the H number programmed in the $T$ word is transferred to the cycle in the variable \$C_D.
Bit7=1:
Is only active in the ISO mode turning. If $T$ substitution ( MD10717 \$MN T NO FCT CYCLE NAME ) is active, the Siemens cutting edge number D corresponding to the $H$ number programmed in the $T$ word is transferred to the cycle in the variable \$C_D.


Description: The indexing position table is used to assign the axis positions in the valid unit of measurement (mm, inches or degrees) to the indexing positions [n] on the indexing axis. The number of indexing positions used in table 1 is defined by MD10900 \$MN_INDEX_AX_LENGTH_POS_TAB_1.
These indexing positions must be assigned valid values in table 1. Any indexing positions in the table above the number specified in the machine data are ignored. Up to 60 indexing positions (0 to 59) can be entered in the table.
Table length $=0$ means that the table is not evaluated. If the length is not equal to 0 , then the table must be assigned to an axis with MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB. If the indexing axis is defined as a rotary axis (MD30300 \$MA_IS_ROT_AX = "1") with modulo $360^{\circ}$ (MD30310 \$MA_ROT_IS_MODULO = "1"), the machine data defines the last indexing position after which, with a further traversing movement in the positive direction, the indexing positions begin again at 1.
Special cases:
Alarm 17090 "Value violates upper limit" if values over 60 are entered in MD10900 \$MN_INDEX_AX_LENGTH_POS_TAB_1.
Related to:
MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
MD10910 \$MN_INDEX_AX_POS_TAB_1 (indexing position table 1)
MD30300 \$MA_IS_ROT_AX(rotary axis)
MD30310 \$MA_ROT_IS_MODULO (modulo conversion for rotary axis)

| 10910 | INDEX_AX_POS_TAB_1 |  |  | N09 | T1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm/inch, degrees | Indexing position table 1 |  |  | DOUBLE | Rese |  |
| - |  |  |  |  |  |  |
| - | 60 | $\begin{aligned} & 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., \\ & 0 . . . . \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/2 | M |

$[n]=$ indexing for the entry of the indexing positions in the indexing position table.
Range: 0 y $n$ x 59, where 0 corresponds to the 1 st indexing position and 59 to the 60 th indexing position.
Note.
Programming with the absolute indexing position (e.g. CAC) starts with indexing position 1. This corresponds to the indexing position with indexing $n=0$ in the indexing position table.

The following should be noted when entering the indexing positions:

- Up to 60 different indexing positions can be stored in the table.
- The 1st entry in the table corresponds to indexing position 1; the nth entry corresponds to indexing position $n$.
- The indexing positions must be entered in the table in ascending order (starting with the negative and going to the positive traversing range) with no gaps between the entries. Consecutive position values must not be identical.
- If the indexing axis is defined as a rotary axis (MD30300 \$MA_IS_ROT_AX = "1") with modulo $360^{\circ}$ (MD30310 \$MA_ROT_IS_MODULO = "1"), then the position values are limited to a range of $0^{\circ} \mathrm{x}$ pos. $<360^{\circ}$.
The number of indexing positions used in the table is defined by MD10900 \$MN_INDEX_AX_LENGTH_POS_TAB_1.
Entering the value 1 in axial MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB assigns indexing position table 1 to the current axis.

Special cases:
Alarm 17020 "Illegal array index" if over 60 positions are entered in the table. Related to:

MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
MD10900 \$MN_INDEX_AX_LENGTH_POS_TAB_1 (number of indexing positions used in table 1)
MD30300 \$MA_IS_ROT_AX(rotary axis)
MD30310 \$MA_ROT_IS_MODULO (modulo conversion for rotary axis)

| 10920 | INDEX_AX_LENGTH_POS_TAB_2 |  |  |  |  |  | N09 | T1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of positions for indexing axis table 2 | DWORD | Reset |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 60 | $7 / 2$ |  |  |  |$]$ M

## Description:

The indexing position table is used to assign the axis positions in the valid unit of measurement (mm, inches or degrees) to the indexing positions [ $n$ ] on the indexing axis. The number of indexing positions used in table 2 is defined by MD10920 \$MN_INDEX_AX_LENGTH_POS_TAB_2.
These indexing positions in table 2 must be assigned valid values. Any indexing positions in the table above the number specified in the machine data are ignored.
Up to 60 indexing positions (0 to 59) can be entered in the table.
Table length $=0$ means that the table is not evaluated. If the length is not equal to 0 , the table must be assigned to an axis with MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB.

If the indexing axis is defined as a rotary axis (MD30300 \$MA IS ROT AX = "1") with modulo $360^{\circ}$ (MD30310 \$MA_ROT_IS_MODULO $=" 1 "$ ), the machine dā̄a $\bar{d} e f i \bar{n} e s ~ t h e ~ l a s t ~$ indexing position after which, with a further traversing movement in the positive direction, the indexing positions begin again at 1.

Not relevant for tool magazines (turrets, chain magazines)
Special cases:
Alarm 17090 "Value violates upper limit" if a value over 60 is entered in MD10920 \$MN_INDEX_AX_LENGTH_POS_TAB_2.

Related to:
MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
MD10930 \$MN_INDEX_AX_POS_TAB_2 (indexing position table 2)
MD30300 \$MA_IS_ROT_AX(rotary axis)
MD30310 \$MA_ROT_IS_MODULO (modulo conversion for rotary axis)

| 10930 | INDEX_AX_POS_TAB_2 |  |  | N09 | T1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm/inch, degrees | Indexing position table 2 |  |  | DOUBLE | Reset |  |
| - |  |  |  |  |  |  |
| - | 60 | $\begin{aligned} & 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., \\ & 0 . . . . \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/2 | M | measurement (mm, inches or degrees) to the indexing positions [n] on the indexing axis.

$[n]=$ indexing for the entry of the indexing positions in the indexing position table.
Range: 0 y $n \times 59$, where 0 corresponds to the 1st indexing position and 59 to the 60 th indexing position.

Note:
Programming with the absolute indexing position (e.g. CAC) starts with indexing position 1. This corresponds to the indexing position with indexing $n=0$ in the table. The following should be noted when entering the indexing positions:

- Up to 60 different indexing positions can be stored in the table.
- The 1st entry in the table corresponds to indexing position 1; the nth entry corresponds to indexing position $n$.
- The indexing positions should be entered in the table in ascending order (starting with the negative and going to the positive traversing range) with no gaps between the entries. Consecutive position values must not be identical.
- If the indexing axis is defined as a rotary axis (MD30300 \$MA_IS_ROT_AX = "1") with modulo $360^{\circ}$ (MD30310 \$MA_ROT_IS_MODULO = "1"), then the position values are limited to a range of $0^{\circ} \mathrm{x}$ pos. $<360^{\circ}$.

The number of indexing positions used in the table is defined by MD10920 \$MN_INDEX_AX_LENGTH_POS_TAB_2.
Entering the value 1 in axial MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB assigns indexing position table 1 to the current axis.
Special cases:
Alarm 17020 "Illegal array index" if over 60 positions are entered in the table.
Related to:
MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB (axis is an indexing axis)
MD10920 \$MN_INDEX_AX_LENGTH_POS_TAB_2 (num ber of indexing positions used in table 2) MD30300 \$MA_IS_ROT_AX(rotary axis)
MD30310 \$MA_ROT_IS_MODULO (modulo conversion for rotary axis)


| 11100 | AUXFU_MAXNUM_GROUP_ASSIGN | N01, N07, N02 | H2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of auxiliary functions distr. amongst aux. fct. groups | DWORD | PowerOn |  |  |  |  |
| - | $7 / 2$ |  |  |  |  |  | M |
| - | - | 1 | 1 | 255 | $7 / 2$ |  |  |

## Description:

The maximum number of auxiliary functions that can be assigned to a group by AUXFU_ASSIGN_TYPE, AUXFU_ASSIGN_EXTENTION, AUXFU_ASSIGN_VALUE and AUXFU_ASSIGN_GROUP.
This number includes only the user-defined auxiliary functions, not the predefined auxiliary functions.
Related to:
MD22010 \$MC_AUXFU_ASSIGN_TYPE[n].

| 11110 | AUXFU_GROUP_SPEC | N07 | H2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Auxiliary function group specification | UDWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 168 | $\begin{array}{l}0 \times 81,0 \times 21,0 \times 41, \\ 0 \times 41,0 \times 41,0 \times 41, \\ 0 \times 41,0 \times 41 \ldots\end{array}$ | 0 | $0 \times 7 F F F F F F F$ | $7 / 2$ |$]$ M

## Description:

Defines the output options for the auxiliary functions belonging to a group.
However, the output option of an auxiliary function configured by MD22080
\$MC_AUXFU_PREDEF_SPEC[ preIndex ] or MD22035 \$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] has a higher priority.
Bit $0=1 \quad$ "Normal" acknowledgment after an OB1 cycle
Bit $1=1$ "Quick" acknowledgment with OB40
Bit $2=1 \quad$ No predefined auxiliary function
Bit $3=1 \quad$ No output to PLC
Bit $4=1$ Spindle response after acknowledgment by the PLC
Bit $5=1$ Output prior to motion
Bit $6=1$ Output during motion
Bit $7=1$ Output at end of block
Bit $8=1 \quad$ No output after block search types 1, 2, 4
Bit $9=1$ Collection during block search type 5 (SERUPRO)
Bit $10=1$ No output during block search type 5 (SERUPRO)
Bit 11 = Cross-channel auxiliary function during block search type 5 (SERUPRO)
Bit $12=1$ Output via synchronized action
Bit 13 = 1 Implicit auxiliary function
Bit $14=1$ Active M01
Bit $15=1$ No output during running-in test
Bit $16=1$ Nibbling off
Bit $17=1$ Nibbling on
Bit $18=1$ Nibbling
The MD must be defined for each existing auxiliary function group.
The index [n] corresponds to the auxiliary function group index: 0...63
The assignment of individual auxiliary functions to specific groups is defined in channel-specific machine data ( AUXFU_PREDEF_TYPE, AUXFU_PREDEF_EXTENTION, AUXFU_PREDEF_VALUE, AUXFU_PREDEF_GROUP, AUXFU_ASSIGN_TYPE, AUXFU_ASSIGN_EXTENTION, AUXFU_ASSIGN_VALUE, AUXFU_ASSIGN_GROUP ).
M0, M1, M2, M17 and M30 are assigned to group 1 by default.

```
The specification of this group ( 0x81: output duration 1 OB1 pass, output at end of
block ) must not be changed.
All spindle-specific auxiliary functions ( M3, M4, M5, M19, M70 ) are assigned to group
2 by default.
If several auxiliary functions with different output types ( before / during / at end
of motion ) are programmed in one motion block, then the output of the individual
auxiliary functions corresponds to their output types.
All auxiliary functions are output simultaneously in a block without motion.
Default setting:
AUXFU_GROUP_SPEC[0]=81H
AUXFU_GROUP_SPEC[1]=21H
AUXFU_GROUP_SPEC[2]=41H
AUXFU_GROUP_SPEC[n]=41H
```



| 11140 | GUD_AREA_SAVE_TAB | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Additional saving for GUD modules | UDWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 9 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 1$ | $7 / 2$ |  | M

## Description:

This data indicates in which area the contents of the GUD module are also saved.
MD11140 \$MN_GUD_AREA_SAVE_TAB[0] : SGUD_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[1] : MGUD_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[2] : UGUD_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[3] : GUD4_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[4] : GUD5_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[5] : GUD6_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[6] : GUD7_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[7] : GUD8_DEF
MD11140 \$MN_GUD_AREA_SAVE_TAB[8] : GUD9_DEF
BitNo. Hexadec. Meaning when bit is set
Value
0 (LSB) 0x00000001 TOA area

| 11160 | ACCESS_EXEC_CST |  |  |  |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Execution right for /_N_CST_DIR |  |  |  |  | BYTE | PowerOn |  |
| - | - |  |  |  |  |  |  |  |
| - | - |  | 7 | 7 | 0 | 7 | 7/2 | M |
| Description: |  | Execut <br> Value <br> Value <br> Value <br> Value | on righ <br> 0: Siem <br> 1: Mach <br> 2: Pass <br> 3: End | ht assign mens pass hine OEM sword of user pas | p | d in | / ${ }^{1}$ |  |

```
Value 4: Keyswitch position 3
Value 5: Keyswitch position 2
Value 6: Keyswitch position 1
Value 7: Keyswitch position 0
Machine data can only be written with values 0 and 1, and with the corresponding
password also active.
```

| 11161 | ACCESS_EXEC_CMA | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Execution right for /_N_CMA_DIR | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 |  |  |

Description: Execution right assigned to the programs stored in directory /_N_CMA_DIR :
Value 0: Siemens password
Value 1: Machine OEM password
Value 2: Password of setup engineer, service
Value 3: End user password
Value 4: Keyswitch position 3
Value 5: Keyswitch position 2
Value 6: Keyswitch position 1
Value 7: Keyswitch position 0
Machine data can only be written with values 0 and 1 , and with the corresponding password also active.

| 11162 | ACCESS_EXEC_CUS |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Execution right for /_N_CUS_DIR |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 7 | 0 | 7 | 7/3 | U |

Description: Execution right assigned to the programs stored in directory /_N_CUS_DIR :
Value 0: Siemens password
Value 1: Machine OEM password
Value 2: Password of setup engineer, service
Value 3: End user password
Value 4: Keyswitch position 3
Value 5: Keyswitch position 2
Value 6: Keyswitch position 1
Value 7: Keyswitch position 0
Machine data can only be written with values 0,1 and 2 , and with the corresponding password also active.

| 11165 | ACCESS_WRITE_CST |  |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Write protection for directory /_N_CST_DIR |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | - | -1 | -1 | 7 | 7/2 | M |

Description: Set write protection for cycle directory /_N_CST_DIR:
Assigned to the programs:
Value -1: Keep the value currently set
Value 0: Siemens password
Value 1: Machine OEM password
Value 2: Password of setup engineer, service
Value 3: End user password
Value 4: Keyswitch position 3
Value 5: Keyswitch position 2
Value 6: Keyswitch position 1
Value 7: Keyswitch position 0

The machine data can only be written with values 0 and 1, and with the corresponding password also active.


| 11167 | ACCESS_WRITE_CUS | N01 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write protection for directory /_N_CUS_DIR |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | -1 | -1 | 7 | U |  |  |  |

Description:
Set write protection for cycle directory /_N_CUS_DIR:
Assigned to the programs:
Value -1: Keep the value currently set
Value 0: Siemens password
Value 1: Machine OEM password
Value 2: Password of setup engineer, service
Value 3: End user password
Value 4: Keyswitch position 3
Value 5: Keyswitch position 2
Value 6: Keyswitch position 1
Value 7: Keyswitch position 0
The machine data can only be written with values 0,1 and 2 , and with the corresponding password also active.

| 11170 | ACCESS_WRITE_SACCESS | N01 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Write protection for_N_SACCESS_DEF |  |  |  |  |
| - |  |  |  |  |  |
| - | BYTE | PowerOn |  |  |  |

```
Value 0: Siemens password
Value 1: Machine OEM password
Value 2: Password of setup engineer, service
Value 3: End user password
Value 4: Keyswitch position 3
Value 5: Keyswitch position 2
Value 6: Keyswitch position 1
Value 7: Keyswitch position 0
The machine data can only be written with values 0 and 1, and with the corresponding
password also active.
```

| 11171 | ACCESS_WRITE_MACCESS |  |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Write protection for _N_MACCESS_DEF |  |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | 7/2 | M |
| Description: | Set write protection for definition file /_N_DEF_DIR/_N_MACCESS_DEF: |  |  |  |  |  |
|  | Value 0: Siemens password |  |  |  |  |  |
|  | Value 1: Machine OEM password |  |  |  |  |  |
|  | Value 2: Password of setup engineer, service |  |  |  |  |  |
|  | Value 3: End user password |  |  |  |  |  |
|  | Value 4: Keyswitch position 3 |  |  |  |  |  |
|  | Value 5: Keyswitch position 2 |  |  |  |  |  |
|  | Value 6: Keyswitch position 1 |  |  |  |  |  |
|  | Value 7: Keyswitch position 0 |  |  |  |  |  |

The machine data can only be written with values 0 and 1 , and with the corresponding password also active.

| 11172 | ACCESS_WRITE_UACCESS | N01 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write protection for_N_UACCESS_DEF |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $7 / 3$ |  |  |  |

## Description:

Set write protection for definition file /_N_DEF_DIR/_N_UACCESS_DEF:
Value 0: Siemens password
Value 1: Machine OEM password
Value 2: Password of setup engineer, service
Value 3: End user password
Value 4: Keyswitch position 3
Value 5: Keyswitch position 2
Value 6: Keyswitch position 1
Value 7: Keyswitch position 0
The machine data can only be written with values 0,1 and 2 , and with the corresponding password also active.


## Description:

A power on must be triggered after setting MD11200 \$MN_INIT_MD. The function is executed and the MD reset to "0" at power on.

Meaning of the input:

Bit 0 set:
All machine data (with the exception of the memory-configuring data) will be overwritten with the compiled values at the next NCK power on.

Bit 1 set:
All memory-configuring machine data will be overwritten with the compiled values at the next NCK power on.

Bit 2 set:
The OEM machine data and the SIEMENS cycle machine data brought in by compile cycles will be deleted from the buffered memory at the next power on.
Bit 3 set:
All setting data will be overwritten with the compiled values at the next power on. Bit 4 set:

All option data will be overwritten with the compiled values at the next power on.
Bit 5 set:
The passive file system (including PowerFail log file) will be deleted at the next power on of the NCK.
INIT_MD is automatically set to 0 at power on.
Memory configuring MDs are:

- MD10010 \$MN_ASSIGN_CHAN_TO_MODE_GROUP
- All machine data starting with "MM_"

MD 18000 - 18999 (general MD)
MD 28000-28999 (channel-specific MD)
MD 38000 - 38999 (axis-specific MD)

| 11202 | MD_MODE_MASK |  |  | EXP, N01 | IA |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Behavior of machine data changes |  |  | UBYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | - | 7/2 | M |

Description:
Behavior of machine data changes
Bit 0 (LSB): When configuring linear/rotary axes, do not load initial values for axis type-dependent MDs
Due to the existence of one plausible default value each for a linear axis or rotary axis, axial machine data can facilitate setup for the user. With the switchover process (Lin $->$ Rot, or Rot $->$ Lin), the respectively configured default values become active as actual values at the next warm restart of the controller.

| 11210 | UPLOAD_MD_CHANGES_ONLY |  |  | N01, N05 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Machine data backup of changed machine data only |  |  | UBYTE | Imm |  |
| - |  |  |  |  |  |  |
| - | - | 0xFF | 0 | - | 7/3 | M |

Description: Either all data or only those data which differ from the default setting can be set to be output when creating standard archives (ARC) and copying 'NC active data'.
Bit0(LSB) Effectiveness of the differential upload with INI/TEA files
0: All data are output
1: Only those MDs that have changed in comparison to the compiled values are output
Bit1 is reserved and acts like bit 0
Bit2 Change to an array element
0: Complete arrays are output
1: Only those elements of an array that have changed are output
Bit3 R variables (only for INI files)
0: All R variables are output
1: Only $R$ variables not equal to '0' are output

Bit4 Frames (only for INI files)
0: All frames are output
1: Only those frames that are not zero frames are output.
Bit5 Tool data (cutting edge parameters) (only for INI files)
0: All tool data are output
1: Only those tool data not equal to '0' are output.
Bit6 Buffered system variables (\$AC_MARKER[], \$AC_PARAM[] only for INI files)
0: All system variables are output
1: Only those system variables not equal to '0' are output
Bit7 Synchronized actions GUD (for INI files only)
0: All Syna GUD are output
1: Only those Syna GUD not equal to '0' are output
Active: The change in the data becomes active on the start of the upload for the next range.
The settings are only active, if MD11212 \$MN_UPLOAD_CHANGES_ONLY=FALSE.

| 11212 | UPLOAD_CHANGES_ONLY |  | N01, N05 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Data backup type for an active file system. |  | BOOLEAN | Imm |  |
| - |  |  |  |  |  |
| - | TRUE | - | - | 7/3 | M |

## Description:

Only values of the selected file of the active file system
that deviate from the default setting are backed up.
TRUE = only the values of the selected file of the active file system that deviate from the standard setting are backed up (a differential data backup)

The value of MD11210 \$MN_UPLOAD_MD_CHANGES_ONLY than has no effect.
FALSE = all values of the selected file of the active file system are backed up.
Same significance as MD11210 \$MN_UPLOAD_MD_CHANGES_ONLY=0.
However, if MD11210 \$MN_UPLOAD_MD_CHANGES_ONLY is not equal to 0, then this setting is active.

| 11220 | INI_FILE_MODE |  | N01, N05 | G2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Error response to INI file errors |  | BYTE | Reset |  |
| - |  |  |  |  |  |
| - | - 1 | 0 | 2 | 7/2 | M |

Description: If, while reading machine data files (INI files) into controls, data are read in

- that are faulty or
- do not agree with the check sum
then alarms are generated and the reading in may be canceled. The following control behaviors can be selected via machine data
settings:
0 : Output of an alarm, cancelation on detection of 1 st error. (As $S W$ versions 1 and 2).
1: Output of an alarm, continuation of execution. An alarm with the number of errors
is output at the end of execution.
2: Execution continues despite possible errors. An alarm with the number of errors is output at the end of execution.

| 11230 | MD_FILE_STYLE |  | N01, N05 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Structure of machine data backup files |  | UBYTE | Immediately |  |
| LINK, - |  |  |  |  |  |
| - | 0x3 | 0 | - | 7/3 | M |



| 11285 | MACH_MODEL_MODE | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Type of file with machine model | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 |  |  |

Description:
If 3 D protection zones have been defined, creation of a machine model can be requested with this machine data.
Value 0: No model is created.
Value 1: After each change (including activation) of the 3D protection zones, a machine model is created in user directory /_N_VRML_DIR with the name _N_VRMLMODEL_WRL.

| 11294 | SIEM_TRACEFILES_CONFIG |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Configuration of the SIEM* trace file | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 7 F F F F F F F$ | $2 / 2$ |  |  |  |

Description: Configuration of the SIEM* trace files Bit0:

Additional information about the PDUs sent will be entered in _N_SIEMDOMAINSEQ_MPF during download
Bit1:

Additional information about the PDUs received will be entered in _N_SIEMDOMAINSEQ_MPF during download

Bit2:
Trace of warm start and connection cancelation in _N_SIEMDOMAINSEQ_MPF

## Bit4:

Additional information about the PDUs sent will be entered in _N_SIEMDOMAINSEQ_MPF during upload

Bit5:
Additional information about the PDUs received will be entered in _N_SIEMDOMAINSEQ_MPF during upload

| 11297 | PROTOC_IPOCYCLE_CONTROL | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Prevent overrun of IPO time level | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 1 | $1 / 1$ |  |

Description: Setting whether an overflow of the time level is to be prevented during the recording of data in the time level of the IPO.

If applicable, data sets are discarded when the function is active, and are not entered in the log file in order to prevent an impending overflow of the IPO time level.
This may mean that data sets are also then lost if a level overflow would not yet have occurred with the function inactive.
The individual values apply to the users of the logging function, which are assigned the following functions:
0: Reserved for system functions: simultaneous recording, simulation, synchronized action analysis

1: Reserved for system functions: determining program runtimes, multi-step editor
2: Reserved for OEM applications
3: Reserved for OEM applications

```
4: Reserved for OEM applications
5: Reserved for system functions: trace
6: Reserved for system functions: trace
7: Reserved for system functions: trace
8: Reserved for system functions: trace
9: Reserved for system functions: action log
```

| 11298 | PROTOC_PREPTIME_CONTROL |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Interruption time prep time level in seconds. |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | 10 $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0 \ldots$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 1/1 | M |
| Description: | Time in seconds, for which the manage to pass through within thus ensured that operation can The individual values apply to the following functions: <br> 0 : Reserved for system functions action analysis <br> 1: Reserved for system functions <br> 2: Reserved for OEM applications <br> 3: Reserved for OEM applications <br> 4: Reserved for OEM applications <br> 5: Reserved for system function <br> 6: Reserved for system functions <br> 7: Reserved for system functions <br> 8: Reserved for system function <br> 9: Reserved for system function | rep time lev e set time, ot be comple he users of <br> : simultaneo <br> : determinin <br> : trace <br> : trace <br> : trace <br> : trace <br> : action log | may be <br> e cyclic <br> ly block <br> e logging <br> recordin <br> program | . I <br> ar <br> data <br> ion <br> mula <br> s, | P does not ged. It is g. <br> re assigned <br> chronized <br> p editor |



## Description:

1: Jog mode for JOG-INC and reference point approach
JOG-INC:
When the traversing key is pressed in the required direction (e.g. +), the axis begins to traverse the set increment. If the key is released before the increment has been completely the traversed, the movement is interrupted and the axis stops. If the same key is pressed again, the axis completes the remaining distance-to-go until this is 0 .
0: Continuous operation for JOG-INC and reference point approach
JOG-INC:
When the traversing key is pressed (first rising edge) the axis travels the whole set increment. If the same key is pressed again (second rising edge) before the axis has completed traversing the increment, the movement is canceled, i.e. not completed.

The differences in axis travel behavior between the jog mode and continuous operation in incremental traversing are described in detail in the relevant chapters.
For travel behavior in reference point approach see
References: /FB/, R1, "Reference Point Approach"
MD irrelevant for:
Continuous traversing (JOG continuous)

| 11310 | HANDWH_REVERSE | N09 | H1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Threshold for direction change handwheel | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 2 | 0 | - | 7/2 |  |  |  |

Description: Handwheel travel:
Value = 0:
No immediate travel in the opposite direction
Value > 0:
Immediate travel in the opposite direction if the handwheel is turned at least the stated number of pulses in the opposite direction.
Whether this machine data is also active for handwheel travel with DRF depends on bit10 of MD20624 \$MC_HANDWH_CHAN_STOP_COND.


Description: The connected handwheels are adapted to the control in MD11320
\$MN_HANDWH_IMP_PER_LATCH.
The number of pulses generated by the handwheel for each handwheel detent position has to be entered. The handwheel pulse weighting must be defined separately for each connected handwheel (1 to 3). With this adaptation, each handwheel detent position has the same effect as one press of the traversing key in incremental traversal. Entering a negative value reverses the direction of rotation of the handwheel.
Related to:

$$
\begin{aligned}
& \text { MD31090 \$MA_JOG_INCR_WEIGHT } \\
& \text { (weighting of an increment of a machine axis for } \\
& \text { INC/manual). }
\end{aligned}
$$



Description: Adaptation factor to the hardware of the contour handwheel: Enter the number of pulses issued per detent position by the contour handwheel.
Because of this normalization, a detent position of the contour handwheel
corresponds to one press of a key with incremental jog processes.
Sign reversal reverses the direction of evaluation.

| 11324 | HANDWH_VDI_REPRESENTATION |  | N01 | OEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Display of handwheel number in VDI Interface |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | - 0 | 0 0 | 1 | 7/2 | M |

Description: The number of the handwheel is displayed in the channel/axis-specific signals of the VDI interface:
Value = 0 :
Bit coded (1 of 3, only 3 handwheels can be displayed)
Value = 1 :

Binary coded (6 handwheels can be displayed)

| 11330 | JOG_INCR_SIZE_TAB | EXP, N09 | H1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Increment size for INC/handwheel |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 5 | $1 ., 10 ., 100 ., 1000 .$, <br> 10000. | 0.0 | $1.0 \mathrm{E}+301$ | M |  |  |  |

Description: In incremental traversal or handwheel travel, the number of increments to be traversed by the axis can be defined by the user, e.g. via the machine control panel.
In addition to the variable increment size (INCvar), 5 fixed increment sizes (INC...) can also be set.
The increment size for each of these 5 fixed increments is defined collectively for all axes by entering values in JOG_INCR_SIZE_TAB [n]. The default setting is INC1, INC10, INC100, INC1000 and INC1000 ${ }^{-}$.
The entered increment sizes are also active for DRF.
The size of the variable increment is defined in SD41010 \$SN_JOG_VAR_INCR_SIZE. Related to:

MD31090 \$MA_JOG_INCR_WEIGHT (weighting of an increment for INC/manual) NC/PLC interface signal DB21-30 DBX41.0-.4, DBX47.0-.4, DBX53.0-. 4
(Geometry axis 1-3 active machine function: INC1; ...; INC10000) NC/PLC interface signal DB31, ... DBB65.0 - . 5
(active machine function: INC1; ...; INC10000).

| 11342 | ENC_HANDWHEEL_MODULE_NR |  |  |  |  |  | N01 | H1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | 3rd handwheel: drive number / measuring circuit number | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 31 | $7 / 2$ |  |  |  |$\quad$ M

Description:
Only for test purposes for PROFIBUS/PROFINET:
Number of the module within a segment (MD11340 \$MN_ENC_HANDWHEEL_SEGMENT_NR), used to address the 3rd handwheel.
$=0$ : The configuration of a 3rd handwheel is deactivated, in this case
the setting of MD11340 \$MN_ENC_HANDWHEEL_SEGMENT_NR and
MD11344 \$MN_ENC_HANDWHEEL_INPUT_NR are irrelevant.
Corresponds with MD11340 \$MN_ENC_HANDWHEEL_SEGMENT_NR
MD11344 \$MN_ENC_HANDWHEEL_INPUT_NR

| 11344 | ENC_HANDWHEEL_INPUT_NR |  |  |  |  |  | N01 | H1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | 3rd handwheel: Input to module/meas. circ. Board | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 1 | 2 | $7 / 2$ | M |  |  |  |

## Description:

Only for test purposes for PROFIBUS/PROFINET:
Number of the input on a module used to address the 3rd handwheel.
840D: $1 / 2$ = upper/lower actual value input
Corresponds with MD11340 \$MN_ENC_HANDWHEEL_SEGMENT_NR
MD11342 \$MN_ENC_HANDWHEEL_MODULE_NR

| 11346 | HANDWH_TRUE_DISTANCE |  | N01 | H1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Handwheel default path or velocity |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 1 | 0 | 7 | $7 / 2$ | M |

## Description:

Setting the behavior for traversing with the handwheel, contour handwheel and with FDA=0:

Value = 1: (default value)
The default settings of the handwheel are path inputs. No pulses are lost. Residual axis motions occur as a result of the limitation to a maximal permissible velocity. Value = 0 :

The default settings of the handwheel are velocity inputs. The axes stop as soon as the handwheel stops. The motion is immediately braked if no pulses come from the handwheel in an interpolation cycle. Therefore, only a short residual motion of the axes can occur as a result of the braking ramp. The handwheel pulses do not supply a path default.
Value = 2 :
The default settings of the handwheel are velocity inputs. The axes are intended to stop as soon as the handwheel stops. The motion is immediately braked if no pulses come from the handwheel in an interpolation cycle. However, in contrast to value $=0$ braking is not along the shortest possible path but to the next possible point in an intended grid.

Each increment in the grid corresponds to a displacement which the selected axis travels per handwheel grid position (see MD31090 \$MA_JOG_INCR_WEIGHT and see MD31090 \$MA JOG INCR WEIGHT and,

MD11330 \$MN_JOG_INCR_SIZE_TAB,
MD20620 \$MC_HANDWH_GEOAX_MAX_INCR_SIZE).
MD32080\$MA_HANDWH_MAX_INCR_SIZE
The start of the traversing is taken as the zero point of the grid.
Value = 3:
The default settings of the handwheel are path inputs. If premature braking is required on account of settings in other machine data

MD11310 \$MN HANDWH REVERSE ! = 0
MD20624 \$MC_HANDWH_CHAN_STOP_COND
MD32084 \$MA_HANDWH_STOP_COND
then in contrast to value $=1$ braking is not along the shortest possible path, but to the next possible point in an intentional grid (see value $=2$ ).

Value = 6:
Same as value = 2, but travel does not stop at the last possible grid position in front of a limit, but at the limit.
Value = 7:
Same as value = 3, but travel does not stop at the last possible grid position in front of a limit, but at the limit.

| 11350 | HANDWHEEL_SEGMENT | N09 | H1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Handwheel segment | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 255 | $7 / 2$ |  |

Description:
Machine data defines which
hardware segment the handwheel is connected to:
$0=$ SEGMENT_EMPTY ; no handwheel
$1=$ SEGMENT_840D_HW ;handwheel at 840D HW
$2=$ SEGMENT_8xXD_HW ; handwheel at 828D sl, 808D -HW
$5=$ SEGMENT_PROFIBUS ;handwheel at PROFIBUS
$7=$ SEGMENT_ETHERNET ;handwheel at Ethernet


| 11352 | HANDWHEEL_INPUT |  | N09 | H1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Handwheel connection |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | $6 \quad 0,0,0,0,0,0$ | 0 | 6 | 7/2 | M |

## Description: <br> Machine data which is intended to select

the handwheels connected to
a hardware module:
$0=$ No handwheel configured
$1 . .6 \quad=$ Handwheel connection to HW module/Ethernet interface

| 11353 | HANDWHEEL_LOGIC_ADDRESS |  |  | N04, N10 | H1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Logical handwheel slot addresses |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 6 | 0, 0, 0, 0, 0, 0 | 0 | 16383 | 7/2 | M |

Description: For PROFIBUS/PROFINET only:
Logical start address of the hand wheel slots if handwheels are connected by PROFIBUS/ PROFINET (MD11340 \$MN_HANDWHEEL_SEGMENT = 5)
\(\left.\begin{array}{|l|l|l|l|l|l|}\hline 11354 \& HANDWHEEL_FILTER_TIME \& N09 \& - <br>
\hline \mathrm{s} \& Filter time for handwheel pulses \& DOUBLE \& PowerOn <br>
\hline- \& 6 \& \begin{array}{l}0.0,0.0,0.0,0.0,0.0, <br>

0.0\end{array} \& 0.0 \& 2.0 \& 7 / 2\end{array}\right]\)| M |
| :--- |
| - |

Description:
The filter time indicates the time during which the pulses from the handwheel are output to the interpolator. The values are incremented internally in interpolation cycles.
In the case of a filter time setting $=0.0$, the pulses from the handwheel are output to the interpolator within a single interpolation cycle. This can cause the controlled axis to exhibit jerk during traversing.
Machine data is valid for the following types of handwheel (see 11350 \$MN_HANDWHEEL_SEGMENT) :
SEGMENT_ETHERNET:

- Recommended filter time: 0.2-0.5 s

| 11398 | AXIS_VAR_SERVER_SENSITIVE |  | EXP | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axis-Var server response |  | UBYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | - | 7/2 | M |
| Description: | The axis-variable serve SSP. <br> If no value can be supp default value (usually <br> For debugging purposes, sensitive so that an er <br> 0 : default value <br> 1: error message | s <br> an ur <br> hi ge | the OP <br> because <br> be used instead | SM <br> s is <br> the defa | GA/SEGA and axis) then a -server to |


| 11410 | SUPPRESS_ALARM_MASK | EXP, N06 | D1, M3, K3, S1, V1, W1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Mask for support of special alarm outputs |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |
| - | - | $0 \times 100000$ | 0 | $0 x F F F F F F F F$ |  |  |  |

Description:
Mask for suppressing special alarm outputs
Bit set: The corresponding alarm (warning) is NOT triggered.
Bit 0:
Alarm 15110 "Channel \%1 block \%2 REORG not possible"
Bit 1:
Alarm 10763 "Channel \%1 block \%2. The path component of the block in the contour plane is zero"

Bit 2:
Alarm 16924 "Channel \%1 Caution: Program testing can modify tool/magazine data"
--> Note: The alarm is only a message alarm
Bit 3:
Alarm 22010 "Channel \%1 spindle \%2 block \%3. Actual gear stage does not correspond to set gear stage"
Bit 4:
Alarm 17188 "Channel \%1 D number \%2 with tool T nos. $\% 3$ and $\% 4$ defined"
Alarm 17189 "Channel \%1 D number \%2 of the tools in magazines/magazine locations \%3 and $\% 4$ defined". The two alarms are of equal status and are only message alarms.

Bit 5:
Alarm 22071 "TO unit \%1 tool \%2 duplo no. \%3 is active but not in the active wear grouping." The alarm is only a message alarm.

Bit 6:
Alarm 4027 "NOTICE! MD \%1 was also changed for the other axes in the axis container \%2 "

Alarm 4028 "NOTICE! The axial MDs in the axis container will be aligned on the next runup "
Bit 7:
Alarm 22070 "TO unit \%1 please change tool $T=\% 2$ to magazine. Repeat data backup". The alarm is only a message alarm.

Bit 8:
Alarm 6411 "Channel \%1 tool \%2 with duplo no. \%3 has reached tool prewarning limit" Alarm 6413 "Channel \%1 tool \%2 with duplo no. \%3 has reached tool monitoring limit." The two alarms are only message alarms. They occur during program execution.
Bit 9:

Alarm 6410 "TO unit \%1 tool \%2 with duplo no. \%3 has reached tool prewarning limit ." Alarm 6412 "TO unit $\% 1$ tool $\% 2$ with duplo no. $\% 3$ has reached tool monitoring limit ". The two alarms are only message alarms. They occur as a result of an operator action. Bit10:
Alarm 10604 "channel \%1 block \%2 "Thread lead increase too high"
Alarm 10605 "channel \%1 block \%2 "Thread lead decrease too high"
Bit 11:
Alarm 14088 "Channel 51 block $\% 2$ axis $\% 3$ doubtful position".
Bit 12:
obsolete (Alarm 10607)"
Bit13:
Alarm 10704 " channel \%1 block \%2 Protection area monitoring is not guaranteed."
Bit14:
Alarm 21701 "Measuring reactivated too soon (<2 IPO cycles)"
Bit15:
Alarm 5000 "Communication order cannot be executed"
Bit16:
Alarm 21600 "Monitoring active for ESR"
Bit17:
Alarm 16945 "Channel \%1 action $\% 2<A L N X>$ is delayed until block end"
Note: The alarm is only a message alarm.
Bit18:
Alarm 10750 "Channel \%1 block \%2 Activation of the tool radius compensation without tool number"
Bit19: Alarm 17193 "Channel \%1 block \%2 The active tool ist no longer at tool holder no./spindle no. \%3, program \%4"
Bit20:
Alarm 2900 "Reboot is delayed"
Bit21:
Alarm 22012 "Channel \%1 block \%2. Leading axis \%3 is in simulation mode"
Alarm 22013 "Channel \%1 block \%2. Following axis \%3 is in simulation mode"
Alarm 22014 "Channel \%1 block \%2. The dynamics of leading axis \%3 and following axis \%4 are very different"
Alarm 22040 "Channel\%1 Block \%3 Spindle \%2 not referenced with zero mark" is no longer checked (cyclically) with

Bit21 set after power ON of the closed loop position control.
Bit22:
Alarm 26080 "Channel \%1 retraction position of axis \%2 not programmed or invalid"
Alarm 26081 "Channel \%1 single axis trigger axis \%2 is triggered, but axis is not PLC controlled"
Bit23:
Alarm 16949 "Correspondence between marks of channel \%1 and channel \%2
is invalid"

Bit24:
Alarm 16950 "Channel \%1 search run with holding block"
Bit25:
Alarm 22016 "Channel \%1 block \%2 following spindle \%3 in range of reduced acceleration capacity"
Bit26:

```
Alarm 22015 "Channel %1 block %2 following spindle %3 no dynamic response for
additional motion"
Bit27:
Alarms 16112 and 22030 "Channel %1 block %2 following spindle %3 impermissible
programming"
Bit28:
Alarm 26083 "Channel %1 ESR for PLC controlled axis %2 was triggered"
Bit29:
Alarm 16772 "Channel %1 block %2 axis %3 is following axis, coupling is opened"
Bit30:
Alarm 16600 "Channel %1 block %2 spindle %3 gear stage change not possible"
Bit31:
Alarm 16774 "Channel %1 axis %2 synchronization canceled"
```

| 11411 | ENABLE_ALARM_MASK |  | EXP | D1, K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activation of warnings |  | UDWORD | Reset |  |
| - |  |  |  |  |  |
| - | 0x0 | 0 | 0x7FFFFFFF | 7/2 | M |

## Description:

Mask for generating alarms that are normally suppressed.
Bit set: Alarms of this alarm group are output.
Bit not set: Alarms of this alarm group are not output.
Bit Hex. Meaning
value

0: 0x1 Alarms that have SHOWALARMAUTO as the alarm response are output.
1: $0 \times 2$ Alarms that have SHOWWARNING as the alarm response are output.
2: $0 x 4$ Alarm 22280 "Thread power up path too short" is output.
3: 0x8 Alarms that are triggered by the NCU LINK MODULE are switched on.
4: 0x10 Alarm 10883 "Chamfer or rounding must be shortened" allowed.
5: 0x20 Alarm 20096 "Brake test canceled" is output.
6: 0x40 Alarm 16956 "Program cannot be started because of global start disable" is output.

Alarm14005 "Program cannot be started because of program-specific start disable" is output. Alarm can only be switched on in channel status RESET, in all other channel states it is output without conditions.
7: 0x80 Alarm 16957 "Stop delay range is suppressed" is output.
8: $0 \times 100$ Alarm 1011 fine coding150019 or 150020 "Incorrect axis number in the LINK".
9: 0x200 Alarm 22033 Diagnostics 1 to 6 for "Track synchronism" (linkages).
10: 0x400 Alarm 15122 "PowerOn after Powerfail: \%1 data were restored, thereof \%2 machine data, $\% 3$ errors" is output.
11: $0 \times 800$ Alarms 10722, 10723, 10732 or 10733 are output instead of alarms 10720, 10721, 10730 or 10731.
12: 0x1000 Alarm 22033 diagnostics greater than or equal to 7 for "Track synchronism" (linkages)
13: $0 \times 2000$ All alarms that refer to the rejection of an ASUB start are also output. 14: $0 \times 4000$ All alarms that refer to the rejection of a PI service are also output. 15: 0x8000 Alarm 14004 "channel-specific start disable is set" is output on an NC start. The alarm always appears with block search, irrespective of bit 15 .

| 11412 | ALARM_REACTION_CHAN_NOREADY | EXP, N01 | D1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Alarm response CHAN_NOREADY permitted |  |  |  |  |  | BOOLEAN | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | M |  |  |  |

## Description:

This MD is used for compatibility with the PLC systems older than SW4.1.
If this MD is not set, the behavior implemented before SW4.1 (configured alarm reaction) is set
With SW 4.1 and higher, it is possible to set signal CHANNEL_NOREADY on the PLC in response to alarms.
If this MD is not set, then the alarm handler internally re-configures BAG_NOREADY into CHAN_NOREADY.

| 11414 | ALARM_CLR_NCSTART_W_CANCEL | EXP, N01 | D1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Clear NCSTART alarms with CANCEL |  |  |  |  |  | BOOLEAN | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | M |  |  |  |

Description: If this MD is set, then alarms that have ClearInfo=NCSTART are cleared by the Alarm Cancel button as well as by NC-Start.

If this MD is not set, then NCSTART alarms are not cleared by Cancel.
The purpose of this MD is to provide compatibility with system behavior.


## Description:

Mask for suppressing special alarm outputs
Bit set: Corresponding alarm (warning) is NOT triggered.
Bit Hex. Meaning
Value

0: 0x1 16773 "Channel $\% 1$ axis $\% 3$ is slave axis. The axis/spindle disables for the master axes differ."
1: $0 x 2 \quad 2100$ "NCK battery warning level reached"
2101 "NCK battery alarm"
2102 "NCK battery alarm"
2: $0 x 4 \quad 2120$ "NCK fan alarm" (ineffective on modules that require a fan due to their design)
3: $0 x 815120$ "PowerFail: Show buffer overflow"
4: $0 \times 10 \quad 15187$ "Error during execution of PROGEVENT file"
5: $0 \times 20 \quad 15188$ "Error during execution of ASUB file"
6: $0 \times 4026120$ "\$AA_ESR_ENABLE $=1$ and axis is to become neutral"
26121 "Axis is neutral and \$AA_ESR_ENABLE =1 is to be set"
26123 "\$AA_ESR_ENABLE = 1 is to be set, but MD37500 \$MA_ESR_REACTION is not set"
26124 "\$AC TRIGGER triggered, but axis is neutral, ESR ignores this axis"
7: 0x80: 10724 "Software limit violated at start of block" 10734 "Operating range limit violated at start of block" 10737 "Work (WCS) operating range limit violated at start of block"
8: 0x100: 14008 "WRITE command in /_N_EXT_DIR" 10734 "Operating range limit violated at start of block"

```
    10737 "Work (WCS) operating range limit violated at start of block"
9: 0x200 14006 "Invalid program name"
10: 0x400: 4006 "Maximum number of axes that can be activated exceeded"
11: 0x800 16017 "LIFTFAST ignores this axis, as it cannot be used for the current
axis type"
12: 0x1000 22025 "Channel %1 Block %2 Following axis/spindle %3 Synchronism (2):
Fine tolerance exceeded"
- Exception: Alarm is generated if CPMALARM[FAx] bit \(8=0\) is programmed for the corresponding slave axis/spindle.
22026 "Channel \%1 Block \%2 Following axis/spindle \%3 Synchronism (2): Coarse tolerance exceeded"
- Exception: Alarm is generated if CPMALARM[FAx] bit \(9=0\) is programmed for the corresponding slave axis/spindle.
13: 0x2000 22001 "Braking ramp longer than Stop D time." 22002 "Braking ramp longer than Stop D time with gear stage \%3 reason \% 4 "
14: 0x4000 16963 "ASUB start refused."
15: 0x8000 21751,"Limit velocity %2 deg/min on modulo axis %1 exceeded (defective
cam output)"
    21752,"Axis %1 minimum cam width cam %3 undershot at curr. velocity %2 "
16: 0x10000 17212 "Channel %1 Tool management: Load manual tool %3, Duplo no. %2
to spindle/toolholder"
```

17214 "Channel \%1 Tool management: Unload manual tool \%3 from spindle/
toolholder \%2"

17215 "Channel \%1 Tool management: Unload manual tool \%3 from buffer
location \%2"
17216 "Channel \%1 Unload manual tool from toolholder \%4 and load manual
tool \%3 \%2"
17: 0x20000 16771 "Channel \%1 Block \%3 Following axis \%2 Overlaid movement not enabled"

18: 0x40000 4039 "Channel \%1 Axis container \%2 Advance not allowed: Channel has no container axes"

19: 0x80000 7204 "The compile cycle \%1 is a preliminary version
20: 0x100000 This bit is effective at RESET. This means that the SHOWALARM and SETVDI responses of the following alarms can be suppressed:

10700 "Channel \%1 block \%2 NCK protection area \%3 in automatic or MDI
violated"
10701 "Channel \%1 block \%2 channel-specific protection area \%3 in automatic
or MDI violated"
21: 0x200000 26295 "Protection area \%1 was only roughly approximated."
22: 0x400000 6030 "Information alarm: Channel/axis activation or storage option (MD19240, 19250) requires more memory than is available"
23: 0x800000 6035 "Information alarm: Less free memory detected during cold start than is defined in MD18050, 18060"

24: 0x1000000 380040 "PROFIBUS/PROFINET: Bus \%3, configuration error \%1, parameter \%2"
PROFINET-device-specific consistency checks for Ti/To are disabled.
The setup engineer or user is thus responsible for ensuring that axes
and distributed I/Os work synchronously with one another on the PROFINET, e.g. they
can interpolate with one another.
25: 0x2000000 16736/22282 "Informational alarms channel \%1 Block \%2: Prog. thread block is too short $\% 3$ to maintain dynamic limit values, $\% 4$ is required

Alarms relating to short smoothing blocks and the associated exceeding of the dynamic limit values between thread blocks are disabled.

| 11416 | LINK_DYNMSG_ALARM_MASK |  |  |  |  |  | EXP, N06 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Mask for activating special alarm outputs with NCU-Link |  |  |  |  |  | UDWORD | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 \times 000001$ | 0 | $0 x 1 F F$ | M |  |  |  |

Description:

This mask is used by developers for diagnostics.
Mask for activating special alarm outputs with NCU-Link if non-cyclic messages cannot be transferred immediately.
Alarm 14764 (NCU-Link cannot immediately transfer all non-cyclic link messages of the stated type) is issued if, for the set type (corresponds to the bits of this MD), the affected message type could not be transferred immediately).

| 11420 | LEN_PROTOCOL_FILE |  | N01 | PGA |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Size of protocol files (kB) |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | 1 | 1 | 1000000 | 7/2 | M |

Description: Blocks from the part program can be stored in a file in the passive file system with the WRITE command. The length of the log file is limited. If this maximum length is exceeded, the WRITE command returns an error (error code 10).


Description:
Setting the behavior of the WRITE command for writing to the passive file system Bit $0=0$ :

The file created with WRITE is stored persistently in the USR area (see \$MM_U_FILE_MEM_SIZE).

The block written with WRITE becomes persistent immediately, i.e. it is stored power failsafe.

WRITE is slowed down by the backup with this setting.
Bit $0=1$ :
The file created with WRITE is stored persistently in the USR area (see
\$MM_U_FILE_MEM_SIZE).
The block written with WRITE becomes persistent after a time delay.
WRITEs less than one second old may be lost in the event of a power failure.
WRITE runs faster with this setting.
Bit 1: Reserved

| 11450 | SEARCH_RUN_MODE | EXP, N01 | K1, TE3, N4, H2, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Parameterization for search run | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 40$ | 0 | 0xFF |  |  |

Description:

The behavior during the action blocks after block search can be affected by the following bits:
Bit $0=0$ :
Machining is stopped after loading of the last action block after block search, the NC/ PLC interface signal DB21-30 DBX32.6 (last action block active) is set and alarm 10208 is output.

Bit 0 = 1:

Machining is stopped with the loading of the last action block after block search, and the NC/PLC interface signal DB21-30 DBX32.6 (last action block active) is set. Alarm 10208 is not output until the PLC requests it by setting the NC/PLC interface signal DB21-30 DBX1.6 (PLC action finished).
Application:
Starting an ASUB from the PLC after block search.
The message to the operator that another NC start is required in order to continue with the program is not to be displayed until after the end of the ASUB.

## Bit $1=1$

Automatic ASUB start after output of the action blocks. Alarm 10208 is not output until the ASUB has finished.
See also MD11620 \$MN_PROG_EVENT_NAME.
Bit $2=0$ :
Spindle: auxiliary functions are output in the action blocks.
Bit 2 = 1 :
The output of the auxiliary functions in the action blocks is suppressed. The spindle programming collected by block search can be output at a later point in time (e.g. in an ASUB).
The program data for this are stored in the following system variables:

- \$P_SEARCH_S,
- \$P_SEARCH_SDIR,
- \$P_SEARCH_SGEAR,
- \$P_SEARCH_SPOS,
- \$P_SEARCH_SPOSMODE

Bit 3 = 1:
The cascaded search run is disabled (default setting: release).
Cascaded search run means that the search run is restarted immediately after finding a search target.
Bit 4: Reserved
Bit $5=0$ :
During block search tp a nibbling block, the 1st nibbling stroke is not executed.
Bit $5=1$ :
During block search to a nibbling block, a punching stroke is triggered at block start (1st nibbling stroke).
Bit $6=0$ :
With block search, complex path calculations are made.
Bit $6=1$ :
With block search, calculation is made with simple, computing-time-optimized algorithms.
Bit $7=0$ :
Any adjustment movements that may be necessary on activation of a tangential axis coupling, during or after an SSL, are performed with the feed conditions active in the activation block (G0 or G1 with feedrate). In the case of G1, the feedrate can additionally be set in SD 42121: \$SC_AX_ADJUST_FEED.
Bit $7=1$ :
The adjustment movements necessary on activation of a tangential axis coupling, during or after an SSL, are always performed with rapid traverse feedrate (GO). In this case, the feedrate value in SD 42121: \$SC_AX_ADJUST_FEED is ignored.



Description:
This bit mask can be used to set the behavior of the control during repositioning.
Bit no. Meaning when bit set

0 (LSB)
The dwell time is continued in the residual repositioning block from where it was interrupted. (If the bit is not set, the dwell time is repeated completely).
1 Reserved
2 When the bit is set, repositioning of individual axes can be prevented or delayed via the VDI interface.
3 When the bit is set, positioning axes are repositioned in the approach block during search run via program test.
4 As 3, but after every Repos, not only during search run.
5 When the bit is set, changed feeds and spindle speeds already become valid in the residual block, otherwise not until the following block.
6 When the bit is set, neutral axes and positioning spindles are repositioned after SERUPRO as command axes in the approach block.
7 The bit changes the behavior of the VDI-AXIN interface signal DB31, ... .DBX10. 0 (Repos Delay). The level of DB31, ... .DBX10.0 (Repos Delay) is read if REPOSA is interpreted.

Axes that are neither geo nor orientation axes are then excluded from the REPOS,
that is REPOS does NOT move these axes.
Note: This bit completely switches off the channel-specific VDI signal
DB21, ... .DBX31.0..2 (ReposPathMode).


Description:
Buffer depth of PLC trace data at OB1.
Multiple values of PLC data are buffered, between the time of collection in the PLC and the time of inspection in NCK. Variables traced at "OB1" are collected once per complete PLC scan, but can only be inspected once per IPO cycle.

The buffer size must accomodate at least one more value than the total number of buffered values to be inspected. This is to prevent NCK from inspecting a value that the PLC is in the process of collecting.

A good value to start with is one more than MD10074 \$MN_PLC_IPO_TIME RATIO.
The larger the buffer depth, the fewer PLC variables that can be traced, because there is a single, small, fixed pool of data slots for sending data samples from the PLC to NCK (64 data slots). Every PLC variable being traced is allocated as many data slots from the pool as the value of the buffer depth.
This single pool of data slots is shared by data collected at OB1, OB35, and OB40 (even though the buffer depths of OB1, OB35, and OB40 can be configured to be different from one another). It is also shared by all concurrent users of trace, even though the users might have no knowledge of one another.

| 11481 | PLC_OB35_TRACE_DEPTH |  |  |  |  |  |  | EXP, N03, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Buffer depth of PLC trace data at OB35 | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 2 | 2 | 8 |  |  |  |  |  |

## Description:

Buffer depth of PLC trace data at OB35.
Multiple values of PLC data are buffered, between the time of collection in the PLC and the time of inspection in NCK. Variables traced at "OB35" are collected every time the PLC timer interrupts, but can only be inspected once per IPO cycle.
The buffer size must accomodate at least one more value than the number of buffered values to be inspected. This is to prevent NCK from inspecting a value that the PLC is in the process of collecting.

A good value to start with is one more than the number of PLC timer interrupts expected to occur every IPO cycle.
The larger the buffer depth, the fewer PLC variables that can be traced, because there is a single, small, fixed pool of data slots for sending data samples from the PLC to NCK (64 data slots). Every PLC variable being traced is allocated as many data slots from the pool as the value of the buffer depth.
The single pool of data slots is shared by data collected at OB1, OB35, and OB40 (even though the buffer depths of OB1, OB35, and OB40 can be configured to be different from each other). It is also shared by all concurrent users of trace, even though the users might have no knowledge of one another.

| 11482 | PLC_OB40_TRACE_DEPTH | EXP, N03, N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Buffer depth of PLC trace data at OB40 | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 2 | 2 | 8 | $2 / 2$ |  |$]$ M

## Description:

Buffer depth of PLC trace data at OB40.
Multiple values of PLC data are buffered, between the time of collection in the PLC and the time of inspection in NCK. Variables traced at "OB40" are collected just when the PLC receives the special, programmably initiated OB40 interrupt from NCK, but can only be inspected once per IPO cycle.
The buffer size must accomodate at least one more value than the number of buffered values to be inspected. This is to prevent NCK from inspecting a value that the PLC is in the process of collecting.

If the OB40 interrupt is issued less frequently than once per IPO cycle, then the OB40 buffer depth should be 2. Otherwise it should be one more than the largest number of interrupts expected during any one IPO cycle.

The larger the buffer depth, the fewer PLC variables that can be traced, because there is a single, small, fixed pool of data slots for sending data samples from the PLC to NCK (64 data slots). Every PLC variable being traced is allocated as many data slots from the pool as the value of the buffer depth.

The single pool of data slots is shared by data collected at OB1, OB35, and OB40 (even though the buffer depths of OB1, OB35, and OB40 can be configured to be different from each other). It is also shared by all concurrent users of trace, even though the users might have no knowledge of one another.

| 11500 | PREVENT_SYNACT_LOCK | N01, N09 | S5, FBSY |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protected synchronized actions | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 0,0 | 0 | 1399 | $7 / 2$ |  | M

Description:
First and last IDs of a protected synchronized action area.
Synchronized actions with ID numbers in the protected area can no longer be

- overwritten
- disabled (CANCEL)
- locked (LOCK)
once they have been defined. Furthermore, protected synchronized actions cannot be locked by the PLC (LOCK). They are shown at the interface to the PLC as non-lockable. Note:
The protection should be suspended while creating the synchronized actions to be protected, as otherwise a Power On will be necessary after every change in order to be able to redefine the logic. There is no area of protected synchronized actions with 0.0 . The function is disabled. The values are read as absolute values, and over and under values can be given in any order.



## Description: Enable utilization analysis via synchronized actions.

This MD11510 \$MN_IPO_MAX_LOAD sets the IPO computing time (in of the IPO cycle) after which the variable \$AN_IPO_LOAD_LIMIT is to be set to TRUE. The variable is reset to FALSE if the value falls below this after having once exceeded it. This diagnostics function is disabled if the machine data is 0.

| 11550 | STOP_MODE_MASK |  | N01 | V1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Defines the stop behavior. |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 0x1 | 7/2 | M |

Description:
This MD describes the stop behavior of the NCK under certain conditions:
Bit no. Meaning
Bit $0==0$ :=
No stop if $G$ codes $G 331 / G 332$ are active and a path motion or $G 4$ has also been programmed.
Bit 0 == 1 :=
A stop is possible during G331/G332 with interruption of the continuous-path mode (G60 or G4 between G331/G332 blocks interrupt the continuous-path mode).

Bits 1..... 15
Not assigned

| 11600 | BAG_MASK |  |  |  |  |  | N01 | K1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Defines the mode group behavior | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 3 | $7 / 2$ |  |  |  |$]$ M

## Description:

The MD describes the effect of the VDI signals on all channels of a mode group (BAG) and the behavior of the internal mode changeover in relation to ASUBs and interrupt routines.

Value = 0: When an interrupt is started in a channel of the mode group, all channels of the mode group respond normally to mode group VDI signals (such as BAG-RESET und BAG-STOP). If the interrupt is started from JOG, all channels of the mode group change internally into AUTO mode. Similarly, the mode group automatically switches back to JOG when the interrupt ends.

Value = 1: If an interrupt is started in a channel of the mode group, this channel no longer responds to mode group VDI signals (such as BAG-RESET and BAG-STOP). If, for example, BAG-STOP is triggered, all channels of the mode group are stopped, but the interrupt continues to run. A channel STOP remains active as before. Furthermore, if an interrupt is started from JOG in a channel of the mode group, only this channel automatically changes the mode to AUTO internally, all other channels of the mode group remain in JOG mode. The automatic switch back of the mode at the end of the interrupt only relates correspondingly to the channel in which the interrupt ran.
Value = 2: If an interrupt is started in a channel of the mode group, all channels of the mode group respond normally to mode group VDI signals (such as BAG-RESET and BAGSTOP). If an interrupt is started from JOG in a channel of the mode group, only this channel automatically changes the mode to AUTO internally. All other channels of the mode group remain in JOG mode. The automatic switch back of the mode at the end of the interrupt naturally only relates to the channel in which the interrupt ran. This behavior is not supported until V4.7 SP4 HF1. This setting was not defined in earlier versions. Furthermore, the functionality "JOG in ASUB" is permitted with this setting (see MD11602 \$MN_ASUP_START_MASK, bit3).
Value = 3: As value = 1. But the functionality "JOG in ASUB" is also permitted (see MD11602 \$MN_ASUP_START_MASK, bit3).

| 11602 | ASUP_START_MASK |  | N01 | K1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Ignore stop conditions for ASUB |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 0xf | 7/2 | M |

Description:
This machine data defines which stop reasons are to be ignored on an ASUB start. The ASUB is started or the following stop reasons are ignored:
Bit 0 :
STOP reason: STOP key, MO or MO1
An ASUB is started immediately if NCK is in RESET status (or JOG mode) (no ASUB can be started in RESET/JOG without this bit).

Bit 1:
Reserved! This bit was replaced by MD20105 \$MC_PROG_EVENT_IGN_REFP_LOCK and MD20115 \$MC_IGNORE_REFP_LOCK_ASUP.

Bit 2:
Start allowed even if a read-in disable is active; in other words, the blocks of the ASUB program are loaded and executed immediately. This therefore disables machine data MD20107 \$MC_PROG_EVENT_IGN_INHIBIT and MD20116 \$MC_IGNORE_INHIBIT_ASUP. The NCK behavior corresponds to the machine data assignment \$MC PROG EVENT IGN INHIBIT=H3F \$MC_IGNORE_INHIBIT_ASUP=HFFFFFFFF.
If the bit is not set:
The assignment of machine data MD20107 \$MC_PROG_EVENT_IGN_INHIBIT and MD20116
\$MC_IGNORE_INHIBIT_ASUP are evaluated.
If the particular bit in \$MC_PROG_EVENT_IGN_INHIBIT or \$MC_IGNORE_INHIBIT_ASUP is 0, then although an ASUB or prog event are immediately internally initiated, the blocks of the ASUB program are only loaded when the read-in inhibit is withdrawn.
The path is decelerated immediately when the ASUB is triggered (except with option BLSYNC).

The read-in disable is set once more in the ASUB program.

Bit 3:
Notice:
The following function can always be activated in single-channel systems. Multichannel systems require bit1 in MD11600 \$MN_BAG_MASK in addition. The function is active o_n_l_y for those ASUBs that were activated from the cancelation program status (Reset channel status). The function is not active in multi-channel systems without MD11600 \$MN_BAG_MASK bit1.
If an ASUB is started automatically from JOG, the user may stop in the middle of the ASUB program. JOG mode is displayed continuously for the user. With bit 3 set, the user may jog in this situation. This is not possible without bit 3 . In this case, mode change is locked with alarm 16927. By pressing the Start key, the user can continue the ASUB program. As long as the ASUB program is running, the user is naturally not able to jog. At the end of the ASUB program, the user may jog again.
Bit 4...15: Reserved
Corresponds with:
MD11604 \$MN_ASUP_START_PRIO_LEVEL
MD20105 \$MC_PROG_EVENT_IGN_REFP_LOCK
MD20107 \$MC_PROG_EVENT_IGN_INHIBIT
MD20115 \$MC_IGNORE_REFP_LOCK_ASUP
MD20116 \$MC_IGNORE_INHIBIT_ASUP

| 11604 | ASUP_START_PRIO_LEVEL |  |  |  |  | N01 | K1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Priorities from which 'ASUP_START_MASK' is effective |  |  |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |  |  |
| - | - |  | 0 |  | 0 | 128 | 7/2 | M |
| Description: | This machine data defines the ASUB priority from which MD11602 \$MN_ASUP_START_MASK is to be applied. MD11602 \$MN_ASUP_START_MASK is applied from the level specified here up to the highest ASUB priority level 1. <br> Related to: <br> MD11602 \$MN_ASUP_START_MASK |  |  |  |  |  |  |  |


| 11610 | ASUP_EDITABLE |  |  | N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activation of a user-specific ASUB program |  |  | UDWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 0 | 0 | 0 | 0x7 | 7/2 | M |

Description:
This MD determines whether user-specific routine: _N_ASUP_SPF stored in directory _N_CUS_DIR/ _N_CMA_DIR is to be used to process RET $\overline{\text { and }}$ REPOS. The user ASUB is searched for first in _N_CUS_DIR.
Value: Meaning:
0 Routine _N_ASUP_SPF is not activated for either RET or REPOS.
Bit0 = 1 User-specific routine _N_ASUP_SPF is executed for RET, the routine supplied by the system is executed for REPOS.
Bit1 = 1 User-specific routine _N_ASUP_SPF is executed for REPOS, the routine supplied by the system is executed for RET
Bit0 $=+$ bit1 $=3$ User-specific routine _N_ASUP_SPF is executed for both RET and REPOS
Bit2 = 1 User ASUB _N_ASUP_SPF is searched for first in _N_CMA_DIR
Related to:
MD11612 \$MN_ASUP_EDIT_PROTECTION_LEVEL


| 11620 | PROG_EVENT_NAME |  |  |  |  |  |  | EXP, N12 | K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Program name for PROG_EVENT | STRING | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | - | - | - | M |  |  |  |  |

## Description:

Name of the user program called by the "event-driven program calls" and "automatic ASUB start after block search" functions (MD11450 \$MN_SEARCH_RUN_MODE, bit 1). _N_PROG_EVENT_SPF is the default setting.
The default setting is activated if MD11620 \$MN_PROG_EVENT_NAME includes a blank string.
If the machine data does not contain a blank string, then the syntax of the string is checked as in the case of a subprogram identifier. This means that the first two characters must be letters (not numbers) or underscores. If this is not the case, alarm 4010 is output during ramp-up.
The program must be located in a cycle directory. When it is called, the search runs through the cycle directories in accordance with the setting of MD11622 \$MN_PROG_EVENT_PATH.
The prefix (_N_) and the suffix (_SPF) of the program name are added automatically if they have not been specified.


Description: Path on which the user program set with MD11620 \$MN_PROG_EVENT_NAME is called in response to an event-driven program call configured with ${ }^{-}$MD2010 8 \$MC_PROG_EVENT_MASK:
0: /_N_CMA_DIR
1: /_N_CUS_DIR
2: /_N_CST_DIR
3: Search path in the sequence /_N_CUS_DIR, /_N_CMA_DIR, and /_N_CST_DIR

| 11625 | FILE_ONLY_WITH_EXTENSION | N01 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | On program call, only search for files with an extension | BYTE | Reset |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 3$ |  |  |

Description: This machine data can be used to set whether the file system is to be searched for files without an extension on a subprogram call. The search for files without an extension can be disabled to speed up the search for a program in the various paths in the file system, e.g. when using EES.
0: On subprogram calls, the search also includes files without an extension

1: On subprogram calls, the search is restricted to files with an extension (e.g. SPF, MPF etc.)

| 11626 | CYCLES_ONLY_IN_CYCDIR |  |  |  |  |  |  | N01 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Search for subprograms with PROC instruction in the cycle <br> directories only | BYTE | Reset |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $7 / 3$ |  |  |  |  |
| - | - |  |  |  |  |  |  |  |  |

Description:
This machine data can be set to limit the search for subprograms that have a PROC instruction and have been stored in the cycle directories (CUS, CMA, CST), to just these directories. The PROC instructions are read in during a warm restart. The function therefore only applies to subprograms that were in the cycle directories at the time of the warm restart.
Use: this setting prevents unnecessary accesses to the external storage during program execution by the function "Execution from External Storage EES" and therefore speeds up calling SIEMENS cycles, for example.

0: On subprogram calls, the NC program is searched for in all program directories in the search path
1: On subprogram calls, the $N C$ program is searched for only in the cycle directories CUS, CMA, and CST
2: On subprogram calls, the $N C$ program is searched for in the directory defined by the CALLPATH instruction, and then in the cycle directories CUS, CMA and CST

| 11640 | ENABLE_CHAN_AX_GAP | N01, N11 | K2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Allow channel axis gaps in AXCONF_MACHAX_USED | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 0$ | 0 | $0 \times 1$ | $2 / 2$ |  |

Description:
Bit0 $=1$
Machine data allows configuration of channel axis gaps in the MD20070
\$MC_AXCONF_MACHAX_USED.
Permits following MD assignment:
\$AXCONF_MACHAX_USED[0] = 1 ; 1st MA is 1st axis in channel
\$AXCONF_MACHAX_USED[1] = $2 \quad ; 2 n d$ MA is 2nd axis in channel
\$AXCONF_MACHAX_USED[2] = 0 ; Channel axis gap
\$AXCONF_MACHAX_USED[3] = 3 ; 3rd MA is 3rd axis in channel
\$AXCONF_MACHAX_USED[4] = 0
C A U T I O N:
(BITO set with MD20070 \$MC_AXCONF_MACHAX_USED):
If a geo axis is placed in a channel axis gap with MD20050
\$MC_AXCONF_GEOAX_ASSIGN_TAB[1]= 3, the control responds as with MD20050
\$MC_AXCONF_GEOAX_ASSIGN_TAB[1]= 0. This eliminates the geo axis!
Transformation machine data must not be assigned a channel axis number specified as a gap.
BIT1 - BIT31: not used.
Related to:
MD20080 \$MC_AXCONF_CHANAX_NAME_TAB,
MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB,
MD20060 \$MC_AXCONF_GEOAX_NAME_TAB
MD20070 \$MC_AXCONF_MACHAX_USED
MD2 4... \$MC_TRAFO_AXES_IN_...
MD2 4... \$MC_TRAFO_GEOAX_ASSIGN_TAB_...

| 11717 | D_NO_FCT_CYCLE_NAME | EXP, N12, N07 | K1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Subroutine name for D function replacement | STRING | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | - | - | - | 7/2 |  |  |

## Description:

Cycle name for replacement routine of the $D$ function.
If a $D$ function is programmed in a part program block, then, depending on machine data MD10717 \$MN_T_NO_FCT_CYCLE_NAME, MD10719 \$MN_T_NO_FCT_CYCLE_MODE and MD10718 \$MN_M_NO_FCT_CYCLE_PAR, the MD subprogram defined in MD11717 \$MN_D_NO_FCT_CYCLE_NAME is called.
The programmed D number can be polled in the cycle via system variable \$C_D / \$C_D_PROG.
MD11717 \$MN_D_NO_FCT_CYCLE_NAME is only active in Siemens mode (G290).
No more than one M/T/D function replacement can be active per part program line. A modal subprogram call must not be programmed in the block with the $D$ function replacement. Furthermore, neither subprogram return nor part program end are allowed.
In the event of a conflict alarm 14016 is output.

| 11750 | NCK_LEAD_FUNCTION_MASK |  |  |  |  |  |  | N09 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Functions for master value coupling | UDWORD | NEW CONF |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | $0 \times 00$ | 0 | $0 \times 10$ |  |  |  |  |  |

Description:
Special functions of the master value coupling are set with this MD.
The MD is bit-coded, the following bits are assigned:
Bits 0-3:
reserved
Bit $4=0$ :
the following axis of a master value coupling decelerates independently on $N C$ or mode group stop or channel-specific feed disable
Bit 4 == 1:
the following axis of a master value coupling does not decelerate independently on NC or mode group stop or channel-specific feed disable
Bits 5-31:
reserved

| 11752 | NCK_TRAIL_FUNCTION_MASK | N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Functions for coupled motion | UDWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 0$ | 0 | $0 \times 10$ | $1 / 1$ |  |

Description:
Special functions for coupled motions are set with this MD.
The MD is bit-coded; the following bits are assigned:
Bits 0-3:
reserved
Bit $4=0$ :
the following axis of a coupled axis grouping activated by a synchronized action decelerates independently on $N C$ or mode group stop or channel-specific feed disable Bit 4 = 1 :
the following axis of a coupled axis grouping activated by a synchronized action does not decelerate independently on $N C$ or mode group stop or channel-specific feed disable Bit 5-31:
reserved



Description:
Evaluation of the axis velocity override switch with gray-coded interface. Not relevant with:
MD12000 \$MN_OVR_AX_IS_GRAY_CODE = 0
Related to:
NC/PLC interface signal DB31, ... DBBO (Feed override A-H), (axis-specific)

| 12020 | OVR_FEED_IS_GRAY_CODE |  | EXP, N10 | V1, Z 1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Path feedrate override switch Gray-coded |  | BOOLEAN | PowerOn |  |
| - |  |  |  |  |  |
| - | TRUE | 0 | - | 7/2 | M |

Description:
This machine data is used to adapt the path feed override switch to the interface coding of the PLC interface.

1: The 5 low-order bits of the NC/PLC interface signal DB31, ... DBB0 (Feed override A-H) are interpreted as a Gray code. The value which is read corresponds to a switch setting. It is used as an index for selecting the correct override factor from the table of MD12030 \$MN_OVR_FACTOR_FEEDRATE [n].
0: The feed override byte of the PLC interface is interpreted as a binary representation of the override value in percent (limit 200 percent).
Related to:
NC/PLC interface signal DB31, ... DBBO (Feed override A-H)
MD12030 \$MN_OVR_FACTOR_FEEDRATE [n]
(Evaluation of the path feed override switch)


## Description:

Evaluation of the feedrate override switch with gray-coded interface.
Special function of the 31st value for the velocity control:
The setting of the 31 st override value defines the dynamic reserves which take the velocity control to be an excessive increase in the path feed. The setting should correspond to the highest override factor actually used.
The function of the 31 st value is thus identical to the effect of MD12100 \$MN_OVR_FACTOR_LIMIT_BIN when using the binary-coded interface.
Not relevant with:
MD12020 \$MN_OVR_FEED_IS_GRAY_CODE = 0
Related to:
NC/PLC interface signal DB31, ... DBB0 (Feed override A-H)

| 12040 | OVR_RAPID_IS_GRAY_CODE |  |  |  |  |  | EXP, N10 | V1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Rapid traverse override switch Gray-coded | BOOLEAN | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | TRUE | 0 | - |  |  |  |  |

Description:
This machine data is used to adapt the rapid traverse override switch to the interface coding of the PLC interface.
1: The 5 low-order bits of the PLC interface signal DB21-30 DBB5 (Rapid traverse override A-H) are interpreted as a Gray code. The value which is read corresponds to a switch setting.

It is used as an index for selecting the correct override factor from the table of MD12050 \$MN_OVR_FACTOR_RAPID_TRA[n].
$0: \quad$ The rapid traverse override byte of the PLC interface is interpreted as a binary representation of the override value in percent (limit 200 percent).
Related to:
NC/PLC interface signal DB21-30 DBB5 (Rapid traverse override A-H)
MD12050 \$MN_OVR_FACTOR_RAPID_TRA[n]
(Evaluation of the rapid traverse override switch)

| 12050 | OVR_FACTOR_RAPID_TRA | EXP, N10 | V1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Evaluation of rapid traverse override switch | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 31 | $\begin{array}{l}0.00,0.01,0.02,0.04, \\ 0.06,0.08,0.10,0.20 \ldots\end{array}$ | 0.00 | 1.00 | $7 / 2$ |  |$]$| M |
| :--- |

Description:
Evaluation of the rapid traverse override switch with gray-coded interface.

Not relevant with:
MD12040 \$MN_OVR_RAPID_IS_GRAY_CODE = 0
Related to:
NC/PLC interface signal DB21-30 DBB5 (Rapid traverse override A-H)

| 12060 | OVR_SPIND_IS_GRAY_CODE |  | EXP, N10 | V1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Spindle override switch Gray-coded |  | BOOLEAN | Pow |  |
| - |  |  |  |  |  |
| - | TRUE | 0 | - | 7/2 | M |

This machine data is used to adapt the spindle speed override switch to the interface coding of the PLC interface.

1: The 5 low-order bits of the "spindle speed override" PLC interface signal are interpreted as a Gray code. The value which is read corresponds to a switch setting. It is used as an index for selecting the correct override factor from the table of MD12070 \$MN_OVR_FACTOR_SPIND_SPEED [n].
$0: \quad$ The spindle speed override byte of the PLC interface is interpreted as a binary representation of the override value in percent (limit 200 percent).
Related to:
NC/PLC interface signal DB31, ... DBB19 (Spindle speed override)
MD12070 \$MN_OVR_FACTOR_SPIND_SPEED[n]
(Evaluation of the spindle speed override switch)

| 12070 | OVR_FACTOR_SPIND_SPEED | EXP, N10 | V1, Z1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Evaluation of spindle override switch |  |  |  |  |  | DOUBLE | PowerOn |
| - | 31 | $\begin{array}{l}0.5,0.55,0.60,0.65, \\ 0.70,0.75,0.80,0.85 \ldots . .\end{array}$ | 0.00 | 2.00 | $7 / 2$ |  |  |  |$]$ M

Description:
Evaluation of the spindle-specific override switch with Gray-coded interface.
Special function of the 31st value for the velocity control:
The setting of the 31 st override value defines the dynamic reserves which take the velocity control to be an excessive increase in the spindle feed. The setting should correspond to the highest override factor actually used.

The function of the 31st value is thus identical to the effect of MD12100 \$MN_OVR_FACTOR_LIMIT_BIN when using the binary-coded interface.

Not relevant for:
MD12060 \$MN_OVR_SPIND_IS_GRAY_CODE = 0
Related to:
NC/PLC interface signal DB31, ... DBB19 (Spindle speed override)

| 12080 | OVR_REFERENCE_IS_PROG_FEED |  | N10, N09 | V1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Override reference speed |  | BOOLEAN | PowerOn |  |
| - |  |  |  |  |  |
| - | TRUE | 0 | - | 7/2 | M |
| Description: | The entry in this MD speci the speed limited by MD/SD <br> 1: Spindle override act (programmed speed _ spindl 0: Spindle override act (speed limited by MD/SD _ Related machine data: <br> A speed limitation is effe | t | ndle overr d speed. the progra <br> by MD <br> \%) <br> g MDs or | give <br> spe | IS refers to |

```
MD35100 $MA_SPIND_VELO_LIMIT
MD35130 $MA_GEAR_STEP_MAX_VELO_LIMIT
MD35160 $MA_SPIND_EXTERN_VELO_LIMIT
SD43220 $SA_SPIND_MAX_VELO_G26
```

SD43230 \$SA_SPIND_MAX_VELO_LIMS Spindle speed limitation with G96

Maximum spindle speed
Maximum speed of gear stage
Spindle speed limitation by PLC
Maximum spindle speed
Spindle speed limitation with G96

| 12082 | OVR_REFERENCE_IS_MIN_FEED |  |  |  |  |  | N10, N09 | V1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Specification of the reference of the path override | BOOLEAN | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - |  |  |  |  |
| M |  |  |  |  |  |  |  |  |

Description: The reference speed for the path feed override specified via the machine control panel can be set differently from the standard.
0 : Standard:
The override is relative to the programmed feed.
1: Special case:
The override is relative to the programmed feed or to the path feed limit, depending on which resulting value is lower. In this way, even for a great feed reduction (due to the permissible axis dynamics), the effect of the override value (in the range 0 to 100\%) is always visible.

| 12090 | OVR_FUNCTION_MASK | N01, N10, N09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Selection of override specifications | UDWORD | Reset |  |  |  |  |  |
| - |  |  |  |  |  |  | $7 / 2$ | M |
| - | - | 0 | 0 | $0 \times 01$ |  |  |  |  |

## Description:

The functionality of the override switches can be affected by the bits.
Bit 0: $=0$,
Standard: Spindle override active with G331/G332
$=1$,
Path override is active instead of spindle override with G331/G332
(Tapping without compensating chuck)

| 12100 | OVR_FACTOR_LIMIT_BIN |  |  |  |  |  | EXP, N10 | V1, B1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Limitation for binary-coded override switch |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 1.2 | 0.0 | 2.0 | M |  |  |  |

Description: This machine data can be used as an additional limit for the override factor when using the binary-coded interface for path, axis and spindle feeds.
In this case, the maximum values

- 200\% for channel-specific feed override
- $100 \%$ for channel-specific rapid traverse override
- $200 \%$ for axis-specific feed override
- $200 \%$ for spindle override
are replaced with the limit value entered in MD: OVR_FACTOR_LIMIT_BIN when this value is lower.
Example: OVR_FACTOR_LIMIT_BIN = 1.20
--> maximum override factor for
- channel-specific feed override $=120 \%$
- channel-specific rapid traverse override $=100 \%$
- axis-specific feed override $=120 \%$
- spindle override $=120 \%$

This value also defines the dynamic reserves maintained by the speed control for increasing the path and spindle feedrates.
References:
/FB/, B1, "Continuous Path Mode, Exact Stop and Look Ahead"


| 12202 | PERMANENT_FEED | N01, N09 | Z1, V1 |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Fixed feedrates for linear axes      <br>       <br> -      $\operatorname{4}$ |  |  |  |  |  | $0 ., 0 ., 0 ., 0$. | DOUBLE | Reset |

## Description:

In AUTOMATIC mode:
After activating a fixed feedrate via an interface signal, traversing is done with a fixed feedrate instead of the programmed feedrate.

Note:
The fixed feedrate is also evaluated in continuous-path mode in order to optimize the overhead for the Look Ahead calculation. Unnecessarily high values should therefore be avoided. Enter zero if a fixed feedrate is not wanted
In JOG mode:
After activating a fixed feedrate via an interface signal, and traversing the linear axis with a traversing key, traversing proceeds in the selected direction with the fixed feedrate.
$\mathrm{n}=0,1,2,3$ mean fixed feedrates 1, 2, 3, 4. The values must be entered in ascending order.
Special cases, errors, ......
The maximum velocity defined by MD32000 \$MA_MAX_AX_VELO is active. An override setting of $100 \%$ is assumed. MD12200 \$MN_RUN_OVERRIDE_0 is active if the override is 0.
Related to:
MD12200 \$MN_RUN_OVERRIDE_0

| 12204 | PERMANENT_ROT_AX_FEED | N01, N09 | V1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| rev/min | Fixed feedrates for rotary axes | DOUBLE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | 4 | $0 ., 0 ., 0 ., 0$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

Description: Fixed feedrate values:
In AUTOMATIC mode:

After activating a fixed feedrate via an interface signal, traversing is done with a fixed feedrate instead of the programmed feedrate.
Note: PERMANENT_ROT_AX_FEED is used instead of PERMANENT_FEED for the path motion if all synchronously traversed axes in the current block are rotary axes. PERMANENT_FEED applies if linear and rotary axes are to be synchronously traversed together.
The fixed feedrate is also evaluated in continuous-path mode in order to optimize the overhead for the Look Ahead calculation. Unnecessarily high values should therefore be avoided. Enter zero if a fixed feedrate is not wanted
In JOG mode:
After activating a fixed feedrate via an interface signal, and traversing the rotary axis with a traversing key, traversing proceeds in the selected direction with the fixed feedrate.
$\mathrm{n}=0,1,2,3$ mean fixed feedrates $1,2,3,4$.
Special cases, errors, ......
The maximum velocity defined by MD32000 \$MA_MAX_AX_VELO is active.
An override setting of $100 \%$ is assumed. MD12200 \$MN_RUN_OVERRIDE_0 is active if the override is 0.
Related to:
MD12200 \$MN_RUN_OVERRIDE_0

| 12205 | PERMANENT_SPINDLE_FEED | N01, N09 | FBMA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| rev/min | Fixed feedrates for spindles | DOUBLE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | 4 | $0 ., 0 ., 0 ., 0$. | 0.0 | $1.0 \mathrm{E}+301$ |  |  |

## Description:

Fixed feedrate values:
JOG: A spindle is traversed with a fixed feedrate by activating the traversing keys and activating the appropriate signals in the PLC interface.
The override is not active.
Depending upon MD12200 \$MN_RUN_OVERRIDE_0, traversing also takes place with override 0 .
The value defined by MD32000 \$MA_MAX_AX_VELO is taken as the upper limit. If the fixed feedrate has a larger value, the aforementioned limiting value applies.

| 12300 | CENTRAL_LUBRICATION | N01, N09 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Central lubrication active | BOOLEAN | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | M |  |  |

Description: When a settable axial path has been exceeded, the axial VDI signals request a lubrication pulse from the PLC (compare MD33050 \$MA_LUBRICATION_DIST). These axial pulses act (by default) independently of each other.
If the machine construction requires a central lubrication, i.e. the lubrication pulse of any axis is acting on all axes, the corresponding path monitoring of all axes must be restarted after lubrication pulse output. This start synchronization of the monitoring is executed via MD12300 \$MN_CENTRAL_LUBRICATION=TRUE.

| 12510 | NCU_LINKNO | N01 | B3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | NCU number in an NCU cluster | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 1 | 1 | 16 | $7 / 2$ |  |  |  |$]$ M

## Description:

Number or name for identifying an NCU within an NCU grouping.
In an NCU grouping (NCU cluster), the NCUs are connected to one another by a link bus. Related to:

MD18780 \$MN_MM_NCU_LINK_MASK

| 12520 | LINK_TERMINATION |  |  | N01 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | NCU numbers for which bus termination resistances are activated |  |  | BYTE | Pow |  |
| LINK, - |  |  |  |  |  |  |
| - | 2 | 0, 1 | 0 | 15 | 3/2 | M |

Description: LINK_TERMINATION defines with which NCUs the bus termination resistances for the timing circuit must be switched in through the link module.
Related to:
MD18780 \$MN_MM_NCU_LINK_MASK


| 12550 | LINK_RETRY_CTR | N01 | B3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Maximum number of message frame transmission retries |  |  |  |  |  |
|  |  |  |  |  |  |  |
| LINK, - |  |  |  |  |  |  |
| - | - | 4 | 1 | DWORD | PowerOn |  |

## Description:

Maximum retry limit in cases of error.
Not relevant for:
Systems without link modules
Related to:
MD18780 \$MN_MM_NCU_LINK_MASK

| 12701 | AXCT_AXCONF_ASSIGN_TAB1 |  |  | N01 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of an axis container location |  |  | STRING | Pow |  |
| CTDE |  |  |  |  |  |  |
| - | 32 | - | - | - | 3/2 | M |

Description: Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container.

Structure of entries:

NCm_AXn

Example:
NC2_AX1 ; The axis is on the NCU2 and is the
; 1st machine axis there.
AX5 ; local axis 5 only with one NCU
; the axis container mechanism is only used by
; several channels of one NCU.
The reference to an axis container location of a channel is defined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB.
The actually assigned axis at a specific time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels of various NCUs access this container, then inter-NCU consistency must be ensured.
Example:
CHANDATA (1)
\$MC_MACHAX_USED[4]=9 MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1" MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1 [1]="NC2_AX1"
This machine data is distributed via NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB

| 12702 | AXCT_AXCONF_ASSIGN_TAB2 |  |  | N01 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of an axis container location |  |  | STRING | Pow |  |
| CTDE |  |  |  |  |  |  |
| - | 32 | - | - | - | 3/2 | M |

Description: Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container.
Structure of entries:
NCm_AXn with NCU number m: 1..16 and machine axis address $n: 1 \ldots 31$

Example:
NC2_AX1 ; The axis is on the NCU2 and is the
; 1st machine axis there.
AX5 ; local axis 5 only with one NCU
; the axis container mechanism is only used by
; several channels of one NCU.
The reference to an axis container location of a channel is defined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB.
The actually assigned axis at a specific time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels of various NCUs access this container, then inter-NCU consistency must be ensured.
Example:
CHANDATA (1)
\$MC_MACHAX_USED[4]=9
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed via NCU-link.

Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB


| 12704 | AXCT_AXCONF_ASSIGN_TAB4 |  |  | N01 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of an axis container location |  |  | STRING | Pow |  |
| CTDE |  |  |  |  |  |  |
| - | 32 | - | - | - | 3/2 | M |

Description: Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container. Method of writing entries:
NCm_AXn with NCU number m: 1..16
and machine axis address $\mathrm{n}: 1 . .31$
Example:
NC2_AX1 ; The axis is on the NCU2 and is the
; 1st machine axis there
AX5 ; local axis 5, with only one NCU
; the axis container mechanism is only used by
; several channels from one NCU.
The reference to an axis container location of a channel is determined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB.

The axis actually assigned at a given time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels from various NCUs access this container, ensure that there is consistency between the NCUs!
Example:
CHANDATA (1)
\$MC_MACHAX_USED[4]=9 MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1 MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1" MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB

| 12705 | AXCT_AXCONF_ASSIGN_TAB5 |  |  | N01 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of an axis container location |  |  | STRING | Pow |  |
| CTDE |  |  |  |  |  |  |
| - | 32 | - | - | - | 3/2 | M |

Description:
Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container.

Method of writing entries:
NCm_AXn with NCU number m: $1 . .16$
and machine axis address n: 1... 31
Example:
NC2_AX1 ; The axis is on the NCU2 and is the
; 1st machine axis there
AX5 ; local axis 5, with only one NCU
; the axis container mechanism is only used by
; several channels of one NCU.
The reference to an axis container location of a channel is determined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels from various NCUs access this container, ensure that there is consistency between the NCUs!
Example:
CHANDATA (1)
\$MC_MACHAX_USED[4]=9
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1 MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1"
MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB

| 12706 | AXCT_AXCONF_ASSIGN_TAB6 | N01 | B3 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Assignment of an axis container location | STRING | PowerOn |  |  |  |  |
| CTDE |  |  |  |  |  |  |  |
| - | 32 | - | - | - | $3 / 2$ |  |  |$]$ M

Description: Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:

```
NCm_AXn with NCU number m: 1..16
    and machine axis address n: 1... 31
Example:
NC2_AX1 ; The axis is on the NCU2 and is the
    ; 1st machine axis there
AX5 ; local axis 5, with only one NCU
    ; the axis container mechanism is only used by
    ; several channels from one NCU.
The reference to an axis container location of a channel is determined by the
definitions in MD20070 $MC_AXCONF_MACHAX_USED and MD10002 $MN_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container rotation
status. All channels that access an axis container use the same axis entries stored
there. If channels from various NCUs access this container, ensure that there is
consistency between the NCUs!
Example:
CHANDATA(1)
$MC_MACHAX_USED[4]=9 MD10002 $MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1 MD12701
$MN_AXCT_AXXCONF_ASSIGN_TAB1[0]="NC1_AX1" - MD12\overline{7}01
$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 $MN_AXCONF_LOGIC_MACHAX_TAB
```




| 12709 | AXCT_AXCONF_ASSIGN_TAB9 | N01 | B3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Assignment of an axis container location |  |  |  |  |  | STRING | PowerOn |
| CTDE |  |  |  |  |  |  |  |  |
| - | 32 | - | - | - | $3 / 2$ |  |  |  |$]$ M

Description: Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container.

Method of writing entries:
NCm_AXn with NCU number m: 1..16 and machine axis address $\mathrm{n}: 1 . . .31$

Example:
NC2_AX1 ; The axis is on the NCU2 and is the
; 1st machine axis there
AX5 ; local axis 5, with only one NCU
; the axis container mechanism is only used by
; several channels from one NCU.
The reference to an axis container location of a channel is determined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB.

The axis actually assigned at a given time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels from various NCUs access this container, ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
\$MC_MACHAX_USED[4]=9 MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1 MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1" MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB

| 12710 | AXCT_AXCONF_ASSIGN_TAB10 |  |  | N01 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of an axis container location |  |  | STRING | Pow |  |
| CTDE |  |  |  |  |  |  |
| - | 32 | - | - | - | 3/2 | M |

Description: Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container.

Method of writing entries:
NCm_AXn with NCU number m: 1..16 and machine axis address n: 1... 31
Example:
NC2_AX1 ; The axis is on the NCU2 and is the
; 1st machine axis there
AX5 ; local axis 5, with only one NCU
; the axis container mechanism is only used by
; several channels from one NCU.
The reference to an axis container location of a channel is determined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB.
The axis actually assigned at a given time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels from various NCUs access this container, ensure that there is consistency between the NCUs!
Example:
CHANDATA(1)
\$MC_MACHAX_USED[4]=9 MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1" MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB





The axis actually assigned at a given time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels from various NCUs access this container, ensure that there is consistency between the NCUs!
Example:
CHANDATA (1)
\$MC_MACHAX_USED[4]=9 MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1
MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1" MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB

| 12715 | AXCT_AXCONF_ASSIGN_TAB15 | N01 | B3 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Assignment of an axis container location | STRING | PowerOn |  |  |  |  |
| CTDE |  |  |  |  |  |  |  |
| - | 32 | - | - | - | M |  |  |

Description:
Assignment of an axis container location (slot s) to a machine axis or link axis. A maximum of 32 locations can be assigned axes in an axis container.
Method of writing entries:
NCm_AXn with NCU number m: 1..16
and machine axis address $\mathrm{n}: 1 . . .31$
Example:
NC2_AX1 ; The axis is on the NCU2 and is the ; 1st machine axis there

AX5 ; local axis 5, with only one NCU ; the axis container mechanism is only used by ; several channels from one NCU.

The reference to an axis container location of a channel is determined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB.

The axis actually assigned at a given time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels from various NCUs access this container, ensure that there is consistency between the NCUs!

Example:
CHANDATA (1)
\$MC MACHAX USED[4]=9 MD10002 \$MN AXCONF LOGIC MACHAX TAB[8]=CL1 SL1 MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1" MD12701
\$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB


```
and machine axis address n: 1... 31
Example:
NC2_AX1 ; The axis is on the NCU2 and is the
; 1st machine axis there
AX5 ; local axis 5, with only one NCU
; the axis container mechanism is only used by
; several channels from one NCU.
The reference to an axis container location of a channel is determined by the definitions in MD20070 \$MC_AXCONF_MACHAX_USED and MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB. The axis actually assigned at a given time is dependent upon the container rotation status. All channels that access an axis container use the same axis entries stored there. If channels from various NCUs access this container, ensure that there is consistency between the NCUs!
Example:
CHANDATA (1)
\$MC_MACHAX_USED[4]=9 MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB[8]=CL1_SL1 MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[0]="NC1_AX1" MD12701 \$MN_AXCT_AXCONF_ASSIGN_TAB1[1]="NC2_AX1"
This machine data is distributed over the NCU-link.
Related to:
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB
```



Description:
List of axis container identifiers
In addition to the channel identifier of an axis, the axis container identifier, which can be defined by the user here, can also be used as an axis container name for e.g. a rotation of an axis container (AXCTSWE (CT1)).

| 12760 | AXCT_FUNCTION_MASK |  |  |  |  |  | N09 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Functions for the axis container | UDWORD | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 \times 0$ | 0 | $0 \times 1$ |  |  |  |  |

Description:
This MD is used to set the specific functions for the axis container. The MD is bit-coded, the following bits are assigned:

Bit 0 = 0 : For a direct axis container switch (AXCTSWED), all other channels must be in RESET status.

Bit 0 = 1: For a direct axis container switch (AXCTSWED), only those other channels which have interpolation right on axes of the axis container must be in RESET status.

| 13050 | DRIVE_LOGIC_ADDRESS | N04, N10 | G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Logical drive addresses | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 31 | $\begin{array}{l}4100,4140,4180, \\ 4220,4260,4300, \\ 4340,4380 \ldots\end{array}$ | 258 | 16383 | $7 / 2$ |  |$]$| M |
| :--- |

Description:
For PROFIdrive only:
Logical I/O addresses of the PROFIdrive drives on the PROFIBUS/PROFINET that can be assigned to an axis.

The MD value is the logical I/O address of the drive assigned with HW-Config (SIMATIC Manager S7).
The index $n$ from $\$ M N \_D R I V E \_L O G I C \_A D D R E S S[n]$ is used for actual value and setpoint assignment:
MD30220 \$MA_ENC_MODULE_NR=n+1, MD30110 \$MA_CTRLOUT_MODULE_NR=n+1.

| 13060 | DRIVE_TELEGRAM_TYPE | N04, N10 | G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Standard message frame type for PROFIdrive | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 31 | $\begin{array}{l}116,116,116,116, \\ 116,116,116,116 \ldots\end{array}$ | 0 | - | $7 / 2$ |  |$]$ M |  |
| :--- |

Description:
For PROFIdrive only:
Standard telegram type for PROFIdrive axes:
0 = No standard type, user-defined
(telegram type 103 is then used internally in the NCK, whereby other process data can be added.)
1... $6=$ PROFIdrive type
101...107 = SIEMENS type
$116=$ SIEMENS type as 106 plus trace data
$118=$ SIEMENS type as 116 , but use of encoders $2+3$
$136=$ SIEMENS type as 116 plus torque feedforward control
$138=$ SIEMENS type as 136 , but use of encoders $2+3$
139 = SIEMENS type telegram specifically for Weiss spindle functionality
Notes:
The descriptions of the SIEMENS telegram type can be found in the SINAMICS function plan.
Alarm 26015 is issued with reference to this machine data if the telegram
configuration exhibits inconsistencies, i.e. if the telegram type selected on the NCK does not match the telegram type set on the drive (see drive parameter p922) and the process data configuration does not match (see drive parameters p923, p915, p916). The check for telegram configuration errors can be disabled using MD DRIVE_FUNCTION_MASK bit 15.
The SIEMENS telegram types 1 xx must be operated in the SINUMERIK context in 611U interface mode.

| 13070 | DRIVE_FUNCTION_MASK | N04, N10 | G2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | PROFIdrive expansion functions | UDWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 31 | $2,2,2,2,2,2,2,2 \ldots$ | 0 | $0 x 7 F F F F F F F$ | $7 / 2$ |  |  |

Description:
For PROFIdrive only:
Bit-coded mask for skipping the scope of available functions for PROFIdrive axes
expected by the NCK.
Meaning of set bits:
Bit 0: Deactivation of axial drive alarm display
Note: the effect of this bit may be hidden, depending on the value in MD13140 \$MN_PROFIBUS_ALARM_ACCESS.
Bit 1: Reserved, free (previous deactivation of 611U description file intermediate storage in the NCK)
Bit 2: Deactivation of axial encoder driver parameter accesses
Bit 3: Deactivation of axial output driver parameter accesses
Bit 4: Reserved, free (previous activation of DSC bits)

```
Bit 5: Deactivation of the 611U-specific drive parking (STW2.7/STA2.7)
Bit 6: Deactivation of the 611U-specific travel to fixed stop (STW2.8/STA2.8
Bit 7: Deactivation of the 611U-specific motor switching int. (STW2.9 to 2.11)
Bit 8: Deactivation of the 611U-specific ramp block (STW1.11+13)
Bit 9: Deactivation of the 611U-specific function generator bits (STW1.8/STA1.13)
Bit 10: Deactivation of the control of the holding brake (STW1.12 / STA2.5)
Bit 11: Deactivation of the effect of OFF2/OFF3 on DB31, ... DBX93.5 (Drive Ready)
Bit 12: Deactivation of the error/alarm class SINAMICS (STA1.11 to STA1.12)
Bit 13: Drive parking simulation (STA2.7 = STW2.7)
Bit 14: Selection of non-cyclical communication 0 = DPT 1 = DPV1
Bit 15: Deactivation of the consistency check of the PROFIdrive message frame
configuration
Configuration of bits 5 - 10 allows adaptation of certain control or status bits that
are not standardized in the PROFIdrive profile. The bits may have a different
significance and effect in the default setting of third-party drives.
```

| 13080 | DRIVE_TYPE_DP | EXP | G2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | PROFIBUS/PROFINET drive type | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 31 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 5 | $7 / 2$ |$]$ M

## Description:

MD is relevant to PROFIdrive drives at the PROFIBUS/PROFINET: Drive type:
0: No drive or drive type unknown (default), software-internally treated as:
1: FDD drive (SRM: Synchronous rotary drive)
2: MSD drive (ARM: Asynchronous rotary drive)
3: Linear drive
4: Analog drive (no automatic entry)
5: Hydraulic drive
Note:
In general, the drive type is entered automatically with Siemens drives as soon as the drives start operating.

With non-Siemens drives (at least with linear drives), the value must be entered manually if automatic drive recognition is not possible.

| 13100 | DRIVE_DIAGNOSIS | EXP, N05 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Diagnostics drive link | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 9 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7 F F F F F F F$ |  |  |

Description: reserved

| 13110 | PROFIBUS_TRACE_ADDRESS | EXP | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | PROFIBUS/PROFINET trace of I/O slots | DWORD | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 14 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | - | $2 / 2$ |$]$ M

[^4]| 13111 | PROFIBUS_TRACE_TYPE | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | PROFIBUS/PROFINET trace settings | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 3 |  |  |

Description: For PROFIBUS/PROFINET only:
0: Recording to the part program memory /_N_MPF_DIR/_N_SIEMDPTRC_MPF
1: Recording to mass storage /user/sinumerik/data/temp/siemdptrc.trc
2: Recording to the part program memory with runtime measurement
3: Recording of cyclic PN-NCULINK communication

| 13112 | PROFIBUS_TRACE_FILE_SIZE | EXP | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Maximum trace file size in kbytes |  |  |  |  |  | DWORD | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 40 | - | - | $2 / 2$ |  |  |  |

## Description: For PROFIBUS/PROFINET only: <br> 0: Trace without file size limitation <br> >0: Trace with file size limitation

| 13113 | PROFIBUS_TRACE_START | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Activation of PROFIBUS/PROFINET trace | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $2 / 2$ |  |$]$ M

Description: For PROFIBUS/PROFINET only:
0 : Trace off
1: Trace on
MD13112 \$MN_PROFIBUS_TRACE_FILE_SIZE > 0: Trace is automatically disabled when the file size is

| 13114 | PROFIBUS_TRACE_START_EVENT |  |  |  |  |  | EXP | - |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Trigger conditions for PROFIBUS/PROFINET trace |  |  |  |  |  | UDWORD | NEW CONF |  |
| - | 14 | $0,0,0,0,0,0,0,0 \ldots$ | $0 \times 00000000$ | $0 \times 1111$ fffff | $2 / 2$ |  |  |  |  |
| - |  |  | M |  |  |  |  |  |  |

## Description:

For PROFIBUS/PROFINET only:
The trigger frequency is configured bit-by-bit
Bits 0-15: 0x0001-0xffff: bit mask
Bits 16-23: 0x01-0x14: process data number (a maximum of 20 words are permissible)
Bits 24-27:0x01: status change $0->1$
$0 \times 00$ : status change $1->0$
Bits 28-31:0×10: send slot
0x00: receive slot
When MD13113 \$MN_PROFIBUS_TRACE_START=1 and MD13114
\$MN_PROFIBUS_TRACE_START_EVENT= $0 \times 0$ Recording starts immediately
When MD13113 \$MN_PROFIBUS_TRACE_START=1 and MD13114
\$MN_PROFIBUS_TRACE_START_EVENT= $\overline{0} \times 1$ Recording starts on control power on
When MD13113 \$MN_PROFIBUS_TRACE_START=1 and MD13114
\$MN_PROFIBUS_TRACE_START_EVENT= $\overline{0} \times 2$ Recording starts on loss of the sign of life

| 13120 | CONTROL_UNIT_LOGIC_ADDRESS | N04, N10 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| - | Logical address of SINAMICS CU | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| 840dsl-71 | 9 | $6500,0,0,0,0,0,0,0 \ldots$ | 0 | 16383 | $7 / 2$ | M |
| $840 \mathrm{dsl}-72$ | 13 | $6500,0,0,0,0,0,0,0 \ldots$ | 0 | 16383 | $7 / 2$ | M |
| 840 dsI-73 | 15 | $6500,0,0,0,0,0,0,0 \ldots$ | 0 | 16383 | $7 / 2$ | M |

Description: For PROFIBUS/PROFINET, SINAMICS:
Logical I/O address of a SINAMICS-CU (Control Unit) on the PROFIBUS/PROFINET.
The cyclic DP communication with SINAMICS-CU is activated by taking over the associated slot address from the STEP7 project. The onboard I/Os cannot be accessed until after configuration.


| 13150 | SINAMICS_ALARM_MASK |  | N04, N05 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activate fault and warning buffer output for Sinamics |  | UDWORD | Imm |  |
| - |  |  |  |  |  |
| - | 0x0909 | 0 | 0x7FFFFFFFF | 7/2 | M |

## Description:

For PROFIBUS/PROFINET only, especially SINAMICS:
Relevant to SINAMICS diagnostics:
Note: the effect of this MD may be hidden independently of
the value of MD13140 \$MN_PROFIBUS_ALARM_ACCESS.

```
Mask for displaying the SINAMICS DOS fault and warning buffers
Bit set: Alarms in this DO group are output
Bit not set: Alarms in this DO group are not output
Bit Hex. Meaning
value
```



| $0:$ | $0 x 1$ | Output faults of the Control Units |
| :--- | :--- | :--- |
| 1: | $0 \times 2$ | Reserved |
| $2:$ | $0 \times 4$ | Output faults of the Drive Controls |
| $3:$ | $0 \times 8$ | Output faults of the Line Modules |
| 4: | $0 \times 10$ | Output faults of the Terminal Boards |
| $5:$ | $0 \times 20$ | Output faults of the Terminal Modules |
| 8: | $0 \times 100$ | Output warnings of the Control Units |
| 9: | $0 \times 200$ | Output warnings of the Communication Objects |
| 10: | $0 \times 400$ | Output warnings of the Drive Controls |
| $11:$ | $0 \times 800$ | Output warnings of the Line Modules |
| $12:$ | $0 \times 1000$ | Ouptut warnings of the Terminal Boards |
| $13:$ | $0 \times 2000$ | Output warnings of the Terminal Modules |


| 13160 | SINAMICS_MAX_SLAVE_ADDRESS |  |  | N04, N10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Highest SINAMICS slave address |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 4 | 0, 0, 0, 0 | 0 | - | 7/2 | M |

Description: Highest slave/device address supported per bus
All slaves/devices with an address higher than the address set here are ignored by the NCK

Value 0: No limitation


Description:
This MD defines the electrical polarity of each connected sensor.
Value 0:
(Default setting)
Non-deflected state 0 V
Deflected state 24 V
Value 1:
Non-deflected state 24 V
Deflected state 0 V
The programmed edges of the sensor are independent of the electrical polarity, and are to be regarded as purely mechanical. The programming of a positive edge always means the transition from the non-deflected into the deflected state. The programming of a negative edge always means the transition from the deflected into the non-deflected state.

| 13210 | MEAS_TYPE | N10, N09 | M5 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Meas. type with decentralized drives | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 2$ |  |$]$ M

```
Description: For PROFIdrive only:
This MD sets the measuring function of decentralized drives.
The MD currently only functions for PROFIdrive drives.
MEAS_TYPE = 0 defines:
A probe is used that is connected centrally to the NC.
However, as the encoders only provide actual position values in cycles, the actual
measuring position is found by interpolation.
MEAS_TYPE = 1 defines:
The probe must be wired decentralized to ALL drives.
The measuring functionality of the drive is then used,
saving the actual encoder values in the hardware at the time of the measuring edge.
This method is more accurate than that with MEAS TYPE = 0, but it requires a more
complex wiring and drives that support this measuring functionality (e.g. 611U).
```

| 13211 | MEAS_CENTRAL_SOURCE | N10, N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Data source central measurement with PROFIBUS/PROFINET <br> drives | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 3 | 1 | 3 | $7 / 2$ |  |

## Description:

For PROFIBUS/PROFINET only:
Sets the method used to obtain the time stamps for central measurement with PROFIdrive drives.

For MEAS_CENTRAL_SOURCE = 1, the following applies:
NRK access operations are used in order to access the onboard measuring register. For this purpose, the appropriate hardware, which permits this, must be available, e.g. for 840Di with MCI-Extension Board.

For MEAS_CENTRAL_SOURCE $=2$, the following applies:
The SINAMICS DO1 telegram is used (telegram types 391 and 395), and more specifically in the "Cyclic measurement" version without handshake.

For this purpose, an integrated SINAMICS must be available, e.g. NCU 710.
For measurement without handshake, two probes must be available in drive parameters p0680 index 0 and 1.
For MEAS_CENTRAL_SOURCE = 3, the following applies:
The SINAMICS DO1 telegram is used (telegram type 391), and more specifically in a version with handshake. This technique is fault-tolerant, however, it only permits a measurement edge every 4 PROFIBUS/PROFINET cycles, i.e. it is therefore significantly slower.

For this purpose, an integrated SINAMICS must be available, e.g. NCU 710.
This MD is only relevant, if MD13210 \$MN_MEAS_TYPE == 0 .

| 13220 | MEAS_PROBE_DELAY_TIME | N10, N09 | FBA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Delay time between probe deflection and recognition | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $0.0,0.0$ | 0 | 0.1 | $7 / 2$ |  |

Description: For probes with, for example, radio transmission, the probe deflection can be detected in the NC only with delay.
With this MD, the transmission link delay between the probe deflection and its detection is set in the control.

The measured value is corrected internally by the control by the distance that corresponds to the traversing motion during this time before measuring (modeling).

As the modeling does not work with the expected accuracy at higher position control cycles, the delay time is limited independently of the input value to 31 position control cycles).

| 13230 | MEAS_PROBE_SOURCE |  | N10, N09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Probe simulation |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 9 | 7/2 | M |

Description: Simulation of the probe only works when all axes are simulated.
Value $=0:$ the probe is triggered on the programmed end position.
Value $=1-8:$ the probe is triggered via digital output with the number=value.
Value = 9: reserved


Description: The switching position of the probe is offset by the value.
The offset is only active with the simulated probes and MD 13230
\$MN_MEAS_PROBE_SOURCE=0.


Description:
Filter between $F$ user data and \$A_INSE variables
This machine data defines which bits are transferred from the $F$ user data interface of the PROFIsafe module to the NCK for further processing.

The filtered F user data bits are compressed internally in the NCK to form a contiguous bit field.
Machine data MD10388 \$MN_PROFISAFE_IN_ASSIGN then also defines the \$A_INSE variables to which the filtered $F$ user data bits are transferred.

Example:
Note:
Only 16 bits are shown for the sake of simplicity.
Parameterization:
\$MN_PROFISAFE_IN_FILTER = 1010100101000100
\$MN_PROFISAFE_IN_ASSIGN = 011006
$\begin{array}{llll}\mathrm{n}=16 & 11 & 6 & 1\end{array}$
$|x| x|x| x|x| 1|1| 1|0| 0|1| x|x| x|x| x \mid$
\$A_INSE[n], $x=$ irrelevant |0|0|0|0|0|0|0|0|0|0|1|1|1|0|0|1|

NCK-internal image of $F$ user data | 1 | 0| 1|0|1|0|0|1|0|1|0|0|0|1|0|0|
\$MN_PROFISAFE_IN_FILTER
| 1|0|1|0|1|0|0|0|0|0|0|0|0|1|0|0|

Example value present at $F$ user data interface of the PROFIsafe module


| 13302 | PROFISAFE_IN_ENABLE_MASK | N01, N10 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Enable mask for connections to PROFIsafe input modules. | UDWORD | PowerOn |  |  |  |
| - | 2 | $0 \times 0,0 \times 0$ | 0xFFFFFFFF, <br> $0 \times 0000 F F F F$ | $7 / 2$ | M |  |

The enable mask is used to enable the machine data blocks for the connections to PROFIsafe input modules.
A machine data block comprises the following data:

- MD10386 \$MN_PROFISAFE_IN_ADDRESS[n]
- MD10388 \$MN_PROFISAFE_IN_ASSIGN[n]
- MD13300 \$MN_PROFISAFE_IN_FILTER[n]
- MD13305 \$MN_PROFISAFE_IN_SUBS[n]

Bit $\mathrm{n}=0$
The machine data block [n] is checked for consistency but not activated.
The PROFIsafe connection [n] or the slot [n] is not active.
Bit $\mathrm{n}=1$
The machine data block [n] is active.
The PROFIsafe connection [n] or the slot [n] is active.
Related to:
MD10095: \$MN_SAFE_MODE_MASK, Bit 1

### 4.1 General NC machine data

MD13304: \$MN_PROFISAFE_IN_SUBS_ENAB_MASK

| 13303 | PROFISAFE_OUT_ENABLE_MASK | N01, N10 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Enable mask for connections to PROFIsafe output modules. |  |  |  |  |  | UDWORD | PowerOn |
| - | 2 | $0 \times 0,0 \times 0$ | $0 \times 0,0 \times 0$ | $\begin{array}{l}\text { 0xFFFFFFFF, } \\ 0 \times 0000 F F F F\end{array}$ | $7 / 2$ |  |  |  |$]$| M |
| :--- |
| - |

Description:
The enable mask is used to enable the machine data blocks for the connections to
PROFIsafe output modules.
A machine data block comprises the following data:

- MD10387 \$MN_PROFISAFE_OUT_ADDRESS[n]
- MD10389 \$MN_PROFISAFE_OUT_ASSIGN[n]
- MD13301 \$MN_PROFISAFE_OUT_FILTER[n]

Bit $\mathrm{n}=0$
The machine data block [ $n$ ] is checked for consistency but not activated.
The PROFIsafe connection [ $n$ ] or the slot [ $n$ ] is not active.
Bit $\mathrm{n}=1$
The machine data block [n] is active.
The PROFIsafe connection [ $n$ ] or the slot [ $n$ ] is active.
Related to:
MD10095: \$MN_SAFE_MODE_MASK, Bit 1

| 13304 | PROFISAFE_IN_SUBS_ENAB_MASK | N01, N10 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Activation of substitute value output for PROFIsafe input modules |  |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 2 | $0 \times 0,0 \times 0$ | $0 \times 0,0 \times 0$ | $\begin{array}{l}0 \times F F F F F F F F, \\ 0 \times 0000 F F F F\end{array}$ | $7 / 2$ |  |  |  |$]$ M

Description:
The enable mask is used to enable subsitute value output for connections to PROFIsafe input modules.
Bit $\mathrm{n}=0$
The PROFIsafe input module's process data is transferred to the SPL input data for the connection parameterized in machine data block [n].
The PROFIsafe connection [ $n$ ] or the slot [ $n$ ] is active.
Bit $\mathrm{n}=1$
The substitute values from MD13305 \$MN_PROFISAFE_IN_SUBS are transferred to the SPL input data for the connection parameterized in machine data block [n].
The PROFIsafe connection [ $n$ ] or the slot [ $n$ ] is passive.
Related to:
MD10095: \$MN_SAFE_MODE_MASK, Bit 1
MD13305: \$MN_PROFISAFE_IN_SUBS

| 13305 | PROFISAFE_IN_SUBS | N01, N10 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | $\begin{array}{l}\text { Substitute values for passive connections to PROFIsafe input } \\ \text { modules }\end{array}$ | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 48 | $\begin{array}{l}0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots\end{array}$ | $0 \times 0$ | $0 \times F F F F F F F F$ | $7 / 2$ |  |$]$ M |  |
| :--- |

Description:
For passive connections to PROFIsafe input modules, the substitute values parameterized in the machine data are transferred to the SPL inputs (\$A_INSE) parameterized in MD10388 \$MN_PROFISAFE_IN_ASSIGN[n].

If the SPL inputs parameterized in MD10388 \$MN_PROFISAFE_IN_ASSIGN[n] overlap the SPL inputs of an active slot, the control will modify the passive slot's substitute values in order to prevent duplicate assignment of the SPL inputs. Here, the states of the signals from the active slots have priority.
Related to:
MD10095: \$MN_SAFE_MODE_MASK, bit 1
MD13304: \$MN_PROFISAFE_IN_SUBS_ENAB_MASK

| 13307 | PROFISAFE_IPO_RESERVE |  | N01, N10 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of IPO cycles without PROFIsafe calculations |  | DWORD | Pow |  |
| SFCO |  |  |  |  |  |
| - | 0 | 0 0 | 50 | 7/1 | M |

Description:
The value specifies the number of IPO cycles for each PROFIsafe cycle, in which no PROFIsafe calculations should be made.
This machine data is only active, if machine data MD10095 \$MN_SAFE_MODE_MASK, bit 3 is set.

The number of $I P O$ cycles must be selected less than the value in machine data MD10098 \$MN_PROFISAFE_IPO_TIME_RATIO.

| 13308 | PROFISAFE_IN_NAME |  |  |  |  |  | N01, N10 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Name of the PROFIsafe input module | STRING | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 48 | - | - | - | $7 / 2$ |  |  |  |$]$ M

Description: A symbolic name can be assigned to each PROFIsafe input module.
If a name has been assigned, this will be displayed in the alarm text instead of the PROFIsafe address.

| 13309 | PROFISAFE_OUT_NAME | N01, N10 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Name of the PROFIsafe output module | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 48 | - | - | - | $7 / 2$ |  |$]$ M

Description: A symbolic name can be assigned to each PROFIsafe output module.
If a name has been assigned, this will be displayed in the alarm text instead of the PROFIsafe address.

| 13310 | SAFE_SPL_START_TIMEOUT |  | N01, N06 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Delay in display of alarm 27097 |  | DOUBLE | Pow |  |
| - |  |  |  |  |  |
| - | 20. | 1. | 60. | $7 / 2$ | M |

Description: After powerup of the control, alarm 27097 is displayed after the time if the SPL start is not carried out.

| 13312 | SAFE_SPL_USER_DATA |  |  |  |  |  | N01 | FBSI |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | User data | UDWORD | PowerOn |  |  |  |  |  |
| SFCO |  |  |  |  |  |  |  |  |
| - | 4 | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$ | $0 \times 0$ | $0 \times F F F F F F F F$ | $7 / 2$ |  |  |  |

## Description:

User data for storing user-specific information.
These data are monitored for changes by the data cross-check between NCK and PLC. Changes to these data are detected when included in the checksums, and reported by alarm 27071.

The data must agree with the corresponding PLC data (DB18 DBD256,260,264,268). Deviations between NCK and PLC trigger the programmed stop (Stop D or Stop E) and are displayed via alarm 27090.

| 13316 | SAFE_GLOB_CFG_CHANGE_DATE |  |  | N01, N05 | FBSI |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Date/time of last change of SI-NCK MD |  |  | STRING | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 7 | - | - | - | ReadOnly | S |

Description: Display data for safety functions:
Date and time of the last configuration change to safety-related NCK machine data. Changes to the machine data included in the calculation of the checksums MD13318 \$MN_SAFE_GLOB_ACT_CHECKSUM are recorded.

| 13318 | SAFE_GLOB_ACT_CHECKSUM |  |  |  |  |  | N01, N05 | FBSI |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Actual checksum NCK | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 4 | $0,0,0,0$ | 0 | $0 x F F F F F F F F$ |  |  |  |  |

Description:
Display data:
This data contains the actual checksum calculated across the current values of the safety-related machine data after power-on or on RESET.
Assignment of the field indices:
Index 0: General safety parameterization, parameterization of the SPL-I/O link
Index 1: SPL user data
Index 2: Enable for I/O link (PROFIsafe and F_SEND/F_RECV)
Index 3: PROFIsafe parameter from the 57 configuration

| 13319 | SAFE_GLOB_DES_CHECKSUM | N01, N05 | FBSI |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Desired (expected) checksum | UDWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 4 | $0,0,0,0$ | 0 | $0 x F F F F F F F F$ | $7 / 1$ |  |  |

## Description:

In this data, the set checksum stored at the time of the last machine acceptance overwrites the current values of the safety relevant machine data.
Assignment of the field indices:
Index 0: General safety parameterization, parameterization of the SPL-I/O link
Index 1: SPL user data
Index 2: Enable for I/O link (PROFIsafe and F_SEND/F_RECV)
Index 3: PROFIsafe parameter from the S7 configuration

| 13320 | SAFE_SRDP_IPO_TIME_RATIO | N01, N10 | FBSI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Factor F_DP communication cycle | DWORD | PowerOn |  |  |  |
| SFCO |  |  |  |  |  |  |
| - | - | 10 | 1 | 65535 | $7 / 2$ |  |

## Description:

Ratio between interpolator cycle and F_DP cycle, in which the F_DP communication is performed. In the resulting time interval the NCK triggers OB40 on the PLC in order to perform the $F_{-}$DP communication.
The value for the communication cycle resulting from this MD and the set IPO cycle must not exceed 250 ms .

| 13322 | INFO_SAFE_SRDP_CYCLE_TIME |  |  |  |  |  | N01, N10, N05 | FBSI |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Maximum F_DP communication cycle |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | - | - |  |  |  |  |

## Description:

Display data:
Displays the maximum time frame in which F_DP communication with the system coupling is performed that is operated on the PLC via OB40.
The value is obtained from the interpolation cycle and MD13320
\$MN_SAFE_SRDP_IPO_TIME_RATIO.
If the set communication cycle in cyclic operation is exceeded, this is also displayed here.

In the case of a parameterization error (communication cycle exceeds the maximum value of 250.0 ms ), the maximum value that can be set is displayed.

| 13330 | SAFE_SDP_ENABLE_MASK |  |  | N01, N10 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Enable screen F_SENDDP communication relationships |  |  | UDWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | - | 0x0 | 0x0 | 0xFFFF | $7 / 2$ | M |



| Description: | Any network unique value as ID for F_SENDDP communication relationship. |
| :--- | :--- |
|  | SIMATIC module parameter: DP_DP_ID |



Description: A name can be assigned to each F_SENDDP communication link.
If a name was assigned, this name will be displayed in the alarm text instead of DP_DP_ID.

| 13333 | SAFE_SDP_CONNECTION_NR |  |  | N01, N10 | FBSI |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of the F_SENDDP SPL connection |  |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 16 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 16 | 7/2 | M |
| Description: | ```This machine data is used to set the number of the F_SENDDP SPL connection that is parameterized with this data record. The number of the F_SENDDP SPL connection is also the index for access to the system variables of the user interface of this F_SENDDP SPL connection. This applies to the following system variables: \\ - \$A_FSDP_ERR_REAC \\ - \$A_FSDP_ERROR \\ - \$A_FSDP_SUBS_ON \\ - \$A_FSDP_DIAG``` <br> Example: |  |  |  |  |  |

Machine data

MD13333 \$MN_SAFE_SDP_CONNECTION_NR[2] = 3 means that the control and status information of the $\mathrm{F}_{\text {_SENDDP }}$ SPL connection that is parameterized via data record 2 can be found in the system variables with field index 3.

| 13334 | SAFE_SDP_LADDR | N01, N10 | FBSI |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Log. base address of the input/output data range F_SENDDP |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |
| - | 16 | $288,288,288,288$, <br> $288,288,288,288 \ldots$ | 288 | 32767 |  |  |  |

Description:
The logical base address of the input and output data range - parameterized in SIMATIC STEP 7 - through which this F_SENDDP connection communicates.
SIMATIC block parameter: LADDR

| 13335 | SAFE_SDP_TIMEOUT | N01, N10 | FBSI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Monitoring time F_SENDDP | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 16 | $\begin{array}{l}0.5,0.5,0.5,0.5,0.5, \\ 0.5,0.5,0.5 \ldots\end{array}$ | 0.0 | 60.0 | $7 / 2$ |  |$]$| M |
| :--- |

Description:
The monitoring time is the time in which $\mathrm{F}_{\mathrm{n}}$ SENDDP must have sent a new F telegram to F_RECVDP or in which F_RECVDP must have acknowledged a new $F$ telegram. When the monitoring time is exceeded, F_RECVDP outputs replacement values to the SPL. SIMATIC module parameter: TIMEOUT

| 13336 | SAFE_SDP_ASSIGN | N01, N10 | FBSI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Output assignment \$A_OUTSE to F_SENDDP user data | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 16 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 192192 |  |  |
| $7 / 2$ | M |  |  |  |  |  |

Description: The SPL signals \$A_OUTSE to be transmitted into the F_SENDDP useful data can only be selected area by area.

The SPL area is specified in decimals in aaa bbb format
aaa $=$ area limit 1, SPL signal \$A_OUTSE[aaa]
bbb = area limit 2, SPL signal \$A_OUTSE[bbb]
Example:
\$MN_SAFE_SDP_ASSIGN[0] = 001004 or alternatively 004001
The SPL signals \$A_OUTSE[1] to \$A_OUTSE[4] are transferred to the F_SENDDP user data selected in MD13337 \$MN_SAFE_SDP_FILTER[0].


Description:
The SPL signals selected via MD13336 \$MN_SAFE_SDP_ASSIGN are transmitted to the F_SENDDP user data signals in the order of the FILTER bits set to 1 . The lowest-value SPL signal to the bit position of the F_SENDDP user data of the lowest-value filter bit set to 1, etc. for all SPL signals selected.

Bit $\mathrm{x}=1:$ an SPL signal is transmitted to bit position x of the F_SENDDP user data.
Bit $x=0$ : no SPL signal is transmitted to bit position $x$ of the $\mathrm{F}_{\mathrm{S}}$ SENDDP user data.

| 13338 | SAFE_SDP_ERR_REAC | N01, N10 | FBSI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Fault reaction F_SENDDP | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 16 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 3 |  |  |

Description: In the case of a communication error the fault reaction defined here is triggered. This value is valid as long as no other value is specified from the SPL via system variable
\$A_FSDP_ERR_REAC.
Meaning of the values:

- $0=$ alarm 27350 + stop D/E
- 1 = alarm 27350
- 2 = alarm 27351 (displayed only; self-extinguishing)
- 3 = no system reaction

| 13340 | SAFE_RDP_ENABLE_MASK | N01, N10 | FBSI |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Enable screen F_RECVDP communication relationships |  |  |  |  |  | UDWORD | PowerOn |
| - | - | $0 \times 0$ | $0 \times 0$ | $0 x F F F F$ |  |  |  |  |
| - | - | $7 / 2$ | M |  |  |  |  |  |

Description:
Enable screen for the individual F_RECVDP communication links and their SPL connections

| 13341 | SAFE_RDP_ID |  |  | N01, N10 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | ID for F_RECVDP communication relationships |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 16 | $0,0,0,0,0,0,0,0 \ldots$ | -32768 | 32767 | 7/2 | M |

Description: Any network unique value as ID for F_RECVDP communication relationships. SIMATIC module parameter: DP_DP_ID

| 13342 | SAFE_RDP_NAME |  |  |  |  |  |  | N01, N10 | FBSI |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Name of the F_RECVDP communication link | STRING | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 16 | - | - | - | 7/2 |  |  |  |  |

Description: A name can be assigned to each F_RECVDP communication link.
If a name was assigned, this name will be displayed in the alarm text instead of DP_DP_ID.

| 13343 | SAFE_RDP_CONNECTION_NR |  | N01, N10 | FBSI |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of the F_RECVDP-SPL connection |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 16 \| $0,0,0,0,0,0,0,0 \ldots$ | 0 | 16 | $7 / 2$ | M |
| Description: | This machine data is used to parameterized with this data The number of the F_RECVDP SP variables of the user interfa <br> This applies to the followin <br> - \$A_FRDP_SUBS <br> - \$A_FRDP_ERR_REAC <br> - \$A_FRDP_ERROR <br> - \$A_FRDP_SUBS_ON <br> - \$A_FRDP_ACK_REQ <br> - \$A FRDP DIAG |  | the $F_{-} R$ <br> lso the DP SPL C s: | SPL <br> for ion. | n that is <br> the system |

Machine data

## - \$A_FRDP_SENDMODE

Example:
MD13343 \$MN_SAFE_RDP_CONNECTION_NR[2] = 3 means that the control and status information of the $F_{\text {_RECVDP }}$ SPL connection that is parameterized in data record 2 can be found in the system variables with field index 3.


Description:
The logical base address of the input and output data range - parameterized in SIMATIC STEP 7 - through which this F_RECVDP connection communicates.
SIMATIC block parameter: LADDR


Description:
The monitoring time is the time in which $\mathrm{F}_{\mathrm{n}}$ SENDDP must have sent a new F telegram to F_RECVDP or in which F_RECVDP must have acknowledged a new $F$ telegram. When the monitoring time is exceeded, F_RECVDP outputs replacement values to the SPL. SIMATIC module parameter: TIMEOUT

| 13346 | SAFE_RDP_ASSIGN | N01, N10 | FBSI |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Input assignment F_RECVDP user data to \$A_INSE |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 16 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 192192 |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |

Description: The SPL signals \$A_INSE to be supplied from the F_RECVDP useful data can only be selected area by area.

The SPL area is specified in decimals in aaa bbb format
aaa $=$ area limit 1, SPL signal \$A_INSE[aaa]
bbb = area limit 2, SPL signal \$A_INSE[bbb]
Example:
\$MN_SAFE_RDP_ASSIGN[0] = 001004 or alternatively 004001
The F_RECVDP user data selected in MD13347 \$MN_SAFE_RDP_FILTER[0] are transferred to the SPL signals \$A_INSE[1] to \$A_INSE[4].


## Description:

The F_RECVDP user data signals the filter bits of which are set to 1 are transmitted to the SPL signals via MD13346 \$MN SAFE RDP ASSIGN. The lowest-value F RECVDP user data signal to the lowest-value selected $S P L$ signal etc. for all F_RECVDP user data selected.

Bit $\mathrm{x}=1$ : the $\mathrm{F}_{\text {_RECVDP }}$ user data signal of bit position x is transmitted as SPL signal.

Bit $x=0$ : the $F_{-}$RECVDP user data signal of bit position $x$ is not transmitted as SPL signal.

| 13348 | SAFE_RDP_ERR_REAC |  | N01, N10 | FBSI |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Fault reaction F_RECVDP |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 16 \| $0,0,0,0,0,0,0,0 \ldots$ | 0 | 3 | 7/2 | M |
| Description: | In the case of a communication error, the fault reaction defined here is triggered. This value is valid as long as no other value is specified from the SPL via system variable \$A_FRDP_ERR_REAC. <br> Meaning of the values: <br> - $0=$ alarm 27350 + stop D/E <br> - 1 = alarm 27350 <br> - 2 = alarm 27351 (displayed only; self-clearing) <br> - 3 = no system reaction |  |  |  |  |



Description: In the case of a communication error, the replacement values defined here are activated in the system variables \$A_INSE assigned to this F_RECVDP-SPL connection. This value is valid as long as no other value is specified from the SPL via system variable \$A_FRDP_SUBS.

| 13370 | SAFE_MODE | N01 | FBSI |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Safety operating mode | UBYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | 0 | $0 \times 00$ | $0 \times 03$ | $7 / 2$ |$\quad$ M

## Description:

MD to make a distinction between the safety operating modes:
$0=$ Safety operating mode "SINUMERIK Safety Integrated (SPL)"
1 = Safety operating mode "SINUMERIK Safety Integrated (Drive Based)"
2 = Reserved
3 = Safety operating mode "SINUMERIK Safety Integrated plus (F-PLC)"


Description: Logical basis addresses for PROFIsafe communication between the F-PLC and drive.

| 13374 | SAFE_INFO_DRIVE_LOGIC_ADDR |  |  | N01, N04 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Logical basis addresses, SIC/SCC |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 31 | 5800, 5816, 5832, <br> 5848, 5864, 5880, 5896, 5912... | 0 | 16383 | 7/2 | M |
| Description: | Logical base addresses for SIC/SCC communication between NCK and drive. The standard values of the logical base addresses correspond to the values from the S7 default configuration. |  |  |  |  |  |

### 4.1 General NC machine data

| 13376 | SAFE_INFO_TELEGRAM_TYPE | N01, N04 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | SIC/SCC telegram type | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 31 | $701,701,701,701$, <br> $701,701,701,701 \ldots$ | 0 | 999 | $7 / 2$ |  |  |

## Description: Number of the SIC/SCC telegram type

| 14504 | MAXNUM_USER_DATA_INT | N03 | P3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of user data (INT) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 256 | $7 / 2$ |  |

Description: Number of NC/PLC user data of type INT

| 14506 | MAXNUM_USER_DATA_HEX | N03 | P3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of user data (HEX) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 256 |  |  |

Description: Number of NC/PLC user data (HEX)

| 14508 | MAXNUM_USER_DATA_FLOAT | N03 | P3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of user data (FLOAT) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 64 |  |  |

Description: Number of NC/PLC user data of type FLOAT

| 14510 | USER_DATA_INT | N03 | P3, "PLC-Maschinendaten", P4, <br> "PLC-Maschinendaten" |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | User data (INT) | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 256 | $0,0,0,0,0,0,0,0 \ldots$ | -32768 | 32767 | $7 / 2$ |  |  |

Description: User data can be read from the DB20 (user data block) in the PLC user program.

| 14512 | USER_DATA_HEX | N03 | P3, "PLC-Maschinendaten", P4, <br> "PLC-Maschinendaten" |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | User data (HEX) | UDWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 256 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 0 F F$ | $7 / 2$ |  |  |

Description: User data can be read from the DB20 (user data block) in the PLC user program.


Description: User data can be read from the DB20 (user data block) in the PLC user program.

| 15700 | LANG_SUB_NAME |  | N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Name for substitution subroutine |  | STRING | PowerOn |  |
| - |  |  |  |  |  |
| - | - - | - | - | 7/2 | M |

## Description:

Name of the user program called on the basis of a substitution configured by MD30465 \$MA_AXIS_LANG_SUB_MASK.
The user program is called with the path configured by MD15702 \$MN_LANG_SUB_PATH.

| 15702 | LANG_SUB_PATH |  |  | N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Call path for substitution subroutine |  |  | BYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | 7/2 | M |

Description: Path with which the user program set by MD15700 \$MN_LANG_SUB_NAME is called on the
basis of a substitution configured by MD30465 \$MA_AXIIS_LĀNG_S SUB_MASK:
0: /_N_CMA_DIR (default)
1: /_N_CUS_DIR
2: /_N_CST_DIR

| 15710 | TCA_CYCLE_NAME | N09 | K1, FBWsI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Program name for replacement of the TCA command | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | - | - | - | 7/2 |  |

Description: Program name for the replacement program when calling the TCA command.
If the TCA command is programmed in a part program block, then the subprogram defined in MD15710 \$MN_TCA_CYCLE_NAME is called at the end of the block. The programmed tool can be requestēd in the replacement program via the system variables \$C_TS_PROG / \$C_TS, the Duplo number via \$C_DUPLO_PROG / \$C_DUPLO and the toolholder/spindle number via \$C_THNO_PROG / \$C_THNO. The system variable \$C_TCA returns the value TRUE in the replacement program. Since the replacement takes place at the end of the block, the system variable \$P_SUB_STAT in the replacement program provides the value 2
If MD15710 \$MN_TCA_CYCLE_NAME contains an empty string, the replacement is deactivated (default).

| 16800 | ROOT_KIN_ELEM_NAME |  | EXP, N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Name of the root chain element |  | STRING | Res |  |
| - |  |  |  |  |  |
| - | ROOT | - | - | 7/2 | M |

Description: Specifies the name of the chain element, which, for a machine description using kinematic chains, is the only one that extends from the zero point of the global coordinate system (root chain element).

| 16900 | COLLISION_EXT_FUNCTION_MASK | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Parameterization of external collision check | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 7$ | $7 / 2$ |  |$]$ M

Description: Bit mask for parameterization of external collision check

| 16901 | COLLISION_EXT_PREVIEW_TIME | EXP | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Preview time for external collision check |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.000 | 100.0 |  |  |  |  |

## Description:

The time applies during operation provided that enough data is available for a prediction. When a movement is started, the movement preview starts at the current position, and returns predictions in the largest possible increments until the preview time is reached.

| 16902 | COLLISION_EXT_PREVIEW_STEP |  |  | EXP | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s | Preview time step for external collision check |  |  | DOUBLE | Pow |  |
| - |  |  |  |  |  |  |
| - | - | 0.0 | 0.000 | 100.0 | 7/2 | M |

Description: When a movement is started, the movement preview starts at the current position, and returns predictions in the configured increment until the preview time COLLISION_EXT_PREVIEW_TIME is reached.

| 16903 | COLLISION_EXT_TIMEOUT | EXP | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $s$ | Timeout for external collision check |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.000 | 100.0 |  |  |  |  |

Description: Timeout for communication with an external system to avoid collisions.

| 16904 | COLLISION_EXT_STOP_TIME | EXP | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Maximum braking time for external collision avoidance |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.000 | 100.0 |  |  |  |  |

Description: If the external collision avoidance triggers a stop, the machine must come to a
standstill within the set time (identical to response to STOP D).


Description: For each Ipo cycle, a package with current positions and the configured number of preview packages is created.

| 16906 | COLLISION_EXT_CFG_MASK | EXP | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Parameterization of external collision check | UDWORD | Reset |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $0 \times 1$ | 0 | $0 \times 1$ | $7 / 2$ |  |  |$]$ M

## Description:

Bit mask for parameterization of external collision check

| 17000 | EXTENSIONS_OF_BIN_FILES | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Extensions of binary files | STRING | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 20 | $\begin{array}{l}\text { JPG, GIF, PNG, BMP, } \\ \text { PDF, ICO, HTM, CLC }\end{array}$ | - | - | $2 / 2$ |  |$]$| M |
| :--- |

Description:
Extensions of files which are saved in the binary format in the passive NCKs file system.

For these files, there are no restrictions regarding the content.
For ASCII content (e.g. HTM) any line length is possible; this is not permissible for NC programs (e.g. MPF, SPF and DEF).
Each extension must comprise precisely three uppercase letters.

| 17400 | OEM_GLOBAL_INFO | A01, A11 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | OEM version information | STRING | PowerOn |  |  |  |
| - | 5 | - | - | - | $7 / 2$ |  |

Description:
A version information freely available to the user
(is indicated in the version screen)
Note: MD17400 \$MN_OEM_GLOBAL_INFO[0] is used with functions such as logbook, licensing, etc. to store the machine identity.


| 17504 | MAX_TOOLS_PER_MULTITOOL |  |  |  |  |  | N02, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Multitool function. Maximum number of tool locations per multitool. |  |  |  |  | DWORD | PowerOn |  |
| - | - | 6 | 2 | 72 |  |  |  |  |
| - | - | $1 / 1$ | M |  |  |  |  |  |

Description: "Multiple tools in one magazine location" function (multitool). Maximum number of locations / tools per multitool.

| 17510 | TOOL_UNLOAD_MASK |  | N09 | FBW |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Behavior of tool data when unloading |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 0xF | $7 / 2$ | M |

Description:
When unloading a tool, certain tool data can be set to store fixed values.
Bit no. Bit value HEX Meaning

00 Tool status 'active' remains unchanged.
1 0x1 Tool status 'active' is deleted (\$TC_TP8, Bit 0).
10 Tool status 'was in use' remains unchanged.
1 0x2 Tool status 'was in use' is deleted (\$TC_TP8, Bit 7).
20 Tool parameter \$TC_TP10 remains unchanged.

1 0x4 Tool parameter \$TC_TP10 is set to zero. That is, the tool replacement change strategy is reset.

30 Tool parameter \$TC_TP11 remains unchanged.
$10 \times 8$ Tool parameter $\$ T C \_T P 11$ is set to zero. That is, the assignment to the tool subgroup is resolved.

| 17515 | TOOL_RESETMON_MASK |  |  |  |  |  | N09 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Tool data behavior with RESETMON |  |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 \times 14$ | 0 | $0 \times 49 F$ |  |  |  |  |

Description:
The 5th parameter of the RESETMON command defines which tool status is to be reset. If the 5th parameter is omitted, it is replaced by the value in this MD. With the PI service "_N_TRESMON", work is always done with this value.
In that case, the bits are always assigned as the bits in the tool status \$TC_TP8[x].
Bit no.: 0 Bit value: 0 hex value: -
Meaning: Tool status "active" remains unchanged
Bit no.: O Bit value: 1 hex value: 'H1'
Meaning: Tool status "active" is deleted
Bit no.: 1 Bit value: 0 hex value: -
Meaning: Tool status "released" remains unchanged
Bit no.: 1 Bit value: 1 hex value: 'H2'
Meaning: Tool status "released" is set
Bit no.: 2 Bit value: 0 hex value: -
Meaning: Tool status "locked" remains unchanged
Bit no.: 2 Bit value: 1 hex value: 'H4'
Meaning: Tool status "locked" is deleted, if this is permitted by the monitoring data and the 4 th parameter is set correspondingly.

Bit no.: 3 Bit value: 0 hex value: -
Meaning: Tool status "measure" remains unchanged
Bit no.: 3 Bit value: 1 hex value: 'H8'
Meaning: Tool status "measure" is set.
Bit no.: 4 Bit value: 0 hex value: -
Meaning: Tool status "prewarning limit" remains unchanged
Bit no.: 4 Bit value: 1 hex value: 'H10'
Meaning: Tool status "prewarning limit" is deleted, if this is permitted by the monitoring data and the 4 th parameter is set.

Bit no.: 5 Not permitted (tool status "tool is being changed")
Bit no.: 6 Not permitted (tool status "tool is fixed-location-coded")
Bit no.: 7 Bit value: 0 hex value: -
Meaning: Tool status "was in use" remains unchanged
Bit no.: 7 Bit value: 1 hex value: 'H80'
Meaning: Tool status "was in use" is deleted
Bit no.: 8 Bit value: 0 Not permitted (tool status "is in retract")
Bit no.: 9 Bit value: 0 hex value: -
Meaning: Tool status "locked is ignored" remains unchanged
Bit no.: 9 Bit value: 1 hex value: 'H200'
Meaning: Tool status "locked is ignored" is deleted
Bit no.: 10 Bit value: 0 hex value: -
Meaning: Tool status "to unload" remains unchanged
Bit no.: 10 Bit value: 1 hex value: 'H400'

Meaning: Tool status "to unload" is deleted
Bit no.: 11 Not permitted (tool status "to load")
Bit no.: 12 Bit value: 0 Not permitted (tool status "master tool")
Bit no.: 13 Not permitted (reserved)
The default setting corresponds to the previous behavior.
Impermissible bits are filtered and not displayed in the limit mask. Bits not defined here are ignored when writing the machine data.

| 17520 | TOOL_DEFAULT_DATA_MASK |  |  |  |  |  | N09 | FBWsI |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Create new tool: default settings |  |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 1 \mathrm{~F}$ | M |  |  |  |

Description:
When defining a tool for the first time (bits 0, 1, 2) or the magazine locations (bit 3) for the first time, certain data of the tool can be set to fixed default values. Bit 4 can couple the magazine location status 'Overlapping allowed' ('H2000') to the value of the magazine location status 'disabled' ('H1'). This can prevent simple applications from dealing with data which do not necessarily have to be assigned individual values.
Bit no.: 0 Bit value: 0 Hex value: -
Meaning: Default value of tool status (\$TC_TP8), bit1=0 ='not released'
Bit no.: 0 Bit value: 1 Hex value: 'H1'
Meaning: Default value of tool status (\$TC_TP8), bit1=1 ='released'
Bit no.: 1 Bit value: 0 Hex value: -
Meaning: Default value of tool status (\$TC_TP8), bit6=0 ='not fixed-location-coded' Bit no.: 1 Bit value: 1 Hex value: 'H2'
Meaning: Default value of tool status (\$TC_TP8), bit6=1 ='fixed-location-coded' Bit no.: 2 Bit value: 0 Hex value: -

Meaning: The tool is only accepted in the tool group when the explicit write command is used for the tool name. Only then can it be loaded via programming.
Bit no.: 2 Bit value: 1 Hex value: 'H4'
Meaning: The tool is automatically accepted in the tool group corresponding to the tool name when it is defined for the first time. The tool can then be changed using the default name ("t" = t-No.).
The term 'tool name' (\$TC_TP2) can be hidden from the user. (This only makes sense if you do not use replacement tools or if the tool name is not written explicitly, as this may give rise to data consistency problems.)
Bit no.: 3 Bit value: O Only with TMMG: Default value of location type (\$TC_TP7) $=9999=$ not defined
Bit no.: 3 Bit value: 1 Hex value: 'H8'
Meaning: Only with TMMG: Default value of location type (\$TC_TP7) = 1 and consequently the default value of magazine location type $\left(\$ T C \_M P P 2\right)=1$. This means that all magazine locations can accept all tools.
Bit no.: 4 Bit value: 0 Hex value: -
Meaning: Only with TMMG + active consider adjacent location: With SET/RESET of the magazine location status 'disabled', the magazine location status 'Overlapping allowed' remains unchanged.
Bit no.: 4 Bit value: 1 Hex value: 'H10'
Meaning: Only with TMMG + active consider adjacent location: With SET/RESET of the magazine location status 'disabled', the magazine location status 'Overlapping allowed' is automatically SET/RESET.

| 17530 | TOOL_DATA_CHANGE_COUNTER |  | EXP, N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Mark tool data change for HMI |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0x1F | 0 | 0x1F | 7/2 | M |

Description:
HMI display support. This data enables individual data to be explicitly taken into account or not taken into account in the OPI variables (block C/S) toolcounter, toolCounterC, toolCounterM.

Bit no. : 0 Bit value: 0 Hex value: -
Meaning: Changes to the values of the tool status (\$TC_TP8) are not taken into account in toolCounterC

Bit no. : 0 Bit value: 1 Hex value: 'H1'
Meaning: Changes to the values of the tool status (\$TC_TP8) are taken into account in toolCounterc
Bit no. : 1 Bit value: 0 Hex value: -
Meaning: Changes to the values of the remaining number of tools (\$TC_MOP4) are not taken into account in toolcounterc
Bit no. : 1 Bit value: 1 Hex value: 'H2'
Meaning: Changes to the values of the remaining number of tools (\$TC_MOP4) are taken into account in toolCounterC

Bit no. : 2 Bit value: 0 Hex value: -
Meaning: Changes to the values of the tool data are not taken into account in the tool data update service

Bit no. : 2 Bit value: 1 Hex value: 'H4'
Meaning: Changes to the values of the tool data are taken into account in the tool data update service
Bit no. : 3 Bit value: 0 Hex value: -
Meaning: Changes to the values of the magazine data are not taken into account in the tool data update service
Bit no. : 3 Bit value: 1 Hex value: 'H8'
Meaning: Changes to the values of the magazine data are taken into account in the tool data update service.

Bit no. : 4 Bit value: 0 Hex value: -
Meaning: Changes to the values of the ISO tool offset data are not taken into account in the tool data update service

Bit no. : 4 Bit value: 1 Hex value: 'H10' Meaning: Changes to the values of the ISO tool offset data are taken into account in the tool data update service The statements "Changes to the values of the tool status" and "Changes to the values of the remaining number of tools" refer not only to value changes effected by internal processes in the NC but also to value changes produced by writing the corresponding system variables.


Description:
Definition of the tool types permitted in NCK (see \$TC DP1) with the tool offset selection. That is, tools of any type may be loaded in the NCK; but only the tools types defined here may be defined in the offset defining tool. A bit value $=1$ means that the named tool type range is permitted for the offset selection. A bit value $=0$ means that the named tool type range is rejected with an offset-capable alarm in the case of an attempted offset selection of a cutting edge of this type. The special value $=0$, 9999 for the tool type means "undefined". Tool offsets with this tool type value generally cannot be selected.

Bit no.: 0 value $0 x 1$ means: Tool types 1 to 99 permitted
Bit no.: 1 value $0 \times 2$ means: Tool types 100 to 199 permitted (milling tools)
Bit no.: 2 value $0 x 4$ means: Tool types 200 to 299 permitted (drilling tools)
Bit no.: 3 value $0 \times 8$ means: Tool types 300 to 399 permitted
Bit no.: 4 value $0 \times 10$ means: Tool types 400 to 499 permitted (grinding tools)
Bit no.: 5 value $0 \times 20$ means: Tool types 500 to 599 permitted (turning tools)
Bit no.: 6 value $0 \times 40$ means: Tool types 600 to 699 permitted
Bit no.: 7 value $0 \times 80$ means: Tool types 700 to 799 permitte
Bit no.: 8 value $0 \times 100$ means: Tool types 800 to 899 permitted
Bit no.: 9 value $0 \times 200$ means: Tool types 900 to 999 permitted
Related to:
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA

| 17600 | DEPTH_OF_LOGFILE_OPT |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Depth of log memory optimization in REORG | EXP, N01 | - |  |  |
| - |  |  |  |  |  |
| - | - | 5 | 0 | DWORD | Reset |

Description:
The depth of memory optimization in the REORG log file
(=search depth to determine if a parameter to be written is already included in the REORG log file).
The value of the machine data can be increased if alarm 15110 occurs during program execution and if this alarm is to be avoided.
(Alternatively, the size of the REORG log file can be increased with MD28000 \$MC_MM_REORG_LOG_FILE_MEM, provided that the operator has the access rights required. This procedure should generally be preferred.)
Value
0 = No optimization,
That is each write operation creates an input into the REORG log file. Writing a variable value is therefore very time-efficient, but requires more memory.

## $0<\mathrm{n}<=$ Maximum value

When a new variable value is written, the $n$ previously entered write operations (but maximally up to the previous indicatable block) are checked to determine if the parameter now to be written has already been written in the past. If this is the case, a new entry is not made in the REORG log file.
If this is not the case, an entry is made. A variable value can therefore be written in a very memory-efficient way, but requires more time.
Example:
MD17600 \$MN_DEPTH_OF_LOGFILE_OPT is assumed to be 5 and the following would be a typical proğram sequēnce:
$x 10$; Executable NC block
r1=1 ; The first write command since x10
; -> Save old value in log file. 1st entry
r2=1 ; Determine that $r 2$ is not yet included
; -> Save old value in log file. 2nd entry
r3=1 ; Determine that $r 3$ is not yet included
; -> Save old value in log file. 3rd entry
r4=1 ; Determine that $r 4$ is not yet included
; -> Save old value in log file. 4th entry
r5=1 ; Determine that r 5 is not yet included
; -> Save old value in log file. 5th entry
r6=1 ; Determine that $r 6$ is not yet included

```
    ; -> Save old value in log file. 6th entry
r2=1 ; Determine that r2 is already included
    ; (5th oldest entry) -> no renewed saving
r3=1 ; Determine that r3 is already included
    ; (4th oldest entry) -> no renewed saving
r1=2 ; As MD17600 $MN_DEPTH_OF_LOGFILE_OPT = 5 it is not detected that
        ; r1 is already included
        ; (6th oldest entry) -> save old value in log file.
        ; 7th entry
x20 ; Executable NC block
r1=3 ; The first write command since x20
    ; -> Save old value in log file. 1st entry
r1=4 ; Determine that r1 is already included
    ; (Only one entry) -> no renewed saving
```

The setting of the $M D$ is particularly useful if a small number of verious parameters are written frequently (e.g. in a loop) and if alarm 15110 occurs for this reason.

| 17610 | DEPTH_OF_LOGFILE_OPT_PF | EXP, N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Depth of the PowerFail log memory optimization | DWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $100,10,30$ | 0 | 1000 | $1 / 1$ |  |

Description:
Depth of the memory optimization in the PowerFail log file (=search depth, to find out whether a parameter to be written is already included in the PowerFail log file).

It is possible to increase the value of the machine data if
alarm 15120 occurs during program processing and if you wish to avoid it.
(Alternatively, you can increase the size of the PowerFail log file itself by means of MD18232 \$MN_MM_ACTFILESYS_LOG_FILE_MEM, if you have the necessary access right
and if the required memory is available.
Value
$0 \quad=$ same effect as value 1.
Writing of a variable value is therefore very time-efficient at the cost of the required memory.
$0<\mathrm{n}<=$ Maximum value
= Writing of a new variable value leads, prior to saving of the new variable value in the PowerFail log file, to the last $n$ write operations which have been being checked to see whether the new parameter to be written has already been written once. If yes, the new value is not entered again in the PowerFail log file, but the old value is overwritten with the new one. If no, the new value is entered. At the cost of the required time, writing of a variable value can therefore be designed very memory-efficiently.

Changing of the data can shorten/increase the time requirement of the present application.

Changing of the data can fill the available log buffers faster/more slowly.
Frequent occuring of alarm 15120 -> Increase values for index=0,1,2.
The value indicating the index to be changed can be deducted from the parameter of alarm 15120:
if it is the value for MD18232 \$MN_MM_ACTFILESYS_LOG_FILE_MEM[0], then increase the value for index 0;
or increase MD18232 \$MN_MM_ACTFILESYS_LOG_FILE_MEM[0] itself.
Index Meaning
0 Search depth in preprocessing buffer
1 Search depth in buffer for data changes within the range of tool change
2 Search depth in buffer for data changes of main processing (especially synchronized actions)

| 17900 | VDI_FUNCTION_MASK |  | EXP, N09 | H1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Setting to VDI signals |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0x0 | 0 | 0x1 | 7/2 | M |

## Description:

Settings for VDI signals:
Bit $0=0$ :
The VDI signals motion command $+/$ motion command - are already issued if there is a travel request (default).

Bit $0=1$ :
The VDI signals motion command $+/$ motion command - are issued only if the axis actually moves.

| 17950 | IS_AUTOMATIC_MEM_RECONFIG |  | EXP, N02 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | System: automatic memory reconfiguration |  | BOOLEAN | Pow |  |
| - |  |  |  |  |  |
| - | TRUE | - | - | 3/1 | M |

Description:
Value $=0$ : If machine data that redefines the buffered memory is modified, then generally the alarm 4400 is output which indicates that the user data will be deleted the next the software is started.
Value = 1 : If machine data that redefines the buffered memory is modified, then generally the alarm 4400 is not output. This means the data is retained the next time the software is started.

The preassigned value is selected model-specifically and generally it must not be changed.

| 17951 | AUTOMATIC_MEM_RECONFIG_FILE | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Path and file name for internal data backup | STRING | PowerOn |  |  |  |
| - | - | lsiemens/sinumerik/ <br> sys_cache/nck/ <br> content.reconfig | - | ReadOnly | S |  |

Description: File name with file path where the data backup file is stored if the persistent memory is reconfigured.

| 18030 | HW_SERIAL_NUMBER |  | N05 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Hardware series number |  | STRING | PowerOn |  |
| - |  |  |  |  |  |
| - | 1 | - | - | ReadOnly | M |

Description: During power on of the control, a unique hardware serial number is stored in this MD:

- For Powerline series modules this is the serial number of the NCU module
- For Solutionline series modules this is the serial number of the CF card, or the unique number of the MCI module in the case of PC-based systems

This data cannot be written.

| 18040 | VERSION_INFO | N05 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Version and product information | STRING | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 9 | - | - | - | ReadOnly |  |  |

Description: Version and model information for the system software component NCK
[O]:'Software component name[SI version]' - value: "Numeric Control NCK" (can be overwritten as from "trol NCK" with 'SIxxx'. 'SI' stands for Safety Integrated, 'xxx' for the SI version)
[1]:'Version (and date of the NCK installation on the target system)'
[2]:'Date and time of the NCK program generation'
[3]: 'Name of the model and submodel' - values: 808d-me42, ... 828d-me42, ... 840DSL731,... 840D732, ...
[4]:'Hardware type' - values for NCK
in NCU: IDC, SOC2, ... simulations NCK: PC (Windows), PC (Linux), ... HOST development NCK: HOST development
[5]:'Product type' - values: machine tool, simulation, simulation development
[6]:'Subscaling 1' - values: file name. different variants of a model can have data (properties) deviating from those of the model.
[7]:'Subscaling 2' - values: file name. different variants of a model can have data (properties) deviating from those of the model.
[8]:'Subscaling 3' - values: file name. different variants of a model can have data (properties) deviating from those of the model.

Applies to indices 6,7,8: Prerequisite for a value input is that the file exists when the NCK starts.

Example for 840dsl on NCU hardware:
[0]:"Numeric Control NCK" (without NC-based Safety Integrated)
[0]:"Numeric ControSI112" (with NC-based Safety Integrated)
[1]:"112.00.00 "
[2]:"22/02/16 09:28:03"
[3]:"840DSL731"
[4]:"SOC2"
[5]:"machine tool"
[6]:""
[7]:""
[8]:""
Example for '840d virtual commissioning' (a simulation product) on a Windows computer:
[0]:"Numeric Control NCK" (without Safety Integrated)
[1]:"112.00.00"
[2]:"31/01/16 08:58:43"
[3]:"840D732"
[4]:"PC (Windows)"
[5]:"simulation"
[6]:"840evoVC_addon"
[7]:""
[8]:""

| 18042 | CC_VERSION_INFO | N05 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Compile cycle version | STRING | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 10 | - | - | - | $7 / 2$ | M |  |

Description: Version identifiers of the compile cycles

| 18045 | EES_MODE_INFO |  |  |  |  |  | N05 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Mode in which the EES function works. |  |  |  |  |  | BYTE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - | ReadOnly |  |  |  |

Description:
Mode in which the function "Execution from External Storage" works.
Bit0 (LSB) $=1$
CNC user memory expanded (local EES active)
Bit1 $=1$
Execution from external memory (global EES is active)
Bit2 = 1
A global part program memory has been set up on an external memory. See also:

OD19730 \$ON_HMI_FUNCTION_MASK[0] bit 5 "CNC user memory expanded"
OD19334 \$ON_SYSTEM_FUNCTION_MASK bit 9 "Execute from external memory"
OD19334 \$ON_SYSTEM_FUNCTION_MASK bit 12 "Additional HMI user memory on CF card of the NCU"

| 18050 | INFO_FREE_MEM_DYNAMIC | N01, N02, N05 | S7 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display data of the free volatile memory | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 6291456 | 0 | 268435456 | ReadOnly |  |

## Description:

The data is used for
a) the manufacturer's presetting of the memory size [ bytes ] available to the user for each channel after cold restart.
b) displaying the available volatile memory [ bytes ]

The data cannot be written.
The contents of the data state how much volatile memory is available per channel for increasing the volatile user data storage area via MD.
It is advisable to check whether the available memory is sufficient before increasing, for example, the number of LUDs, number of functional parameters, or the size of the IPO buffer.
If necessary, proceed step by step:

- increase by 1 , note (old) value
- NCK startup (= 'warm start' or NCK reset), read off new value
- memory requirement $=$ new value - old value

On the first NCK startup or cold restart of the control (=deletion of user data), MD18210 \$MN_MM_USER_MEM_DYNAMIC is set by the NCK software so that at least the preset value results for MD18050 \$MN_INFO_FREE_MEM_DYNAMIC.
That is, the value is automatically increased if the initial value of MD18210 \$MN_MM_USER_MEM_DYNAMIC is too low.
The following also applies to multichannel systems:

- The preset value applies to each possible channel. That is, if there are ten possible channels, MD18210 \$MN_MM_USER_MEM_DYNAMIC is set by the NCK SW so that at least the 'preset value* ten' results for MD18050 \$MN_INFO_FREE_MEM_DYNAMIC.
- On activation of a channel, MD18210 \$MN_MM_USER_MEM_DYNAMIC is increased if necessary so that the memory free at the time of activation continues to be free (provided that the memory structure permits this) after the channel has become active.
- The activation of the maximum possible number of axes is ensured by increasing the data MD18210 \$MN_MM_USER_MEM_DYNAMIC if necessary so that memory free at the time of activation continues to be free (provided that the memory structure permits this) after the axis has become active.
'If necessary' in the previous sentences means that the adjustment is automatic if the channel/axis could not be activated with the current values of MD18210 \$MN_MM_USER_MEM_DYNAMIC/\$MN_INFO_FREE_MEM_DYNAMIC.

| 18060 | INFO_FREE_MEM_STATIC | N01, N02, N05 | S7 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display data of the free nonvolatile memory | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 7340032 | 0 | 48234496 | ReadOnly |  |

## Description:

The preassigned value specifies how many bytes, as a minimum, are free for the user when the NCK runs up with a 'cold restart'.
The contents of the data state how much nonvolatile memory is available during startup for configuration of the active and passive file system and other functions.
e.g. MD18082 \$MN_MM_NUM_TOOL
e.g. MD18150 \$MN_MM_GUD_VALUES_MEM
e.g. MD18352 \$MN_MM_U_FILE_MEM_SIZE
e.g. MD38000 \$MA_MM_ENC_COMP_MAX_POINTS)

On the first NCK power-up or cold restart of the control (=deletion of user data) MD18230 \$MN_MM_USER_MEM_BUFFERED is set by the NCK software so that at least the default value results for MD18060 \$MN_INFO_FREE_MEM_STATIC.

Machine data for configuration of functions that require nonvolatile memory (tools, GUDs, compensations, ...) can be increased until this memory has all been allocated.

| 18070 | INFO_FREE_MEM_DPR |  |  |  |  |  |  | EXP, N01, N02, <br> N05 | S7 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Display data of free memory in DUAL PORT RAM | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - |  |  |  |  |  |

Description: Output of the available memory in the Dual Port RAM (Bytes).
The data cannot be written.

| 18074 | MM_TOOL_MANAGEMENT_TRACE_SZ |  |  |  |  |  | N02, N09 | /FBWsI/, "Description of <br> Functions, Tool Management" |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Max. size of the tool management diagnostic ring buffers |  |  |  |  |  | DWORD | PowerOn |
| - | 2 | 4 | 500 | $7 / 2$ | M |  |  |  |
| - | 25,25 | 4 |  |  |  |  |  |  |

## Description:

The number of entries in the tool management diagnostic ring buffers.
Index $0=$ IPO trace buffer size.
Index 1 = Prep trace buffer size.
There are separate IPO trace buffers in each channel, and a Prep trace buffer in channel 1 only.
The buffers are allocated only if bit 0 ( $0 \times 0001$ ) is ON at warm start, in both MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK and per-channel MD20310 \$MC_TOOL_MANAGEMENT_MASK.

Trace data is written to the buffers when bit $13(0 \times 2000)$ is ON in per-channel MD20310 \$MC_TOOL_MANAGEMENT_MASK.

| 18075 | MM_NUM_TOOLHOLDERS |  | N02, N09 |  | ption of Management" |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Max. number of tool holders per TOA |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | 16 | 1 | 20 | 7/2 | M |

Description:
Max. number of definable tool holders per $T O$ range.
The address extension $e$ of commands $T e=t$, $M e=6$ (*) is the number of the tool holder.
$t=T$ number/tool name - depending on the function activated in the NCK.
(*) if: MD22550 \$MC_TOOL_CHANGE_MODE=1 and MD22560 \$MC_TOOL_CHANGE_M_CODE=6 applies Normally the tool holder of milling machines is a spindle.
Also see MD20090 \$MC_SPIND_DEF_MASTER_SPIND.
For turning machines the tool holder normally is not a spindle axis.
Also see MD20124 \$MC_TOOL_MANAGEMENT_TOOLHOLDER.
In this case it should reasonably apply that MD18075 \$MN_MM_NUM_TOOLHOLDERS is larger or equal to MD20090 \$MC_SPIND_DEF_MASTER_SPIND/MD20124 \$MC_TOOL_MANAGEMENT_TOOLHOLDER.
If bit $0=1$ in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK and MD20310
\$MC_TOOL_MANAGEMENT_MASK is set (=magazine management (TOOLMAN))
it will apply for reasonable values that MD18075 \$MN_MM_NUM_TOOLHOLDERS is smaller or equal to MD18076 \$MN_MM_NUM_LOCS_WITH_DISTANCE.
A maximum of MD18075 \$MN_MM_NUM_TOOLHOLDERS intermediate memory locations of the type spindle
(\$TC_MPP1[9998,x]=2) can then be defined.
Example: TOOLMAN inactive
MD20090 \$MC_SPIND_DEF_MASTER_SPIND shall be =3, MD18075 \$MN_MM_NUM_TOOLHOLDERS shall be $=3$.

Then $T 1=t, T 2=t, T 3=t, T=t$ can be programmed.
Example: TOOLMAN active, milling machine with Me=6 as tool change command
MD18075 \$MN_MM_NUM_TOOLHOLDERS shall be = 14, MD18076
\$MN_MM_NUM_LOCS_WITH_DISTANCE=20,
10 channels shall be active, all channels have TOOLMAN active and have the same tool and magazine data
(=one TO range for all channels). MD20090 \$MC_SPIND_DEF_MASTER_SPIND=1,..... 10 for the channels.
Then up to 14 locations of the kind 'tool holder'/'spindle' can be defined in the intermediate magazine memory.

Additional 6 grippers or others can be defined.
These 20 locations max. can be linked to magazines.
In the channels $T 1=t$, .... T14 $=t$ and $T t$, or $M 1=6, \ldots$ M14 $=6$ and M6 can be programmed.
The PLC version used can limit the maximum number of tool holders.


- See MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, MD20310 \$MC_TOOL_MANAGEMENT_MASK; for each bit $0=1$.

Max. number of magazine locations (spindles, load locations,...) per TOA, that can have a remote connection to a magazine, defined by \$TC_MDPx[n,m].
Example: TOOLMAN shall be active: MD18076 \$MN_MM_NUM_LOCS_WITH_DISTANCE shall be = 5 and MD18077 \$MN MM NUM DIST REL PER MAGLOC $=2$.

Two TO units shall be defined with three tool holders/spindles and two load locations each.

Furthermore, two grippers each shall be defined in each TO unit.
This means that a total of 14 locations shall be defined in the intermediate memory magazine/load magazine for the distances and assignments.
4 magazines shall be defined for TO unit 1,6 magazines for TO unit 2.
With the value set to MD18076 \$MN_MM_NUM_LOCS_WITH_DISTANCE = 5 each tool holder and each load location
of the two TO units with up to two magazines (MD18077 \$MN_MM_NUM_DIST_REL_PER_MAGLOC = 2) per remote relationship
can be connected; (see \$TC MDP1 and \$TC MDP2) and for each tool holder max. two more grippers
(MD18077 \$MN_MM_NUM_DIST_REL_PER_MAGLOC = 2) can be assigned; (see \$TC_MLSR).
One tool holder / one spindle location can subsequently have two tables - one distance table for magazines and
one assignment table for grippers and similar locations.

| 18077 | MM_NUM_DIST_REL_PER_MAGLOC |  | N02, N09 | /FBWsI/, "Description of Functions, Tool Management" |
| :---: | :---: | :---: | :---: | :---: |
| - | Max. no. of magazines in the distance table of a magazine loc. |  | DWORD | PowerOn |
| - |  |  |  |  |
| - | 64 | 64 0 | 64 | 7/2 M |

Description:

This machine data will only be active, if the magazine management, TOOLMAN function is active.

- See MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, MD20310 \$MC_TOOL_MANAGEMENT_MASK.

Two sizes are defined with this magazine data:
1.) Max. number of magazines in the distance table of a magazine location (spindle, load location, ...)
2.) Max. number of locations (gripper, ...) in the connection table of a spindle/tool holder location.
Example: MD18077 \$MN_MM_NUM_DIST_REL_PER_MAGLOC shall be $=3$.
Two TO units shall be defined with two tool holder/spindles each and one load location each.

Furthermore four grippers shall be defined in each TO unit.
4 magazines shall be defined for $T O$ unit 1; 6 magazines shall be defined for to unit 2.

Then, each tool holder can define max. three distances for the magazines (see \$TC_MDP2) and additionally a max. of three relationships to the grippers (\$TC_MLSR).


Description: The machine data only has effect if the function 'tool magazine management', TMMG, is activated - see MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, MD20310 \$MC_TOOL_MANAGEMENT_MASK.

The maximum number of hierarchies for magazine location types.
In variable \$TC_MPTH[n,m], the allowed range of $n$ is from 0 to MD18078 '\$MN_MM_MAX_NUM_OF_HIERARCHIES - 1'.
(The maximum of index $m$ is given by MD18079 \$MN_MM_MAX_HIERARCHY_ENTRIES.)
Value $=0$ means that the function 'magazine location type hierchies' is not available.

| 18079 | MM_MAX_HIERARCHY_ENTRIES |  |  |  |  |  |  | N02, N09 | /FBWsI/, "Description of <br> Functions, Tool Management" |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | The max. number of entries in a mag. location type hierarchy. |  |  |  |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 1 | 32 | $7 / 2$ | M |  |  |  |  |

Description:
The machine data is only effective if the function 'tool magazine management', TMMG, is activated - see MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, MD20310 \$MC_TOOL_MANAGEMENT_MASK - and $\bar{i} f ~ \overline{M D 18078 ~ \$ M N \_M M \_M A X \_N U M \_O F \_H I E R A R C H I E S ~ i s ~ g r e a t e r ~}$ than zero.
The maximum number of entries in a magazine location type hierarchy.
The permissible range of the index $m$ of system parameter $\$ T C$ _MPTH [n,m] is from 0 to 'MD18079 \$MN_MM_MAX_HIERARCHY_ENTRIES - 1'.
(The maximum of index $n$ is given by MD18078 \$MN_MM_MAX_NUM_OF_HIERARCHIES.)

| 18080 | MM_TOOL_MANAGEMENT_MASK |  | N02, N09 | K1, W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Step-by-step memory reservation for tool management (SRAM) |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 0x2 | 0 | 0xFFFF | 7/1 | M |

The set TM data does not take up any memory space, TM is not available.
 have to be set accordingly (MD18086 \$MN_MM_NUM_MAGAZINE_LOCATION, MD18084 \$MN_MM_NUM_MAGAZINE)
Bit 1=1: Memory for monitoring data (WZMO) is provided
Bit 2=1: Memory for user data (CC data) is provided
Bit 3=1: Memory to consider adjacent location is provided
Bit 4=1: Memory and function enable for PI service _N_TSEARC = "Complex search for tools in magazines" is provided.
Bit 5=1: Wear monitoring active
Bit 6=1: Wear grouping available
Bit 7=1: Reserve memory for adapters for magazine locations
Bit 8=1: Memory for application and/or setup offsets
Bit 9=1: Tools associated with a turret no longer leave their turret location on tool change (display).
Bit $10=1$ :The multitool function is available
(other MDs can be used to modify the configuration).
Bit $10=0$ :The multitool function is not available
(the functional scope configured with other MDs is ineffective).
This broken down approach to memory reservation means that memory usage can be optimized in line with the functions used.
Example:
Default memory reservation for TM:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK = 3 (bit $0+1=1$ ) means that $T M$ and tool
monitoring data are provided
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK = 1 means tool management without tool monitoring function data

| 18082 | MM_NUM_TOOL | N02, N09 | FBWsl, S7 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of tools the NCK can manage (SRAM) | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 30 | 0 | 1500 |  |  |  |

Description: The NC cannot manage more tools than the number entered in the MD. A tool has at least one cutting edge.
Buffered user memory is used.
The maximum possible number of tools is equal to the number of cutting edges. The MD must also be set when TOOLMAN is not used.
The buffered data are lost when the machine data is changed.
Related to:
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA

| 18083 | MM_NUM_MULTITOOL | N02, N09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Multitool function. Number of tools the NCK can manage. |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 15 | 0 | 750 | $1 / 1$ |  |  |  |

Description: "Multiple tools in one magazine location" function (multitool). Number of multitools the NCK can manage.

| 18084 | MM_NUM_MAGAZINE |  |  |  |  |  |  | N02, N09 | FBWsI |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of magazines the NCK can manage (SRAM) | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 64 | M |  |  |  |  |

Description: Tool management (TOOLMAN and TMMG) - only when MD TOOLMAN and option TOOLMAN are set: Number of magazines which the NCK can manage (active and background magazines).
This MD reserves the buffered memory for the magazines.
Important: One loading and one buffer magazine are set up in in the tool management for each TOA unit. These magazines have to be taken into account here.
Value $=0$-The tool management cannot be activated because no data can be created.
Related to:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK
MD20310 \$MC_TOOL_MANAGEMENT_MASK

| 18085 | MM_NUM_MULTITOOL_LOCATIONS |  |  |  |  |  | N02, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Multitool function: Number of multitool locations the NCK can <br> manage. | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 30 | 0 | 1500 | $1 / 1$ |  |  |  |$⿻$| M |
| :--- |

Description: "Multiple tools in one magazine location" function (multitool). Number of multitool
locations the NCK can manage.


Description: TMMG - only when MD TOOLMAN and TOOLMAN option are set:

Number of magazine locations which the NCK can manage.
This machine data reserves the buffered memory for the magazine lcations.
Important: The number of all buffers and loading points also has to be included in the calculation here.
Value = 0: Tool management cannot be activated because no data can be created.
Related to:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK
MD20310 \$MC_TOOL_MANAGEMENT_MASK


| 18090 | MM_NUM_CC_MAGAZINE_PARAM | N02, N09 | FBWsI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of OEM magazine data (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 64 | $2 / 2$ |  |

Description: Number of magazine data (of type Integer) which are available to the user or the compile cycle.
This machine data increases the buffered memory requirement by sizeof(int)*max. number of magazines.
Related to:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK
MD18084 \$MN_MM_NUM_MAGAZINE

| 18091 | MM_TYPE_CC_MAGAZINE_PARAM | N02, N09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Type of OEM magazine data (SRAM) |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 64 | $3,3,3,3,3,3,3,3 \ldots$ | 1 | 6 | $2 / 2$ |  |  |  |$]$ M

Description: Individual types can be assigned to the parameters in this way. Array index $n$ can take values from 0 to that of MD18090 \$MN_MM_NUM_CC_MAGAZINE_PARAM.
Type of magazine-specific user data configured by MD18090
\$MN_MM_NUM_CC_MAGAZINE_PARAM.
Each parameter can be assigned its own type. Permissible types are:
Type Value of machine data
(See types of the NC language)
BOOL 1
CHAR 2
INT 3
REAL 4
STRING 5 (is not allowed, is not supported by the MCP.)
AXIS 6

Machine data

```
FRAME
Not defined
Example:
MD18090 $MN_MM_NUM_CC_MAGAZINE_PARAM=1
MD18091 $MN_MM_TYPE_CC_MAGAZINE_PARAM=2
Parameter $TC_MAPC1 = "A" can then be programmed.
Buffered user memory is used. A value change leads to a reconfiguration of the buffered
memory.
Related to:
MD18090 $MN_MM_NUM_CC_MAGAZINE_PARAM
MD18084 $MN_MM_NUM_MAGAZINE
```

| 18092 | MM_NUM_CC_MAGLOC_PARAM |  |  |  |  |  | N02, N09 | FBWsI |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of OEM magazine location data | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 64 |  |  |  |  |

Number of magazine location data parameters (of type Integer) which are available to the user or the compile cycle.
This machine data increases the buffered memory requirement by sizeof(int)*max. number of magazines.
Related to:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK
MD18086 \$MN_MM_NUM_MAGAZINE_LOCATION

| 18093 | MM_TYPE_CC_MAGLOC_PARAM | N02, N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Type of OEM magazine location data (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 64 | $3,3,3,3,3,3,3,3 \ldots$ | 1 | 6 |  |  |

Description: Individual types can be assigned to the parameters in this way. Array index $n$ can take values from 0 to that of MD18092 \$MN_MM_NUM_CC_MAGLOC_PARAM.

Type of magazine location-specific user data configured by MD18092 \$MN_MM_NUM_CC_MAGLOC_PARAM.
Each parameter can be assigned its own type. Permissible types are:
Type Value of machine data
(See types of the NC language)
$\qquad$
BOOL 1
CHAR 2
INT 3
REAL 4
-(STRING is explicitly not possible here, the value 5 is treated as the value 2)
AXIS 6
FRAME Not defined
Example:
MD18092 \$MN_MM_NUM_CC_MAGLOC_PARAM=1
MD18093 \$MN_MM_TYPE_CC_MAGLOC_PARAM=2
Parameter $\$$ TC_MPPC1 = "A" can then be programmed.
Buffered user memory is used. A value change leads to a reconfiguration of the buffered memory.
Related to:
MD18092 \$MN_MM_NUM_CC_MAGLOC_PARAM

MD18086 \$MN_MM_NUM_MAGAZINE_LOCATION

| 18094 | MM_NUM_CC_TDA_PARAM | N02, N09 | H2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of OEM tool data (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 64 |  |  |

Description: Number of tool-specific data (of type Integer) which can be created per tool, and which are available to the user or the compile cycle.
This machine data increases the buffered memory requirement by sizeof(double)*max. number of tools.
Related to:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK
MD18082 \$MN_MM_NUM_TOOL

| 18095 | MM_TYPE_CC_TDA_PARAM | N02, N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Type of OEM tool data (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 64 | $4,4,4,4,4,4,4,4 \ldots$ | 1 | 6 | $2 / 2$ |  |

Description: Individual types can be assigned to the parameters in this way. Array index $n$ can take values from 0 to that of MD18094 \$MN_MM_NUM_CC_TDA_PARAM.
Type of tool-specific user data configured by MD18094 \$MN_MM_NUM_CC_TDA_PARAM.
Each parameter can be assigned its own type. Permissible types are:
Type Value of machine data
(See types of the NC language)

BOOL 1
CHAR 2
INT 3
REAL 4
STRING 5 (Identifier allowed up to a maximum of 31 characters.)
AXIS 6
FRAME Not defined
Example:
MD18094 \$MN_MM_NUM_CC_TDA_PARAM=1
MD18095 \$MN_MM_TYPE_CC_TDA_PARAM=5
Parameter $\$ T C$ TPC1 = "UserTool" can then be programmed.
Buffered user memory is used. A value change leads to a reconfiguration of the buffered memory.
Related to:
MD18094 \$MN_MM_NUM_CC_TDA_PARAM
MD18082 \$MN_MM_NUM_TOOL

| 18096 | MM_NUM_CC_TOA_PARAM |  |  |  |  |  | N02, N09 | G2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of data per tool edge for compile cycles (SRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 64 | $2 / 2$ |  |  |  |

## Description:

Number of TOA data (of type Real) which can be created per tool, and which are available to the user or the compile cycle.
This MD increases the buffered memory requirement by sizeof(double)*max. number of cutting edges.

```
Related to:
MD18080 $MN_MM_TOOL_MANAGEMENT_MASK
MD18100 $MN_MM_NUM_CUTTING_EDGES_IN_TOA
```

| 18097 | MM_TYPE_CC_TOA_PARAM | N02, N09 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Type of OEM data per cutting edge (SRAM) | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 64 | $4,4,4,4,4,4,4,4 \ldots$ | 1 | 6 | $2 / 2$ |  |  |

Description:
Individual types can be assigned to the parameters in this way.
Array index $n$ can take values from 0 to that of MD18096 \$MN_MM_NUM_CC_TOA_PARAM.
Type of cutting edge-specific user data configured by MD18096 \$MN_MM_NUM_CC_TOA_PARAM.
Each parameter can be assigned its own type. Permissible types are:
Type Value of machine data
(See types of the NC language)
$\qquad$
BOOL 1
CHAR 2
INT 3
REAL 4
-(STRING is explicitly not possible here, the value 5 is treated as the value 2)
AXIS 6
FRAME Not defined
Example:
MD18096 \$MN_MM_NUM_CC_TOA_PARAM=1
MD18097 \$MN_MM_TYPE_CC_TOA_PARAM=2
Parameter $\$ T C$ DPC1 = "A" can then be programmed.
Buffered user memory is used. A value change leads to a reconfiguration of the buffered memory.

Related to:
MD18096 \$MN_MM_NUM_CC_TOA_PARAM
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA

| 18098 | MM_NUM_CC_MON_PARAM | N02, N09 | FBWsI |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of monitoring data per tool for compile cycles | DWORD | PowerOn |  |  |
| - | - | 0 | 64 | $2 / 2$ | M |
| - | - | 0 | 0 |  |  |

Description:
Number of monitoring data (of type Integer) which can be created per tool, and which are available to the user or the compile cycle.
This MD increases the buffered memory requirement by sizeof(int)*max. number of cutting edges.

Related to:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA

| 18099 | MM_TYPE_CC_MON_PARAM | N02, N09 | FBWsI |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Type of OEM monitor data (SRAM) |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 64 | $3,3,3,3,3,3,3,3 \ldots$ | 1 | 6 |  |  |  |  |

Description: Individual types can be assigned to the parameters in this way. Array index $n$ can take values from 0 to that of MD18098 \$MN_MM_NUM_CC_MON_PARAM.

Type of monitoring-specific user data configured by MD18098 \$MN_MM_NUM_CC_MON_PARAM.
Each parameter can be assigned its own type. Permissible types are:
Type Value of machine data
(See types of the NC language)

BOOL 1
CHAR 2
INT 3
REAL 4
-(STRING is explicitly not possible here, the value 5 is treated as the value 2)
AXIS 6
FRAME Not defined
Example:
MD18098 \$MN_MM_NUM_CC_MON_PARAM=1
MD18099 \$MN_MM_TYPE_CC_MON_PARAM=2
Parameter $\$ T C$ MOPC1 $=$ "A" can then be programmed.
Buffered user memory is used. A value change leads to a reconfiguration of the buffered memory.
Related to:
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA
MD18098 \$MN_MM_NUM_CC_MON_PARAM

| 18100 | MM_NUM_CUTTING_EDGES_IN_TOA |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  | N02, N09 |
| W1 |  |  |  |  |  |
| - | Number of tool offsets that the NCK can manage (SRAM) | DWORD | PowerOn |  |  |
| - | - | 0 | 3000 | $7 / 2$ | M |
| - | - | 0 |  |  |  |

Description:
.Defines the number of tool cutting edges. This machine data reserves approximately 250 bytes of battery-buffered memory per TOA block for each tool cutting edge, irrespective of the tool type

Tools with cutting edges of type 400-499 (= grinding tools) also occupy the location of a cutting edge.

Example:
Defining 10 grinding tools each of which has one cutting edge. Then at least:
MD18082 \$MN MM NUM TOOL = 10
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA = 20
Also see MD18082 \$MN_MM_NUM_TOOL
Buffered user memory is used
Special cases:
The buffered data is lost if this machine data is altered!

| 18102 | MM_TYPE_OF_CUTTING_EDGE |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Type of D No. programming (SRAM) |  |  |  |  |
| NDLD |  |  |  |  |  |
| - | - | 0 | 0 | DWORD | PowerOn |

This MD activates the 'flat D number management'. This function is no longer supported.
The default value is zero. This means that the NCK manages the $T$ and $D$ numbers.
The NCK only accepts a value >0 if bit 0 and bit 1 are not set in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK. That means neither the magazine management function nor tool monitoring may be active.

Value: Meaning

0: No 'flat D number management' active
1: 'Flat D number' function is active

| 18104 | MM_NUM_TOOL_ADAPTER | N02, N09 | W1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Tool adapters in TO area (SRAM) | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | -1 | -1 | 1500 | M |  |  |

Description:
Number of tool adapters in the $T O$ area.
The function can only be used if there are magazine locations in the NCK.
The tool management function must be active.
Bit 7 ( $=0 \times 80$ ) also has be set in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK for the setting to become active.

Adapter data blocks and the cutting edge-specific basic/adapter dimensions are mutually exclusive. This means that if adapter data are defined, then the parameters \$TC_DP21, \$TC_DP22, \$TC_DP23 and their values are available in the NCK.
-1:
An adapter is automatically assigned to each magazine location.
This means that internally the same number of adapters are provided as magazine locations are provided by MD18086 \$MN_MM_NUM_MAGAZINE_LOCATION.
0 :
No adapter data definitions possible. The cutting edge-specific parameters \$TC_DP21, \$TC_DP22, \$TC_DP23 are available provided that adapters are used outside the active TMMG.
$>0$ :
-
Note: The setting >0 is currently not supported by HMI Operate.
See the machine data:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK,
MD20310 \$MC_TOOL_MANAGEMENT_MASK,
MD18084 \$MN_MM_NUM_MAGAZINE,
MD18086 \$MN_MM_NUM_MAGAZINE_LOCATION

| 18105 | MM_MAX_CUTTING_EDGE_NO | N02, N09 | W1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Maximum value of D number |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 9 | 1 | 32000 |  |  |  |  |

Description:
Maximum value of the $D$ number.
This does not affect the maximum number of $D$ numbers per cutting edge.
The monitoring of the $D$ number assignment associated with this value is only active when the $D$ numbers are redefined. This means that existing data sets are not subsequently checked if the MD is changed.
The following settings are advantageus:
MD18105 \$MN_MM_MAX_CUTTING_EDGE_NO is equal to
MD18106 \$MN_MM_MAX_CUTTING_EDGE_PER_TOOL.
If MD18105 \$MN_MM_MAX_CUTTING_EDGE_NO is selected > MD18106
\$MN_MM_MAX_CUTTING_ED $\bar{G} E \_P E R \_T O \bar{L}, \bar{t}$, cutting-edge number CE should be known.
See also language commands CHKDNO, CHKDM, GETDNO, SETDNO, DZERO.
The machine data is not evaluated with the function "flat D number", and therefore has no significance there.

The MD can affect the memory requirement:
If the relation between the two, above-mentioned MDs changes from "less than or equal to" to "greater than" or vice versa, then this affects the non-buffered memory requirement.

Related to:
MD18106 \$MN_MM_MAX_CUTTING_EDGE_PER_TOOL

| 18106 | MM_MAX_CUTTING_EDGE_PERTOOL |  |  | N02, N09 | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Maximum number of $D$ numbers per tool |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 9 | 9 | 1 | 12 | $7 / 2$ | M |

Description:
Maximum number of cutting edges ( $D$ offsets) per tool (per $T$ number).
This enables more safety to be achieved in the data definition. The value can be set to 1 if only tools with one cutting edge are used. This prevents more than one cutting edge being assigned to a tool in the data definition.

The following settings are advantageus: MD18105 \$MN_MM_MAX_CUTTING_EDGE_NO is equal to MD18106 \$MN_MM_MAX_CUTTING_EDGE_PER_TOOL. If MD18105 \$MN_MM_MAX_CUTTING_EDGE_NO is selected > MD18106 \$MN_MM_MAX_CUTTING_EDGE_PER_TOOL, then the difference between offset number $D$ and cutting-edge number $C E$ should be known.
See also language commands CHKDNO, CHKDM, GETDNO, SETDNO, DZERO.
The machine data is not evaluated with the function "flat D number", and therefore has no significance there.
The data can affect the memory requirement.
The MD can affect the memory requirement.
If the relation between the two, above-mentioned MDs changes from "less than or equal to" to "greater than" or vice versa, then this affects the non-buffered memory requirement.

Related to:
MD18105 \$MN_MM_MAX_CUTTING_EDGE_NO

| 18108 | MM_NUM_SUMCORR | N02, N09 | W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Resulting offsets in TO area (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | -1 | -1 | 9000 |  |  |

Description:
Total number of resulting offsets in the NCK.
The value $=-1$ means that the number of resulting offsets is equal to the number of cutting edges multiplied by the number of resulting offsets per cutting edge.

A value > 0 and < "number of cutting edges multiplied by the number of resulting offsets per cutting edge" means that a maximum "number of resulting offsets per cutting edge" can be defined per cutting edge but do not have to be. This means that buffered memory can be used economically. Only those cutting edges for which expliicit data have been defined have a resulting offset data block.
Buffered memory is reserved. The memory requirement for a resulting offset doubles if "setup offset active" has also been configured, see MD18112 \$MN_MM_KIND_OF_SUMCORR. See also:
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA,
MD18110 \$MN_MM_MAX_SUMCORR_PER_CUTTEDGE

| 18110 | MM_MAX_SUMCORR_PER_CUTTEDGE |  |  |  |  |  | N02, N09 | S7 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Max. number of additive offsets per edge (SRAM) |  |  |  |  |  | DWORD | PowerOn |
| - | - | 1 | 6 | $7 / 2$ | M |  |  |  |
| - |  |  |  |  |  |  |  |  |

```
Description: Maximum number of resulting offsets per cutting edge.
If MD18108 $MN_MM_NUM_SUMCORR > 0 then:
The data is not memory defining, but is only used for monitoring.
If MD18108 $MN_MM_NUM_SUMCORR = -1 then:
The data is memory defining.
See also
MD18108 $MN_MM_NUM_SUMCORR,
MD18100 $MN_MM_NUM_CUTTING_EDGES_IN_TOA.
```

| 18112 | MM_KIND_OF_SUMCORR | N02, N09 | W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Properties of resulting offsets in TO area (SRAM) | UDWORD | PowerOn |  |  |  |
| - | - | 0 | 0 | $0 \times 1 \mathrm{~F}$ |  |  |

Description: Properties of the resulting offsets in NCK.
Bit $0=0$ "Resulting offsets fine" are backed up when the tool data are backed up.
Bit $0=1$ "Resulting offsets fine" are backed up when the tool data are backed up.
Bit $1=0$ Set-up offsets are backed up when the tool data are backed up.
Bit $1=1$ Set-up offsets are not backed up when the tool data are backed up.
Bit $2=0$ If work is done with the function tool management (TOOLMAN) and/or tool
monitoring (TMMO), existing "resulting offsets fine/setup offsets" are not affected when the tool status is set to "active".

Bit 2 =1 Existing resulting offsets are set to zero when the tool status is set to "active".
Bit $3=0$ If work is done with the function "TOOLMAN" +"adapter", the "resulting offsets fine"/setup offsets are transformed.
Bit $3=1$ No transformation of the "resulting offsets fine"/setup offsets
Bit $4=0$ No set-up offset data sets
Bit $4=1$ Set-up offset data sets are additionally created. Whereby the resulting offset is composed of the sum of the set-up offset + "resulting offset fine"
Changing the status of bits $0,1,2,3$ does not change the memory structure.
Changing the status of bit 4 triggers restructuring of the buffered memory after the next PowerOn.

See also
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA
MD18108 \$MN_MM_NUM_SUMCORR
MD18110 \$MN_MM_MAX_SUMCORR_PER_CUTTEDGE
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK,
MD20310 \$MC_TOOL_MANAGEMENT_MASK,
MD18086 \$MN_MM_NUM_MAGAZINE_LOCATION,
MD18104 \$MN_MM_NUM_TOOL_ADAPTER

| 18113 | MM_NUM_DRS_GRINDING_PATHS |  | N02, N09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of different path names for grinding tool dressing programs. |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | 10 | 0 | 1500 | 2/2 | M |

## Description:

The number of different path names in the NCK that can be defined for the storage of the dressing programs of the grinding tools. See system parameter \$TC_TPG_DRSPATH. Grinding tools can only be defined if MD17540 \$MN_TOOLTYPES_ALLOWED has the bit value 'H90' set.
Buffered memory is reserved if MD17540 \$MN_TOOLTYPES_ALLOWED has enabled the function.


| 18116 | MM_NUM_TOOL_ENV |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of tool environments in the TO area (SRAM) | N02, N09 | W1 |  |  |
| - |  |  |  |  |  |
| - | - | 0 | 0 | DWORD | PowerOn |



UGUD
MGUD
GUD5
GUD8
then the machine data must be set to a value of 8 , signifying a memory requirement of $8 \times 120$ bytes $=960$ bytes.
It is therefore advisable to selected the "lowest" possible GUD module. If GUD modules UGUD and MGUD have not been assigned elsewhere, then they may be used for this purpose. Related to:

MD18150 \$MN_MM_GUD_VALUES_MEM
(Memory space for user variables)

| 18120 | MM_NUM_GUD_NAMES_NCK |  |  |  |  |  |  | N02 | S7 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |  |
| - | Number of global user variable names (SRAM) | DWORD | PowerOn |  |  |  |  |  |  |
| - | - | 60 | 60 | 32000 | $7 / 2$ |  |  |  |  |

Description:
Defines the number of user variables for NCK global user data (GUD). Approximately 80 bytes of memory per variable are reserved in the SRAM for the names of the variables. The additional memory required for the value of the variable depends on the data type of the variable. The number of available NCK global user data is exhausted on reaching the limit value set in MD18120 \$MN_MM_NUM_GUD_NAMES_NCK or MD18150 \$MN_MM_GUD_VALUES_MEM (memory space fō user variables).

Buffered user memory is used.
Special cases:
The battery-backed data are lost if this machine data is altered.
Related to:
MD18150 \$MN_MM_GUD_VALUES_MEM
(Memory space for user variables)

| 18130 | MM_NUM_GUD_NAMES_CHAN |  | N02 | S7 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of channel-specific user variable names (SRAM) |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | 450 | 450 | 32000 | 7/2 | M |

## Description:

Defines the number of user variable names for channel-specific global user data (GUD). Approximately 80 bytes of memory are reserved in the SRAM for each variable name. The additional memory required for the value of the variable is equal to the size of the data type of the variable multiplied by the number of channels. This means that each channel has its own memory available for the variable values. The number of available channel-specific global user data is exhausted on reaching the limit value set in MD18130 \$MN_MM_NUM_GUD_NAMES_CHAN or MD18150 \$MN_MM_GUD_VALUES_MEM (memory space for user variables).

The name created with the DEF statement is valid for all channels.
The memory requirement for the variable value is equal to the size of the data type multiplied by the number of channels.
Buffered user memory is used.
Special cases:
The battery-backed data are lost if this machine data is altered.
Related to:
MD18150 \$MN_MM_GUD_VALUES_MEM
(Memory space for user variables)



Description: Defines the number of available global R-parameters in the NCK.

| 18160 | MM_NUM_USER_MACROS | N02 | S7 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of macros (DRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 82 | 82 | 32000 | $7 / 2$ |  |

Description: Defines the number of macros that can be stored in the files _N_SMAC_DEF, _N_MMAC_DEF und _N_UMAC_DEF. Each of these files which is opened occupies at least one kbyte memory space for the file code in the part program memory. Another kbyte of memory is reserved for the file when the one kbyte file code limit is exceeded.
The dynamic user memory is used. For the stated number of macros, approximately 375 bytes are reserved per macro for management tasks.

| 18170 | MM_NUM_MAX_FUNC_NAMES | N02 | V2, A2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of miscellaneous functions (cycles, DRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 450 | 450 | 32000 | $7 / 2$ |  |

Description: The data limits the maximum number of special functions over and above the predefined functions (such as sine, cosine, etc.) which can be used in

- cycle programs
- compile cycle software.

The function names are entered in the global NCK dictionary and must not conflict with the names that already exist.
The SIEMENS cycle package contains special functions that are taken into account by the default setting of the MD.

The data are stored in unbuffered memory. Approximately 150 bytes are required for each special function for management purposes.
Related to:
MD18180 \$MN_MM_NUM_MAX_FUNC_PARAM
(Number. of additional parameters)


Description: Defines the maximum number of parameters required for the special functions in

- cycle programs
- compile cycle software.

50 parameters are required for the special functions of the SIEMENS cycle package, software version 1.

The data are stored in unbuffered memory. 72 bytes of memory are reserved for each parameter.
Related to:
MD18170 \$MN_MM_NUM_MAX_FUNC_NAMES
(Number of special functions)

| 18190 | MM_NUM_PROTECT_AREA_NCK |  |  |  | N12, N02, N06, <br> N09 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | A3 |  |  |  |  |
| - | Number of control-specific protection areas (SRAM) | DWORD | PowerOn |  |  |
| - | - | 0 | 10 | $7 / 2$ | M |

## Description:

This machine data defines how many control-specific protection areas have been created.
Related to:
MD28200 \$MC_MM_NUM_PROTECT_AREA_CHAN (number of channel-specific protection areas)
MD28210 \$MC_MM_NUM_PROTECT_AREA_ACTIVE (number of simultaneously active protection
areas)
References:
/FB/, A3, "Axis Monitoring, Protection Areas"


Description: Number of multitool-specific parameters \$TC_MTPCn which can be created per multitool and are available to the user or compile cycle.

| 18193 | MM_TYPE_CC_MULTITOOL_PARAM | N02, N09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Type of OEM multitool data |  |  |  |  |  | DWORD | PowerOn |
| - | 64 | $4,4,4,4,4,4,4,4 \ldots$ | 1 | 6 | $1 / 1$ |  |  |  |
| - |  |  |  |  |  |  |  |  |

## Description:

User or OEM data in tool management.
Type of multitool-specific user data \$TC_MTPCn configured with MD18192 \$MN_MM_NUM_CC_MULTITOOL_PARAM.
Each parameter can be assigned its own type. The permissible types are:
Type Value of the machine data
(See types of the NC language)
$\qquad$
BOOL 1
CHAR 2
INT 3
REAL 4
STRING 5 (is not allowed, is not supported by the MCP.)
AXIS 6
FRAME not defined
Buffered user memory is used. A value change leads to reconfiguration of the buffered memory.
Related to:
MD18192 \$MN_MM_NUM_CC_MULTITOOL_PARAM
MD18083 \$MN_MM_NUM_MULTITOOL

| 18194 | MM_NUM_CC_MTLOC_PARAM |  |  |  |  |  | N02, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of multitool-loc.-spec. parameters \$TC_MTPPCn per <br> multitool location | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 64 |  |  |  |  |

Description:

Number of multitool-location-specific parameters \$TC_MTPPCn which can be created per multitool location and are available to the user or compile cycle.

| 18195 | MM_TYPE_CC_MTLOC_PARAM |  |  | N02, N09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Type of OEM multitool location data |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 64 | 4, 4, 4, 4, 4, 4, 4, 4... | 1 | 6 | 1/1 | M |
| Description: | User or OEM data in tool management. <br> Type of multitool-location-specific user data \$TC_MTPPCn configured with MD18194 \$MN_MM_NUM_CC_MTLOC_PARAM. <br> Each parameter can be assigned its own type. The permissible types are: <br> Type Value of the machine data |  |  |  |  |  |

(See types of the NC language)


| 18200 | MM_NUM_CCS_MAGAZINE_PARAM |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of Siemens OEM magazine data (SRAM) | N02, N09 | FBWsI |  |  |
| - | - | 0 | 0 | 10 | PowerOn |
| - | - |  | $2 / 2$ | M |  |

Description: Only when MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, bit 0=1 ('H1') and bit 2=1 ('H4'), is set for TMMG (and option is set):

User or OEM data in the tool management (TMMG).
Number of Siemens OEM magazine data (standard format IN_Int).
See also: MD18090 \$MN_MM_NUM_CC_MAGAZINE_PARAM, MD18084 \$MN_MM_NUM_MAGAZINE
Buffered user memory is used

| 18201 | MM_TYPE_CCS_MAGAZINE_PARAM | N02, N09 | FBWsI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Type of Siemens OEM magazine data (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $3,3,3,3,3,3,3,3 \ldots$ | 1 | 6 | $2 / 2$ |  |

## Description:

User or OEM data in tool management.
Type of magazine-specific Siemens user data configured with MD18200 \$MN_MM_NUM_CCS_MAGAZINE_PARAM.
Each parameter can be assigned its own type. The permissible types are:
Type Value of the machine data
(See types of the NC language)

BOOL 1
CHAR 2
INT 3
REAL 4
STRING 5 (is not allowed, is not supported by the MCP.)
AXIS 6
FRAME not defined
Buffered user memory is used. A value change leads to reconfiguration of the buffered memory.

Related to:
MD18200 \$MN_MM_NUM_CCS_MAGAZINE_PARAM
MD18084 \$MN_MM NUM MAGAZINE


| 18204 | MM_NUM_CCS_TDA_PARAM |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of Siemens OEM tool data (SRAM) | N02, N09 | FBWsI |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | DWORD | PowerOn |  |

Description:
Only when MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, bit $2=1$ ('H4'), is set:
User or OEM data of the tools.
Number of Siemens OEM TDA (=tool-specific) data (standard format Int). See also: MD18094 \$MN_MM_NUM_CC_TDA_PARAM, MD18082 \$MN_MM_NUM_TOOL
Buffered user memory is used

| 18205 | MM_TYPE_CCS_TDA_PARAM | N02, N09 | FBWsI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Type of Siemens OEM tool data (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $4,4,4,4,4,4,4,4 \ldots$ | 1 | 6 | $2 / 2$ |  |

Description: User or OEM data in tool management.
Type of tool-specific Siemens user data configured with MD18204
\$MN_MM_NUM_CCS_TDA_PARAM.
Each parameter can be assigned its own type. The permissible types are:
Type Value of the machine data
(See types of the NC language)

BOOL 1
CHAR 2
INT 3
REAL 4
STRING 5 (is not allowed, is not supported by the MCP.)
AXIS 6
FRAME not defined
Buffered user memory is used. A change in value leads to reconfiguration of the buffered memory.

Related to:
MD18204 \$MN_MM_NUM_CCS_TDA_PARAM
MD18082 \$MN_MM_NUM_TOOL

| 18206 | MM_NUM_CCS_TOA_PARAM | N02, N09 | FBWsI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | No. of Siemens OEM data per cutting edge (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 10 | $2 / 2$ |  |

Description: Only when MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, bit 2=1 ('H4'), is set:
User or OEM data of the tools.
Number of Siemens OEM TOA data (standard format IN_Real).
See also: MD18096 \$MN_MM_NUM_CC_TOA_PARAM, MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA
Buffered user memory is used

| 18207 | MM_TYPE_CCS_TOA_PARAM | N02, N09 | FBWsI |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Type of Siemens OEM data per cutting edge (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $4,4,4,4,4,4,4,4 \ldots$ | 1 | 6 | $2 / 2$ |  |

Description:
User or OEM data in tool management.
Type of cutting-edge-specific Siemens user data configured with MD18206 \$MN_MM_NUM_CCS_TOA_PARAM.
Each parameter can be assigned its own type. The permissible types are:
Type Value of the machine data
(See types of the NC language)
$\qquad$
BOOL 1
CHAR 2
INT 3

```
REAL 4
-(STRING is explicitly not possible here; the value 5 is treated as the value 2)
AXIS 6
FRAME not defined
Buffered user memory is used. A change in value leads to reconfiguration of the buffered memory.
Related to:
MD18206 \$MN_MM_NUM_CCS_TOA_PARAM
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA
```

| 18208 | MM_NUM_CCS_MON_PARAM |  | N02, N09 | FBW |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | No. of Siemens OEM monitor data (SRAM) |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 10 | 2/2 | M |
| Description: | ```Only when MD18080 $MN_MM_TOOL_MANAGEMENT_MASK, bit 0 = 1 or bit 1 = 1 and bit 2=1 ('H4'), is set: User or OEM data in the tool management. Number of Siemens OEM monitoring data; standard format IN_Int). See also: MD18098 $MN_MM_NUM_CC_MON_PARAM, MD18100 $MN_MM_NUM_CUTTING_EDGES_IN_TOA Buffered user memory is used``` |  |  |  |  |
| 18209 | MM_TYPE_CCS_MON_PARAM |  | N02, N09 | FBWsI |  |
| - | Type of Siemens OEM monitor data (SRAM) |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 10 年 $3,3,3,3,3,3,3,3 \ldots$ | 1 | 6 | 2/2 | M |

Description:
User or OEM data in tool management.
Type of monitoring-specific Siemens user data configured with MD18208 \$MN_MM_NUM_CCS_MON_PARAM.
Each parameter can be assigned its own type. The permissible types are:
Type Value of the machine data
(See types of the NC language)
$\qquad$
BOOL 1
CHAR 2
INT 3
REAL 4
-(STRING is explicitly not possible here; the value 5 is treated as the value 2)
AXIS 6
FRAME not defined
Buffered user memory is used. A change in value leads to reconfiguration of the
buffered memory.
Related to:
MD18208 \$MN_MM_NUM_CCS_MON_PARAM
MD18100 \$MN_MM_NUM_CUTTING_EDGES_IN_TOA

| 18210 | MM_USER_MEM_DYNAMIC |  | EXP, N02 | S7 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Volatile user memory [kB] |  | DWORD | PowerOn |  |
| NDLD |  |  |  |  |  |
| - | - - | 0 | 135072 | ReadOnly | M |

Description: The volatile memory in the NCK.

MD18210 \$MN_MM_USER_MEM_DYNAMIC makes the size of the volatile memory available to the user visible.

There are various types of user data in this memory area, for example.

- Local user data
- Ipo block buffers
- User macros
- Diagnostics functions such as trace recording of times,.....
- Tool management trace
- Communication with 1-n HMIs; Value of n: See MD10134 \$MN_MM_NUM_MMC_UNITS.
- Reorg Log file (required for internal purposes of the NC program sequence)
- ...

Each additionally active channel occupies a substantial amount of memory. With channel activation, the value of the MD is automatically increased accordingly and the value of MD18050 \$MN_INFO_FREE_MEM_DYNAMIC is retained if possible.
Each activated axis requires part of this memory. With axis activation, the value of the MD is automatically increased accordingly and the value of MD18050 \$MN_INFO_FREE_MEM_DYNAMIC is retained if possible.
The possible values of MD18050 depend on the hardware and software configurations. Information alarms 6030, 6035 can indicate that the desired total memory may not be available on the model or on the hardware. See also MD11415 \$MN_SUPPRESS_ALARM_MASK_2, bit 22

The value of NCK is automatically set after startup of the NCK without memory retention (cold restart). The value is then such that the free memory defined in MD18050 \$MN_INFO_FREE MEM DYNAMIC is available to the user. To enlarge this user memory further, ${ }^{-}$MD19 $\overline{2} 40$ \$ON_USER_MEM_DYNAMIC must be increased.
(See the description of MD18050 \$MN_INFO_FREE_MEM_DYNAMIC).
The data in the volatile memory are lost when the NCK is switched off.
Related to:
The available dynamic memory can be taken from MD18050 \$MN_INFO_FREE_MEM_DYNAMIC (display data of the free dynamic memory).

| 18230 | MM_USER_MEM_BUFFERED | N02 | S7 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Buffered user memory |  |  |  |  |  | DWORD | PowerOn |
| NDLD |  |  |  |  |  |  |  |  |
| - | - | - | 0 | 36864 |  |  |  |  |

Description: Nonvolatile user memory (in kB).
Various types of user data are stored in this memory area.
For example:

- NC part programs
- R variables
- Global user data (GUD)
- Definitions of the protection zones
- Correction tables EEC, CEC, QEC
- Tool / magazine data
.

This data is retained after control power-off.
(Provided the data backup (battery,...) is in good working order, i.e. the Init switch is correctly set on the control).
This means that they are available unchanged after restart.
Each additional active channel occupies some nonvolatile memory. With channel activation, the value of the $M D$ is automatically increased accordingly; the value of MD18060 \$MN_INFO_FREE_MEM_STATIC is retained if possible.
To enlarge this user memory further, MD19250 \$ON_USER_MEM_BUFFERED must be increased.

The available values depend on the hardware and software configurations.
Information alarms 6030, 6035 can indicate that the desired total memory may not be available on the model or on the hardware. See also MD11415 \$MN_SUPPRESS_ALARM_MASK_2, bit 22

See also the meaning of MD18060 \$MN_INFO_FREE_MEM_STATIC

| 18232 | MM_ACTFILESYS_LOG_FILE_MEM |  |  | N02 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | System: logfile size in SRAM [KB] |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 3 | 400, 50, 30 | 0 | 32000 | 2/2 | M |

Description:
Buffered log file for buffered data of the active file system (in kbytes )
Systems with slow data buffering media store changed buffered data in the internal system SRAM. When the buffer is full, all data of the active file system are made persistent. The buffer backs up the data persistence of the last persistence operation until the next power fail. After a power fail (power failure or power OFF), data that had not yet been made persistent at the time of the power fail can be restored from this buffer.
The log file serves to minimize or totally avoid data loss in the event of power fail. 1000 entries require approximately 70 kB .
A value greater than 0 is only practicable if MD18231
\$MN_MM_USER_MEM_BUFFERED_TYPEOF[1] = 1 .
A value equal to 0 means that the buffered data are not voltage loss safe if MD18231 \$MN_MM_USER_MEM_BUFFERED_TYPEOF[1] = 1 (typical for SINUMERIK solution line) Example:
With MD18232 \$MN_MM_ACTFILESYS_LOG_FILE_MEM[2] = 0, data changes from synchronized actions can be exclūded from the power fail data backup.
An improved time response of the synchronized actions would be advantageous. This should only be set if the buffered data that are changed by the synchronized action are not safety-related.
Index Meaning
$0 \quad$ Preprocessing buffer
1 Buffer for data changes within the range of the tool change and retract 2 Buffer for data changes of the main processing (synchronized actions) See also MD17610 \$MN_DEPTH_OF_LOGFILE_OPT_PF, which can be used to optimize the behavior.

| 18233 | IS_CONTINOUS_DATA_SAVE_ON |  |  | EXP, N02 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | System: Automatic saving of persistent data |  |  | BOOLEAN | Pow |  |
| - |  |  |  |  |  |  |
| - | 3 | TRUE, TRUE, TRUE | FALSE | TRUE | 7/2 | M |

Description: The machine data is relevant only if MD18231 \$MN_MM_USER_MEM_BUFFERED_TYPEOF = 1 .
Value $=0$ : Continuous saving of persistent data on disk/flash/etc. is deactivated.
The dynamic response of the software on systems of the SolutionLine range
can thus be improved.
Value = 1 : Continuous automatic saving of persistent data on disk/flash/etc. is active.
Index 0 Reserved
Index 1 = Definition for the buffered data of the active file system (incl. machine data).

Index 2 = Definition for the buffered data of the passive file system (part programs, cycles, ....).
The default value should be changed only for diagnostic purposes or for optimizing the dynamic response.

### 4.1 General NC machine data

The default value should be changed only if the system is operated in an environment, where no spontaneous shutdown of the system / spontaneous power failure occurs. Otherwise, persistent data can be lost.

| 18234 | MM_MEMORY_CONFIG_MASK |  |  |  |  |  | EXP, N02 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Setting of backup of persistant data of the current file system | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 \times 00$ | $0 \times 00$ | $0 \times 01$ | $2 / 2$ |  |  |  |

Description: Bit 0 is defined for MD18231 \$MN_USER_MEM_BUFFERED_TYPEOF[1]=1. If the buffer size defined by MD18232 \$MN_MM_ACTFILESYS_LOG_FILE_MEM Contains many data in the respective buffer, they are made persistent by the NCK software as follows:
Value $=0$ : synchronous data backup
Value = 1: asynchronous data backup
Asynchronous means not synchronized with the NCK sequence. Synchronous means that the preprocessing task in NCK is stopped for the time required for making the data persistent. Which setting is preferable depends on the hardware used and/or on the actual NCK application.

| 18235 | MM_INCOA_MEM_SIZE |  |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Size of the DRAM memory for INCOA applications [Kbyte] | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 20480 | 0 | 25600 |  |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |  |

Description: On cold restart of the control system, the default value of MD18235 \$MN_MM_INCOA_MEM_SIZE specifies
the DRAM memory range that is available for INCOA applications in total.
This MD can only be read. With the diagnostics function "Read current actual value" the memory space actually occupied by the INCOA applications can be determined.

| 18237 | MM_CYC_DATA_MEM_SIZE | EXP, N02 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Cycle/display setting data in SRAM [kB] |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 128 |  |  |  |  |

Description: Size of the buffered memory for 'Setting data for cycles and display' [kB]

| 18270 | MM_NUM_SUBDIR_PER_DIR | N02 | S7 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of subdirectories (DRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 256 | 0 | - | ReadOnly |  |  |  |

Description: Defines the maximum number of subdirectories that can be created in a directory or subdirectory of the passive file system.
This value is for information only, and cannot be changed.
See also MD18280 \$MN_MM_NUM_FILES_PER_DIR (number of files per directory).

| 18280 | MM_NUM_FILES_PER_DIR |  |  |  |  |  | N02 | S7 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of files per directory (DRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 512 | 0 | - | ReadOnly |  |  |  |

## Description:

Defines the maximum number of files that can be created in a directory or subdirectory of the passive file system.
This value is for information only, and cannot be changed.
See also MMD18270 \$MN_MM_NUM_SUBDIR_PER_DIR (number of subdirectories per directory).

| 18310 | MM_NUM_DIR_IN_FILESYSTEM | N02 | S7 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of directories in passive file system (SRAM) |  |  |  |  |
| - | DWORD | PowerOn |  |  |  |
| - | - | 30 | 30 | $7 / 2$ | M |

Description:
The machine data limits the number of directories in the passive file system.
It can be used to reserve memory in the buffered user memory for the management of the directories. The directories and subdirectories of the passive file system set up by the system are included in this machine data. The memory required for the management of the directories can be calculated as follows:
Corresponds with:
MD18270 \$MN_MM_NUM_SUBDIR_PER_DIR

| 18320 | MM_NUM_FILES_IN_FILESYSTEM |  |  |  |  |  | N02 | S7 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of files in passive file system (persistent) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 750 | 64 | 1000 | $7 / 2$ |  |  |  |

Description:
Defines the number of files available in the part program memory. This machine data is used to reserve memory in persistent memory - approximately 320 bytes per file - for managing the file memory. Each file created requires a minimum of one kbyte of memory for the file code. If the one kbyte limit for the file code is exceeded another kbyte is reserved for the file.

Nonvolatile user memory is used.
Special cases:
The backed-up data are lost if this machine data is altered.
Related to:
MD18280 \$MN_MM_NUM_FILES_PER_DIR
(Number of files in directories)

| 18321 | MM_NUM_SYSTEM_FILES_IN_FS |  |  |  |  |  | NO2 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of system files | DWORD | PowerOn |  |  |  |  |  |
| - | 1 | 500 | 500 | 1000 | $1 / 1$ |  |  |  |
| - | 1 |  |  |  |  |  |  |  |

Description:
Index 0: Number of temporary system files in the passive file system (see also MD18355 \$MN_MM_T_FILE_MEM_SIZE);
e.g.: system traces


Description:
The MD defines the memory space available for the compensation tables.
When MD18342 \$MN_MM_CEC_MAX_POINTS = 0, no memory is set up for the table. The sag compensation function cannot then be used.
Caution!
If MD18342 \$MN_MM_CEC_MAX_POINTS[t] is changed, when the system is powered up, the buffered $N C$ user memory is automatically reset. This deletes all user data in the buffered user memory (e.g. drive and HMI machine data, tool offsets, part programs etc.).

Related to:
SD41300 \$SN_CEC_TABLE_ENABLE[t]

Evaluation of the sag compensation table (t) enabled.
References:
/FB/, S7, "Memory Configuration"

| 18352 | MM_U_FILE_MEM_SIZE | EXP, N02 | S7 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | End user memory for part programs/cycles/files | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $2560,0,0$ | 0 | 15360 | $2 / 2$ |  |

Description: The machine data is not available or not defined for PowerLine control models.
End user memory for files in the passive file system ( in kbyte ).
There are various types of user data in this memory area.
E.g.: NC part programs, cycle programs of the end user, diagnostic files, ....

The settable values depend on the hardware and software configurations.
The settable size of the part program memory is, apart from the upper limit value, determined by the MD18230 \$MN_MM_USER_MEM_BUFFERED and can also
be determined by a software option.
Index $0=$ Size of the battery-backed part program / cycle program memory
Index 1 = Reserved
Index 2 = Reserved

| 18353 | MM_M_FILE_MEM_SIZE |  |  |  |  |  | EXP, N02 | S7 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Memory capacity for machine manufacturer's cycles/files |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $512,0,0$ | 0 | 15360 |  |  |  |  |

Description: The machine data is not available or not defined for PowerLine control models.
Memory for machine manufacturer files in the passive file system ( in kbyte ).
The machine manufacturer's files are in this memory area of the passive file system.
E.g.: cycle programs

The settable values depend on the hardware and software configurations.
The settable size of the memory is, apart from the upper limit value, determined by the MD18230 \$MN_MM_USER_MEM_BUFFERED.
Index 0 = Minimum size of the battery-backed (persistent) part program / cycle program memory
Index 1 = Reserved
Index 2 = Reserved

| 18354 | MM_S_FILE_MEM_SIZE | EXP, N02 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | $\begin{array}{l}\text { Size of the Siemens cycle program memory } \\ \text { [0] Size of the volatile cycle program memory } \\ \text { [1] Reserved } \\ \text { [2] Size of the volatile memory for system files (NRK fault file, etc.) }\end{array}$ | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $3072,0,30$ | 0 | 3072 |  |  |$]$| M |
| :--- |

Description: Memory for the control manufacturer's files in the passive file system ( in $K B$ ) The control manufacturer's files are in this memory area of the passive file system, e.g: cycle programs, system files

The settable values depend on the hardware and software configurations.
The settable size of the memory, apart from the upper limit value
for index $=0$ is limited by the size of the available nonvolatile memory (see siehe MD18230\$MN_MM_USER_MEM_BUFFERED),
for Index $=2$, is limited by the wize of the internally available buffered (SRAM) memory.

Index 0 = Size of the nonvolatile cycle program memory
Index 2 = Size of the non-volatile memory for system files in the SRAM. E.g. storage location of the NRK fault file.

| 18355 | MM_T_FILE_MEM_SIZE |  | EXP, N02 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Memory size for temporary files |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | 4608 | 4608 | 1048576 | 7/2 | M |

Memory for temporary files in the passive file system (in $K B$ ), e.g. compilations of cycles (preprocessing), cycles on CF, system traces


| 18360 | MM_EXT_PROG_BUFFER_SIZE |  |  |  |  |  | N01 | B1, K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | FIFO buffer size for processing from external source (DRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 30 | 1000000 | $7 / 2$ | M |  |  |  |

Description: A FIFO buffer is needed on the NCK for each program level (main program or subprogram) that is processed externally (reload mode).

The size of the FIFO buffer is defined in kbyte by MD18360 \$MN_MM_EXT_PROG_BUFFER_SIZE. MD18360 \$MN_MM_EXT_PROG_NUM sets the number of FIFO buffers which are simultaneously available.
During startup, the memory size determined by multiplying MD18360
\$MN_MM_EXT_PROG_BUFFER_SIZE by MD18362 \$MN_MM_EXT_PROG_NUM is reserved in the DRAM.
If the stated value exceeds the available memory space, alarm 4077 is output when writing the machine data.

References:
/PGA/Programming Guide Advanced, Section 2

| 18362 | MM_EXT_PROG_NUM |  | N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of program levels which can be simultaneously processed |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 1 | 1 0 | 13 | 7/2 | M |

Description:
Number of program levels that can simultaneously be in "Processing from external source" mode NCK-wide.

System resources are reserved for the HMI <-> NCK communication during "Processing from external source". Machine data MD18362\$MN_EXT_PROG_NUM defines the number of possible program levels.
The memory space is reserved during power on by MD18360 \$MN_MM_EXT_PROG_BUFFER_SIZE * MD18362 \$MN_MM_EXT_PROG_NUM. If it is found during program execution that all system resources are ōccupied, this is reported by alarm 14600.

| 18370 | MM_PROTOC_NUM_FILES |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| Max.no. of log files in passive file system |  |  |  |  |  |  |  |  |
| - |  |  |  |  |  |  | N02 | D1, OEM |
| - | 10 | $2,2,0,0,0,2,2,2 \ldots$ | DWORD | PowerOn |  |  |  |  |
| - | $2,2,0,0,0,2,2$, | $10,10,10,10$, <br> $2 \ldots$ | $1 / 1$ | M |  |  |  |  |

## Description:

Maximum number of $\log$ files in the passive file system.
The individual values involve the users of the logging function, which are assigned the following functions:
0 : Reserved for system functions: simultaneous recording, simulation, synchronized actions analysis
1: Reserved for system functions: determining program runtimes, multi-step editor
2: Reserved for OEM applications
3: Reserved for OEM applications
4: Reserved for OEM applications
5: Reserved for system functions: trace
6: Reserved for system functions: trace
7: Reserved for system functions: trace
8: Reserved for system functions: trace
9: Reserved for system functions: action log

| 18371 | MM_PROTOC_NUM_ETPD_STD_LIST |  |  | N02 | D1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of standard data lists ETPD. |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 10 | $\begin{aligned} & 25,6,0,0,0,25,25, \\ & 25 \ldots \end{aligned}$ | $\begin{aligned} & 25,6,0,0,0,25, \\ & 25,25 \ldots \end{aligned}$ | $\begin{aligned} & 25,25,25,25, \\ & 25,25,25,25 \ldots \end{aligned}$ | 1/1 | M |

## Description:

Number of standard data lists in the OPI module ETPD (user-specific).
The individual values involve the users of the logging function, which are assigned the following functions:
0 : Reserved for system functions: simultaneous recording, simulation, synchronized action analysis

1: Reserved for system functions: determining program runtimes, multi-step editor
2: Reserved for OEM applications
3: Reserved for OEM applications
4: Reserved for OEM applications
5: Reserved for system functions: trace
6: Reserved for system functions: trace
7: Reserved for system functions: trace
8: Reserved for system functions: trace
9: Reserved for system functions: action log

| 18372 | MM_PROTOC_NUM_ETPD_OEM_LIST |  |  |  |  |  |  | N02 | D1, OEM |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of OEM data lists ETPD. | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 10 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 20 | $1 / 1$ |  |  |  |  |

Description: Number of OEM data lists in the OPI module ETPD (user-specific).
The individual values involve the users of the logging function, which are assigned the following functions:
0 : Reserved for system functions: simultaneous recording, simulation, synchronized action analysis
1: Reserved for system functions: determining program runtimes, multi-step editor


| 18375 | MM_PROTOC_SESS_ENAB_USER |  |  |  |  |  | N02 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Users enabled for sessions | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 10 | $0,0,0,0,0,1,1,1 \ldots$ | 0 | 1 | $1 / 1$ |  |  |  |

Description: Users that are available for session management
The individual values involve the users of the logging function, which are assigned
the following functions:
0 : Reserved for system functions: simultaneous recording, simulation, synchronized action analysis
1: Reserved for system functions: determining program runtimes, multi-step editor
2: Reserved for OEM applications
3: Reserved for OEM applications
4: Reserved for OEM applications
5: Reserved for system functions: trace
6: Reserved for system functions: trace
7: Reserved for system functions: trace
8: Reserved for system functions: trace
9: Reserved for system functions, action log

| 18390 | MM_COM_COMPRESS_METHOD | EXP, N01, N02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Supported compression methods. | UDWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $0 \times 01$ | 0 | $0 \times 7 F F F F F F F$ | $2 / 2$ |  |  |

Description:
Setting for the compression methods to be supported.

| 18391 | TRACE_PATHNAME |  |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |  |
| NBUP | Path for trace generation | STRING | PowerOn |  |  |  |  |  |  |
| - | - | - | - | - | $1 / 1$ |  |  |  |  |

Description: Path on which traces are saved.
The trace files are used for problem analysis by NCK development.

| 18392 | TRACE_SAVE_OLD_FILE |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Old trace files are retained | BOOLEAN | PowerOn |  |  |  |  |  |
| NBUP |  |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $1 / 1$ |  |  |  |

Description: The old traces are no longer overwritten when new traces are created; instead, a version extension is added to the trace file name.
At the current time this function is executed only if files are saved on the host file system (see TRACE_PATHNAME).
The trace files are used for problem analysis by NCK development.

| 18400 | MM_NUM_CURVE_TABS | N02, N09 | M3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of curve tables (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | - | $1 / 1$ |  |

Description: Defines the maximum number of curve tables that can be stored in the SRAM of the entire system. A curve table consists of a number of curve segments.
Related to:

MD18402 \$MN_MM_NUM_CURVE_SEGMENTS

| 18402 | MM_NUM_CURVE_SEGMENTS | N02, N09 | M3, B3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of curve segments (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | - |  |  |

Description:
Defines the maximum number of curve segments that can be stored in the SRAM of the entire system. The curve segments are a component of a curve table.
Related to
MD18400 \$MN_MM_NUM_CURVE_TABS

| 18403 | MM_NUM_CURVE_SEG_LIN |  |  |  |  |  | N02, N09 | M3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of linear curve segments (SRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | - | $1 / 1$ |  |  |  |

Description: Number of linear curve segments in the SRAM available throughout the NCK.
A curve table may consist of "normal" curve segments and linear segments. The number of "normal" curve segments in the SRAM is defined by MD18402
\$MN_MM_NUM_CURVE_SEGMENTS, these curve segments can accommodate polynomials.
Linear curve segments can only accommodate straight lines.
These linear curve segments are stored in battery-backed memory.


| 18406 | MM_NUM_CURVE_TABS_DRAM | N02, N09 | M3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of curve tables (DRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | - | $1 / 1$ |  |

Description: Number of curve tables in the DRAM available throughout the NCK.
The curve tables are stored either in the buffer memory or in the dynamic memory. This MD is used to set the number of curve tables in the dynamic memory (DRAM).

| 18408 | MM_NUM_CURVE_SEGMENTS_DRAM | N02, N09 | M3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of curve segments (DRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | - | $1 / 1$ |  |

Description: Number of polynomial curve segments in the DRAM available throughout the NCK.
The curve segments are stored either in the buffer memory or in the dynamic memory.
This MD is used to set the number of segments in the dynamic memory (DRAM).

### 4.1 General NC machine data

| 18409 | MM_NUM_CURVE_SEG_LIN_DRAM |  |  |  |  |  |  | N02, N09 | M3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of linear curve segments (DRAM) | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | - | $1 / 1$ |  |  |  |  |

Description: Number of linear curve segments in the DRAM available throughout the NCK. A curve table may consist of "normal" curve segments and linear segments. The number of "normal" curve segments in the DRAM is defined by MD18408
\$MN_MM_NUM_CURVE_SEGMENTS_DRAM, these curve segments can accommodate polynomials. Linear curve segments can only accommodate straight lines.
The curve segments are stored either in the buffer memory or in the dynamic memory. This MD defines the number of curve segments in the dynamic memory (DRAM).

| 18410 | MM_NUM_CURVE_POLYNOMS_DRAM |  |  |  |  |  | N02, N09 | M3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of curve table polynomials (DRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | - | $1 / 1$ |  |  |  |

## Description:

Number of polynomials for curve tables in the DRAM available throughout the NCK. The polynomials for curve tables are stored in the buffer memory or in the dynamic memory.
This MD is used to set the number of polynomials for curve tables in the dynamic memory (DRAM).

| 18450 | MM_NUM_CP_MODULES | N02, N09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Max. number of CP modules |  |  |  |  |  | DWORD | PowerOn |
| - | - | 4 | 0 | 48 | $1 / 1$ |  |  |  |
| - | - |  |  |  |  |  |  |  |

## Description:

Number of CP coupling modules available within the NCK
The MD defines the max. permissible number of $C P$ couplings and reserves the required dynamic memory (DRAM).

| 18452 | MM_NUM_CP_MODUL_LEAD |  |  |  |  |  |  | N02, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Maximum number of CP master values |  |  |  |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 99 | $1 / 1$ |  |  |  |  |

## Description:

Number of NCK-wide available CP master values.
This MD defines the max. permissible number of $C P$ master values and reserves the required dynamic memory (DRAM).

| 18600 | MM_FRAME_FINE_TRANS | N02 | K2, M5 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Fine offset with FRAME (SRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  | $7 / 2$ | M |
| - | - | 1 | 0 | 1 |  |  |  |  |

Description: 0: The fine offset cannot be entered or programmed.
Disabling fine offset saves a maximum of 10KB SRAM, (depending on MD28080 \$MC_MM_NUM_USER_FRAMES).
1: The fine offset is possible for settable frames, the basic frame and the programmable frame by operator input or via program.

| 18601 | MM_NUM_GLOBAL_USER_FRAMES | N02 | K2, M5 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of global predefined user frames (SRAM). | DWORD | PowerOn |  |  |  |  |
| - | $7 / 2$ |  |  |  |  |  | M |
| - | - | 0 | 0 | 100 | $7 / 2$ |  |  |

## Description:

Number of global predefined user frames.
The value corresponds to the number of field elements for the predefined field \$P_UIFR[].
If the value of the data is greater than 0 , then all settable fields are only global. The MD28080 \$MC_MM_NUM_USER_FRAMES is then ignored.

| 18602 | MM_NUM_GLOBAL_BASE_FRAMES | N02 | K2, M5 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of global base frames (SRAM). | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 16 | $7 / 2$ |  |

## Description:

Number of NCU basic frames.
The value corresponds to the number for the predefined field \$P_NCBFR[].

| 18603 | MM_NUM_GLOBAL_G_FRAMES |  |  | N02 | K2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of global grinding frames (SRAM) |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 0 | 0 | 0 | 100 | 7/2 | M |

Description:
Number of global grinding frames.
The value corresponds to the number of field elements for the predefined field \$P_GFR[].
If the value of the data is greater than 0 , all settable frames are only global. MD28079 \$MC_MM_NUM_G_FRAMES is then ignored.

| 18660 | MM_NUM_SYNACT_GUD_REAL | N02 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of configurable GUD variables of type REAL | DWORD | PowerOn |  |  |
| - | 9 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32767 | $7 / 2$ |
| - | 9 |  |  |  |  |

Description: The MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[ ] can be used to extend individual GUD blocks by additional channel-specific parameter areas of type REAL. The GUD blocks are differentiated by the field index:
MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[0] = <value> -> extension of the SGUD block
MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[1] = <value> -> extension of the MGUD block
MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[2] = <value> -> extension of the UGUD block
MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[3] = <value> -> extension of the GUD4 block
MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[8] = <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type REAL
Field size corresponding to <value> of the relevant machine data
Predefined names:
SYG_RS[ ] -> Synact parameter of type REAL in the SGUD block
SYG_RM[ ] -> Synact parameter of type REAL in the MGUD block
SYG_RU[ ] -> Synact parameter of type REAL in the UGUD block
SYG_R4[ ] -> Synact parameter of type REAL in the GUD4 block

SYG_R9[ ] -> Synact parameter of type REAL in the GUD9 block

The parameters can be read and written both by the part program and also via synchronous actions.


Description: The MD18661 \$MN MM NUM SYNACT GUD INT[ ] can be used to extend individual GUD blocks by additional channel-specific parameter areas of type INTEGER. The GUD blocks are differentiated by the field index:
MD18661 \$MN_MM_NUM_SYNACT_GUD_INT[0] = <value> -> extension of the SGUD block
MD18661 \$MN_MM_NUM_SYNACT_GUD_INT[1] = <value> -> extension of the MGUD block
MD18661 \$MN_MM_NUM_SYNACT_GUD_INT[2] = <value> -> extension of the UGUD block
MD18661 \$MN_MM_NUM_SYNACT_GUD_INT[3] = <value> -> extension of the GUD4 block
MD18661 \$MN_MM_NUM_SYNACT_GUD_INT[8] = <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type BOOL
Field size corresponding to <value> of the relevant machine data
Predefined names:
SYG_IS[ ] -> Synact parameter of type INT in the SGUD block
SYG_IM[ ] -> Synact parameter of type INT in the MGUD block
SYG_IU [ ] -> Synact parameter of type INT in the UGUD block
SYG_I4[ ] -> Synact parameter of type INT in the GUD4 block
....
SYG_I9[ ] -> Synact parameter of type INT in the GUD9 block
The parameters can be read and written both by the part program and also via synchronous actions.

| 18662 | MM_NUM_SYNACT_GUD_BOOL | N02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of configurable GUD variables of type Boolean | DWORD | PowerOn |  |  |  |  |
| - | $7 / 2$ |  |  |  |  |  | M |
| - | 9 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32767 | $7 / 2$ |  |  |

Description:
The MD18662 \$MN MM NUM SYNACT GUD BOOL[ ] can be used to extend individual GUD blocks by additional channel-specific parameter areas of type Boolean. The GUD blocks are differentiated by the field index:
MD18662 \$MN_MM_NUM_SYNACT_GUD_BOOL[0] = <value> -> extension of the SGUD block
MD18662 \$MN_MM_NUM_SYNACT_GUD_BOOL[1] = <value> -> extension of the MGUD block
MD18662 \$MN_MM_NUM_SYNACT_GUD_BOOL[2] = <value> -> extension of the UGUD block
MD18662 \$MN_MM_NUM_SYNACT_GUD_BOOL[3] = <value> -> extension of the GUD4 block
MD18662 \$MN_MM_NUM_SYNACT_GUD_BOOL[8] = <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type BOOL
Field size corresponding to <value> of the relevant machine data
Predefined names:
SYG_BS[ ] -> Synact parameter of type Boolean in the SGUD block
SYG_BM[ ] -> Synact parameter of type Boolean in the MGUD block
SYG_BU[ ] -> Synact parameter of type Boolean in the UGUD block
SYG_B4[ ] -> Synact parameter of type Boolean in the GUD4 block

SYG_B9[ ] -> Synact parameter of type Boolean in the GUD9 block

The parameters can be read and written both by the part program and also via synchronous actions.

| 18663 | MM_NUM_SYNACT_GUD_AXIS | N02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of configurable GUD variables of type Axis | DWORD | PowerOn |  |  |  |  |
| - | 9 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32767 | $7 / 2$ |  |  |
| - | 9 |  |  |  |  |  |  |

## Description:

The MD18663 \$MN_MM_NUM_SYNACT_GUD_AXIS[ ] can be used to extend individual GUD blocks by additional channel-specific parameter areas of type AXIS. The GUD blocks are differentiated by the field index:
MD18663 \$MN_MM_NUM_SYNACT_GUD_AXIS[0] = <value> -> extension of the SGUD block
MD18663 \$MN_MM_NUM_SYNACT_GUD_AXIS[1] = <value> -> extension of the MGUD block
MD18663 \$MN_MM_NUM_SYNACT_GUD_AXIS[2] = <value> -> extension of the UGUD block
MD18663 \$MN_MM_NUM_SYNACT_GUD_AXIS[3] = <value> -> extension of the GUD4 block
MD18663 \$MN_MM_NUM_SYNACT_GUD_AXIS[8] = <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type AXIS
Field size corresponding to <value> of the relevant machine data
Predefined names:
SYG_AS[ ] -> Synact parameter of type AXIS in the SGUD block
SYG_AM[ ] -> Synact parameter of type AXIS in the MGUD block
SYG_AU [ ] -> Synact parameter of type AXIS in the UGUD block
SYG_A4[ ] -> Synact parameter of type AXIS in the GUD4 block
..
SYG_A9[ ] -> Synact parameter of type AXIS in the GUD9 block
The parameters can be read and written both by the part program and also via synchronous actions.

| 18664 | MM_NUM_SYNACT_GUD_CHAR | N02 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Configurable GUD variable of type Char | DWORD | PowerOn |  |  |  |
| - | 9 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32767 |  |  |

Description:
The MD18664 \$MN_MM_NUM_SYNACT_GUD_CHAR[ ]
can be used to extend individual GUD blocks by additional
channel-specific parameter areas of type CHAR.
The GUD blocks are differentiated by the field index:
MD18664 \$MN_MM_NUM_SYNACT_GUD_CHAR[0] = <value> -> extension of the SGUD block
MD18664 \$MN_MM_NUM_SYNACT_GUD_CHAR[1] = <value> -> extension of the MGUD block
MD18664 \$MN_MM_NUM_SYNACT_GUD_CHAR[2] = <value> -> extension of the UGUD block
MD18664 \$MN_MM_NUM_SYNACT_GUD_CHAR[3] = <value> -> extension of the GUD4 block
MD18664 \$MN_MM_NUM_SYNACT_GUD_CHAR[8] = <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type CHAR
Field size corresponding to <value> of the relevant machine data
Predefined names:
SYG_CS[ ] -> Synact parameter of type CHAR in the SGUD block
SYG_CM[ ] -> Synact parameter of type CHAR in the MGUD block
SYG_CU[ ] -> Synact parameter of type CHAR in the UGUD block
SYG_C4[ ] -> Synact parameter of type CHAR in the GUD4 block

Machine data

SYG_C9[ ] -> Synact parameter of type CHAR in the GUD9 block
The parameters can be read and written both by the part program and also via synchronous actions.

| 18665 | MM_NUM_SYNACT_GUD_STRING | N02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Configurable GUD variable of type STRING | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 9 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 25 |  |  |  |

Description: The MD18665 \$MN_MM_NUM_SYNACT_GUD_STRING[ ] can be used to extend individual GUD blocks by additional channel-specific parameter areas of type STRING.
The GUD blocks are differentiated by the field index:
MD18665 \$MN_MM_NUM_SYNACT_GUD_STRING[0] = <value> -> extension of the SGUD block
MD18665 \$MN_MM_NUM_SYNACT_GUD_STRING[1] = <value> -> extension of the MGUD block
MD18665 \$MN_MM_NUM_SYNACT_GUD_STRING[2] = <value> -> extension of the UGUD block
MD18665 \$MN_MM_NUM_SYNACT_GUD_STRING[3] = <value> -> extension of the GUD4 block
MD18665 \$MN_MM_NUM_SYNACT_GUD_STRING[8] = <value> -> extension of the GUD9 block
In each case, fields with the following properties are created:
Data type STRING
Field size corresponding to <value> of the relevant machine data The maximum length of a string is 31 characters.

Predefined names:
SYG SS[ ] -> Synact parameter of type STRING in the SGUD block
SYG_SM[ ] -> Synact parameter of type STRING in the MGUD block
SYG_SU[ ] -> Synact parameter of type STRING in the UGUD block
SYG_S4[ ] -> Synact parameter of type STRING in the GUD4 block

SYG_S9[ ] -> Synact parameter of type STRING in the GUD9 block
The parameters can be read and written both by the part program
and also via synchronous actions.

| 18700 | MM_SIZEOF_LINKVAR_DATA |  | N02 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Size of NCU-link variable memory |  | DWORD | Pow |  |
| LINK, - |  |  |  |  |  |
| - | 0 | 0 | 1073741824 | 7/2 | M |

Description: Number of bytes of the NCK link memory for the variables \$A_DLx.

| 18710 | MM_NUM_AN_TIMER | N02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of global time variable for synchronized actions | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 10000 |  |  |  |

Description: Number of global time variables for motion-synchronous actions (DRAM)

| 18720 | MM_SERVO_FIFO_SIZE | EXP, N01 | B3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Setpoint value for buffer size between IPO and position control |  |  |  |  |  | DWORD | PowerOn |
| - | 3 |  |  |  |  |  |  |  |
| - | - | 2 | 35 | M |  |  |  |  |

[^5] and position control, and has a direct effect on the dynamic user memory requirement.

That is normally 2. If several NCUs are connected via NCU link for e.g. rotary indexing machines, the value should be set to 3 on all NCUs. This will balance the transmission rates of the setpoint values via the link.
In a master value application (e.g. line shaft), the value should be set to 4 , but only on the NCU that generates the master value. For all the other NCUs, the preset value should be maintained at 2 .

Note:
In control loops that are connected via interpolator, every increase of the value generates a further dead-time.
When the IPO cycles of the NCUs within an NCU group are set to different values, the link communication will only run in the slowest IPO cycle. The MD must be increased in the ratio of the NCU IPO cycle to the slowest IPO cycle in the NCU group, in order to achieve a synchronized output of the setpoint values on the drive interface. The formula for this is as follows:
MM_SERVO_FIFO_SIZE $=2$ * IPO cycle ratio + 1
Example:
In an IPO cycle ratio of $4: 1$, the value on the fast $N C U$ should be set to 9 instead of 3. On the slow NCU, the value must be set to 3 .

| 18730 | MM_MAXNUM_ALARM_ACTIONS |  |  |  |  | N02 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Length of the alarm action list | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 500 | 100 | 2000 |  |  |  | action list.



## Description:

Activating NCU link communication
Bit-coded activation data. That is the NCU link communication can be activated in
various forms.
Bit-coded activation data:
Bit $0=0 x 1:$ Link communication is to be activated.
Bit $1=0 \times 2$ : reserved
Bit $2=0 x 4$ : Extended search for link SDBs
SDBs are additionally searched for in the following directories:
-/user/sinumerik/sdb/...
-/oem/sinumerik/sdb/...
-/addon/sinumerik/sdb/...
As usual it is first searched in the user, oem, addon directories and then in the siemens directory
(See description FAST_IPO_LINK)
Irrelevant for:
Systems without link modules
Related to:
MD30560 \$MA_IS_LOCAL_LINK_AXIS,
MD12510 \$MN_NCU_LINKNO,
MD12520 \$MN_LINK_TERMINATION,
MD18782 \$MN_MM_LINK_NUM_OF_MODULES,
MD12540 \$MN_LINK_BAUDRATE_SWITCH,

### 4.1 General NC machine data

MD12550 \$MN_LINK_RETRY_CTR

| 18781 | NCU_LINK_CONNECTIONS | N01 | B3 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of internal link connections | DWORD | PowerOn |  |  |
| LINK, - |  |  |  |  |  |
| - | - | 0 | 0 | 32 |  |

Description: Value $=0$
The software calculates the internal link connnections itself.
Value > 0
Number of internal link connnections from each NCU to each other NCU.
These link connnections do not accommodate the non-cyclic messages.
Each of these connections can transfer 240 bytes of raw data.
Non-cyclic messages occur with alarms, container switches and link variablen.

| 18782 | MM_LINK_NUM_OF_MODULES |  | N01, N02 | B3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of NCU-link modules |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 2 | 2 | 16 | 3/2 | M |

Description:
LINK_NUM_OF_MODULES defines how many link modules can participate in the link communication.

| 18788 | MM_CC_STATION_CHAN_MASK |  |  |  |  |  |  | N01 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Channel bit mask for allocating CC stations |  |  |  |  |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 3 | $1,0,0$ | 0 | $0 x 7 F F F F F F F$ |  |  |  |  |  |

Description: Machine data for channel-specific creation of special additional software stations for compile cycles.
Enter a bit mask with the bits set for the channels, in which a compile cycle shall use the relevant station.

Meaning of the individual array elements:
MD18788 \$MN_MM_CC_STATION_CHAN_MASK[0]:
Creates a CC station at the end of the geometry preparation and prior to velocity planning in the preparation task. A compile cycle application can buffer the blocks there and manipulate their contents.
MD18788 \$MN_MM_CC_STATION_CHAN_MASK[1]:
Creates another CC-Station that is called directly after the first CC station (see above) and permits the internal block contents independently of this manipulation. MD18788 \$MN_MM_CC_STATION_CHAN_MASK[2]:
Creates an additional CC station in the preparation task that is called directly prior to tool radius offset and allows manipulation of the internal block contents.

| 18790 | MM_MAX_TRACE_LINK_POINTS |  |  |  |  |  | EXP, N02, N06 | B3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Trace data buffer size for NCU-Link |  |  |  |  |  | DWORD | PowerOn |
| NBUP |  |  |  |  |  |  |  |  |
| - | - | 8 | 0 | 20000 |  |  |  |  |

## Description: MM_MAX_TRACE_LINK_DATAPOINTS defines the size of an internal data buffer which

 contains the trace recordings for the NCU-link functionality.The MD is only evaluated if bit 0 is set in MD18792 \$MN_MM_TRACE_LINK_DATA_FUNCTION.
Related to:
MD22708 \$MC_TRACE_SCOPE_MASK,
MD22714 \$MC_MM_TRACE_DATA_FUNCTION,

```
MD28180 $MC_MM_MAX_TRACE_DATAPOINTS
MD22700 $MC_TRACE_STARTTRACE_EVENT,
MD22702 $MC_TRACE_STARTTRACE_STEP,
MD22704 $MC_TRACE_STOPTRACE_EVENT,
MD22706 $MC_TRACE_STOPTRACE_STEP,
MD22710 $MC_TRACE_VARIABLE_NAME,
MD22712 $MC_TRACE_VARIABLE_INDEX,
MD18792 $MN_MM_TRACE_LINK_DATA_FUNCTION
```

| 18792 | MM_TRACE_LINK_DATA_FUNCTION |  |  |  |  |  | EXP, N02, N06 | B3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Specifies the contents of the NCU-link-trace files |  |  |  |  |  | UDWORD | PowerOn |
| NBUP |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 x 7 F F F F F F F$ | $2 / 2$ |  |  |  | M

Description: The NCK link sends and receives 32 buffers with a length of 240 bytes in each interpolation cycle.
These buffers are saved in a FIFO (first in-first out) memory of length MD18790 \$MN_MM_MAX_TRACE_LINK_POINTS and written to a file (ncsctr01.mpf for the 1st channel) if a "trigger event" occurs (e.g. Cancel Alarm button, see MD22704 \$MC_TRACE_STOPTRACE_EVENT and MD22700 \$MC_TRACE_STARTTRACE_EVENT).
The machine data should be interpreted as a bit mask and has the following meaning: $\mathrm{BITO}=1$
Enables the NCU link trace file.
The others are only evaluated if this bit is set!
MD18790 \$MN_MM_MAX_TRACE_LINK_POINTS is only evaluated with this bit.
BIT1 = 1
The stored buffer content is analyzed according to its meaning and written to the file in plain text. This means setpoint transfer can be detected, for example, from the text items "desVal", actual value transfer from the identifiers "actVal" etc.
BIT1 $=0$
The buffer content is displayed in HEX and is not analyzed.
BIT2 = 1
Only buffers that contain a sporadically occuring communication message (dynamic message) between the NCUs are recorded.
These include, for example, the following events:

- Set machine data
- Set link variables
- Alarms spanning NCUs
- Axis container rotation

BIT3 $=1$
Every addition and deletion of a CLEARHIMSELF alarm transferred via LINK triggers the following action:

The internal receive tree is recorded before and after the action and the most recent values can be
found again in trace.
NOTICE: Very very time-consuming; please only use in an emergency.


Description: The NCK sends and receives PLC VDI signals. The Trace function stores the signals which have changed in each interpolation cycle in an FIFO memory (first in-first out) having a size of MM_MAX_TRACE_POINTS.
The FIFO is written to a file (for the lst channel: ncsctr01.mpf) when a "trigger event" occurs (e.g. Cancel Alarm key, see MD22704 \$MC_TRACE_STOPTRACE_EVENT and MD22700 \$MC_TRACE_STARTTRACE_EVENT).
The machine data should be interpreted as bit mask. The corresponding VDI signals are recorded depending on which bit is set.
Bits 1.. 6 describe which axial VDI input signals are recorded in the trace
(see .. TRACE_DATA_FUNCTION).

| 18800 | MM_EXTERN_LANGUAGE | N01, N12 | K1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Activation of external NC languages | UDWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $0 \times 0000$ | $0 \times 0000$ | $0 \times 0001$ |  |  |  |

## Description:

The corresponding NC language must be activated to execute part programs of other control manufacturers. Only one external NC language can be selected. The range of instructions which is made available in each case is to be taken from the current documentation.
Bit 0 (LSB):
Execution of part programs ISO_2 or ISO_3.
See MD10880 \$MN_MM_EXTERN_CNC_SYSTEM for coding.

| 18860 | MM_MAINTENANCE_MON |  | EXP, N01 | W6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activation of maintenance data recording |  | BOOLEAN | Pow |  |
| - |  |  |  |  |  |
| - | FALSE | 0 | - | 7/2 | M |

Description: Maintenance data is recorded when this MD has the value TRUE.
The axial MD33060 \$MA_MAINTENANCE_DATA sets which data are to be recorded.
Details are to be found in the service documentation.

| 18866 | MM_NUM_KIN_TRAFOS |  |  |  |  |  | N02, N09 | W1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Maximum number of transformations that can be defined by <br> kinematic chains. | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 200 |  |  |  |  |

Description: This machine data defines the maximum number of transformations in the NCK that can be defined by kinematic chains.
It also defines the number of data sets (\$NT_...[1] to \$NT_...[\$MN_MM_NUM_KIN_TRAFOS] available for parameterizing these transformations. The data record with index 0 is locked.)
The kinematic transformations conventionally parameterized in machine data can exist irrespective of this.

| 18880 | MM_MAXNUM_KIN_CHAIN_ELEM |  |  |  |  |  | EXP, N01 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Maximum number of elements in kinematic chains |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1000 | I |  |  |  |

Description: Maximum number of links in kinematic chains. If this MD has the value 0 (default value) then no kinematic chains at all are possible.


| 18890 | MM_MAXNUM_3D_PROT_AREAS |  |  |  |  |  | EXP, N01 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Maximum number of 3D protection areas |  |  |  |  |  | DWORD | PowerOn |
| - | - | 0 | 0 | 200 |  |  |  |  |
| - | - | $7 / 2$ | M |  |  |  |  |  |

Description: Maximum number of protection areas. This MD must not be equal to 0 in order to activate the function "collision avoidance".


Description: Maximum number of protection area elements for the automatic generation of protection areas with the language commands WORKPIECE and FIXTURE.

| 18892 | MM_MAXNUM_3D_PROT_AREA_ELEM |  |  |  |  |  | EXP, N01 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Max. number of protection zone elements |  |  |  |  |  | DWORD | PowerOn |
| - | - | 0 | 0 | 1000 | $7 / 2$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: Maximum number of protection zone elements. If this MD is 0 (default value), no protection zones are possible.


| 18894 | MM_MAXNUM_3D_FACETS_INTERN |  |  |  |  |  | EXP, N01 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Max. number of protection zone facets ro variable protection zones |  |  |  |  |  | DWORD | PowerOn |
| - | - | 0 | 0 | 5000 |  |  |  |  |
| - | - | $7 / 2$ | M |  |  |  |  |  |

[^6]| 18895 | MM_MAXNUM_3D_FACETS | EXP, N01 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Max. number of protection area facets/primitives |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 5000 |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |

Description: Maximum number of primitives and facets allowed for all protection areas. Only applies if MAXNUM_3D_PROT_AREAS is greater than zero.

| 18896 | MM_MAXNUM_3D_COLLISION | EXP, N01 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Max. number of the memory location for collision check |  |  |  |  |  | DWORD | PowerOn |
| - | 7 |  |  |  |  |  |  |  |
| - | - | - | 0 | 50000 | M |  |  |  |

Description: Maximum size of a temporary memory area (in KB), which is required for the collision check of two protection zones.
If the contents of this machine data is 0 , the required memory space is determined automatically from machine data MD18892 \$MN MM MAXNUM 3D_PROT AREA ELEM, MD18890 \$MN_MM_MAXNUM_3D_PROT_AREAS and MD18895 \$MN_MM_MAXNUM_3D_FACETS.
If the determined memory space is insufficient, it can be explicitely determined using this machine data.

| 18897 | MM_MAXNUM_3D_INTERFACE_IN | EXP, N01 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Max. no. of interf. bits for pre-activation of protection zones |  |  |  |  |  | DWORD | PowerOn |
| - | - | 16 | 0 | 64 | $7 / 2$ |  |  |  |$]$ M

Description: Defines how many input bits are available on the VDI interface for pre-activation of 3D protection zones.
It will influence the size of the memory space required for each NC block.
If this machine data has value $n$, a memory size of approximately $n$ * ( $n+1$ ) / 16 bytes will be required per block.
This machine data will be evaluated and will cause reservation of memory space, only if MD18890 \$MN_MM_MAXNUM_3D_PROT_AREAS is inequal to 0 .

| 18898 | MM_MAXNUM_3D_COLL_PAIRS | EXP, N01 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Maximum number of 3D collision pairs |  |  |  |  |  | DWORD | PowerOn |
| - | - | 0 | 0 | 100 | $7 / 2$ |  |  |  |$]$ M

Description: Maximum number of 3D collision pairs.
This machine data is only evaluated if MD18890 \$MN_MAX_NUM_3D_PROT_AREAS is not equal
to zero.
If this machine data is zero and MD18890 \$MN_MAX_NUM_3D_PROT_AREAS is not equal to zero, memory space is automatically reserved for the maximum possible number of different 3D collision pairs (\$MN_MAX_NUM_3D_PROT_AREAS * (\$MN_MAX_NUM_3D_PROT_AREAS - 1) / 2).

If the content of this machine data is greater than the specified maximum value, then it is limited to this maximum value internally without an error message.

| 18899 | PROT_AREA_TOOL_MASK | EXP | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Controls the creation of automatically created tool protection areas |  |  |  |  |  | DWORD | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - | U |  |  |  |

Description: Controls the way tool protection areas are automatically created with collision detection active.

If bit $0=1$, then in MD 18894 \$MN_MM_MAXNUM_3D_FACETS_INTERN memory space must be reserved.

This machine data is bit-coded.
Bit 0 ( $0 \times 1$ ) If no other data are available, create the tool protection area from the tool data (tool length and radius).


| 18960 | POS_DYN_MODE |  |  |  |  |  | N01 | K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Type of positioning axis dynamic response |  |  |  |  |  | BYTE | Reset |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 1 | M |  |  |  |  |

Description: The machine data deterrmines the accelerations and jerks which are applied in the case of positioning axis motion.
Value 0:
The acceleration is taken from the first field entry in MD32300 \$MA_MAX_AX_ACCEL (value for DYNNORM).

With G75 and active jerk limitation (SOFT), the jerk is taken from the first field entry in MD32431 \$MA_MAX_AX_JERK (value for DYNNORM) ; without jerk limitation (BRISK) it is infinite.

The following applies for all other positioning axis movements:
If MD32420 \$MA_JOG_AND_POS_JERK_ENABLE is true, the jerk is taken from MD32430 \$MA_JOG_AND_POS_MAX_JERK; otherwise it is infinite (BRISK behavior).
Value 1:
The acceleration is taken from the second field entry in MD32300 \$MA_MAX_AX_ACCEL (value for DYNPOS).
The jerk is taken from the second field entry in MD32431 \$MA_MAX_AX_JERK (value for DYNPOS).
For BRISK behavior, enter very high values here.

| 19010 | SYSTEM_INFO |  |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | System information |  |  | UBYTE | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 4 | 0x6, 0xA4 | 0 | - | ReadOnly | S |

## Description:

System information
Current software identifiers
[0]: Class ID
[1]: Subsystem ID
[2]: Possibly export ID
[3]: Reserved
Class ID:
===========
$5(0 \times 5) 828 D$
6 (0x6) 840D sl SW 4.4 and higher

```
7(0x7) 808D
8 (0x8) 840evo
15 (0xF) Simulation
Subsystem ID:
============
The following applies to 808D:
    1 (0x01) PPU14*.* M
    2 (0x02) PPU14*.* T
    3 (0x03) Reserved
    4 (0x04) PPU16*.* M
    5 (0x05) PPU16*.* T
    6 (0x06) Reserved
    7 (0x07) PPU15*.* M
    8 (0x08) PPU15*.* T
The following applies to 828D:
    1 (0x01) SW26*.* T
    2 (0x02) SW26*.* M
    3 (0x03) Reserved
    4 (0x04) Reserved from 4.8 SP3: was SW28*.* T
    5 (0x05) Reserved from 4.8 SP3: was SW28*.* M
    6 (0x06) Reserved
    7 (0x07) SW24*.* T
    8 (0x08) SW24*.* M
    9 (0x09) Reserved
10 (0x0A) From 4.8 SP3 : SW28*.* T, was SW28*.* T Adv
11 (0x0B) From 4.8 SP3 : SW28*.* M, was SW28*.* M Adv.
81/1 (0x51) SW24*.* GC
81/2 (0x51) SW24*.* GS
83/1 (0x53) SW26*.* GC
83/2 (0x53) SW26*.* GS
85/1 (0x55) SW28*.* GC Adv.
85/2 (0x55) SW28*.* GS Adv.
```

The following applies to 840Dsl:
4 (0xA4) 31-3
5 (0xA5) 31-3e
The following applies to 840evo:
4 (0xB4) 31-3
5 (0xB5) 31-3e
Export ID:
$============$
14 (0x0E) non-export-restricted system software
This data cannot be written.

| 19100 | NUM_AXES_IN_SYSTEM | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Additionally 1 axis/spindle | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 3 | 0 | 8 | $3 / 3$ |  |

If more axes are activated by the channel-specific MD20070 \$MC_AXCONF_MACHAX_USED than are permitted in OD19100 \$ON_NUM_AXES_IN_SYSTEM and/or OD19102 \$ON_NUM_ADD_AXES_IN_SYSTEM, then a power-up alarm is triggered and the NC start is prevented.
Note:
Virtual and simulated axes (actual value sensing and setpoint output are simulated) are not taken into account when calculating the number of axes.

Corresponds with:
MD30132 \$MA_IS_VIRTUAL_AX
MD30130 \$MA_CTRLOUT_TYPE
MD30240 \$MA_ENC_TYPE

| 19102 | NUM_ADD_AXES_IN_SYSTEM | N01 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Additional 1 positioning axis/auxiliary spindle | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| 840 dsl-71 | - | - | 0 | 8 | $3 / 3$ | I |  |
| 840dsl-72 | - | 0 | 0 | 31 | $3 / 3$ | 1 |  |
| 840 dsl-73 | - | 0 | 0 | 31 | $3 / 3$ | 1 |  |

Description: Number of available positioning/auxiliary axes
If more axes are activated by channel-specific MD \$MC_AXCONF_MACHAX_USED than permitted in OD19100 \$ON_NUM_AXES_IN_SYSTEM and/or OD19102
\$ON_NUM_ADD_AXES_IN_SYSTEM, a power-up alarm is triggered and the NC start is prevented.

| 19110 | NUM_IPO_AXES | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |  |
| - | Multiple-axis interpolation (more than 4 axes) | BYTE | PowerOn |  |  |  |
| 840 dsl-71 | - | - | 0 | 8 | $3 / 3$ | I |
| 840 dsl-72 | - | 4 | 0 | 31 | $3 / 3$ | I |
| 840 dsl-73 | - | 4 | 0 | 31 | $3 / 3$ | I |

Description:
Number of simultaneously interpolating path axes
If more interpolating axes are programmed than are permitted in OD19110 \$ON_NUM_IPO_AXES,
a power-up alarm is output and the corresponding block is
not executed.

| 19120 | NUM_SAFE_AXES | N01, N06 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | SI axis/spindle, add. 1 axis/spindle | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | 1 | 0 | 31 | $3 / 3$ |



Description: Number of axes in which drive-based safety functions can be activated.


| 19142 | NUM_LEAD_LINK_AXES | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of supported lead-link axes | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 32 | $3 / 3$ |  |

Description: Number of lead link axes supported by the software


## Description: Number of activatable channels

If more channels are activated by the global MD \$MN_ASSIGN_CHAN_TO_MODE_GROUP than are permitted in OD19200 \$ON_NUM_CHANNELS, then a power-up alarm is triggered which prevents the NC start.

| 19220 | NUM_MODE_GROUPS | N01 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Additional 1 operation mode modul (BAG) | BYTE | PowerOn |  |  |  |  |
| - | 3 |  |  |  |  |  |  |
| - | - | 1 | 1 | 10 | 3 |  |  |

## Description:

Number of mode groups
If more mode groups are activated by the global MD \$MN_ASSIGN_CHAN_TO_MODE_GROUP than
 the NC start.

| 19240 | USER_MEM_DYNAMIC | N01, N02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Add. 4 Mbyte CNC user memory | BYTE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 6 | $3 / 3$ |  |  |

Description: Option data for enabling the expansion levels of the volatile user memory on the $N C$ CPU.
The following applies:
Available memory = basic configuration + OD19240 \$ON_USER_MEM_DYNAMIC * 4MB
E.g. OD19240 \$ON_USER_MEM_DYNAMIC = 10: The memory size \$MN_MM_USER_MEM_DYNAMIC is increased by 10 * $4 \mathrm{MB}=40 \mathrm{MB}$.
OD19240 \$ON_USER_MEM_DYNAMIC therefore indicates the added part of the volatile user memory relative to the basic configuration.

| 19250 | USER_MEM_BUFFERED |  | N01, N02 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Add. 2 Mbyte CNC user memory |  | BYTE | Immediately |  |
| - |  |  |  |  |  |
| - | - - | 0 | 3 | 3/3 | 1 |
| Description: | Option data for enabling the expansion levels of the nonvolatile user memory on the NC CPU. <br> Available memory = basic configuration + OD19250 \$ON_USER_MEM_BUFFERED * 2MB OD19250 \$ON_USER_MEM_BUFFERED thus always indicates the part of the memory relative to the basic configuration. |  |  |  |  |
| 19270 | PLC_USER_MEM_SIZE |  | N01, N02, N03 | - |  |
| - | Add. 128 KB PLC user memory |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 4 | 1 | 12 | 3/3 | I |
| Description: | Option data for enabli <br> 1 Minimal configuration $\begin{array}{ll} 4 & \text { Basic configuration } \\ 5 & \text { GA }+128 \mathrm{kB} \\ 6 & \text { GA }+256 \mathrm{kB} \\ 7 & \text { GA }+384 \mathrm{kB} \\ \ldots & \text { etc. } \\ 12 & \text { GA }+1 \mathrm{MB} \text { (maximal cd } \end{array}$ | P <br> on | on the PLC | $\text { n } \quad 12$ |  |


| 19280 | PLC_C_USER_MEM_SIZE |  |  |  |  |  |  | N01, N02, N03 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Additional 64 KB for PLC C programming |  |  |  |  |  | BYTE | PowerOn |  |
| - | - | 0 | 0 | 14 | $3 / 3$ |  |  |  |  |
| - | - |  |  |  |  |  |  |  |  |

Description:
Option data for enabling the memory configuration stages for $C$ programming
on the PLC. (Incrementation: 64KB)
$0=$ No memory
$1=64 \mathrm{~KB}$
. .
$14=896 \mathrm{~KB}$


| 19308 | SINAMICS_FUNCTION_MASK |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Drive options |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 0x7FFFFFFF | 3/3 | I |

## Description:

Option data for enabling SINAMICS drive functions:
Bit 0 (LSB): Enable "'Advanced Position Control' (APC)" (drive parameter r108 bit 7)
Bit 1: Enable "'Advanced Positioning Control ECO' (APCeco)" (drive parameter
r108 bit 19)

| 19310 | AXIS_FUNCTION_MASK | N01, N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Axial options | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | $0 \times 0$ | $0 x 7 F F F F F F F$ | $3 / 3$ |  |

Description: Option data for enabling axial functions:
Bit 0 (LSB): Enable "Gantry axes" ( MD37100 \$MA_GANTRY_AXIS_TYPE )
Bit 1: Enable "Force Control" ( MD37080 \$MA_FOC_ACTIVATION_MODE )
Bit 2: Enable "Position switching signals" ( MD10450 \$MN_SW_CAM_ASSIGN_TAB )
-----: Reserved "Prog. acceleration" not an option since 10/2000
Bit 4: Enable "Master-Slave" (MD37250 \$MA_MS_ASSIGN_MASTER_SPEED_CMD MD37252
\$MA_MS_ASSIGN_MASTER_TORQUE_CTR)
Bit 5: Enable "Digital setpoint exchange"
The listed machine data are reset during power on and
alarm 8040 is output if the corresponding bit of the option data
is not set.

| 19320 | TECHNO_FUNCTION_MASK |  | N01, N09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Technological options |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | - - | 0x0 | 0x7FFFFFFF | 3/3 | I |

Description:
Option data for enabling technology-related functions
-----: (LSB): Reserved "Caliper function" ( MD21220 \$MC_MULTFEED_ASSIGN_FASTIN) not an
option since 10/2000
Bit 1: Enable "Adaptive Control (evaluation of internal drive variables)"
Bit 2: Enable "SINUMERIK HMI OA copy license WinCC flexible CE" (OP)
Bit 3: Enable "Oscillation functions" ( MD43780 \$SA_OSCILL_IS_ACTIVE)
-----: Reserved "Tool management" ( MD20310 \$MC_TOOL_MANAGEMENT_MASK )
Bit 5: Enable "Nibbling/punching" ( MD26012 \$MC_PUNCHNIB_ACTIVATION )
Bit 6: Enable "Contour tunnel monitoring" ( MD21050 \$MC_CONTOUR_TUNNEL_TOL )
-----: Reserved "F word interpolation" ( FLIN/FCUB/FPO ) not an option since
10/2000
-----: Reserved "Continuous Dressing" ( FTOCON/FTOCOF ) not an option since
10/2000
Bit 9: Enable "Tangential control" ( TANON/TANGOF )
------: Reserved "Synchronous spindle/Multi-edge turning" ( COUPON/COUPOF )
Bit 11: Enable "Path velocity-dependent analog value output (\$AC_VACTB/\$AC_VACTW)"
------: Reserved "Position offset as output of a synchronized action (2D)" (\$AA_OFF), not an option since 10/2000
------: Reserved "Free contour input with stock removal against the contour"
(ShopMill)


| 19321 | TECHNO_FUNCTION_MASK_1 |  |  |  |  |  | N01, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Technological options |  |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 \times 00003040$ | $0 \times 00003040$ | $0 \times 7 F F F F F F F$ | $3 / 3$ |  |  |  |

Description:
Option data for enabling functions relating to technologies.
Bit 0:(LSB): Enable "Measuring cycles (MEACALC)"
Bit 1: Enable "Contour handwheel"
Bit 2: Enable "Generic coupling 'CP-BASIC'"
Bit 3: Enable "Generic coupling 'CP-COMFORT'"
Bit 4: Enable "Generic coupling 'CP-EXPERT'"
Bit 5: Enable "Generic coupling 'CP-STATIC'"
Bit 6: Enable "Replacement tools for TM"
Bit 7: Enable "TM with multiple magazines"
Bit 8: Enable "Monitoring for max. tool speed / acceleration"
Bit 9: Enable "Advanced Surface"
Bit 10: Enable "Machining package milling 3 axes ( $\mathrm{pkg} / o n l y$ placeholder
for group option)"
Bit 11: Enable "Machining package milling 5 axes (pkg/only placeholder
for group option)"
Bit 12: Enable "Siemens Cycles Base Technology"
Bit 13: Freigabe "Siemens Cycles Advanced Technology"
Bit 14: Enable "Balance cutting"
Bit 15: Enable "SINUMERIK Grinding Advanced"
Bit 16: Free
Bit 17: Enable "Top Surface"
Bit 18: Enable "Orientation offset static/dynamic"

| Bit 19: | Free |
| :--- | :---: |
| Bit 31: | Reserved "" |


| 19330 | IPO_FUNCTION_MASK |  |  |  |  |  |  | N01, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Interpolation |  |  |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | $0 \times 0$ | $0 x 7 F F F F F F F$ | $1 / 1$ |  |  |  |  |

Description: Option data for enabling interpolation-related functions
-----: (LSB): Reserved "REPOS per program (REPOSx without REPOSA)" not an option since 10/2000
Bit 1: Enable "Spline interpolation (xSPLINE)"
Bit 2: Enable "Compressor 5-axis machining (COMPON/COMPCAD/COMPCURV) (solution line: incl. xSPLINE; as from NCK75 only xSPLINE because COMPx is GA)"
Bit 3: Enable "Polynomial interpolation (POLY)"
Bit 4: Enable "3D tool offset (CUT3Dx)"
Bit 5: Reserved "Master value coupling and curve table interpolation (LEADON,
CTAB)"
-----: Reserved "Command axes and spindles"
Bit 7: Enable "Involute interpolation"
Bit 8: Enable "Compressor 3-axis machining (COMPON/COMPCAD/COMPCURV) (solution line: incl. xSPLINE); as from NCK75 only xSPLINE because COMPx is GA)"

Bit 31: Reserved ""



| 19500 | SAFE_PLC_LOGIC |  | N01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Safety Integrated plus /SI Logic |  | BOOLEAN | PowerOn |  |
| - |  |  |  |  |  |
| - | FALSE | - | - | 3/3 | 1 |

Description: Basic option to operate an F-PLC.

| 19510 | SAFE_FUNCTION_MASK | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Safety Integrated functions | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | $0 \times 00$ | $0 \times 01$ | $3 / 3$ |  |

Description:
Option data for enabling Safety Integrated functions
Bit $0=0$ : Maximum of 3 FSEND and 3 FRECV connections available
Bit 0 = 1: More than 3 FSEND and 3 FRECV connections available


Description:
Option data for activating technology functions that have been
brought in for the first time as reloadable compile cycles.
\$ON_TECHNO_EXTENTION_MASK[0]
Bit 0: = O Only those ELF files can be loaded which are licensed by a bit in ON_TECHNO_EXTENTION_MASK[1].

1 All ELF files can be loaded
Bit 16-32: reserved for use by OEM customers
\$ON_TECHNO_EXTENTION_MASK[1]
(ELF files marketed by Siemens)

| 19700 | ELEC_TRANSFER | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Electronic transfer | BOOLEAN | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $3 / 3$ |  |$]$ I

Description:
Option data for enabling "electronic transfer" functionality
The 'individual options' required for this functionality are set,

+ One additional positioning axis
+ Gantry
+ Synchronized actions level 2
+ Position switching signals/cams
+ Polynomial interpolation
+ Master value coupling
+ Cross-mode actions (ASUB and SYNACT)
+ PROFIBUS
and the function normally present as a basic function
- Spindle (assignments are not possible in MD35000 \$MA_SPIND_ASSIGN_TO_MACHAX)
- Tool offsets (G40/G41/G42 are not possible)
is disabled.

| 19701 | ELEC_TRANSFER_CP | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Electronic transfer (CP) | BOOLEAN | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $3 / 3$ |  |

Description: Option data for enabling "electronic transfer with CP" functionality The 'individual options' required for this functionality are set,

+ One additional positioning axis
+ Gantry
+ Synchronized actions level 2
+ Position switching signals/cams
+ Polynomial interpolation

```
    + Generic coupling CP-Comfort
    + Cross-mode actions (ASUB and SYNACT)
    + PROFIBUS
and the function normally present as a basic function
    - Spindle (assignments are not possible in MD35000 $MA_SPIND_ASSIGN_TO_MACHAX)
    - Tool offsets (G40/G41/G42 are not possible)
is disabled.
```



| 19710 | HANDLING | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Handling package | BOOLEAN | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $3 / 3$ |  |

Description:
Option data for enabling "handling" functionality
The 'individual options' required for this functionality are set,

+ 3 additional positioning axis
+ 3 additional channels
+ Synchronized actions level 2
+ Handling transformation package
+ Cross-mode actions (ASUB and SYNACT)
and the function normally present as a basic function
- Spindle (assignments are not possible in MD35000 \$MA_SPIND_ASSIGN_TO_MACHAX)
- Tool offsets (G40/G41/G42 are not possible)
is disabled.

| 19730 | HMI_FUNCTION_MASK |  |  |  |  |  | N01, N09 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Operating options |  |  |  |  |  | UDWORD | PowerOn |
| - | 2 | 0x00000804, <br> 0x000EFFFC | 0x00000804, <br> 0x000EFFFC | 0x7FFFFFFF, <br> 0x7FFFFFFF | $3 / 3$ |  |  |  |

Description:
Option data for enabling HMI functions:

```
Bit 0 (LSB): Enable "Additional languages"
OD19730 $ON_HMI_FUNCTION_MASK[0].0
-----: Reserved "External HMI"
OD19730 $ON_HMI_FUNCTION_MASK[0].1
Bit 2: Enable "Network drive
management" OD19730 $ON_HMI_FUNCTION_MASK[O].
2
Bit 3: Enable "Multi-channel step sequence
programming" OD19730 $ON_HMI_FUNCTION_MASK[0].3
Bit 4: Enable "Manual machine"
OD19730 $ON_HMI_FUNCTION_MASK[0].4
Bit 5: Enable "Add. 256 MB HMI user memory on NCU CF card"
OD19730 $ON_HMI_FUNCTION_MASK[0].5
Bit 6: Enable "Simulation milling (2D dynamic, 3D
static)" OD19730 $ON_HMI_FUNCTION_MASK[0].6
-----: Reserved "Measuring
cycles" OD19730
$ON_HMI_FUNCTION_MASK[0].7
Bit 8: Enable "SINUMERIK HMI copy license OA"
OD19730 $ON_HMI_FUNCTION_MASK[0].8
Bit 9: Reserved "was Ethernet 802Dsl
pro" OD19730 $ON_HMI_FUNCTION_MASK[O].
9
Bit 10: Enable "ShopTurn/Mill HMI for 840Di sl incl. HMI
Advanced" OD19730 $ON_HMI_FUNCTION_MASK[0].10
Bit 11: Enable "Advanced operator
functions" OD19730 $ON_HMI_FUNCTION_MASK[O].
11
Bit 12: Enable "ShopMill/ShopTurn
StepGuide" OD19730 $ON_HMI_FUNCTION_MASK[0].
12
Bit 13: Enable "Measure kinematics"
OD19730 $ON_HMI_FUNCTION_MASK[0].13
Bit 14: Enable "Trace (real-time simulation of curr. machining) MigA; for
ShopMill" OD19730 $ON_HMI_FUNCTION_MASK[0].14
Bit 15: Enable "Trace (real-time simulation of curr. machining) MigA; for
ShopTurn" OD19730 $ON_HMI_FUNCTION_MASK[0].15
Bit 16: Enable "3D simulation 1 (finished
part)" OD19730 $ON_HMI_FUNCTION_MASK[0].16
Bit 17: Free
OD19730 $ON_HMI_FUNCTION_MASK[0].17
Bit 18: Enable "Manual machine plus"
OD19730 $ON_HMI_FUNCTION_MASK[0].18
------: Reserved "was AP60 Run MyHMI /3GL -> }1973
$ON_HMI_MASK" OD19730 $ON_HMI_FUNCTION_MASK[0].19
------: Reserved AP61 "SINUMERIK HMI sl copy license OA
project" OD19730 $ON_HMI_FUNCTION_MASK[0].20
------: Reserved AP62 "SINUMERIK HMI sl copy license OA upgrade
programming" OD19730 $ON_HMI_FUNCTION_MASK[0].21
------: Reserved AP63 "SINUMERIK HMI sl copy license OA upgrade
configuration" OD19730 $ON_HMI_FUNCTION_MASK[0].22
Bit 23: Enable "SINUMERIK HMI sl Runtime OA Easy
Screen" OD19730 $ON_HMI_FUNCTION_MASK[0].23
Bit 24: Enable "Operation without SINUMERIK
OP" OD19730 $ON_HMI_FUNCTION_MASK[0].24
```



### 4.1 General NC machine data

```
Bit 21: Enable "Electronic key system (EKS)"
OD19730 $ON_HMI_FUNCTION_MASK[1].21
------: Reserved
OD19730 $ON_HMI_FUNCTION_MASK[1]. 22
Bit 23: Enable "Integrated spindle monitor (S-
Monitor)" OD19730 $ON_HMI_FUNCTION_MASK[1].23
Bit 24: Enable "DXF reader"
OD19730 $ON_HMI_FUNCTION_MASK[1].24
Bit 25: Unused (was "SINUMERIK 828 Ladder
Editor") OD19730 $ON_HMI_FUNCTION_MASK[1].
25
Bit 26: Enable "SINUMERIK extended touch"
OD19730 $ON_HMI_FUNCTION_MASK[1].26
Bit 27: Enable "Run MyRobot /Handling" OD19730
$ON HMI FUNCTION MASK[1]. 27
```

| 19732 | HMI_MASK | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Operating options | UBYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | $0 \times 0$ | $0 x 7 F$ | ReadOnly |  |

Description:
Option data for enabling HMI functions:
Bit 0 (LSB): SINUMERIK Operate /NCU.
Bit 1: SINUMERIK Operate /PCU
Bit 2: SINUMERIK Operate /PC
Bit 3: SINUMERIK basic PCU software /IPC
Bit 4: SINUMERIK Operate /universal client
Bit 5: Run MyHMI /3GL
Bit 6: SINUMERIK Operate Display Manager

| 19742 | DRIVE_CNT | N01, N06 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | $\begin{array}{l}\text { Drive count licenses } \\ \text { [1] Cogging torque compensation for } 1 \text { axis/spindle }\end{array}$ | UBYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 18 | $0,0,0,0,0,0,0,0 \ldots$ | $\begin{array}{l}0,0,0,0,0,0,0, \\ 0 \ldots\end{array}$ | - | $3 / 3$ |  |  |$]$|  |
| :--- |

Description: Option data

| 19750 | DRIVE_EXTENSION_MASK | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Drive OA license bits | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $0 \times 0,0 \times 0,0 \times 0$ | $0 \times 0$ | $0 \times F F F F F F F F$ |  |  |

Description: Option data

| 19830 | COLLISION_MASK |  |  |  |  |  |  | N01 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Functional scope of collision avoidance | UDWORD | PowerOn |  |  |  |  |  |  |
| - |  | $0 \times 0$ | $0 \times 0$ | $0 \times 7$ | $3 / 3$ | 1 |  |  |  |
| - | - |  |  |  |  |  |  |  |  |

Description: Functional scope of collision avoidance
Bit 0 (LSB): collision avoidance
Bit 1: Basic collision avoidance
Bit 2: Advanced collision avoidance

### 4.2 Channel-specific NC machine data

\(\left.\begin{array}{|l|l|l|l|l|l|}\hline 20000 \& CHAN_NAME \& C01, C10 \& B3, K1 <br>
\hline- \& Channel name \& STRING \& PowerOn <br>
\hline- \& - \& \begin{array}{l}CHAN1, CHAN2, <br>
CHAN3, CHAN4, <br>
CHAN5, CHAN6, <br>

CHAN7, CHAN8...\end{array} \& - \& - \& 7 / 2\end{array}\right]\)| M |
| :--- |
| - |

Description: The channel name can be defined in this MD. The channel name is only used for the display on the HMI.

| 20050 | AXCONF_GEOAX_ASSIGN_TAB |  |  | C01, C10 | TE7 | 2, K1, K2 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axis to channel axis |  |  | BYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 1,2,3,0,0,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0 \\ & 0,0,0,0 \ldots \end{aligned}$ | 0 | 20 | 7/2 | M |

Description:
This MD is used to specify which channel axis the geometry axis is assiged to. Each geometry axis must be assigned to a specific channel. If a geometry axis is not assigned to a channel axis, then this geometry axis is not available, and cannot be programmed (with the name defined under MD20060 \$MC_AXCONF_GEOAX_NAME_TAB).
For example: Turning machine without transformation:
MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB[ 0 ] = 1 ; 1st geometry axis = 1st channel axis MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB[ 1 ] = 0 ; 2nd geometry axis not defined MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB[ 2 ] = 2 ; 3rd geometry axis = 2nd channel axis The assignment made here is valid if no transformation is active. With active transformation $n$, the transformation-specific assignment table MD24... \$MC_TRAFO_GEOAX_ASSIGN_TAB_... becomes active.


Description: This MD is used to enter the names of the geometry axes separately for each channel. Geometry axes can be programmed in the part program using the names specified here. Special cases:

- The geometry axis name entered must not conflict with the designations and assignments of the machine and channel axis names or other identifiers.
Names for Euler angles (MD10620 \$MN_EULER_ANGLE_NAME_TAB),
Names for direction vectors (MD10640 \$MN_DIR_VECTOR_NAME_TAB),
Names for intermediate circle point coordinates for CIP (MD10660
\$MN_INTERMEDIATE_POINT_NAME_TAB) and the
Names for interpolation parameters (MD10650 \$MN_IPO_PARAM_NAME_TAB) coincide.
- The geometry axis name entered must not include any of the following reserved address letters:
- D Tool offset (D function) - E Reserved
- F Feedrate (F function) - G Path condition
- H Auxiliary function (H function) - L Subroutine call
- M Miscellaneous function (M function) - N Subblock
- P Subroutine number of passes - R Arithmetic parameters
- S Spindle speed (S function)
- T Tool (T function)
- The name must not include any keywords (e.g. DEF, SPOS etc.) or pre-defined identifiers (e.g. ASPLINE, SOFT).
- The use of an axis identifier consisting of a valid address letter (A, B, C, I, J, $K, ~ Q, ~ U, ~ V, ~ W, ~ X, ~ Y, ~ Z) ~ f o l l o w e d ~ b y ~ a n ~ o p t i o n a l ~ n u m e r i c a l ~ e x t e n s i o n ~(1-99) ~ g i v e s ~$ slightly better block change times than a general identifier.
- Identical names may be given to geometry axes assigned to different channels.

Related to:
MD10000 \$MN_AXCONF_MACHAX_NAME_TAB
(machine axis name [axis no.])
MD20080 \$MC_AXCONF_CHANAX_NAME_TAB
(channel axis name in the channel [channel axis no.])


## Description:

This MD is used to specify the machine axis which the channel axis/special axis is assigned to. Each channel axis has to be assigned to a specific channel. A machine axis that has not been assigned to a channel is inactive, i.e. the axis control is not computed, the axis is not shown on the screen, and it cannot be programmed in any channel.

From software version 5, a machine axis need not be assigned to a channel axis for reasons of uniform configuration. The MD for the machine axis is set to 0 in this case. At the same time, MD11640 \$MN_ENABLE_CHAN_AX_GAP must be set to 1 (channel axis gaps are permitted).
From software version 5, the machine data MD20070 \$MC_AXCONF_MACHAX_USED does not directly refer to the machine axes created with MD100 00 \$MN_ $\bar{A} X C O N F \quad \bar{M} A C H A X \_N A M E \_T A B$, but to the logical machine axis map which is defined with MD10002
\$MN_AXCONF_LOGIC_MACHAX_TAB.
MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB refers:

- directly to a local machine axis on the NCU,
- to a machine axis of another NCU in the NCU grouping or
- indirectly to an axis container with local or remote machine axes.

If the default values AX1, AX2, ..., AX31 are entered with MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB, then the NCK behaves in the same way as up to software version 4, this means that machine data MD20070 \$MC_AXCONF_MACHAX_USED refers to the corresponding local machine axis.

Special cases:

- Each geometry axis must be assigned to a channel axis and a machine axis so that it can be programmed.
- If a machine axis is assigned to several channels by means of MD20070 \$MC_AXCONF_MACHAX_USED, then the number of the channel from which the axis is to be programmed must be entered in MD30550 \$MA_AXCONF_ASSIGN_MASTER_CHAN.
- Up to software version 4, the list of entries must not contain any gaps (as from software version 5 - see above). In contrast, the assignment of the machine axes used may contain gaps.

For example:

```
Permissible:
AXCONF_MACHAX_USED [0] = 3; 3rd MA is the 1st axis in the channel
AXCONF_MACHAX_USED [1] = 1; 1st MA is the 2nd axis in the channel
AXCONF_MACHAX_USED [2] = 5; 5th MA is the 3rd axis in the channel
AXCONF_MACHAX_USED [3] = 0
Error for software version 4, permissible for version 5:
AXCONF_MACHAX_USED [0] = 1; 1st MA is the 1st axis in the channel
AXCONF_MACHAX_USED [1] = 2; 2nd MA is the 2nd axis in the channel
AXCONF_MACHAX_USED [2] = 0; gap in the list ...
AXCONF_MACHAX_USED [3] = 3; ... of the channel axes
Axis identifiers must be defined in the corresponding list places of
AXCONF CHANAX NAME TAB for the axes activated in the channel.
Related to:
MD30550 $MA_AXCONF_ASSIGN_MASTER_CHAN
MD20080 $MC_AXCONF_CHANAX_NAME_TAB
MD10002 $MN_AXCONF_LOGIC_MACHAX_TAB
MD11640 $MN_ENABLE_CHAN_AX_GAP
Reference:
Description of Functions B3.
```

| 20080 | AXCONF_CHANAX_NAME_TAB | C01, C11, C10 | F2, V2, M1, K2, V1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Channel axis name in channel | STRING | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 20 | X, Y, Z, A, B, C, U, <br> V, X11, Y11, X, Y, Z, <br> A, B, ... | - | 7/2 | M |

The name of the channel axis/special axis is entered in this MD. Normally the first three channel axes are assigned by the three assigned geometry axes
(see also MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB)
The remaining channel axes are also called special axes. The channel axis/special axis on the screen in the $W C S$ (workpiece coordinate system) is always displayed with the name entered in this MD.

Special cases:

- The specified channel axis name/special axis name must not conflict with the designation and assignment of the machine and geometry axis names or other identifiers.
Names for Euler angles (MD10620 \$MN_EULER_ANGLE_NAME_TAB),
Names for direction vectors (MD10640 \$MN_DIR_VECTOR_NAME_TAB),
Names for intermediate circle point coordinates for CIP (MD10660
\$MN_INTERMEDIATE_POINT_NAME_TAB)
and the names for interpolation parameters (MD10650 \$MN_IPO_PARAM_NAME_TAB) overlap.
- The channel axis name entered must not include any of the following reserved address letters:
- D Tool offset (D function)
- E Reserved
- F Feedrate (F function)
- G Path condition
- H Auxiliary function (H function)
- L Subroutine call
- M Miscellaneous function (M function)
- N Subblock
- P Subroutine number of passes
- R Arithmetic parameters
- S Spindle speed (S function)
- T Tool (T function)
- The name must not include any keywords (e.g. DEF, SPOS etc.) or pre-defined identifiers (e.g. ASPLINE, SOFT).
- The use of an axis identifier consisting of a valid address letter (A, B, C, I, J, $K, ~ Q, ~ U, ~ V, ~ W, ~ X, ~ Y, ~ Z) ~ f o l l o w e d ~ b y ~ a n ~ o p t i o n a l ~ n u m e r i c a l ~ e x t e n s i o n ~(1-99) ~ g i v e s ~$ slightly better block change times than a general identifier.
- No special names need be entered in this MD for channel axes to which geometry axes are assigned (normally the first three channel axes).

Axis identifiers that are not allowed are rejected with an alarm during runup.

| 20082 | AXCONF_CHANAX_DEFAULT_NAME |  | C01, C11, C10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Default axis name for axis variables in the channel |  | STRING | PowerOn |  |
| - |  |  |  |  |  |
| - | - - | - | - | 7/2 | M |

## Description:

Variables or parameters of type Axis which have not been initialized are initialized with a default axis identifier. The identifier can be configured via the machine data MD20082 \$MC_AXCONF_CHANAX_DEFAULT_NAME. If this machine data is set with an empty string, the lst geometry axis is used, as previously.
MD20082 \$MC_AXCONF_CHANAX_DEFAULT_NAME can be set by default with all available, valid axis identifiers. The value of this machine data should generally always correspond to a value of $\$ M D 20060$ \$MC_AXCONF_GEOAX_NAME_TAB, MD20080 \$MC_AXCONF_CHANAX_NAME_TAB or MD10000 \$MN_AXCONF_MACHAX_NAME_TAB.
If an invalid axis name is entered as a value or if this name has been changed, for example, in MD20080 \$MC_AXCONF_CHANAX_NAME_TAB but not in MD20082
\$MC_AXCONF_CHANAX_DEFAULT_NAME, then this is indicated with alarm 4041 channel \%1 block \%2 axis identifier \%3 is invalid".
Only valid axis identifiers, empty string and "NO_AXIS" may be entered in MD20082 \$MC_AXCONF_CHANAX_DEFAULT_NAME. "NO_AXIS" is used to indicate a non-initialized axis varíable, empty string means previous behavior, i.e. each variable is initialized with the 1st geometry axis.

| 20090 | SPIND_DEF_MASTER_SPIND |  |  |  |  |  | C01, C03 | H2, K1, K2, P3 pl, P3 sl, S1, W1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Initial setting of master spindle in channel |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 1 | 20 | M |  |  |  |

Description: Definition of the default setting for the master spindle (in the channel).
The number of the spindle is entered.
A number of functions are linked to the master spindle, which are not possible with any other spindle.
Note:
The language command SETMS(n) can declare the spindle number as the master spindle. The spindle defined in this MD is declared once again as the master spindle with SETMS. The spindle defined in this MD is also declared as the master spindle at program end and program cancelation.

\(\left.\begin{array}{|l|l|l|l|l|l|}\hline 20094 \& SPIND_RIGID_TAPPING_M_NR \& C01, C03, C10 \& H2, K1, S1 <br>
\hline- \& M function for switching into controlled axis mode \& DWORD \& PowerOn <br>
\hline- \& - \& \begin{array}{l}70,70,70,70,70,70, <br>

70,70 ···\end{array} \& - \& - \& 7 / 2\end{array}\right]\)| M |
| :--- |
| - |

Description: This machine data defines the $M$ auxiliary function number with which the spindle is switched into axis mode.

The M number defined in the machine data replaces M70 in Siemens mode.
Note:
On the VDI interface, M70 is always output with the corresponding address extension to indicate the switch to axis mode.
Restrictions: Refer to machine data MD10715 \$MN_M_NO_FCT_CYCLE
Related to:
MD10714 \$MN_M_NO_FCT_EOP,
MD10715 \$MN_M_NO_FCT_CYCLE,
MD20094 \$MC_SPIND_RIGID_TAPPING_M_NR,
MD22254 \$MC_AUXFU_ASSOC_M0_VALUE
MD10814 \$MN_EXTERN_M_NO_MAC_CYCLE,
MD10804 \$MN_EXTERN_M_NO_SET_INT
MD10806 \$MN_EXTERN_M_NO_DISABLE_INT,
MD10800 \$MN_EXTERN_CHAN_SYNC_M_NO_MIN,
MD10802 \$MN_EXTERN_CHAN_SYNC_M_NO_MAX
MD20095 \$MC_EXTERN_RIGID_TAPPING_M_NR
\$MD26008 \$MC_NIBBLE_PUNCH_CODE

| 20095 | EXTERN_RIGID_TAPPING_M_NR |  | $\begin{aligned} & \text { C01, C11, C03, } \\ & \text { C10 } \end{aligned}$ | H2, K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | M function for switching to controlled axis mode(external mode) |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 29,29,29,29,29,29, \\ & 29,29 \ldots \end{aligned}$ | - | - | $7 / 2$ | M |
| Description: | This machine data defines the M function number with which the switchover to controlled spindle/axis mode is to be carried out. <br> The M number defined in the machine data replaces M29 in external language mod |  |  |  |  |

```
Pre-defined M numbers, such as M00,M1,M2,M3, etc., are not allowed as M numbers.
Restrictions: See machine data MD10715 $MN_M_NO_FCT_CYCLE
Related to:
MD10714 $MN_M_NO_FCT_EOP,
MD10715 $MN_M_NO_FCT_CYCLE,
MD20094 $MC_SPIND_RIGID_TAPPING_M_NR,
MD22254 $MC_AUXFU_ASSOC_MO_VALUE
MD10814 $MN_EXTERN_M_NO_MAC_CYCLE,
MD10804 $MN_EXTERN_M_NO_SET_INT
MD10806 $MN_EXTERN_M_NO_DISABLE_INT,
MD10800 $MN_EXTERN_CHAN_SYNC_M_NO_MIN,
MD10802 $MN_EXTERN_CHAN_SYNC_M_NO_MAX
MD20095 $MC_EXTERN_RIGID_TAPPING_M_NR
MD26008 $MC_NIBBLE_PUNCH_CODE
```



## Description:

This MD is only significant if the functions 'Tool management'/'flat D numbers' are inactive.
FALSE
The contents of the address extensions of the $N C$ addresses $T$ and $M$ 'tool change command number' are not evaluated by the NCK. The PLC decides on the significance of the programmed extension.
TRUE
The address extensions of the $N C$ addresses $T$ and $M$ 'tool change command number' - 'tool change command number'=TOOL_CHANGE_M_CODE with 6 as the default value - are interpreted as spindle numbers.

NCK treats the extension in the same way as the active functions 'tool management' and 'flat D number management'.
That is, the programmed $D$ number always refers to the $T$ number of the programmed main spindle number.
See also:
MD20090 \$MC_SPIND_DEF_MASTER_SPIND,
MD22550 \$MC_TOOL_CHANGE_MODE,
MD22560 \$MC_TOOL_CHANGE_M_CODE

| 20098 | DISPLAY_AXIS |  |  | EXP, C01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Display axis on HMI |  |  | UDWORD | Imm |  |
| - |  |  |  |  |  |  |
| - | 20 | 0x7FFFFFFF, <br> $0 \times 7$ FFFFFFF, <br> 0x7FFFFFFF, <br> $0 \times 7$ FFFFFFF, <br> 0x7FFFFFFFF, 0x7... | 0 | 0x7FFFFFFF | 7/2 | M |

## Description:

Identifies whether the axis will be displayed by the HMI as a machine, geometry, or auxiliary axis.
This data is only evaluated by the HMI.

Bit 0 to 15: Machine (MCS)
Bit $0=1$ Machine - display machine axis in the actual value windows
0 Machine - hide machine axis in the actual value windows
Bit $1=1$ Machine - display machine axis in the reference point window
0 Machine - hide machine axis in the reference point window
Bit 2= 1 Machine - display machine axis in preset/scratch/parameter work offset windows
0 Machine - hide machine axis in preset/scratch/parameter work offset windows
Bit 3= 1 Machine - display machine axis in the handwheel selection window 0 Machine - hide machine axis in the handwheel selection window
(Bit 4) Not assigned
Bit 5= 1 Display spindle in the $T, F, S$ window
0 Hide spindle in the $T, F, S$ window
Bit 16 to 31: Work (WCS)
Bit $16=1$ Work - display geometry axis in the actual value windows 0 Work - hide geometry axis in the actual value windows
(Bit 17) Not assigned
Bit $18=1$ Work - display geometry axis in parameter work offset window
0 Work - hide geometry axis in parameter work offset window
Bit $19=1$ Work - display geometry axis in the handwheel selection window 0 Work - hide geometry axis in the handwheel selection window
Bit 20= 1 Work - display position axis in the position/straight line windows 0 Work - hide position axis in the position/straight line windows
(Bit 21) Not assigned

| 20100 | DIAMETER_AX_DEF | C01, C10 | H1, M5, P1, V1, W1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Geometry axis with transverse axis function |  |  |  |  |  | STRING | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | - | - | $7 / 2$ | M |  |  |  |

## Description:

This MD is used to define a geometry axis as a transverse axis. Only one transverse axis can be defined here for each channel.

Further transverse axes for axis-specific diameter programming can be activated via MD30460 \$MA_BASE_FUNCTION_MASK, bit 2.
The axis identifier of an active geometry axis that has been defined in the channelspecific MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB[n]
or MD24120 \$MC_TRAFO_AX_GEOAX_ASSIGN_TAB_1[n] (from SW 4) and
MD20060 \$MC_AXCONF_GEOAX_NAME_TAB[n] must be specified.
If space characters are entered or if an axis identifier is specified for an axis which is not defined as a geometry axis, this leads to the following alarms:

- during runup, to alarm 4032 "Channel \%1 wrong identifier for transverse axis in \%2", if the "Diameter programming" function (DIAMON) or constant cutting speed G96/G961/ G962 is the switch-on setting.
- when the "Diameter programming (DIAMON)" function is activated, to alarm 16510 "Channel \%1 block \%2 No transverse axis available for diameter programming", if no axis has been permitted via DIAMCHANA[AX] for channel-specific diameter programming.
- when G96/G961/G962 has been programmed, to alarm 10870 "Channel \%1 block \%2 No transverse axis defined as reference axis for $G 96 / G 961 / G 962 "$, if no geometry axis has been defined as the reference axis for G96/G961/G962 by the instruction SCC[ax]. Related to:
MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB[n]
MD20060 \$MC_AXCONF_GEOAX_NAME_TAB[n]
MD2 4120 \$MC_TRAFO_AX_GEOAX_ASSIGN_TAB_1[n]

MD30460 \$MA_BASE_FUNCTION_MASK

| 20105 | PROG_EVENT_IGN_REFP_LOCK | N01 | K1, Z1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Start Prog-Events despite non-referenced axes. | UDWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $\begin{array}{l}0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots\end{array}$ | 0 | $0 \times 3 F$ | $7 / 2$ |$]$| M |
| :--- |

## Description:

The behavior of event-driven program calls (prog-events) regarding non-referenced axes can be set.
Bit $0=1$ :
Prog-event ignores non-referenced axes after part program start
Bit $1=1$ :
Prog-event after part program end ignores non-referenced axes
Bit 2 = 1 :
Prog-event after operator panel reset ignores non-referenced axes
Bit $3=1$ :
Prog-event after power-up ignores non-referenced axes
Bit $4=1$ :
Prog-event after lst start after search ignores non-referenced axes
Bit $5=1$ :
Reserved
Corresponds with:
MD20106 \$MC_PROG_EVENT_IGN_SINGLEBLOCK
MD20107 \$MC_PROG_EVENT_IGN_INHIBIT
MD20108 \$MC_PROG_EVENT_MASK
MD20192 \$MC_PROG_EVENT_IGN_PROG_STATE
MD20193 \$MC_PROG_EVENT_IGN_STOP
The machine data MD20105 \$MC_PROG_EVENT_IGN_REFP_LOCK and MD20115
\$MC_IGNORE_REFP_LOCK_ASUP replace bit 1 from MD11602 \$MN_ASUP_START_MASK.
If MD20700 \$MC_REFP_NC_START_LOCK is equal to 0, the setting in MD20105
\$MC_PROG_EVENT_IGN_REFP_LOCK ${ }^{-}$is ignored, and non-referenced axes are always ignored.

| 20106 | PROG_EVENT_IGN_SINGLEBLOCK | N01 | K1, Z1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Prog-Events ignore single block | UDWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | $0 \times 3 F$ |  |

## Description:

Event-driven program calls (Prog-Events) can be set regarding their single-block response.
Bit $0=1$ :
Prog-Event after start-of-part-program causes block change without restart
Bit $1=1$ :
Prog-Event after end-of-part-program causes block change without restart
Bit $2=1$ :
Prog-Event after OP reset causes block change without restart
Bit $3=1$ :
Prog-Event after ramp-up causes block change without restart
Bit $4=1$ :
Prog-Event after lst start after search causes block change without restart Bit $5=1$ :

```
Safety Prog-Event during ramp-up causes block change without restart
Corresponds to:
MD20105 $MC_PROG_EVENT_IGN_REFP_LOCK
MD20107 $MC_PROG_EVENT_IGN_INHIBIT
MD20108 $MC_PROG_EVENT_MASK
MD20192 $MC_PROG_EVENT_IGN_PROG_STATE
MD20193 $MC_PROG_EVENT_IGN_STOP
```



| 20108 | PROG_EVENT_MASK | N01 | TE3, K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Setting of event-driven programm calls | UDWORD | PowerOn |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | $0 \times 3 F$ | $7 / 2$ |

Parameterization of the events with which the user program set with MD11620 \$MN_PROG_EVENT_NAME (default: _N_PROG_EVENT_SPF) is implicitly called.
Parameterization of the events causing the safety program _N_SAFE_SPF to be called implicitly:
Bit $0=1$ : Start of part program
Bit $1=1$ : End of part program
Bit 2 = 1 : Operator panel reset
Bit $3=1$ : Ramp-up
Bit 4 = 1 : Reserved
Bit 5 = 1 : Safety program booting
The user program is called via the following search path:

1. /_N_CUS_DIR/_N_PROG_EVENT_SPF
2. /_N_CMA_DIR/_N_PROG_EVENT_SPF
3. /_N_CST_DIR/_N_PROG_EVENT_SPF

The safety program has to be available in the following location:

1. /_N_CST_DIR/_N_SAFE_SPF

Furthermore, MD11450 \$MN_SEARCH_RUN_MODE bit 1 also causes the user program set with MD11620 \$MN_PROG_EVENT_NAME to be started up automatically after the action blocks, regardless of the settings in this machine data.
Related to:
MD20105 \$MC_PROG_EVENT_IGN_REFP_LOCK
MD20106 \$MC_PROG_EVENT_IGN_SINGLEBLOCK
MD20107 \$MC_PROG_EVENT_IGN_INHIBIT
MD20192 \$MC_PROG_EVENT_IGN_PROG_STATE
MD20193 \$MC_PROG_EVENT_IGN_STOP
Note:
The Siemens cycle package includes the cycle /_N_CST_DIR/_N_PROG_EVENT_SPF, that should be used by default to process the event-driven program calls. It contains subroutine calls for the particular manufacturer and end user applications (For details see the documentation "Standard cycle PROG-EVENT.SPF").

| 20109 | PROG_EVENT_MASK_PROPERTIES | N01 | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Properties of Prog-Events | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{array}{l}0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots\end{array}$ | 0 | $0 \times 1$ | $7 / 2$ |  |$]$| M |
| :--- |

Description: Parameterization of additional properties of the event-controlled program calls (in short, Prog-Event), that is, the MD20108 \$MC_PROG_EVENT_MASK is further parameterized. Bit $0=1$ :

An ASUB started from channel status RESET does not result in a Prog-Event.

| 20110 | RESET_MODE_MASK | C11, C03 | F2, K6, M3, TE4, W5, B3, K5, <br> M1, G2, K1, K2, P1, S1, W1, 2.4, <br> 2.7 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Definition of basic control settings after reset/PP end | UDWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 1,0 \times 1,0 \times 1,0 \times 1$, <br> $0 \times 1,0 \times 1,0 \times 1,0 \times 1 \ldots$ | 0 | $0 \times 17 F F F F$ |  |  |

## Description:

Definition of the initial setting of the control after ramp-up and at reset/end-of-part-program with regard to the $G$ codes (in particular the active plane and the settable work offset), tool length offset and transformation by setting the following bits:
Bit 0: Reset mode
Bit 1: Suppress aux. funct. output on tool selection
Bit 2: Select reset response after power-on (e.g. tool offset)
Bit 3: Select reset response after end of test mode with regard to active tool offsets.
Bit 4: Reserved
Bit 5: Reserved
Bit 6: Reset response "Active tool length offset"
Bit 7: Reset response "Active kinematic transformation"
Bit 8: Reset response "Coupled-motion axes"
Bit 9: Reset response "Tangential correction"
Bit 10: Reset response "Synchronous spindle"

Bit 11: Reset response "Revolutional feedrate"
Bit 12: Reset response "Geo axis replacement"
Bit 13: Reset response "Master value coupling"
Bit 14: Reset response "Basis frame"
Bit 15: Reset response "Electronic gearbox"
Bit 16: Reset response "Master spindle"
Bit 17: Reset response "Master toolholder"
Bit 18: Reset response "Reference axis for G96/G961/G962"
Bit 19: Reserved "Adjustable software limit switch ineffective"
Bit 20: Reset response "\$P_USEKT"
Bits 4 to 11,16 and 17 are only evaluated for bit $0=1$.
Meaning of the individual bits:
Bit $0(L S B)=0$ : corresponds to the behavior of $S W$ release 1 , is only recommended for test mode

Initial setting after ramp-up:

- G codes according to MD20150 \$MC_GCODE_RESET_VALUES
- Tool length offset not active
- Transformation not active
- No coupled-motion axis groupings active
- No tangential correction active
- No axial revolutional feedrate active
- Path revolutional feedrate with master spindle (default))

Initial setting after reset or end of part program:
The current settings are retained.
When next part program is started, the following initial setting is effective:

- G codes according to MD20150 \$MC_GCODE_RESET_VALUES
- Tool length offset not active
- Transformation not active
- No coupled-motion axis groupings active
- No tangential correction active
- No master value coupling active
- No axial revolutional feedrate active
- Path revolutional feedrate with master spindle (default)

Bit $0(L S B)=1:$ Standard value for Powerline and Solutionline systems Initial setting after startup:

- G codes acc. to MD20150 \$MC_GCODE_RESET_VALUES
- Tool length offset active acc. to MD20120 \$MC_TOOL_RESET_VALUE, MD20130
\$MC_CUTTING_EDGE_RESET_VALUE, and MD20132 \$MC_SUMCORR_RESET_VALUE
- Transformation active acc. to MD20140 \$MC_TRAFO_RESET_VALUE
- Geometry axis replacement acc. to MD20118 \$MC_GEOAX_CHANGE_RESET
- No coupled-motion axis groupings active
- No tangential correction active

Initial setting after reset or end of part program:
Depending on MD20152 \$MC_GCODE_RESET_MODE, the current settings are retained for the G groups or the initial settings stored in MD20150\$MC_GCODE_RESET_VALUES are set.
Initial setting after reset or end of part program
Depending on MD20110 \$MC_RESET_MODE_MASK bits 6 to 7, for

- Tool length offset
- Transformation
either the current settings are retained or the initial settings saved in the MDs are set.

Depending on bits 8 and 9, the current settings of coupled-motion axes or tangentially corrected axes are either deactivated or retained.

Configured synchronous spindle coupling:
The coupling is deselected depending on the setting in MD21330 \$MC COUPLE RESET MODE 1. Non-configured synchronous spindle coupling:

Depending on bit 10, the coupling is either deactivated or retained.
Depending on bit 14, the basic frame is either retained or deselected.
Bit $1=0$ :
Auxiliary function output (D,T,M) at the PLC for tool selection corresponding to machine data

MD20120 \$MC_TOOL_RESET_VALUE
MD20130 \$MC_CUTTING_EDGE_RESET_VALUE
MD20121 \$MC_TOOL_PRESEL_RESET_VALUE
MD22550 \$MC_TOOL_CHANGE_MODE
When magazine management is active, $T$, $M$ are not output as auxiliary functions.
The function uses its own communication to output $T, M$ to the PLC, for example.
Bit $1=1$ :
Suppress aux. funct. output to PLC on tool selection.
If tool management or magazine management is active, $T, M$ are never output as auxiliary functions.
Bit $2=0$ :
If tool or magazine management is not active:

- No tool offset active after power-on. Active and programmed $T$ depend on the subsequent settings of the machine data (bits 0, 6).

If tool or magazine management is active:

- No meaning.

Bit $2=1$ :
If tool or magazine management is not active:

- If bits 0 and 6 both $=1$ ( $0 \times 41$ ), the tool offset of the last tool active in the NCK is active after the first reset after power-on.
(The value of the programmed tool depends on the value of machine data MD20121
\$MC_TOOL_PRESEL_RESET_VALUE.)
Notice: The NCK does not know the conditions at the machine.
For active tool or magazine management:
- No meaning

Bit $3=0$ :
With and without active tool management:

- End of test mode: "Retain current setting for active tool length offset" (bits 0 and 6 set) refers to the program that was active before test mode was activated.
Bit 3 = 1:
Relevant only if tool management is not active:
- End of test mode: "Retain current setting for active tool length offset" (bits 0 and 6 set) refers to the program that was active when test mode ended. (If tool management is active, the tool on the spindle is generally the active tool. Exception only for MD20270 \$MC_CUTTING_EDGE_DEFAULT = -2.)
Bit $4=0: \quad$ Reserved
Bit 4 = 1: Reserved
Bit $5=0: \quad$ Reserved
Bit 5 = 1: Reserved

Bit $6=0$ :
Initial setting for active tool length offset after reset/end of part program acc. to MD20120 \$MC_TOOL_RESET_VALUE, MD20130 \$MC_CUTTING_EDGE_RESET_VALUE, MD20123\$MC_USEKT_RESET_VALUE and MD20132 \$MC_SUMCORR_RESET_VALUE.
If MD22550 \$MC_TOOL_CHANGE_MODE = 1, the tool specified in MD20121
\$MC_TOOL_PRESEL_RESET_VALUE is additionally preselected.
If tool or magazine management is active, MD20122 \$MC_TOOL_RESET_NAME is used instead of data MD20120 \$MC_TOOL_RESET_VALUE.
Bit 6 = 1:
The current setting for active tool length offset is retained after reset/end of part program.
If tool or magazine management is active, the tool currently on the master spindle (generally $=$ master toolholder) is selected.
If the tool on the master spindle is disabled, the "disabled" status is ignored. Please note that after a program ends or is terminated, either the most recent value for master spindle or master toolholder programmed in the program, or the value set in MD20090 \$MC_SPIND_DEF_MASTER_SPIND or MD20124 \$MC_TOOL_MANAGEMENT_TOOLHOLDER defines the master spindle or master toolholder.
(The selection is made in bit 16 or bit 17.)
For MD20270 \$MC_CUTTING_EDGE_DEFAULT = -2, the following applies specifically:
If a tool has been loaded into the spindle, but a new offset $D$ has not yet been programmed, the previous tool is still active in the NCK.
If machining is canceled in this status (e.g. with the Reset key), the offset is defined with the smallest $D$ number of the master spindle tool.
Bit $7=0$ :
Initial setting for active transformation after reset/end of part program according to MD20140 \$MC_TRAFO_RESET_VALUE.
Bit $7=1$ :
The current setting for active transformation is retained after reset/end of part program.
Bit $8=0$ :
Coupled-motion axis groups are ungrouped at reset/end of part program.
Bit $8=1$ :
Coupled-motion axis groups remain active after reset/end of part program.
Bit $9=0$ :
Tangential correction is deactivated at reset/end of part program.
Bit 9 = 1 :
Tangential correction remains active after reset/end of part program.
Bit $10=0$ :
Non-configured synchronous spindle coupling is deactivated at reset/end of part program.
Bit $10=1$ :
Non-configured synchronous spindle coupling remains active after reset/end of part program.
Bit $11=0$ :
At reset/end of part program, the setting data SD43300 \$SA_ASSIGN_FEED_PER_REV_SOURCE is reset to 0 for all non-active axes/spindles, i.e. traversing at revolutional feedrate is canceled and the setting for path and synchronous axes is reset to the master spindle (default).
Bit $11=1$ :

The current setting for revolutional feedrate is retained after reset/end of part program. At the start of the part program, the setting data SD43300 \$SA_ASSIGN_FEED_PER_REV_SOURCE is reset to 0 for all non-active axes/spindles, i.e. traversing at revolutional feedrate is canceled and the setting for path and synchronous axes is reset to the master spindle (default).
Bit $12=0$ :
If machine data MD20118 \$MC_GEOAX_CHANGE_RESET is set, a changed geometry axis assignment is canceled at reset/end of part program. The initial setting for the geometry axis assignment defined in the machine data becomes active.
Bit 12 = 1:
A changed geometry axis assignment remains active after reset/end of part program.
Bit $13=0$ :
Master value couplings are canceled at reset/end of part program.
Bit 13 = 1:
Master value couplings remain active after reset/end of part program.
Bit $14=0$ :
The basic frame is deselected.
Bit 14 = 1:
The current setting of the basic frame is retained.
Bit $15=0$ :
Active electronic gearboxes remain active at reset/end of part program.
Bit 15 = 1:
Active electronic gearboxes are canceled at reset/end of part program.
Bit $16=0$ :
Initial setting for the master spindle according to MD20090 \$MC_SPIND_DEF_MASTER_SPIND.
Bit $16=1$ :
The current setting of the master spindle (SETMS) is retained.
For MD20124 \$MC_TOOL_MANAGEMENT_TOOLHOLDER = 0, this bit also influences the behavior of bit 6.

Bit $17=0$ :
Initial setting for the master toolholder according to MD20124
\$MC_TOOL_MANAGEMENT_TOOLHOLDER.
Bit 17 = 1:
The current setting of the master toolholder (SETMTH) is retained.
(Bit17 is only relevant for active tool or magazine management MD20124
\$MC TOOL MANAGEMENT TOOLHOLDER $>0$. Otherwise, the setting is valid for master spindle bit 16, for active tool or magazine management. This bit also influences the behavior of bit6.)

Bit $18=0$ :
Reference axis for G96/G961/G962 acc. to MD 20100: \$MC_DIAMETER_AX_DEF.
When using SCC for your own spindle reset, bit 18 = 1 is recommended (see also MD 20112 \$MC_START_MODE_MASK, bit 18).
Bit $18=1$ :
Reference axis for G96/G961/G962 is retained.
Bit 19: Reserved!
Bit 19= 0:
The two adjustable software limit switches are deleted after reset and are no longer effective.

Bit 19 = 1 :
The two adjustable software limit switches remain active after reset.
Bit 20: Reset response for \$P_USEKT (use kind of tool)
Bit 20=0:

```
    After the RESET, $P_USEKT is set to $MC_USEKT_RESET_VALUE (default=0).
Bit 20 = 1:
    On RESET, $P_USEKT is retained.
Related to:
MD20120 $MC TOOL RESET VALUE
MD20130 $MC CUTTING EDGE RESET VALUE
MD20150 $MC GCODE RESET VALUES
MD20152 $MC_GCODE_RESET_MODE
MD20140 $MC_TRAFO_RESET_VALUE
MD20112 $MC_START_MODE_MASK
MD20121 $MC_TOOL_PRESEL_RESET_VALUE
MD20118 $MC_GEOAX_CHANGE_RESET
MD20123 $MC_USEKT_RESET_VALUE
```



## Description:



The bits 8 (TRAIL), 10 (COUP), bit 13 (LEAD) and bit 15 EG) are evaluated only on part program start

Bit $1=0$ :
Auxiliary function output ( $D, T, M, D L$ ) to PLC on tool selection according to the following MDs: MD20120 \$MC TOOL RESET VALUE, MD20130 \$MC CUTTING EDGE RESET VALUE, MD20121 \$MC_TOOL_PRESEL_RESET_VALUE, and MD22550 \$MC_TOOL_CHANGE_MODE.
Note:
If tool or magazine management is active, only auxiliary functions $D$ and DL are output.

Bit 1 = 1:
Suppress auxiliary function output to PLC on tool selection.
Bit 1 is not relevant if tool or magazine management is active.
Bit 2 : Reserved (reset response after power-on)
Bit 3 : Reserved (end of test mode)
Bit $4=0$ :
The current setting for $G$ code "current plane" is retained.
Bit 4 = 1:
Initial setting for $G$ code "current plane" according to MD20150 \$MC GCODE RESET VALUES
Bit $5=0$ :
The current setting for $G$ code "settable work offset" is retained.
Bit 5 = 1:
Initial setting for $G$ code "settable work offset" according to MD20150 \$MC_GCODE_RESET_VALUES

Bit $6=0$ :
The current setting for active tool length offset is retained.
If tool or magazine management is active, the tool currently on the active toolholder (spindle) is always selected.
If the tool that is currently on the spindle is disabled, it is automatically replaced by a suitable replacement tool.
If such a replacement tool does not exist, an alarm is output.
Bit $6=1$ :
Initial setting for active tool length offset according to MD20120
\$MC TOOL RESET VALUE, MD20130 \$MC CUTTING EDGE RESET VALUE, MD20123
\$MC_USEKT_RESET_VALUE, and MD2013 $\overline{2}$ \$MC_SUMCORR_RESET_VALUE.
If MD22550 \$MC_TOOL_CHANGE_MODE = 1, the tool selected via MD20121
\$MC_TOOL_PRESEL_RESET_VALUE is preselected in addition.
If tool or magazine management is active, MD20120 \$MC_TOOL_RESET_NAME is used instead of MD20122 \$MC_TOOL_RESET_VALUE.

Bit $7=0$ :
The current setting for the active transformation is retained.
Bit 7 = 1 :
Initial setting for active transformation after reset/end of part program according to MD20140 \$MC_TRAFO_RESET_VALUE

Bit $8=0$ :
Coupled-motion axis groupings remain active.
Bit 8 = 1:
Coupled-motion axis groupings are deactivated.
Bit 9 = 0 :
Tangential correction remains active.
Bit $9=1$ :
Tangential correction is deactivated.

```
Bit 10 = 0:
Non-configured synchronous spindle coupling remains active.
Bit 10 = 1:
Non-configured synchronous spindle coupling is deactivated.
Bit 11 : Reserved (revolutional feedrate)
Bit 12 = 0:
A changed geometry axis assignment remains active when the part program starts.
Bit 12 = 1:
If machine data MD20118 $MC_GEOAX_CHANGE_RESET is set, a changed geometry axis
assignment is deleted when the parrt program starts.
Bit 13 = 0:
Master value couplings remain active.
Bit 13 = 1:
Master value couplings are deactivated.
Bit 14 : Reserved (basic frame)
Bit 15 = 0:
Active electronic gearboxes remain active.
Bit 15 = 1:
Active electronic gearboxes are deactivated.
Bit 16 = 0:
The current setting of the master spindle (SETMS) is retained.
Bit 16 = 1:
Initial setting for the master spindle according to MD20090 $MC_SPIND_DEF_MASTER_SPIND
Bit 17 = 0:
The current setting of the master toolholder (SETMTH) is retained (relevant only if
tool or magazine management is active)
Bit 17 = 1:
Only if MD20124 $MC_TOOL_MANAGEMENT_TOOLHOLDER> 0: Initial setting for the master
toolholder according to MD20124 $MC_TOOL_MANAGEMENT_TOOLHOLDER.
Otherwise, the setting for the master spindle applies.
Bit 18 = 0:
Reference axis for G96/G961/G962 according to MD20100 $MC_DIAMETER_AX_DEF.
When using SCC with its own spindle reset, setting bit 18 = 1 is recommended (see also
MD20110: $MC_RESET_MODE_MASK, bit 18).
Bit 18 = 1:
Reference axis for G96/G961/G962 is retained.
Related to:
MD20120 $MC_TOOL_RESET_VALUE
MD20130 $MC_CUTTING_EDGE_RESET_VALUE
MD20150 $MC_GCODE_RESET_VALUES
MD20152 $MC_GCODE_RESET_MODE
MD20140 $MC_TRAFO_RESET_VALUE
MD20110 $MC_RESET_MODE_MASK
MD20121 $MC_TOOL_PRESEL_RESET_VALUE
MD20118 $MC_GEOAX_CHANGE_RESET
```

| 20114 | MODESWITCH_MASK |  |  |  | C03 |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | K1 |  |  |  |  |  |
| - | - | UDWORD | Reset |  |  |  |
| - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | $0 \times F F F F$ | $7 / 2$ | M |  |

Description:
After program interruption in MDI mode (e.g. in order to carry out a measurement on the workpiece and to correct the tool wear values or after tool breakage) the tool can be manually withdrawn from the contour by changing into JOG mode.
In this case, the control stores the coordinates of the position of the interruption and indicates the path differences traversed by the axes in JOG mode as "Repos offset". When MDI mode is selected again, the axis is repositioned on the contour. This response can be canceled by means of this machine data.
Bit $0(L S B)=0$ :
When MDI (JOG, JOGREF, JOGREPOS, MDIREF and MDIREPOS) are deselected in stopped status, the system ASUB Repos is selected.
Bit $0(L S B)=1$ :
When MDI (JOG, JOGREF, JOGREPOS, MDIREF and MDIREPOS) are deselected in stopped status, the system ASUB Repos is not selected.
Bit 1 (LSB) $=0$ :
If the NCK stops at a part program block in the program execution in which repositioning is not possible, alarm 16916 is generated if an attempt is made to switch to manual mode.
Bit 1 (LSB) $=1$ :
If the NCK stops at a part program block in the program execution in which repositioning is not possible, no alarm is generated if an attempt is made to switch to manual mode.

| 20115 | IGNORE_REFP_LOCK_ASUP | C01 | K1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Process interrupt program despite non-referenced axes | UDWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 200,0 \times 200,0 \times 200$, <br> $0 \times 200,0 \times 200,0 \times 200$, <br> $0 \times 200,0 \times 200 .$. | 0 | $0 \times 7 F F F F F F F$ |  |  |

Description:
Despite non-referenced axes, the assigned ASUB with the set bit is processed for the interrupt.
Bit $0=1$ : Enable interrupt 1 (user interrupt)
Bit 1 = 1: Enable interrupt 2 (user interrupt)

Bit 7 = 1: Enable interrupt 8 (user interrupt)
Bit 8 = 1: Enable interrupt 9 (system interrupt, reserved)
Bit 9 = 1: Enable interrupt 10 (system interrupt, reserved)
Bit $10=1$ : Enable interrupt 11 (system interrupt, reserved)

Bit 31 = 1: Enable interrupt 32 (system interrupt, reserved)
Notice
System interrupts can start system ASUBs with traversing motions
Notes

1. Replace following machine data MD11602 \$MN_ASUP_START_MASK, bit1.

- MD20105 \$MC_PROG_EVENT_IGN_REFP_LOCK
- MD20115 \$MC_IGNORE_REFP_LOCK_ASUP

```
2. If MD20700 $MC_REFP_NC_START_LOCK == 0, the setting in MD20105
$MC_PROG_EVENT_IGN_REFP_LOCK will be ignored, and non-referenced axes will be ignored.
Related to:
MD11602 $MN_ASUP_START_MASK
MD20116 $MC_IGNORE_INHIBIT_ASUP
MD20117 $MC_IGNORE_SINGLEBLOCK_ASUP
MD20191 $MC_IGN_PROG_STATE_ASUP
MD20194 $MC_IGNORE_NONCSTART_ASUP
```

| 20116 | IGNORE_INHIBIT_ASUP | C01 | K1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Execute interrupt program despite read-in disable | UDWORD | NEW CONF |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7 F F F F F F F$ |  |  |

Description:
The assigned ASUB with the set bit is executed in spite of read-in disable being set.
Bit 0 = 1: Enable interrupt 1 (user interrupt)
Bit 1 = 1: Enable interrupt 2 (user interrupt)
..
Bit 7 = 1: Enable interrupt 8 (user interrupt)
Bit 8 = 1: Enable interrupt 9 (system interrupt, reserved)
Bit 9 = 1: Enable interrupt 10 (system interrupt, reserved)
Bit 10 = 1: Enable interrupt 11 (system interrupt, reserved)
..
Bit 31 = 1: Enable interrupt 32 (system interrupt, reserved)
NOTICE:
System ASUBs started by system interrupts may contain traversing motions.
Related to:
MD11602 \$MN_ASUP_START_MASK
MD20115 \$MC_IGNORE_REFP_LOCK_ASUP
MD20117 \$MC_IGNORE_SINGLEBLOCK_ASUP
MD20191 \$MC_IGN_PROG_STATE_ASUP
MD20194 \$MC_IGNORE_NONCSTART_ASUP


```
Note:
The machine data is only active with single block SBL1.
Related to:
MD11602 $MN_ASUP_START_MASK
MD20115 $MC_IGNORE_REFP_LOCK_ASUP
MD20116 $MC_IGNORE_INHIBIT_ASUP
MD20191 $MC_IGN_PROG_STATE_ASUP
MD20194 $MC_IGNORE_NONCSTART_ASUP
```

| 20118 | GEOAX_CHANGE_RESET |  |  |  |  |  |  | C03 | M1, K1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Enable automatic geometry axis change | BOOLEAN | Reset |  |  |  |  |  |  |
| - | - | $\begin{array}{l}\text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE... }\end{array}$ | 0 | - | $7 / 2$ |  |  |  |  |$]$| M |
| :--- |
| - |

Description:
0: The current configuration of the geometry axes remains unchanged on reset and part program start. With this setting, the response is identical to that with older software versions without geometry axis replacement.
1: The configuration of the geometry axes remains unchanged on reset or part program end, depending on MD20110 \$MC_RESET_MODE_MASK and, on part program start, depending on MD20112 \$MC_START_MODE_MASK, or is switched to the initial state defined by MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB.
Related to:
MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK


Description: Definition of the tool for which tool length compensation is selected during runup or on reset or part program end as a function of MD20110 \$MC_RESET_MODE_MASK, and on part program start as a function of MD20112 \$MC_START_MODE_MASK
Related to:
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK

| 20121 | TOOL_PRESEL_RESET_VALUE | C03 | K1, W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Preselected tool on RESET | DWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32000 | $7 / 2$ |  |$]$ M $\quad$.

Description: Definition of the preselected tool in MD20310 \$MC_TOOL_MANAGEMENT_MASK=1.
A tool is selected after runup, or on reset or part program end as a function of MD20110 \$MC_RESET_MODE_MASK, and on part program start as a function of MD20112
\$MC_START_MODE_MASK.
This MD is valid only without tool management.
Related to:
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK


| 20123 | USEKT_RESET_VALUE | C03 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Preselected value of \$P_USEKT on RESET | DWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 x F$ | $7 / 2$ |  |$]$ M

Description: The system variable \$P_USEKT is set with the value of this MD:

- after run-up:

As a function of MD20112 \$MC_START_MODE_MASK

- after RESET or part program end:

As a function of MD20110 \$MC_RESET_MODE_MASK
Related to:
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK

| 20124 | TOOL_MANAGEMENT_TOOLHOLDER |  |  | C03 | H2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Tool holder number |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 20 | 7/2 | M |

Description:
This MD is only relevant with tool management active.
The TM must know on which tool holder a tool has to be loaded.
The data is only evaluated if the value is greater than zero.
Then, the numbers \$TC_MPP5 are no longer regarded as spindle numbers but as tool holder numbers.
The automatic address extension of $T$ and $M=6$ is then the value of this machine data, and no longer the value of MD20090 \$MC_SPIND_DEF_MASTER_SPIND.
The MD defines the master tool holder number to which a tool preparation or a tool change refers.

Reference is also made to this value for the determination of the tool on the tool holder for the setting 'retain old offset' of MD20110 \$MC_RESET_MODE_MASK.
If a machine has several tool holders but no defined master spindle, then the MD serves as a default value for determining the tool holder on which the tool is to be loaded during a tool change (reset, start, T='identifier', M6).
When defining the magazine locations of internal magazines (see documentation for $T M$ ), locations of the type 'SPINDLE' - \$TC_MPP1=2 = spindle location can be given a 'location kind index' (\$TC_MPP5). This assigns the location to a specific tool holder.

The tool holder with the number $n$ can be declared the master tool holder with the language command SETMTH(n). That is, the offsets of a tool, which is loaded in a provisional buffer storage location of the type 'SPINDLE', correct the tool path with the value \$TC_MPP5=n.
Tool changes on 'SPINDLE' locations with \$TC_MPP5 unequal to the number of the master tool holder do not influence the path.

The tool holder defined in the $M D$ is again declared as the master tool holder with SETMTH.

```
Related to:
MD20110 $MC_RESET_MODE_MASK,
MD20112 $MC_START_MODE_MASK
MD20122 $MC_TOOL_RESET_NAME
MD20130 $MC_CUTTING_EDGE_RESET_VALUE
References:
Description of Functions: Coordinate Systems (K2)
```

| 20125 | CUTMOD_ERR |  |  |  |  |  | C08 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Error handling for function CUTMOD | UDWORD | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7 F F F F F F F$ | $7 / 7$ |  |  |  |

## Description:

When function CUTMOD becomes active (through explicit call or tool selection), various error conditions may occur. For any of these error conditions it is possible to use this machine data to set whether the error shall trigger an alarm and, if so, whether such an alarm shall only be displayed (warning) or whether the interpretation of the part program shall be canceled.
Two machine data bits are assigned to each error condition (also see the description of alarm 14162).

The 2nd bit, which can be used in the case of an error to set that the part program interpretation should be interrupted, is only effective, if the associated lst bit (display) of an alarm is also set.

Bit Hex. Meaning
Value


| 20126 | TOOL_CARRIER_RESET_VALUE |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
|  |  |  |  |  |  |  |
| - | Active tool holder on RESET | C03 | W1 |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | - | Reset |  |

Description: Definition of the tool holder for which tool length compensation is selected during runup or on reset or part program end as a function of MD20110 \$MC_RESET_MODE_MASK and as a function of MD20112 \$MC_START_MODE_MASK on part program start.
This data is valid without tool management.
Related to:
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK

| 20127 | CUTMOD_INIT |  |  |  |  | C08 | K1, W1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Initialize CUTMOD after power ON | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | -2 | 999999999 |  |  |  |

Description:

The value programmable with NC command CUTMOD is initialized automatically on power ON with the value stored in this machine data. If the value of the machine data equals -2, CUTMOD will be set to the value included in MD20126 \$MC_TOOL_CARRIER_VALUE.

| 20128 | COLLECT_TOOL_CHANGE |  |  |  |  |  | C04 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Tool change commands to PLC after search run |  |  |  |  |  | DWORD | PowerOn |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | - | - | $1 / 1$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

## Description:

This MD is only relevant with active magazine management (MD18080
\$MN_MM_TOOL_MANAGEMENT_MASK, MD20310 \$MC_TOOL_MANAGEMENT_MASK).
It defines whether or not tool change commands, tool preparation commands (tool change commands in general) are output to the PLC after block search with calculation.

1: Tool change commands, tool preparation commands are collected and, after reaching the search target, output to the PLC with program start.
0: All tool/magazine-specific commands that have been collected during the block search are not output to the PLC with the subsequent program start! This means that programmed POSM, TCI, TCA commands are not output either.
Note 1:
Without active magazine management, the tool change $M$ code is not collected if it is not assigned to an auxiliary function group. With active magazine management, this corresponds to MD value $=0$.

Note 2:
Value $=0$ is appropriate if, for example, after reaching of the search target, the collected tool change commands are output to the PLC in an ASUB by means of the GETSELT, GETEXET commands.
Related to:
MD22560 \$MC_TOOL_CHANGE_M_CODE


With active tool management and with bit 0 and bit 6 set in MD20110 \$MC_RESET_MODE_MASK at selection, the last offset of the tool active at power OFF - as a rule the tool on the spindle - is effective after runup.
Related to:
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK

| 20132 | SUMCORR_RESET_VALUE |  |  |  |  |  | C03 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Effective resulting offset on RESET | DWORD | Reset |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 6 | $7 / 2$ |  |  |  |

Description: Definition of the total offset with which the tool length compensation is selected in the runup and on reset or part program end as a function of MD20110 \$MC_RESET_MODE_MASK and as a function of MD20112 \$MC_START_MODE_MASK on part program start.
MD18110 \$MN_MM_MAX_SUMCORR_PER_CUTTEDGE determines the maximum useful value which can be entered.

| 20140 | TRAFO_RESET_VALUE | C03 | F2, TE4, M1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Transformation data block selected during runup (reset/pp end) | BYTE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 20 |  |  |

Description: Definition of the transformation data block which is selected during runup and on
reset or part program end as a function of MD20110 \$MC_RESET_MODE_MASK, and as a
function of MD20112 \$MC_START_MODE_MASK on part program start.
Related to:
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK

| 20142 | TRAFO_RESET_NAME | C03 | K1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Transformation during power up (reset/part program end ) |  |  |  |  |  | STRING | Reset |
| - |  |  |  |  |  |  |  |  |
| - | - | - | - | - | M |  |  |  |

## Description:

Specifies the name of a transformation (\$NT_NAME[n]) defined with the aid of kinematic chains, which is selected during power on or on reset/part program end as a function of MD 20110: \$MC_RESET_MODE_MASK and, on part program start, as a function of MD 20112: \$MC_START_MODE_MASK.
If this machine data is not empty, machine data MD20140 \$MC_TRAFO_RESET_VALUE is
ignored. This means that MD20142 \$MC_TRAFO_RESET_NAME has priority over MD20140
\$MC_TRAFO_RESET_VALUE.
Not relevant:
MD20110 \$MC_RESET_MODE_MASK, bit $0=0$

| 20144 | TRAFO_MODE_MASK |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Function selection of kinematic transformation | UBYTE | Reset |  |  |  |  |  |
| - | - | $\begin{array}{l}0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots\end{array}$ | 0 | $0 \times 03$ | $7 / 2$ |  |  |  |$]$| M |
| :--- |
| - |

Description:
The specific functionality of the kinematic transformation is selected by setting the following bits:
Bit $0=0$ :
Default behavior.
Bit $0=1$ :

The transformation as defined in MD20140 \$MC_TRAFO_RESET_VALUE is persistent. That is, it is also selected with TRAFOOF and not shown in the display. This requires that the transformation defined in MD20140 \$MC_TRAFO_RESET_VALUE is selected automatically after RESET and START via MD20110 \$MC_RESET_MODE_MASK and MD20112 \$MC_START_MODE_MASK. This means that:

```
MD20110 $MC_RESET_MODE_MASK bit 0 = 1 and bit 7 = 0,
```

MD20112 \$MC_START_MODE_MASK bit $7=1$
MD20118 \$MC_GEOAX_CHANGE_RESET = TRUE
Bit $1=0$ :
Default behavior.
Bit $1=1$ :

The last active transformation is selected again after control power on. MD20110 \$MC_RESET_MODE_MASK Bit $0=1$ and Bit $7=1$ also have to be set.

| 20147 | ZERO_CHAIN_ELEM_NAME |  |  |  |  |  |  | EXP, N01 | K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Name of the kinematic chain element for defining the machine zero <br> point | STRING | Reset |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | - | - | - | M |  |  |  |  |

Description:
Specifies the name of a kinematic chain element that defines the machine zero point. This zero point is required, for example, to specify the position of a workpiece defined by the language command WORKPIECE, if its position is not specified relative to a kinematic chain in the language command itself.

| 20150 | GCODE_RESET_VALUES |  |  | C11, C03 |  | M5, K1, K2, P1, |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Initial setting of G groups |  |  | BYTE | Reset |  |
| - |  |  |  |  |  |  |
| - | 70 | $\begin{aligned} & 2,0,0,1,0,1,1,1,0, \\ & 1,0,1,2,1,2,1,1,1, \\ & 1,1,1,, \ldots \end{aligned}$ | 0 | - | 7/2 | M |

Description:
Definition of the G codes, which are active when powering up and reset and/or end of
part program depending on MD20152 \$MC_GCODE_RESET_MODE and for the start of part program depending on MD20112 \$MC_START_MODE_MASK.
The index of the $G$ codes in the respective groups must be programmed as the default value.

For a list of the $G$ groups and their $G$ functions, please refer to References:
Programming Manual, Fundamentals
Designation Group Standard value for 840D

GCODE_RESET_VALUES[0] $1 \quad 2$ (G1)
GCODE_RESET_VALUES[1] 20 (inactive)
GCODE_RESET_VALUES[2] 30 (inactive)
GCODE_RESET_VALUES[3] 4 (STARTFIFO)
GCODE_RESET_VALUES[4] 5 (inactive)
GCODE_RESET_VALUES[5] $6 \quad 1$ (G17)
GCODE_RESET_VALUES[6] 7 (G40)
GCODE_RESET_VALUES [7] $8 \quad 1$ (G500)
GCODE_RESET_VALUES[8] 9 (inactive)
GCODE_RESET_VALUES[9] 10 (G60)
GCODE_RESET_VALUES[10] 110 (inactive)
GCODE_RESET_VALUES[11] 121 (G601)
GCODE_RESET_VALUES[12] 13 (G71)

| GCODE_RESET_VALUES [13] | 14 | 1 | (G90) |
| :---: | :---: | :---: | :---: |
| GCODE_RESET_VALUES[14] | 15 | 1 | (G94) |
| GCODE_RESET_VALUES [15] | 16 | 1 | (CFC) |
| GCODE_RESET_VALUES[16] | 17 | 1 | (NORM) |
| GCODE_RESET_VALUES[17] | 18 | 1 | (G450) |
| GCODE_RESET_VALUES[18] | 19 | 1 | (BNAT) |
| GCODE_RESET_VALUES [19] | 20 | 1 | (ENAT) |
| GCODE_RESET_VALUES [20] | 21 | 1 | (BRISK) |
| GCODE_RESET_VALUES [21] | 22 | 1 | (CUT2D) |
| GCODE_RESET_VALUES [22] | 23 | 1 | (CDOF) |
| GCODE_RESET_VALUES [23] | 24 | 1 | (FFWOF) |
| GCODE_RESET_VALUES[24] | 25 | 1 | (ORIWKS) |
| GCODE_RESET_VALUES [25] | 26 | 2 | (RMI) |
| GCODE_RESET_VALUES [26] | 27 | 1 | (ORIC) |
| GCODE_RESET_VALUES [27] | 28 | 1 | (WALIMON) |
| GCODE_RESET_VALUES [28] | 29 | 1 | (DIAMOF) |
| GCODE_RESET_VALUES [29] | 30 | 1 | (COMPOF) |
| GCODE_RESET_VALUES [30] | 31 | 1 | (inaktiv) |
| GCODE_RESET_VALUES [31] | 32 | 1 | (inactive) |
| GCODE_RESET_VALUES [32] | 33 | 1 | (FTOCOF) |
| GCODE_RESET_VALUES [33] | 34 | 1 | (OSOF) |
| GCODE_RESET_VALUES [34] | 35 | 1 | (SPOF) |
| GCODE_RESET_VALUES [35] | 36 | 1 | (PDELAYON) |
| GCODE_RESET_VALUES [36] | 37 | 1 | (FNORM) |
| GCODE_RESET_VALUES [37] | 38 | 1 | (SPIF1) |
| GCODE_RESET_VALUES [38] | 39 | 1 | (CPRECOF) |
| GCODE_RESET_VALUES [39] | 40 | 1 | (CUTCONOF) |
| GCODE_RESET_VALUES [40] | 41 | 1 | (LFOF) |
| GCODE_RESET_VALUES [41] | 42 | 1 | (TCOABS) |
| GCODE_RESET_VALUES [42] | 43 | 1 | (G140) |
| GCODE_RESET_VALUES [43] | 44 | 1 | (G340) |
| GCODE_RESET_VALUES[44] | 45 | 1 | (SPATH) |
| GCODE_RESET_VALUES[45] | 46 | 1 | (LFTXT) |
| GCODE_RESET_VALUES [46] | 47 | 1 | (G290 SINUMERIK |
| GCODE_RESET_VALUES [47] | 48 | 3 | (G462) |
| GCODE_RESET_VALUES [48] | 49 | 1 | (CP) |
| GCODE_RESET_VALUES [49] | 50 | 1 | (ORIEULER) |
| GCODE_RESET_VALUES [50] | 51 | 1 | (ORIVECT) |
| GCODE_RESET_VALUES[51] | 52 | 1 | (PAROTOF) |
| GCODE_RESET_VALUES [52] | 53 | 1 | (TOROTOF) |
| GCODE_RESET_VALUES [53] | 54 | 1 | (ORIROTA) |
| GCODE_RESET_VALUES [54] | 55 | 1 | (RTLION) |
| GCODE_RESET_VALUES [55] | 56 | 1 | (TOWSTD) |
| GCODE_RESET_VALUES [56] | 57 | 1 | (FENDNORM) |
| GCODE_RESET_VALUES [57] | 58 | 1 | (RELIEVEON) |
| GCODE_RESET_VALUES [58] | 59 | 1 | (DYNNORM) |
| GCODE_RESET_VALUES [59] | 60 | 1 | (WALCSO) |
| GCODE_RESET_VALUES [60] | 61 | 1 | (ORISOF) |
| GCODE_RESET_VALUES [61] | 62 |  | (inactive) |


| GCODE_RESET_VALUES [62] | 63 | 1 (inactive) |  |
| :--- | :--- | :--- | :--- |
| GCODE_RESET_VALUES [63] | 64 | 1 (GS0) |  |
| $:$ | $:$ |  | 1 (not defined) |
| GCODE_RESET_VALUES[69] | 70 | 1 |  |


| 20152 | GCODE_RESET_MODE | C03 | M1, K1, K2, P1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Reset response of G groups | BYTE | Reset |  |  |
| - |  |  |  |  |  |
| - | 70 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0, \ldots$ | 0 | 1 | M |

Description:
This MD is only evaluated if bit 0 is set in MD20110 \$MC_RESET_MODE_MASK.
For each entry in MD20150 \$MC_GCODE_RESET_VALUES (that is for each G group), this MD is used to determine whether, on reset/part program end, the setting in MD20150 \$MC_GCODE_RESET_VALUES is used again ( $M D=0$ ) or the current setting is retained (MD = 1) .
Example 1:
Here, the basic setting for the 6th G group (current plane) is read from MD20150 \$MC_GCODE_RESET_VALUES at each reset / part program end:
MD20150 \$MC_GCODE_RESET_VALUES[5]=1 ; reset value of the 6th G group is G17 MD20152\$MC_GCODE_RESET_MODE[5]=0 ; after reset / part program end, the basic setting for 6th G group corresponds to MD20150 \$MC_GCODE_RESET_VALUES[5]
However, if the current setting for the 6 th $G$ group (current plane) is to be retained after reset / part program end, then the following setting results: MD20150 \$MC_GCODE_RESET_VALUES[5]=1 ; reset value of the 6th G group is G17 MD20152 \$MC_GCODE_RESET_MODE[5]=1 ; current setting for the 6th G group ;is retained even after reset / part program end.
Example 2:
Here, the basic setting for the 8th G group (work offset) is read from MD20150 \$MC_GCODE_RESET_VALUES at each reset / part program end
MD20150 \$MC_GCODE_RESET_VALUES[7]=2 ; Reset value of the 8th G group is G54
MD20152 \$MC_GCODE_RESET_MODE[7]=0 after reset / part program end, the basic setting for the 8th G group corresponds to MD20150 \$MC_GCODE_RESET_VALUES[7]
If G54 was already active, especially at the time of reset, the values of the corresponding data handling frame at the time of reset are activated.
However, if the current setting for the 8 th $G$ group (work offset) is to be retained after reset / part program end, then the following setting results:
MD20152 \$MC_GCODE_RESET_MODE[7]=1 ; if a work offset (e.g. G54) was active at the time of reset, then the values of the corresponding data handling frame at the time of reset are activated (that is UIFR[1] with G54)
Changing the initial setting of individual $G$ groups can be disabled for specific systems.
Related to:
MD20110 \$MC_RESET_MODE_MASK
MD20112 \$MC_START_MODE_MASK


Description:
When an external NC programming language is used, the $G$ codes which become active on runup and reset or at part program end are defined as a function of MD20110 \$MC_RESET_MODE_MASK and at part program start as a function of MD20112
\$MC_START_MODE_MASK.
The following external programming languages are possible:
ISO mode Milling
ISO mode Turning
The G group division that is to be used is stated in the current SINUMERIK documentation.

The following groups within MD20154 \$MC_EXTERN_GCODE_RESET_VALUES can be written:
ISO mode M:
G group 2: G17/G18/G19
G group 3: G90/G91
G group 5: G94/G95
G group 6: G20/G21
G group 13: G96/G97
G group 14: G54-G59
ISO mode $T$ :
G group 2: G96/G97
G group 3: G90/G91
G group 5: G94/G95
G group 6: G20/G21
G group 16: G17/G18/G19

| 20156 | EXTERN_GCODE_RESET_MODE | C03 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Reset response of external G groups | BYTE | Reset |  |  |
| - |  |  |  |  |  |
| - | 31 | $\begin{array}{l}0,0,0,0,0,0,0,0,0, \\ 0,0,0,0,0,0,0,0,0, \\ 0,0,0, \ldots\end{array}$ | 0 | 1 | $7 / 2$ |$]$| M |
| :--- |

This MD is evaluated only if bit0 is set in MD20110 \$MC_RESET_MODE_MASK (see there). For each entry in MD20154 \$MC_EXTERN_GCODE_RESET_VALUES (that is for each G group), this MD is used to determine whether, on reset/part program end, the setting in MD20154 \$MC_EXTERN_GCODE_RESET_VALUES is used again (MD = 0) or the current setting is retāined ( $\overline{\mathrm{M}} \mathrm{D}=1$ ).

Example for ISO mode M:
Here, the basic setting for the 14 th $G$ group (settable work offset) is read from MD20154 \$MC_EXTERN_GCODE_RESET_VALUES at each reset / part program end: MD20154 \$MC_EXTERN_GCODE_RESET_VALUES[13]=1 ; the reset value for the 14 th $G$ group ;is G54
MD20156 \$MC_EXTERN_GCODE_RESET_MODE[13]=0 ; the basic setting for the 14th G group ;after reset / part program end is defined by
; MD20154 \$MC_EXTERN_GCODE_RESET_VALUES [13]

However, if the current setting for the 14 th $G$ group is to be retained beyond reset / part program end, this results in the following setting:
MD20154 \$MC_EXTERN_GCODE_RESET_VALUES[13]=1 ; reset value for the 14 th G group
;is G54
MD20156 \$MC_EXTERN_GCODE_RESET_MODE[13]=1 ; current setting for the 14th
; G group is retained even after

## ;reset / part program end




## Description:

The machine data defines the maximum traversing length of a block that can be compressed. Longer blocks interrupt the compression and are traversed in the normal way.
Related to:
MD33100 \$MA_COMPRESS_POS_TOL (maximum deviation with compression)
References:
/PA/, Programming Guide: Fundamentals

| 20171 | SURF_BLOCK_PATH_LIMIT | C09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm | Maximum traverse length of an NC block for the COMPSURF <br> function | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  | M.

## Description:

The machine data defines the maximum traverse length of a block that is still regarded as compressible. Longer blocks interrupt the smoothing and are traversed normally.
If the value 0 is entered, then the maximum traverse length in the control is determined by the specified tolerance.

| 20172 | COMPRESS_VELO_TOL | C09 | B1, V1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{mm} / \mathrm{min}$ | Max. permissible deviation of path feedrate with compression |  |  |  |  |
| - | DOUBLE | PowerOn |  |  |  |
| - | - | $60000.0,60000.0$, <br> $60000.0,60000.0$, <br> $60000.0,60000.0$, <br> $60000.0,6 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |

Description: The value indicates the maximum permissible deviation for the compression for the path feedrate. The larger the value, the more short blocks can be compressed into one long block. The maximum number of compressible blocks is limited by the size of the spline buffer.
In this way, the the compressors COMPON and COMPCURV may limit the compression of the path axes.

Compressor COMPCAD acts differently: It ignores changes to the $F$ word as long as they lie below the threshold defined by COMPRESS_VELO_TOL. If the feed programmed in a block changes more than COMPRESS_VELO_TOL, $\bar{C} O M P C \bar{A} D$ interrupts the compression at this block transition so that the feed change takes place at exactly the desired position. Related to:
MD33100 \$MA_COMPRESS_POS_TOL[AXn]
MD20170 \$MC_COMPRESS_BLOCK_PATH_LIMIT
References:
/PGA/, Programming Guide, Advanced

| 20173 | SURF_VELO_TOL | C09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Maximum permitted deviation of the path feed on compression <br> with COMPSURF | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $1000.0,1000.0$, <br> $1000.0,1000.0$, <br> $1000.0,1000.0$, <br> $1000.0,1000.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

## Description: <br> The value specifies the maximum permitted deviation for compression for the path feed.

 The larger the value, the more short blocks can be compressed into one long block.| 20180 | TOCARR_ROT_ANGLE_INCR | C08 | W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Rotary axis increment of orientable tool holder | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 3$ |  |

## Description:

For orientable tool carriers, this machine data defines the size of the minimum increment (in degrees) by which the first or second orientation axis can be changed (e.g. for Hirth tooth systems).

A programmed or calculated angle is rounded to the nearest value resulting from
phi $=s+n * d$
with integer $n$.
In which:
s = MD20180 \$MC_TOCARR_ROT_ANGLE_INCR[i]
$\mathrm{d}=\mathrm{MD} 20182$ \$MC_TOCARR_ROT_ANGLE_OFFSET[i]
and i is 0 for the 1 st and 1 for the 2 nd axis.
There is no rounding if this machine data is equal to zero.


## Description:

This machine data defines the offset of the rotary axis for an orientable tool holder if its position cannot be continuously changed.
It is only evaluated if MD20180 \$MC_TOCARR_ROT_ANGLE_INCR is not equal to zero.
For the precise meaning of this machine data, see the description of MD20180
\$MC_TOCARR_ROT_ANGLE_INCR.

| 20184 | TOCARR_BASE_FRAME_NUMBER |  |  |  |  |  | C08 | K2, W1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Base frame number for holding machine table offset | DWORD | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $-1,-1,-1,-1,-1,-1,-1$, <br> $-1 \ldots$ | -1 | 15 | M |  |  |  |

Description: This machine data indicates into which channel-specific base frame the table offset of an orientable tool holder with a rotary table is written.
This machine data must refer to a valid base frame.
If its content is less than 0 or greater than or equal to the maximum number of base frames set in MD28081 \$MC_MM_NUM_BASE_FRAMES, selection of a corresponding tool holder causes an alarm.

| 20188 | TOCARR_FINE_LIM_LIN |  |  |  |  |  | C07 | W1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Limit of linear fine offset TCARR | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0 .$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 3$ |  |  |  |

Description: Indicates for each channel the input limit for the linear fine offset values of an orientable tool holder.

| 20190 | TOCARR_FINE_LIM_ROT | C07 | W1 |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| degrees | Limit of rotary fine offset TCARR | DOUBLE | Immediately |  |
| - | - | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0 \ldots$ | 0.0 | $7 / 3$ |
| - | Indicates for each channel the input limit for the rotary fine offset values of an <br> orientable tool holder. |  |  |  |


| Description: |
| :--- |


| 20191 | IGN_PROG_STATE_ASUP | EXP | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Do not display interrupt program execution on OPI | UDWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7 F F F F F F F$ | $7 / 2$ |  |

Description: The execution of the ASUB assigned to the interrupt is NOT displayed by the OPI variables "progStatus" and "chanStatus".
Bit $0=1$ : Enable interrupt 1 (user interrupt)
Bit $1=1$ : Enable interrupt 2 (user interrupt)
...
Bit 7 = 1: Enable interrupt 8 (user interrupt)
Bit 8 = 1: Enable interrupt 9 (system interrupt, reserved)
Bit 9 = 1: Enable interrupt 10 (system interrupt, reserved)
Bit 10 = 1: Enable interrupt 11 (system interrupt, reserved)
...
Bit 31 = 1: Enable interrupt 32 (system interrupt, reserved)
NOTICE:
System ASUBs started by system interrupts may contain traversing motions.
Related to:
MD11602 \$MN_ASUP_START_MASK
MD20115 \$MC_IGNORE_REFP_LOCK_ASUP
MD20116 \$MC_IGNORE_INHIBIT_ASUP
MD20117 \$MC_IGNORE_SINGLEBLOCK_ASUP

MD20194 \$MC_IGNORE_NONCSTART_ASUP

| 20192 | PROG_EVENT_IGN_PROG_STATE | EXP | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Do not display the Prog-Event on OPI | UDWORD | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | $0 \times 3 F$ |  |

## Description:

```
Event-driven program calls (Prog-Events) can be set regarding their response on the OPI.
The progStatus and chanStatus variables remain unaffected despite Prog-Event processing being active and retain the old value. This provides a means of concealing Prog-Event processing from the HMI.
Bit \(0=1\) :
Reserved bit, ineffective
Bit \(1=1\) :
Prog-Event after end-of-part-program does not change progStatus and chanStatus
Bit \(2=1\) :
Prog-Event after OP reset does not change progStatus and chanStatus
Bit \(3=1\) :
Prog-Event after ramp-up does not change progStatus and chanStatus
Bit \(4=1\) :
Reserved
Bit \(5=1\) :
Safety-Prog-Event during ramp-up does not change progStatus and chanStatus
Corresponds to:
MD20105 \$MC_PROG_EVENT_IGN_REFP_LOCK
MD20106 \$MC_PROG_EVENT_IGN_SINGLEBLOCK
MD20107 \$MC_PROG_EVENT_IGN_INHIBIT
MD20108 \$MC_PROG_EVENT_MASK
MD20193 \$MC_PROG_EVENT_IGN_STOP
```



```
Corresponds to:
MD20105 $MC_PROG_EVENT_IGN_REFP_LOCK
MD20106 $MC_PROG_EVENT_IGN_SINGLEBLOCK
MD20107 $MC_PROG_EVENT_IGN_INHIBIT
MD20108 $MC_PROG_EVENT_MASK
MD20192 $MC_PROG_EVENT_IGN_PROG_STATE
```

| 20194 | IGNORE_NONCSTART_ASUP |  | EXP | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Permit ASUB in spite of "Interlock NC-START" if user alarms present. |  | UDWORD | NEW |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 0x7FFFFFFF | 7/2 | M |

Description:
A user alarm from the number range $65500-65999$ sets the signal "NC start interlock". By default, an ASUB is not executed on account of interrupts.
Despite the presence of signal "NC start interlock", the assigned ASUB with the set bit is executed for the interrupt:
Bit $0=1$ : Enable interrupt 1 (user interrupt)
Bit $1=1$ : Enable interrupt 2 (user interrupt)
...
Bit 7 = 1: Enable interrupt 8 (user interrupt)
Bit 8 = 1: Enable interrupt 9 (system interrupt, reserved)
Bit 9 = 1: Enable interrupt 10 (system interrupt, reserved)
Bit 10 = 1 : Enable interrupt 11 (system interrupt, reserved)
...
Bit 31 = 1: Enable interrupt 32 (system interrupt, reserved) NOTICE:

System ASUBs started by system interrupts may contain traversing motions.
Related to:
MD11602 \$MN_ASUP_START_MASK
MD20115 \$MC_IGNORE_REFP_LOCK_ASUP
MD20116 \$MC_IGNORE_INHIBIT_ASUP
MD20117 \$MC_IGNORE_SINGLEBLOCK_ASUP
MD20191 \$MC_IGN_PROG_STATE_ASUP

| 20196 | TOCARR_ROTAX_MODE |  | C07 | W1 <br> Immediately |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | ToolCarrier: rotary axis setting with axis positions not defined |  | UDWORD |  |  |
| - |  |  | 0x7 |  |  |
| - | 2, 2, 2, 2, 2, 2, 2, 2... | 0 |  | 7/3 | U |

The MD is bit-coded. Bit 0 applies to orientable tool holders with one axis, bit 1 for those with 2 axes.
When the axis positions of an orientable tool holder are determined from a specified frame, it may happen that the required orientation is achieved at any position of a rotary axis.
This MD specifies how the rotary axis position is defined in these cases:
If the relevant bit is 0 , the position of the rotary axis will be 0 ; a possibly necessary rotation is performed through the specified frame.
If the relevant bit is 1 , the rotation is performed by means of the rotary axis of the orientable tool holder. The resulting frame will no longer include a rotation. Example:

A tool in its basic position points into the $Z$ direction, and an axis of the orientable tool holder rotates the workpiece around $Z$ (C_Axis). If the tool is to be oriented parallel to the $Z$ axis of a rotating frame, $\bar{n} d$ if the frame only rotates around the $Z$ axis, the tool orientation will not be changed if the $C$ axis is rotated. The condition stating that the tool is to point in the direction of the $Z$ axis defined by the frame is therefore fulfilled for any position of the $Z$ axis.
Bit 2: If this bit is set, the value 1 is output in the system variable \$P_TCSOL as the number of solutions in a singular position for which there is one unique solution because of the alignment with the vertical coordinate axes perpendicular to the orientation. If this bit is not set, two solutions are output (the angles around the orientation axis differ by 180 degrees). This variant is required for compatibility with older software versions.

| 20200 | CHFRND_MAXNUM_DUMMY_BLOCKS |  | $\begin{aligned} & \text { EXP, C02, C06, } \\ & \text { C09 } \end{aligned}$ | V1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Empty blocks with chamfer/radii |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | - $\quad 3,3,3,3,3,3,3,3 \ldots$ | 0 | 15 | $7 / 2$ | M |

Description: Indicates the maximum number of blocks without traversing information in the compensation plane (dummy blocks) that can be programmed between two blocks with traversing information when chamfer/rounding are active.

| 20201 | CHFRND_MODE_MASK | C09 | V1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Chamfer/rounding behavior |  |  |  |  |
| - |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | UDWORD | Reset |

Description:
Determination of the chamfer/rounding behavior
Bit 0 : (LSB) Assignment of the chamfer/rounding to the preceding or following block.
This influences:

- The technology of the chamfer/rounding (feed, type of feed, M commands ...)
- The execution of the blocks without movement in the active plane (e.g. M commands, movement in the applicate) before or after a modal rounding (RNDM)
Bit 1: free
Meaning of the individual bits:
Bit $0=0$
Chamfer/rounding is derived from the following block (default value).
The technology of the chamfer/rounding is determined by the following block. Blocks without movement (M commands) or movement only in the applicate between two motion blocks in the plane are executed before the modal rounding.
Bit $0=1$ :
Chamfer/rounding is derived from the preceding block.
The technology of the chamfer/rounding is determined by the preceding block. Blocks without movement (M commands) or movement only in the applicate between two motion blocks in the plane are executed after the modal rounding.

| 20202 | WAB_MAXNUM_DUMMY_BLOCKS |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Maximum number of blocks w/o traversing movement with SAR |  |  |  |  |  |
| BYTE |  |  |  |  |  |
| - | - | $5,5,5,5,5,5,5,5 \ldots$ | 0 | 10 | Reset |
| - | - | $7 / 2$ | M |  |  |

## Description:

Maximum number of blocks which can appear between the SAR (soft approach and retraction) block and the traversing block which determines the direction of the approach or retraction tangent.

| 20204 | WAB_CLEARANCE_TOLERANCE | C06 | W1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Change of direction with SAR |  |  |  |  |
| - |  |  |  |  |  |
| - | - | $0.01,0.01,0.01,0.01$, <br> $0.01,0.01,0.01,0.01 \ldots$ | 0.0 | DOUBLE | PowerOn |

Description:
In the case of smooth approach and retraction, the point defined with DISCL, from which, in the case of infeed from the initial plane, traversing is carried out at lower speed (G341) or the point in which the actual approach movement begins (G 340), must lie between the initial plane and the approach plane.
If this point lies outside this interval and the deviation is less than or equal to this machine data, it is assumed that the point lies in the approach or retraction plane.

If the deviation is greater, then alarm 10741 is output.
Example:
An approach is made from position $Z=20$. The SAR plane is at $Z=0$. The point defined by DISCL must therefore lie between these two values. If it lies between 20.000 and 20.010 or between 0 and -0.010 , it is assumed that the value 20.0 or 0.0 was programmed (under the condition that the MD has the value 0.010 ). The alarm is output if the position is greater than 20.010 or less than -0.010 .


Description: Where outer corners are very pointed, G451 can result in long idle paths. The system therefore switches automatically from $G 451$ (intersection) to G450 (transition circle, with DISC where appropriate) when the outer corners are very pointed. The contour angle which can be traversed following this automatic switchover (intersection ---> transition circle) can be defined in CUTCOM_CORNER_LIMIT.

| 20212 | CUTCOM_CUSP_LIMIT | C08, C06 | W1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | Maximum angle for path overlap with tool radius compensation |  |  |  |  |  | DOUBLE | Reset |
| - | - | $\begin{array}{l}0.3,0.3,0.3,0.3,0.3, \\ 0.3,0.3,0.3 \ldots\end{array}$ | 0.0 | 2. | $7 / 2$ |  |  |  |$]$ M $\quad$| - |  |
| :--- | :--- |

Description:
Owing to rounding errors (limited resolution of the positions in the NC program), very sharp outside corners (near 180 degrees) may lead to overlapping at the reversal point of the path. This means that block transitions that should actually be outside corners are regarded mathematically as inside corners.
This machine data can be used to set the deviation from 180 degrees at which an inside corner is to be treated as an outside corner.

| 20220 | CUTCOM_MAX_DISC |  | C08, C06 | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Maximum value for DISC |  | DOUBLE | Reset |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & \text { 50.0, 50.0, 50.0, 50.0, } \\ & 50.0,50.0,50.0,50.0 \ldots \end{aligned}$ | 0.0 | 75.0 | 7/2 | M |
| Description: | The G450 transition circle canno path of the tool center point th cutting edge stops at the outer |  | outer ition c med pos | $\begin{aligned} & \text { r co } \\ & \text { is } \mathrm{c} \end{aligned}$ |  |

Where sharp outer corners are to be machined with G450, the DISC instruction can be used in the program to program an overshoot. This transforms the transition circle into a conic section and the cutting edge lifts off from the outer corner.
The value range of the DISC instruction extends from 0 to theoretically 100 in steps of 1 .
DISC $=0 \quad$..Overshoot disabled, transition circle active
DISC $=100$...Overshoot large enough to theoretically produce a
response similar to intersection (G451).
Programmed values of DISC which are higher than those stored in CUTCOM_MAX_DISC are limited to this maximum value without output of a message. A severely non-linear alteration in the path velocity can thus be avoided.
Special cases:
It is not generally meaningful to enter values higher than 50 in DISC.
It is therefore not possible to enter values > 75.

| 20230 | CUTCOM_CURVE_INSERT_LIMIT |  | C08, C06 | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Maximum angle for calculation of intersection with TRC |  | DOUBLE | Rese |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & \text { 10., 10., 10., 10., 10., } \\ & \text { 10., 10., 10.... } \end{aligned}$ | 0.0 | 150. | 7/2 | M |

Description:
Where outer corners are very flat, G450 (transition circle) and G451 (intersection) approximate each other more and more. In such a case, it is no longer useful to insert a transition circle. Especially with 5-axis machining, it is not allowed to insert a transition circle at these outer corners, as this might lead to losses in velocity during continuous-path mode (G64).
That is why the system switches automatically from $G 450$ (transition circle, possibly with DISC) to G451 (intersection) in the case of very flat outer corners. The contour angle (in degrees), as of which the automatic switchover (transition circle ---> intersection) is to be carried out, can be specified in CUTCOM_CURVE_INSERT_LIMIT.

| 20240 | CUTCOM_MAXNUM_CHECK_BLOCKS |  | C08, C02 | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Blocks for look-ahead contour calculation with TRC |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | 4, 4, 4, 4, 4, 4, 4, 4... | 2 | 10000 | 7/2 | M |

## Description:

Indicates the maximum number of blocks with traversing information at the offset plane that are considered simultaneously for collision detection with active radius compensation.

| 20250 | CUTCOM_MAXNUM_DUMMY_BLOCKS | C08, C02 | W1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Maximum number of blocks without traversing motion in TRC |  |  |  |  |  | DWORD | PowerOn |
| - | - | $3,3,3,3,3,3,3,3 \ldots$ | 0 | 1000 | $7 / 2$ |  |  |  |$]$ M $\quad$| - |
| :--- |

## Description:

During active TRC only program blocks with movements of geometry axes perpendicular to the current tool orientation are normally programmed. Nevertheless, individual intermediate blocks that do not contain such path information may also be programmed during active TRC. For example:

- Movements in the direction of tool orientation
- Movements in axes that are not geometry axes
- Auxiliary functions
- In general: Blocks that are taken over into the main run and executed there The maximum number of intermediate blocks is defined with this MD. If the value is exceeded, alarm 10762 "Too many empty blocks between 2 traversing blocks during active tool radius compensation" is output.

Note:
Comment blocks, arithmetic blocks and empty blocks are not intermediate blocks in the sense of this MD and can therefore be programmed in any number (without an alarm being triggered).

| 20252 | CUTCOM_MAXNUM_SUPPR_BLOCKS |  | $\begin{aligned} & \text { EXP, C01, C08, } \\ & \text { C02 } \end{aligned}$ | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Maximum number of blocks with compensation suppression |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | $5,5,5,5,5,5,5,5 \ldots$ | 0 | 1000 | 7/2 | M |

Description: Indicates the maximum number of blocks for active tool radius compensation, in which the function "Keep radius offset constant" (CUTCONON or reprogramming of G41 / G42 during active TRC) may be active.
Note:
The restriction of the number of blocks with active CUTONON is necessary in order to carry out repositioning in this situation too. Increasing this value for the machine data can lead to an increased memory requirement for NC blocks.

| 20254 | ONLINE_CUTCOM_ENABLE | EXP, C01, C08 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Real-time tool radius compensation enabled | BOOLEAN | PowerOn |  |  |
| - | - | $\begin{array}{l}\text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE... }\end{array}$ | 0 | - | $7 / 2$ |$]$ M

Description: This data enables online tool radius compensation. When the function is enabled, the control reserves the necessary memory space required for online tool radius compensation after POWER ON.
ONLINE_CUTCOM_ENABLE $=0$ :
Online tool radius compensation can be used
ONLINE_CUTCOM_ENABLE = 1:
Online tool radius compensation cannot be used

| 20256 | CUTCOM_INTERS_POLY_ENABLE |  | C09 | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Intersection procedure for polynomials is possible |  | BOOLEAN | PowerOn |  |
| - |  |  |  |  |  |
| - | TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE... | 0 | - | 7/2 | M |

Description: If this machine data is TRUE and tool radius compensation active, the transitions at outer corners where polynomes (splines) are involved can be treated with the
intersection mode. If the machine data is FALSE, conic sections (circles) are always inserted in this case.
If the machine data is FALSE, the response is identical to that of software releases older than 4.0.

| 20262 | SPLINE_FEED_PRECISION | EXP, C09, C05 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Permissible rel. error of path velocity for spline | DOUBLE | PowerOn |  |  |  |
| - | - | $0.001,0.001,0.001$, <br> $0.001,0.001,0.001$, <br> $0.001,0.001 \ldots$ | 0.000001 | 1.0 | $7 / 2$ |  |



| 20270 | CUTTING_EDGE_DEFAULT |  |  |  |  |  | C11, C03 | H2, W1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Initial position of tool cutting edge without programming |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | -2 | 32000 |  |  |  |  |

Description:
Default cutting edge after tool change
If no cutting edge has been programmed after a tool change, the default cutting edge number set in MD20270 \$MC_CUTTING_EDGE_DEFAULT is used.

Value
:= 0
Initially, no cutting edge is active after a tool change.
The cutting edge is not selected until $D$ programming.
:= 1
MD_SLMAXCUTTINGEDGENUMBER
No. of cutting edge (MD_SLMAXCUTTINGEDGENUMBER=9 is valid up to P4)
:= -1
Cutting edge number of old tool also applies to new tool.
:= -2
Cutting edge (correction) of old tool remains active until $D$ is programmed. This means that the old tool remains the active tool until $D$ is programmed. In other words, the tool on the spindle remains the programmed tool until $D$ is programmed.

Example:
MD20270 \$MC_CUTTING_EDGE_DEFAULT = 1;
After a tool change, the first cutting edge is active if no other cutting edge has been programmed.

| 20272 | SUMCORR_DEFAULT |  | C03 | H2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Initial position resulting offset without program |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | -1 | 6 | 7/2 | M |

Description: The number of the total offset of the cutting edge which becomes active when a new cutting edge compensation is activated without a programmed DL value being available.
MD18110 \$MN_MM_MAX_SUMCORR_PER_CUTTEDGE
defines the maximum useful value which can be entered.
Value Meaning
> 0 Number of the total offset
$=0 \quad$ No total offset active with D programming
$=1$ The total offset number for the previously programmed $D$ is used.
Related to:
MD20270 \$MC_CUTTING_EDGE_DEFAULT.

| 20274 | MULTITOOLLOC_DEFAULT | N09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of the multitool location, whose tool is selected for T= <br> location. | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 72 | $7 / 3$ |  |

Description:
Only of significance when the 'Multitool' function is active plus 'T= location' programming: Multitool location number of the location in the multitool, whose tool is selected for a tool change programmed with 'T= location'. If the tool is not ready for use, with the appropriate configuration, an attempt is made to select a replacement tool.

If the tool at the magazine location programmed with 'T= location' is not a multitool, then MD20274 has no effect.
The value zero signifies that when programming 'T= location' the multitool location number is used, which corresponds to the multitool position.
Entering the MD can be suppressed by explicitly programming the multitool location number with the MTL command.

The value entered in MD20274 must correspond at the time of programming to the location of the multitool, located in the magazine location, which was programmed with 'T= location'.

Example:
MD20274 \$MC_MULTITOOLLOC_DEFAULT = 2 ;
$\mathrm{T}=5$; 5 is a magazine location with a multitool. Select the tool that is located at location 2 of this multitool.
$\mathrm{T}=5 \mathrm{MTL}=1$; 5 is a magazine location with a multitool. Select the tool that is located at location 1 of this multitool. Programming MTL suppresses the setting of this MD

| 20280 | LIMIT_CHECK_MODE |  |  |  |  |  | EXP | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Type of limit position check |  |  |  |  |  | DWORD | Reset |
| - |  |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 1 | $1 / 1$ |  |  |  |

Description:
This MD can be used to set the mode of operation for the software limit position check. The following options are available:
0: The limit positions are checked in real time on active transformation
1: The limit positions are checked in a preparative manner on active transformation

| 20310 | TOOL_MANAGEMENT_MASK |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Activation of tool management functions |  |  |  |  |
| - | - | $0 \times 2,0 \times 2,0 \times 2,0 \times 2$, <br> $0 \times 2,0 \times 2,0 \times 2,0 \times 2 \ldots$ | 0 | UDWORD | PowerOn |
| - | - | $0 \times F F F F F F F$ | $7 / 2$ | M |  |

## Description:

MD $=0$ : Tool management inactive
Bit 0 to bit4
Bit $0=1$ : Tool management active
Tool management functions are enabled for the current channel.
Bit 1=1: Tool monitoring function active
The functions for monitoring the tools (tool life and quantity) are enabled.
Bit 2=1: OEM functions active
The memory for user data can be used (see also MD18090 \$MN_MM_NUM_CC_MAGAZINE_PARAM
to MD18098 \$MN_MM_NUM_CC_MON_PARAM)
Bit 3=1: Consider adjacent location active
Bit 0 to bit 3 must be set as in MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK.

Bit 4=1: The PLC has the option of requesting a $T$ preparation again with changed parameters.
The acknowledgment states "2", "7" und "103" are enabled with this bit. The tool selection is then recalculated in the NCK.

Note: Bit4=1 (PLC can reject tool) and Bit23=1 (interpreter selects tool) are mutually exclusive.
Bit 5 to bit 8
Bit 5 and bit 7 refer to the main spindle
Bit 6 und bit 8 refer to secondary spindles
Bit 5 = 1: The command is regarded as output when the internal transport acknowledgment + the transport acknowledgment are present, that is, when the command has been accepted by the basic PLC program.
(Bit $19=1$ also allows the block change to be prevented (main run) until the required acknowledgments have been received.)

Bit 7 = 1: The output of the command is not regarded as being completed until the end acknowledgment has been received from the PLC. That is, the command has been acknowledged by the PLC user program with status "1".
(Bit $19=1$ also allows the block change to be prevented (main run) until the required acknowledgments have been received.)
Bit 5 and bit 7 (alternatively bit 6 and bit 8) are mutually exclusive.
Only the following combinations are permissible:
Bit 5: ...0...1... 0
Bit 7: ...0...0... 1
With the default setting, that is bits 5 to $8=0$, synchronization takes place in the block in which a cutting edge is selected for the first time.
Setting these bits delays the block processing.
Bit 9 to bit 11
Bit 9: Reserved for test purposes
It can also be used by machine manufacturers during the test phase, provided that the PLC program does not yet control the tool change.
Bit $10=1$ : M06 is delayed until the preparation has been accepted by the PLC user program.
The change command is not output until the preparation acknowledgment has been received. That can be, for example, status "1" or "105".

Bit 10=0: The change command is output without delay, directly after the preparation command.
Bit 11=1: The tool preparation command (PLC command numbers=2, 4, 5) is also executed if the same tool preparation command has already been executed. (Commands 4, 5 contain the tool preparation)

Example: (Tool changed with M6 (PLC command no.= 3):
T="Tooll"; tool preparation
M6; tool change
T="Tool2" ; 1st tool preparation after M6 (for same tool holder)
; is always output to PLC.
T="Tool2"; 2nd tool preparation is only output as a command to the PLC if bit $11=1$.
; This tool preparation counts as the first if the state of the tool has changed since the previous tool preparation such that it would no longer be serviceable.

That might be, for example, an asynchronous unloading of the tool. This tool preparation then attempts to select a replacement tool.

Bit 11=0: The preparation command can only be output once for any one tool.
Bit 12 to bit 14
Bit 12=1: The preparation command (PLC command numbers $=2,4,5$ ) is also executed when the tool is already in the spindle/tool holder.

T="Tooll" ; tool preparation
M6; tool change
$\mathrm{T}=$ "Tooll"; tool is already in the tool holder
; 1st tool preparation after M6 (for the same tool holder)
; is only output to the PLC if bit $12=1$.
; An unserviceable tool (e.g. disabled because of tool monitoring.) on the tool holder does not count as being on the tool holder. This tool preparation then attempts to select a replacement tool.
T="Tool2" ; 2nd tool preparation - the rules of bit 11 apply to the output.
Bit 12=0: The preparation command is not executed if the tool is already in the spindle.
Bit 13=1: On reset, the commands are retrieved from the diagnostics buffer and stored in the passive file system (TCTRAxx.MPF under part program) This file is required by the Hotline.
The tool sequences are only recorded in the diagnostics buffers of systems that have adequate memory (NCU572, NCU573)).
Bit 14=1: Reset mode
Tool and offset selection correspond to the settings in MD20110 \$MC_RESET_MODE_MASK and MD20112 \$MC_START_MODE_MASK.
Bit 14=0: No reset mode
Bit 15 to bit 19
Bit 15=1: No return transport of the tool if there are multiple preparation commands (Tx->Tx).
Bit 15=0: Return transport of the tool from any defined buffers.
Bit 16=1: $T$ = location number is active
Bit 16=0: T="Tool name"
Bit 17=1: Tool life decrementation can be started and stopped via the PLC in channel DB 2.1...DBx 1.3.
Bit 18=1: Activation of monitoring of "Last tool in the tool group"
Bit 18 Lengthens the search for a suitable tool, above all, when there are a large number of disabled replacement tools.
Bit 18=0: No monitoring of "Last tool in the tool group"
Bit 19=1: The synchronizations determined by bits 5...8 refer to the main run block. This means that the block change is delayed until the required acknowledgments have been received.
Bit 19, in conjunction with set bits 5, 6, 7, 8, delays block processing.
Bit 19=0: The synchronizations determined by bits 5...8 refer to the tool command output. This means that the block change is not delayed.
Bit 20 to bit 24
Bit 20=0: If the PLC signal "Program test active" is present, then the commands generated are not output to the PLC. The NCK acknowledges the commands itself. The magazine and tool data are not changed.
Bit 20=1: If the PLC signal "Program test active" is present, then the commands generated are output to the PLC. Depending upon the type of acknowledgment, tool/ magazine data can be changed in the NCK. If the acknowledgment parameters for the "target magazine" are given the values of the "source magazine", then there is no tool transport, and thus also no data change in the NCK.
Bit 21=0: Default setting: Ignore the tool state "W" during tool selection.
Bit 21=1: Tools in the state "W" cannot be selected by another tool change/tool preparation command.
Bit 22=1: Function "Tool subgroups"
\$TC_TP11[x] is the grouping or selection parameter
Bit 23=0: Default setting

The tool management selects the tool optimally and safely in the main run. This means that the interpreter may have to wait until the end of the tool selection for the offset selection.
Bit 23=1: For simple applications
The interpreter selects the tool itself. This means synchronization with the main run is not required for the offset selection. (However, an uncorrectable alarm may be issued if a tool becomes unserviceable after selection but before loading.)
Note: Bit4=1 (PLC can reject tool) and Bit23=1 (interpreter selects tool) are mutually exclusive.
Bit 24=0: Default setting
If the PLC commands 8 and 9 (asynchronous transfer) want to move a tool to a location reserved for another tool, then this is rejected with an alarm.
Bit 24=1: If the PLC commands 8 and 9 want to move a tool to a location reserved for
another tool with "Reserved for tool from buffer" (bit value= "H4"), then this is possible. This location reservation is removed before execution of the motion
("Reserved for new tool to be loaded" (bit value= "H8") remains effective).
Related to:
MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK
MD20320 \$MC_TOOL_TIME_MONITOR_MASK
MD20122 \$MC_TOOL_RESET_NAME
MD20110 \$MC_RESET_MODE_MASK
MD20124 \$MC_TOOL_MANAGEMENT_TOOLHOLDER
MD22560 \$MC_TOOL_CHANGE_M_CODE

| 20320 | TOOL_TIME_MONITOR_MASK |  | C06, C09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Time monitoring for tool in tool holder |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots \end{aligned}$ | 0 | 0x7FFFFFFF | 7/2 | M |

Description:
Activation of the tool time monitoring for the tool holders and spindles 1..x.
As soon as the path axes have been traversed (not with G00, always with G63), the tool time monitoring data of the active D compensation are updated for the tool in the selected tool holder, which is also the master tool holder.
Bit $0 . . . x-1$ : Monitoring of the tool in tool holder 1...x

| 20350 | TOOL_GRIND_AUTO_TMON | C06, C09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Activation of tool monitoring. 0/1: Monitoring off/on | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | $7 / 2$ |  |$]$ M $\quad$.

Description: This MD is used to define whether tool monitoring is switched on automatically if tool length compensation for a grinding tool with monitoring is selected (odd type number types 401 - 499).
TOOL_GRIND_AUTO_TMON = 1 : Automatic monitoring switched on
TOOL_GRIND_AUTO_TMON = 0 : Automatic monitoring switched off

| 20360 | TOOL_PARAMETER_DEF_MASK | C09 | M5, P1, W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of tool parameters | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{array}{l}0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots\end{array}$ | 0 | $0 \times 7 F F F F F$ | $7 / 2$ |  |$]$ M | ( |
| :--- |

Description:
Definition of the effects of tool parameters.
Bit no. meaning when bit is set

```
Bit 0: (LSB):
For turning and grinding tools, the wear parameter of the transverse axis is included
in the calculation as a diameter value.
Bit 1:
For turning and grinding tools, the tool length component of the transverse axis is
included in the calculation as a diameter value.
Bit 2:
If a tool length correction is included in the calculation as a diameter value, the
tool may only be used in the plane that was active when the tool was selected. If this
bit is set, a plane change leads to an alarm.
Bit 3:
Work offsets in frames in the transverse axis are included in the calculation as
diameter values.
Bit 4:
PRESET value is included in the calculation as a diameter value
Bit 5:
Include the external work offset in the transverse axis in the calculation as a
diameter value
Bit 6:
Read actual values of the transverse axis as diameter values (AA_IW, AA_IEN, AA_IBN,
AA_IB. Notice: Not AA_IM.)
Bit 7:
Display all actual values of the transverse axis as diameter values, irrespective of
the G code of group 29 (DIAMON / DIAMOF)
Bit 8:
Always display the distance-to-go as a radius in the Work (WCS)
Bit 9:
During DRF handwheel travel of a transverse axis, only half the distance of the
specified increment is traveled (on condition that MD11346 $MN_HANDWH_TRUE_DISTANCE =
1).
Bit10:
Activate the tool component of an active, orientable tool holder even if no tool is
active.
Bit11:
The tool parameter $TC_DP6 is not interpreted as a tool radius but as a tool diameter.
Bit12:
The tool parameter $TC_DP15 is not interpreted as wear of the tool radius but as wear
of the tool diameter.
Bit13:
During JOG of circles, the circle center coordinate is always a radius value, see
D42690 $SC_JOG_CIRCLE_CENTRE.
Bit14:
    Absolute values of the transverse axis with cycle screenforms in the radius
Bit15:
    Incremental values of the transverse axis with cycle screenforms as diameter
Bit16:
For GWPS (GWPSON/TMON), the tool parameters, tool length, wear and base dimension, are
interpreted as diameter values
Bit17:
```

With cutting edge position compensation (CUTMOD) for turning and grinding tools, the cutting plane for calculating the compensation values is rotated into the machining plane. If this bit is not set, the cutting edge is projected into the machining plane instead.
Bit18:
With cutting edge position compensation (CUTMOD) for turning and grinding tools, always use the active plane (G17 - G19). If this bit is not set, the plane specified by setting data SD42940 \$SC_TOOL_LENGTH_CONST has priority over the plane specified by the $G$ code group 6 (plane selection, G17 - G19).
Bit19:
The tool orientation change caused by an orientable tool holder becomes effective even if no tool is active. This bit is only effective if bit 10 is also set.
Bit20:
If this bit is zero, and if the tool parameter \$TC_DP10 (holder angle) and/or \$TC_DP24 (clearance angle) contain the value 0, the following default values are used as the basis for the function CUTMOD to calculate the modified cutting-edge position and the modified cutting-edge direction:
Holder angle 112.5 degrees for cutting-edge positions 1 - 4
Holder angle 67.5 degrees for cutting-edge positions 5 - 8
Clearance angle 22.5 degrees for cutting edge positions 1 - 4
Clearance angle 67.5 degrees for cutting-edge positions 5 - 8
If this bit is set, an alarm is output in the cases mentioned. This bit is used to establish compatibility with older software releases.
Bit21:
If this bit is zero, any existing rotation in the part proportion of the tool carrier is taken into account for CUTMOD with tool carrier when modifying the cutting edge position. Frames are ignored.

If this bit is 1 , in the place of the part proportion of the tool carrier, the active total frame is taken into account with CUTMOD with tool carrier with modification of the cutting edge position. The total frame can also contain a part proportion of the tool carrier.

## Bit22:

If this bit is zero, with an active kinematic transformation, a wear component of the tool that cannot be transformed (see SD42935 \$SC_WEAR_TRANSFORM) is taken into account statically with the position of the transformation that was valid at the time of the tool selection.
If this bit is 1, with an active kinematic transformation, a wear component of the tool that cannot be transformed (see SD42935 \$SC_WEAR_TRANSFORM) is taken into account in real-time with the relevant current position of $\overline{\text { the }}$ transformation.

| 20370 | SHAPED_TOOL_TYPE_NO | C01, C08 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Tool type number for contour tools | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | - | - | M |  |

## Description:

Indicates for each channel max. two number ranges for tool types that are treated as forming tools. Therefore individual ranges are possible both for grinding and for turning tools.
The first range is specified by the first and the second number, the second range by the third and fourth number.
If the first number is not smaller than the second one (the same applies for the third and fourth number), no range will be defined, but two individual numbers will be specified instead.

The numbers 400 through 599 are permissible (tool type numbers for turning and grinding tools), and also value 0 (no tool type number defined).
Examples:

| 400 | 405 |
| ---: | :--- |
| 410 | 400 |
| 490 | 596 |
| 496 | : Tool types $400-405$ and 590-596 are contour tools |
| 450 | 0 | 420430 : Tool types 450 and $420-430$ are contour tools


| 20372 | SHAPED_TOOL_CHECKSUM | C01, C08 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Checksum test for contour tools | BOOLEAN | Immediately |  |  |  |
| - | - | $\begin{array}{l}\text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE... }\end{array}$ | 0 | - | $7 / 5$ |  |$]$ U

## Description:

Indicates for each channel whether for completion of the contour tool definition an edge must be available that includes the negative sums of tool length components and tool radius of the previous edges.

| 20380 | TOOL_CORR_MODE_G43G44 |  |  |  |  |  | C01, C08, C11 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Treatment of tool length compensation with G43/G44 |  |  |  |  |  | BYTE | Reset |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | $7 / 2$ |  |  |  |
| - | - |  |  |  |  |  |  |  |

Description:
This machine data determines in ISO mode M (G43 / G44) the way in which length compensations programmed with $H$ are processed.

0: Mode A
Tool length $H$ always acts on the third geometry axis (usually Z)
1: Mode B
Tool length $H$ acts, depending on the active plane, on one of the three geometry axes.
This means with
G17 on the 3rd geometry axis (usually Z)
G18 on the 2nd geometry axis (usually Y)
G19 on the 1st geometry axis (usually X)
In this mode, compensations in all three geometry axes can be configured through multiple programming, i.e. through the activation of one component, the length compensation possibly active in another axis is not deleted.
2: Mode C
The tool length acts, independent of the active plane, on the axis that has simultaneously been programmed with H. Otherwise, the response is the same as with mode $B$.


### 4.2 Channel-specific NC machine data




| 20392 | TOOL_TEMP_COMP_LIMIT | C01, C08 | W1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Max. temperature compensation for tool length |  |  |  |  |
| - | DOUBLE | Reset |  |  |  |
| - | 3 | $1.0,1.0,1.0,1.0,1.0$,  <br> $1.0,1.0,1.0,1.0,1.0$, 0.0 <br> $1.0,1.0, \ldots$  | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
|  |  |  |  |  |  |

Description: With temperature compensation, this machine data indicates the maximum permissible value for the tool length for each geometry axis.
If a temperature compensation value larger than this limit value is entered, it will be limited without an alarm.

| 20400 | LOOKAH_USE_VELO_NEXT_BLOCK | EXP, C05 | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | LookAhead following block velocity | BOOLEAN | PowerOn |  |  |  |
| - | - | $\begin{array}{l}\text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE... }\end{array}$ | 0 | - | $7 / 2$ |  |$]$| M |
| :--- |

Description: For SW-internal function optimization.

| 20430 | LOOKAH_NUM_OVR_POINTS | EXP, C02, C05 | B1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of override characteristics for LookAhead | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 2 |  |  |  |

[^7]| 20440 | LOOKAH_OVR_POINTS | EXP, C05 | B1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Override switch points for Look Ahead | DOUBLE | PowerOn |  |  |
| - | 2 | $1.0,0.2,1.0,0.2,1.0$, <br> $0.2,1.0,0.2,1.0,0.2$, <br> $1.0,0.2,1.0, \ldots$ | 0.2 | $7 / 2$ | M |
|  |  |  |  |  |  |

Description: For SW-internal function optimization.

| 20443 | LOOKAH_FFORM |  |  | EXP, C05 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activate extended LookAhead |  |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 5 | $\begin{aligned} & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0 \ldots \end{aligned}$ | 0 | 2 | 7/2 | M |

Description:
The MD specifies for which technology groups the extended LookAhead is active.
Value 0: Default LookAhead
Value 1: Extended LookAhead
Value 2: reserved
E.g. MD20443 \$MC_LOOKAH_FFORM[4]=1; i.e. activation for DYNFINISH.

Entry for all dynamic $G$ code groups.
When changing between default LookAhead and extended LookAhead or vice versa, the continuous-path mode is interrupted by an interpolatory stop.

| 20450 | LOOKAH_RELIEVE_BLOCK_CYCLE | EXP, C05 | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Relief factor for the block change time | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  | M |  |
| :--- |

Description:
Block change problems occur for the following reason:
The traversing length of the $N C$ blocks to be processed is so short that the Look Ahead function has to reduce the machine velocity to provide enough time for block preparation. In this situation, constant decelerations and accelerations of the path motion can occur.
This machine data defines the extent to which such velocity fluctuations are to be smoothed.
Special cases:
Values up to approx. 1.0 are appropriate.
The value 0.0 means that the function is deactivated.

| 20455 | LOOKAH_FUNCTION_MASK | EXP, C05 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Look Ahead special functions | UBYTE | NEW CONF |  |  |  |
| - | - | $\begin{array}{l}0 \times 1,0 \times 1,0 \times 1,0 \times 1, \\ 0 \times 1,0 \times 1,0 \times 1,0 \times 1 \ldots\end{array}$ | 0 | $0 \times 3$ | $7 / 2$ |  |$]$ M

[^8]4.2 Channel-specific NC machine data

| 20460 | LOOKAH_SMOOTH_FACTOR | EXP, C05 | B1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Smoothing factor for Look Ahead |  |  |  |  |  | DOUBLE | NEW CONF |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | 0. | 0. | $7 / 2$ |  |  |  |

Description: Notice: This function is obsolete and is no longer supported!
A smoothing factor could be defined to give a more stable path velocity control.
It defined the maximum permitted productivity loss.
Acceleration procedures which contribute less than this factor to a shorter program run time have not been executed.
In this case, only those acceleration procedures whose frequency lies above the frequency parameterized in MD32440 \$MA_LOOKAH_FREQUENCY have been taken into account. The entry of 0.0 deactivates the function.

| 20462 | LOOKAH_SMOOTH_WITH_FEED | EXP, C05 | B1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Path velocity smoothing with programmed feed | BOOLEAN | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | M |

## Description:

The MD defines whether the programmed feed is also taken into account for smoothing the path velocity. In these cases, the factor defined in MD20460
\$MC_LOOKAH_SMOOTH_FACTOR can be better maintained when the override is set to $100 \%$.
Related to:
MD32440 \$MA_LOOKAH_FREQUENCY,
MD20460 \$MC_LOOKAH_SMOOTH_FACTOR

| 20463 | FIFOCTRL_ADAPTION | EXP, C05 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Adaptation of the IPO buffer control |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | 0.0 | 1.0 |  |  |  |  |

Description:
The MD defines how significantly the IPO buffer control (FIFOCTRL) should influence the path feedrate with the buffer full.
0.0 means that the IPO buffer control, for a full IPO buffer stops limiting the path feedrate. This shortens the machining time, but it can increase the risk of the IPO buffer running empty.
1.0 means that the IPO buffer control, with full IPO buffer continues to control the path feedrate, and therefore avoids the IPO buffer becoming empty faster. This results in minor fluctuations of the IPO buffer fill level. However, a longer machining time must be expected.
Values between 0.0 and 1.0 permit a smooth, seamless transition from the old to the new response.
Corresponds with:
FIFOCTRL


Description:
This machine data is used to influence the path action

Bit0:
If only rotary axes are traversed in the block as path axes with active G700, the programmed rotary axis velocity corresponds to
0: [degrees/min]
1: [25.4*degrees/min]


## Description:

Notice: This function is obsolete and is no longer supported!
This adaptation factor could be used to reduce the dynamics of changes in the path velocity.
ADAPT_PATH_DYNAMIC[0] was effective with Brisk and reduced the permissible acceleration ADAPT_PATH_DYNAMIC[1] was effective with Soft and reduced the permissible jerk

Only acceleration processes using a frequency above the frequency parameterized in MD32440 \$MA_LOOKAH_FREQUENCY were considered.
To disable this function, enter 1.0 .

| 20470 | CPREC_WITH_FFW |  |  |  |  |  | EXP, C06, C05 | K6 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Programmable contour accuracy | BYTE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 5 |  |  |  |  |

Description:

This machine data defines the behaviour of the programmable function CPRECON.
0 : The CPRECON function is inactive when feedforward control is activated simultaneously.
1: CPRECON is also active with feedforward control.
2: As 1, but the function is parameterised with MD32415 \$MA_EQUIV_CPREC_TIME.
3: As 2, but any contour accuracy programmed with CTOL has priority over SD42450 \$SC_CONTPREC.
4: CPRECON is active independently of the feedforward control and jerk filter. Only MD32415 \$MA_EQUIV_CPREC_TIME is taken into account in the calculation of the contour error. All time constants that have effects on the contour error must be summated and entered MD32415 \$MA_EQUIV_CPREC_TIME.
5: As 4, but a contour accuracy that may have been programmed with CTOL has priority over SD42450 \$SC_CONTPREC.
The values 0 and 1 are no longer recommended. They only provide compatibility with older software versions.
Related to:
SD42450 \$SC_CONTPREC
SD42460 \$SC_MINFEED
MD32415 \$MA_EQUIV_CPREC_TIME

| 20476 | ORISON_STEP_LENGTH |  | EXP | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Path length for block division with ORISON |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0.5,0.5,0.5,0.5,0.5, \\ & 0.5,0.5,0.5 \ldots \end{aligned}$ | 0.001 | $1.0 \mathrm{E}+301$ | 1/1 | M |

Description:
The path lengths of the part blocks are set with this MD as they are formed with orientation smoothing with ORISON.

For this data to be active, the division of blocks with ORISON must be enabled with MD20478 \$MC_ORISON_MODE
(Value 100).
If a length is set for this $M D$ that is significantly shorter than the default length of 0.5 mm , problems may occur with the performance and effectiveness of the orientation smoothing with large tolerances. If this length is reduced, the block buffer for the orientation smoothing (MD28590 \$MC_MM_ORISON_BLOCKS) usually also has to be increased, so that the orientation smoothing can still act over an adequately long path length.


## Description:

The mode of operation of orientation smoothing with ORISON can be set with this MD. The units, tens, hundreds and thousands digits have different meanings.
The following possibilities are available:
The units digits of this data define the type of smoothing: rotary axis or vector smoothing.
$x x 0$ : The type of smoothing is defined by the active $G$ code of the 51st $G$ code group:
ORIAXES active: rotary axis smoothing, ORIAXES inactive (e.g. ORIVECT): vector smoothing.
xx1: Vector smoothing irrespective of the active $G$ code of the 51st $G$ code group
xx2: Rotary axis smoothing irrespective of the active $G$ code of the 51st $G$ code group The tens digits can change the effect of the smoothing:
x0x: Smoothing takes place along the entire path length.
x1x: Smoothing takes place homogeneously along the traversing length of the orientation axes.
x2x: Tolerance changes become active block-synchronously. In the other case, a change of tolerance becomes active incrementally over a defined path length. As a rule, this leads to a more homogeneous progression of the orientation. This setting option only plays a role if the blocks are subdivided (hundreds digit of this machine data 1 xx ). If the blocks are not subdivided, any tolerance change always becomes active blocksynchronously.
The hundreds digits can be used to set whether the smoothing works on the programmed original blocks or on suitably split blocks:
0xx: The programmed blocks are not subdivided. The effect of the orientation smoothing is very dependent on the programmed block structure.
1xx: The programmed blocks are subdivided so that the orientation smoothing can generate a homogeneous progression of the orientation.

Only those blocks are subdivided, in which a compressor (COMPCAD, COMPCURV, COMPON) is active.
2xx: The programmed blocks are subdivided so that the orientation smoothing can generate a homogeneous progression of the orientation.

All program blocks are subdivided, irrespective of whether a compressor (COMPCAD, COMPCURV, COMPON) is active in it or not.
The thousands digit can be used to set how the tolerance is specified for the orientation smoothing:
0xxx: The tolerance is specified according to the usual rules. This means that when OTOL $=<\ldots$.$\rangle is programmed, the value thus programmed becomes active, otherwise the$ value of SD \$SC_ORISON_TOL becomes active. The GO tolerance factor is always calculated in (value of MD20560 \$MC_GO_TOLERANCE_FACTOR or the value programmed with STOLF $=<\ldots$. .

1xxx: The tolerance is always specified with SD42678 \$SC_ORISON_TOL, irrespective of whether OTOL $=<. . .>$ was programmed.
2xxx: The GO tolerance factor is not included in the calculation. This is the case both for the tolerance specified with OTOL $=<\ldots$ as well as with SD42678 \$SC_ORISON_TOL. The two numerical values can be combined with one another.

| 20480 | SMOOTHING_MODE |  |  |  |  |  | EXP | B1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Behavior of smoothing with G64x | DWORD | NEW CONF |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 75744 | $7 / 7$ |  |  |  |

Configuration of smoothing with G641 and G642 or G643.
The MD is decimal-coded. The units digits define the response with G643, and the tens digits the response with G642. The hundreds digit can define whether, with G641 or G642, the axes may be accelerated within the smoothing range or traversed at constant velocity. The thousands and ten-thousands digits are used to configure smoothing with G644.
x0: G643 uses axis-specific tolerances; these are set with the axis-specific MD33100 \$MA_COMPRESS_POS_TOL.
x1: G643 uses the contour tolerance SD42465 \$SC_SMOOTH_CONTUR_TOL for smoothing the geometry axes. The axis-specific tolerances in MD33100 \$MA_COMPRESS_POS_TOL are used for smoothing all other axes.
x2: The angular tolerance SD42466 \$SC_SMOOTH_ORI_TOL is used for smoothing the orientation movement. The axis-specific tolerances in MD33100 \$MA_COMPRESS_POS_TOL are used for all other axes.
x3: Combination of the two options 01 and 02 . This means that $G 643$ uses the tolerances SD42465 \$SC_SMOOTH_CONTUR_TOL and SD42466 \$SC_SMOOTH_ORI_TOL. All other axes are smoothed with an axis-specific tolerance.
x4: G643 uses the smoothing length programmed with ADIS= or ADISPOS=. The specification of possible axis-specific tolerances or contour and orientation tolerances is ignored.
0x: G642 uses axis-specific tolerances; these are set with the axis-specific MD33100 \$MA_COMPRESS_POS_TOL.
1x: G642 uses the contour tolerance for smoothing the geometry axes. The axisspecific tolerances in MD33100 \$MA_COMPRESS_POS_TOL are used for smoothing all other axes.
2x: The orientation movement with G642 is smoothed using the angular tolerance SD42466 \$SC_SMOOTH_ORI_TOL. The axis-specific tolerances in MD33100 \$MA_COMPRESS_POS_TOL are used for smoothing all other axes.
3x: Combination of both options 10 and 20. This means that $G 642$ uses the tolerances SD42465 \$SC_SMOOTH_CONTUR_TOL and SD42466 \$SC_SMOOTH_ORI_TOL. Other axes are smoothed with an axis-specific tolērance.
4x: G642 uses the smoothing length programmed with ADIS= or ADISPOS=. The specification of possible axis-specific tolerances or contour and orientation tolerances is ignored.
Possible values of the hundreds digit (specification of path velocity for smoothing): 0xx: A profile of the limit velocity is calculated within the smoothing range from the specified maximum values for acceleration and jerk of the axes or path involved. This can lead to an increase in
path velocity in the smoothing range and consequently to an acceleration of the axes involved.
1xx: A profile of the limit velocity is not calculated for smoothing blocks with G641. Only a constant limit velocity is specified. In the case of smoothing with G641/ G642, this prevents the axes involved accelerating in the
smoothing range. However, this setting may lead to smoothing blocks
being traversed at a velocity that is too low, especially in the case of long smoothing ranges.

2xx: No velocity profile for G642 and G645 (see the above scenario for description).
4xx: The "effective" path velocity in a smoothing block will remain constant, if possible, as long as the dynamic response of the axes permits this. Unlike the default setting, the smoothing blocks are also interpolated as a path with this setting.

Possible values for the thousands digit (configuration of G644):
0xxx:
When smoothing with G644, the maximum deviations of each axis specified in MD COMPRESS POS TOL are adhered to. If the dynamic response of the axis allows, the specified tolerance may not be fully utilized.
1xxx:
When smoothing with G644, the smoothing distance is specified.
2xxx:
When smoothing with G644, the maximum frequency at which the smoothing movement of each axis occurs is limited. The maximum frequency is specified in MD32440 \$MA_LOOKAH_FREQUENCY.

3xxx:
When smoothing with G644, neither the tolerance nor the smoothing distance is monitored. Each axis traverses around a corner with the maximum possible dynamic response. With SOFT, both the maximum acceleration and the maximum jerk of each axis are observed. With BRISK, the jerk is not limited; instead, each axis traverses with the maximum possible acceleration.
4xxx:
When smoothing with G644, the maximum deviations of each axis specified in MD COMPRESS_POS_TOL are adhered to. In contrast to the value 0xxx, the specified tolerance is fully utilized where possible. The axis then does not reach its maximum possible dynamic response.
5xxx:
When smoothing with G644, the smoothing distance is specified (ADIS or ADISPOS). In contrast to the value lxxx, the specified smoothing distance is also fully utilized where possible. The axes involved then might not reach their maximum dynamic response. Possible values for the ten-thousands digit (various special setting options for G641/ G642/G645) :
0xxxx:
The velocity profiles of the axes in the smoothing range are defined without jerk limitation when BRISK is active, and with jerk limitation when SOFT is active.
1xxxx:
The velocity profiles of the axes in the smoothing range are always defined with jerk limitation no matter whether BRISK or SOFT is active.

2xxxx: When smoothing tangential block transitions with G645, "counter motion" may occur when moving along the contour. This can be avoided if circles are involved. If this function is activated, the circles involved are reduced by the set tolerance. As a consequence, the smoothed contour runs on the inner side of the tolerance band and "counter motion" is avoided.
4xxxx: When smoothing with G641/G642 and G645, the smoothing movements of the orientation axes are made with vector interpolation if possible, this is conditional upon vector interpolation being active in both the blocks involved and the active orientation transformation permitting this (e.g. by pole handling).

By default, the orientation axes are always smoothed by means of rotary axis interpolation.
The values of the units, tens, hundreds and ten-thousands digits are added.
The values of the thousands digit are interpreted individually.
Related to:
MD33100 \$MA_COMPRESS_POS_TOL,

SD42465 \$SC_SMOOTH_CONTUR_TOL, SD42466 \$SC_SMOOTH_ORI_TOL

| 20481 | ORISMOOTHING_MODE |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |
| - | Behavior of smoothing of orientations with OST/OSD | DWORD | NEW CONF |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 12 | $7 / 7$ |
| - | - | U |  |  |  |

Description:
Settings for the behavior of smoothing of orientation motions with OST/OSD.
It can be set how block transitions are smoothed if addition rotary axes are participating in a path motion which do not act as orientation axes in a transformation. If the value of this MD is zero, for OST/OSD at a block transition, only rotary axes that act as orientation axes in a transformation are smoothed. For values <> 0, any existing additional rotary axes are also smoothed, depending on the situation.
Meaning of the unit position:
x0: Additional rotary axes are not smoothed.
x1: Additional rotary axes are only smoothed if rotary axis interpolation is active for orientation.
x2: Additional rotary axes are smoothed even if vector interpolation is active. In this case, in both blocks it is switched to rotary axis interpolation. Depending on machine kinematics and situation, the switchover can cause undesired rotary axis movements (orientation changes).
Meaning of the decade:
0x: If no orientation transformation is active, rotary axis motions with OST/OSD are not smoothed.
1x: Even without active transformation, rotary axis motions are smoothed. This permits the active smoothing of rotary axes with OST/OSD even without active orientation transformation.

| 20482 | COMPRESSOR_MODE | EXP | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Mode of compressor | DWORD | NEW CONF |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1333 | $7 / 7$ |  |

Description:
This MD is used to set the compressor operating mode.
The units digits, the tens digits and the hundreds digits have different meanings.
The following options are available:
Units digits:
0 : With the compressor, the tolerances specified with MD33100 \$MA_COMPRESS_POS_TOL are met for all axes (geometry and orientation axes).
1: With the compressor, the contour tolerances specified with SD42475
\$SC_COMPRESS_CONTUR_TOL are active for the geometry axes.
For the orientation axes, the axis-specific tolerances MD33100 \$MA_COMPRESS_POS_TOL are active.
2: With the compressor, the axis-specific tolerances MD33100 \$MA_COMPRESS_POS_TOL become active for the geometry axes. The orientation movement is compressed in compliance with the maximum angular deviations specified with SD42476 \$SC_COMPRESS_ORI_TOL or SD42477 \$SC_COMPRESS_ORI_ROT_TOL.
3: With the compressor, the contour tolerance SD42475 \$SC_COMPRESS_CONTUR_TOL becomes active for the geometry axes and the maximum angular deviation SD42476 \$SC_COMPRESS_ORI_TOL or SD42477 \$SC_COMPRESS_ORI_ROT_TOL becomes active for the oriēntation āxes.
Tens digits:
The tens digits of this $M D$ can be used to set a compressor response that is compatible with previous software releases (< SW 6.3).

0x: All blocks with orientations and value assignments are compressed.
This is the default setting.
Notice: This response is incompatible with previous software releases!
1x: Blocks with value assignments are not compressed (e.g. X=100 ..., etc.)
2x: Blocks with a programmed tool orientation are not compressed.
(e.g. A3 = B3 = C3 = ) .

3x: All blocks with value assignments and/or programmed tool orientation are not compressed. With this setting, the response is fully compatible with previous software releases (< 6.3).
Hundreds digits:
The hundreds digit can be used to set which blocks in addition to G01 blocks are to be compressed or not:

0xx: Circular blocks and GOO blocks are not compressed. Is compatible with previous releases.
1xx: Circular blocks are linearized and compressed by COMPCAD.
2xx: G00 blocks are compressed; a different tolerance may be applied here (see MD 20560 \$MC_GO_TOLERANCE_FACTOR).
3xx: Combination of the two previous options: Both circular blocks and G00 blocks are compressed.
The thousands digits optimize the compressor for different machine types:
0xxx: Optimization for a good surface quality in tool and mold building.
1xxx: Optimization for soft and fast traversing in special applications.


Description: Smoothing of the programmed block end points with compressor type COMPCAD. Value 0: no smoothing. Value 1: maximum smoothing.
Entry for all dynamic $G$ code groups.

| 20486 | COMPRESS_SPLINE_DEGREE | EXP, C05 | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Compressor spline degree | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 5 | $3,3,3,3,3,3,3,3,3$, <br> $3,3,3,3,3,3,3,3,3$, <br> $3,3,3,3 \ldots$ | 3 | 5 | M |  |

Description:
Spline degree for compressor type COMPCAD. Value 3 is recommended; value 5 may be possible for roughing, if soft and rapid movements are more important than accuracy Entry for all dynamic $G$ code groups.


## Description:

Extent to which the programmed block end points are smoothed in the case of compressor type COMPCAD for non-geometry axes. Value 0: No smoothing. Value 1: Maximum smoothing. Entry for each dynamic $G$ code group.

| 20488 | SPLINE_MODE |  |  |  |  |  | EXP | B1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Setting for spline interpolation | UBYTE | NEW CONF |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7$ |  |  |  |  |

Description: This MD is used to determine the settings for spline interpolation. The allocation of the spline segments to the NC blocks can thus be influenced. With spline interpolation, the spline blocks are combined, if possible, in such a way, that there are no blocks that are too short and could lead to a reduction in the possible path velocity.
Bit 0: With BSPLINE, blocks that are too short are avoided.
Bit 1: With BSPLINE/ORICURVE, blocks that are too short are avoided.
Bit 2: With CSPLINE, blocks that are too short are avoided.

| 20490 | IGNORE_OVL_FACTOR_FOR_ADIS | EXP | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | G64x independent of overload factor | BOOLEAN | NEW CONF |  |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | U |  |

Description:
A block transition is normally only smoothed with $G 64 x$ when the path velocity at block transition is reduced by the overload factor set in MD32310 \$MA_MAX_ACCEL_OVL_FACTOR. When SOFT is active, the maximum jerk occurring at block transitions is also $\bar{l} i m i t e d$ by MD32432 \$MA_PATH_TRANS_JERK_LIM. This means that the effect of smoothing with G64x depends on the values set for the overload factor and possibly for the maximum jerk. By setting MD20490 \$MC_IGNORE_OVL_FACTOR_FOR_ADIS = TRUE, a block transition can be smoothed with G64x, irrespectively of the values set for the overload factor.

| 20500 | CONST_VELO_MIN_TIME |  |  |  |  |  | EXP, C05 | B2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $s$ | Minimum time with constant velocity | DOUBLE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | 0.0 | 0.1 | M |  |  |  |

Defines the minimum time for constant velocity during transition from acceleration to deceleration in short blocks in which the set velocity cannot be reached. Entering a time of at least several IPO cycles prevents a direct transition from the acceleration to the deceleration phase and thus reduces the acceleration jump to half. This acceleration limitation is only active with the acceleration profile BRISK.
MD irrelevant for:
Look Ahead does not take account of this function.

| 20550 | EXACT_POS_MODE | EXP | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Exact stop conditions on G00/G01. | BYTE | NEW CONF |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 33 | $7 / 2$ |  |

Configuration of the exact stop conditions for $G 00$ and other $G$ codes of the 1 st $G$ code group.
The MD is decimal-coded. The units digits define the behavior at G00 (infeed motion) and the tens digits the behavior of all the other $G$ codes of the 1st group ("machining G codes").
x0: At G00, the relevant programmed exact stop conditions become active.
x1: At G00, G601 (fine positioning window) becomes active independent of the programmed exact stop condition.
x2: At G00, G602 (coarse positioning window) becomes active independent of the programmed exact stop condition.
x3: At G00, G603 (setpoint value reached) becomes active independent of the programmed exact stop condition.
0x: At the machining $G$ codes, the relevant programmed exact stop conditions become active.

1x: At the machining G codes, G601 (fine positioning window) becomes active independent of the programmed exact stop condition.

2x: At the machining G codes, G602 (coarse positioning window) becomes active independent of the programmed exact stop condition.
3x: At the machining G codes, G603 (setpoint value reached) becomes active independent of the programmed exact stop condition.
The values of the units digits and tens digits are added.
For example, the value of EXACT_POS_MODE $=2$ means that the exact stop condition G602 is always activated automatically $\bar{l} \bar{t} G 00$, independently of which exact stop condition was programmed. At all other $G$ codes of group 1, the programmed exact stop condition becomes active.

| 20552 | EXACT_POS_MODE_G0_TO_G1 | EXP | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Exact stop condition at G00-G01 transition | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 5 |  |  |

## Description:

Configuration of a stop at transition from GOO to a different $G$ code of the lst $G$ code group, and also vice versa, at transition from non-G00 to G00 in continuous-path mode. In exact-stop mode, the positioning window programmed or set in MD20550 \$MC_EXACT_POS_MODE is used.
The following applies:
0: No additional stop, no control of exact stop
1: Behavior active as with G601 (positioning window, fine).
2: Behavior active as with G602 (positioning window, coarse).
3: Behavior active as with G603 (setpoint reached).
4: As 0, no stop at block transition.
At block change from G0 to non-G0 in the G0 block in continuous-path mode, LookAhead takes account of the current value of the feedrate override of the following non-G0 block. Depending on the axis dynamics and the path length of the current block, the block change takes place with the exact or best possibly adapted velocity of the following block.

5: As 0, no stop at block transition.
At block change from G0 to non-G0 and non-G0 to GO in continuous path mode, LookAhead takes account of the current value of the feedrate override (GO to non-G0) or rapid traverse override (non-G0 to GO) of the following block. Depending on the axis dynamics and the path length of the current block, the block change takes place with the exact or best possibly adapted velocity of the following block.

| 20560 | G0_TOLERANCE_FACTOR | EXP | B1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Tolerance factor for G00 | DOUBLE | NEW CONF |  |  |
| - | - | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0 \ldots$ | $1 . e-9$ | $1.0 E+301$ | $1 / 1$ |

This tolerance factor is relevant for the following control functions:

1. Compressor (COMPCAD, COMPCURV, and COMPON)
2. Smoothing with G64x
3. Smoothing of orientation with OST
4. Smoothing of orientation response with ORISON

This factor can be both greater than 1 and less than 1. However, higher tolerance settings are usual for infeed motion.
If the factor is equal to 1 , the tolerances applied for $G 00$ motion are the same as those for non-G00 motion.


| 20602 | CURV_EFFECT_ON_PATH_ACCEL | EXP, C05 | B1, B2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Effect of path curvature on path dynamic | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 5 | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 ., 0 ., \ldots$ | 0. | 0.95 | M |

Description:
This MD is used to determine whether the reaction of path curvature on path acceleration and path velocity is taken into account.

0 :
Not taken into account
$>0$ :
If required, the path velocity and path acceleration are reduced in order to keep a sufficient reserve on the machine axes for centripetal acceleration.
0.75: Recommended setting.

MD20602 \$MC_CURV_EFFECT_ON_PATH_ACCEL defines the proportion of the axis accelerations (see MD3230 ${ }^{-}$\$MA_MAX_AX_ACCEL[.-]) that can be used for centripetal acceleration. The remainder is used for changing the path velocity.
Centripetal acceleration is not required for linear blocks; the full axis acceleration is therefore available for the path acceleration. On slightly curved contours or with a sufficiently low maximum path feedrate \$MC_CURV_EFFECT_ON_PATH_ACCEL has only a partial or no effect. Accordingly, the path acceleration $\bar{i} \overline{\text { h }} \overline{\mathrm{h}} \mathrm{ighe} \bar{r}$ than that specified by (1. - MD20602 \$MC_CURV_EFFECT_ON_PATH_ACCEL) * MD32300 \$MA_MAX_AX_ACCEL[..].
There is an entry for each dynamic $G$ code group.

| 20603 | CURV_EFFECT_ON_PATH_JERK |  |  | EXP, C05 | B1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Effect of path curvature on path jerk |  |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |  |
| - | 5 | $\begin{aligned} & \text { 0., 0., 0., 0., 0., 0., 0., } \\ & \text { 0., 0., 0., 0., 0., 0., 0., } \\ & 0 ., 0 ., \text {.., } \end{aligned}$ | 0. | 1000. | 7/2 | M |

Description:
Allows the reaction of the path curvature on the path jerk to be taken into account on especially jerk-sensitive machines.

Entry for each dynamic $G$ code group.


Description: Factor to determine the degree of smoothing and torsion.
A larger value of this MD causes a stronger smoothing and thus a more homogenous curvature/torsion and resulting path velocity.
With this factor being zero no smoothing is performed.
There is an entry for all dynamic $G$ code groups.


Description:
Switch on of curve and torsion smoothing.
Smoothing of the curve or torsion causes a homogenous path velocity.
Smoothing is only performed, when the relevant factor is MD 20605
\$MC_PREPDYN_SMOOTHING_FACTOR > 0 .
Meaning:
0: Curve smoothing off.
1: Curve smoothing on.
2: Curve smoothing also on for axis couplings.
There is an entry for all dynamic $G$ code groups.

| 20610 | ADD_MOVE_ACCEL_RESERVE |  | C05 | F2, B2, K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Acceleration margin for overlaid movements |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | $.2, .2, .2, .2, .2, .2, .2,$ 2... | 0. | 0.9 | 7/2 | M |

Description:
This machine data contains the factor that defines the acceleration and velocity margins which are not used by the path movements on the machine axes in order to provide sufficient acceleration and velocity margins for an overlaid movement for the velocity control.

A factor of 0.2 means that the path axes utilize $80 \%$ of the path acceleration and of the maximum velocity in normal operation. Only when a request for overlaid movement is made, can $100 \%$ of the path acceleration and velocity be utilized.
MD irrelevant for:

```
Error states that lead to a rapid stop. In addition, the limitation is also ineffective
for positioning axes.
Special cases:
At the moment the machine data is only taken into account:
    If the function "Fast retraction" is already activated
    If the function "Online tool length compensation" is activated by the program
command TOFFON
Related to:
MD32000 $MA_MAX_AX_VELO (maximum axis velocity)
MD32300 $MA_MAX_AX_ACCEL (maximum axis acceleration)
```

| 20620 | HANDWH_GEOAX_MAX_INCR_SIZE |  | C08, C06 | H1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Limitation handwheel increment for geometry axes |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| Description: | > 0: Limitation of the size of MD 11330 \$MN_JOG_INCR_SIZEO[<in SD41010 \$SN_JOG_VAR_INCR_SIZE f 0: No limitation on geometry a | he rem r $g$ es | crement nal>] or s | met |  |


| 20621 | HANDWH_ORIAX_MAX_INCR_SIZE | C08, C06 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees |  |  |  |  |  |  |
| - | Limiting of handwheel increment for orientation axes | DOUBLE | PowerOn |  |  |  |
| - | - | $\begin{array}{l}0.0,0.0,0.0,0.0,0.0, \\ 0.0,0.0,0.0 \ldots\end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |$] \mathrm{M}$.

Description:
> 0: Limitation of the size of the selected increment for orientation axes
MD11330 \$MN_JOG_INCR_SIZE[<increment/VDI signal>] or
SD41010 \$SN_JOG_VAR_INCR_SIZE for orientation axes
= 0: No limitation on orientation axes

| 20622 | HANDWH_GEOAX_MAX_INCR_VSIZE |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{mm} / \mathrm{min}$ | Path velocity override | C08, C06, C05 | - |  |  |
| - |  |  |  |  |  |
| - | - | $500 ., 500 ., 500 ., 500 .$, <br> $500 ., 500 ., 500 ., 500 . . .$. | 0.0 | DOUBLE | PowerOn |

Description:
The following applies to the velocity override of the path:
> 0: Limitation of the size of the selected increment
(MD11330 \$MN_JOG_INCR_SIZE_[<increment/VDI signal>] or SD41010 \$SN_JOG_VAR_INCR_SIZE) / 1000*IPO sampling time = 0: No limitation

| 20623 | HANDWH_ORIAX_MAX_INCR_VSIZE |  |  |  |  |  | C08, C06, C05 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min | Orientation velocity overlay | DOUBLE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0.1,0.1,0.1,0.1,0.1$, <br> $0.1,0.1,0.1 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |  |  |

Description:
For the orientation velocity overlay:
> 0: Limitation of the size of the selected increment (MD11330 \$MN_JOG_INCR_SIZE[< increment/VDI signal>] or

SD41010 \$SN_JOG_VAR_INCR_SIZE) / 1000 * IPO sampling time
= 0: No limitation


Description:
Definition of the response for handwheel travel to channel-specific VDI interface signals (bit 0 to bit 7) or CP-SW limit stop or stop by an OEM application (bit 7): Bit $=0$ :
Interruption or collection of the displacements entered via the handwheel.
Bit = 1:
Traversing canceled and no collecting.
Bit assignment:
Bit 0: Mode group stop
Bit 1: Mode group stop, axes plus spindle
Bit 2: NC stop
Bit 3: NC stop, axes plus spindles
Bit 4: Feedrate disable (exception for MD30460 \$MA_BASE_FUNCTION_MASK bit6)
For bit 4 feed disable, it must be taken into account that a PLC-controlled axis, for which MD30460 \$MA_BASE_FUNCTION_MASK bit $6=1$, is not stopped by the feed disable, and that no interruption and no cancellation are triggered here.
Bit 5: Feedrate override
Bit 6: Rapid traverse override
Bit 7: Feedrate stop, geometry axis or CP-SW limit stop or stop by an OEM application
Bit $8=0$ :
The maximum feedrate for handwheel travel of geometry axes is that specified in machine data JOG_AX_VELO for the corresponding machine axis/axes.
Bit 8 = 1 :
The maximum feedrate for handwheel travel of geometry axes is that specified in machine data MAX_AX_VELO for the corresponding machine axis/axes.
Bit $9=0$ :
The override is active during handwheel travel of geometry axes.
Bit 9 = 1 :
During handwheel travel of geometry axes, the override is assumed to be $100 \%$
irrespective of the position of the override switch.
Exception: override 0, which is always active.
Bit $10=0$ :
MD11310 \$MN_HANDWH_REVERSE is not active for DRF, i.e. handwheel travel with DRF is carried out as if MD11310 \$MN_HANDWH_REVERSE $=0$.
Bit $10=1$ :
MD11310 \$MN_HANDWH_REVERSE is active for DRF.
Bit $11=0$ :
When the contour handwheel is deselected, program processing is continued automatically.
Bit $11=1$ :
When the contour handwheel is deselected, an NCSTOP is triggered automatically. Program processing is not continued until NCSTART is entered.

Bit $12=0$ :
NC start has no effect on handwheel travel.
Bit $12=1$ :
The previously collected paths are rejected at NC start.
Bit $13=0$ :
For DRF, bits $0-3$ and bit 12: bit $=0 /$ bit $=1$ are active (see above).
Bit 13 = 1:
For DRF, bits $0-3$ and bit 12 are NOT active: the DRF motion is not interrupted by a stop, and a DRF motion can take place even in "Automatic interrupted" state (achieved by NC Stop).
Note:
If an alarm leads to an axis stop and if such an alarm is pending, no DRF motion can take place.
Bit $14=0$ :
The maximum feedrate for handwheel travel of geometry axes is that specified in SD41120 \$SN_JOG_REV_SET_VELO or in MD32050 \$MA_JOG_REV_VELO (for revolutional feedrate) or in MD32040 \$MA_JOG_REV_VELO_RAPID (for rapid traverse) for the corresponding machine axis, the spindle or rotary axis feedrate is included in the calculation.
Bit $14=1$ :
The maximum rotational feedrate for handwheel travel of geometry axes is the feedrate specified in MD32000 \$MA_MAX_AX_VELO for the corresponding machine axis (see also bit 6).

Bit $15=0$ :
If an axis with active diameter programming is traversed in the channel, only half the distance of the specified increment is traveled during handwheel travel (MD11346 \$MN_HANDWH_TRUE_DISTANCE $=1$ or 3
Bit $15=1$ :
If an axis with active diameter programming is traversed in the channel, the specified increment is fully traveled during handwheel travel (MD11346 \$MN_HANDWH_TRUE_DISTANCE $=1$ or 3 ).
Bit $16=0$ :
Return traveling is possible to the start of the block.
Bit $16=1$ :
Return traveling is not possible (response as at start of block, i.e. pulses are ignored).

| 20700 | REFP_NC_START_LOCK | C01, C03 | D1, R1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | NC start disable without reference point | BYTE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 2 | $7 / 2$ |  |

0: The NC/PLC interface signal DB21-30 DBX7.1 (NC start) for starting part programs or part program blocks (MDI and overstore) is active even if one or all axes of the channel have not yet been referenced.
To ensure that the axes nevertheless reach the correct position after NC startup, the work (workpiece coordinate system = work) must be set to the correct value by means of other methods (scratch method, automatic work offset determination etc.).
1: Axes for which the axial MD34110 \$MA_REFP_CYCLE_NR specifies that a reference point is mandatory (value > -1), must be referenced for NC startup to be enabled.
2: Advanced form of setting 1 in that the axis state "Position restored" (instead of "referenced") is sufficient for $N C$ startup in MDI or overstore.

| 20730 | G0_LINEAR_MODE | C09 | P2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | G0 interpolation mode | BOOLEAN | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | M |

## Description:

This machine data defines the interpolation behavior of GO :
0: Non-linear interpolation (RTLIOF): Each path axis interpolates as an individual axis (positioning axis), independently of the other axes, at the rapid traverse velocity of the axis (MD32000 \$MA_MAX_AX_VELO).

However, this is possible only in simple cases:

- No transformation active (TRAORI, TRANSMIT etc.).
- G60 active (stop at end of block).
- No compressor active (COMPOF).
- No tool radius compensation active (G40).
- No contour handwheel selected.
- No nibbling active.

If one of these conditions is not fulfilled, linear interpolation takes place with the value 1 (RTLION).
1: Linear interpolation (RTLION): The path axes are interpolated jointly.

| 20734 | EXTERN_FUNCTION_MASK | N12 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Function mask for external language | UDWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 x 7 F F F F F F F$ | $7 / 2$ |  |$]$ M

Description:
This machine data is used to influence functions in ISO mode.
Bit0: 0:
ISO mode T: "A" and "C" are interpreted as axes. If contour definition has been programmed, "A" or "C" must be preceded by a comma.

1:
"A" and "C" in the part program are always interpreted as a contour definition. An axis "A" or "C" is not allowed.
Bit1: 0:
ISO mode $T: G 10 P<100$ tool geometry P > 100 tool wear
1:
G10 P < 10000 tool geometry P > 10000 tool wear

Bit2: 0:
G04 dwell time: always [s] or [ms]
1:
If G95 is active, in spindle revolutions
Bit3: 0:
Errors in ISO mode lead to an alarm
1:
Errors in ISO mode are not output, the block is translated in Siemens mode.
Bit4: 0:
G00 is traversed with the current exact stop - continuous-path mode $G$ code 1:

G00 is always traversed with G09
Bit5: 0:
Modulo rotary axis is positioned at the shortest possible distance 1:
Direction of rotation of modulo rotary axis depends on sign
Bit6: 0:
Only 4-digit program number allowed.
1:
8-digit program number allowed. If the program number has less than 4 digits, it is expanded to 4 digits with 0 .
Bit7: 0:
Axis programming for geometry axis exchange/parallel axes is compatible with ISO mode. 1:

Axis programming for geometry axis exchange/parallel axes in ISO mode is compatible with Siemens mode.
Bit8: 0:
With cycles, the $F$ value transferred is always interpreted as a feedrate. 1:
With threading cycles, the $F$ value transferred is interpreted as a pitch.
Bit9: 0:
Multiplication with $0.01 \mathrm{~mm} / 0.0001$ inch is carried out in $I S O$ mode $T$ for $G 84$, G88 and in standard mode $F$ for $G 95$.

1:
Multiplication with $0.001 \mathrm{~mm} / 0.00001$ inch is carried out in ISO mode $T$ for $G 84$, G88 and in standard mode $F$ for $G 95$.
Bit10: 0:
With M96 Pxx, the program programmed with Pxx is always called in the case of an interrupt

1:
With M96 Pxx, CYCLE396.spf is always called in the case of an interrupt
Bit11: 0:
With G54 Pxx, only G54.1 is displayed
1:
With G54 Pxx, the programmed program is displayed after the point, e.g. G54.48
Bit12: 0:
When the subroutine defined with M96 Pxx is called, \$P_ISO_STACK is not modified 1:
When the subroutine defined with M96 Pxx is called, \$P_ISO_STACK is incremented Bit13: 0:
G10 is executed without internal STOPRE
1:
G10 is executed with internal STOPRE
Bit14: 0:
ISO mode $T$ : No alarm if a cutting edge has been programmed in the $T$ command. 1:
ISO mode $T$ : Alarm 14185 if a cutting edge has not been programmed in the $T$ command.
Bit 15: 0:
ISO mode M: G51 Scale, the axial scale factors I, J, $K$ work with 'pocket calculator notation' as programmed.

$$
1:
$$

ISO mode M: G51 Scale, the axial scale factors I, J, K with 'pocket calculator notation', are multiplied by the value in MD22910 \$MC_WEIGHTING_FACTOR_FOR_SCALE. Bit 16: 0: In circular-path programming with radius $R$, there is no replacement of missing geometry axes of the selected plane. This corresponds to the behavior in Siemens mode 1:

In circular-path programming with radius $R$, missing geometry axes of the selected plane are supplemented by incremental distance 0

| 20750 | ALLOW_G0_IN_G96 | C09, C05 | P2, V1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | G0 logic with G96, G961 | BOOLEAN | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $\begin{array}{l}\text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE... }\end{array}$ | 0 | - | $7 / 2$ |$]$| M |
| :--- |

Description:
This machine data defines the speed regulation characteristic of the spindle in G0 blocks with constant cutting speed (G96, G961) selected.
1: In a GO block, the spindle speed is kept constant at the last value of the previous block that was unequal GO.
Prior to a subsequent block that does not contain $G 0$, the spindle speed is increased to a value that belongs to the transverse axis position of the subsequent block.
0: In a GO block, the spindle speed changes against the transverse axis position.

| 20800 | SPF_END_TO_VDI |  | C04, C03 | H2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | End of subroutine to PLC |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - |  |  | - | 7/2 | M |

## Description:

Bit $0=1$ :
The M functions for subroutine end (M17 and/or M2/M30) are transferred to the PLC interface.
Bit $0=0$ :
The M functions for subroutine end (M17 and/or M2/M30) are not transferred to the PLC interface.
Note:
To prevent stopping in continuous-path mode, M17 must not be programmed alone in a block.
Example of a subroutine: G64 F2000 G91 Y10 X10 X10 Z10 M17

Bit $1=0$ :
M01:
conditional program stop is always output to PLC, irrespective of whether the M01 signal is active or not.
Fast auxiliary function output $M=Q U(1)$ is inactive because $M 01$ is assigned to the 1 st M function group and thus is always output at block end.
Bit $1=1$ :
M01:
conditional program stop is only output to PLC, if M01 is also active.
This thus enables optimal run-time processing of the part program.
With fast auxiliary function output $M=Q U(1)$, $M 1$ is output during the movement; thus it is possible to traverse blocks in continuous-path mode with programmed M01 as long as M01 is not active.

The request of the M01 signal with $M=Q U(1)$ no longer occurs at block end but during the movement.


| 20900 | CTAB_ENABLE_NO_LEADMOTION | EXP | M3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Curve tables with jump of slave axis | BYTE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | $7 / 2$ |  |

This MD is used to configure the way jumps of the slave axis are processed in curve tables. A jump of the slave axis results from the presence of a movement of the slave axis in a segment of the curve table with no corresponding movement of the master axis. The jumps of the slave axis may be programmed directly, or they are created internally in the control.

These segments may be created especially if a curve table with active tool radius compensation is generated.
The following configurations are possible:
0: No curve tables are created that contain a jump of the slave axis. If a jump of the slave axis occurs, alarm 10949 (CTAB_NO_LEADMOTION) is issued and program processing is terminated. This setting is compatible with previous software versions.

1: Curve tables containing a jump of the slave axis may be implemented. If a jump of the slave axis occurs, alarm 10955 (CTAB_NO_LEADMOTIONWARNING) is issued without terminating program processing.

2: Curve tables with jumps of the slave axis are implemented without issuing an alarm or a note.

| 20905 | CTAB_DEFAULT_MEMORY_TYPE |  |  |  |  |  | EXP | M3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Default memory type for curve tables | BYTE | Reset |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | $7 / 2$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: This machine data defines the memory (SRAM or DRAM) in which the curve tables are created by default.

This MD is only relevant if no memory type was specified when defining a curve table using CTABDEF().
The following settings can be selected:
0 : By default, curve tables are created in the SRAM.
1: By default, curve tables are created in the DRAM.

| 21000 | CIRCLE_ERROR_CONST | C06 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm | Circle end point monitoring constant | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.01,0.01,0.01,0.01$, <br> $0.01,0.01,0.01,0.01 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

## Description:

This machine data is used to specify the permissible absolute circle error [mm].
When a circle is programmed, both conditions (that the distances from the programmed center point to the start and end points (circle radius) must be the same and that the center point of the circle must be located on the perpendicular bisector of the straight line connecting the start and end points (perpendicular bisector of the circular plane)) apply.
The fact that the circular parameters can be freely programmed means that these conditions are not usually met exactly in the case of circle programming with $I$, $J$, and K (the circle is "overdefined").
The maximum permissible difference between the two radii that is accepted without an alarm, as well as the distance between the programmied center point of the circle and the perpendicular bisector described above, is defined by the larger value in the following data:

- MD21000 \$MC_CIRCLE_ERROR_CONST
- Start radius multiplied by MD21010 \$MC_CIRCLE_ERROR_FACTOR

This means that for small circles the tolerance is a fixed value (MD21000 \$MC_CIRCLE_ERROR_CONST), and for large circles it is proportional to the start radius. Related to:
MD21010 \$MC_CIRCLE_ERROR_FACTOR
(circle end point monitoring factor)
In the context of the predefined tolerances, conflicting circle data is compensated essentially by moving the center point of the circle. Please note that the deviation between the programmed center point and the actual center point can reach the order of magnitude set with machine data MD21000 \$MC_CIRCLE_ERROR_CONST and/or MD21010 \$MC_CIRCLE_ERROR_FACTOR. In the case of circles which are almost full circles in particular, this can also lead to contour deviations of the same order of magnitude.

| 21010 | CIRCLE_ERROR_FACTOR | C06 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Circle end point monitoring factor | DOUBLE | NEW CONF |  |  |  |
| - | - | $0.001,0.001,0.001$, <br> $0.001,0.001,0.001$, <br> $0.001,0.001 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

Factor for permissible radius difference.
Defines the factor for large circles by which the starting radius and end radius may deviate from each other
(see also MD21000 \$MC_CIRCLE_ERROR_CONST (circle end point monitoring constant).
When a circle is programmed, both conditions (that the distances from the programmed center point to the start and end points (circle radius) must be the same and that the center point of the circle must be located on the perpendicular bisector of the straight line connecting the start and end points (perpendicular bisector of the circular plane)) apply.
The fact that the circular parameters can be freely programmed means that these conditions are not usually met exactly in the case of circle programming with $I$, $J$, and K (the circle is "overdefined").
The maximum permissible difference between the two radii that is accepted without an alarm, as well as the distance between the programmied center point of the circle and the perpendicular bisector described above, is defined by the larger value in the following data:

- MD21000 \$MC_CIRCLE_ERROR_CONST
- Start radius multiplied by MD21010 \$MC_CIRCLE_ERROR_FACTOR

This means that for small circles the tolerance is a fixed value (MD21000 \$MC_CIRCLE_ERROR_CONST), and for large circles it is proportional to the start radius. Related to:
MD21000 \$MC_CIRCLE_ERROR_CO'NST
(circle end point monitoring factor)
In the context of the predefined tolerances, conflicting circle data is compensated essentially by moving the center point of the circle. Please note that the deviation between the programmed center point and the actual center point can reach the order of magnitude set with machine data MD21000 \$MC_CIRCLE_ERROR_CONST and/or MD21010 \$MC_CIRCLE_ERROR_FACTOR. In the case of circles which are almost full circles in particular, this can also lead to contour deviations of the same order of magnitude.

| 21015 | INVOLUTE_RADIUS_DELTA | C06 | A2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Involute end point monitoring | DOUBLE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $0.01,0.01,0.01,0.01$, <br> $0.01,0.01,0.01,0.01 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |
| M |  |  |  |  |  |

Description:
Permissible absolute difference of radius at involute interpolation [mm].
At involute interpolation, the radius of the basic circle determined by the end point may differ from the programmed radius.
This data is used to limit the permissible maximum difference between start radius and end radius.


Description: If the angle of rotation is programmed for an involute (AR=angle), the maximum angle of rotation is limited in case the involute is travelling towards the basic circle (AR $<0)$. The maximum angle of rotation is reached when the involute touches the basic circle.

Normally, if an angle larger than the maximum angle is programmed, an alarm is issued and the $N C$ program canceled.
If this MD is set to TRUE any angle is accepted without an alarm for programming. If required, this angle is limited automatically.


| 21050 | CONTOUR_TUNNEL_TOL |  | C06 | K6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Response threshold for contour tunnel monitoring |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

Description:
Response threshold for contour tunnel monitoring. Defines the radius of the "tunnel" around the path of the tool tip.

If three geometry axes are defined, the tunnel can be regarded as a tube through the center of which the path of the tool tip travels.
If only two geometry axes are defined, this tube can be regarded as squashed flat in the plane of the two geometry axes.
Monitoring is only active if:

- option contour tunnel monitoring is present and
- MD21050 \$MC_CONTOUR_TUNNEL_TOL is larger than 0.0 and
- at least two and at most three geometry axes are defined.

Related to:
MD21060 \$MC_CONTOUR_TUNNEL_REACTION,
MD21070 \$MC_CONTOUR_ASSIGN_FASTOUT,
MD36500 \$MA_ENC_CHANGE_TOL

| 21060 | CONTOUR_TUNNEL_REACTION | C06 | K6 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Reaction when contour tunnel monitoring responds | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 2 | $7 / 2$ |  |  |$]$ M

Description: Reaction to response of the alarm
0: Only display alarm, continue machining
1: Ramp stop
2: Rapid stop
MD irrelevant:
If the contour tunnel monitoring option is not available
Related to:
MD21050 \$MC_CONTOUR_TUNNEL_TOL, MD21070 \$MC_CONTOUR_ASSIGN_FASTOUT

| 21070 | CONTOUR_ASSIGN_FASTOUT |  | C01, C06 | K6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of an analog output for the output of contour error |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 8 | 7/2 | M |

Description: Assignment of an analog output on which the calculated contour error can be output.
0: No output
1: Output on output 1
2: Output on output 2
etc.
8: Output on output 8
An error as large as the response threshold MD21050 \$MC_CONTOUR_TUNNEL_TOL appears on the output as a voltage of 10 V .
Multiple assignment of the same output by other signals is checked automatically.
MD irrelevant:
If the contour tunnel monitoring option is available
Related to:

MD21050 \$MC_CONTOUR_TUNNEL_TOL, MD21060 \$MC_CONTOUR_TUNNEL_REACTION

| 21080 | CUTCOM_PARALLEL_ORI_LIMIT | C08, C06 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | Minimum angle (path tangent / tool orientation) in 3D TRC |  |  |  |  |  | DOUBLE | Reset |
| - | - | 3., 3., 3., 3., 3., 3., 3., <br> 3.... | 0.1 | 89. | M |  |  |  |
| - | - |  |  |  |  |  |  |  |

## Description:

With 3 D tool radius compensation, the angle between the path tangent and the tool orientation may not drop below a certain limit angle. This machine data specifies this angle (in degrees).
Generally speaking, the lower the value entered in this machine data, the greater the computing capacity required to check that the above conditions are fulfilled.
Linear blocks with constant orientation are an exception.

| 21082 | CUTCOM_PLANE_ORI_LIMIT | C08, C06 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees |  |  |  |  |  |  |
| - | Minimum angle between surface normal vector and tool orientation | DOUBLE | Reset |  |  |  |
| - | - | 3., 3., 3., 3., 3., 3., 3., <br> $3 . \ldots .2$ | 1.0 | 89. | $7 / 2$ |  |

## Description:

This machine data applies to 3D face milling operations and specifies the minimum angle that must exist between the surface normal vector and the tool orientation on every point of the path if the applied lateral angle is not equal to zero and the tool is not a ball mill. Otherwise, machining is canceled with an alarm if the angle is smaller than the value set here.
Generally speaking, the lower the value entered in this machine data, the greater the computing capacity required to check that the above conditions are fulfilled. This data has no effect in linear blocks with constant orientation. The angle between the surface normal vector and tool orientation may be as small as desired in such cases, even if the lateral angle is not equal to zero.

| 21084 | CUTCOM_PLANE_PATH_LIMIT | C08, C06 | W5 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees |  |  |  |  |  |  |
| - | Min. angle betw. surface normal vector and path tangent vector | DOUBLE | Reset |  |  |  |
| - | - | 3., 3., 3., 3., 3., 3., 3., <br> $3 . \ldots .2$ | 1.0 | 89. | M |  |

## Description:

This machine data applies to 3D face milling operations and specifies the minimum angle that must exist between the surface normal vector and the path tangent vector on every point of the path. Otherwise machining is canceled with an alarm if the angle is smaller than the value set here.
Generally speaking, the lower the value entered in this machine data, the greater the computing capacity required to check that the above conditions are fulfilled.

| 21090 | MAX_LEAD_ANGLE | C08, C09 | M1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | Maximum value of permitted lead angle for orientation progr. |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | $80 ., 80 ., 80 ., 80 ., 80 .$, <br> $80 ., 80 ., 80 \ldots .$, | 0. | 80. | $7 / 7$ |  |  |  |

Description: Maximum permissible value of the lead angle in degrees.
4.2 Channel-specific NC machine data


Description: Maximum permissible value of the tilt angle in degrees.

| 21094 | ORIPATH_MODE | C02 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Setting for ORIPATH path-relative orientation | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1241 | $7 / 7$ |  |

Description:
This MD is used to set the response for ORIPATH, i.e. path-relative interpolation of tool orientation.
The various digits of this machine data are used to activate different functions for ORIPATH.

The tens digit of this MD enables the specification of the way in which the programmed LEAD and TILT angles are to be interpreted.

This setting option is also significant without active ORIPATH if offsets have been programmed for the LEAD and TILT angles
(with \$P_OFF_LEAD and \$P_OFF_TILT or \$AC_OFF_LEAD and \$AC_OFF_TILT).
Meaning of the units digit: Activation of "true" path-relative orientation
interpolation
xxx0:
The tool orientation has the relation to the path tangent and the normal vector programmed with LEAD and TILT only at the end of the block; within the block, the orientation does not follow the path tangent. This corresponds to the response in SW release $6 . x x$.
xxx1:
The tool orientation relation to the path tangent and the surface normal vector programmed with LEAD/TILT is retained throughout the block. Meaning of the tens digit: Interpretation of the TILT angle.
Meaning of the tens digit: Interpretation of the LEAD and TILT angles. This applies both to the angles programmed with LEAD and TILT with path-relative orientation interpolation (ORIPATH),
as well as to offsets of the LEAD and TILT angles, which can also be programmed without ORIPATH by means of \$P_OFF_LEAD and \$P_OFF_TILT or \$AC_OFF_LEAD and \$AC_OFF_TILT.
With path-relative orientation, the coordinate system is formed by the two vectors path tangent and normal vector. If an offset is applied to a programmed orientation, the current orientation itself takes over the role of the normal vector. A plane is then formed by the current orientation and the path tangent, in which the rotation is made perpendicularly with the LEAD angle or
the TILT angle.
xx 0 x :
The angles programmed with LEAD and TILT are evaluated in the following rotation sequence:

1. LEAD = Rotation around direction vertical to tangent and normal vector/orientation vector (forward angle)
2. TILT $=$ Rotation of orientation around normal vector

This is the interpretation of the LEAD/TILT angles in SW releases < 7.2 xx1x:

The angles programmed with LEAD and TILT are evaluated in the following rotation sequence:

1. LEAD = Rotation around direction vertical to tangent and normal vector/ orientation vector (forward angle) 2. TILT $=$ Rotation of orientation around vector in direction of tangent (tilt angle) $x \times 2 x:$

The angles programmed with LEAD and TILT are evaluated in the following rotation sequence:

1. LEAD = Rotation around direction vertical to tangent and normal vector/ orientation vector (forward angle)
2. TILT = Rotation of orientation around vector in direction of rotated (new) tangent (tilt angle) xx3x:

The angles programmed with LEAD and TILT are evaluated in the following rotation sequence:

1. TILT $=$ Rotation of orientation around vector in direction of tangent (tilt angle)
2. LEAD = Rotation around direction vertical to tangent and normal vector/ orientation vector (forward angle)
xx4x:
The angles programmed with LEAD and TILT are evaluated in the following rotation sequence:
3. TILT $=$ Rotation of orientation around vector in direction of tangent (tilt angle)
4. LEAD = Rotation around direction vertical to tangent and rotated (new) normal vector/orientation vector (forward angle)
Meaning of hundreds digit: Activation of a retract movement in the case of reorientation.

0 xx :
In the case of reorientation with ORIPATH, a retract movement is not executed.
1xx:
In the case of reorientation with active ORIPATH, a retract movement in the direction of the programmed vector is executed. The programmed vector for the direction of the retract movement refers to the coordinate system defined by the current tool direction (z coordinate) and the change in orientation (x coordinate).

2xx:
In the case of reorientation with active ORIPATH, a retract movement in the direction of the programmed vector is executed. The programmed vector for the direction of the retract movement refers to the coordinate system defined by the current surface normal vector (z coordinate) and the change in orientation (x coordinate).

A retract movement is possible only with a "true" path-relative orientation interpolation, i.e. if the units digit of this MD has a value of one.

Meaning of the thousands digit: Response of path-relative orientation on activation / deactivation of tool offset.
$0 x x x:$
The path-relative orientation is also retained in activation / deactivation blocks associated with tool offset.

1xxx:
The path-relative orientation is not retained in activation / deactivation blocks associated with tool offset. In these blocks, the tool orientation usually remains constant. However, tool orientation can be programmed in these blocks and then traversed there, although any orientation has to be programmed with vectors (the programming of rotary axis positions is not permitted).


## Description:

```
With this machine data, the effect of the override of the tool orientation is set with
the system variables (bit 0-15)
$AC_OFF_O[i], $AC_OFF_R[i], $AC_OFF_LEAD, $AC_OFF_TILT, $AC_OFF_THETA,
$AC_OFF_O_ANGLE and $AC_OFF_R_ANGLE
and the program variables (bit 16-31)
$P_OFF_O[i], $P_OFF_R[i], $P_OFF_LEAD, $P_OFF_TILT, $P_OFF_THETA, $P_OFF_O_ANGLE and
$P_OFF_R_ANGLE.
Bit 0-15: Effect of the overrides in the interpolator
```

Bit 0: Behavior of the system variables on RESET
0: Offset is deselected on RESET
1: Offset is retained after RESET
Bit 1: Behavior of the system variables in JOG mode
$0:$ No offset of the tool orientation on account of the system variables for offsetting
the tool orientation
1: An overlaid motion is interpolated on account of the system variables for
offsetting the tool orientation.
Bit 2: Effect of the value assignment to the components of the system variable
\$AC_OFF_O[i]
0: Absolute value
1: Incremental value (integrator)
Bit 3: Effect of the value assignment to the components of the system variable
\$AC_OFF_R[i]
0: Absolute value
1: Incremental value (integrator)
Bit 4: Effect of the value assignment to the system variable \$AC_OFF_LEAD
0: Absolute value
1: Incremental value (integrator)
Bit 5: Effect of the value assignment to the system variable \$AC_OFF_TILT
0 : Absolute value
1: Incremental value (integrator)
Bit 6: Effect of the value assignment to the system variable \$AC_OFF_THETA
0: Absolute value
1: Incremental value (integrator)
Bit 7: Effect of the value assignment on the system variable \$AC_OFF_O_ANGLE
0: Absolute value
1: Incremental value (integrator)
Bit 8: Effect of the value assignment on the system variable \$AC_OFF_R_ANGLE
0: Absolute value
1: Incremental value (integrator)
Bit 9: Suppression of the alarm 20301
0: Alarm is output
1: Alarm is suppressed
Bit 16-31: Effect of the overrides in the NC program
Bit 16: Effect of the value assignment to the components of the system variable
\$P_OFF_O[i]
0: Absolute value
1: Incremental value (integrator)

```
Bit 17: Effect of the value assignment to the components of the system variable
$P_OFF_R[i]
0: Absolute value
1: Incremental value (integrator)
Bit 18: Effect of the value assignment on the system variable $P_OFF_LEAD
0: Absolute value
1: Incremental value (integrator)
Bit 19: Effect of the value assignment on the system variable $P_OFF_TILT
0: Absolute value
1: Incremental value (integrator)
Bit 20: Effect of the value assignment on the system variable $P_OFF_THETA
0: Absolute value
1: Incremental value (integrator)
Bit 21: Effect of the value assignment on the system variable $P_OFF_O_ANGLE
0: Absolute value
1: Incremental value (integrator)
Bit 22: Effect of the value assignment on the system variable $P_OFF_R_ANGLE
0: Absolute value
1: Incremental value (integrator)
```



Description:
This data is only active for MD21102 \$MC_ORI_DEF_WITH_G_CODE = 0 $\mathrm{MD}=0$ (FALSE):

The values programmed with A2, B2, C2 during orientation programming are interpreted as an RPY angle (in degrees).
The orientation vector is produced by rotating a vector in direction $Z$ first by $C 2$ around the $Z$ axis, then by $B 2$ around the new $Y$ axis and finally by $A 2$ around the new X axis. In contrast to Euler angle programming, all three values influence the orientation vector in this case.
MD = 1 (TRUE):
The values programmed with A2, B2, C2 during orientation programming are interpreted as Euler angles (in degrees).
The orientation vector is produced by rotating a vector in direction $Z$ first by A2 around the $Z$ axis, then by $B 2$ around the new $X$ axis and finally by $C 2$ around the new $Z$ axis. This means that the value of $C 2$ is meaningless.



## Description:

Definition of the orientation angles A2, B2, C2:
FALSE: Definition as per MD21100 \$MC_ORIENTATION_IS_EULER
TRUE : Definition as per G code ( ORIEULER, ORIRPY, ORIVIRT1, ORIVIRT2)
Only programming of angles with A2, B2, C2 is interpreted in accordance with $G$ codes ORIEULER, ORIRPY, ORIVIRT1, ORIVIRT2 and not programming of angles by means of the orientation axes, as is the case with MD21102 \$MC_ORI_DEF_WITH_G_CODE $=1$.

| 21104 | ORI_IPO_WITH_G_CODE | C01, C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | G code for orientation interpolation | BOOLEAN | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{array}{l}\text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE... }\end{array}$ | 0 | - | $7 / 2$ |  |$]$ M

## Description:

Definition of the type of interpolation for the orientation
FALSE: Referred to $G$ codes ORIWKS and ORIMKS
TRUE : Referred to G codes ORIAXES, ORIVECT, ORIPLANE, ORICONxx and ORICURVE of the 51st G code group

| 21106 | CART_JOG_SYSTEM |  |  |  |  |  | C01, C07 | F2, M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Coordinate systems for Cartesian JOG |  |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 7 | M |  |  |  |

Description: This machine data has two meanings. First, it is used to activate the "Cartesian manual traverse" function. Second, it is used to determine the reference systems between which a switchover can be performed.
The meaning of the individual bits is determined as follows:
Bit 0 : Basic coordinate system
Bit 1 : Workpiece coordinate system
Bit 2 : Tool coordinate system

| 21108 | POLE_ORI_MODE | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Response with vector interpolation in pole position | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 11122 |  |  |
| $7 / 7$ | U |  |  |  |  |  |

## Description:

This MD defines how the change in orientation in the case of vector interpolation is treated if the orientation runs through the pole taper, which is defined by MD2 4540, 24640, 25240, 35340 \$MC_TRAFO5_POLE_LIMIT_1,2,3,4.
Vector interpolation is present, if tool orientation is interpolated independent of the kinematics, e.g. by means of large circle interpolation (orientation is swiveled in a plane), taper interpolation or through interpolation of a 2 nd reference point on the tool (ORICURVE), and not directly the orientation axes.
In the pole, the pole axis can have any position. For large circle interpolation, however, this axis requires a certain orientation.

### 4.2 Channel-specific NC machine data

If the start orientation is equal or close to the pole orientation and the end orientation of the block lies outside the tolerance circle defined by machine data TRAFO5_POLE_LIMIT_n, the pole axis can be moved to a position suitable to ensure that the subsequent vector interpolation can be carried out. This is set via the units and tens digits of this machine data.

The units digits can have the following values (active if start orientation is equal to pole orientation):
0 : The interpolation is carried out as an axis interpolation. The specified orientation path (large circle) is followed only if the pole axis (coincidentally) has the right position and the basic orientation is perpendicular to the 2 nd rotary axis.

1: A block, that positions the pole axis such that large circle interpolation can be carried out in the subsequent block, is inserted before the block where the described situation occurs.

2: If the block preceding the block, in which the described situation occurs, contains a geometry axis movement but no orientation movement, the required positioning movement of the pole axis is additionally carried out in this previous block.

If one of the two conditions is not fulfilled (block does not contain a geometry axis movement or block contains an orientation movement), the pole axis movement is carried out in a separate block (same behavior as under 1.)
The tens digits can have the following values (active if the start orientation differs from the pole orientation, but lies within the tolerance circle defined by TRAFO5_POLE_LIMIT_n):
00: The interpolation is carried out as an axis interpolation. The specified orientation path (large circle) is followed only if the pole axis (coincidentally) has the right position and the basic orientation is perpendicular to the 2 nd rotary axis.
10: A block that positions the two rotary axes to the point where the programmed large circle interpolation intersects with the tolerance circle defined by TRAFO5_POLE_LIMIT_n is inserted before the block where the described situation occurs. In the original block, large circle interpolation is applied as of this point.

20: If the block preceding the block in which the described situation occurs contains a geometry axis movement but no orientation movement, the necessary positioning movements of the two rotary axes are additionally carried out in this previous block. The residual movement in the original block is the same as that of value 10 of this machine data.
If one of the two conditions is not fulfilled (block does not contain a geometry axis movement or block contains an orientation movement), the pole axis movement is carried out in a separate block (same behavior as under 10.)
The hundreds digit of this MD is used to set the behavior in case the orientation runs through the pole taper or ends within the pole taper.
The hundreds digit can have the following values:
000: A block with the orientation running within the pole taper is subdivided only if the start orientation is equal to the pole orientation (with POLE_ORI_MODE = 1) or is close to the pole orientation (with POLE_ORI_MODE = 10). If the pole orientation occurs at an arbitrary point in the block, the whole change in orientation is traversed by means of rotary axis interpolation. In general, this leads to a more or less significant deviation from the programmed orientation path.
100: If the programmed orientation path runs through the pole taper, the block is subdivided in up to 3 parts, so that there is a deviation from the orientation path only within the pole taper. Outside the pole taper, the orientation is interpolated exactly on the programmed orientation path.
The pole handling behavior with active ORIANGLE (interpolation of orientation in virtual axis angles) is set with the thousands digit of the MD.

Oxxx: With this setting, the normal pole behavior is active even if ORIANGLE is active. If the transformation causes a switchover to axis interpolation due to a pole, orientation is interpolated by means of the real rotary axes. This can result in considerable deviations from the programmed orientation path. Any different settings of the MD \$MC POLE ORI MODE are also effective. This means, for example, that by means of the setting MD21108 \$MC_POLE_ORI_MODE = 100 , this behavior can be changed such that deviations from the programmed orientation path only occur within the pole taper.
1xxx: If ORIANGLE is active, there is never a switchover to the interpolation of the orientation by means of real rotary axes. The orientation is always interpolated with virtual axis angles (e.g. Euler angle or RPY angle). Different settings of the MD21108 \$MC_POLE_ORI_MODE do not become effective. For example, with MD21108 \$MC_POLE_ORI_MODE = $\overline{1} 100$ the division of the orientation movement, which was activated by the value 100, does not become effective. Therefore, if MD21108 \$MC_POLE_ORI_MODE = 1xxx, the units, tens and hundreds digits are ignored.

Using the ten thousands digit, it is possible to set whether for the generic 5/6 axis transformation, alarm 14112 should be output, if the intermediate orientations do not lie in the orientation range of the kinematics but final orientation of the block is possible:

0xxxx: The intermediate orientations are checked, as to whether these can be reached. If an orientation characteristic is programmed which goes through the range that cannot be reached, alarm 14112 (program orientation path not possible) is output.
1xxxx: The intermediate orientations are checked as to whether these can be reached. However, no alarm is output if the orientation runs through the range that cannot be reached, instead, the orientation change is performed using the rotary axis interpolation. This can result in significant deviations in orientation from the programmed orientation characteristic.
The values of the units, tens, hundreds and thousands digits are added. If the thousands digit $=1$, the remaining decimals of the MD are not evaluated (with the exception of the ten thousands digit).

| 21110 | X_AXIS_IN_OLD_X_Z_PLANE |  |  |  |  |  |  | EXP, C01, C09 | M1, K2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Coordinate system for automatic frame definition | BOOLEAN | NEW CONF |  |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | $7 / 7$ |  |  |  |  |

## Description:

$1=$ With automatic definition of a frame (TOFRAME), the $Z$ direction of which equals the current tool orientation, the new coordinate system is additionally rotated around the new $Z$ axis so that the new $X$ axis is in the old $Z-X$ plane.
$0=$ With automatic definition of a frame (TOFRAME), the $Z$ direction of which equals the current tool orientation, the new coordinate system is maintained as it results from the kinematics of the machine, i.e. it is assumed that the coordinate system is fixed to the tool and rotates with the tool (orientation).
From SW 5.3:
This machine data is only effective when the three lowest value decimal positions
(units, tens, hundreds) of SD42980 \$SC_TOFRAME_MODE) equal zero. Otherwise the frame
definition is specified by SD42980 \$SC_TOFRAME_MODE.
MD irrelevant for:
No orientation programming
Related to:
MD21100 \$MC_ORIENTATION_IS_EULER
Further references:
/PG/, Programming Guide, Fundamentals


| 21130 | ORIAX_TURN_TAB_2 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Definition of reference axes for orientation axes | BYTE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $1,2,3,1,2,3,1,2,3$, <br> $1,2,3,1,2,3,1,2,3$, <br> $1,2,3,1 \ldots$ | 3 | $7 / 2$ | M |
|  |  |  |  |  |  |

Description:
Defines the assignment of the rotations of the orientation axes around the reference axes for each channel (definition 2).
This orientation description is activated with the $G$ code ORIVIRT2
0: No rotation
1: Rotation around reference axis $X$
2: Rotation around reference axis $Y$
3: Rotation around reference axis Z
Example :
MD21120 \$MC_ORIAX_TURN_TAB_1[ 0 ] = 3 ; 1st ORI axis rotates around reference axis Z MD21120 \$MC_ORIAX_TURN_TAB_1[ 1 ] = 2 ; 2nd ORI axis rotates around reference axis Y MD21120 \$MC_ORIAX_TURN_TAB_1[ 2 ] = 1 ; 3rd ORI axis rotates around reference axis X


Description:
This MD is used to activate the modulo display of orientation axes.
This only impairs the displayed positions and not the possible programming or traversing range of these axes.
The modulo range is set using MD21134 \$MC_ORI_DISP_MODULO_RANGE and MD21136 \$MC_ORI_DISP_MODULO_RANGE_START.

| 21134 | ORI_DISP_MODULO_RANGE |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | Size of the modulo range for orientation axis display. |  |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |  |
| - | 3 | 360.0, 360.0, 360.0, 360.0, 360.0, 360.0, 360.0, 360.0, 360.0, 3 .. | 1.0 | 360000000.0 | $7 / 7$ | U |

Description: Defines the size of the modulo range for the display of orientation axis positions. This modulo range does not impair the programmable values of the positions nor the possible traversing range of orientation axes.

| 21136 | ORI_DISP_MODULO_RANGE_START |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | Starting position of the modulo range for orientation axis display. |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & -180.0,-180.0,-180.0, \\ & -180.0,-180.0,-180.0, \\ & -180.0,-180.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| Description: | Defines the s orientation ax <br> This only impa traversing ran Example: <br> Start = 0 <br> Start $=180$ <br> Start $=-180$ | tart position for as. <br> irs the displayed ge of these axes. <br> degree -> modulo r <br> degrees -> modulo <br> degrees -> modulo | he modulo ran positions, bu <br> nge $0<->3$ <br> range $180<->$ <br> range -180 <-> | e used to <br> not the <br> 0 degrees <br> 40 degree <br> 80 degree | lay <br> ble | ions of <br> ng or |



## Description:

| The dynamic override of the tool orientation is activated with this MD. The current |
| :--- |
| orientation is then corrected according to the current path velocity. This enables, |
| for example, the jet of water jet machines to be corrected as a function of the |
| velocity. See also the MDs |
| MD21142 \$MC_DYN_ORI_OFF_VEL |
| MD21144 \$MC_DYN_ORI_OFF_ANGLE |
|  |
|  |

Description:
For the dynamic override of the tool orientation. The outflow speed of the water jet is specified with this data.



| 21155 | JOG_VELO_ORI | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| rev/min | Jog feedrate for orientation axes | DOUBLE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $2.0,2.0,2.0,2.0,2.0$, <br> $2.0,2.0,2.0,2.0,2.0$, <br> $2.0,2.0,2.0, \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

Description: Velocity in JOG mode for orientation axes in the channel


| 21159 | JOG_JERK_ORI_ENABLE |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Jogging of orientation axes with SOFT |  |  | BOOLEAN | Rese |  |
| - |  |  |  |  |  |  |
| - | 3 | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, F... | 0 | - | 7/2 | M |



| 21160 | JOG_VELO_RAPID_GEO | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{mm} / \mathrm{min}$ | JOG rapid traverse for geometry axes | DOUBLE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $10000 ., 10000.0$, <br> $10000 ., 10000 .$, <br> $10000.0,10000 .$, <br> $10000 ., 10000 . \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

Description: Velocity in JOG mode with rapid traverse override for geometry axes in the channel (mm/ min)


Description: JOG velocity for geometry axes in the channel ( $\mathrm{mm} / \mathrm{min}$ )

| 21166 | JOG_ACCEL_GEO | C07, A04 | F2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{s}^{2}$ | Acceleration for geometry axes |  |  |  |  |  | DOUBLE | Reset |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $.0, .0, .0, .0, .0, .0, .0,$. <br> $0, .0, .0, .0, .0, .0, .0,$. <br> $0, .0, \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |  |  |

Description: Acceleration of the geometry axes when traversing in Jog mode.
If the machine data has the value zero, the value of the machine data MD32301 \$MA_JOG_MAX_ACCEL[<axis>] is used.


Description:
The jerk limit value limits the change in acceleration of the geometry axes in SOFT mode when jogging. The acceleration divided by the jerk limit value results in a time period during which the acceleration is changed.
If the machine data has the value zero, the value of the machine data MD32436 \$MA_JOG_MAX_JERK[<axis>] is used.
Jerk limitation during jogging of geometry axes is activated by the machine data \$JOG_AND_POS JERK_ENABLED[<axis> = 1 (SOFTA) of the underlying machine axes, and it is deactivā̄ed b̄y \$JOGG_AND_POS_JERK_ENABLED[<axis>] = 0 (BRISKA), or by means of the NC commands SOFTA, DRIVEA or BRISKA.
Not relevant for:
Fault conditions that cause a rapid stop.


Description: Acceleration for orientation axes in the channel

| 21180 | ROT_AX_SWL_CHECK_MODE | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Check of software limits for orientation axes | DWORD | NEW CONF |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 112 | $7 / 7$ |  |

## Description:

This machine data is evaluated only with the generic 5-axis transformation.
If the block preparation shows that the path programmed in the direction programming would lead to a violation of the software limits of the orientation axes, this machine data determines how the motions of the rotary axes have to be modified.

The units digit of the $M D$ is used to determine how alternative end positions of the rotary axes are created if the software limits would be violated. The tens digit is used to determine how the axes approach these end positions. The hundreds digit is used to activate an automatic limitation of the axis that swivels through the pole (nonpole axis).
Meaning of the units digit:
0: The path is not modified. Alarm 10720 (SW_LIMITSWITCH) is output if it is not possible to travel along the shortest path.
1: If the initially determined orientation path would violate the limits of the orientation axes, an attempt is made to modify the end points so that a motion becomes possible.
The first attempt uses the second solution. (There are usually two solutions to the conversion: orientation $==>$ angle of axis). If this solution would also violate the axis limits, an attempt is made to find a permissible solution by modifying both rotary axes by multiples of 360 degrees in both solutions.
The modifications of end positions described will only be performed if axis interpolation of rotary axes is active.

2: Monitoring and possibly modifications of the rotary-axis positions are the same as those when the machine data has the value 1.

However, modifications are also permissible if vector interpolation (large-circle interpolation, taper circumference interpolation, etc.) is active. If, in such a case, the rotary-axes positions would have to be modified, there is a switch to axis interpolation. The originally programmed orientation path will then usually not be followed.

Meaning of the tens digit:
0x: The orientation axes travel simultaneously to their possible end positions. There may be larger or smaller deviations from the original orientation path.

1x: If possible, the orientation is first rotated in the pole direction. In the pole position, the pole axis is then positioned so that the final orientation can be approached by rotating the orientation from the pole position into the programmed direction. The originally programmed orientation path is then followed.
Meaning of the hundreds digit:
0xx: The range of the non-pole axis is determined by its software limits or working area limitations.
lxx: The range of the non-pole axis is limited either in the positive or negative travel range. The possible range is limited by the larger of the absolute positive and negative values.

Examples:

1. MD36100 \$MA_POS_LIMIT_MINUS[AX5] = -5.0 and MD36110 \$MA_POS_LIMIT_PLUS[AX5] = 135.0, the possible range of axis AX5 is 0 ... 135.0
2. MD36100 \$MA_POS_LIMIT_MINUS[AX5] = -100.0 and MD36110 \$MA_POS_LIMIT_PLUS [AX5] = 10.0, the possible range of axis AX5 is $-100.0 \ldots 0.0$
3. MD36100 \$MA_POS_LIMIT_MINUS[AX5] = 5.0 und MD36110 \$MA_POS_LIMIT_PLUS[AX5] = 120.0, the possible range is 5.0 ... 120.0, there is no automatic limitation of the travel range.


Description:
Rotary axes offset for the orientable tool holder is automatically accepted from the work offset activated on activation of the orientable tool holder for the rotary axes.

| 21190 | TOFF_MODE |  | C08 | F2, 2.4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Mode of correction in tool direction |  | UDWORD | Reset |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 0x7FF | 7/2 | M |

Description:


1: Abortion of the traversing movement, that means no collection
Bit 9: \$AA_TOFF handwheel override possible without activation by TOFFON.
0 : \$AA_TOFF handwheel override possible only after activation of the \$AA_TOFF function by TOFFON.
1: \$AA_TOFF handwheel override possible without activation of the \$AA_TOFF function by TOFFON.

Bit 10: Axis assignment of the TOFF components on plane change.
0 : The axis components are exchanged cyclically on plane change from G17 to G18 or G19. This means that all three axes of the rotated coordinate system point in the positive axis directions of the initial coordinate system.
1: The coordinate system is rotated -90 degrees around the $X$ axis on plane change from G17 to G18, and 90 degrees around the $Y$ axis on plane change from G17 to G18.

In both cases, the rotated $Z$ axis points in the same direction as when bit 10 is not set.

The other two axes are exchanged in comparison to the setting with bit 10 not set, and one of the two axes points in the negative direction.

This setting should only be used if compatibility with older software versions is required (SW 4.5 and older). This setting is not recommended for new developments.


Description: Feedrate for online correction in tool direction [ mm/min ] via \$AA_TOFF[ ]


Description: Acceleration for online correction in tool direction [ m/s**2 ] via \$AA_TOFF[ ]


Description:
If, in the case of an orientation transformation, the effective BCS position or the effective tool length deviates from the values applied in preprocessing by more than the value defined in this machine data (e.g. due to superimposed movement or the activation of online tool length offset), real-time limiting of the dynamic response is activated.
$\left.\begin{array}{|l|l|l|l|l|l|}\hline 21199 & \text { ORI_TRAFO_ONLINE_CHECK_LIMR } & \text { C07 } & \text { F2 } \\ \hline \text { degrees } & \begin{array}{l}\text { Activation limit for real-time monitoring of dynamic response, } \\ \text { rotary axes }\end{array} & \text { DOUBLE } & \text { NEW CONF } \\ \hline- & - & \begin{array}{l}1.0,1.0,1.0,1.0,1.0, \\ 1.0,1.0,1.0 \ldots\end{array} & 0.0 & 1.0 \mathrm{E}+301 & 7 / 2\end{array}\right] \mathrm{M} 9$

Description: If, in the case of an orientation transformation, the effective BCS position of one of the rotary axes involved in the transformation deviates from the values applied in preprocessing by more than the value defined in this machine data (e.g. due to superimposed movement), real-time limiting of the dynamic response is activated.


Description:
The machine data determines the absolute value of the traverse movement for rapid lift. The direction of the traverse movement is defined in the part program by the command ALF.
References:
/PA/, Programming Guide: Fundamentals


Description:
1: When determining the retraction direction, if mirroring of the contour is active then the retraction direction is also mirrored. Mirroring of the retraction direction only refers to the directional components vertical to the tool direction.
0: Mirroring of the contour is NOT taken into account when determining the retraction direction.


## Description:

Bit0: Behavior of LFWP with active frame
$=0$ If the retraction direction is defined with LFWP, the active frame is not effective.
$=1$ If the retraction direction is defined with LFWP, the active frame is effective. In
this case MD21202 \$MC_LIFTFAST_WITH_MIRROR has no effect.

| 21204 | LIFTFAST_STOP_COND | C09 | M3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Stop behavior with fast retraction | UDWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 .$. | 0 | $0 x 7 F F F F F F F$ | $7 / 2$ |  |

Description: Specifies the stop behavior of the liftfast motion under different stop conditions Bit0: Axial NC/PLC interface signal DB31, ... DBX4.3 (Axial feed stop / Spindle stop) or CP-SW limit stop or a stop by an OEM application
$=0$ Stop of the retraction motion in case of an axial feed stop or CP-SW limit stop or stop by an OEM application
$=1$ No stop of the retraction motion in case of an axial feedstop or CP-SW limit stop
or stop by an OEM application
Bit1: Feed disable in channel NC/PLC interface signal DB21-30 DBX6.0 (Feed stop)
$=0$ Stop of the retraction motion in case of a feed stop in the channel
$=1$ No stop of the retraction motion in case of a feed stop in the channel


| 21220 | MULTFEED_ASSIGN_FASTIN | C01, C09 | A4, V1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |
| - | Assignment of the NC I/Os for 'several feedrates in the block' | UDWORD | PowerOn |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7 F F F F F F F$ |  |

Description: In MD21220 \$MC_MULTFEED_ASSIGN_FASTIN (assignment of the input bytes of the NC I/Os for "Multiple feeds in one block"), at most two digital input bytes or comparator input bytes of the NC I/Os can be assigned to the input byte for the "Multiple feeds in one block" function.

Furthermore, the assigned input signals can be inverted with the machine data.
The MD is coded as follows:
Bit 0-7
No. of lst digital input byte or comparator input byte used
Bit 8 - 15:
No. of 2 nd digital input byte or comparator input byte used
Bit 16 - 23 :
Inversion mask for describing the lst byte
Bit 24 - 31 :
Inversion mask for describing the 2 nd byte
Bit=0: do not invert
Bit=1: invert
The number for the digital inputs should be specified as follows:
1: for the on-board byte

2 - 5: for external bytes
The number for a comparator input byte should be specified as follows:
128: for comparator 1 (corresponds to 80Hex)
129: for comparator 2 (corresponds to 81Hex)

| 21230 | MULTFEED_STORE_MASK | C01, C09 | V1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Memory response for 'several feedrates in the block' | UBYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | - | $7 / 2$ |  |


| Description: | ```The priority of the signals for feeds F2 - F7 of the "Multiple feeds in one block" function decreases as the bit number increases in the input byte. The highest priority signal determines the current feed.``` |
| :---: | :---: |
|  | The MD21230 \$MC_MULTFEED_STORE_MASK (store input signals of the "Multiple feeds in one block" function) can be used to specify the response when the highest priority input drops out: |
|  | Set bit $2-7$ has the effect that the associated feed (F2 to F7) that has been selected by the highest priority input signal in each case is retained, even if the input signal drops out and a lower priority is present. |
|  | The MD is coded as follows: |
|  | Bit 0-1: No significance |
|  | Bit $2-7:$ Storage response of the feed signals |


| 21240 | PREVENT_SYNACT_LOCK_CHAN | C01, C09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protected synchronized actions | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $-1,-1,-1,-1,-1,-1,-1$, <br> $-1,-1,-1,-1,-1,-1,-1$, <br> $-1,-1 \ldots$ | 1399 | $7 / 2$ | M |  |

Description:
The machine data specifies a range of synchronized action IDs.
Synchronized actions with IDs in this range cannot be overwritten, canceled or locked via synchronized actions.

With 0.0, there is no range of protected synchronized actions. The values are read as absolute values; the upper value and the lower value can be indicated in any order. If a value is configured with -1, the configuration of the general machine data becomes active.

Note:
During the creation of protected static synchronized actions, the protection should be canceled; otherwise, a power ON would be necessary for each change in order to be able to redefine the logic.

| 21300 | COUPLE_AXIS_1 | C09 | S3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | $\begin{array}{l}\text { Synchron. spindle pair def, mach. axis no: follow. spindle [0], } \\ \text { lead.sp [1] }\end{array}$ | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $\begin{array}{l}0,0,0,0,0,0,0,0,0, \\ 0,0,0,0,0,0,0 \ldots\end{array}$ | 0 | 31 | $7 / 2$ |  |$]$| M |
| :--- |

Description:
One pair of synchronous spindles per NC channel can be defined in a fixed configuration with this machine data.

The machine axis numbers (channel-specific MD20070 \$MC_AXCONF_MACHAX_USED) applicable in the $N C$ channel must be entered for the following spindle [ $n=0$ ] and the leading spindle [n=1].
The coupling is not regarded as configured if values of "0" are entered, thus leaving 2 couplings to be configured freely via the NC part program.

MD irrelevant for:
User-defined coupling
Related to:
Channel-specific MD21310 \$MC_COUPLING_MODE_1
(type of coupling in synchronous spindle mode)
Channel-specific MD21340 \$MC_COUPLE_IS_WRITE_PROT_1
(coupling parameters cannot be changed)
Channel-specific MD21330 \$MC_COUPLE_RESET_MODE_1
(coupling cancelation response)

Channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous spindle mode)
SD42300 \$SC_COUPLE_RATIO_1
(speed ratio parameters for synchronous spindle mode)

| 21310 | COUPLING_MODE_1 |  | C03, C09 | S3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Type of coupling in synchronous spindle operation |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 7/2 | M |

Description:
This machine data determines the type of coupling for the fixed coupling configuration defined with machine data COUPLE_AXIS_1[n].
1: Setpoint coupling activated.
With a setpoint coupling, the reference variable for the following spindle is calculated from the position setpoint of the leading spindle, thus allowing the setpoints for the FS and LS to be input simultaneously. This has a particularly positive effect on the spindle synchronism during acceleration and deceleration processes.
A setpoint coupling thus achieves better command behavior than an actual-value coupling.
When a setpoint coupling is used, the following conditions must be fulfilled before synchronous mode is activated:

- The LS must be assigned to the same NC channel as the FS
- The FS and LS must be in position control mode (SPCON)
- The FS and LS must have the same dynamic control response

0: Actual-value coupling activated.
With an actual-value coupling, the command variable for the following spindle is calculated from the actual position value of the leading spindle. With this type of coupling, the following drive must be significantly more dynamic than the leading drive, but never vice versa.
The actual-value coupling can be used, for example, in the following cases:

- The LS must be assigned to a different NC channel than the FS.
- For leading spindles which are not suitable for position control.
- In cases where the dynamic control response of the leading spindle is considerably slower than that of the following spindle. As soon as the actual-value coupling is active, the NC/PLC interface signal DB31, ... DBX98.2 (Actual-value coupling) for the FS is set to "1-signal".
2: Speed coupling activated.
Internally, the speed coupling is a setpoint coupling. Lower dynamic requirements are placed on the FS and LS. A defined relation between the positions of the FS and LS cannot be established.
A speed coupling is used in the following cases:
- LS and/or FS are not in position control.
- There are no measuring systems present.

The coupling type can be altered in the $N C$ part program when the coupling is deactivated by means of language instruction COUPDEF provided this option has not been inhibited by the channel-specific MD21340 \$MC_COUPLE_IS_WRITE_PROT_1. However, the parameterized value of channel-specific MD21310 \$MC_COUPLING_MODE_MD irrelevant to:
User-defined coupling
Related to:
Channel-specific MD21300 \$MC_COUPLE_AXIS_1
(definition of pair of synchronous spindles)
Channel-specific MD21340 \$MC_COUPLE_IS_WRITE_PROT_1
(write-protection for configured coupling parameters)
NC/PLC interface signal DB31, ... DBX98.2 (Actual-value coupling)

| 21320 | COUPLE_BLOCK_CHANGE_CTRL_1 | C09 | S3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Block change behavior in synchronous spindle operation | BYTE | PowerOn |  |  |  |
| - | - | $3,3,3,3,3,3,3,3 \ldots$ | 0 | 3 | $7 / 2$ |  |

Description:
This machine data determines the condition under which a block change has to be executed when synchronous mode is activated for the fixed coupling configuration defined in the channel-specific machine data COUPLE_AXIS_ [n].
The following options are available:
0: Block change is enabled immediately
1: Block change in response to "Fine synchronization"
2: Block change in response to "Coarse synchronization"
3: Block change in response to IPOSTOP (i.e. after setpoint-based synchronization)
The block change response can be altered in the NC part program with language
instruction COUPDEF provided this option is not inhibited by the channel-specific
MD21340 \$MC_COUPLE_IS_WRITE_PROT_1. However, the parameterized value of the channel-

The selected block change response remains valid even when the velocity ratio is changed or a defined angular offset is programmed while the coupling is active.
MD irrelevant for:
User-defined coupling
Related to:
Channel-specific MD21300 \$MC_COUPLE_AXIS_1
(definition of pair of synchronous spindles)
Channel-specific MD21340 \$MC_COUPLE_IS_WRITE_PROT_1
(coupling parameters cannot be changed)
Channel-specific MD37200 \$MA_COUPLE_POS_TOL_COARSE or MD37220
\$MA_COUPLE_VELO_TOL_COARSE
(threshold value for coarse synchronization)
Channel-specific MD37210 \$MA_COUPLE_POS_TOL_FINE or MD37230 \$MA_COUPLE_VELO_TOL_FINE
(threshold value for fine synchronization)

| 21330 | COUPLE_RESET_MODE_1 | C03, C09 | S3, K1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Coupling cancelation behavior |  |  |  |  |  | UDWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | $0 \times 3 F F$ | 7/2 |  |  |  |

## Description:

This machine data defines the behavior of the synchronous mode for the pair of synchronous spindles configured with machine data COUPLE_AXIS_1[n].
Bit $0=0$ :
Synchronous mode remains active with a new program start and, as long as the control remains switched on, can be canceled only with COUPOF.
Bit $0=1$ :
Synchronous mode is canceled with program start (from the reset condition).
Bit 1=0:
Synchronous mode remains active even with program end and reset and, as long as the control remains switched on, can be canceled only with COUPOF.
Bit 1=1:
Synchronous mode is canceled with program end or RESET.
Bit 5=1:

The configured data are activated with program start.
Bit 6=1:
The configured data are activated with program end or RESET.
Bit 9=1:
Synchronous mode is switched on with program start.
Note:
Synchronous mode is not deselected with NC Start after NC Stop.
MD irrelevant to:
User-defined coupling
Related to:
Channel-specific MD21300 \$MC_COUPLE_AXIS_1 (definition of pair of synchronous spindles)

NC/PLC interface signal DB31, ... DBX84.4 (Active spindle mode - synchronous mode)

| 21340 | COUPLE_IS_WRITE_PROT_1 |  | C09 | S3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Coupling parameters cannot be altered |  | BOOLEAN | PowerOn |  |
|  |  |  |  |  |  |
|  | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE.. |  |  | 7/2 | M |
| Description: | This machine data defines whether or not the coupling parameters (speed ratio, block change response, coupling type) for the pair of synchronous spindles configured with channel-specific machine data COUPLE_AXIS_1[n] may be altered by the NC part program. <br> 1: Coupling parameters may not be altered by the NC program (write-protection active) <br> An alarm message is generated if an attempt is made to change the parameters. <br> 0: NC part program may alter coupling parameters using language instruction COUPDEF. <br> MD irrelevant for: <br> User-defined coupling <br> Related to: <br> Channel-specific MD21300 \$MC_COUPLE_AXIS_1 <br> (definition of pair of synchronous spindles) <br> Channel-specific MD21310 \$MC_COUPLING_MODE_1 <br> (type of coupling in synchronous spindle mode) <br> Channel-specific MD21330 \$MC_COUPLE_RESET_MODE_1 <br> (coupling cancelation response) <br> Channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1 <br> (block change response in synchronous spindle mode) <br> SD42300 \$SC_COUPLE_RATIO_1 <br> (speed ratio parameters for synchronous spindle mode) |  |  |  |  |


| 21380 | ESR_DELAY_TIME1 | EXP, N09 | M3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Delay time ESR axes | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

[^9] for example, to enable a retraction from the tooth gap (ESR) in gear wheel machining.

### 4.2 Channel-specific NC machine data

| 21381 | ESR_DELAY_TIME2 |  | EXP, N09 | M3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | ESR time for IPO controlled braking |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

Description: When time MD21380 \$MC_ESR_DELAY_TIME1 has expired, the time (MD21381 \$MC_ESR_DELAY_TIME2) specified for interpolatory braking is still available.
When time MD21381 \$MC_ESR_DELAY_TIME2 has expired, rapid deceleration with following tracking is initiated.


## Description:

The vertical offset of the grinding axis is specified in this MD.

| 21501 | TRACLG_GRINDSPI_HOR_OFFSET |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Horiz. position offset of grinding axis in centerless grinding |  | DOUBLE | Pow |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & \text { 0., 0., 0., 0., 0., 0., 0., } \\ & 0 . . . . \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |

Description: Horizontal position offset of the grinding axis in centerless grinding.
The setting in this MD is significant only when MD: TRAFO_AXES_IN_n[0] = 0, i.e. no axis is programmed for the grinding wheel.

| 21502 | TRACLG_CTRLSPI_VERT_OFFSET | C07 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Vert. position offset of regulating axis in centerless grinding |  |  |  |  |  | DOUBLE | PowerOn |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . . .$. | -MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |  |  |

Description: The vertical offset for the regulating axis is specified in this MD.



## Description:

X offset for work blade
Rule: $X(0)=X(o f f s e t)+Q 1<X(d i r e c t i o n ~ v e c t o r ~ Q 1)+Q 2<X(d i r e c t i o n ~ v e c t o r ~ Q 2) ~$





| 21516 | TRACLG_SUPPORT_LEAD_ANGLE | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| degrees | Lead angle of work blade in centerless grinding | DOUBLE | PowerOn |  |  |
| - | - | 0., 0., 0., 0., 0., 0., 0., <br> $0 . \ldots .$. | -90. | 90. | $7 / 2$ |
| - | O. |  |  |  |  |


| 21518 | TRACLG_CONTACT_UPPER_LIMIT |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Upper contact limit of work blade with work in centerl. grinding |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., \\ & 0 . . . . \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/2 | M |
| Description: | It is necessary to specify the upper contact limit of the blade with the part to be ground (d1) for the purpose of monitoring the support range limits. |  |  |  |  |


| 21520 | TRACLG_CONTACT_LOWER_LIMIT |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Lower contact limit of work blade with work in centerl. grinding |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., \\ & 0 . . . \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/2 | M |

Description: It is necessary to specify the lower contact limit of the blade with the part to be ground (d2) for the purpose of monitoring the support range limits.
Related to:
MD: TRACLG_CONTACT_UPPER_LIMIT


Description: The number of the grinding spindle is specified in this MD.

| 21524 | TRACLG_CTRLSPI_NR |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Definition of regulating spindle for centerless grinding |  | BYTE | Pow |  |
| - |  |  |  |  |  |
| - | 1, 1, 1, 1, 1, 1, 1, 1... | 1 | 20 | 7/2 | M |

Description: The number of the regulating spindle is specified in this MD.


Description:
This MD can be used to define how the speed of the regulating wheel must respond in the case of transitions from motion blocks with GO and without G0 (see table).
TRACLG_GO_IS_SPECIAL = 1 :
On transition from a motion block with GO to one without GO, the speed of the regulating wheel is increased during the GO block to the desired initial speed in the block without GO.
TRACLG_GO_IS_SPECIAL = 0 :
The speed of the regulating wheel is controlled only for motion blocks without G0 (the transitions from a motion block with GO to one without GO are not taken into account).

| 22000 | AUXFU_ASSIGN_GROUP | C04 | H2, S1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Auxiliary function group | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 255 | $1,1,1,1,1,1,1,1,1$, <br> $1,1,1,1,1,1,1,1,1$, <br> $1,1,1,1, \ldots$ | 1 | 168 | M |


| Description: |
| :--- | :--- | :--- |

Description:
See MD22010 \$MC_AUXFU_ASSIGN_TYPE [n] (auxiliary function type)



| 22030 | AUXFU_ASSIGN_VALUE | C04 | H2, S1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Auxiliary function value | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 255 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,, \ldots$ | - | - | M |

Description:
See MD22010 \$MC_AUXFU_ASSIGN_TYPE[n] (auxiliary function type)


Description:
Specification of the output behavior of the user-defined auxiliary functions. Bit $0=1 \quad$ Acknowledgment "normal" after an OB1 cycle
Bit $1=1 \quad$ Acknowledgment "quick" with OB40
Bit $2=1 \quad$ No predefined auxiliary function
Bit $3=1 \quad$ No output to the PLC
Bit $4=1$ Spindle reaction after acknowledgment by the PLC
Bit $5=1$ Output before the motion
Bit $6=1 \quad$ Output during the motion
Bit $7=1 \quad$ Output at block end
Bit $8=1 \quad$ No output after block search types $1,2,4$
Bit $9=1$ Collection during block search type 5 (SERUPRO)
Bit $10=1$ No output during block search type 5 (SERUPRO)
Bit $11=1$ Cross-channel auxiliary function during block search type 5 (SERUPRO)
Bit $12=1$ Output via synchronized action
Bit $13=1$ Implicit auxiliary function
Bit $14=1$ Active M01
Bit $15=1$ No output during running-in test
Bit $16=1$ Nibbling off
Bit $17=1$ Nibbling on
Bit $18=1$ Nibbling


Description:
Acknowledgment time for auxiliary functions in ms. See MD22010 \$MC_AUXFU_ASSIGN_TYPE[n] (auxiliary function type)

| 22040 | AUXFU_PREDEF_GROUP | C04 | H2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Predefined auxiliary function groups | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 301 | $1,1,1,1,1,1,2,2,2$, <br> $2,2,4,4,4,4,4,4,3$, <br> $1,1,1, \ldots$ | 168 | $7 / 2$ | M |

```
Description: Group assignment of predefined auxiliary functions.
The predefined groups cannot be changed for indices 0, 1, 2, 3, 4, 22, 23, 24.
```



| 22060 | AUXFU_PREDEF_EXTENSION | C04 | H2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Predefined auxiliary function extension | DWORD | PowerOn |  |  |
| - | 301 | $0,0,0,0,0,0,1,1,1$, <br> $1,1,1,1,1,1,1,1,1$, <br> $0,0,0,, \ldots$ | 99 | M |  |

## Description: Address extension for predefined auxiliary functions: <br> This setting can be changed only for indices 5 to 17 and 21!

| 22070 | AUXFU_PREDEF_VALUE | C04 | H2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Predefined auxiliary function value | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 301 | $0,1,2,17,30,6,3,4$, <br> $5,19,70,40,41,42$, <br> $43,44,45,-1, \ldots$ | - | - | M |

Description:
Value of predefined auxiliary functions.
This setting cannot be changed!

| 22080 | AUXFU_PREDEF_SPEC |  |  | C04 | H2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Output specification |  |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 301 | $0 \times 81,0 \times 81,0 \times 81$, <br> 0x81, 0x81, 0x21, <br> $0 \times 21,0 \times 21,0 \times 21$, <br> $0 \times 21$,, $0 \times 8 \ldots$ | $\begin{array}{\|l} \hline 0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0 \ldots \end{array}$ | 0x7FFFF, 0x7FFFF, 0x7FFFF, 0x7FFFF, 0x7FFFF, 0x7FFFF, 0x7FFFF, 0... | 7/2 | M |

## Description:

Specification of the output behavior of the predefined auxiliary functions.
Bit $0=1$ Acknowledgment "normal" after an OB1 cycle
Bit $1=1 \quad$ Acknowledgment "quick" with OB40
Bit $2=1$ No predefined auxiliary function
Bit $3=1$ No output to the PLC
Bit $4=1$ Spindle reaction after acknowledgment by the PLC
Bit $5=1$ Output before the motion
Bit $6=1$ Output during the motion
Bit $7=1$ Output at block end
Bit $8=1 \quad$ No output after block search types 1, 2, 4
Bit $9=1$ Collection during block search type 5 (SERUPRO)

```
Bit 10 = 1 No output during block search type 5 (SERUPRO)
Bit 11 = 1 Cross-channel auxiliary function during block search type 5 (SERUPRO)
Bit 12 = 1 Output via synchronized action
Bit 13 = 1 Implicit auxiliary function
Bit 14 = 1 Active M01
Bit 15 = 1 No output during running-in test
Bit 16 = 1 Nibbling off
Bit 17 = 1 Nibbling on
Bit 18 = 1 Nibbling
```



Description:
Acknowledgment time for auxiliary functions in ms.
See MD22010 \$MC_AUXFU_PREDEF_TYPE[n] (auxiliary function type)

| 22100 | AUXFU_QUICK_BLOCKCHANGE | C04 | H2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Block change delay with quick auxiliary functions. | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | $7 / 2$ |  |

Description: Block change is not delayed with quick auxiliary functions.
0: With the quick auxiliary function output the block change is delayed until acknowledgment by the PLC (OB40).
1: With the quick auxiliary function output to the PLC the block change is not delayed.
MD irrelevant for:
Auxiliary functions with normal acknowledgment
References:
/FBSY/, Synchronized Actions

| 22110 | AUXFU_H_TYPE_INT | C11, C04 | H2, K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Data format of H auxiliary functions (integer/real) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 |  |  |

Description: 0: The values of $H$ auxiliary functions are present in floating point format. The maximum value range is $+/-3.4028$ ex 38 .
1: The value of $H$ auxiliary functions is rounded and changed to an integer.
The basic program in the PLC must interpret the value as an integer.
The maximum value range is -2147483648 to 2147483647.


Description:
Synchronization of the M auxiliary functions with regard to a simultaneously programmed axis motion.
$0=$ Output before motion

1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
Notice:
An auxiliary function output specification configured by MD22080 \$MC_AUXFU_PREDEF_SPEC[ preIndex ], MD22035 \$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] or
A group output specification configured by MD11110 \$MN_AUXFU_GROUP_SPEC[ groupIndex ] has a higher priority.

| 22210 | AUXFU_S_SYNC_TYPE | C04 | H2, 2.4 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Output time of S functions | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 4 | $7 / 2$ |$]$ M

## Description:

Synchronization of the $S$ auxiliary functions with regard to a simultaneously programmed axis motion.
$0=$ Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification
Notice:
An auxiliary function output specification configured by MD22035
\$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] has a higher priority.

| 22220 | AUXFU_T_SYNC_TYPE |  | C11, C04 | H2, 2.4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Output time for T functions |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 4 | 7/2 | M |

## Description:

Synchronization of the $T$ auxiliary functions with regard to a simultaneously programmed axis motion.
$0=$ Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification
Notice:
An auxiliary function output specification configured by MD22035
\$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] has a higher priority.


An auxiliary function output specification configured by MD22080 \$MC_AUXFU_PREDEF_SPEC[ preIndex ], MD22035 \$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] or A group output specification configured by MD11110 \$MN_AUXFU_GROUP_SPEC[ groupIndex ], which has a higher priority.

| 22240 | AUXFU_F_SYNC_TYPE | C04 | H2, K1, V1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Output time for F functions | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $3,3,3,3,3,3,3,3 \ldots$ | 0 | 4 | $7 / 2$ |  |

## Description:

Synchronization of the $F$ auxiliary functions with regard to a simultaneously programmed axis motion.
$0=$ Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification
Notice:
An auxiliary function output specification configured by MD22035
\$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] has a higher priority.

| 22250 | AUXFU_D_SYNC_TYPE | C04 | H2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Output time for D functions | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 4 | $7 / 2$ |  |$]$ M

Description:
Synchronization of the $D$ auxiliary functions with regard to a simultaneously programmed axis motion.
$0=$ Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification
Notice:
An auxiliary function output specification configured by MD22035
\$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] has a higher priority.

| 22252 | AUXFU_DL_SYNC_TYPE | C04 | H2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Output time of DL functions | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 4 | $7 / 2$ |  |

Description: Synchronization of the auxiliary function with regard to a simultaneously programmed motion.
0 = Output before motion
1 = Output during motion
2 = Output at block end
3 = No output to the PLC (therefore no block change delay)
4 = Output in accordance with the predefined output specification
Notice:
An auxiliary function output specification configured by MD22035
\$MC_AUXFU_ASSIGN_SPEC[ auxIndex ] has a higher priority.



Description:
4.2 Channel-specific NC machine data
$\left.\begin{array}{|l|l|l|l|l|l|}\hline 22400 & \text { S_VALUES_ACTIVE_AFTER_RESET } & \text { C04, C03, C05 } & - \\ \hline- & \text { S function active beyond RESET } & \text { BOOLEAN } & \text { PowerOn } \\ \hline- & - & \begin{array}{l}\text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE... }\end{array} & 0 & - & 7 / 2\end{array}\right]$ M

## Description:

1: The last $S$ values set in the main run are still active after a RESET. This also applies to the dynamic correction values ACC, VELOLIM in spindle mode. 0 0: The various $S$ values are equal to 0 after a RESET, and must therefore be reprogrammed.
The dynamic correction values $A C C$ and VELOLIM are reset to $100 \%$ for spindle mode if the axis-specific MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET and MD32320 \$MA_DYN_LIMIT_RESET_MASK do not specify anything else.
Note:
The values for ACC and VELOLIM are also retained for spindle mode if MD35040
\$MA_SPIND_ACTIVE_AFTER_RESET is not equal to zero or the axis-specific MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET is not equal to zero.

| 22410 | F_VALUES_ACTIVE_AFTER_RESET | C04, C03, C05 | M3, V1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | F function active beyond RESET | BOOLEAN | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{array}{l}\text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE... }\end{array}$ | 0 | - | $7 / 2$ |  |$]$ M

## Description:

1: The last programmed F, FA, OVR and OVRA values are still active after RESET.
This also applies to the dynamic correction values (ACC, VELOLIM, JERKLIM, ACCLIMA, VELOLIMA, JERKLIMA).
0: The various values are set to their default values after reset.
This does not apply to the dynamic correction values if the axis-specific MD32320 \$MA_DYN_LIMIT_RESET_MASK specifies anything else.
Note:
The dynamic correction values are also retained if the axis-specific MD32320 \$MA_DYN_LIMIT_RESET_MASK is not equal to zero.
Related to:
MD22240 \$MC_AUXFU_F_SYNC_TYPE Output time of the F functions

| 22420 | FGROUP_DEFAULT_AXES | C11 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Default setting for FGROUP command | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 8 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | - | $7 / 7$ | U |  |

## Description:

Default setting for $F G R O U P$ command. You can specify up to 8 channel axes whose resulting velocity is equivalent to the programmed path feed.

If all eight values are zero (default), the geo axis entered in MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB are active as the default setting for the FGROUP command as previously.


| 22440 | FGROUP_PATH_RATIO | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Path ratio when using the FGROUP singularity strategy | DOUBLE | Immediately |  |  |  |
| - | - | $\begin{array}{l}1.0,1.0,1.0,1.0,1.0, \\ 1.0,1.0,1.0 \ldots\end{array}$ | 0. | $1 . e 6$ | $3 / 3$ |  |$]$| U |
| :--- |

Description: Ratio of the path of non-FGROUP axes to the FGROUP axes, from which also the path of the first is taken into account for the reference of the path velocity.
Is only of significance for MD22430 \$MC_FGROUP_PATH_MODE > 0 . A value of 0 has the same effect as if all axes were in the FGROUP. For larger values, this approaches the behavior of that of MDMD22430 \$MC_FGROUP_PATH_MODE $=0$.
Corresponds with:
MD22420 \$MC_FGROUP_DEFAULT_AXES, MD22430 \$MC_FGROUP_PATH_MODE

| 22510 | GCODE_GROUPS_TO_PLC | C04 | K1, P3 pl, P3 sl |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | G codes output at NCK-PLC interface on block change/RESET | BYTE | PowerOn |  |  |  |
| - | 8 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | - | $7 / 2$ | M |  |

Description:

Specification of the $G$ code group, the $G$ codes of which are output to the NCK/PLC interface in case of block change/ reset.
The interface is updated after each block change and reset.
Notice:
It is not guaranteed that a PLC user program has at all times a block-synchronous relation between the active NC block and the $G$ codes present.
Example: Path mode with very short blocks


Description:
Specification of the $G$ code group of external languages, the $G$ codes of which are output at the NCK interface on block change/reset.
The interface is updated at each block change and after RESET.
Notice:
It is not guaranteed that a PLC user program has at all times a block-synchronous relation between the active $N C$ block and the $G$ codes present. (Example: Path mode with very short blocks).

| 22515 | GCODE_GROUPS_TO_PLC_MODE |  |  |  |  |  | C04 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Behavior of G group transfer to PLC | UDWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 1$ | $7 / 2$ |  |  |  |

## Description:

For setting the behavior, i.e. how the $G$ groups are to be interpreted in the PLC with regard to data.
With the current behavior (bit $0=0$ ), the $G$ group is the array index of a 64 -byte field (DBB 208 - DBB 271).

Maximally the 64 th $G$ group can be reached in this way.
With the new behavior (bit $0=1$ ), the data storage in the PLC consists of max. 8 bytes (DBB 208 - DBB 215).
With this procedure, the array index of this byte array is identical with the index of the MD22510 \$MC_GCODE_GROUPS_TO_PLC[Index] and MD22512
\$MC_EXTERN_GCODE_GROUPS_TO_PLC[Index].
Each index (0 - 7) may only be set for one of the two machine data; the value 0 must be entered for the other MD.
Bit $0(\mathrm{LSB})=0$ :
Behavior as before, the 64-byte field is used for displaying the $G$ codes
Bit $0(\mathrm{LSB})=1$ :
The user specifies for which $G$ groups the first 8 bytes are to be used

| 22530 | TOCARR_CHANGE_M_CODE |  |  |  |  |  | C04 | H2, W1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | M code at change of tool holder | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | -99999999 | 99999999 | $7 / 2$ |  |  |  |

Description: The absolute value of this machine data indicates the number of the $M$ code, which is output at the VDI interface when a tool holder is activated.

- If the MD is positive, the unchanged M code is always output.
- If the MD is negative, the number of the tool holder is added to the absolute value of the machine data and the number is output.
Special cases:
N M code is output, if the number of the $M$ code to be output or the absolute value of this MD is set to one of the values 0 to 6,17 or 30 . It is not monitored whether an M code created in this way will conflict with other functions.
References:
/FB/, H2, Auxiliary Function Output to PLC

| 22532 | GEOAX_CHANGE_M_CODE | C04 | H2, K2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | M code at change of geo axes | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 99999999 |  |

Description: Number of the M code, which is output at the VDI interface in the case of a switchover of the geometry axes.
No M code is output if this MD is set to one of the values 0 to 6, 17 or 30 .
It is not monitored whether an $M$ code created in this way will conflict with other functions.

| 22534 | TRAFO_CHANGE_M_CODE |  |  |  |  |  | C04 | M1, H2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | M code at change of transformation | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 99999999 | $7 / 2$ |  |  |  |

Description: Number of the $M$ code that is output at the VDI interface in the case of a transformation changeover of the geometry axes.
No $M$ code is output if this MD is set to one of the values 0 to 6,17 or 30 . It is not monitored whether an $M$ code created in this way will conflict with other functions.

| 22550 | TOOL_CHANGE_MODE |  | $\begin{aligned} & \text { C01, C11, C04, } \\ & \text { C09 } \end{aligned}$ | W3, K1, W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | New tool compensation for M function |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - |  |  | 1 | 7/2 | M |

Description: The $T$ function is used to select a tool in the program. The setting in this machine data determines whether the new tool is loaded immediately on execution of the $T$ function:
MD22550 \$MC_TOOL_CHANGE_MODE = 0
The new tool is loaded directly with the programming of $T$ or $D$. This setting is mainly used on turning machines. If a $D$ is not programmed in the block by $T$, then the tool offset defined in MD20270 \$MC_CUTTING_EDGE_DEFAULT is active.
In this case, the function "Manual tools" is not enabled.
MD22550 \$MC_TOOL_CHANGE_MODE = 1
The new tool is prepared for loading on execution of the $T$ function. This setting is used mainly on milling machines with a tool magazine in order to bring the new tool into the tool change position without interrupting the machining process. The M function entered in MD22560 \$MC_TOOL_CHANGE_M_CODE is used to remove the old tool from the spindle and load the new tool onto the spindle. According to DIN 66025, this tool change has to be programmed with $M$ function M06.
Related to:
MD22560 \$MC_TOOL_CHANGE_M_CODE

| 22560 | TOOL_CHANGE_M_CODE |  |  | C01, C04, C09 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | M function for tool change |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | - | $6,6,6,6,6,6,6,6 \ldots$ | 6 | 99999999 | 7/2 | M |

Description: If the $T$ function is only used to prepare a new tool for a tool change (this setting is used mainly on milling machines with a tool magazine, in order to bring the new tool into the tool change position without interrupting the machining process), another $M$ function must be used to trigger the tool change.

The $M$ function entered in TOOL_CHANGE_M_CODE triggers the tool change (remove old tool from the spindle and load new tool into the spindle). This tool change is required to be programmed with M function M06, in accordance with DIN 66025.
Related to:
MD22550 \$MC_TOOL_CHANGE_MODE

| 22562 | TOOL_CHANGE_ERROR_MODE |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |
| - | Response to tool change errors | C09 | W1 |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | UDWORD | PowerOn |
| - | - | $7 / 2$ | M |  |  |

Description:
Behavior if faults/problems occur during programmed tool change.
Bit $0=0$ : Standard behavior: Stop at the faulty NC block
Bit $0=1:$ If a fault is detected in the block with the tool change preparation, the alarm relevant to the preparation command $T$ is delayed until the corresponding tool change command (M06) has been interpreted in the program sequence. Until then, the alarm triggered by the preparation command is not output. The operator can take corrective actions in this block. When the program continues, the faulty NC block is re-interpreted, and the preparation command is automatically executed again internally.
The value = 1 is relevant only if the setting MD22550 \$MC_TOOL_CHANGE_MODE $=1$ is used. Bit 1 Only relevant with active tool management.
Bit 1=0: Standard behavior: Only tools with data assigned to a magazine are detected during tool change preparation.
Bit $1=1$ : Manual tools can be loaded.
A tool will also be loaded if its data is known in the NCK but has not been assigned to a magazine. In this case, the tool data is automatically assigned to the programmed toolholder.
The user is prompted to insert tools into or remove tools from the toolholder.
Bit 2 qualifies the offset programming
Bit 2=0: active D no. > 0 and active $T$ no. $=0$ gives offset 0
Active D no. > 0 and active D no. $=0$ gives total offset 0
Bit 2=1: active D no. > 0 and active $T$ no. $=0$ lead to an alarm message
Active D no. > 0 and active $D$ no. $=0$ lead to an alarm message
Bits 3 and 4 are only relevant with active tool management.
Function:
Control of the behavior of the init. block generation on program start if a disabled tool is on the spindle and this tool is to be activated.
See also: MD20112 \$MC_START_MODE_MASK, MD20110 \$MC_RESET_MODE_MASK
On RESET, this does not affect the behavior "Keep disabled tool on the spindle active". Bit $3=0$ : Standard: If the tool on the spindle is disabled, generate a tool change command requesting a replacement tool. An alarm will be generated if there is no such replacement tool.
Bit $3=1$ : The disabled status of the spindle tool is ignored. The tool becomes active. The subsequent part program should be formulated so that no parts are machined with the disabled tool.
Bit 4=0: Standard: The system tries to activate the spindle tool or its replacement tool
Bit 4=1: If the tool on the spindle is disabled, $T 0$ is programmed in the start init block.
The combination of bits 3 and 4 produces the following statements:
$0 / 0$ : Behavior as before, automatic change on NC start if a disabled tool is in the spindle
1 / 0: No automatic change

0 / 1: A T0 is automatically generated if a disabled tool is in the spindle at NC start
1 / 1: No statement
Bit 5: Reserved
Bit 6=0: Standard: If $T 0$ or $D 0$, only $T 0$ or $D 0$ is exactly programmed.
This means that MD20270 \$MC_CUTTING_EDGE_DEFAULT and MD20272 \$MC_SUMCORR_DEFAULT
define, with the programming of $T 0$ the value of $D, D L$.
For example, MD20270 \$MC_CUTTING_EDGE_DEFAULT=1
MD20272 \$MC_SUMCORR_DEFAULT=2
MD22550 \$MC_TOOL_CHANGE_MODE=0 (tool change with T programming)
N10 T0; T no. 0 has active number $D 1$ and $D L=2$ which results in offset zero. If bit 2 is also set:

Programming of
a) TO; for tool deselection
b) DO; for offset deselection
generates an alarm, if at least one of the machine data
MD20270 \$MC_CUTTING_EDGE_DEFAULT
MD20272 \$MC_SUMCORR_DEFAULT
is not equal to zero (T0 DO DL=0 is the correct programming).
or MD20272 \$MC_SUMCORR_DEFAULT is not equal to zero (DO DL=0 is the correct programming).
Bit 6=1: controls the NCK response when programming (x, y, z all greater than zero),
if at least one of
MD20270 \$MC_CUTTING_EDGE_DEFAULT
MD20272 \$MC_SUMCORR_DEFAULT
is not equal to zero.
a) Tx Dy -> T0

TO is automatically programmed in NCK DO or DO DL=0; i.e. values not equal to zero of MD20270 \$MC_CUTTING_EDGE_DEFAULT, MD20272 \$MC_SUMCORR_DEFAULT are treated as value equal to zero.
b) Tx Dy -> TO Dy, or TO DL =z, or TO Dy DL=z, or TO DO DL=z explicitly programmed values of $D, D L$ are not influenced.
c) Dy DL=z -> DO

With DO, DL=0 is automatically programmed in the NCK; i.e. values in MD20272
\$MC_SUMCORR_DEFAULT unequal to zero are treated as values equal to zero.
d) Dy $\mathrm{DL}=\mathrm{z}$-> DO DL=z

Explicitly programmed values of DL are not influenced.
If bit 2 is also set:
Only T0 / DO have to be programmed for tool/offset deselection, and this does not generate an alarm.
The statements relating to MD20272 \$MC_SUMCORR_DEFAULT or DL are only valid if the total offset function is active
(see MD18080 \$MN_MM_TOOL_MANAGEMENT_MASK, bit 8).
Bit 7=0: When Tx is programmed, a check is made to see whether a tool with $T$ number $x$ is known in the $T O$ unit of the channel. If not, the program is stopped in this block with alarm 17190.

Bit 7=1: only if the tool basic functionality is active
(MD20310 \$MC_TOOL_MANAGEMENT_MASK, bit 0,1=0)
and (MD18102 \$MN_MM_TYPE_OF_CUTTING_EDGE=0):

When Tx is programmed, an unknown $T x$ is intially ignored, and the alarm relating to the preparation command (Tx) is also ignored until the $D$ selection is interpreted in the program sequence. Only then is alarm 17191, which has been triggered by the preparation command, output. This means that the operator can take corrective actions with the D selection in this block. When the program is continued, the incorrect NC block is re-interpreted, and the preparation command is automatically executed again internally.
(This is of interest for Cutting-Edge-Default=0 or $=-2$ and D0 programming, otherwise the D of Cutting-Edge-Default is deselected on tool change.).)
This variant is justified for programming "Tool number=Location" (turret as toolholder) without tool management. The turret can now be positioned on a location for which a tool has not (yet) been defined.
This bit has no meaning if bit $0=1$ is set.
Bit $8=0$ : A tool that is located at a blocked magazine location is not taken into account when selecting a tool. (default setting)
Bit 8=1: Even a tool that is located at a blocked magazine location is taken into account when selecting a tool (this corresponds to the previous behavior.)

| 22600 | SERUPRO_SPEED_MODE | EXP | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Speed for block search run type 5 | DWORD | Immediately |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 3 |  |  |

## Description:

This machine data specifies the search run mode: SERUPRO in more detail. SERUPRO search run is activated with PI service _N_FINDBL mode parameter $=5$. SERUPRO means Search Run by Program test, i.e. traversing under program test from beginning of program to search target.
Note:
Program test does not move any axes/spindles.
MD22600 \$MC_SERUPRO_SPEED_MODE= 0
Program test with the search run/dry run speed
Under program test, the axes/spindles are traversed at the following velocity/speed:
Axes: MD22601 \$MC_SERUPRO_SPEED_FACTOR*dry run feed
Spindles: MD22601 \$MC_SERUPRO_SPEED_FACTOR*programmed speed
Dynamic axis / spindle limitations are not taken into account.
MD22600 \$MC_SERUPRO_SPEED_MODE= 1
Program test at programmed speed
Under program test, the axes/spindles are traversed at the following velocity/speed:
Axes: at the same velocity as dry run feed.
Spindles: at the programmed speed.
Dynamic axis / spindle limitations are taken into account.
MD22600 \$MC_SERUPRO_SPEED_MODE= 2
Program test at dry run speed
Under program test, the axes/spindles are traversed at the programmed velocity/speed.
Dynamic axis /spindle limitations are taken into account.
MD22600 \$MC_SERUPRO_SPEED_MODE= 3
Program test at search run speed
Under program test, the axes/spindles are traversed at the following velocity/speed:
Axes: MD22601 \$MC_SERUPRO_SPEED_FACTOR*programmed feed
Spindles: MD22601 \$MC_SERUPRO_SPEED_FACTOR*programmed speed.
Dynamic axis / spindle limitations are not taken into account.
Note:

With active revolutional feedrate (e.g. G95), the programmed $F$ value is not multiplied by the factor MD22601 \$MC_SERUPRO_SPEED_FACTOR but only by the programmed spindle speed. Here again, this increases the effective path velocity by the MD22601 \$MC_SERUPRO_SPEED_FACTOR.

Related to:
SD42100 \$SC_DRY_RUN_FEED, MD22601 \$MC_SERUPRO_SPEED_FACTOR



Description:
This machine data is activated via MD22621 \$MC_ENABLE_START_MODE_MASK_PRT.
If MD22621 \$MC_ENABLE_START_MODE_MASK_PRT is in its initial setting, MD22620 \$MC_START_MODE_MASK_PRT is inactive.
If MD22620 \$MC_START_MODE_MASK_PRT is activated for "search via program test" (abbr. SERUPRO), then $\operatorname{MD2} 26 \overline{2} 0$ \$MC_START_MODE_MASK_PRT replaces MD20112 \$MC_START_MODE_MASK when "search via program test" is started.
This enables a behavior deviating from PLC start to be set at the start of the search. The meaning of the bit-by-bit assignment of MD22620 \$MC_START_MODE_MASK_PRT is the same as that in MD20112 \$MC_START_MODE_MASK.

| 22621 | ENABLE_START_MODE_MASK_PRT |  | EXP, C03 | M3, K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Enables MD22620 \$MC_START_MODE_MASK_PRT |  | UDWORD | Reset |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots \end{aligned}$ | 0 | 0x1 | 7/2 | M |

## Description:

MD22620 \$MC_START_MODE_MASK_PRT is activated via MD22621
\$MC_ENABLE_START_MODE_MASK_DPRT.
If MD22621 \$MC_ENABLE_START_MODE_MASK_PRT is in its initial setting, MD22620
\$MC_START_MODE_MASK_PRT is inactive.
Bit0 $=1:$

### 4.2 Channel-specific NC machine data

If a "search via program test" (English abbr. SERUPRO) is started from RESET (PI service _N_FINDBL mode paramter == 5), MD22620 \$MC_START_MODE_MASK_PRT replaces MD20112 \$MC_START_MODE_MASK.
This method can be used to set a start behavior differing from PLC start when the search is started.

| 22622 | DISABLE_PLC_START |  | EXP | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Enable part program start via PLC |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots \end{aligned}$ | 0 | 0x7FFFFFFFF | 2/2 | M |

## Description:

Allow part program start via PLC.
This machine data will ONLY be evaluated, if "Group-Serupro" mode is switched on.
"Group-Serupro" is switched on by means of "\$MC_SERUPRO_MODE BIT2".
BITO $=0$
A part program can be started in this channel only via the PLC. Starting via the part program command "START" is interlocked.
BITO = 1
A part program can be started in this channel only by means of the part program command "START" from another channel. Starting via the PLC is interlocked.

| 22680 | AUTO_IPTR_LOCK | EXP, C03 | K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Disable interrupt pointer | UDWORD | Reset |  |  |
| - |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | $0 \times 3$ |  |
| $7 / 2$ | M |  |  |  |  |

Description:
With MD22680 \$MC_AUTO_IPTR_LOCK program areas are defined in which the individually indicated coupling types are active. If a program cancelation is executed in a program range that is defined as such, it will not be the currently executed part program block that is stored in the interrupt pointer (OPI module InterruptionSearch), but the last block prior to activation of the coupling.

| 22700 | TRACE_STARTTRACE_EVENT |  |  |  |  |  |  | EXP, C06 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Diagnostic data rec. starts with event <br> TRACE_STARTTRACE_EVENT. | STRING | PowerOn |  |  |  |  |  |  |
| NBUP |  |  |  |  |  |  |  |  |  |
| - | - | - | - | - | $2 / 2$ |  |  |  |  |

## Description:

The machine data is intended for diagnostics.
The recording of the diagnostic data does not start until the event
(TRACE_STARTTRACE_EVENT) has occurred at the trace point
(TRACE_STARTTRACE_TRACEPOINT) and in the correct step (TRACE_STARTTRACE_STEP)!
The machine data is additionally activated using the Cancel alarm key.

| 22702 | TRACE_STARTTRACE_STEP |  |  |  |  |  | EXP, C06 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Conditions for start of trace recording | STRING | PowerOn |  |  |  |  |  |
| NBUP |  |  |  |  |  |  |  |  |
| - | 2 | ,,,,,,,,,,,,,,,$\ldots$ | - | - | $2 / 2$ |  |  |  |

## Description:

The machine data is only intended for diagnostic use.
See TRACE_STARTTRACE_EVENT
For TRACE_STARTTRACE_EVENT BLOCK_CHANGE the string TRACE_STARTTRACE_STEP is
interpreted as a file name and block number!
For BSEVENTTYPE_SETALARM the string is interpreted as an alarm number.

The machine data can be additionally activated using the Cancel alarm key.


| 22706 | TRACE_STOPTRACE_STEP | EXP, C06 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | CommandSequenzStep with which the recording ends | STRING | PowerOn |  |  |  |
| NBUP |  |  |  |  |  |  |
| - | 2 | ,,,,,,,,,,,,,,,$\ldots$ | - | - | $2 / 2$ |  |

$\begin{array}{ll}\text { Description: } & \text { The machine data is only intended for diagnostics. } \\ & \text { The machine data can be additionally activated using the cancel alarm key. }\end{array}$

| 22708 | TRACE_SCOPE_MASK |  | EXP, C06 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Selects the contents of the trace file |  | STRING | PowerOn |  |
| NBUP |  |  |  |  |  |
| - | - - | - | - | 2/2 | M |

Description:
The machine data is only intended for diagnostics purposes. Specific trace contents are selected with the MD data.
The entry SETALARM records the alarm environment and the block change in the main run is also logged by means of BLOCK_CHANGE.
The machine data is additionally activated using the Cancel alarm key.


Description:
The machine data is only intended for diagnostic purposes. The MD datum defines which data are recorded in the trace file.

| 22712 | TRACE_VARIABLE_INDEX |  |  | EXP, C06 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Index for trace recording data |  |  | DWORD | PowerOn |  |
| NBUP |  |  |  |  |  |  |
| - | 10 | $\begin{aligned} & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0, \ldots \end{aligned}$ | 0 | 0xFFFF | 2/2 | M |

## Description:

The machine data is only intended for diagnostic use.
The MD data, together with TRACE_VARIABLE_NAME, determines which data are recorded in the trace file.
It enables access to an array element.
E.g. use as an axis index when accessing axis data.

| 22714 | MM_TRACE_DATA_FUNCTION |  | EXP, C02, C06 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activating diagnostics |  | UDWORD | Pow |  |
| NBUP |  |  |  |  |  |
| - | $\begin{array}{\|l} \hline 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots \end{array}$ | 0 | 0xFFFFFFF | 2/2 | M |

## Description:



```
    Only in conjunction with MD18794 $MN_MM_TRACE_VDI_SIGNAL
OEM traces are activated. Dynamic data.
13 Synchronized actions are recorded. Dynamic data.
NOTICE: Filled in applications with intensive use of
these trace points, other events are ignored!
That is why this bit should remain at 0 in these cases.
14 Reserved.
15 Recording of station commands. Dynamic data.
    Note: Most important output of the NCK module NCSC!
16 Recording of gantry commands
17 Recording of changes in the drive's status
18 Recording of the processing of the Event-Queue and generation of command sequences
19 Recording of time of event destructor calls
20 Recording of the dynamic limitations per block (only active when bit 0 is set).
21 Recording of the Look Ahead data (only active when bit 0 is set).
22 Recording of all Functions Config data.
Both a static part as well as a block-related part with the dynamic block data
are output at the time of trace generation.
22 Config data output (static)
23 Recording if computing time is given away during preprocessing (only active when
bit 0 is set).
24 Recording of multi-threading sequences (Multicore).
25 Recording of the external communication.
26 Recording of geometry data: positions, vLim, vLimSafety, OVR, clamping, etc.
27 Program trace: Extension of bit 10 to include recording of NC blocks in a
representation based on the basic block display with preceding identifier ":PT:"
```

| 22900 | STROKE_CHECK_INSIDE | EXP, C01, C11 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction (inside/outside) in which prot. zone 3 is effective | BOOLEAN | PowerOn |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | $7 / 2$ |

Description:
This MD defines whether protection zone 3 is a protection zone inside or outside.
Meaning:
0: Protection zone 3 is a protection zone inside, i.e. the protection zone must not entered inwardly.

1: Protection zone 3 is a protection zone outside

| 22910 | WEIGHTING_FACTOR_FOR_SCALE | EXP, C01, C11 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Input resolution for scaling factor | BOOLEAN | PowerOn |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | M |
| - | Definition of the unit for the scaling factor $P$ <br> J, K. and for the axial scaling factors I, <br> Meaning: <br> $0 \quad$ Scale factor in 0.001 |  |  |  |  |

```
1 Scale factor in 0.00001
Related to:
SD43120 $SA_DEFAULT_SCALE_FACTOR_AXIS,
SD42140 $SC_DEFAULT_SCALE_FACTOR_P
```



## Description:

This MD enables axial scaling.
Meaning:
0: Axial scaling not possible
1: Axial scaling possible -> MD DEFAULT_SCALE_FACTOR_AXIS is active
Related to:
SD43120 \$SA_DEFAULT_SCALE_FACTOR_AXIS


## Description:

This MD is used to activate the fixed feedrates set in SD42160 \$SC_EXTERN_FIXED_FEEDRATE_F1_F9[].
Meaning:
0: no fixed feedrates with F1 - F9
1: the feedrates set in SD42160 \$SC_EXTERN_FIXED_FEEDRATE_F1_F9[] become active when F1 - F9 are programmed.

| 22930 | EXTERN_PARALLEL_GEOAX | EXP, C01, C11 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Assignment of a parallel channel axis to the geometry axis | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 |  |

## Description:

Assignment table of the axes positioned parallel to the geometry axes.
This table can be used to assign channel axes positioned parallel to the geometry axes.
The parallel axes can then be activated as geometry axes in ISO mode using the $G$ functions of plane selection (G17 - G19) and the axis name of the parallel axis.

The axis is then replaced by the axis defined via MD20050
\$MC_AXCONF_GEOAX_ASSIGN_TAB[].
Prerequisite:
The channel axes used must be active. ( list position assigned in AXCONF_MACHAX_USED ). Entering zero deactivates the corresponding parallel geometry axis:

| 24000 | FRAME_ADD_COMPONENTS | C03 | K2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Frame components for G58 and G59 | BOOLEAN | PowerOn |  |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | $7 / 7$ |  |

## Description:

Additive programmable frame components can be separately programmed and modified. 0: Additive translations which have been programmed with ATRANS are stored in the frame together with the absolute translation (prog. with TRANS).
G58 and G59 are not possible.
1: The sum of the additive translations are stored in the fine offset of the programmable frame. The absolute and the additive translations can be changed independently of one another.
G58 and G59 are possible.

| 24002 | CHBFRAME_RESET_MASK |  | C03 | K2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Active channel-specific base frames after reset |  | UDWORD | Reset |  |
| - |  |  |  |  |  |
| - | 0xFFFF, 0xFFFF, <br> 0xFFFF, 0xFFFF, <br> 0xFFFF, 0xFFFF, <br> 0xFFFF, 0xFFFF... | 0 | 0xFFFF | 7/2 | M |
| Description: | Bit mask for the reset setting of the channel-specific base frames which are included in the channel. <br> The following apply: <br> If MD20110 \$MC_RESET_MODE_MASK bit0 = 1 and BIT14 = 1 <br> the entire base frame is determined on reset by chaining the base frame field elements, whose bit is 1 in the bit mask. <br> If MD20110 \$MC_RESET_MODE_MASK bit0 = 1 and BIT14 = 0 <br> the entire base frame is deselected on reset. |  |  |  |  |


4.2 Channel-specific NC machine data

| 24006 | CHSFRAME_RESET_MASK |  | C03 | K2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Active system frames after reset |  | UDWORD | Reset |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 \times 1,0 \times 1,0 \times 1,0 \times 1, \\ & 0 \times 1,0 \times 1,0 \times 1,0 \times 1 \ldots \end{aligned}$ | 0 | 0x00000FFF | 7/2 | M |

## Description:

Bit mask used for the reset setting of the channel-specific system frames included in the channel.

Bit 0: System frame for actual value setting and scratching is active after reset.
Bit 1: System frame for external work offset is active after reset.
Bit 2: Reserved, for TCARR and PAROT see MD20150 \$MC_GCODE_RESET_VALUES[].
Bit 3: Reserved, for TOROT and TOFRAME see MD20150 \$MC_GCODE_RESET_VALUES[].
Bit 4: System frame for workpiece reference points is active after reset.
Bit 5: System frame for cycles is active after reset.
Bit 6: Reserved; reset behavior dependent on MD20110 \$MC_RESET_MODE_MASK.
Bit 7: System frame \$P_ISO1FR (ISO G51.1 Mirror) is active after reset.
Bit 8: System frame \$P_ISO2FR (ISO G68 2DROT) is active after reset.
Bit 9: System frame \$P_ISO3FR (ISO G68 3DROT) is active after reset.
Bit 10: System frame \$P_ISO4FR (ISO G51 Scale) is active after reset.
Bit 11: System frame \$P_RELFR is active after reset.
Related to:
MD28082 \$MC_MM_SYSTEM_FRAME_MASK

| 24007 | CHSFRAME_RESET_CLEAR_MASK |  |  |  |  |  | C03 | K2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Deletion of system frames after reset | UDWORD | Reset |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | $0 \times 00000 F F F$ |  |  |  |  |

Description:
Bit mask used to delete channel-specific system frames from the data management on reset.

Bit 0: System frame for actual value setting and scratching is deleted on reset.
Bit 1: System frame for exernal work offset is deleted on reset.
Bit 2: Reserved, for TCARR and PAROT, see MD20150 \$MC_GCODE_RESET_VALUES[].
Bit 3: Reserved, for TOROT and TOFRAME, see MD20150 \$MC_GCODE_RESET_VALUES[].
Bit 4: System frame for workpiece reference points is deleted on reset.
Bit 5: System frame for cycles is deleted on reset.
Bit 6: Reserved; reset behavior depends on MD20110 \$MC_RESET_MODE_MASK.
Bit 7: System frame \$P_ISO1FR (ISO G51.1 Mirror) is deleted on reset.
Bit 8: System frame \$P_ISO2FR (ISO G68 2DROT) is deleted on reset.
Bit 9: System frame \$P_ISO3FR (ISO G68 3DROT) is deleted on reset.
Bit 10: System frame \$P_ISO4FR (ISO G51 Scale) is deleted on reset.
Bit 11: System frame $\$ P$ RELFR is deleted on reset.


```
Description:
This machine data defines whether channel-specific system frames are reset in the data
management on Power On. That is offsets and rotations are set to 0, scalings to 1.
Mirroring is disabled.
The selection can be made separately for individual system frames.
Bit 0: System frame for set actual value and scratching is deleted after Power On.
Bit 1: System frame for external work offset is deleted after Power On.
Bit 2: System frame for TCARR and PAROT is deleted after Power On.
Bit 3: System frame for TOROT and TOFRAME is deleted after Power On.
Bit 4: System frame for work piece reference points deleted after Power On.
Bit 5: System frame for cycles retained after Power On.
Bit 6: System frame for transformations deleted after Power On.
Bit 7: System frame $P_ISO1FR (ISO G51.1 Mirror) is deleted after power ON.
Bit 8: System frame $P_ISO2FR (ISO G68 2DROT) is deleted after power ON.
Bit 9: System frame $P_ISO3FR (ISO G68 3DROT) is deleted after power ON.
Bit 10: System frame $P_ISO4FR (ISO G51 Scale) is deleted after power ON.
Bit 11: System frame $P_RELFR is deleted after power ON.
Related to:
MD28082 $MC_MM_SYSTEM_FRAME_MASK
```



Description: 0: Programmable frame is deleted at reset.
1: Programmable frame remains active at reset.


Description:
Bit mask for configuring the positions for frame suppressions (SUPA, G153, G53).
The following rule applies:
Bit 0: Positions for display (OPI) without frame suppression
Bit 1: Position variables without frame suppression

| 24030 | FRAME_ACS_SET |  |  | C03 | K2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Adjustment of SZS coordinate system |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | 7/2 | M |
| Description: | $0:$ SZS r <br> 1: SZS $r$ | ults from the Work <br> ults from the Work | tr | th \$P_CY <br> th the \$ | and |  |


| 24040 | FRAME_ADAPT_MODE | C03 | K2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Adaptation of active frames | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{array}{l}0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots\end{array}$ | 0 | $0 \times 0000007$ | $7 / 2$ |  |$] \mathrm{M}$.

Description:
Bit mask for adapting the active frames or axis configuration
The following applies:

Bit 0 :
Rotations in active frames that rotate coordinate axes for which there are no geometry axes are deleted from the active frames.

Bit 1:
Shear angles in active frames are orthogonalized.
Bit 2:
Scalings of all geometry axes in the active frames are set to value 1.


## Description:

Bit mask for saving and activating data management frames.
The following applies:
Bit 0 :
Data management frames are only activated by programming the bit masks \$P_CHBFRMASK, \$P_NCBFRMASK and \$P_CHSFRMASK. G500..G599 only activate the relevant settable frame, GFRAMEO..GFRAME100 only activate the corresponding grinding frame. The reset behavior is independent of this.
Bit 1:
Data handling frames are not written implicitly by system functions such as TOROT, PAROT, ext. work offset, transformations.

| 24080 | USER_FRAME_POWERON_MASK | N01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Parameterize properties for settable frame | UDWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | 0 | $0 \times 1$ | $7 / 2$ |  |

Description:
Setting the following bits activates certain properties of the settable frame:
Bit $0=0$ : default behavior.
Bit $0=1:$ if MD20152 \$MC_GCODE_RESET_MODE[7] = 1, the last active settable frame is selected again according to $G$ code group 8 after power up of the control.

| 24100 | TRAFO_TYPE_1 | C07 | F2, TE4, M1, K1, W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of transformation 1 in channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |

## Description:

This MD specifies the first available transformation in each channel.
The 4 low-value bits identify the specific transformation of a specific transformation group. The transformation group is identified by a number starting with the 5 th bit.
Meaning:
0 No transformation
ab 16
5-axis transformation with turnable tool
ab 32
5-axis transformation with turnable workpiece
ab 48
5-axis transformation with turnable tool and turnable workpiece
72

Generic 5-axis transformation. Type and kinematic data are determined by an associated, orientable toolholder.
see:
MD24582 \$MC_TRAFO5_TCARR_NO_1
MD24682 \$MC_TRAFO5_TCARR_NO_2
The 4 low-value bits have the following meaning for a 5-axis transformation:
0 axis sequence $A B$
1 axis sequence $A C$
2 axis sequence BA
3 axis sequence $B C$
4 axis sequence CA
5 axis sequence CB
8 Generic orientation transformation (3-5 axes)
ab 256
TRANSMIT transformation
ab 512
TRACYL transformation
ab 1024
TRAANG transformation
2048
TRACLG: centerless transformation
ab 4096 bis 4098
OEM transformation
ab 8192
TRACON: cascaded transformations
Example:
A 5-axis transformation with turnable tool and axis sequence CA (i.e. C axis turns A axis) has number $20(=16+4)$
Notice:
Not all combinations of group numbers and axis sequence numbers are allowed. An error message is output if a number for a non-existent transformation is entered.
Corresponds with:
MD2 4200 \$MC_TRAFO_TYPE_2, MD24300 \$MC_TRAFO_TYPE_3, ... MD24460 \$MC_TRAFO_TYPE_8
References:
/FB/, F2, "5-Axis Transformation"


References:
/FB/, F2, "5-Axis Transformation"

| 24120 | TRAFO_GEOAX_ASSIGN_TAB_1 | C07 | F2, TE4, TE4, M1, K1, W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Assignment of the geometry axes to channel axes for <br> transformation 1 | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | U |  |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 1.
Not relevant:
No transformation
Related to:
MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB, if no transformation is active.
References:
/FB/, K2, "Coordinate Systems, Axis Types, Axis Configurations, Workpiece-Related
Actual Value System, External Work Offset"

| 24130 | TRAFO_INCLUDES_TOOL_1 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Tool handling with active 1st transformation |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | NEW CONF |
| - | - | U |  |  |  |

Description: This machine data states for each channel whether the tool is handled during the lst transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only the "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

| 24200 | TRAFO_TYPE_2 |  |  |  |  |  | C07 | F2, M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Definition of the 2nd transformation in the channel | DWORD | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |  |  |

## Description:

This MD states the second available transformation in each channel.
Same as TRAFO_TYPE_1, but for the second available transformation in the channel.
References:
/FB/, F2, "5-Axis Transformation"

| 24210 | TRAFO_AXES_IN_2 |  |  | C07 | F2, M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axis assignment for transformation 2 |  |  | BYTE | NEW |  |
| - |  |  |  |  |  |  |
| - | 20 | $\begin{aligned} & 1,2,3,4,5,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,, \ldots \end{aligned}$ | 0 | 20 | 7/7 | U |
| Description: TRAFO_AXES_IN_2(n) <br>  Axis assignment at input of 2nd to 8th transformation. <br>  Same meaning as for TRAFO_AXES_IN_1. |  |  |  |  |  |  |


| 24220 | TRAFO_GEOAX_ASSIGN_TAB_2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | 2 |  |  |  |  |

Description: This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 2.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 24230 | TRAFO_INCLUDES_TOOL_2 |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Tool handling with active 2nd transformation |  | BOOLEAN | NEW CONF |  |
| - |  |  |  |  |  |
| - | TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE... | 0 | - | $7 / 7$ | U |

Description:

This machine data states for each channel whether the tool is handled during the 2nd transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition. If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

| 24300 | TRAFO_TYPE_3 |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Definition of the 3rd transformation in the channel | DWORD | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | U |  |  |  |

Description: This MD states the third available transformation in each channel.
Same as TRAFO_TYPE_1, but for the third available transformation in the channel.
References:
/FB/, F2, "5-Axis Transformation"
4.2 Channel-specific NC machine data

| 24310 | TRAFO_AXES_IN_3 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Axis assignment for transformation 3 |  |  |  |  |
| - | BYTE |  |  |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0, \ldots$ | NEW CONF |  |  |

Description:
Axis assignment at the input point of the 3rd transformation in the channel.
Meaning is the same as TRAFO_AXES_IN_1, but for the third available transformation in the channel.

| 24320 | TRAFO_GEOAX_ASSIGN_TAB_3 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 3 | C07 | MYTE | NEW CONF |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | $7 / 7$ | U |
| - |  | 20 |  |  |  |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 3.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 24330 | TRAFO_INCLUDES_TOOL_3 | C07 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Tool handling with active 3rd transformation | BOOLEAN | NEW CONF |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | $7 / 7$ |  |$⿻$| U |
| :--- |

Description: This machine data states for each channel whether the tool is handled during the 3 rd transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition. If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

| 24400 | TRAFO_TYPE_4 | C07 | M1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of the 4th transformation in the channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |

## Description:

This MD states the fourth available transformation in each channel.
Same as TRAFO_TYPE_1, but for the fourth available transformation in the channel.
References:
/FB/, F2, "5-Axis Transformation"

| 24410 | TRAFO_AXES_IN_4 |  |  |  |  |  | C07 | F2, M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Axis assignment for the 4th transformation in the channel | BYTE | NEW CONF |  |  |  |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,, \ldots$ | 0 | 20 | U |  |  |  |

Description:
Axis assignment at the input point of the 4 th transformation in the channel.
Meaning is the same as TRAFO_AXES_IN_1, but for the fourth available transformation in the channel.

| 24420 | TRAFO_GEOAX_ASSIGN_TAB_4 |  |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axes to channel axes for transformation 4 |  |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0 \\ & 0,0,0,0 \ldots \end{aligned}$ | 0 | 20 | $7 / 7$ | U |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 4.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 24426 | TRAFO_INCLUDES_TOOL_4 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Tool handling with active 4th transformation | BOOLEAN | NEW CONF |  |  |
| - | - | $\begin{array}{l}\text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE... }\end{array}$ | 0 | - | $7 / 7$ |$]$| U |
| :--- |

Description: This machine data states for each channel whether the tool is handled during the 4 th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition. If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

| 24430 | TRAFO_TYPE_5 |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Type of transformation 5 in the channel | DWORD | NEW CONF |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |  |  |

Description:
Type of transformation available as the fifth in the channel. See MD24100 \$MC_TRAFO_TYPE_1 for explanation.


Description: Axis assignment at the input point of the 5th transformation. See TRAFO_AXES_IN_1 for explanation.

| 24434 | TRAFO_GEOAX_ASSIGN_TAB_5 |  |  |  |  |  |  | Assignment of geometry axes to channel axes for transformation <br> 5 | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | NEW CONF |  |  |  |  |  |  |
| - |  | 20 | U |  |  |  |  |  |  |  |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 5.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 24436 | TRAFO_INCLUDES_TOOL_5 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Tool handling with active 5th transformation |  |  |  |  |  | BOOLEAN | NEW CONF |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |  |  |  |
| - | - | $7 / 7$ |  |  |  |  |  |  |

## Description:

This machine data states for each channel whether the tool is handled during the 5th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition.
If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).

The method of operation of protection zones and working area limitations varies correspondingly.

| 24440 | TRAFO_TYPE_6 |  |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Type of transformation 6 in the channel |  |  |  |  |  | DWORD | NEW CONF |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |  |  |  |

Description: Type of transformation available as the sixth in the channel. See MD24100 \$MC_TRAFO_TYPE_1 for explanation.


| 24444 | TRAFO_GEOAX_ASSIGN_TAB_6 |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axes to channel axes for transformation 6 |  |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0 \ldots \end{aligned}$ | 0 | 20 | $7 / 7$ | U |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 6.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 24446 | TRAFO_INCLUDES_TOOL_6 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Tool handling with active 6th transformation | BOOLEAN | NEW CONF |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |  |  |  |

Description: This machine data states for each channel whether the tool is handled during the 6th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition. If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

| 24450 | TRAFO_TYPE_7 |  |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |  |
| - | Type of transformation 7 in the channel | DWORD | NEW CONF |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |  |  |  |

Description: Type of transformation available as the seventh in the channel. See MD24100 \$MC_TRAFO_TYPE_1 for explanation.

| 24452 | TRAFO_AXES_IN_7 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Axis assignment for transformation 7 |  |  |  |  |  |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,, \ldots$ | 0 | BYTE | NEW CONF |  |  |  |
| - | $7 / 7$ | U |  |  |  |  |  |  |

Description: Axis assignment at the input point of the 7th transformation. See TRAFO_AXES_IN_1 for explanation.

| 24454 | TRAFO_GEOAX_ASSIGN_TAB_7 |  |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axes to channel axes for transformation <br> 7 | BYTE | NEW CONF |  |  |  |  |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 .$. | 0 | 20 | U |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |

```
Description: This MD states the channel axes on which the axes of the cartesian coordinate system
are mapped for active transformation 7.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.
```

| 24456 | TRAFO_INCLUDES_TOOL_7 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Tool handling with active 7th transformation | BOOLEAN | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | $7 / 7$ |

Description:
This machine data states for each channel whether the tool is handled during the 7 th transformation or externally.
This machine data is evaluated only with specific transformations.
It is evaluated on the condition that the orientation of the tool with reference to the Basic Coordinate System cannot be changed by the transformation. In standard transformations, only "inclined-axis transformation" fulfills this condition. If this machine data is set, the Basic Coordinate System (BCS) refers to the tool reference point even with active transformations. Otherwise, it refers to the tool tip (Tool Center Point - TCP).
The method of operation of protection zones and working area limitations varies correspondingly.

| 24460 | TRAFO_TYPE_8 |  |  |  |  |  |  | C07 | F2, TE4, M1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |  |
| - | Type of transformation 8 in the channel | DWORD | NEW CONF |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |  |  |  |

Description: Type of transformation available as the eighth in the channel. See MD24100 \$MC_TRAFO_TYPE_1 for explanation.

| 24462 | TRAFO_AXES_IN_8 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Axis assignment for transformation 8 | BYTE | NEW CONF |  |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,, \ldots$ | 0 | 20 | U |  |

Description: Axis assignment at the input point of the 8th transformation. See TRAFO_AXES_IN_1 for explanation.

| 24464 | TRAFO_GEOAX_ASSIGN_TAB_8 |  |  |  |  |  |  | Assignment of geometry axes to channel axes for transformation <br> 8 | BYTE | NEW CONF |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | U |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |  |  |

## Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 8.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.


| 24470 | TRAFO_TYPE_9 |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Type of transformation 9 in the channel |  |  |  |  |  | DWORD | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | U |  |  |  |

Description: Type of transformation available as the ninth in the channel. See MD24100 \$MC_TRAFO_TYPE_1 for explanation.

| 24472 | TRAFO_AXES_IN_9 |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axis assignment for transformation 9 |  |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 20 | $\begin{aligned} & 1,2,3,4,5,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,, \ldots \end{aligned}$ | 0 | 20 | 7/7 | U |

Description: Axis assignment at the input point of the 9th transformation. See TRAFO_AXES_IN_1 for explanation.

| 24474 | TRAFO_GEOAX_ASSIGN_TAB_9 |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axes to channel axes for transformation 9 |  |  | BYTE | NEW |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0 \ldots \end{aligned}$ | 0 | 20 | $7 / 7$ | U |

Description: This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 9.

4.2 Channel-specific NC machine data

| 24480 | TRAFO_TYPE_10 | C07 | F2, M1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Transformation 10 in channel | DWORD | NEW CONF |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |

Description: Same as TRAFO_TYPE_1, but for the tenth available transformation in the channel.


Description: Axis assignment at the input of the 10 th transformation. See TRAFO_AXES_IN_1 for explanation.

| 24484 | TRAFO_GEOAX_ASSIGN_TAB_10 |  |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axes to channel axes for transformation 10 |  |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0 \\ & 0,0,0,0 \ldots \end{aligned}$ | 0 | 20 | $7 / 7$ | U |

## Description:

Assignment table of geometry axes with transformation 10
Same as AXCONF_GEOAX_ASSIGN_TAB, but only effective when transformation 10 is active.

| 24486 | TRAFO_INCLUDES_TOOL_10 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Treatment of tool with active 10th transformation | BOOLEAN | NEW CONF |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |

Description: Same as TRAFO_INCLUDES_TOOL_1, but for the 10 th transformation.

| 24500 | TRAFO5_PART_OFFSET_1 | C07 | F2, M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm |  |  |  |  |  |
| - | Offset vector of 5-axis transformation 1 | DOUBLE | NEW CONF |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

[^10]MD irrelevant:
if the "5-Axis Transformation" option is not installed.

| 24510 | TRAFO5_ROT_AX_OFFSET_1 |  |  |  |  |  | C07 | F2, M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees |  |  |  |  |  |  |  |  |
| - | Position offset of rotary axes $1 / 2 / 3$ for 5-axis transformation 1 | DOUBLE | NEW CONF |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: This machine data designates the angular offset of the first or second rotary axis in degrees for the first 5-axis transformation of a channel.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.

| 24520 | TRAFO5_ROT_SIGN_IS_PLUS_1 | C07 | F2, M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Sign of rotary axis $1 / 2 / 3$ for 5-axis transformation 1 |  |  |  |  |
| - | 3 | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | NEW CONF |
| - | $7 / 7$ | U |  |  |  |

Description: This machine data designates the sign with which the two rotary axes are included in the first 5-axis transformation of a channel.
$\mathrm{MD}=0$ (FALSE):
Sign is reversed.
MD = 1 (TRUE) :
Sign is not reversed and the traversing direction is defined according to MD32100 \$MA_AX_MOTION_DIR.
This machine data does not mean that the rotational direction of the rotary axis concerned is to be reversed, but specifies whether its motion is in the mathematically positive or negative direction when the axis is moving in the positive direction.
The result of a change to this machine data is not therefore a change in the rotational direction, but a change in the compensatory motion of the linear axes.
However, if a directional vector and thus, implicitly, a compensatory motion is specified, the result is a change in the rotational direction of the rotary axis concerned.
On a real machine, therefore, the machine data may be set to FALSE (or zero) only if the rotary axis is turning in an anti-clockwise direction when moving in a positive direction.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.

| 24530 | TRAFO5_NON_POLE_LIMIT_1 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Definition of pole range for 5-axis transformation 1 | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $2.0,2.0,2.0,2.0,2.0$, <br> $2.0,2.0,2.0 \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description:
This MD designates a limit angle for the fifth axis of the first 5-axis transformation with the following properties: if the path runs below this angle past the pole, the traverse will pass through the pole.

For the 5-axis transformation, the two orientation axes of the tool form a coordinate system of length and width circles on a spherical surface. If orientation programming (that is the orientation vector lies in a plane) leads the path so close past the pole that the angle defined by the MD is undershot then there is a deviation from the defined interpolation such that the interpolation runs through the pole.

Alarm 14112 is output if this modification of the path gives a deviation greater than a tolerance defined by MD24540 TRAFO5\$MC_TRAFO5_POLE_LIMIT_1.
MD irrelevant:
If the "5-Axis Transformation" option is not installed.
Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
MD: TRAFO5_POLE_LIMIT_n


## Description:

This MD designates an end angle tolerance for the fifth axis of the first 5-axis transformation with the following properties:
With the interpolation through the pole point, only the fifth axis moves, the fourth axis retains its starting position. If a motion is programmed that does not run exactly through the pole point but will run near the pole within the area given by MD: TRAFO5_NON_POLE_LIMIT_n, there is a deviation from the defined path as the interpolation runs exactly through the pole point. This results in a deviation in the position of the end point of the fourth axis (the polar axis) from the programmed value.
This MD defines the angle by which the polar axis may deviate from the programmed value with 5-axis transformation when switching from the programmed interpolation to the interpolation through the pole point.
Alarm 14112 is output if there is a greater deviation and the interpolation is not executed.
MD irrelevant:
If the "5-Axis Transformation" option is not installed.
Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
MD2 . . . \$MC_TRAFO5_NON_POLE_LIMIT_...

| 24542 | TRAFO5_POLE_TOL_1 | C07 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | End angle tolerance for tool orientation |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

## Description:

End angle tolerance for interpolation through the pole for the 1st 5/6-axis transformation.
This MD is evaluated only by the generic 5/6-axis
transformation.
If the programmed end orientation lies within the body cone and within the tolerance cone specified by this MD, the pole axis does not move
and retains it starting positions. The other rotary axis, however,
moves to the programmed angle.
This results in the end orientation deviating
from the programmed orientation.

Another function of this $M D$ is the handling of the programmed end orientation with non-orthogonal kinematics. As a rule, not all tool orientations can be set with these machine kinematics.
Alarm 14112 is output if an orientation is programmed that lies outside the settable range of the orientation cone (the programmed orientation path is not possible).
However, if the programmed orientation still lies within the range defined by MD2 4542 \$MC_TRAFO5_POLE_TOL,
an alarm is not output, and the programmed orientation is accepted.
However, the programmed orientation is corrected so that the orientation remains stationary at the edge of the settable range.
The maximum active value of this MD is the value of MD TRAFO5_POLE_LIMIT_1, which is used to define the body cone.


Description:
This MD specifies the vector of the base tool which takes effect when the first transformation is activated without a length compensation being selected. Programmed length compensations have an additive effect with respect to the base tool.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.

| 24558 | TRAFO5_JOINT_OFFSET_PART_1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Vector of kinematic table offset | C07 | F2, M1, W1 |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, $-M D \_D B L M A X ~$ <br>  $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$  | $1.0 \mathrm{E}+301$ | NOUBLE | NEW CONF |

Description:

This machine data is only evaluated for generic 5-axis transformations with rotatable workpiece and rotatable tool (TRAFO_TYPE $=56$, mixed kinematics).
It indicates the part of the vector between table and turning head assigned to the table.
Only the sum of this MD and MD TRAFO5_JOINT_OFFSET is entered in the transformation equations.
A difference results only when reading the whole tool length using the function GETTCOR. In this case, only the MD TRAFO5_JOINT_OFFSET is considered.
On a machine with mixed kinematics, this machine data can be used to assign the machine data of the 5-axis transformation and the parameters of the orientable tool holder uniquely to one another as follows:
Orientable tool holder 5-axis transformation (1st transformation)
1 TRAFO5_JOINT_OFFSET_1
2 TRAFO5_BASE_TOOL_1
3 TRAFO5_JOINT_OFFSET_PART_1
4 TRAFO5_PART_OFFSET_1
4.2 Channel-specific NC machine data

| 24560 | TRAFO5_JOINT_OFFSET_1 | C07 | F2, W1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Vector of the kinem.offset of the 1st 5-axis transf. in channel |  |  |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description:
This machine data designates the vector between first and second rotary joint for the first transformation of a channel and has a specific meaning for the various machine types:
Machine type 1 (two-axis swivel head for tool) and:
Machine type 2 (two-axis rotary table for workpiece):
Vector between first and second rotary joint of tool rotary head or workpiece rotary table.
Machine type 3 (single-axis rotary table for workpiece and single-axis swivel head for tool):
Vector from machine reference point to joint of workpiece table.
MD irrelevant:
if the "5-Axis Transformation" option is not installed. The same applies for 3-axis and 4-axis transformations.

| 24561 | TRAFO6_JOINT_OFFSET_2_3_1 |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Vector of kinematic offset |  |  | DOUBLE | NEW | NEW CON |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description: In the case of 6-axis transformations, defines the offset between the 2nd and third rotary axes for the 1 st transformation of each channel.

| 24562 | TRAFO5_TOOL_ROT_AX_OFFSET_1 | C07 | M1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Offset of swivel point of 1st rotary axis on 5 -axis transform. 1 |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

## Description:

In the case of a 5-axis transformation with a swiveling linear axis, the value indicates the offset of the rotary axis which swivels the linear axis with reference to machine zero for the 1 st transformation.
MD irrelevant for:
other 5-axis transformations
Related to:
MD2 4662 \$MC_TRAFO5_TOOL_ROT_AX_OFFSET_2

| 24564 | TRAFO5_NUTATOR_AX_ANGLE_1 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| degrees | Nutating head angle in 5-axis transformation | DOUBLE | NEW CONF |  |  |
| - | - | $45.0,45.0,45.0,45.0$, <br> $45.0,45.0,45.0,45.0 \ldots$ | -89. | 89. | $7 / 7$ |

## Description:

Angle between the second rotary axis and the axis corresponding to it in the rectangular coordinate system
MD irrelevant for a transformation type other than "universal milling head".

Related to:
MD2 . . . \$ \$MC_TRAFO_TYPE_..

| 24566 | TRAFO5_NUTATOR_VIRT_ORIAX_1 |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Virtual orientation axes |  | BOOLEAN | NEW CONF |  |
| - |  |  |  |  |  |
| - | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE.. | 0 | - | 7/7 | U |

Description:
The MD has the following values:
0: The axis angles of the orientation axes are machine axis angles.
1: Virtual orientation axes are defined that form a rectangular coordinate system and the axis angles are rotations around these virtual axes.

| 24570 | TRAFO5_AXIS1_1 | C07 | F2, M1, W1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction of 1st rotary axis | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description: The MD indicates the vector that describes the direction of the first rotary axis in the general 5-axis transformation (TRAFO_TYPE_* = 24).
The vector can have any magnitude.
Example:
Both with $(0,1,0)$ and with $(0,7.21,0)$, the same axis is described (in the direction of the 2nd geometry axis, i.e. usually Y).
Valid for the first transformation of a channel.

| 24572 | TRAFO5_AXIS2_1 | C07 | F2, M1, W1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction of 2nd rotary axis | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description:
Indicates the vector that describes the direction of the second rotary axis in the general 5-axis transformation (TRAFO_TYPE_* $=24,40,56)$.
The vector can have any magnitude except zero.
Example:
Both with $(0,1,0)$ and with $(0,7.21,0)$, the same axis is described (in the direction of the 2nd geometry axis, i.e. usually Y).
Valid for the first transformation of a channel.

| 24573 | TRAFO5_AXIS3_1 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction of the 3rd rotary axis | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description: Indicates the vector which defines the direction of the third rotary axis in the case of the general 6-axis transformation (TRAFO_TYPE_* $=24,40,56,57$ ).
The vector may have any value except zero.

### 4.2 Channel-specific NC machine data

Example:
The same axis is defined with both $(0,1,0)$ and $(0,7.21,0)$ (in the direction of the 2nd geometry axis, that is as a rule Y).
Valid for the first orientation transformation of a channel.


| 24576 | TRAFO6_BASE_ORIENT_NORMAL_1 |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Normal tool vector in 6-axis transformation |  |  | DOUBLE |  | NEW C |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,1.0,0.0,0.0,1.0, \\ & 0.0,0.0,1.0,0.0,0.0, \\ & 1.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description: Indicates a vector that is perpendicular to the tool orientation
(TRAFO5_BASE_ORIENTATION_1) in the case of the general 6-axis transformation (TRAFO_TYPE_* $=24,40,56,57)$.
If TRAFO6_BASE_ORIENT_NORMAL_1 and TRAFO5_BASE_ORIENTATION_1 are neither orthogonal nor parallel, then the two vectors are orthogonalized by modifying the normal vector. The two vectors must not be parallel.
The vector may have any value other than zero.
Valid for the first orientation transformation of a channel.

| 24580 | TRAFO5_TOOL_VECTOR_1 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Direction of orientation vector for the first 5-axis transf. | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $2,2,2,2,2,2,2,2 \ldots$ | 0 | 2 |  |  |$]$| M |
| :--- |

Description: Indicates the direction of the orientation vector for the first 5-axis transformation for each channel.
0: Tool vector in $x$ direction
1: Tool vector in $y$ direction
2: Tool vector in $z$ direction

| 24582 | TRAFO5_TCARR_NO_1 |  |  |  |  |  | C07 | F2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | TCARR number for the 1st 5-axis transformation | DWORD | NEW CONF |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |  |  |

Description: If the value of this machine data is not zero and if MD2.... \$MC_TRAFO_TYPE_..., which points to the first orientation transformation, has the value $7 \overline{2}$, then the kinematics data (offsets etc.) that parameterize the first 5-axis transformation, will not be read from the machine data, but from the data of the orientable tool carrier to which this machine data refers.



Description: The positions (angles) of the rotary axes are defined by the offset for the orientation axes of the 5/6-axis transformation, whereby the tool orientation is in the basic position. This offset has 2 components. The first one is the value of MD24510 \$MC_TRAFO5_ROT_AX_OFFSET_1 for the 1st orientation transformation. For the other orientation transformations, these are the values of MD24610/25210/25310 \$MC_TRAFO5_ROT_AX_OFFSET_2/3/4/. The 2nd component is defined when the transformation is activated. Either directly as an optional parameter with the language command TRAORI(), or it can be taken from an active work offset of the rotary axes that are active when the transformation is activated. This is only taken into the offset of the orientation axes if this MD has the value TRUE, and if the work offsets are retained when the transformation is activated, this means that MD10602: \$MN_FRAME_GEOAX_CHANGE_MODE > 0 .
Note: In the normal case, the automatic acceptance of active work offsets into the offset is only useful for the polar axis with table kinematics. This means, for example, with AC kinematics for the C-axis. If the offset is changed in another orientation axis, especially in the non-polar axis, this changes the kinematic behavior of the transformation, and may lead to the compensatory motions of the linear axes no longer being correct.

| 24594 | TRAFO7_EXT_ROT_AX_OFFSET_1 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Position offset of the external rotary axes for 7 -axis transformation <br> 1 | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

## Description:

This machine data designates the angular offset of the external rotary axis in degrees for the first 7 -axis transformation of a channel.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.


Description: The MD indicates the vector that describes the direction of the first external rotary axis in the general 5/6-axis transformation (TRAFO_TYPE_* $=24$ ). The vector can have any magnitude.
Example:
Both with $(0,1,0)$ and with $(0,7.21,0)$, the same axis is described (in the direction of the 2nd geometry axis, i.e. usually Y).

Valid for the first transformation of a channel.

| 24600 | TRAFO5_PART_OFFSET_2 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm |  |  |  |  |  |
| - | Offset vector of the 2nd 5-axis transformation in the channel | DOUBLE | NEW CONF |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

## Description:

This machine data designates an offset of the workpiece carrier for the first (MD24500 \$MC_TRAFO5_PART_OFFSET_1) or second (MD24600 \$MC_TRAFO5_PART_OFFSET_2) 5-axis transformation of a chānnel, and has a specific meaning for the different machine types:
Machine type 1 (two-axis swivel head for tool):
Vector from machine reference point to zero point of workpiece table. This will generally be a zero vector if both coincide.
Machine type 2 (two-axis rotary table for workpiece):
Vector from second joint of workpiece rotary table to zero point of table.
Machine type 3 (single-axis rotary table for workpiece and single-axis swivel head for tool):
Vector from joint of workpiece table to zero point of table.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.

| 24610 | TRAFO5_ROT_AX_OFFSET_2 |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | Position offset of rotary axes $1 / 2 / 3$ | DOUBLE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description:
Indicates the offset for each channel of the rotary axes in degrees for the second orientation transformation.

| 24620 | TRAFO5_ROT_SIGN_IS_PLUS_2 | C07 | F2, M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Sign of rotary axis 1/2/3 for 5-axis transformation 2 | BOOLEAN | NEW CONF |  |  |
| - | 3 | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | $7 / 7$ | U |

Description:
This machine data designates the sign with which the two rotary axes are included in the second 5-axis transformation of a channel.
$\mathrm{MD}=0$ (FALSE):
Sign is reversed.
MD = 1 (TRUE) :
Sign is not reversed and the traversing direction is defined according to MD32100 \$MA_AX_MOTION_DIR.

This machine data does not mean that the rotational direction of the rotary axis concerned is to be reversed, but specifies whether its motion is in the mathematically positive or negative direction when the axis is moving in the positive direction. The result of a change to this data is not therefore a change in the rotational direction, but a change in the compensatory motion of the linear axes.
However, if a directional vector and thus, implicitly, a compensatory motion is specified, the result is a change in the rotational direction of the rotary axis concerned.

On a real machine, therefore, the machine data may be set to FALSE (or zero) only if the rotary axis is turning in an anti-clockwise direction when moving in a positive direction.

MD irrelevant:
if the "5-Axis Transformation" option is not installed.


Description: This MD designates a limit angle for the fifth axis of the second 5-axis transformation with the following properties: if the path runs past the pole below this angle, the traverse passes through the pole.
In a 5-axis transformation, the two orientation axes of the tool form a coordinate system of length and width circles on a spherical surface. If orientation programming (that is the orientation vector lies in a plane) leads the path so closely past the pole that the angle defined by this MD is undershot, then there is a deviation from the defined interpolation such that the interpolation runs through the pole.

Alarm 14112 is output if this modification of the path results in a deviation greater than a tolerance defined by MD24640 \$MC_TRAFO5_POLE_LIMIT_2.
MD irrelevant:
If the "5-Axis Transformation" option is not installed.
Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
MD2 .... \$MC_TRAFO5_POLE_LIMIT_...

| 24640 | TRAFO5_POLE_LIMIT_2 |  | C07 | F2, M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | End angle tolerance for tool orientation |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 2.0,2.0,2.0,2.0,2.0, \\ & 2.0,2.0,2.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

This MD designates an end angle tolerance for the fifth axis of the second 5-axis transformation with the following properties:

With the interpolation through the pole point, only the fifth axis moves, the fourth axis retains its starting position. If a motion is programmed that does not run exactly through the pole point but is to run near the pole within the area given by MD: TRAFO5_NON_POLE_LIMIT_n then there is a deviation from the defined path as the interpolation runs exactly through the pole point. This results in a deviation in the position of the end point of the fourth axis (the polar axis) from the programmed value. This MD defines the angle by which the polar axis may deviate from the programmed value with 5-axis transformation when switching from the programmed interpolation to the interpolation through the pole point.

An error message (alarm 14112) is output if there is a greater deviation and the interpolation is not executed.

MD irrelevant:

If the "5-Axis Transformation" option is not installed.
Also irrelevant with programming in the machine coordinate system ORIMKS.
Related to:
MD24530 \$MC_TRAFO5_NON_POLE_LIMIT_1

| 24642 | TRAFO5_POLE_TOL_2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | End angle tolerance for pole interpolation | C07 | - |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

## Description:

End angle tolerance for interpolation through the pole for the 2 nd 5/6-axis transformation.
This MD is evaluated only by the generic 5/6-axis
transformation.
If the programmed end orientation lies within the body cone and within the tolerance cone
specified by this MD, the pole axis does not move and retains its starting positions.
However, the other rotary axis moves to the programmed angle.
This results in the end orientation deviating
from the programmed orientation.
Another function of this MD is the handling of the programmmed end orientation with non-orthogonal kinematics. As a rule, not all tool orientations can be set with
these machine kinematics.
Alarm 14112 is output if an orientation is programmed that lies outside the settable range of the orientation cone (the programmed orientation path is not possible).
However, if the programmed orientation still lies within the range defined by MD24542 \$MC_TRAFO5_POLE_TOL,
an alarm is not output, and the programmed orientation is accepted.
However, the programmed orientation is corrected so that the orientation remains stationary at the edge of the settable range.
The maximum active value of this MD is the value of MD TRAFO5_POLE_LIMIT_1, which is used to define the body cone.


## Description:

This MD indicates the vector of the base tool which takes effect when the second transformation is activated without a length compensation being selected. Programmed length compensations have an additive effect with respect to the base tool.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.


Description: Same as MD24558 \$MC_TRAFO5_JOINT_OFFSET_PART_1, but for the second transformation.

| 24660 | TRAFO5_JOINT_OFFSET_2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Vector of the kinem.offset of the 2nd 5-axis transformation |  |  |  |  |
| - | DOUBLE | NEW CONF |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description:
This machine data designates the vector between first and second rotary joint for the first transformation of a channel and has a specific meaning for the various machine types:
Machine type 1 (two-axis swivel head for tool) and:
Machine type 2 (two-axis rotary table for workpiece):
Vector between first and second rotary joint of tool rotary head or workpiece rotary table.
Machine type 3 (single-axis rotary table for workpiece and single-axis swivel head for tool):
Vector from machine reference point to joint of workpiece table.
MD irrelevant:
if the "5-Axis Transformation" option is not installed. The same applies for 3-axis and 4-axis transformations.

| 24661 | TRAFO6_JOINT_OFFSET_2_3_2 |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Vector of kinematic offset |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description: As TRAFO6_JOINT_OFFSET_2_3_1 but for the second transformation.

| 24662 | TRAFO5_TOOL_ROT_AX_OFFSET_2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Offset swivel point of 2nd 5-axis transformation (swivelled linear <br> axis) | C07 | M1 |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |
| - | NEW CONF |  |  |  |  |

Description: In the case of 5-axis transformation with swiveled linear axis, the value indicates the offset of the rotary axis which swivels the linear axis with reference to machine zero for the 2nd transformation.
MD irrelevant for:
other 5-axis transformations
Related to:
MD2 4562 \$MC_TRAFO5_TOOL_ROT_AX_OFFSET_1

| 24664 | TRAFO5_NUTATOR_AX_ANGLE_2 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| degrees | Nutating head angle | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | - | $45.0,45.0,45.0,45.0$, <br> $45.0,45.0,45.0,45.0 \ldots$ | -89. | 89. | $7 / 7$ |

Description: Angle between the second rotary axis and the axis corresponding to it in the rectangular coordinate system
MD irrelevant for:
Transformation type other than "universal milling head"
Related to:
MD2 4564 \$MC_TRAFO5_NUTATOR_AX_ANGLE_1

| 24666 | TRAFO5_NUTATOR_VIRT_ORIAX_2 |  |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Virtual orientation axes | BOOLEAN | NEW CONF |  |  |  |  |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | $7 / 7$ |  |  |  |  |

## Description:

The MD has the following values:
0: The axis angles of the orientation axes are machine axis angles.
1: Virtual orientation axes are defined that form a rectangular coordinate system and the axis angles are rotations around these virtual axes.

| 24670 | TRAFO5_AXIS1_2 | C07 | F2, M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction of 1st rotary axis | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description: As for TRAFO5_AXIS1_1 but for the second orientation transformation of a channel.


Description: As for TRAFO5_AXIS2_1 but for the second transformation of a channel.

| 24673 | TRAFO5_AXIS3_2 |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Direction of the 3rd rotary axis |  |  | DOUBLE | NEW CO |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description:
As TRAFO5_AXIS3_1 but for the second orientation transformation of a channel.


| 24676 | TRAFO6_BASE_ORIENT_NORMAL_2 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Normal tool vector |  |  |  |  |  | DOUBLE | NEW CONF |
| - | 3 | $0.0,1.0,0.0,0.0,1.0$, <br> $0.0,0.0,1.0,0.0,0.0$, <br> $1.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 E+301$ | $7 / 7$ |  |  |  |
| - |  |  |  |  |  |  |  |  |

Description: As TRAFO6_BASE_ORIENT_NORMAL_1 but for the second orientation transformation

| 24680 | TRAFO5_TOOL_VECTOR_2 |  |  |  |  |  | C07 | F2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Direction of orientation vector | BYTE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $2,2,2,2,2,2,2,2 \ldots$ | 0 | 2 | M |  |  |  |

Description: Indicates the direction of the orientation vector for the second 5-axis transformation for each channel.
0: Tool vector in x direction
1: Tool vector in $y$ direction
2: Tool vector in $z$ direction

| 24682 | TRAFO5_TCARR_NO_2 |  |  |  |  |  | C07 | F2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | TCARR number for the 2nd 5-axis transformation |  |  |  |  |  | DWORD | NEW CONF |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |  |  |
| - | - | U |  |  |  |  |  |  |

Description: Same as TRAFO5_TCARR_NO_1, but for the second orientation transformation.



| 24694 | TRAFO7_EXT_ROT_AX_OFFSET_2 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Position offset of the external rotary axes for 7-axis transformation <br> 2 | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

## Description:

This machine data designates the angular offset of the external rotary axis in degrees for the second 7-axis transformation of a channel.

MD irrelevant:
if the "5-Axis Transformation" option is not installed.

| 24695 | TRAFO7_EXT_AXIS1_2 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction of the 1st external rotary axis | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description:
The MD indicates the vector that describes the direction of the second external rotary axis in the general 5/6-axis transformation (TRAFO_TYPE_* $=24$ ).

The vector can have any magnitude.
Example:
Both with ( $0,1,0$ ) and with ( $0,7.21,0)$, the same axis is described (in the direction of the 2nd geometry axis, i.e. usually $Y$ ).
Valid for the first transformation of a channel.


## Description:

Indicates for the first agreed TRAANG transformation of the channel the angle of the inclined axis in degrees between the 1st machine axis and the 1st basic axis while TRAANG is active. The angle is measured positively clockwise.

Related to:
MD2 4750 \$MC_TRAANG_ANGLE_2


## Description:

Indicates a basic offset of the tools zero for the 1st TRAANG transformation. The offset is referenced to the geometry axes valid when TRAANG is active. The basic offset is included with and without selection of the tool length compensation. Programmed length corrections have an additive effect with respect to the basic tool.
The index i takes the values $0,1,2$ for the 1 st to 3rd geometry axes.
Related to:
MD24760 \$MC_TRAANG_BASE_TOOL_2

| 24720 | TRAANG_PARALLEL_VELO_RES_1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Velocity margin for 1st TRAANG transformation | C07 | M1 |  |  |
| - |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | 0.0 | DOUBLE | NEW CONF |
| - | 1.0 | $7 / 7$ | U |  |  |

## Description:

Indicates the axis velocity reserve for jog, positioning and oscillating movements for each channel for the first TRAANG transformation which is held ready on the parallel axis (see MD2.... \$MC_TRAFO_AXES_IN_...[1]) for the compensating movement.
Velocity reserve to be provided for jog, positioning and oscillating movements on the parallel axis to handle the compensating movement as a consequence of the inclined axis.
0.0 means that the control or the transformation itself determines the reserve according to the angle of the inclined axis and the velocity capacity of the inclined and parallel axes. - The criterion for this is that the same velocity limit has to be maintained in the direction of the parallel axis and the (virtual) axis at rightangles to it.
$>0.0$ means that a fixed reserve has been set (MD24720 \$MC_TRAANG_PARALLEL_VELO_RES_1 * MD32000 \$MA_MAX_AX_VELO of the parallel axis). The velocity capacity in the virtual axis is determined by this. The lower MD24720 \$MC_TRAANG_PARALLEL_VELO_RES_1 has been set, the lower it is
Related to:
MD24771 \$MC_TRAANG_PARALLEL_ACCEL_RES_2


## Description:

Indicates the acceleration margin for jog, positioning and oscillating movements for each channel for the first TRAANG transformation which is held ready on the parallel axis (see MD2.... \$MC_TRAFO_AXES_IN_...[1]) for the compensating movement.
Related to:
MD2 4720 \$MC_TRAANG_PARALLEL_VELO_RES_1

| 24750 | TRAANG_ANGLE_2 |  |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | Angle between Cartesian axis and real (inclined) axis |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{array}{\|l} \hline 0.0,0.0,0.0,0.0,0.0, \\ 0.0,0.0,0.0 \ldots \\ \hline \end{array}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| Description: | Indicates for the second agreed TRAANG transformation of the channel the angle of the inclined axis in degrees between the 1st machine axis and the 1st basic axis while TRAANG is active. The angle is measured positively clockwise. |  |  |  |  |  |



| Description: | Indicates a basic offset of the tools zero for the 2nd TRAANG transformation. The |
| :--- | :--- |
| offset is referenced to the geometry axes valid when TRAANG is active. The basic offset |  |
| is included with and without selection of the tool length compensation. Programmed |  |
|  | length corrections have an additive effect with respect to the basic tool. |
|  | The index i takes the values $0,1,2$ for the lst to 3rd geometry axes. |
|  | Related to: |
|  | $M D 24710 \$ M C \_T R A A N G \_B A S E \_T O O L \_1 ~$ |


| 24770 | TRAANG_PARALLEL_VELO_RES_2 | C07 | M1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Velocity margin for 2nd TRAANG transformation |  |  |  |  |  | DOUBLE | NEW CONF |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | 0.0 | 1.0 | U |  |  |  |
| - | - | $7 / 7$ |  |  |  |  |  |  |

## Description:

Indicates the axis velocity reserve for jog, positioning and oscillating movements for each channel for the second TRAANG transformation which is held ready on the parallel axis (see MD2.... \$MC_TRAFO_AXES_IN_...[1]) for the compensating movement.
Related to:
MD2 4771 \$MC_TRAANG_PARALLEL_ACCEL_RES_2


Description:
Indicates the axis acceleration margin for jog, positioning and oscillating movements which is held ready on the parallel axis (see MD2... \$MC_TRAFO_AXES_IN_...[1]) for the compensatory movement; MD setting applies to the second TRAANG transformation for each channel.
Related to:
\$MC_TRAANG_PARALLEL_RES_1


Description:
Indicates the offset of the rotary axis for the first agreed TRACYL transformation in degrees in relation to the neutral position while TRACYL is active.
Related to:
MD24850 \$MC_TRACYL_ROT_AX_OFFSET_2

| 24805 | TRACYL_ROT_AX_FRAME_1 |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Rotary axis offset TRACYL 1 |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | 7/7 | U |

Description: 0: axial rotary axis offset is not considered.
1: axial rotary axis offset is considered.
2: axial rotary axis offset is considered until SZS.
SZS frames include transformed axial rotary axis offsets.

| 24806 | TRACYL_BASE_TOOL_COMP_1 |  | C07 | M1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Compensation of the BASE_TOOL in the TRACYL frame 1 |  | UBYTE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots \end{aligned}$ | 0x0 | 0x7 | $7 / 7$ |  |
| Description: | Components of the base tool can via the transformation frame so in the Work component. <br> Bit0: MD24820 \$MC_TRACYL_BAS <br> Bit1: MD24820 \$MC_TRACYL_BAS <br> Bit2: MD24820 \$MC_TRACYL_BAS <br> This function is only availabl using MD28082 \$MC_MM_SYSTEM_FR | be compen that for <br> TOOL_1[0] <br> TOOL_1[1] <br> TOOL_1[2] <br> if the sy <br> E_MASK bi | by usi formati <br> ompensa ompensa ompensa frame \$ | bit ctio <br> ng \$ <br> ng \$ <br> ng \$ <br> AME | Components of the base tool can be compensated by using this bit-coded machine data via the transformation frame so that for transformation selection, no change is made in the Work component. |


| 24808 | TRACYL_DEFAULT_MODE_1 |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | TRACYL mode selection |  |  |  |  |  | BYTE | NEW CONF |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | $7 / 7$ |  |  |  |
| - | - |  |  |  |  |  |  |  |

## Description:

Default setting of TRACYL type 514:
0: without groove side offset (i.e. TRACYL type 514 - equals 512)
1: with groove side offset (i.e. TRACYL type 514 - equals 513)
MD2... \$MC_TRAFO_TYPE_... = 514 can be used to decide, via the selection parameters, whether calculation is made with or without groove side offset. The parameter defines the variable to be selected if no selection is made in the call parameters.
If MD24808 \$MC_TRACYL_DEFAULT_MODE_1 = 1, it is sufficient to program TRACYL(30) in the part progrām instēad of $\operatorname{TRACYL} \overline{\operatorname{T}}(30,1,1)$.

| 24810 | TRACYL_ROT_SIGN_IS_PLUS_1 |  |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |  |
| - | Sign of rotary axis for 1st TRACYL transformation | BOOLEAN | NEW CONF |  |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |  |  |  |  |

Description: Indicates the sign with which the rotary axis is taken into account in the TRACYL transformation for the first agreed TRACYL transformation.
Related to:
MD24860 \$MC_TRACYL_ROT_SIGN_IS_PLUS_2

| 24820 | TRACYL_BASE_TOOL_1 |  |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Vector of base tool for 1st TRACYL transformation |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description:
Indicates a basic offset of the tools zero for the 1st TRACYL transformation. The offset is referenced to the geometry axes valid when TRACYL is active. The basic offset is included with and without selection of the tool length compensation. Programmed length corrections have an additive effect with respect to the basic tool.
The index i takes the values $0,1,2$ for the 1 st to 3 rd geometry axes.
Related to:

### 4.2 Channel-specific NC machine data

MD24870 \$MC_TRACYL_BASE_TOOL_2

| 24850 | TRACYL_ROT_AX_OFFSET_2 | C07 | M1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Offset of rotary axis for the 2nd TRACYL transformation | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 . .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description: Indicates the offset of the rotary axis in degrees in relation to the neutral position for the 2nd agreed TRACYL transformation for each channel.
MD irrelevant:
If no TRACYL is active
Related to:
MD24800 \$MC_TRACYL_ROT_AX_OFFSET_1

| 24855 | TRACYL_ROT_AX_FRAME_2 |  |  | C07 | M1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Rotary axis offset TRACYL 2 |  |  | BYTE | NEW |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | $7 / 7$ | U |

Description: 0: axial rotary axis offset is not considered.
1: axial rotary axis offset is considered.
2: axial rotary axis offset is considered until SZS.
SZS frames include transformed axial rotary axis offsets.

| 24856 | TRACYL_BASE_TOOL_COMP_2 |  |  |  |  | C07 | M1, K2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Compensation of the BASE_TOOL in the TRACYL frame 2 | UBYTE | NEW CONF |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots$ | $0 \times 0$ | $0 \times 7$ |  |  |  |

Description: Components of the base tool can be compensated by using this bit-coded machine data via the transformation frame so that for transformation selection, no change is made in the Work
component.
Bit0: MD24870 \$MC_TRACYL_BASE_TOOL_2[0] is compensated using \$P_TRAFRAME.
Bit1: MD24870 \$MC_TRACYL_BASE_TOOL_2[1] is compensated using \$P_TRAFRAME.
Bit2: MD24870 \$MC_TRACYL_BASE_TOOL_2[2] is compensated using \$P_TRAFRAME.
This function is only available if the system frame \$P_TRAFRAME has been configured using MD28082 \$MC_MM_SYSTEM_FRAME_MASK bit6.

| 24858 | TRACYL_DEFAULT_MODE_2 | C07 | M1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | TRACYL mode selection |  |  |  |  |  | BYTE | NEW CONF |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 |  |  |  |  |

## Description:

Default setting of TRACYL type 514 for the 2nd TRACYL:
0: without groove side offset (i.e. TRACYL type 514 - equals 512)
1: with groove side offset (i.e. TRACYL type 514 - equals 513)
MD2.... \$MC_TRAFO_TYPE_... = 514 can be used to decide, via the selection parameters, whether calculation is made with or without groove side offset. The parameter defines the variable to be selected if no selection is made in the call parameters.
If MD24858 \$MC_TRACYL_DEFAULT_MODE_2 = 1, it is sufficient to program TRACYL (30,2) in the part program instead of $\operatorname{TRACYL} \overline{\operatorname{R}}(30,2,1)$.


| 24870 | TRACYL_BASE_TOOL_2 |  |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Vector of base tool for 2nd TRACYL transformation |  |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & \hline 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |

Description:
Indicates a basic offset of the tools zero for the 2ndTRACYL transformation. The offset is referenced to the geometry axes valid when TRACYL is active. The basic offset is included with and without selection of the tool length compensation. Programmed length corrections have an additive effect with respect to the basic tool. The index $i$ takes the values $0,1,2$ for the 1 st to 3 rd geometry axes. Related to:
MD24820 \$MC_TRACYL_BASE_TOOL_1

| 24900 | TRANSMIT_ROT_AX_OFFSET_1 | C07 | M1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Offset of rotary axis for the 1st TRANSMIT transformation | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description: Indicates the offset of the rotary axis for the first agreed TRANSMIT transformation in degrees in relation to the neutral position while TRANSMIT is active.
Related to:
MD24950 \$MC_TRANSMIT_ROT_AX_OFFSET_2

| 24905 | TRANSMIT_ROT_AX_FRAME_1 |  |  |  |  |  | C07 | M1, K2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Rotary axis offset TRANSMIT 1 | BYTE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | $7 / 7$ |  |  |  |

## Description:

0 : axial rotary axis offset is not considered.
1: axial rotary axis offset is considered.
2: axial rotary axis offset is considered until SZS.
SZS frames include transformed rotations around the rotary axis.

| 24906 | TRANSMIT_BASE_TOOL_COMP_1 |  | C07 | M1, K2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Compensation of the BASE_TOOL in the TRANSMIT frame 1 |  | UBYTE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots \end{aligned}$ | 0x0 | 0x7 | 7/7 | U |

Machine data

```
via the transformation frame so that for transformation selection, no change is made
in the Work
component.
Bit0: MD24920 $MC_TRANSMIT_BASE_TOOL_1[0] is compensated using $P_TRAFRAME.
Bit1: MD24920 $MC_TRANSMIT_BASE_TOOL_1[1] is compensated using $P_TRAFRAME.
Bit2: MD24920 $MC_TRANSMIT_BASE_TOOL_1[2] is compensated using $P_TRAFRAME.
This function is only available if the system frame $P_TRAFRAME has been configured
using MD28082 $MC_MM_SYSTEM_FRAME_MASK bit6.
```

| 24910 | TRANSMIT_ROT_SIGN_IS_PLUS_1 |  |  |  | C07 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Sign of rotary axis for 1st TRANSMIT transformation | M1 |  |  |  |
| - |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | NEW CONF |

## Description:

Indicates the sign with which the rotary axis is taken into account in the TRANSMIT transformation for the first agreed TRANSMIT transformation for each channel.
Related to:
MD24960 \$MC_TRANSMIT_ROT_SIGN_IS_PLUS_2

| 24911 | TRANSMIT_POLE_SIDE_FIX_1 | C07 | M1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Restriction of working range in front of / behind the pole, 1. <br> TRANSMIT | BYTE | NEW CONF |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | $7 / 7$ |  |  |

## Description:

Restriction of the working area in front of/behind pole or no restriction, i.e. traversal through the pole.
The assigned values have the following meanings:
1: Working area of linear axis for positions >=0,
(if tool length compensation parallel to linear axis equals 0 )
2: Working area of linear axis for positions <=0,
(if tool length compensation parallel to linear axis equals 0)
0: No restriction of working area. Traversal through pole.


## Description:

Indicates a basic offset of the tools zero for the 1st TRANSMIT transformation. The offset is referenced to the geometry axes valid when TRANSMIT is active. The basic offset is included with and without selection of the tool length compensation. Programmed length corrections have an additive effect with respect to the basic tool. The index i takes the values 0, 1, 2 for the 1 st to 3rd geometry axes.
Related to:
MD2 4970 \$MC_TRANSMIT_BASE_TOOL_2

| 24950 | TRANSMIT_ROT_AX_OFFSET_2 |  |  |  |  |  | C07 | M1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees |  |  |  |  |  |  |  |  |
| - | Offset of rotary axis for the 2nd TRANSMIT transformation | DOUBLE | NEW CONF |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | -MD_DBLMAX | $1.0 E+301$ | $7 / 7$ |  |  |  |

Description: Indicates the offset of the rotary axis for the second agreed TRANSMIT transformation in degrees in relation to the neutral position while TRANSMIT is active.
Related to:
MD24900 \$MC_TRANSMIT_ROT_AX_OFFSET_1

| 24955 | TRANSMIT_ROT_AX_FRAME_2 | C07 | M1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Rotary axis offset TRANSMIT 2 | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | $7 / 7$ |  |

Description:
0 : axial rotary axis offset is not considered.
1: axial rotary axis offset is considered.
2: axial rotary axis offset is considered until SZS.
SZS frames include transformed rotations around the rotary axis.

| 24956 | TRANSMIT_BASE_TOOL_COMP_2 |  | C07 | M1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Compensation of the BASE_TOOL in the TRANSMIT frame 2 |  | UBYTE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $\begin{aligned} & 0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ & 0 \times 0,0 \times 0,0 \times 0,0 \times 0 \ldots \end{aligned}$ | 0x0 | 0x7 | 7/7 | U |

Description: Components of the base tool can be compensated by using this bit-coded machine data via the transformation frame so that for transformation selection, no change is made in the Work
component.
Bit0: MD24970 \$MC_TRANSMIT_BASE_TOOL_2[0] is compensated using \$P_TRAFRAME.
Bit1: MD24970 \$MC_TRANSMIT_BASE_TOOL_2[1] is compensated using \$P_TRAFRAME.
Bit2: MD24970 \$MC_TRANSMIT_BASE_TOOL_2[2] is compensated using \$P_TRAFRAME.
This function is only available if the system frame \$P_TRAFRAME has been configured using MD28082 \$MC_MM_SYSTEM_FRAME_MASK bit6.

| 24960 | TRANSMIT_ROT_SIGN_IS_PLUS_2 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Sign of rotary axis for 2nd TRANSMIT transformation | C07 | M1 |  |  |
| - | - | $\begin{array}{l}\text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE, TRUE, } \\ \text { TRUE, TRUE... }\end{array}$ | 0 | - | BOOLEAN |$]$| NEW CONF |
| :--- |
| - |

Description: Indicates the sign with which the rotary axis is taken into account in the TRANSMIT transformation for the second agreed TRANSMIT transformation for each channel.
Related to:
MD24910 \$MC_TRANSMIT_ROT_SIGN_IS_PLUS_1

| 24961 | TRANSMIT_POLE_SIDE_FIX_2 |  | C07 | M1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Restriction of working range before/behind the pole, 2. TRANSMIT |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 2 | 7/7 | U |

Description: Restriction of working area in front of/behind pole or no restriction, i.e. traversal through pole.
The assigned values have the following meanings:
1: Working area of linear axis for positions >=0,
(if tool length compensation parallel to linear axis equals 0)
2: Working area of linear axis for positions <=0,
(if tool length compensation parallel to linear axis equals 0 )
0: No restriction of working area. Traversal through pole.


## Description:

Indicates a basic offset of the tools zero for the 2nd TRANSMIT transformation. The offset is referenced to the geometry axes valid when TRANSMIT is active. The basic offset is included with and without selection of the tool length compensation. Programmed length corrections have an additive effect with respect to the basic tool. The index i takes the values 0, 1, 2 for the 1st to 3rd geometry axes. Related to:

MD24920 \$MC_TRANSMIT_BASE_TOOL_1

| 24995 | TRACON_CHAIN_1 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Transformation grouping |  |  |  |  |
| - | 4 | DWORD | NEW CONF |  |  |
| - | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | U |  |

Transformation chain of the first concatenated transformation.
In the table, the numbers of the transformations which are to be concatenated are given in the order in which the transformation has to be executed from BCS into MCS.
Example:
A machine can be operated optionally either as a 5-axis machine or as a transmit
machine. A linear axis is not arranged at a right-angles to the other linear axes
(inclined axis).
5 transformations must be set via the machine data, e.g.
TRAFO_TYPE_1 = 16 (5-axis transformation)
TRAFO_TYPE_2 = 256 (Transmit)
TRAFO_TYPE_3 = 1024 (Inclined axis)
TRAFO_TYPE_4 = 8192 (Concatenated transformation)
TRAFO_TYPE_5 = 8192 (Concatenated transformation)
If the 4th transformation concatenates the 5-axis transformation / inclined axis and the 5th transformation concatenates the transmit / inclined axis, then (1, 3, 0, 0) is entered in the first table TRACON_CHAIN_1, and (2, 3, 0, 0) in the table TRACON_CHAIN_2. The entry 0 means no transformation.
The order in which the transformations are assigned (TRAFO_TYPE_1 to TRAFO_TYPE_20) is arbitrary. The linked transformations do not have to be the last. However, they must always stand behind all the transformations which occur in a transformation chain. In the previous example, this means that, e.g. the third and fourth transformations must not be switched.

However, it would be possible to define a further, sixth transformation, if this does not go into a linked transformation.

Transformations cannot be linked with one another at will.
The following limitations apply in SW version 5:
The first transformation in the chain must be an orientation transformation (3- , 4- , 5-axis transformation, nutator) transmit or peripheral curve transformation. The second transformation must be an inclined axis transformation.

No more than two transformations may be linked.

| 24996 | TRACON_CHAIN_2 |  |  |  | C07 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Transformation grouping |  |  |  |  |
| - |  |  |  |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | DWORD | NEW CONF |  |

Description:
Transformation chain of the first concatenated transformation.
In the table, the numbers of the transformations which are to be concatenated are given in the order in which the transformation has to be executed from BCS into MCS.

Example:
A machine can be operated optionally either as a 5-axis machine or as a transmit machine. A linear axis is not arranged at a right-angles to the other linear axes (inclined axis).
Transformation chain of the second concatenated transformation.
Example: 5 transformations must be set via the machine data
TRAFO_TYPE_1 = 16 (5-axis transformation)
TRAFO_TYPE_2 = 256 (Transmit)
TRAFO_TYPE_3 = 1024 (Inclined axis)
TRAFO_TYPE_4 = 8192 (Concatenated transformation)
TRAFO_TYPE_5 = 8192 (Concatenated transformation)
If the 4th transformation concatenates the 5-axis transformation / inclined axis and the 5th transformation concatenates the transmit / inclined axis, then (1, 3, 0, 0) is entered in the first table TRACON_CHAIN_1, and (2, 3, 0, 0) in the table TRACON_CHAIN_2. The entry 0 means no transformation.

The order in which the transformations are assigned (TRAFO_TYPE_1 to TRAFO_TYPE_20) is arbitrary. The cocatenated transformations do not have to be the last. However, they must always follow all the transformations which occur in a transformation chain. In the previous example, this means that, e.g. the third and fourth transformations must not be switched.
However, it would be possible to define a further, sixth transformation, if this does not go into a concatenated transformation.
Transformations cannot be concatenated with one another at will.
The following limitations apply in SW version 5:
The first transformation in the chain must be an orientation transformation (3- , 4- , 5-axis transformation, nutator) transmit or peripheral curve transformation.

The second transformation must be an inclined axis transformation.
No more than two transformations may be concatenated.

| 24997 | TRACON_CHAIN_3 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Transformation grouping | DWORD | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 . .$. | 0 | U |  |

4.2 Channel-specific NC machine data

| 24998 | TRACON_CHAIN_4 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Transformation grouping |  |  |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | DWORD | NEW CONF |  |
| - | 4 | 20 | $7 / 7$ | U |  |

## Description:

Transformation chain of the fourth concatenated transformation. See TRACON_CHAIN_1 for documentation.

| 25100 | TRAFO_TYPE_11 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Definition of the 11th transformation in the channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |

Description: This MD defines for each channel, which transformation is available as l1th transformation in the channel.
Other than that it has the same meaning as TRAFO_TYPE_1.

| 25102 | TRAFO_AXES_IN_11 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Axis assignment for transformation 11 | BYTE | NEW CONF |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0, \ldots$ | 0 | 20 | U |

Description:
Axis assignment at the input of the 11th transformation.
See TRAFO_AXES_IN_1 for explanation.

| 25104 | TRAFO_GEOAX_ASSIGN_TAB_11 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 11 | BYTE | NEW CONF |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | $7 / 7$ | U |
| - |  |  |  |  |  |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 11.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 25106 | TRAFO_INCLUDES_TOOL_11 | C07 | M1, F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Tool handling with active 11th transformation |  |  |  | BOOLEAN |
| - |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |

Description:
This MD defines for each channel, whether the tool is treated in the 11 th transformation or externally.
Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

| 25110 | TRAFO_TYPE_12 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of the 12th transformation in the channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |

## Description:

This MD defines for each channel, which transformation is available as 12 th transformation in the channel.
Other than that it has the same meaning as TRAFO_TYPE_1.

| 25112 | TRAFO_AXES_IN_12 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Axis assignment for transformation 12 | BYTE | NEW CONF |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,, \ldots$ | 0 | 20 | U |

Description: Axis assignment at the input of the 12 th transformation.
See TRAFO_AXES_IN_1 for explanation.

| 25114 | TRAFO_GEOAX_ASSIGN_TAB_12 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 12 | BYTE | NEW CONF |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 .$. | 0 | 20 | U |
| - |  |  |  |  |  |

Description: This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 12.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 25116 | TRAFO_INCLUDES_TOOL_12 | C07 | M1, F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Tool handling with active 12th transformation | BOOLEAN | NEW CONF |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | $7 / 7$ | U |
| - | - | - |  |  |  |

Description:
This MD defines for each channel, whether the tool is treated in the 12 th transformation or externally.
Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

4.2 Channel-specific NC machine data

| 25122 | TRAFO_AXES_IN_13 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Axis assignment for transformation 13 |  |  |  |  |
| - | BYTE |  |  |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0, \ldots$ | NEW CONF |  |  |

## Description:

Axis assignment at the input of the 13th transformation. See TRAFO_AXES_IN_1 for explanation.

| 25124 | TRAFO_GEOAX_ASSIGN_TAB_13 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Assignment of geometry axes to channel axes for transformation <br> 13 | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | $7 / 7$ | U |  |

## Description:

This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 13.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 25126 | TRAFO_INCLUDES_TOOL_13 | C07 | M1, F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Tool handling with active 13th transformation | BOOLEAN | NEW CONF |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | $7 / 7$ |  |

Description:
This MD defines for each channel, whether the tool is treated in the 13th transformation or externally.
Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

| 25130 | TRAFO_TYPE_14 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of the 14th transformation in the channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |

## Description:

This MD defines for each channel, which transformation is available as 14th transformation in the channel.
Other than that it has the same meaning as TRAFO_TYPE_1.

| 25132 | TRAFO_AXES_IN_14 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Axis assignment for transformation 14 | BYTE | NEW CONF |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0, \ldots$ | 0 | 20 | U |

## Description:

Axis assignment at the input of the 14 th transformation.
See TRAFO_AXES_IN_1 for explanation.

| 25134 | TRAFO_GEOAX_ASSIGN_TAB_14 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 14 | BYTE | NEW CONF |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | $7 / 7$ | U |
| - |  |  |  |  |  |

Description: This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 14.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 25136 | TRAFO_INCLUDES_TOOL_14 | C07 | M1, F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Tool handling with active 14th transformation | BOOLEAN | NEW CONF |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |

Description:
This MD defines for each channel, whether the tool is treated in the 14 th transformation or externally.
Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

| 25140 | TRAFO_TYPE_15 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of the 15th transformation in the channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |

Description: This MD defines for each channel, which transformation is available as 15 th
transformation in the channel.
Other than that it has the same meaning as TRAFO_TYPE_1.


| 25144 | TRAFO_GEOAX_ASSIGN_TAB_15 |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axes to channel axes for transformation 15 |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |
| - | 3$0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$, | 0 | 20 | 7/7 | U |
| Description: | This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 15. <br> Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1. |  |  |  |  |

Machine data

| 25146 | TRAFO_INCLUDES_TOOL_15 | C07 | M1, F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Tool handling with active 15th transformation |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | NEW CONF |
| - | - | $7 / 7$ | U |  |  |

## Description:

This MD defines for each channel, whether the tool is treated in the 15th transformation or externally. Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

| 25150 | TRAFO_TYPE_16 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Definition of the 16th transformation in the channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |

Description: This MD defines for each channel, which transformation is available as 16th transformation in the channel.
Other than that it has the same meaning as TRAFO_TYPE_1.


## Description:

Axis assignment at the input of the 16 th transformation.
See TRAFO_AXES_IN_1 for explanation.

| 25154 | TRAFO_GEOAX_ASSIGN_TAB_16 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 16 | BYTE | NEW CONF |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | $7 / 7$ | U |
| - |  |  |  |  |  |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 16.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.


## Description:

This MD defines for each channel, whether the tool is treated in the 16 th transformation or externally.

Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

| 25160 | TRAFO_TYPE_17 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of the 17th transformation in the channel | DWORD | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  | | Description:This MD defines for each channel, which transformation is available as 17th <br> transformation in the channel. <br> Other than that it has the same meaning as TRAFO_TYPE_1. |
| :--- |



Description: Axis assignment at the input of the 17 th transformation.
See TRAFO_AXES_IN_1 for explanation.

| 25164 | TRAFO_GEOAX_ASSIGN_TAB_17 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 17 | BYTE | NEW CONF |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 . \ldots$ | 0 | 20 | U |
| - |  |  |  |  |  |

Description: This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 17.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 25166 | TRAFO_INCLUDES_TOOL_17 |  | C07 | M1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Tool handling with active 17th transformation |  | BOOLEAN | NEW |  |
| - |  |  |  |  |  |
| - | TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE... | 0 | - | 7/7 | U |
| Description: | This MD defines for each channel, whether the tool is treated in the 17th transformation or externally. <br> Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1. |  |  |  |  |


| 25170 | TRAFO_TYPE_18 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of the 18th transformation in the channel | DWORD | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |
| Description: | This MD defines for each channel, which transformation is available as 18th <br> transformation in the channel. <br> Other than that it has the same meaning as TRAFO_TYPE_1. |  |  |  |  |

4.2 Channel-specific NC machine data

| 25172 | TRAFO_AXES_IN_18 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Axis assignment for transformation 18 |  |  |  |  |
| - |  |  |  |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0, \ldots$ | BYTE | NEW CONF |  |

## Description:

Axis assignment at the input of the 18th transformation. See TRAFO_AXES_IN_1 for explanation.

| 25174 | TRAFO_GEOAX_ASSIGN_TAB_18 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 18 | BYTE | NEW CONF |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | U |
| - |  |  |  |  |  |

Description:
This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 18.

Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 25176 | TRAFO_INCLUDES_TOOL_18 | C07 | M1, F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Tool handling with active 18th transformation | BOOLEAN | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |  |

Description:
This MD defines for each channel, whether the tool is treated in the 18th transformation or externally.
Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

| 25180 | TRAFO_TYPE_19 |  |  |  |  |  | C07 | F2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Definition of the 19th transformation in the channel | DWORD | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |  |  |

## Description:

This MD defines for each channel, which transformation is available as 19th transformation in the channel.
Other than that it has the same meaning as TRAFO_TYPE_1.

| 25182 | TRAFO_AXES_IN_19 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Axis assignment for transformation 19 | BYTE | NEW CONF |  |  |
| - | 20 | $1,2,3,4,5,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0, \ldots$ | 0 | $7 / 7$ | U |

## Description:

Axis assignment at the input of the 19 th transformation. See TRAFO_AXES_IN_1 for explanation.

| 25184 | TRAFO_GEOAX_ASSIGN_TAB_19 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Assignment of geometry axes to channel axes for transformation <br> 19 | BYTE | NEW CONF |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | $7 / 7$ | U |
| - |  |  |  |  |  |

Description: This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 19.
Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1.

| 25186 | TRAFO_INCLUDES_TOOL_19 |  | C07 | M1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Tool handling with active 19th transformation |  | BOOLEAN | NEW CONF |  |
| - |  |  |  |  |  |
| - | TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE... | 0 | - | 7/7 | U |

Description:
This MD defines for each channel, whether the tool is treated in the 19th transformation or externally.
Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.

| 25190 | TRAFO_TYPE_20 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Definition of the 20th transformation in the channel | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |

Description: This MD defines for each channel, which transformation is available as $20 t h$
transformation in the channel.
Other than that it has the same meaning as TRAFO_TYPE_1.


| 25194 | TRAFO_GEOAX_ASSIGN_TAB_20 |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of geometry axes to channel axes for transformation 20 |  | BYTE | NEW CONF |  |
| - |  |  |  |  |  |
| - | 3$0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$, | 0 | 20 | 7/7 | U |
| Description: | This MD states the channel axes on which the axes of the cartesian coordinate system are mapped for active transformation 20. <br> Otherwise the meaning corresponds to TRAFO_GEOAX_ASSIGN_TAB_1. |  |  |  |  |

Machine data
4.2 Channel-specific NC machine data

| 25196 | TRAFO_INCLUDES_TOOL_20 | C07 | M1, F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Tool handling with active 20th transformation |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | NEW CONF |
| - | - | $7 / 7$ | U |  |  |

## Description:

This MD defines for each channel, whether the tool is treated in the 20 th transformation or externally. Other than that it has the same meaning as TRAFO_INCLUDES_TOOL_1.


## Description:

This machine data designates an offset of the workpiece holder for the 3rd 5-axis transformation of a channel and has a special meaning for each of the various machine types:
Other than that it has the same meaning as TRAFO5_PART OFFSET_1.

| 25210 | TRAFO5_ROT_AX_OFFSET_3 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees |  |  |  |  |  |  |
| - | Position offset of rotary axes $1 / 2 / 3$ for 5-axis transformation 3 | DOUBLE | NEW CONF |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description: This machine data designates the angular offset of the first or second rotary axis in degrees for the 3rd 5-axis transformation of a channel.
Other than that it has the same meaning as TRAFO5_ROT_AX_OFFSET_1.

| 25220 | TRAFO5_ROT_SIGN_IS_PLUS_3 |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Sign of rotary axis 1/2/3 for 5-axis transformation 3 |  |  | BOOLEAN | NE |  |
| - |  |  |  |  |  |  |
| - | 3 | TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE... | 0 | - | 7/7 | U |

Description: This machine data designates the sign with which the two rotary axes enter the $3 r d$ -
axis transformation of a channel.
Other than that it has the same meaning as TRAFO5_ROT_SIGN_IS_PLUS_1.


Description:
This machine data designates a limit angle for the fifth axis of the 3rd 5-axis transformation.
Other than that it has the same meaning as TRAFO5_NON_POLE_LIMIT_1.

| 25240 | TRAFO5_POLE_LIMIT_3 |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | End angle tolerance with interpolation through pole for 5-axis transf. |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | - $2.0,2.0,2.0,2.0,2.0$, <br> $2.0,2.0,2.0 \ldots$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| Description: | This machine data designates an end angle tolerance for the fifth axis of the 3rd 5axis transformation with the following properties: <br> Other than that it has the same meaning as TRAFO5_POLE_LIMIT_1. |  |  |  |  |


| 25242 | TRAFO5_POLE_TOL_3 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | End angle tolerance for tool orientation |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: End angle tolerance for interpolation through the pole for 5/6-axis transformation 3 . Other than that it has the same meaning as TRAFO5_POLE_TOL_1.

| 25250 | TRAFO5_BASE_TOOL_3 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Vector of base tool on activation of 5-axis transformation 3 |  |  |  |  |
| - | DOUBLE | NEW CONF |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

## Description:

This MD indicates the vector of the base tool which takes effect when the third transformation is activated without a length compensation being selected. Programmed length compensations have an additive effect with respect to the base tool.
MD irrelevant:
if the "5-axis transformation" option is not installed.

| 25258 | TRAFO5_JOINT_OFFSET_PART_3 |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Vector of kinematic table offset |  |  | DOUBLE |  | NEW CON |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0 \\ & 0.0,0.0,0.0,0.0,0.0 \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description: This machine data is only evaluated in generic 5-axis tranformations with rotatable workpiece and rotatable tool (TRAFO_TYPE = 56, mixed kinematics).
Other than that it has the same meaning as TRAFO5_JOINT_OFFSET_PART_1.


| 25261 TRAFO6_JOINT_OFFSET_2_3_3 C07 - <br> mm Vector of kinematic offset DOUBLE NEW CONF <br> - 3 $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ $-M D \_D B L M A X$ |
| :--- |
| - |



Description: In the case of a 5-axis transformation with a swiveling linear axis, the value indicates the offset of the rotary axis which swivels the linear axis with reference to machine zero for the 3th transformation.
Other than that it has the same meaning as >TRAFO5_TOOL_ROT_AX_OFFSET_1.

| 25264 | TRAFO5_NUTATOR_AX_ANGLE_3 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Nutating head angle in 5-axis transformation | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $45.0,45.0,45.0,45.0$, <br> $45.0,45.0,45.0,45.0 \ldots$ | -89. | 89. | $7 / 7$ |  |

Description: $\begin{aligned} & \text { Angle between the second rotary axis and the axis corresponding to it in the } \\ & \text { rectangular coordinate system }\end{aligned}$
Other than that it has the same meaning as TRAFO5_NUTATOR_AX_ANGLE_1.

| 25266 | TRAFO5_NUTATOR_VIRT_ORIAX_3 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Virtual orientation axes |  |  |  |  |  | BOOLEAN | NEW CONF |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | $7 / 7$ |  |  |  |

Description: It has the same meaning as TRAFO5_NUTATOR_VIRT_ORIAX_1.


Description:
The MD designates the vector that describes the direction of the first rotary axis with the general 5-axis transformation (TRAFO_TYPE_* = 24).
Other than that it has the same meaning as TRAFO5_AXIS1_1.

| 25272 | TRAFO5_AXIS2_3 |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Direction of 2nd rotary axis |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & \text { 0.0, 0.0, 0.0, 0.0, 0.0, } \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| Description: | ```The MD designates the vector that describes the direction of the second rotary axis with the general 5-axis transformation (TRAFO_TYPE_* = 24, 40, 56). Other than that it has the same meaning as TRAFO5 AXIS2 1.``` |  |  |  |  |  |


| 25273 | TRAFO5_AXIS3_3 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Direction of the 3rd rotary axis | DOUBLE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: The MD designates the vector that describes the direction of the third rotary axis with the general 6-axis transformation (TRAFO_TYPE_* $=24,40,56,57$ ). Other than that it has the same meaning as TRAFO5_AXIS3_1.

| 25274 | TRAFO5_BASE_ORIENT_3 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Vector of the tool base orientation for 5-axis transformation | DOUBLE | NEW CONF |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description: Indicates the vector of the tool orientation in the general 5-axis transformation (TRAFO_TYPE_* $=24,40,56$ ) if this is not defined on the transformation call or not read from a programmed tool.
Other than that it has the same meaning as TRAFO5_BASE_ORIENT_1.

| 25276 | TRAFO6_BASE_ORIENT_NORMAL_3 |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Normal tool vector in 6-axis transformation |  |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,1.0,0.0,0.0,1.0, \\ & 0.0,0.0,1.0,0.0,0.0, \\ & 1.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |

Description:
Indicates the vector that stands vertically on the tool orientation
(TRAFO5_BASE_ORIENTATION_1) in general 6-axis transformation (TRAFO_TYPE_* = 24, 40, 56, 57).
Other than that it has the same meaning as TRAFO6_BASE_ORIENT_NORMAL_1.

| 25280 | TRAFO5_TOOL_VECTOR_3 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Direction of orientation vector for the first 5-axis transf. | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $2,2,2,2,2,2,2,2 \ldots$ | 0 | 2 | $7 / 2$ |  |

Description: Indicates the direction of the orientation vector for the first 5-axis transformation
for each channel.
Other than that it has the same meaning as TRAFO5_TOOL_VECTOR_1.1.

| 25282 | TRAFO5_TCARR_NO_3 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |
| - | TCARR number for the 3rd 5-axis transformation | DWORD | NEW CONF |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |

Description: It has the same meaning as TRAFO5_TCARR_NO_1.

| 25285 | TRAFO5_ORIAX_ASSIGN_TAB_3 | C07 | F2, M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Orientation axis / channel axis assignment transformation 3 | BYTE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | M |

Description: Assignment table of the orientation axes for 5-axis transformation 3
Only active with active 5-axis transformation 3 .
Otherwise the meaning is the same as TRAFO5_ORIAX_ASSIGN_TAB_1.

| 25290 | $\begin{array}{l}\text { TRAFO5_ROT_OFFSET_FROM_FR_3 }\end{array}$ |  |  |  |  |  |  | C01, C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Offset of transformation rotary axes from WO. | BOOLEAN | NEW CONF |  |  |  |  |  |  |
| - | - | $\begin{array}{l}\text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { FALSE, FALSE... }\end{array}$ | 0 | - | $7 / 2$ |  |  |  |  |$]$ M

Description: It has the same meaning as TRAFO5_ROT_OFFSET_FROM_FR_1.

| 25294 | TRAFO7_EXT_ROT_AX_OFFSET_3 |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | Position offset of the external rotary axes for 7 -axis transformation 3 |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | 3 $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description:
This machine data designates the angular offset of the external rotary axis in degrees for the third 7-axis transformation of a channel.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.


## Description:

The MD indicates the vector that describes the direction of the first external rotary axis in the third general 5/6-axis transformation (TRAFO_TYPE_* = 24).
The vector can have any magnitude.
Example:
Both with $(0,1,0)$ and with $(0,7.21,0)$, the same axis is described (in the direction of the 2nd geometry axis, i.e. usually Y).
Valid for the first transformation of a channel.



| 25320 | TRAFO5_ROT_SIGN_IS_PLUS_4 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Sign of rotary axis 1/2/3 for 5-axis transformation 4 | BOOLEAN | NEW CONF |  |  |
| - | 3 | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U/7 |

Description: This machine data designates the sign with which the two rotary axes enter the 4th 5axis transformation of a channel.
Other than that it has the same meaning as TRAFO5_ROT_SIGN_IS_PLUS_1.

| 25330 | TRAFO5_NON_POLE_LIMIT_4 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Definition of pole range for 5-axis transformation 4 | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $2.0,2.0,2.0,2.0,2.0$, <br> $2.0,2.0,2.0 .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description:
This machine data designates a limit angle for the fifth axis of the 4th 5-axis transformation.
Other than that it has the same meaning as TRAFO5_NON_POLE_LIMIT_1.

| 25340 | TRAFO5_POLE_LIMIT_4 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| degrees | End angle tolerance with interpolation through pole for 5-axis <br> transf. | DOUBLE | NEW CONF |  |  |
| - | - | 2.0, 2.0, 2.0, 2.0, 2.0, <br> $2.0,2.0,2.0 .$. | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |
| - | This machine data designates an end angle tolerance for the fifth axis of the 4th 5- <br> axis transformation with the following properties: <br> Other than that it has the same meaning as TRAFO5_POLE_LIMIT_1. |  |  |  |  |

4.2 Channel-specific NC machine data

| 25342 | TRAFO5_POLE_TOL_4 |  |  |  |  |  | C07 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | End angle tolerance for tool orientation |  |  |  |  |  | DOUBLE | NEW CONF |
| - | - | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |
| - | - |  |  |  |  |  |  |  |

Description:
End angle tolerance for interpolation through the pole for $5 / 6$-axis transformation 4. Other than that it has the same meaning as TRAFO5_POLE_TOL_1.


Description:
This MD indicates the vector of the base tool which takes effect when the first transformation is activated without a length compensation being selected. Programmed length compensations have an additive effect with respect to the base tool.
MD irrelevant:
if the "5-axis transformation" option is not installed.

| 25358 | TRAFO5_JOINT_OFFSET_PART_4 |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Vector of kinematic table offset |  |  | DOUBLE |  | NEW CONF |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description: This machine data is only evaluated in generic 5-axis tranformations with rotatable workpiece and rotatable tool (TRAFO_TYPE $=56$, mixed kinematics).
Other than that it has the same meaning as TRAFO5_JOINT_OFFSET_PART_1.

| 25360 | TRAFO5_JOINT_OFFSET_4 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Vector of the kinem.offset of the 4th 5-axis transf. in channel |  |  |  |  |
| - | DOUBLE | NEW CONF |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description: This machine data designates the vector from the first to the second rotary joint for the 4 th transformation of a channel.
Other than that it has the same meaning as TRAFO5_JOINT_OFFSET_1.


Description: In the case of 6-axis transformations, defines the offset between the 2 nd and third rotary axes for the 4 th transformation of each channel.

| 25362 | TRAFO5_TOOL_ROT_AX_OFFSET_4 | C07 | F2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Offset of swivel point of the rotary axis on the 4th 5-axis <br> transformation | DOUBLE | NEW CONF |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | $-M D \_$DBLMAX | $1.0 E+301$ | $7 / 7$ |
| - | In the case of a 5-axis transformation with a swiveling linear axis, the value <br> indicates the offset of the rotary axis which swivels the linear axis with reference <br> to machine zero for the 4th transformation. <br> Other than that it has the same meaning as >TRAFO5_TOOL_ROT_AX_OFFSET_1. |  |  |  |  |


| 25364 | TRAFO5_NUTATOR_AX_ANGLE_4 |  |  |  |  | C07 | F2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | Nutating head angle in 5-axis transformation | DOUBLE | NEW CONF |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $45.0,45.0,45.0,45.0$, <br> $45.0,45.0,45.0,45.0 \ldots$ | -89. | 89. |  |  |  |

Description: Angle between the second rotary axis and the axis corresponding to it in the rectangular coordinate system
Other than that it has the same meaning as TRAFO5_NUTATOR_AX_ANGLE_1.

| 25366 | TRAFO5_NUTATOR_VIRT_ORIAX_4 |  |  | C07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Virtual orientation axes |  |  | BOOLEAN |  | NEW CONF |
| - |  |  |  |  |  |  |
| - | - | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE. | 0 | - | 7/7 | U |



Description: The MD designates the vector that describes the direction of the first rotary axis with the general 5-axis transformation (TRAFO_TYPE_* = 24).
Other than that it has the same meaning as TRAFO5_AXIS1_1.

| 25372 | TRAFO5_AXIS2_4 |  |  | C07 | F2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Direction of 2nd rotary axis |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0, \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| Description: | The MD designates the vector that describes the direction of the second rotary axis with the general 5-axis transformation (TRAFO_TYPE_* $=24,40,56$ ). Other than that it has the same meaning as TRAFO5_AXIS2_1. |  |  |  |  |  |

4.2 Channel-specific NC machine data

| 25373 | TRAFO5_AXIS3_4 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction of the 3rd rotary axis | DOUBLE | NEW CONF |  |  |
| - |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

Description:
The MD designates the vector that describes the direction of the third rotary axis with the general 6-axis transformation (TRAFO_TYPE_* $=24,40,56,57$ ).
Other than that it has the same meaning as TRAFO5_AXIS3_1.

| 25374 | TRAFO5_BASE_ORIENT_4 | C07 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Vector of the tool base orientation for 5-axis transformation | DOUBLE | NEW CONF |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |

## Description:

Indicates the vector of the tool orientation in the general 5-axis transformation (TRAFO_TYPE_* $=24,40,56$ ) if this is not defined on the transformation call or not read from a programmed tool.
Other than that it has the same meaning as TRAFO5_BASE_ORIENT_1.

| 25376 | TRAFO6_BASE_ORIENT_NORMAL_4 | C07 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Normal tool vector in 6-axis transformation | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $0.0,1.0,0.0,0.0,1.0$, <br> $0.0,0.0,1.0,0.0,0.0$, <br> $1.0,0.0, \ldots$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

## Description:

Indicates the vector that stands vertically on the tool orientation
(TRAFO5_BASE_ORIENTATION_1) in general 6-axis transformation (TRAFO_TYPE_* = 24, 40, 56, 57).
Other than that it has the same meaning as TRAFO6_BASE_ORIENT_NORMAL_1.

| 25380 | TRAFO5_TOOL_VECTOR_4 | C07 | F2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Direction of orientation vector for the first 5-axis transf. | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $2,2,2,2,2,2,2,2 \ldots$ | 0 | 2 | $7 / 2$ |  |

Description: Indicates the direction of the orientation vector for the first 5-axis transformation for each channel.
Other than that it has the same meaning as TRAFO5_TOOL_VECTOR_1.1.

| 25382 | TRAFO5_TCARR_NO_4 | C07 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | TCARR number for the 4th 5-axis transformation | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - |  |  |

Description: It has the same meaning as TRAFO5_TCARR_NO_1.



Description: This machine data designates the angular offset of the external rotary axis in degrees for the fourth 7-axis transformation of a channel.
MD irrelevant:
if the "5-Axis Transformation" option is not installed.


Description: The MD indicates the vector that describes the direction of the first external rotary axis in the fourth general 5/6-axis transformation (TRAFO_TYPE_* $=24$ ).
The vector can have any magnitude.
Example:
Both with $(0,1,0)$ and with $(0,7.21,0)$, the same axis is described (in the direction of the 2nd geometry axis, i.e. usually Y).
Valid for the first transformation of a channel.

| 25495 | TRACON_CHAIN_5 |  |  |  | C07 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Transformation grouping | M1 |  |  |  |
| - |  |  |  |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | DWORD | NEW CONF |

## Description: Transformation chain of the 5th concatenated transformation.

 See TRACON_CHAIN_1 for documentation.| 25496 | TRACON_CHAIN_6 | C07 | M1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Transformation grouping | DWORD | NEW CONF |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | U |

Description: $\quad$ Transformation chain of the 6th concatenated transformation.

| 25497 | TRACON_CHAIN_7 |  |  |  | C07 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | M1 |  |  |  |  |
| - | Transformation grouping | DWORD | NEW CONF |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | U |

Description:
Transformation chain of the 7th concatenated transformation. See TRACON_CHAIN_1 for documentation.

| 25498 | TRACON_CHAIN_8 |  |  |  | C07 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Transformation grouping |  |  |  | M1 |
| - |  |  |  |  |  |
| - | 4 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | NEW CONF |

Description:
Transformation chain of the 8th concatenated transformation.
See TRACON_CHAIN_1 for documentation.

| 26000 | PUNCHNIB_ASSIGN_FASTIN |  | C01, C09 | N4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Hardware assignment for input byte for stroke control |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 0x7FFFFFFF | 7/2 | M |

Description: Assignment of the high-speed input byte for "punching and nibbling"
Bit 0-7: Number of the input byte used
Bit 8-15: Free
Bit 16-23: Inversion mask for writing the hardware byte
Bit 24-30: Free
This data defines which input byte is to be used for the signal "travel active".
= 1 :
On-board inputs (4 high-speed NC inputs) are used.
2, 3, 4, 5
The external digital NC inputs are used
128-129:
Comparator byte (results from high-speed analog inputs or VDI specification)
Related to:
MD26006 \$MC_NIBBLE_PUNCH_INMASK[n]
References:
/FB/, A4, Digital and Analog NC I/Os

The signal is high active as default from software 3.2. That is there is wire break monitoring. If the signal is low active then, e.g., the MD must be set to the value MD $=" H 00010001$ " for the outboard inputs.


| 26004 | NIBBLE_PUNCH_OUTMASK |  |  |  | C01, C09 | N4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Mask for fast output bits |  |  |  | UBYTE | PowerOn |  |
| - |  |  |  |  |  |  |  |
| - | 8 |  | $\begin{aligned} & 1,0,0,0,0,0,0,0,0 \\ & 0,0,0,0,0,0,0,0,0 \\ & 0,0,0,0 \ldots \end{aligned}$ | 0 | - | 7/2 | M |
| Description: |  | Mask for hig Byte 1: Bytes 2-8: Special case Only NIBBLE This is used Related to: MD26002 \$MC | -speed output bits ntains the bit for rrently free <br> UNCH_OUTMASK[O] is define the outp <br> UNCHNIB ASSIGN FAS | for | signal | st |  |



```
Second punch interface (SPIF2), not available as standard
```

NIBBLE_PUNCH_INMASK[2]=0
NIBBLE_PUNCH_INMASK[7]=0
Note:
-
Special cases:
Only NIBBLE_PUNCH_INMASK[0] is relevant. This is used to define the input bit for the
signal "Stroke active".
Related to:
MD26000 \$MC_PUNCHNIB_ASSIGN_FASTIN

| 26008 | NIBBLE_PUNCH_CODE | C09 | H2, K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Definition of M functions | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 8 | $0,23,22,25,26,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0, \ldots$ | - | $7 / 2$ | M |

Description:

|  | Standard value | Example |
| :---: | :---: | :---: |
| NIBBLE_PUNCH_CODE [0] = 0 | 20 | End punching, nibbling with M20 |
| NIBBLE_PUNCH_CODE[1] = 23 | 23 | End punching, nibbling with M23 |
| NIBBLE_PUNCH_CODE[2] = 22 | 22 | Start nibbling |
| NIBBLE_PUNCH_CODE[3] = 25 | 25 | Start punching |
| NIBBLE_PUNCH_CODE[4] = 26 | 26 | Activate dwell time |
| NIBBLE_PUNCH_CODE [5] =122 | 122 | Start nibbling with pretension, stroke control at servo level |
| NIBBLE_PUNCH_CODE [6] =125 | 125 | Start punching with pretension, stroke control at servo level |
| NIBBLE_PUNCH_CODE[7] = 0 | 0 | Not used (in preparation) |

Special cases:
If MD26012 \$MC_PUNCHNIB_ACTIVATION = 2 (M functions are interpreted directly by the software), then MD26008 \$MC_NIBBLE_PUNCH_CODE[0] =20 has to be set.
Related to:
MD26012 \$MC_PUNCHNIB_ACTIVATION

| 26010 | PUNCHNIB_AXIS_MASK | C09 | N4 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Definition of punching and nibbling axes | UDWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $7,0,0,0,0,0,0,0 \ldots$ | 0 | $0 x 7 F F F F F F F$ | $7 / 2$ |  |  |

Description: Defines the axes involved in punching and nibbling. That is all the axes defined here must be at rest during punching and nibbling.
Related to:
MD26016 \$MC_PUNCH_PARTITION_TYPE

| 26012 | PUNCHNIB_ACTIVATION |  |  |  |  |  |  | C09 | K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Activation of punching and nibbling functions | DWORD | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 2$ |  |  |  |  |

```
Description:
    This MD defines the ways in which punching and nibbling functions can be activated:
    PUNCHNIB_ACTIVATION = 0
    None of the punching or nibbling functions can be activated. The automatic path
    segmentation is the only exception - if it is enabled via MD26014
    $MC_PUNCH_PATH_SPLITTING.
PUNCHNIB_ACTIVATION = 1
The functions are activated via language commands. If M functions are to be used, then
they must be programmed using macros.
PUNCHNIB_ACTIVATION = 2
The M functions are interpreted directly by the software. Language commands can still
be used.
Note:
This option is intended only as a temporary solution.
Related to:
MD26014 $MC_PUNCH_PATH_SPLITTING
MD26008 $MC_NIBBLE_PUNCH_CODE[n]
```



Description:
Activation data for automatic path segmentation.
Value Significance
$\qquad$
$0=$
Automatic path segmentation only active with punching and nibbling.
1 =
Automatic path segmentation can also be activated without punching and nibbling functions;
that is, it is programmable and be used NC internally
2 =
Automatic path segmentation can only be used NC internally;
that is it cannot be programmed.


This machine data defines how single axes that are also nibbling axes within the meaning of MD26010 \$MC_PUNCHNIB_AXIS_MASK are to behave.
In this case, there are the following options for the behavior of the single axes during automatic path segmentation and stroke control:
PUNCH_PARTITION_TYPE = 0
No special behavior during automatic path segmentation. If the single axes are programmed together with path axes in one block, then their total traversing path is split up corresponding to the path axes. That is the pure geometric relationship between the single axes and path axes is identical to the undivided motion. If the single axes are programmed without the path axes but with SPN=<value>, then the path is divided accordng to the programmed SPN value.
PUNCH_PARTITION_TYPE = 1

In this case, the path of the single axes, if they are programmed together with path axes, are generally traversed in the first section (that is independently of the currently active type of interpolation).
PUNCH_PARTITION_TYPE = 2
In this case, the single axes behave with linear interpolation in the same way as with PUNCH_PARTITION_TYPE = 1, and with all other types of interpolation in the same way as with PUNCH_PARTITION_TYPE $=0$.
Related to:
MD26010 \$MC_PUNCHNIB_AXIS_MASK


Description:
To minimize any dead times due to the reaction time of the punching unit, it is possible to release the stroke before reaching the in-position window of the axes. The reference time for this is the interpolation end. Since there is normally a delay of some interpolation cycles after reaching the interpolation end (depending on the machine dynamics) until the axes actually come into position, the prestart time is a delay time with respect to reaching the interpolation end.
The function is therefore coupled to $G 603$ (block change at the end of interpolation). The time can be set via the machine data NIBBLE_PRE_START_TIME).
Example:
With an interpolation cycle of 5 ms , a stroke shall be released 2 cycles after reaching the interpolation end. In this case, the value 0.010 s must be selected for NIBBLE_PRE_START_TIME. If a value that is not integrally divisible by the set interpolation time is selected, then the stroke is initiated in the interpolation cycle following the set time.

| 26020 | NIBBLE_SIGNAL_CHECK | C09 | N4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Alarm on chattering punching signal | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 2$ |  |

Description: When stroke active signal is set, for example by punch overshoots between the strokes, then the interpolation is stopped. It is also possible to generate the message
"unclean punch signal" as a function of machine data NIBBLE_SIGNAL_CHECK.
0: No error message when the punching signal is irregular
1: Alarm, when the punching signal is irregular between strokes

| 27100 | ABSBLOCK_FUNCTION_MASK | N01 | K1, P1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Parameterize basic blocks with absolute values | UDWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $0 \times 0,0 \times 0,0 \times 0,0 \times 0$, <br> $0 \times 0,0 \times 0,0 \times 0,0 \times 0 .$. | 0 | $0 \times 1$ |  |

## Description:

Parameterization of the "basic blocks with absolute values" function Bit $0=1$ :
The position values of the transverse axis are always displayed as diameter values. Transverse axes can be applied using MD20100 \$MC_DIAMETER_AX_DEF or MD30460 \$MA_BASE_FUNCTION_MASK, bit 2.


Description: A version information freely available to the user
(is indicated in the version screen)

| 27850 | PROG_NET_TIMER_MODE | C09 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Impact of the program runtime net counter | UDWORD | Reset |  |  |
| - | - | $\begin{array}{l}0 \times 00,0 \times 00,0 \times 00, \\ 0 \times 00,0 \times 00,0 \times 00, \\ 0 \times 00,0 \times 00 . .\end{array}$ | $0 \times 00$ | $0 \times 03$ | $7 / 2$ |$]$| M |
| :--- |

Description:
The program run time is measured using system variables and can be read out. It provides a means of outputting the current progress of the processing of a part program. This MD can be used to make the following settings on a channel-specific basis:
Bit $0=0$
\$AC_ACT_PROG_NET_TIME is not deleted on a jump to the start of the program with GOTOS
Bit $0=1$
\$AC_ACT_PROG_NET_TIME is deleted on a jump to the start of the program with GOTOS, the valūe is savè in \$AC_OLD_PROG_NET_TIMES, and the program counter
\$AC_OLD_PROG_NET_TIME_COUNT is incremented.
Bit $1=0$
\$AC_ACT_PROG_NET_TIME ceases to be increased if override $=0$ is set; in other words, the program run time is measured without the time for which the override was set to 0 .
Bit $1=1$
\$AC_ACT_PROG_NET_TIME is increased if override $=0$; in other words, the program run time $\bar{i}$ measured with the time for which the override was set to 0 .
Bits 2 to 31
Reserved

| 27860 | PROCESSTIMER_MODE | C09 | K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Activation and impact of program runtime measurement | UDWORD | Reset |  |  |
| - | - | $\begin{array}{l}0 \times 00,0 \times 00,0 \times 00, \\ 0 \times 00,0 \times 00,0 \times 00, \\ 0 \times 00,0 \times 00 \ldots\end{array}$ | 0 | $0 \times 7 F F$ | $7 / 2$ |$]$| M |
| :--- |

Description:
Timers are provided as system variables under the function program runtime. While the NCK-specific timers are always activated (for time measurements since the last control power on), the channel-specific timers have to be started via this machine data.
Meaning:
Bit $0=0$
No measurement of total operating time for any part program
Bit $0=1$
Measurement of total operating time is active for all part programs
(\$AC_OPERATING_TIME)
Bit $1=0$
No measurement of current program runtime

```
Bit 1 = 1
Measurement of current program runtime is active ($AC_CYCLE_TIME)
Bit 2 = 0
No measurement of tool operating time
Bit 2 = 1
Measurement of tool operating time is active ($AC_CUTTING_TIME)
Bit 3
Reserved
Bits 4,5 only when bit 0, 1, 2 = 1:
Bit 4 = 0 No measurement with active dry run feed
Bit 4 = 1 Measurement also with active dry run feed
Bit 5 = 0 No measurement with program test
Bit 5 = 1 Measurement also with program test
Bit 6 only when Bit 1 = 1:
Bit 6 = 0
Delete $AC_CYCLE_TIME also with start by ASUB and PROG_EVENTs
Bit 6 = 1
$AC_CYCLE_TIME is not deleted on start by ASUB and PROG_EVENTs.
Bit 7 only when bit 2 = 1:
Bit 7 = 0 $AC_CUTTING_TIME counts only with active tool
Bit 7 = 1 $AC_CUTTING_TIME counts irrespective of tool
Bits 8 only when bit 1 = 1
Bit 8 = 0
    $AC_CYCLE_TIME is not deleted on jumping to program start with GOTOS
Bit 8 = 1
$AC_CYCLE_TIME is deleted on jumping to program start with GOTOS.
Bit 9 only when bits 0, 1 = 1:
Bit 9 = 0
    $AC_OPERATING_TIME, $AC_CYCLE_TIME: No measurement with override = 0.
Bit 9 = 1
$AC_OPERATING_TIME, $AC_CYCLE_TIME: Measurement also with override = 0.
Bits 10 to 31
Reserved
```



## Description:

```
The part counters can be configured with this machine data.
Note: with bit 0 = 1 and $AC REQUIRED_PARTS less than 0, all workpiece counts
activated in this MD are frozen at the status reached.
Meaning of the individual bits:
Bits 0 - 3: Activating $AC_REQUIRED_PARTS
------------------------------------------------------------------------------
Bit 0 = 1: Counter $AC_REQUIRED_PARTS is activated
Further meaning of bits 1-3 only when bit 0 =1 and $AC_REQUIRED_PARTS > 0:
Bit 1 = 0: Alarm/VDI output if $AC_ACTUAL_PARTS corresponds to $AC_REQUIRED_PARTS
Bit 1 = 1: Alarm/VDI output if $AC_SPECIAL_PARTS corresponds to $AC_REQUIRED_PARTS
```

```
Bit 2 Reserved!
Bit 3 Reserved!
Bits 4 - 7: Activating $AC_TOTAL_PARTS
Bit 4 = 1: Counter $AC_TOTAL_PARTS is active
Further meaning of bits 5-7 only when bit 4 =1 and $AC_REQUIRED_PARTS > 0:
Bit 5 = 0: Counter $AC_TOTAL_PARTS is incremented by 1 with a VDI output of M02/M30
Bit 5 = 1: Counter $AC_TOTAL_PARTS is incremented by 1 with output of the M command
from MD PART_COUNTER_MCODE[0]
Bit 6 = 0: $AC_TOTAL_PARTS also active with program test/block search
Bit 6 = 1: No machining $AC_TOTAL_PARTS with program test/block search
Bit 7 = 1: Counter $AC_TOTAL_PARTS is incremented by 1 on a return with GOTOS
Bits 8 - 11: Activating $AC_ACTUAL_PARTS
Bit 8 = 1: Counter $AC_ACTUAL_PARTS is active
Further significance of bits 9-11 only when bit 8 =1 and $AC_REQUIRED_PARTS > 0:
Bit 9 = 0: Counter $AC_ACTUAL_PARTS is incremented by 1 with a VDI output of M02/M30
Bit 9 = 1: Counter $AC_ACTUAL_PARTS is incremented by 1 with output of the M command
from MD PART_COUNTER_MCODE[1]
Bit 10 = 0: $AC_ACTUAL_PARTS also active with program test/block search
Bit 10 = 1: No machining $AC_ACTUAL_PARTS with program test/block search
Bit 11 = 1: Counter $AC_ACTUAL_PARTS is incremented by 1 on a return with GOTOS
Bit 12 - 15: Activating $AC_SPECIAL_PARTS
-------------------------------------------------------------------------------
Bit 12 = 1: Counter $AC_SPECIAL_PARTS is active
Further significance of bits 13-15 only when bit 12 =1 and $AC_REQUIRED_PARTS > 0:
Bit 13 = 0: Counter $AC_SPECIAL_PARTS is incremented by 1 with a VDI output of M02/
M30
Bit 13 = 1: Counter $AC_SPECIAL_PARTS is incremented by 1 with output of the M
command from MD PART_COUNTER_MCODE[2]
Bit 14 = 0: $AC_SPECIAL_PARTS also active with program test/block search
Bit 14 = 1: No machining $AC_SPECIAL_PARTS with program test/block search
Bit 15 = 1: Counter $AC_SPECIAL_PARTS is incremented by 1 on a return with GOTOS
Bit 16 - 19: Extension $AC_TOTAL_PARTS
Meaning of the bits 16-19 applies only if Bit4 =1 and $AC_REQUIRED_PARTS > 0:
Bit 16 = 0: $AC_TOTAL_PARTS is active in MDI mode
Bit 16 = 1: No machining $AC_TOTAL_PARTS in MDI mode
Bit 17 Reserved!
Bit 18 Reserved!
Bit 19 Reserved!
Bit 20-23: Extension $AC_ACTUAL_PARTS
---------------------------------------------------------------------------------
Meaning of bits 20-23 only if bit8 =1 and $AC_REQUIRED_PARTS > 0:
Bit 20 = 0: $AC_ACTUAL_PARTS is active in MDI mode
Bit 20 = 1: No machining $AC_ACTUAL_PARTS in MDI mode
Bit 21 Reserved!
Bit 22 Reserved!
Bit 23 Reserved!
Bit 24 - 27: Extension $AC_SPECIAL_PARTS
```

```
Meaning of bits 24-27 only if bit12 =1 and $AC_REQUIRED_PARTS > 0:
Bit 24 = 0: $AC_SPECIAL_PARTS is active in MDI mode
Bit 24 = 1: No machining $AC_SPECIAL_PARTS in MDI mode
Bit 25 Reserved!
Bit 26 Reserved!
Bit 27 Reserved!
Related to:
MD27882 $MC_PART_COUNTER_MCODE
```



## Description:

If part counting is activated via MD27880 \$MC_PART_COUNTER, the count pulse can be triggered by a special M command.
Only then are the values defined here taken into account:
Meaning:
The part counters are incremented by 1 in the NST signal output of the M command described, where:
MD27882 \$MC_PART_COUNTER_MCODE[0] for \$AC_TOTAL_PARTS
MD27882 \$MC_PART_COUNTER_MCODE[1] for \$AC_ACTUAL_PARTS
MD27882 \$MC_PART_COUNTER_MCODE[2] for \$AC_SPECIAL_PARTS

| 27920 | TIME_LIMIT_NETTO_INT_TASK | EXP, C01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Runtime limit of interpreter subtask | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.005,0.005,0.005$, | 0.001 | 0.100 | ReadOnly |  |
|  |  | $0.005,0.005,0.005$, |  | S |  |  |
|  | $0.005,0.005 \ldots$ |  |  |  |  |  |

Description:
With MD27920 \$MC_TIME_LIMIT_NETTO_INT_TASK, the maximum runtime of the interpreter subtask is set. The interpreter subtask is started from the preprocessing task. If the interpreter task does not end on its own within the time set with MD27920 \$MC_TIME_LIMIT_NETTO_INT_TASK, it will be stopped and continued after a preprocessing cycle.

| 27930 | TIME_LIMIT_NETTO_EES_TASK | EXP, C01 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Runtime limit of the EES async. subtask | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.008,0.008,0.008$, <br>  | $0.008,0.008,0.008$, |  |  |  |
| $0.008,0.008 \ldots$ | 0.01 | ReadOnly | S |  |  |  |
|  |  |  |  |  |  |  |

Description:
The maximum runtime of the EES async. subtask is set with this machine data. The EES async. subtask is started from the preprocessing task. If the EES async. subtask does not end automatically within the time set in this machine data, it will be stopped and resumed after a preprocessing cycle.

| 28000 | MM_REORG_LOG_FILE_MEM | EXP, C02 | V2, K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Memory space for REORG (DRAM) | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $50,50,50,50,50,50$, <br> $50,50 \ldots$ | 1 | 500 | $7 / 2$ |

Description:
Definition of the size (in kbyte) of the dynamic memory for the REORG-LOG data. The size of the memory determines the quantity of the data available for the function REORG.
References:
/FB/, K1, "Mode Groups, Channel, Program Operation"


## Description:

Defines the number of additional LUD data blocks available for the function REORG (see Description of Functions, Channels, Mode Groups, Program Operation (K1)).
This value can be 0 if the function REORG is not used. The CNC always opens 12 LUD data blocks, of which 8 are used for NC programs and 4 for the ASUBs.
An LUD data block is needed for each $N C$ program and ASUB in which a local user variable is defined. This value may have to be increased for the function REORG if a large IPO buffer is present and a large number of short NC programs in which LUD variables are defined are active (prepared NC blocks of the programs are located in the IPO buffer).
An LUD data block is needed for each of these programs. The size of the reserved memory is affected by the number of LUDs per NC program and their individual memory requirements. The LUD data blocks are stored in the dynamic memory.
The memory requirement for managing the blocks for local user variables with REORG can be determined as follows:
The size of the LUD blocks depends on the number of active LUDs and their data type. The memory for the LUD blocks is limited by the MD28000 \$MC_MM_REORG_LOG_FILE_MEM (memory size for REORG).

| 28020 | MM_NUM_LUD_NAMES_TOTAL | C02 | V2, K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of local user variables (DRAM) |  |  |  |  |
| - | - | $4000,4000,4000$, <br> $4000,4000,4000$, <br> $4000,4000 \ldots$ | 4000 | 32000 | $7 / 3$ |

## Description:

Defines the number of variables for the local user data (LUD) which are permitted to exist in the active sections of the program. Approximately 150 bytes of memory per variable are reserved for the names of the variables and the variable values. The memory required for the variable value is equal to the size of the data type. If the total of the local user variables from the active main program and the related subprograms is larger than the defined limit, the variables which are over the limit are not accepted during execution of the program. Dynamic memory is used for the variable names and variable values.
Overview of the memory used by the data types:
Data type Memory used
REAL 8 bytes
INT 4 bytes
BOOL 1 byte

### 4.2 Channel-specific NC machine data

| CHAR | 1 byte |
| :--- | :--- |
| STRING | 1 byte per character, 200 characters per string are possible |
| AXIS | 4 bytes |
| FRAME | 400 bytes |



Description:
This MD defines the amount of memory space available for LUD variables.
The maximum number of available LUDs is given by one of the limit values of MD28020 \$MC_MM_NUM_LUD_NAMES_TOTAL or MD28040 \$MC_MM_LUD_VALUES_MEM.
It should be remembered that several part programs requiring memory can be open simultaneously in the NCK. The number depends on the type of programming, the program length, and the size of the internal NCK block memory upwards of (MD28060 \$MC_MM_IPO_BUFFER_SIZE, MD28070 \$MC_MM_NUM_BLOCKS_IN_PREP).
Related to:
MD28020 \$MC_MM_NUM_LUD_NAMES_TOTAL
(number of local user variables (DRAM))
\(\left.\begin{array}{|l|l|l|l|l|}\hline 28050 \& MM_NUM_R_PARAM \& C02 \& K1 <br>
\hline- \& Number of channel-specific R variables (SRAM) \& DWORD \& PowerOn <br>
\hline- \& - \& \begin{array}{l}100,100,100,100, <br>

100,100,100,100 ···\end{array} \& 0 \& 32535\end{array}\right]\)| M |
| :--- |
| - |

Description: Defines the number of R variables available in the channel. This machine data reserves 8 bytes of buffered user memory per $R$ variable.

| 28060 | MM_IPO_BUFFER_SIZE | C02 | B1, K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of NC blocks in IPO buffer (DRAM) | DWORD | PowerOn |  |  |
| - | - | $10,10,10,10,10,10$, <br> $10,10 \ldots$ | 2 | 1000 | M |
| - | - |  |  |  |  |

## Description:

Defines the number of blocks for the interpolation buffer. This buffer contains prepared NC blocks available for the interpolation. A number of kbytes of the dynamic user memory are reserved for each NC block. The data also limits the number of blocks for look ahead consideration of speed limitation for the LookAhead function.
MD28060 \$MC_MM_IPO_BUFFER_SIZE is set by the system.
Related to:
MD28070 \$MC_MM_NUM_BLOCKS_IN_PREP
(number of blocks for block preparation)

| 28070 | MM_NUM_BLOCKS_IN_PREP | EXP, C02 | B1, K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of blocks for block preparation (DRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $50,50,50,50,50,50$, <br> $50,50 \ldots$ | 20 | 1000 | $7 / 2$ |  |

Description:
Defines the number of $N C$ blocks available for $N C$ block preparation. This figure is determined mainly by the system software and is used largely for optimization. Approximately 10 Kbytes of dynamic memory is reserved per NC block.
Related to:

MD28060 \$MC_MM_IPO_BUFFER_SIZE
(number of $N C$ blocks with IPO buffer)


| 28072 | MM_MAXNUM_SURF_GROUPS |  |  |  | EXP, C02 | - |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Dimensioning of the COMPSURF function in respect of axis groups (DRAM) |  |  |  | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |  |  |  |
| - | Defines the size of the internal data structures of the COMPSURF function in respect of various axis groups, such as geometry, orientation, and other axis types. Larger values mean better quality smoothing, but also more use of CPU time and memory space. The machine data only has an effect if the Top Surface option is used. <br> Related to: <br> SD42473 \$SC_ACTNUM_SURF_GROUPS |  |  |  |  |  |  |  |
| Description: | Defines the size of the internal data structures of the COMPSURF function in respect of various axis groups, such as geometry, orientation, and other axis types. Larger values mean better quality smoothing, but also more use of CPU time and memory space. The machine data only has an effect if the Top Surface option is used. <br> Related to: <br> SD42473 \$SC_ACTNUM_SURF_GROUPS |  |  |  |  |  |  |  |


| 28079 | MM_NUM_G_FRAMES |  |  | C11, C02 | K1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of grinding frames (SRAM) |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 100 | 7/2 | M |

## Description:

Specifies the number of predefined grinding frames.
The buffered data are lost when this machine data is changed!

| 28080 | MM_NUM_USER_FRAMES |  |  |  |  |  | C11, C02 | K1, K2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of settable frames (SRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $5,5,5,5,5,5,5,5 \ldots$ | 5 | 100 |  |  |  |  |

Description:
Defines the number of predefined user frames. The standard system configuration provides four frames for G54 to G57 and one frame for G500.
The backup data are lost if this machine data is altered!

| 28081 | MM_NUM_BASE_FRAMES | C02 | M5, K2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of base frames (SRAM) | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 16 |  |
| Description: | Number of channel-specific base frames per channel. <br>  <br>  <br>  <br>  <br>  <br>  <br>  <br>  <br>  <br> The value corresponds to the number of field elements for the predefined field <br> Buffered memory is reserved for this. |  |  |  |  |




| 28085 | MM_LINK_TOA_UNIT | C02, C09 | FBWsI, S7 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Assignment of a TO unit to a channel (SRAM) | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $1,2,3,4,5,6,7,8 \ldots$ | 1 | 10 | $7 / 2$ |  |  |$]$ M

Description:
The TO area covers all tool, magazine, ... data blocks known to the NCK. The maximum nujmber of units in the $T O$ area is equal to the number of channels.
If MD28085 \$MC_MM_LINK_TOA_UNIT = default setting, then each channel is assigned a TO unit individually.

If MD28085 \$MC_MM_LINK_TOA_UNIT = i, the channel is assigned TO unit i. This enables one $T O$ unit to be assigned to multiple channels.

Notice
The uppper limit does not indicate that this value is always practical or free of conflicts. If one channel (the first) is active in a system with a maximum of 2 channels, and the other is not, the MD on channel 1 can formally be given the value 2 , but the NCK cannot work with it. This setting would mean that channel 1 did not have any blocks for tool offsets, as the channel with ID=2 did not exist.

The NCK detects this conflict at Power On and restart, and responds by autonomouslöy changing the (incorrect) value to the default value of the MD.

| 28090 | MM_NUM_CC_BLOCK_ELEMENTS |  |  |  |  |  | EXP, C02 | TE1, TE7, TE8, K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of block elements for compile cycles (DRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 130 | $7 / 1$ |  |  |  |

Description:

The input value defines the number of block elements that can be used for compile cycles.
In the case of software version 2, approximately 1.2 KB of dynamic memory is required per block element.

| 28100 | MM_NUM_CC_BLOCK_USER_MEM | EXP, C02 | TE1, TE7, TE8, K1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Size of block memory for compile cycles (DRAM), in KB |  |  |  |  | DWORD | PowerOn |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 64000 |  |  |  |
| - | - | $7 / 1$ | M |  |  |  |  |

## Description: The value defines the total capacity of block memory available to the user in the

 dynamic memory area for the compile cycles. The memory is allocated in staggered blocks of 128 bytes.

Description: Size of the heap memory in kbytes which can be used by the compile cycle user.
Dynamic memory is reserved.
The memory is allocated in subdivisions of 128 byte groups.
The start address and the size of the reserved memory is made available via a binding, the management lies in the hands of the CC user.

| 28150 | MM_NUM_VDIVAR_ELEMENTS | C02 | A2, P3 pl, P3 sI |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of elements for writing PLC variables |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32000 | $7 / 2$ |
| - | - | PWORD |  |  |  |

Description: The MD defines the number of elements which the user has available for writing PLC variables (\$A_DBx=...). This number also applies to block search, but not to synchronized actions.
The memory requirement is ca. 24 bytes per element.
One element is needed for each write action when writing PLC variables in quick succession.
If more writing actions are to be performed than elements are available, block transport must be guaranteed (trigger preprocessing stop, if required)
However, the number of elements can be reduced if the accessing actions are made separately (block transport has already been accomplished). Writing accesses (var= \$A_DBx) are unlimited.
4.2 Channel-specific NC machine data

| 28160 | MM_NUM_LINKVAR_ELEMENTS |  |  |  |  | C02 | B3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of elements for writing NCU-link variables | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32000 |  |  |  |

## Description:

Defines the number of elements which the user has available for programming link variables (\$A_DLx=...). This number also applies to block search, but not to synchronized actions.

The memory requirement is approx. 24 bytes per element.
One element is needed for each write action when writing NCU-link variables in quick succession.
However, the number of elements can be reduced if the accessing actions are made separately (block transport has already been accomplished).
If more writing actions are to be performed than elements are available, block transport must be guaranteed (trigger preprocessing stop, if required).

| 28180 | MM_MAX_TRACE_DATAPOINTS |  |  |  |  |  | EXP, C02, C06 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| NBUP | Length of the trace data buffer | DWORD | PowerOn |  |  |  |  |  |
| - | - | $100,100,100,100$, <br> $100,100,100,100 \ldots$ | 0 | 20000 |  |  |  |  |

Description: MM_MAX_TRACE_DATAPOINTS defines the size of an internal data buffer which contains the trace recordings.

| 28200 | MM_NUM_PROTECT_AREA_CHAN | C02, C06, C09 | A3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of channel-specific protection zones (SRAM) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 10 |  |  |
| $7 / 2$ | M |  |  |  |  |  |

Description:
This machine data defines how many channel-specific protection areas are set up.
Related to:
MD28210 \$MC_MM_NUM_PROTECT_AREA_ACTIVE (number of simultaneously active protection areas)
MD18190 \$MN_MM_NUM_PROTECT_AREA_NCK (number of control-specific protection areas (SRAM) )
References:
/FB/, A3, "Axis/Contour Tunnel Monitoring, Protection Areas"

| 28210 | MM_NUM_PROTECT_AREA_ACTIVE |  |  |  |  |  | C11, C02, C06, <br> C09 | A3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of simultaneously active protection zones in one channel | DWORD | PowerOn |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 20 |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |
| - | - |  |  |  |  |  |  |  |

Description:
This machine data defines the number of protection areas that may be activated simultaneously for each channel.
It is not practical to enter a numerical value greater than MD18190
\$MN_MM_NUM_PROTECT_AREA_NCK + MD28200 \$MC_MM_NUM_PROTECT_AREA_CHAN.
Related to:
MD28200 \$MC_MM_NUM_PROTECT_AREA_CHAN (Number of blocks for channel-specific
protection areas)
MD18190 \$MN_MM_NUM_PROTECT_AREA_NCK (Number of control-specific protection areas (SRAM))
References:
/FB1/ Function Manual Basic Functions; Axis Monitoring, Protection Areas (A3)

| 28212 | MM_NUM_PROTECT_AREA_CONTOUR |  |  |  |  |  | C11, C02, C06, <br> C09 | A3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Elements for active protection zones (DRAM) | DWORD | PowerOn |  |  |  |  |  |
| - | - | $30,30,30,30,30,30, ~$ <br> $30,30 \ldots$ | 0 | 50 | M |  |  |  |
| - | - | $7 / 2$ |  |  |  |  |  |  |

Description: This machine data defines for each channel how many internal contour elements in total are held available for active protection zones.

Dynamic memory is used.
The MD affects the memory requirements for the activated protection zones.
This machine data is active only if MD28210 \$MC_MM_NUM_PROTECT_AREA_ACTIVE is not equal to 0 .


## Description:

The values of the variables and machine data during diagnostics of the motionsynchronous actions are saved to memory elements for storage in the control. A motionsynchronous action uses up to the number of elements for as many variables as are set with MD28241 \$MC_MAXNUM_SYNC_DIAG_VAR.
The following are assigned:

- 1 element for each variable
- 1 element for each index

Example:
WHEN \$R1 == 1 DO $\$ R 2=\$ R\left[A C \_M A R K E R[1]\right]$
R1 = 2 elements, variable with written value 1 element, index "1" an element
R2 = 2 elements, variable with written value 1 Element, index "2" an element
AC_MARKER = 2 elements, variable with read value 1 element, index "1" an element $R=2$ elements, variable with written value 1 element, index "1" an element Total 8 elements.

| 28241 | MAXNUM_SYNC_DIAG_VAR |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| N05 |  |  |  |  | - |
| - |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 10000 | $7 / 2$ |
| - |  |  |  |  |  |

Description: Maximum number of diagnostics variables per synchronized action.

| 28250 | MM_NUM_SYNC_ELEMENTS | C02 | $2.8,6.1$ |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of elements for expressions in synchronized actions | DWORD | PowerOn |  |  |
| - | - | $\begin{array}{l}159,159,159,159, \\ 159,159,159,159 \ldots\end{array}$ | 0 | 32000 | $7 / 2$ |$]$| M |
| :--- |
| - |

## Description: <br> The expressions of the motion-synchronous actions are stored in memory elements in the

 control. A motion-synchronous action occupies at least 4 elements.It occupies:

### 4.2 Channel-specific NC machine data

- 1 element for each operand in the condition
- $>=1$ element for each action
- 2 elements for each assignment
- 1 element for each further operand in complex expressions.

One element occupies approx. 64 bytes.
The option "Synchronous actions stage 2 " is required if the MD can be written to.


## Description:

The expressions of motion-synchronous actions are stored in memory elements of the control. A motion-synchronous action assigns at least 4 elements.
Assignments:
Each operand in the condition: 1 element
Each action: >= 1 element
Each assignment: 2 elements
Each additional operand in complex expressions: 1 element
Also see:
MD28250 \$MC_MM_NUM_SYNC_ELEMENTS

| 28252 | MM_NUM_FCTDEF_ELEMENTS |  | C02 | 2.4, 2.8, 6.1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of FCTDEF elements |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 3, 3, 3, 3, 3, 3, 3, 3... | 0 | 100 | 7/2 | M |

## Description: Defines the number of FCTDEF elements.

| 28253 | MM_NUM_SYNC_STRINGS | C02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of strings for expressions in synchronized actions | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | $\begin{array}{l}200,200,200,200, \\ 200,200,200,200 \ldots\end{array}$ | 0 | 32000 | $7 / 2$ |  |  |$]$| M |
| :--- |

Description: The expressions of motion-synchronous actions are saved in memory elements for storage in the control. Elements have to be reserved specifically for strings within expressions.

| 28254 | MM_NUM_AC_PARAM | C02 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Dimension of \$AC_PARAM. | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{array}{l}50,50,50,50,50,50, \\ 50,50 \ldots\end{array}$ | 0 | 20000 | $7 / 2$ |  |$]$| M |
| :--- |

Description: Panel size of \$AC_PARAM.


Description: \$AC_PARAM[] is stored in SRAM.

| 28256 | MM_NUM_AC_MARKER | C02 | $2.3,6.1$ |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Dimension of \$AC_MARKER | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $8,8,8,8,8,8,8,8 \ldots$ | 0 | 20000 | $7 / 2$ |

## Description:

Number of channel-specific markers \$AC_MARKER for motion-synchronous actions. DRAM or SRAM is required depending on MD28257 \$MC_MM_BUFFERED_AC_MARKER.

| 28257 | MM_BUFFERED_AC_MARKER |  |  |  |  |  | C02 | $2.3,6.1$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | \$AC_MARKER[] is stored in SRAM. | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | $7 / 2$ |  |  |  |

Description: \$AC_MARKER[] is stored in SRAM.

| 28258 | MM_NUM_AC_TIMER | C02 | $2.3,2.4,6.1$ |  |
| :--- | :--- | :--- | :--- | :--- |
| - | Number of time variables \$AC_TIMER (DRAM) | DWORD | PowerOn |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 10000 |
| - | - | $7 / 2$ | M |  |

Description: Number of channel-specific time variables \$AC_TIMER for motion-synchronous actions (DRAM)

| 28260 | NUM_AC_FIFO | C01 | $2.3,2.4,6.1$ |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of FIFO variable for synchronized actions | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 10 | $7 / 2$ |  |

Description:

Number of FIFO variables \$AC_FIFO1 - \$AC_FIFO10 for motion-synchronous actions.
FIFO variables are used for product tracking. A piece of information (e.g. the product
length) for each part on a conveyor belt can be temporarily stored in each FIFO variable.

FIFO variables are stored in $R$ variables.
MD28262 \$MC_START_AC_FIFO defines the number of the R variable as from which the FIFO variables can be stored. All R variables with lower numbers can be used freely in the part program.
$R$ variables above the $F I F O$ range cannot be written from the part program.
The number of $R$ variables must set via MD28050 \$MC_MM_NUM_R_PARAM so that all FIFI variables can be accommodated from the start of the $R$ variables:
MD28050 \$MC_MM_NUM_R_PARAM = MD28262 \$MC_START_AC_FIFO + MD28260 \$MC_NUM_AC_FIFO * (MD28264 \$MC_LEN_AC_FIFO + 6)

The FIFO variables bear the names \$AC FIFO1 to \$AC FIFOn.
They are stored as arrays.
The indices 0 - 5 have special meanings:
$\mathrm{n}=0$ :
A new value is stored in the FIFO when writing with index 0 .
The oldest element is read and removed from the FIFO when writing with index 0 .
$n=1$ : Access to the first element read in
$\mathrm{n}=2$ : Access to the last element 1 read in
n=3: Sum of all FIFO elements
$n=4:$ Number of elements available in the FIFO
n=5: Current write index relative to FIFO start
$\mathrm{n}=6$ : 1 st element read in
4.2 Channel-specific NC machine data

| 28262 | START_AC_FIFO |  |  |  |  |  | C01 | $2.3,2.4,6.1$ |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | FIFO variables store from R variable |  |  |  |  |  | DWORD | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32535 |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |

## Description:

Number of the $R$ variable as from which FIFO variables are stored. All R variables with lower numbers can be used freely in the part program. R variables above the FIFO range cannot be written from the part program.
The number of $R$ variables must set via MD28050 \$MC_MM_NUM_R_PARAM so that all FIFI variables can be accommodated from the start of the $R$ variables:
MD28050 \$MC_MM_NUM_R_PARAM = MD28262 \$MC_START_AC_FIFO + MD28260 \$MC_NUM_AC_FIFO

* (MD28264 \$MC_LEN_AC_FIFO + 6)

The FIFO variables bear the names \$AC_FIFO1 to \$AC_FIFOn. They are stored as arrays.
The indices $0-5$ have special meanings:
$\mathrm{n}=0$ :
A new value is stored in the FIFO when writing with index 0 .
The oldest element is read and removed from the FIFO when reading with index 0 .
$\mathrm{n}=1$ : Access to the first element read in
$\mathrm{n}=2$ : Access to the last element read in
n=3: Sum of all FIFO elements
$\mathrm{n}=4$ : Number of elements available in the FIFO
$\mathrm{n}=5$ : Current write index relative to FIFO start
Related to:
MD28260 \$MC_NUM_AC_FIFO

| 28264 | LEN_AC_FIFO | C01 | $2.3,2.4,6.1$, M5 |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Length of FIFO variables \$AC_FIFO1-\$AC_FIFO10 | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 32535 |  |

Description:
Length of the FIFO variables \$AC_FIFO1 to \$AC_FIFO10.
All FIFO variables are the same length.

| 28266 | MODE_AC_FIFO | C01 | $2.3,2.4,6.1$ |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Mode of FIFO processing |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | - |  |  |  |  |

## Description:

Mode of FIFO processing:
Bit $0=1$ :
The sum of all FIFO contents is updated at each write access.
Bit $0=0$ :
No summation
Related to:
MD28260 \$MC_NUM_AC_FIFO

| 28274 | MM_NUM_AC_SYSTEM_PARAM |  |  |  |  |  | EXP, C02 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of \$AC_SYSTEM_PARAM for motion-synchronous <br> actions | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 20000 |  |  |  |  |

Description:
Number of \$AC_SYSTEM_ PARAM parameters for motion-synchronous actions.

Depending on MD28255 \$MC_MM_BUFFERED_AC_PARAM, DRAM or SRAM is required.
Reserved for SIEMENS applications.

| 28276 | MM_NUM_AC_SYSTEM_MARKER |  | EXP, C02 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of \$AC_SYSTEM_MARKER for motion-synchronous actions |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 20000 | 7/2 | M |

## Description:

Number of \$AC_SYSTEM_MARKER markers for motion-synchronous actions.
Depending on MD28257 \$MC_MM_BUFFERED_AC_MARKER, DRAM or SRAM is required.
Reserved for SIEMENS applications.



Description: This machine data enables the handling of surface normals with polynomials. It is needed, among other things, for smoothing the surface normals with the COMPSURF function.

| 28300 | MM_PROTOC_USER_ACTIVE | C02 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | $\begin{array}{l}\text { Activation of logging for a user }\end{array}$ |  |  |  |  |  | BOOLEAN | PowerOn |
| - | 10 | $\begin{array}{l}\text { TRUE, TRUE, FALSE, } \\ \text { FALSE, FALSE, } \\ \text { TRUE, TRUE, TRUE, } \\ \text { FALSE,, T... }\end{array}$ | 0 | - | $1 / 1$ |  |  |  |$]$| M |
| :--- |
| - |

Description:
Activation of recording for a user.
Users 0 and 1, and 5 to 9 are reserved for system functions.
Users 2, 3 and 4 can be used by OEM.
The individual values concern the users of the log function, the values are assigned
to the following functions:
0 : Reserved for system functions: simultaneous recording, simulation, synchronized action analysis
1: Reserved for system functions: determining program runtimes, multistep editor
2: Reserved for OEM applications
3: Reserved for OEM applications
4: Reserved for OEM applications
5: Reserved for system functions: Trace
6: Reserved for system functions: Trace

Machine data

```
7: Reserved for system functions: Trace
8: Reserved for system functions: Trace
9: Reserved for system functions: Action log
```

| 28301 | MM_PROTOC_NUM_ETP_OEM_TYP | C02 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Number of OEM event types ETP. | DWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 10 | $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0,0,0,0,0,0$, <br> $0,0,0,0 \ldots$ | 0 | 20 | $1 / 1$ |

## Description:

Number of OEM event types in OPI module ETP.
The individual values concern the users of the log function, which are assigned to the following functions:

0 : Reserved for system functions: simultaneous recording, simulation, synchronized action analysis
1: Reserved for system functions: determining program runtimes, multistep editor
2: Reserved for OEM applications
3: Reserved for OEM applications
4: Reserved for OEM applications
5: Reserved for system functions: Trace
6: Reserved for system functions: Trace
7: Reserved for system functions: Trace
8: Reserved for system functions: Trace
9: Reserved for system functions: Action log

| 28302 | MM_PROTOC_NUM_ETP_STD_TYP |  |  |  |  |  | C02 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of standard event types ETP | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 10 | $28,6,0,0,0,20,20$, | $28,6,0,0,0,20$, | $66,66,66,66$, | $1 / 1$ |  |  |  |

## Description:

Number of standard event types required in the ETP OPI block.
The individual values concern the users of the log function, which are assigned to the following functions:
0 : Reserved for system functions: simultaneous recording, simulation, synchronized action analysis
1: Reserved for system functions: determining program runtimes, multistep editor
2: Reserved for OEM applications
3: Reserved for OEM applications
4: Reserved for OEM applications
5: Reserved for system functions: Trace
6: Reserved for system functions: Trace
7: Reserved for system functions: Trace
8: Reserved for system functions: Trace
9: Reserved for system functions: Action log

| 28400 | MM_ABSBLOCK |  |  |  |  |  | EXP, C02 | K1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Activate basic blocks with absolute values | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | 512 |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |

## Description:

Value:

```
0: Basic blocks with absolute values deactivated.
1: Basic blocks with absolute values activated;
A display buffer of the following size is created:
(MD28257 $MC_MM_BUFFERED_AC_MARKER + MD28070 $MC_MM_NUM_BLOCKS_IN_PREP) * 256 bytes
>= 128: Basic blocks with absolute values activated.
A display buffer of the following size is created:
(MD28060 $MC_MM_IPO_BUFFER_SIZE + MD28070 $MC_MM_NUM_BLOCKS_IN_PREP) * <value>
```

| 28402 | MM_ABSBLOCK_BUFFER_CONF | EXP, C02 | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Setting of upload buffer size | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $\begin{array}{l}2,4,2,4,2,4,2,4,2, \\ 4,2,4,2,4,2,4 \ldots\end{array}$ | 0 | 32000 | $7 / 2$ |  |$]$| M |
| :--- |

Description:

Dimensioning the size of the upload buffer:
MD28402 \$MC_MM_ABSBLOCK_BUFFER_CONF[0] : Number of blocks before the current block MD28402 \$MC_MM_ABSBLOCK_BUFFER_CONF[1] : Number of blocks after the current block The machine data is tested for the following upper / lower limits during startup: $0<=$ MD28402 \$MC_MM_ABSBLOCK_BUFFER_CONF[0] <= 8 $0<=$ MD28402 \$MC_MM_ABSBLOCK_BUFFER_CONF[1] <= (MD28060 \$MC_MM_IPO_BUFFER_SIZE + MD28070 \$MC_MM_NUM_BLOCKS_IN_PREP)
Alarm 4152 is issued when the limits are violated.

| 28450 | MM_TOOL_DATA_CHG_BUFF_SIZE |  |  |  |  |  | , C02, C06 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Buffer for tool data changes (DRAM) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $\begin{array}{l}400,400,400,400, \\ 400,400,400,400 \ldots\end{array}$ | 0 | 2500 | $7 / 2$ |  |  |  |$]$| M |
| :--- |

Description:
Number of entries in the buffer for the OPI change service for tool data. Dynamic memory is used.
This buffer is created only if bit 2 or bit 3 is set in MD17530 \$MN_TOOL_DATA_CHANGE_COUNTER.

| 28520 | MM_MAX_AXISPOLY_PER_BLOCK | C02 | B1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Maximal number of axial polynomials per block |  |  |  |  |
|  |  |  |  |  |  |
| - | - | $3,3,3,3,3,3,3,3 \ldots$ | 1 | 15 | DWORD |
| - | - | $7 / 2$ | M |  |  |

Description:
Maximum number of axis polynomials which can be contained in a block.
In the standard case, each block contains only one polynomial per axis, i.e. this data can be set to 1 immediately.

More polynomials are required in the following cases:
This data must have a value of at least 3 for smoothing with G642 to G645.
A value of 5 is recommended if COMPCAD (Advanced Surface) is used.
A value of 15 is recommended if COMPSURF is used.

| 28530 | MM_PATH_VELO_SEGMENTS |  |  |  |  |  | C02 | A2, B1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of memory elements for path velocity limitation | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 100 | $7 / 2$ |  |  |  |

Description: Number of memory elements available for limiting the path velocity and changing it in the block.

```
0 : Each block is limited by a maximum path velocity.
> 0 : If required, a profile of the permissible path velocity
    ; and its modification options is generated and monitored
    ; in the block.
    ; This results in a smoother axis velocity progression and
    ; a shorter travel time.
    ; MD28530 $MC_MM_PATH_VELO_SEGMENTS defines the average
    ; number of segments available in the block.
    ; The necessary setting essentially depends
    ; on the requirements.
The following values are recommended:
3: for G643 and G644, if only geometry axes are traversed
5: for G643 and G644, if geometry and rotary axes are traversed
5: for COMPCAD
5: for dyn. transformation
8: for COMPSURF
A value that is too low may lead to additional velocity limitations if a sufficient
number of blocks cannot be made available for interpolation.
MD28530 $MC_MM_PATH_VELO_SEGMENTS additionally increases the memory requirement of
dyn. Look Ahead. Values higher than 8 are only practical in exceptional cases.
3 ... 8 :
Recommended setting.
```

| 28533 | MM_LOOKAH_FFORM_UNITS |  |  |  |  |  | C02 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Memory for extended LookAhead | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 100000 |  |  |  |  |
| $7 / 2$ | M |  |  |  |  |  |  |  |

## Description:

The machine data is used to configure the work memory for extended LookAhead. The MD scales the value defined internally through MD28060 \$MC MM IPO BUFFER SIZE, MD28520 \$MC_MM_MAX_AXISPOLY_PER_BLOCK, MD28530 \$MC_MM_PATH_VELO_SEGMENTS, MD28535 \$MC_MM_FEED_PROFILE_SEGMENT $\bar{S}, ~ M \bar{D} 28540$ \$MC_MM_ARCLENGTM_SEGMENTS $\overline{)}$.
Its practical size depends on the part program, the block lengths, the axis dynamics, and an active kinematic transformation.
The MD should only be set for those channels in which free-form surfaces are also machined.

0 : default LookAhead is active.
$>0$ : extended LookAhead is active if switched on by MD20443 \$MC_LOOKAH_FFORM.
The set value for free-form surface applications is: 18.

| 28535 | MM_FEED_PROFILE_SEGMENTS |  |  |  |  |  | C02 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of memory element for feed profiles | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 1 | 10 | $7 / 2$ |  |  |  | M

## Description:

Number of memory elements available for feed profile per block.
The default value 1 is adequate for a programmable feed profile (FLIN, FCUB, FPO()).
If compile cycle applications require more segments per block, this machine data must
be increased accordingly.
If, for example, a feed profile is to be activated in which there is deceleration at both the beginning and the end of the block, 3 segments will be required for the feed profile in the block, i.e. this MD must have value 3.

| 28540 | MM_ARCLENGTH_SEGMENTS |  | C02 | B1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of memory elements for arc length function representation |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 100 | 7/2 | M |

Description:
Number of memory elements available for the arc length function for parameterizing polynomials.
If this machine data is equal to zero, a fixed interval division is used to represent the arc length function. In this case, the calculated function is only tangentcontinuous. This can lead to discontinuities in the axis accelerations.
If the function G643 or G644 is used for smoothing and/or COMPCAD or COMPSURF, this MD should be assigned a value of at least 10. In this case, the function also has a constant curvature which results in a smoother progression of the path velocity, as well as the axis velocities and accelerations.
A value of 10 is sufficient when using COMPSURF and 3-axis applications.
Up to 20 may be useful for COMPSURF and 5-axis applications.
Not only the value of MD28540 \$MC_MM_ARCLENGTH_SEGMENTS but also that of MD20262 \$MC_SPLINE_FEED_PRECISION are crucial for accuracy.

| 28560 | MM_SEARCH_RUN_RESTORE_MODE | C02 | K2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Data restore after simulation | UDWORD | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | $\begin{array}{l}0 \times 0,0 \times 0,0 \times 0,0 \times 0, \\ 0 \times 0,0 \times 0,0 \times 0,0 \times 0 . . .\end{array}$ | 0 | $0 \times 00000001$ |  |$] 7 / 2$| M |
| :--- |

Description:
Bit mask to restore data after cancelation of a simulated program execution. The following applies:
Bit 0: All frames in the data storage are restored.

| 28580 | MM_ORIPATH_CONFIG |  |  |  |  |  | C02 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Setting for ORIPATH path-relative orientation | BYTE | PowerOn |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 1 | $1 / 1$ |  |  |  |

Description:
This MD is used to configure the behavior with ORIPATH, that is path-relative interpolation of the tool orientation. Furthermore, orientation smoothing is enabled with the $G$ codes OSD or OST.

The following options are available:
0: MD21094 \$MC_ORIPATH_MODE has no effect. G codes OSD and OST have no effect.
1: The "genuine" path-relative orientation interpolation can be activated with MD21094 \$MC_ORIPATH_MODE = 1. The reference of the tool orientation to the path tangent and to the vector normal to the surface programmed with LEAD/TILT is retained throughout the block.
Note:
Alarm 10980 is output if ORIPATH is programmed with MD21094 \$MC_ORIPATH_MODE = 1 or OSD or OST without MD28580 \$MC_MM_ORIPATH_CONFIG $=1$.

| 28590 | MM_ORISON_BLOCKS |  |  |  |  |  | C02 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Setting for orientation smoothing |  |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | DWORD | PowerOn |  |  |  |

Description: This MD is used to activate and reserve memory for the function "orientation smoothing with ORISON". If this data has a value of "zero", no orientation smoothing will be possible.

### 4.2 Channel-specific NC machine data

The value of this machine data indicates the maximum number of blocks over which the orientation is smoothed. The value of this MD should be at least high enough that the blocks to be averaged fit in the buffer. This is dependent upon the maximum set tolerance and the average distance traversed by the programmed blocks or the length of the part blocks generated (see MD20476 \$MC_ORISON_STEP_LENGTH).
. Setting this MD to higher values will significantly increase the memory requirement in the DRAM.
A value of 4 should be entered as a minimum.
If this MD is $<4$ and if $G$ code ORISON is programmed, alarm 10982 will be displayed.


Description: Number of data sets in the channel that are created for coordinate system-specific operating range limits.
It indicates the maximum value of the 1 st index of system variable \$P_WORKAREA_CS... [WALimNo, Ax]. It furthermore defines the number of the programmable $\bar{G}$ functions "WALCS1, WALCS2, ... WALCS10" as well as the maximum value of the system variable \$AC_WORKAREA_CS_GROUP".
= 0: Function "Monitoring of coordinate system-specific operating range limits" cannot be activated.

| 28610 | MM_PREPDYN_BLOCKS | C02 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of blocks for velocity preparation | BYTE | PowerOn |  |  |  |  |
| - | $1 / 1$ |  |  |  |  |  | M |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 30 | 1 |  |  |

## Description:

This MD is used to define the number of blocks that are considered when defining the path velocity (velocity preparation). If the value of this MD is zero, only the relevant axis motions are considered in this block in order to define the maximum path velocity of a block. If the geometry in adjacent blocks is also considered when defining the path velocity, the path velocity will be more homogenous.

| 28620 | MM_NUM_FEATURE_BLOCKS |  | C02 | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | No. blocks for look-ahead characteristic recognition e.g. slot recognition. |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 20 | $7 / 2$ | M |

Description: Indicates the minimum number of blocks that are considered simultaneously for characteristic recognition.

| 29000 | LOOKAH_NUM_CHECKED_BLOCKS |  |  |  |  |  | C01, C02, C09, <br> C05 | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Option data | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | 0 | $0 x 7 F F F F F F F$ |  |  |  |  |
| $7 / 1$ | M |  |  |  |  |  |  |  |

## Description:

Data for path-related dynamic LookAhead:
(Maximum) number of blocks surveyed beyond the current block for
look ahead consideration of speed limits.
The value defines an upper limit. The value should not be set too low
in order to avoid unnecessary speed reductions.
Increasing the value above the maximum number of blocks in the IPO buffer
( MM_IPO_BUFFER_SIZE ) has no effect.

A LookAhead buffer is not set up for 0 (working memory is relieved).
If in this case LookAhead is activated by part program,
then the speed is reduced to zero at the end of each block.
Unbuffered memory is needed.
Option data

### 4.3 Axis-specific NC machine data

| 30100 | CTRLOUT_SEGMENT_NR | EXP, A01 | G2, S9 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Setpoint assignment: bus segment number | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 1 | 5 | 0 | 5 | $2 / 2$ |  |  |

Description: In this MD, enter the number of the bus segment through which the output is addressed.
0: Local bus (808d, 828d analog spindle)
1: reserved (previously SIMODRIVE611D bus, 1st DCM)
2: reserved (previously local P bus)
3: reserved (previously SIMODRIVE611D-Bus, 2. DCM)
4: reserved (virtual buses)
5: PROFIBUS/PROFINET (e.g. SINUMERIK 840Di)
6: reserved (same effect as 5)


Description: In this MD, enter the number of the module within a bus segment through which the output is addressed.
For an axis on the PROFIBUS/PROFINET, the logical I/O address from MD13050 \$MN_DRIVE_LOGIC_ADDRESS[index] is assigned by entering index+1 in MD30110 \$MA_CTRLOUT_MODULE_NR.

| 30120 | CTRLOUT_NR | EXP, A01 | G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Setpoint assignment: Setpoint output on drive submodule/module | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 1 | $1,1,1,1,1,1,1,1 \ldots$ | 1 | 3 |  |  |

Description: Number of the output on a module which is used to address the setpoint output. The value is always 1 for modular drives.

| 30130 | CTRLOUT_TYPE | A01, A11 | G2, M3, S9 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Output type of setpoint | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 1 | 0 | 0 | 3 | $2 / 2$ |  |

[^11]```
0: Simulation (no HW required)
1: Setpoint output active (differentiation via hardware configuration)
2: Semi servo -only when the hardware is available onboard
3: Reserved
4: Reserved
Note: instead of value 4, MD30132 $MA_IS_VIRTUAL_AX should now be used.
```

| 30132 | IS_VIRTUAL_AX |  |  | A01 | M3, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axis is a virtual axis |  |  | BOOLEAN | Pow |  |
| CTEQ |  |  |  |  |  |  |
| - | 1 | FALSE | 0 | - | 1/1 | M |

Description: Virtual axis. An axis that is also interpolated in follow-up mode. (Electronic transfer technology; virtual and real master values.)

This MD is the successor to MD30130 \$MA_CTRLOUT_TYPE=4. MD30130 \$MA_CTRLOUT_TYPE=0 and MD30132 \$MA_IS_VIRTUAL_AX=1 must now be used instead of MD30130 \$MA_CTRLOUT_TYPE=4. Related to:
MD30130 \$MA_CTRLOUT_TYPE

| 30134 | IS_UNIPOLAR_OUTPUT | A01 | G2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Setpoint output is unipolar |  |  |  |  |  | BYTE | PowerOn |
| - | 1 | 0 | 0 | 2 | $2 / 2$ |  |  |  |
| - | 1 |  |  |  |  |  |  |  |

Description: Only for PROFIdrive, special application of analog additional drives:
Unipolar output driver (for unipolar analog drive actuator):
Only positive set speeds are supplied to the drive, the sign of the set speed is separately output in its own digital control signal.
Input value "0":
Bipolar output with pos./neg. set speed (this is the normal case)
Input value "1":
O. Digital bit = servo enable

1. Digital bit $=$ neg. direction of travel

Input value "2": (linking of enable and direction of travel signals):
0 . Digital bit $=$ servo enable pos. direction of travel

1. Digital bit $=$ servo enable neg. direction of travel


Description: The number of encoders of the axis or spindle is to be entered in the MD for actual position value sensing (the differentiation between direct and indirect measuring systems, i.e. the locations at which these encoders are installed, is then specified, for example, in MD31040 \$MA_ENC_IS_DIRECT).
For simulation axes/spindles, MD30200 \$MA_NUM_ENCS > 0 must be specified for referencing.

| 30220 | ENC_MODULE_NR | A01, A02, A11 | G2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Actual value assignment: Drive number/measuring circuit number |  |  |  |  |  | BYTE | PowerOn |
| - | 2 | $2,2,3,3,4,4,1,1,5,5$ | 1 | 31 | $2 / 2$ |  |  |  |

4.3 Axis-specific NC machine data

| 828d-te42 | 2 | 2, 2, 3, 3, 1, 1, 5, 5, 4, 4 | 1 | 31 | 2/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce42 | 2 | $\begin{aligned} & 1,1,2,2,3,3,4,4,5, \\ & 5,6,6,7,7,8,8 \ldots . \end{aligned}$ | 1 | 31 | 2/2 | M |
| 828d-gse42 | 2 | $\begin{aligned} & 1,1,2,2,3,3,4,4,5, \\ & 5,6,6,7,7,8,8 \ldots \end{aligned}$ | 1 | 31 | 2/2 | M |
| 828d-me62 | 2 | 2, 2, 3, 3, 4, 4, 1, 1, 5, 5 | 1 | 31 | 2/2 | M |
| 828d-te62 | 2 | $\begin{aligned} & 2,2,3,3,1,1,5,5,4, \\ & 4,6,6 \end{aligned}$ | 1 | 31 | 2/2 | M |
| 828d-gce62 | 2 | $\begin{aligned} & 1,1,2,2,3,3,4,4,5, \\ & 5,6,6,7,7,8,8 \ldots \\ & \hline \end{aligned}$ | 1 | 31 | 2/2 | M |
| 828d-gse62 | 2 | $\begin{array}{\|l} \hline 1,1,2,2,3,3,4,4,5, \\ 5,6,6,7,7,8,8 \ldots \\ \hline \end{array}$ | 1 | 31 | 2/2 | M |
| 828d-te82 | 2 | $\begin{aligned} & 2,2,3,3,1,1,5,5,4, \\ & 4,6,6,8,8,7,7 \end{aligned}$ | 1 | 31 | 2/2 | M |
| 828d-me82 | 2 | $\begin{aligned} & 1,1,2,2,3,3,4,4,5, \\ & 5,6,6,7,7,8,8 \ldots \end{aligned}$ | 1 | 31 | 2/2 | M |
| 828d-gce82 | 2 | $\begin{aligned} & 1,1,2,2,3,3,4,4,5, \\ & 5,6,6,7,7,8,8 \ldots \end{aligned}$ | 1 | 31 | 2/2 | M |
| 828d-gse82 | 2 | $\begin{aligned} & 1,1,2,2,3,3,4,4,5, \\ & 5,6,6,7,7,8,8 \ldots \end{aligned}$ | 1 | 31 | 2/2 | M |

## Description:

For an axis on the PROFIBUS/PROFINET, the logical I/O address from MD13050
\$MN_DRIVE_LOGIC_ADDRESS[index] is assigned by entering index+1 in MD30220
\$MA_ENC_MODULE_NR.
The index[n] of the machine data has the following coding:
[Encoder no.]: 0 or 1
Related to:
MD30110 \$MA_CTRLOUT_MODULE_NR (setpoint assignment)


## Description:

For PROFIdrive:
Number of the encoder within the PROFIdrive message frame through which the encoder is addressed.

For example telegram 103: 1 (=G1_ZSW etc.) or 2 (=G2_ZSW etc.).
The index[n] of the machine data has the following coding:
[Encoder no.]: 0 or 1
If an input is selected, to which no encoder is connected, alarm 300008 "Measuring circuit not available on drive" is output.

| 30240 | ENC_TYPE | A01, A02, A11 | A3,, G2, R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Encoder type of actual value acquisition (actual position value). | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 0,0 | 0 | 5 |  |  |

## Description:

Encoder type:
0: Simulation
1: Raw signal encoder (high resolution)
2: Square-wave encoder - only when the onboard hardware is available
3: Encoder for semi servo - only when the onboard hardware is available

```
4: General absolute encoders (e.g. EnDat interface)
5: Reserved
Corresponds with
PROFIdrive parameter P979 (refer there)
```

| 30242 | ENC_IS_INDEPENDENT | A02, A11 | G2, R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Encoder is independent | BYTE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 0,0 | 0 | 3 | $1 / 1$ |  |

Description: If actual value corrections performed by the NC on the encoder selected for position control are not to influence the actual value of any other encoder defined in the same axis, then the position control encoder must be declared to be "independent".
Actual value corrections include the following:

- Modulo treatment,
- Reference point approach,
- Measuring system calibration,
- PRESET

Example:
MD30200 \$MA_NUM_ENCS [ AX1 ] = 2
MD30242 \$MA_ENC_IS_INDEPENDENT[ 0, AX1 ] = 0
MD30242 \$MA_ENC_IS_INDEPENDENT [ 1, AX1 ] = 1
When the VDI interface has selected the first encoder for position control, the above mentioned actual value corrections will be executed on this encoder only.
When the VDI interface has selected the second encoder for position control, the above mentioned actual value corrections will be executed on both encoders.

The machine data is therefore only valid for encoders that have not been selected by the VDI interface for positon control (passive encoders).
As from SW5, the scope of functions has been extended:
MD30242 \$MA_ENC_IS_INDEPENDENT = 2
The passive encoder is dependent. The active encoder changes the actual encoder value. In combination with MD34102 \$MA_REFP_SYNC_ENCS = 1, the passive encoder is adjusted to the active encoder during reference point approach, but is NOT referenced.
In reference mode MD34200 \$MA_ENC_REFP_MODE = 3 (distance-coded reference marks), the passive encoder is automatically referenced with the next traversing movement after zero mark distance overtravel. This is done independently of the current mode setting. MD30242 \$MA_ENC_IS_INDEPENDENT = 3
In contrast to MD30242 \$MA_ENC_IS_INDEPENDENT = 1, modulo actual value corrections are executed in the passive encoder of modulo rotary axes.

| 30244 | ENC_MEAS_TYPE |  |  | A01, A02, A11 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Encoder measurement type |  |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| 828d-te42 | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| 828d-gce42 | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| 828d-gse42 | 2 | 1,1 | 0 | 1 | 7/2 | M |
| 828d-me62 | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| 828d-te62 | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| 828d-gce62 | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| 828d-gse62 | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| 828d-te82 | 2 | 1,1 | 0 | 1 | 7/2 | M |


| $828 \mathrm{~d}-\mathrm{me} 82$ | 2 | 1,1 | 0 | 1 | $7 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828d-gce82 | 2 | 1,1 | 0 | 1 | ReadOnly | S |
| 828d-gse82 | 2 | 1,1 | 0 | 1 | ReadOnly | S |

Description: For PROFIdrive only:
In combination with the MD13210 \$MN MEAS TYPE = 1 (decentralized measurement), this MD can be used to set the type of axial measuring function for drives.

Encoder measurement type:
0: encoder measurement type central (global) measurement
1: encoder measurement type decentral (local) measurement
MEAS_TYPE ENC_MEAS_TYPE measuring sensor input used
00 central
01 central
10 central
1 1 decentralized

| 30250 | ACT_POS_ABS |  |  |  |  |  | EXP, A02, A08 | R1 |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Internal encoder position |  |  |  |  |  |  | DOUBLE | PowerOn |
| ODLD,,-- |  |  |  |  |  |  |  |  |  |
| - | 2 | $0.0,0.0$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $1 / 1$ |  |  |  |  |

## Description:

The actual position (hardware counter status only without machine reference) is stored (in internal format display) in this MD.
At power ON (or encoder activation), it acts with:

- Absolute encoders:

To restore the current position (in combination with the position, possibly with several meanings, buffered in the encoder).

- Incremental encoders:

To buffer the actual value beyond power OFF when the functionality is activated MD34210 \$MA_ENC_REFP_STATE = 1 or. 2 (i.e. as a reference point replacement). To buffer the actual value beyond power OFF when the functionality is activated MD34210 \$MA_ENC_REFP_STATE = 3 (i.e. as a restored position value).

Note:
This MD is changed internally by the control during traversing movements. Loading a previously saved MD data block can therefore destroy the encoder calibration (machine position reference) of absolute encoders.
For software conversions, we recommend removing the MD data block from the old software release prior to conversion and reloading it into the new software release without moving any axis in the meantime. Protection level 1 should be set for SW 3.6 ; protection level 2 suffices for SW 4 and higher. The encoder calibration must be explicitly verified (controlled, calibrated) after the software conversion.

| 30260 | ABS_INC_RATIO |  |  | EXP, A01, A02 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Absolute encoder: Ratio of absolute to incremental resolution |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 2 | 4, 4 | 0 | - | 1/1 | M |

Description:
Absolute track resolution in relation to the incremental track resolution.
This MD only applies for absolute encoders:

- PROFIBUS drives:

Absolute information XIST2 related to incremental information XIST1.
In the case of plausible drive parameters (e.g. in PROFIdrive parameter P979) the value of this MD is automatically calculated and updated from drive parameters (if parameter read-out has not been deactivated with MD13070 \$MN_DRIVE_FUNCTION_MASK, bit2)

Implausible drive parameters (e.g. multiplication of absolute track higher than that of the incremental track) are rejected and replaced by the value entered in the current MD.

Implausible input values in the current MD (e.g. value=0) are reset to the default value. In addition, alarm 26025 or 26002 is output to inform the user accordingly.
If MD31700 \$MA_ENC_EDS_ACTIVE = 1, this machine data has no function and is replaced by MD31730 \$MA_ABS_INC_RATIO_EDS.
Related to:
MD31700 \$MA_ENC_EDS_ACTIVE
MD31730 \$MA_ABS_INC_RATIO_EDS

| 30270 | ENC_ABS_BUFFERING | EXP, A01, A02 | R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Absolute encoder: Traversing range extension | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 0,0 | 0 | 1 | $2 / 2$ |  |$]$ M

Description:
This MD defines the way in which the absolute encoder position is buffered, and whether a traversing range extension is active in the software (exceeding the limits of the absolute encoder range that can be displayed on the hardware).
" $0 "$ " standard = traversing range extension (compare ACT_POS_ABS) is active.
"1" = traversing range extension in the software is inactive.
When using an absolute linear scale, there will not be a traversing range overflow for mechanical reasons. This MD is therefore only valid for rotary absolute encoders. For rotary absolute encoders, the traversing range that can be clearly displayed on the encoder side is stored in MD34220 \$MA_ENC_ABS_TURNS_MODULO. You can do without a traversing range extension without any problems (a hardware counter overflow that might be within the traversing range is concealed in the software via shortest-path decision):
a. in linear axes or limited rotary axes, if the actual traversing range on the load side is smaller than the traversing range on the load side that corresponds to MD34220 \$MA_ENC_ABS_TURNS_MODULO.
b. in endlessly turning rotary axes (ROT_IS_MODULO = TRUE), if the absolute encoder is connected on the load side (no gear to be considered) or if "without remainder" can be calculated:

Number of rotations on the load side $=$ ENC_ABS_TURNS_MODULO * gear ratio
(Example: ENC_ABS_TURNS_MODULO = 4096 encoder rotations, gear 25:32, i.e. number of rotations on load side $\left.=4096^{*}(25 / 32)=3200\right)$.
Notice:
If the conditions under $a$. or $b$. are not met, there is a risk of getting a wrong absolute encoder position at next Power ON or encoder activation after parking without prewarning if the traversing range extension is not working. Therefore, the traversing range extension remains active in the standard version.
If MD31700 \$MA_ENC_EDS_ACTIVE = 1, a traversing range extension is not possible. Alarm 26017 therefore requests the traversing range extension to be switched off with a rotary absolute encoder with reference to this machine data.

If the traversing range extension is essential (because for example the conditions stated under b. for deactivation are not fulfilled), MD31700 \$MA_ENC_EDS_ACTIVE must not be activated.
Related to:
MD30240 \$MA_ENC_TYPE
MD30300 \$MA_IS_ROT_AX
MD30310 \$MA_ROT_IS_MODULO
MD30250 \$MA_ACT_POS_ABS
MD34220 \$MA_ENC_ABS_TURNS_MODULO
MD34090 \$MA_REFP_MOVE_DIST_CORR

MD31700 \$MA_ENC_EDS_ACTIVE

| 30300 | IS_ROT_AX |  |  | A01, A06, A11 | $\begin{aligned} & \text { G1, K3, R2, T1, G2, K2, R1, S1, } \\ & \text { V1 } \end{aligned}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Rotary axis / spindle |  |  | BOOLEAN | PowerOn |  |
| SCAL, CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | FALSE, FALSE, <br> FALSE, TRUE, TRUE | FALSE | TRUE | $2 / 2$ | M |
| 828d-te42 | - | FALSE, FALSE, TRUE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-gce42 | - | FALSE, FALSE, TRUE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-gse42 | - | FALSE, FALSE, <br> FALSE, TRUE, FALSE | FALSE | TRUE | 2/2 | M |
| 828d-me62 | - | FALSE, FALSE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-te62 | - | FALSE, FALSE, TRUE, TRUE, TRUE, FALSE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-gce62 | - | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE... | FALSE | TRUE | 2/2 | M |
| 828d-gse62 | - | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE... | FALSE | TRUE | 2/2 | M |
| 828d-te82 | - | FALSE, FALSE, TRUE, TRUE, TRUE, FALSE, FALSE, TRUE... | FALSE | TRUE | 2/2 | M |
| 828d-me82 | - | FALSE, FALSE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE... | FALSE | TRUE | $2 / 2$ | M |
| 828d-gce82 | - | FALSE, FALSE, TRUE, TRUE, TRUE, FALSE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-gse82 | - | FALSE, FALSE, <br> FALSE, TRUE, <br> FALSE, TRUE, TRUE, <br> TRUE | FALSE | TRUE | 2/2 | M |

## Description:

: Axis: The axis is defined as a "rotary axis".

- The special functions of the rotary axis are active or can be activated by means of additional machine data according to the type of machine required (see below).
- The unit of measurement is degrees.
- The units of the axis-specific machine and setting data are interpreted as follows with the standard control setting:
- Positions in "degrees"
- Speeds in "rev/minute"
- Acceleration in "rev/second²"
- Jerk limitation in "rev/second3"

Spindle:
The machine data should always be set to "1" for a spindle, otherwise alarm 4210
"Rotary axis declaration missing" is output.
0 : The axis is defined as a "linear axis".

Special cases:

- For an axis: Alarm 4200 if the axis is already defined as a geometry axis.
- For a spindle: Alarm 4210

Related to:
The following machine data are active only after activation of MD30300 \$MA_IS_ROT_AX
= "1":

- MD30310 \$MA_ROT_IS_MODULO "Modulo conversion for rotary axis"
- MD30320 \$MA_DISPLAY_IS_MODULO "Position display is modulo"
- MD10210 \$MN_INT_INCR_PER_DEG "Calculation precision for angular positions"

| 30310 | ROT_IS_MODULO |  |  |  | A01, A06, A11 | TE3, K3, R2, T1, A3, R1, R2, S1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Modulo conversion for rotary axis / spindle |  |  |  | BOOLEAN | PowerOn |  |
| CTEQ |  |  |  |  |  |  |  |
| 828d-me42 | - |  | FALSE, FALSE, FALSE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-te42 | - |  | FALSE, FALSE, TRUE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-gce42 | - |  | FALSE, FALSE, TRUE, TRUE, FALSE | FALSE | TRUE | 2/2 | M |
| 828d-gse42 | FALSE, FALSE, <br> FALSE, TRUE, FALSE |  |  | FALSE | TRUE | $2 / 2$ | M |
| 828d-me62 | -- FALSE, FALSE, <br> FALSE, TRUE, TRUE, <br> TRUE, TRUE, TRUE |  |  | FALSE | TRUE | 2/2 | M |
| 828d-te62 | -- FALSE, FALSE, <br> TRUE, TRUE, TRUE, <br> FALSE, TRUE, TRUE |  |  | FALSE | TRUE | 2/2 | M |
| 828d-gce62 | - FALSE, FALSE, <br> FALSE, FALSE, <br>  <br>  <br>  <br> FALSE, FALSE, <br> FALSE, FALSE... |  |  | FALSE | TRUE | $2 / 2$ | M |
| 828d-gse62 |  | - | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE.. | FALSE | TRUE | 2/2 | M |
| 828d-te82 | - |  | FALSE, FALSE, TRUE, TRUE, TRUE, FALSE, FALSE, TRUE... | FALSE | TRUE | $2 / 2$ | M |
| 828d-me82 |  | - FALSE, FALSE, <br>  FALSE, TRUE, TRUE, <br>  TRUE, TRUE, TRUE... |  | FALSE | TRUE | 2/2 | M |
| 828d-gce82 | - |  | FALSE, FALSE, TRUE, TRUE, FALSE, FALSE, TRUE, TRUE | FALSE | TRUE | 2/2 | M |
| 828d-gse82 | - |  | FALSE, FALSE, <br> FALSE, TRUE, <br> FALSE, TRUE, TRUE, <br> TRUE | FALSE | TRUE | 2/2 | M |
| Description: | 1: A modulo conversion is performed on the setpoints for the rotary axis. The software limit switches and the working area limitations are inactive; the traversing range is therefore unlimited in both directions. MD30300 \$MA_IS_ROT_AX must be set to "1" |  |  |  |  |  |  |

Machine data

```
Related to:
MD30320 $MA_DISPLAY_IS_MODULO "Position display is modulo 360"
MD30300 $MA_IS_ROT_AX = 1
MD36100 $MA_POS_LIMIT_MINUS
MD36110 $MA_POS_LIMIT_PLUS
SD43430 $SA_WORKAREA_LIMIT_MINUS
SD43420 $SA_WORKAREA_LIMIT_PLUS
```

```
    "Rotary axis"
```

    "Rotary axis"
    "Software limit switch minus"
    "Software limit switch minus"
    "Software limit switch plus"
    "Software limit switch plus"
    "Working area limitation minus"
"Working area limitation minus"
"Working area limitation plus"

```
    "Working area limitation plus"
```



## Description:

1: "Modulo 360 degrees" position display is active:
The position display of the rotary axis or spindle (for basic or machine coordinate system) is defined as "Modulo 360 degrees". In the case of a positive direction of rotation, the control resets the position display internally to 0.000 degrees following each cycle of 359.999 degrees. The display range is always positive and lies between 0 and 359.999 degrees.
0: Absolute position display is active:

In contrast to the modulo 360 degrees position display, absolute positions are indicated by the absolute position display, e.g. +360 degrees after 1 rotation, and +720 degrees after 2 rotations, etc in the positive direction. In this case, the display range is limited by the control in accordance with the linear axes.
MD irrelevant for:
Linear axes MD30300 \$MA_IS_ROT_AX = "O"
Related to:
MD30300 \$MA_IS_ROT_AX = 1 "Axis is rotary axis"

| 30330 | MODULO_RANGE |  |  |  | EXP, A01 | R2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | Size of modulo range. |  |  |  | DOUBLE | Res |  |
| CTEQ |  |  |  |  |  |  |  |
| - | - |  | 360.0 | 1.0 | 360000000.0 | 1/1 | M |
| Description: |  | Defines the within this settings are useful rela Velocity de | ize of ange. <br> equall <br> onship <br> nition |  | positions <br> * 360 degre tention sho he NC and th ngs in this | acc <br> with be mech | displayed <br> n. Other <br> aving a <br> biguity). |


| 30340 | MODULO_RANGE_START |  | EXP, A01 | R1, R2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| degrees | Modulo range start position |  | DOUBLE | Reset |  |
| CTEQ |  |  |  |  |  |
| - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 1/1 | M |

Description: Defines the start position for the modulo range.
Example:
Start = 0 degree -> modulo range 0 <->360 degrees
Start $=180$ degrees -> modulo range 180 <->540 degrees
Start = -180 degrees -> modulo range -180 <->180 degrees

| 30350 | SIMU_AX_VDI_OUTPUT |  | A01, A06 | A2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axis signals output for simulation axes |  | BOOLEAN | Pow |  |
| CTEQ |  |  |  |  |  |
| - | FALSE | FALSE | TRUE | 2/2 | M |

## Description:

The machine data defines whether axis-specific interface signals are output to the PLC while an axis is being simulated.
1: The axis-specific NC/PLC interface signals for a simulated axis are output to the PLC.

This means that the user PLC program can be tested without the drives having to be available.

0 : The axis-specific NC/PLC interface signals for a simulated axis are not output to the PLC.

All axis-specific NC/PLC interface signals are set to "0".
Not relevant for:
MD30130 \$MA_CTRLOUT_TYPE (setpoint output type) = 1

| 30450 | IS_CONCURRENT_POS_AX |  | EXP, A01 | G1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Default for reset: neutral/channel axis |  | BOOLEAN | Rese |  |
| CTEQ |  |  |  |  |  |
| - | FALSE | FALSE | TRUE | 1/1 | M |

Description:
For SW4.3:
If FALSE: On RESET, a neutral axis is reassigned to the NC program.

If TRUE: On RESET, a neutral axis remains in the neutral axis state and an axis assigned to the NC program becomes a neutral axis

| 30455 | MISC_FUNCTION_MASK |  |  |  |  |  | A06, A10 | R2, S3, R1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Axis functions |  |  |  |  |  | UDWORD | Reset |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | $0 \times 00$ | 0 | $0 \times 7 F F F$ | $1 / 1$ |  |  |  |

## Description:

Bit $0=0$ :
Modulo rotary axis/spindle: programmed positions must be in the modulo range.
Otherwise an alarm is output.
Bit $0=1$ :
When programming positions outside the modulo range, an alarm is not signaled. The position is modulo-converted internally.
Example: B-5 has the same significance as B355, POS[A]=730 is identical to POS[A]=10 and SPOS=-360 behaves the same as SPOS=0 (modulo range 360 degrees)

Bit $1=0$ :
Determination of reference point position of rotary, distance-coded encoders analog (1:1) in relation to the mechanical absolute position.
Bit $1=1$ :
Determination of reference point position of rotary, distance-coded encoders within the configured modulo range.
For rotary axes with MD30310 \$MA_ROT_IS_MODULO=0, which use rotary, distance-coded encoder MD34200 \$MA_ENC_REFP_MODE=3, the reference point position is determined in response to MD30330 \$MA_MODULO_RANGE and MD30340 \$MA_MODULO_RANGE_START. This is automatically adapted to the traversing limits of the modulo range. For rotary axes with MD30310 \$MA_ROT_IS_MODULO=1, this bit has no significance, as the reference point position is always determined within the modulo range.
Bit $2=0$ :
Modulo rotary axis positioned at G90 with AC as default.
Bit 2 = 1 :
Modulo rotary axis positioned at G90 with DC as default (shortest path).
Bit $3=0$ :
For spindle/axis disable \$VA_IM, \$VA_IM1, \$VA_IM2 supply the setpoint value.
Bit $3=1$ :
For spindle/axis disable \$VA_IM, \$VA_IM1, \$VA_IM2 supply the actual value.
Bit $4=0$ :
Synchronous spindle coupling, slave spindle: cancellation of feedrate enable will brake the coupled group.
Bit $4=1$ :
Slave spindle: Feedrate enable only applies to the interpolation portion of the overlaid motion (SPOS, etc.) and has no impact on the coupling.
Bit $5=0$ :
Synchronous spindle coupling, slave spindle: Position control, feedforward control, and parameter block are set in response to the master spindle.
Bit 5 = 1:
Synchronous spindle coupling: The parameters of the slave spindle are set as they would be without coupling.
Bit $6=0$ :
Programming of FA, OVRA, ACC, and VELOLIM is applied separately to spindle and axis modes. The assignment is made by the programmed axis or spindle identifier.
Bit $6=1$ :
Programming of FA, OVRA, ACC, and VELOLIM is applied jointly to spindle and axis modes, irrespective of the programmed identifier.

Bit $7=0$ :
Synchronous spindle, correct synchronism error: Correction value \$AA_COUP_CORR[Sn] is continuously calculated as long as the NC/PLC interface signal DB380x DBX5007. 6 (Correct synchronism) is set and setpoint-related synchronism is present.
Bit $7=1$ :
Synchronous spindle, correct synchronism error: Correction value \$AA_COUP_CORR[Sn] is calculated only at the moment the NC/PLC interface signal DB380x DBX5007. $\overline{6}$ (Correct synchronism) is set from 0 to 1.
Bit $8=0$ :
Absolute encoders can only be readjusted in the enabled state MD34210
\$MA_ENC_REFP_STATE = 1 .
Bit $8=1$ :
Absolute encoders can also be readjusted in the adjusted state MD34210 \$MA_ENC_REFP_STATE = 2 .
Bit $9=0$ :
Coupled axes (e.g. gantry) jointly delete their pulse enable if an error occurs.
Bit $9=1$ :
Coupled axes (e.g. gantry) only delete their pulse enable for their own errors.
Bit $10=0$ :
The maximum dynamic performance of a TRAIL or TANGON axis limits the maximum dynamic path response.
Bit $10=1$ :
The maximum dynamic performance of a TRAIL or TANGON axis has no effect on the dynamic path response. This can result in a longer overtravel of the dependent axis.
Bit $11=0$ :
Deactivation of the CP software limit monitoring
Bit $11=1$ :
Activation of the $C P$ software limit monitoring for the following slave axes/spindles:

- coupling, type CP with CPSETTYPE[FAx] = "CP"
- coupling, type CP, TRAIL, EG, LEAD, or COUP with a maximum of one active master axis/ spindle
Bit $12=0$ :
When resetting the control enable of the stationary axis/spindle (in respect of this master axis/spindle), you must always switch over to actual value coupling, just as for a fast stop after resetting the control enable during motion (alarm 21612). This applies to generic couplings (with replacement cycles or for CP programming).
Bit $12=1$ :
When resetting the control enable of the stationary axis/spindle (in respect of this master axis/spindle), changeover to actual value coupling is inhibited. This applies to generic couplings (with replacement cycles or for CP programming).
Bit $13=0$ :
An axis-specific DRIVE setting by means of MD35240 \$MA_ACCEL_TYPE_DRIVE[] or by programming DRIVEA() of an axis is ignored by the path dynamic response if the relevant axis is interpolated with the path.
Bit 13 = 1 :
An acceleration characteristic of an axis activated by MD35240 \$MA_ACCEL_TYPE_DRIVE[] or by programming of DRIVEA() is taken into account when defining the path dynamic response if the relevant axis is interpolated with the path.
Bit $14=0$ :
During cartesian PTP traversing, the "shortest path" strategy for software limit crossing of a rotary axis is retained.
Bit $14=1$ :

The "long path" strategy for avoiding the software limit crossing is used if a rotary axis were to cross the software limit switch during cartesian PTP traversing with the "shortest path" strategy.


Bit $9=0$ :
The PRESETON is enabled. PRESETONS is inhibited.
Bit 9 = 1:
The PRESETON is inhibited. PRESETONS is enabled.

| 30465 | AXIS_LANG_SUB_MASK |  | N01 | K1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Substitution of NC language commands |  | UDWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0x0 | 0x0 | 0xF | 2/2 | M |

Description:
MD30465 \$MA_AXIS_LANG_SUB_MASK defines for the leading spindle(s) of a coupling (synchronous spindle coupling, electronic gear, coupled motion, master value coupling, master-slave) which language constructs/functions are to be substituted by the user program set by MD15700 \$MN_LANG_SUB_NAME / MD15702 \$MN_LANG_SUB_PATH (default: / _N_CMA_DIR/_N_LANG_SUB_SPF).
The substitution is executed only if a coupling is active for the relevant spindle and, in the case of a gear stage change, only if a gear stage change is actually pending.
Bit 0 and bit 1 are relevant for the axis coupling types: synchronous spindle coupling, electronic gear, coupled motion and master value coupling.

Bit 2 and bit 3 are relevant for the master-slave coupling
Bit 0 = 1:
Axis coupling: Automatic (M40) and direct (M41-M45) gear stage change
Bit 1 = 1:
Axis coupling: Spindle positioning with SPOS/SPOSA/M19
Bit 2 = 1:
Master-slave coupling: Automatic (M40) and direct (M41-M45) gear stage change
Bit 3 = 1:
Master-slave coupling: Spindle positioning with SPOS/SPOSA/M19

| 30500 | INDEX_AX_ASSIGN_POS_TAB |  |  | A01, A10 | T1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axis is an indexing axis |  |  | BYTE | Res |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 3 | 2/2 | M |

Description:

The axis is declared as an indexing axis by assignment of indexing position table 1 or 2.

0: The axis is not declared as an indexing axis
1: The axis is an indexing axis. The associated indexing positions are stored in table 1 (MD10910 \$MN_INDEX_AX_POS_TAB_1).
2: The axis is an indexing axis. The associated indexing positions are stored in table 2 (MD10930 \$MN_INDEX_AX_POS_TAB_2).
3: Equidistant indexing with SW 4.3 and higher (840D) and SW 2.3 and higher (810D)
>3: Alarm 17090 "Value violates upper limit"
Special cases:
Several axes can be assigned to an indexing position table on the condition that all these indexing axes are of the same type (linear axis, rotary axis, modulo $360^{\circ}$ function). If they are not, alarm 4000 is output during power-up.
Alarm 17500 "Axis is not an indexing axis"
Alarm 17090 "Value violates upper limit"
Related to:
MD10910 \$MN_INDEX_AX_POS_TAB_1 (indexing position table 1)
MD10900 \$MN_INDEX_AX_LENGTH_POS_TAB_1
(no. of indexing positions used in table 1)

### 4.3 Axis-specific NC machine data

```
MD10930 $MN_INDEX_AX_POS_TAB_2 (indexing position table 2)
MD10920 $MN_INDEX_AX_LENGTH_POS_TAB_2
(no. of indexing positions used in table 2)
For equidistant indexings with value 3:
MD30501 $MA_INDEX_AX_NUMERATOR Numerator
MD30502 $MA_INDEX_AX_DENOMINATOR Denominator
MD30503 $MA_INDEX_AX_OFFSET First indexing position
MD30505 $MA_HIRTH_IS_ACTIVE Hirth tooth system
```

| 30501 | INDEX_AX_NUMERATOR |  |  |  |  |  | A01, A10 | T1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Indexing axis equidistant positions numerator |  |  |  |  |  | DOUBLE | Reset |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ |  |  |  |  |

Description: Defines the value of the numerator for calculating the distances between two indexing positions when the positions are equidistant. Modulo axes ignore this value and use MD30330 \$MA_MODULO_RANGE instead.
MD irrelevant for non-equidistant indexes in accordance with tables.
Related to:
MD30502 \$MA_INDEX_AX_DENOMINATOR,
MD30503 \$MA INDEX AX OFFSET;
MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB

| 30502 | INDEX_AX_DENOMINATOR |  |  |  |  |  | A01, A10 | T1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Indexing axis equidistant positions denominator | DWORD | Reset |  |  |  |  |  |
| - | - | 1 | - | $2 / 2$ | M |  |  |  |

Description: Defines the value of the denominator for calculating the distances between two indexing positions when the positions are equidistant. For modulo axes it therefore specifies the number of indexing positions.
MD irrelevant for non-equidistant indexes in accordance with tables.
Related to:
MD30501 \$MA_INDEX_AX_NUMERATOR,
MD30503 \$MA_INDEX_AX_OFFSET,
MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB

| 30503 | INDEX_AX_OFFSET | A01, A10 | T1, R2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Indexing axis with equidistant positions first index position |  |  |  |  |  | DOUBLE | Reset |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | $-M D \_D B L M A X$ | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description:
Defines the position of the first indexing position from zero for an indexing axis with equidistant positions.
MD irrelevant for non-equidistant indexes in accordance with tables.
Related to:
MD30501 \$MA_INDEX_AX_NUMERATOR
MD30502 \$MA_INDEX_AX_DENOMINATOR
MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB

| 30505 | HIRTH_IS_ACTIVE |  |  |  |  |  |  | A01, A10 | T1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Axis is an indexing axis with Hirth tooth system |  |  |  |  |  | BOOLEAN | Reset |  |
| CTEQ |  |  |  |  |  |  |  |  |  |
| - | - | FALSE | FALSE | TRUE | $1 / 1$ |  |  |  |  |

## Description:

Hirth tooth system is active when value 1 is set.
MD irrelevant if axis is not an indexing axis.
Related to:
MD30500 \$MA_INDEX_AX_ASSIGN_POS_TAB, MD30501 \$MA_INDEX_AX_NUMERATOR, MD30502 \$MA INDEX AX DENOMINATOR, MD30503 \$MA INDEX AX OFFSET


| 30552 | AUTO_GET_TYPE |  | EXP, A06, A10 | K5, M3, TE6, P2, P5, 2.4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Automatic GET for get axis |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| 828d-me42 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-te42 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-gce42 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-gse42 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-me62 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-te62 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-gce62 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-gse62 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 0/0 | S |
| 828d-te82 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 1/1 | M |
| 828d-me82 | 1, 1, 1, 1, 1, 1, 1, 1... | 0 | 2 | 1/1 | M |
| 828d-gce82 | 1, 1, 2, 1, 1, 1, 1, 1 | 0 | 2 | 1/1 | M |
| 828d-gse82 | 1, 1, 2, 1, 1, 1, 1, 1 | 0 | 2 | 1/1 | M |
| Description: <br> $0=$ No automatically created GET -> Alarm in response to incorrect programming. <br> $1=$ GET is output when GET is generated automatically. <br> 2 = GETD is output when GET is generated automatically. | ```0 = No automatically created GET -> Alarm in response to incorrect programming. 1 = GET is output when GET is generated automatically. 2 = GETD is output when GET is generated automatically.``` |  |  |  |  |


| 30600 | FIX_POINT_POS | A03, A10 | K1, W3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Fixed-value positions of axis with G75 |  |  |  |  |  | DOUBLE | PowerOn |
| - | 4 | $0.0,0.0,0.0,0.0$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |  |  |
| - | 4 | $2 / 2$ | I |  |  |  |  |  |

Description: The fixed-point positions (4 max.) for each axis which can be approached when G75 is programmed or via JOG are entered in these machine data.
References:
/PA/, "Programming Guide: Fundamentals"

| 30610 | NUM_FIX_POINT_POS | A03, A10 | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of fixed-value positions of an axis | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 4 |  |  |

Description: Number of fixed point positions set, i.e. the number of valid entries in MD30600 \$MA_FIX_POINT_POS.
For G75, two (2) fixed point positions are assumed in MD30600 \$MA_FIX_POINT_POS for reasons of compatibility, even if '0' has been entered in this machine data.

| 30800 | WORKAREA_CHECK_TYPE |  |  |  |  |  |  | - | A3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Type of check of working area limitations. |  |  |  |  |  | BOOLEAN | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $1 / 1$ |  |  |  |  |

## Description:

With this machine data you can specify whether only the working area limitations of traversing axes are to be checked (0)
or
whether the stationary axes in a traversing block are also to be checked (1).
The value 0 corresponds to the behavior up to SW5.

| 31000 | ENC_IS_LINEAR | A02, A11 | G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Linear scale | BOOLEAN | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | FALSE, FALSE | 0 | - | $2 / 2$ |  |

Description: $\quad M D=1$ : Encoder for actual position value acquisition is linear (linear scale).
$M D=0:$ Encoder for actual position value acquisition is rotary.
The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1

| 31010 | ENC_GRID_POINT_DIST |  |  |  |  |  | A02, A11 | G2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Division period for linear scales | DOUBLE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 2 | $0.01,0.01$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

## Description:

For linear measuring system only:
The distance between the reference marks on the linear scale must be entered in this MD.

Index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1


| 31025 | ENC_PULSE_MULT |  |  |  |  |  | EXP, A01, A02 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Encoder multiplication (high-resolution) | DWORD | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 2 | $2048,2048,2048$, | 0 | - | $2 / 2$ |  |  |  |

Description:
For PROFIdrive only:
This MD describes the measuring system multiplication on PROFIBUS/PROFINET.
Default value 2048 means: changing by just one encoder line can be seen in bit11 of the actual PROFIdrive value XIST1, that is, the actual encoder value is multiplied by 2 to the power of $11=2048$.
If MD31700 \$MA_ENC_EDS_ACTIVE = 1, this machine data has no function, and is replaced by MD31720 \$MA_ENC_PULSE_MULT_EDS.
Related to:
MD31700 \$MA_ENC_EDS_ACTIVE
MD31720 \$MA_ENC_PULSE_MULT_EDS


Description:
The ball screw lead must be entered in the MD (see data sheet: mm/rev or inch/rev). Special meaning for hydraulic linear drives:
If a hydraulic linear drive (HLA) is configured as rotary axis, it must be specified in this MD, which drive feedrate in mm corresponds to a programmed revolution (360 degrees).


Description: MD = 1:

Encoder for actual position value acquisition is attached directly to the machine (without an intermediate gear unit).
$\mathrm{MD}=0$ :
Encoder for actual position value acquisition is attached to the motor (MD31060 \$MA_DRIVE_AX_RATIO_NUMERA and MD31050 \$MA_DRIVE_AX_RATIO_DENOM are included in the encōder vāluātion).
The index[n] of the machine data has the following coding:
[encoder no.]: 0 or 1
Special cases:
An incorrect entry may result in an incorrect encoder resolution, as, for example, the gear ratios would be calculated incorrectly.

| 31044 | ENC_IS_DIRECT2 |  |  |  |  |  | A02 | G2, S1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Encoder mounted on the additional gearbox | BOOLEAN | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 2 | FALSE, FALSE | 0 | - | $2 / 2$ |  |  |  |

## Description:

When using a load intermediate gearbox (for example for rotating tools, compare MD31066 \$MA_DRIVE_AX_RATIO2_NUMERA and MD31064 \$MA_DRIVE_AX_RATIO2_DENOM), the encoder installation location can be defined as "on the output" of this load intermediate gearbox:
Encoder installation "on the output of the load intermediate gearbox" is configured by MD31040 \$MA_ENC_IS_DIRECT=1 and MD31044 \$MA_ENC_IS_DIRECT2=1 at the same time.
Encoder installation "on the input of the load intermediate gearbox" is configured by MD31040 \$MA_ENC_IS_DIRECT=1 together with MD31044 \$MA_ENC_IS_DIRECT2=0.
A parameterization alarm will be output if MD31044 \$MA_ENC_IS_DIRECT2=1 is set without MD31040 \$MA_ENC_IS_DIRECT=1 (this combination has not been dēfined).

| 31046 | ENC_PASSIVE_PARKING | A02 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Park passive measuring system | BOOLEAN | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | FALSE, FALSE | - | - | $7 / 2$ |  |

Description: The machine data can be used to configure the behavior for the passive measuring system:
$M D=0$ :
The passive measuring system is continuously monitored and updated.
$\mathrm{MD}=1$ :
The passive measuring system is automatically parked. It is no longer monitored or updated. The encoder cable can be disconnected without an alarm being issued.
Notes:

- A measuring system switchover to a parked measuring system takes longer than a switch to a passive measuring system.
- On account of the duration, an axis standstill is recommended for the switchover.
- It is only with incremental encoders that the position and the state "Measuring system is referenced" are applied from the previously active measuring system as a function of MD34210 \$MA_ENC_REFP_STATE. In this case, renewed referencing is not absolutely necessary.
The machine data is inactive if:
- MD30200 \$MA_NUM_ENCS is less than 2
- MD30240 \$MA_ENC_TYPE=0
- The measuring system is used on the drive side, for example as a motor measuring system for speed control. Recommendation: Do not change the default value of the machine data for a motor measuring system.
- MD32950 \$MA_POSCTRL_DAMPING>0
- MD32960 \$MA_POSCTRL_DUAL_FEEDBACK_TIME>0


$\begin{array}{ll}\text { Description: } & \text { The load gearbox numerator is entered in this MD. } \\ \text { The index }[\mathrm{n}] \text { of the machine data has the following coding: }\end{array}$
[control parameter set no.]: 0-5

| 31064 | DRIVE_AX_RATIO2_DENOM | A02 | G2, S1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Denominator additional gearbox | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 1 | 2147000000 | $2 / 2$ |  |$]$ M

Description: Intermediate gearbox denominator
This MD together with MD31066 \$MA_DRIVE_AX_RATIO2_NUMERA defines an intermediate gearbox that acts as a multiplier to the motor/load gearbox (described by MD31060 \$MA_DRIVE_AX_RATIO_NUMERA and MD31050 \$MA_DRIVE_AX_RATIO_DENOM).
The load intermediate gearbox is inactive with the default values 1:1. Please consider MD31044 \$MA_ENC_IS_DIRECT2 for encoder installation.


| 31070 | DRIVE_ENC_RATIO_DENOM |  |  | A02, A11 | A3, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Denominator measuring gearbox |  |  | DWORD | Pow |  |
| - |  |  |  |  |  |  |
| - | 2 | 1,1 | 1 | 2147000000 | 2/2 | M |

```
Description: The measuring gearbox denominator is entered in this MD.
The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1
```

| 31080 | DRIVE_ENC_RATIO_NUMERA | A02, A11 | A3, G2, S1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Numerator measuring gearbox | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 1,1 | 1 | 2147000000 | $2 / 2$ |  |

Description: The measuring gearbox numerator is entered in this MD.
The index [n] of the machine data has the following coding:
[encoder no.]: 0 or 1

| 31090 | JOG_INCR_WEIGHT |  |  | A01, A12 | H1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Evaluation of an increment with INC/handwheel |  |  | DOUBLE | Res |  |
| CTEQ |  |  |  |  |  |  |
| - | 2 | 0.001, 0.00254 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |

Description:
The value entered in this MD defines the path of an increment which applies when an axis is traversed with the JOG keys in incremental mode or with the handwheel.
The path traveled by the axis on each increment each time the traversing key is pressed or for each handwheel detent position is defined by the following parameters:

- MD31090 \$MA_JOG_INCR_WEIGHT
(Weighting of an increment of a machine axis for INC/handwheel)
- Selected increment size (INC1, ..., INCvar)

The possible increment stages are defined globally for all axes in MD11330
\$MN_JOG_INCR_SIZE_TAB [n] and in SD41010 \$SN_JOG_VAR_INCR_SIZE.
Entering a negative value reverses the direction of evaluation of the traverse keys and the handwheel rotation.

Related to:
MD11330 \$MN_JOG_INCR_SIZE_TAB
SD41010 \$SN_JOG_VAR_INCR_SIZE

| 31092 | JOG_INCR_WEIGHT_TRAFO |  | A01, A12 | H1, G2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Evaluation of an increment for $\mathrm{INC} /$ handwheel for active transformation |  | DOUBLE | Reset |  |
| CTEQ |  |  |  |  |  |
| - | $2 \quad 0.0,0.0$ | - | - | 2/2 | M |

Description: The input value is used to define the distance of an increment which, when traversing an axis during active transformation using the JOG keys, is valid for the incremental dimension or via handwheel.
The distance, through which the axis traverses when executing the incremental dimension with transformation active, depending on the traversing key actuated or handwheel grid position, is defined by the following parameters:

- MD31092 \$MA_JOG_INCR_WEIGHT_TRAFO
(Evaluating an increment of ${ }^{-}$a machine axis for INC/handwheel)
- selected increment size (INC1, ..., INCvar)

The possible increment steps are globally defined for all axes in MD11330 \$MN_JOG_INCR_SIZE_TAB [n] or in SD41010 \$SN_JOG_VAR_INCR_SIZE.

Entering a negative value reverses the direction evaluation of the traversing keys and/ or the handwheel direction of rotation.

The set value is only effective, if this is > 0 ist. For values of zero, then MD31090 \$MA_JOG_INCR_WEIGHT is effective
Corresponds with:

MD11330 \$MN_JOG_INCR_SIZE_TAB
MD31090 \$MA_JOG_INCR_WEIGHT
SD41010 \$SN_JOG_VAR_INCR_SIZE

| 31122 | BERO_DELAY_TIME_PLUS | A02, A06 | S1, R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | BERO delay time Plus | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $0.000110,0.000110$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description: This machine data in combination with the setting in MD34200 \$MA_ENC_REFP_MODE (referencing mode) $=7$ causes a signal runtime compensation in the positive direction of movement at a position determined by a BERO (zero mark).
The typical total delay time of the BERO message path for overtravel in the positive direction of movement is entered.

This time includes:

- the BERO edge delay time
- the time for digitizing the signal
- the time for processing the measured value, etc.

The periods of time depend on the hardware used. The default value is typical for SIEMENS products. Adjustment by the customer is only required in exceptional cases. Input of the minimum value " 0.0 " deactivates the compensation (only active in combination with MD34200 \$MA_ENC_REFP_MODE = 7).
The machine data is available for all encoders.
Related to:
MD34200 \$MA_ENC_REFP_MODE (referencing mode)
MD34040 \$MA_REFP_VELO_SEARCH_MARKER[n]
(reference point shutdown velocity [Enc. no.])

| 31123 | BERO_DELAY_TIME_MINUS |  |  | A02, A06 | S1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s | BERO delay time minus |  |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |  |
| - | 2 | 0.000078, 0.000078 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |

Description: This machine data in combination with the setting in MD34200 \$MA_ENC_REFP_MODE (referencing mode) $=7$ causes a signal runtime compensation in the negative direction of movement at a position determined by a BERO (zero mark).
The typical total delay time of the BERO message path for overtravel in the negative direction of movement is entered.

The time includes:

- the BERO edge delay time
- the time for digitizing the signal
- the time for processing the measured value, etc.

The periods of time depend on the hardware used. The default value is typical for SIEMENS products. Adjustment by the customer is only required in exceptional cases.
Input of the minimum value " 0.0 " deactivates the compensation (only active in combination with MD34200 \$MA_ENC_REFP_MODE = 7).
The machine data is available for all encoders.
Related to:
MD34200 \$MA_ENC_REFP_MODE (referencing mode)
MD34040 \$MA_REFP_VELO_SEARCH_MARKER[n]
(shutdown velocity [Enc. no.])

| 31200 | SCALING_FACTOR_G70_G71 |  |  |  |  |  | EXP, A01 | G2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Factor for converting values while G70/G71 is active | DOUBLE | PowerOn |  |  |  |  |  |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 25.4 | $1 . e-9$ | $1.0 \mathrm{E}+301$ |  |  |  |  |

## Description:

The inch/metric conversion factor by which the programmed geometry of an axis (position, polynomial coefficients, radius for circle programming,...) is multiplied when the programmed value for $G$ code group $G 70 / G 71$ differs from the initial setting value (set in MD20150 \$MC_GCODE_RESET_VALUES[n]) is entered in this MD.
The factor can be set for each axis individually, so that pure positioning axes are not dependent on G70/G71. The factors within the three geometry axes should not be different.

The data influenced by G70/G71 are described in the Programming Guide.
Related to:
MD20150 \$MC_GCODE_RESET_VALUES[n] (G group initial setting).

| 31600 | TRACE_VDI_AX |  |  |  |  |  |  | EXP, N06 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Trace-specification for axial VDI signals |  |  |  |  |  | BOOLEAN | PowerOn |  |
| NBUP |  |  |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $1 / 1$ |  |  |  |  |

Description: This machine data determines whether the axial VDI signals for this axis are recorded in the NCSC trace (according to MD18794 \$MN_MM_TRACE_VDI_SIGNAL).

| 31700 | ENC_EDS_ACTIVE |  |  | A02, A11 | G2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activate EDS use |  |  | BOOLEAN | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 2 | FALSE, FALSE | 0 | - | 2/2 | M |

## Description:

For SINAMICS only:
$M D=0$ : encoder data set switchover, EDS is not used, POWERON-MDs \$MA_ENC_RESOL etc.
are active
MD = 1: encoder data set switchover, EDS is used, NEWCONF-MDs \$MA_ENC_RESOL_EDS etc.
are active
The index[n] of the machine data has the following coding:
[Encoder no.]: 0 or 1
Related to:
MD31020 \$MA_ENC_RESOL
MD31710 \$MA_ENC_RESOL_EDS
MD31025 \$MA_ENC_PULSE_MULT
MD31720 \$MA_ENC_PULSE_MULT_EDS
MD30260 \$MA_ABS_INC_RATIO
MD31730 \$MA_ABS_INC_RATIO_EDS


Description:
For SINAMICS only:

The machine data is only active if MD31700 \$MA_ENC_EDS_ACTIVE = 1 and replaces MD31020 \$MA_ENC_RESOL
Only with rotating measuring system:
The encoder marks per encoder revolution with EDS use are to be entered in the MD.
The index[n] of the machine data has the following coding:
[Encoder no.]: 0 or 1
Related to :
MD31700 \$MA_ENC_EDS_ACTIVE
MD31020 \$MA_ENC_RESOL


4.3 Axis-specific NC machine data

| 32000 | MAX_AX_VELO |  |  | A11, A04 | M3, TE1, TE3, W6, Z3, H1, K3, M1, P2, A3, B2, G2, H2, S1, V1, W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$, rev/min | Maximum axis velocity |  |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | $\begin{aligned} & \hline \text { 10000., 10000., } \\ & \text { 10000., 36000., } 36000 . \end{aligned}$ | $\begin{array}{\|l} \hline(1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-te42 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & 36000 ., 36000 ., 36000 . \end{aligned}$ | $\begin{array}{\|l} \hline(1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-gce42 | - | $\begin{aligned} & \hline \text { 10000., 10000., } \\ & 36000 ., 36000 ., 36000 . \end{aligned}$ | $\begin{array}{\|l} \hline(1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-gse42 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., 36000., } 10000 . \end{aligned}$ | $\begin{array}{\|l} \hline(1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-me62 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., } 36000 ., \\ & 36000 ., \text {, 36000., } \\ & 36000 ., \text {, } 36000 . \end{aligned}$ | $\begin{array}{\|l} (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-te62 | - | $\begin{aligned} & \hline 10000 ., 10000 ., \\ & 36000 ., 36000 ., \\ & 36000 ., 10000 ., \\ & 36000 ., 36000 . \end{aligned}$ | $\begin{array}{\|l} \hline(1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-gce62 | - | $\begin{array}{\|l\|} \hline(10000 . / 3000), \\ (10000 . / 3000), \\ (10000 . / 3000), \\ (10000 . / 3000),(100 \ldots . \end{array}$ | $\begin{array}{\|l} \hline(1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-gse62 | - | $\begin{array}{\|l\|} \hline(10000 . / 3000), \\ (10000 . / 3000), \\ (10000 . / 3000), \\ (10000 . / 3000),(100 \ldots \end{array}$ | $\begin{array}{\|l} \hline(1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |


| 828d-te82 | - | $\begin{array}{\|l\|} \hline 10000 ., 10000 ., \\ 36000 ., \text { 36000., } \\ 36000 ., 10000 ., \\ 10000 ., 36000 . . . \end{array}$ | (1e-9/1e-9), <br> (1e-9/1e-9), <br> (1e-9/1e-9), <br> (1e-9/1e-9), <br> (1e-9/1... | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-me82 | - | $\begin{array}{\|l\|} \hline 10000 ., 10000 ., \\ 10000 ., 36000 ., \\ 36000 ., 36000 ., \\ 36000 ., 36000 . . . \end{array}$ | $\begin{array}{\|l} \hline(1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-gce82 | - | $\begin{array}{\|l\|} \hline 10000 ., 10000 ., \\ 36000 ., \text { 36000., } \\ 36000 ., 10000 ., \\ 36000 ., \text { 36000. } \end{array}$ | $\begin{array}{\|l} (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \mathrm{e}-9), \\ (1 \mathrm{e}-9 / 1 \ldots \end{array}$ | (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |
| 828d-gse82 | - | $\begin{array}{\|l} \hline 10000 ., 10000 ., \\ 10000 ., 36000 ., \\ 10000 ., 36000 ., \\ 36000 ., 36000 . \end{array}$ | $\begin{array}{\|l} \hline(1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 e-9), \\ (1 e-9 / 1 \ldots \end{array}$ | (MD_DBLMAXI MD_DBLMAX), (MD_DBLMAX MD_DBLMAX), (MD_DBLMAX/ MD_D... | 2/2 | M |

Description: Maximum velocity at which the axis can permanently travel. The value limits both the positive and the negative axis velocity. The axis traverses at this velocity, if rapid traverse has been programmed.
Depending on the MD30300 \$MA_IS_ROT_AX, the maximum rotary or linear axis velocity has to be entered.
In the machine data, the dynamic behavior of the machine and drive and the limit frequency of the actual value acquisition must be taken into account.

| 32010 | JOG_VELO_RAPID |  |  | A11, A04 | H1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm/min, rev/min | Rapid traverse in jog mode |  |  | DOUBLE | Reset |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | $\begin{aligned} & \hline \text { 10000., 10000., } \\ & \text { 10000., 36000., } 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te42 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & 36000 ., 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gce42 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 36000., 36000., } 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse42 | - | $\begin{array}{\|l\|} \hline \text { 10000., 10000., } \\ \text { 10000., 36000., } 10000 . \end{array}$ | (0./ 0.) | $\begin{array}{\|l} \hline \text { (MD_DBLMAX/ } \\ \text { MD_DBLMAX) } \\ \hline \end{array}$ | 2/2 | M |
| 828d-me62 | - | $\begin{aligned} & \hline 10000 ., 10000 ., \\ & \text { 10000., 36000., } \\ & 36000 ., 36000 ., \\ & 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-te62 | - | $\begin{aligned} & \hline 10000 ., 10000 ., \\ & 36000 ., 36000 ., \\ & 36000 ., 10000 ., \\ & 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce62 | - | $\begin{aligned} & \hline(10000 . / 100), \\ & (10000 . / 100), \\ & (10000 . / 100), \\ & (10000 . / 100), \\ & (10000 . / . . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |

### 4.3 Axis-specific NC machine data

$\left.\begin{array}{|l|l|l|l|l|l|l|}\hline \text { 828d-gse62 } & - & \begin{array}{l}(10000 . / 100), \\ (10000 . / 100), \\ (10000 . / 100), \\ (10000 . / 100),\end{array} & (0 . / 0 .) \\ (10000 . / . . .\end{array}\right)$

## Description:

The axis velocity entered applies when the rapid traverse override key is pressed in JOG mode and when the axial feedrate override is set to $100 \%$.
The value entered must not exceed the maximum permissible axis velocity (MD32000 \$MA_MAX_AX_VELO).
This machine data is not used for the programmed rapid traverse G0.
MD irrelevant to:
Operating modes AUTOMATIC and MDI
Related to:
MD32000 \$MA_MAX_AX_VELO (maximum axis velocity)
MD32040 \$MA_JOG_REV_VELO_RAPID
(revolutional feedrate for JOG with rapid traverse override)
NC/PLC interface signal DB3200 DBX1000.5,1004.5,1008.5 (Rapid traverse override)
NC/PLC interface signal DB3200 DBX4 (Feedrate override A-H)

| 32020 | JOG_VELO |  |  | A11, A04 | H1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm/min, rev/min | Jog axis velocity |  |  | DOUBLE | Reset |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | $\begin{aligned} & \hline 2000 ., 2000 ., 2000 . \text {, } \\ & 36000 ., 36000 . \\ & \hline \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te42 | - | $\begin{array}{\|l\|} \hline 2000 ., 2000 ., 36000 ., \\ 36000 ., 36000 . \\ \hline \end{array}$ | (0./ 0.) | $\begin{aligned} & \text { (MD_DBLMAXI } \\ & \text { MD_DBLMAX) } \end{aligned}$ | 2/2 | M |
| 828d-gce42 | - | $\begin{aligned} & \text { 2000., 2000., 36000., } \\ & 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | $\begin{aligned} & \text { (MD_DBLMAXI } \\ & \text { MD_DBLMAX) } \end{aligned}$ | 2/2 | M |
| 828d-gse42 | - | $\begin{aligned} & \text { 2000., 2000., 2000., } \\ & 36000 ., 2000 . \end{aligned}$ | (0./ 0.) | $\begin{aligned} & \text { (MD_DBLMAXI } \\ & \text { MD_DBLMAX) } \end{aligned}$ | 2/2 | M |
| 828d-me62 | - | $\begin{aligned} & \hline 2000 ., 2000 ., 2000 ., \\ & 36000 ., 36000 . \text {., } \\ & 36000 ., 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-te62 | - | $\begin{aligned} & \text { 2000., 2000., 36000., } \\ & 36000 ., 36000 . \text {., 2000., } \\ & 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAXI MD_DBLMAX) | 2/2 | M |
| 828d-gce62 | - | $\begin{aligned} & \hline(2000 . / 30),(2000 . / 30), \\ & (2000 . / 30),(2000 . / 30), \\ & (2000 . / 30),(200 \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |



4.3 Axis-specific NC machine data

| $828 \mathrm{~d}-\mathrm{me} 62$ | - | $2.5,2.5,2.5,1.0,1.0$, <br> $1.0,1.0,1.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{te} 62$ | - | $2.5,2.5,1.0,1.0,1.0$, <br> $2.5,1.0,1.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| 828 d -gce62 | - | $2.5,2.5,2.5,2.5,2.5$, <br> $2.5,2.5,2.5 .$. | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gse} 62$ | - | $2.5,2.5,2.5,2.5,2.5$, <br> $2.5,2.5,2.5 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{te} 82$ | - | $2.5,2.5,1.0,1.0,1.0$, <br> $2.5,2.5,1.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{me} 82$ | - | $2.5,2.5,2.5,1.0,1.0$, <br> $1.0,1.0,1.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-$ gce82 | - | $2.5,2.5,1.0,1.0,1.0$, <br> $2.5,1.0,1.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-$ gse82 | - | $2.5,2.5,2.5,1.0,2.5$, <br> $1.0,1.0,1.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |

## Description:

The value entered defines the revolutional feedrate of the axis in JOG mode with rapid traverse override in relation to the revolutions of the master spindle. This feedrate is active when SD41100 \$SN_JOG_REV_IS_ACTIVE = 1. (Revolutional feedrate active with JOG)
MD irrelevant for:
SD41100 \$SN_JOG_REV_IS_ACTIVE = "0"
Related to:
SD41100 \$SN_JOG_REV_IS_ACTIVE (revolutional feedrate with JOG active)
MD32050 \$MA_JOG_REV_VELO (revolutional feedrate with JOG)


## Description:

The value entered defines the revolutional feedrate of the axis in JOG mode in relation to the revolutions of the master spindle.
This feedrate is active when SD41100 \$SN_JOG_REV_IS_ACTIVE= 1 (revolutional feedrate active with JOG).

```
MD irrelevant for:
Linear feedrate; i.e. SD41100 $SN_JOG_REV_IS_ACTIVE = 0
Related to:
SD41100 $SN_JOG_REV_IS_ACTIVE
(revolutional feedrate for JOG active)
MD32040 $MA_JOG_REV_VELO_RAPID
(JOG revolutional feedrate with rapid traverse override)
```

| 32060 | POS_AX_VELO |  |  | A12, A04 | H1, P2, K1, V1, 2.4, 6.2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm/min, rev/min | Initial setting for positioning axis velocity |  |  | DOUBLE | Reset |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., 36000., } 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD DBLMAX) | 2/2 | M |
| 828d-te42 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & 36000 ., 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAXI MD_DBLMAX) | 2/2 | M |
| 828d-gce42 | - | $\begin{array}{\|l\|} \hline \text { 10000., 10000., } \\ 36000 ., 36000 ., 36000 . \\ \hline \end{array}$ | (0./ 0.) | $\begin{array}{\|l} \hline \text { (MD_DBLMAX/ } \\ \text { MD_DBLMAX) } \\ \hline \end{array}$ | 2/2 | M |
| 828d-gse42 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., 36000., } 10000 . \end{aligned}$ | (0./ 0.) | $\begin{array}{\|l} \hline \text { (MD_DBLMAXI } \\ \text { MD_DBLMAX) } \\ \hline \end{array}$ | 2/2 | M |
| 828d-me62 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., 36000., } \\ & 36000 ., 36000 ., \\ & 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAXI MD_DBLMAX) | 2/2 | M |
| 828d-te62 | - | $\begin{array}{\|l\|} \hline 10000 ., 10000 ., \\ 36000 ., \text {, } 36000 ., \\ 36000 ., 10000 ., \\ 36000 ., \text {, } 36000 . \\ \hline \end{array}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gce62 | - | (10000./30), <br> (10000./30), <br> (10000./30), <br> (10000./30), <br> (10000./30),... | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse62 | - | $\begin{aligned} & (10000 . / 30), \\ & (10000 . / 30), \\ & (10000 . / 30), \\ & (10000 . / 30), \\ & (10000 . / 30), \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te82 | - | $\begin{array}{\|l\|} \hline 10000 ., 10000 ., \\ 36000 ., 36000 ., \\ 36000 ., 10000 ., \\ 10000 ., 36000 . \ldots . \end{array}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-me82 | - | $\begin{array}{\|l\|} \hline 10000 ., 10000 ., \\ 10000 ., 36000 ., \\ 36000 ., 36000 ., \\ 36000 ., 36000 . . . \end{array}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce82 | - | $\begin{array}{\|l\|} \hline 10000 ., 10000 ., \\ 36000 ., \text { 36000., } \\ 36000 ., 10000 ., \\ 36000 ., \text { 36000.. } \end{array}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse82 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., 36000., } \\ & \text { 10000., 36000., } \\ & 36000 ., 36000 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | $2 / 2$ | M |

Description: If a positioning axis is programmed in the part program without specifying the axisspecific feedrate, the feedrate entered in MD32060 \$MA_POS_AX_VELO is automatically used for this axis. The feedrate in MD32060 \$MA_POS_AX_VELO applies until an axisspecific feedrate is programmed in the part program for this positioning axis.
MD irrelevant for:
MD32060 \$MA_POS_AX_VELO is irrelevant for all axis types other than positioning axis.
Special cases:
If a ZERO velocity is entered in MD32060 \$MA_POS_AX_VELO, the positioning axis does not traverse if it is programmed without feed. If a velocity is entered in MD32060 \$MA_POS_AX_VELO that is higher than the maximum velocity of the axis (MD32000 \$MA_MAX_AX_VELO), the velocity is automatically restricted to the maximum rate.

| 32070 | CORR_VELO |  |  |  |  |  | A04 | $2.4,6.2$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Axis velocity for override |  |  |  |  |  | DOUBLE | Reset |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 50.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: Limitation of axis velocity for handwheel override, external work offset, continuous dressing, distance control \$AA_OFF via synchronized actions related to the JOG velocity
MD32020 \$MA_JOG_VELO,
MD32010 \$MA_JOG_VELO_RAPID,
MD32050 \$MA_JOG_REV_VELO,
MD32040 \$MA_JOG_REV_VELO_RAPID.
The maximum permissible velocity is the maximum velocity in MD32000 \$MA_MAX_AX_VELO. Velocity is limited to this value.
The conversion into linear or rotary axis velocity is made according to MD30300 \$MA_IS_ROT_AX.

| 32074 | FRAME_OR_CORRPOS_NOTALLOWED | A01 | K5, K2, 2.4, 6.2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Frame or tool length compensation are not permissible | UDWORD | PowerOn |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times F F F$ |  |  |

Description: This machine data is used to define the effectiveness of the frames and tool length compensations for indexing axes, PLC axes and command axes started from synchronized actions.
Bit assignment:
Bit $0=0$ :
Programmable work offset (TRANS) allowed for indexing axis
Bit 0 = 1 :
Programmable work offset (TRANS) forbidden for indexing axis
Bit $1=0$ :
Scale modification (SCALE) allowed for indexing axis
Bit 1 = 1:
Scale modification (SCALE) forbidden for indexing axis
Bit $2=0$ :
Direction change (MIRROR) allowed for indexing axis
Bit 2 = 1 :
Direction change (MIRROR) forbidden for indexing axis
Bit $3=0$ :
DRF offset allowed for axis
Bit 3 = 1 :

DRF offset forbidden for axis
Bit $4=0$ :
External work offset allowed for axis
Bit $4=1$ :
External work offset forbidden for axis
Bit $5=0$ :
Online tool compensation allowed for axis
Bit $5=1$ :
Online tool compensation forbidden for axis
Bit $6=0$ :
Synchronized action offset allowed for axis
Bit 6 = 1:
Synchronized action offset forbidden for axis
Bit $7=0$ :
Compile cycles offset allowed for axis
Bit $7=1$ :
Compile cycles offset forbidden for axis
Bit $8=0$ :
Axial frames and tool length compensation are NOT considered for PLC axes (bit evaluation for compatibility reasons)
Bit 8 = 1 :
Axial frames are considered for PLC axes and tool length compensation is considered
for PLC axes which are geometry axes.
Bit $9=0$ :
Axial frames are considered for command axes, and tool length compensation is considered for command axes which are geometry axes.
Bit $9=1$ :
Axial frames and tool length compensation are NOT considered for command axes
If the tool is treated in an active transformation, the tool length compensation is taken into account for geometry axes (as for bit9=0, see also MD24130
\$MC_TRAFO_INCLUDES_TOOL_1).
Bit $10=0$ :
In JOG mode, too, traversing of a geometry axis as a PLC or command axis is NOT allowed with active rotation.
Bit $10=1$ :
In JOG mode, traversing of a geometry axis as a PLC axis or command axis (static synchronized action) is allowed with active rotation (ROT frame). Traversing must be terminated prior to returning to AUTOMATIC mode (neutral axis state), as otherwise alarm 16908 would be output when the mode is changed.
Bit $11=0$ :
In 'Program interrupted' status, repositioning to the interrupt position (AUTO - JOG) takes place when changing from JOG to AUTO.
Bit $11=1$ :
Prerequisite: Bit $10==1$ (PLC or command axis motion with active rotation in JOG mode). In 'Program interrupted' status, the end point of the PLC or command axis motion is taken over when changing from JOG to AUTOMATIC and the geometry axes are positioned according to the rotation


## Description:

Ths machine data can be used to map an axial frame onto an axial frame of another axis. This means that the description of a frame in the data management can simultaneously describe the frame of another axis with the same values. Selected data management frames can be enabled for the mapping in MD10616 \$MN_MAPPED_FRAME_MASK.



## Description:

For the velocity override of positioning axes:
>0: Limitation of size of selected increment \$MN_JOG_INCR_SIZEL<Increment/VDI
signal> 0 or SD41010 \$SN_JOG_VAR_INCR_SIZE for the associated machine axis
0: No limitation


Description:
Definition of the response of the handwheel travel to axis-specific VDI interface signals or the CP-SW limit stop or a stop from an OEM application:
Bit $=0$ :
Interruption or collection of the distances preset via the handwheel.
Bit = 1:
Cancelation of the traversing motion or no collection.
Bit assignment:
Bit 0: feedrate override
Bit 1: spindle speed override
Bit 2: feedrate stop/spindle stop or CP-SW limit stop or stop from an OEM
application
Bit 3: clamping procedure running (= 0 no effect)
Bit 4: servo enable
Bit 5: pulse enable
For machine axis:
Bit $6=0$
For handwheel travel, the maximum velocity at which the relevant machine axis can be traversed is the feedrate set in MD32020 \$MA_JOG_VELO.
Bit $6=1$
For handwheel travel, the maximum velocity at which the relevant machine axis can be traversed is the feedrate set in MD32000 \$MA_MAX_AX_VELO.
Bit $7=0$
The override is active in handwheel travel.
Bit $7=1$
The override is always assumed to be $100 \%$ for handwheel travel, regardless of how the override switch is set.
Exception: override 0\% is always active.
Bit $8=0$
The override is active with DRF
Bit $8=1$
The override is always assumed to be $100 \%$ for DRF, regardless of how the override switch is set.
Exception: override 0\% is always active.
Bit $9=0$
For handwheel travel, the maximum possible velocity with revolutional feedrate is

- with the feedrate in SD41120 \$SN_JOG_REV_SET_VELO or
- the feedrate in MD32050 \$MA_JOG_REV_VELO or
- in the case of rapid traverse with MD32040 \$MA_JOG_REV_VELO_RAPID
of the relevant machine axis calculated with the spindle or rotary axis feedrate. Bit $9=1$
For handwheel travel, the maximum possible velocity is with the revolutional feedrate in MD32000 \$MA_MAX_AX_VELO of the relevant machine axis. (see also bit 6)
Bit $10=0$
For overlaid motions, \$AA_OVR is not active.
Bit $10=1$

For overlaid motions (DRF, \$AA_OFF, external work offset, online tool offset), the override \$AA_OVR settable via synchronized actions is active.
Bit $11=0$
With the VDI interface signal DB390x DBX4001.5 (Drive Ready) missing, paths defined by the handwheel are not collected, but a traversing request is displayed. Start of a continuous JOG motion in continuous mode (MD41050 \$SN_JOG_CONT_MODE_LEVELTRIGGRD 41050 $=0$ ) or an incremental JOG motion in continuous mode (MS11300 \$MN JOG INC MODE LEVELTRIGGRD $11300=0$ ) is displayed as a traversing request. With "driveReady" = 1, however, the tool is not traversed, but the procedure is canceled and must be started again.

Bit $11=1$
With the VDI interface DB390x DBX4001.5 (Drive Ready) missing, the paths defined by the handwheel are collected. Start of a continuous JOG motion in continuous mode (MD41050 \$SN_JOG_CONT_MODE_LEVELTRIGGRD $41050=0$ ) or an incremental JOG motion in continuous mode (MS11300 \$MN JOG INC MODE LEVELTRIGGRD $11300=0$ ) is displayed and saved as a traversing request. With "driveReady" = 1 the traversing motion is started.
Bit $12=0$
Interruption or collection of the distances preset via the handwheel with safe operational stop.

Bit $12=1$
Cancelation of the traversing motion or no collection with safe operational stop.



## Description:

The direction of movement of the machine can be reversed with this MD.
The control direction is, however, not destroyed; i.e. closed-loop control remains stable.
-1: Direction reversal
$0,1:$ No direction reversal

| 32110 | ENC_FEEDBACK_POL | A07, A02, A11 | G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Sign actual value (control direction) | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 1,1 | -1 | 1 | $2 / 2$ |  |$]$ M

Description: The evalution direction of the shaft encoder signals is entered in the $M D$.
-1: Actual value reversal
$0,1:$ No actual value reversal
The index[n] of the machine data is encoded as follows:
[Encoder no.]: 0 or 1
Special cases:
The axis can run off if an incorrect control direction is entered.
Depending on the setting of the corresponding limit values, one of the following alarms is displayed:
Alarm 25040 "Standstill monitoring"
Alarm 25050 "Contour monitoring"
Alarm 25060 "Speed setpoint limitation"
If an uncontrolled setpoint step change occurs on connection of a drive, the control direction might be incorrect.
Note:
In the case of SINAMICS drives, we recommend that the direction of motion is reversed
in the drive (see P410).
This is obligatory if you are using DSC (see also MD32640
\$MA_STIFFNESS_CONTROL_ENABLE).

| 32200 | POSCTRL_GAIN |  |  | A07, A11 | G1, TE1, TE9, K3, S3, A2, A3, D1, G2, S1, V1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1000/min | Servo gain factor |  |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |
| 828d-te42 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |
| 828d-gce42 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |
| 828d-gse42 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |
| 828d-me62 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |


| 828d-te62 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce62 | 6 | $\begin{aligned} & \text { 16.66666667, } \\ & \text { 16.66666667, } \\ & \text { 16.66666667, } \\ & \text { 16.66666667, } \\ & \text { 16.66666667, } \end{aligned}$ | 0 | 2000. | 7/2 | M |
| 828d-gse62 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |
| 828d-te82 | 6 | 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, <br> 16.66666667, | 0 | 2000. | 7/2 | M |
| 828d-me82 | 6 | 16.66666667, 16.6666667, 16.66666667, 16.6666666, 16.6666666, | 0 | 2000. | 7/2 | M |
| 828d-gce82 | 6 | $\begin{array}{\|l\|} \hline 33.33333334, \\ 33.33333334, \\ 33.33333334, \\ 33.33333334, \\ 33.33333334, \\ \hline \end{array}$ | 0 | 2000. | 7/2 | M |
| 828d-gse82 | 6 | $\begin{aligned} & 33.33333334, \\ & 33.33333334, \\ & 33.33333334, \\ & 33.33333334, \\ & 33.33333334, \end{aligned}$ | 0 | 2000. | 7/2 | M |

## Description:

Position controller gain, or servo gain factor.
The input/output unit for the user is [ ( $\mathrm{m} / \mathrm{min}$ )/mm].
I.e. MD32200 \$MA_POSCTRL_GAIN[n] = 1 corresponds to a 1 mm following error at $V=1 \mathrm{~m} /$ min.
The following machine data have default settings for adapting the standard selected input/output unit to the internal unit [rev/s].

- MD10230 \$MN_SCALING_FACTORS_USER_DEF[9] = 16.666667 S
- MD10220 \$MN_SCALING_USER_DEF_MASK = 0x200; (bit no 9 as hex value).

If the value "0" is entered the position controller is opened.
When entering the servo gain factor it is important to take into account that the gain factor of the whole position control loop is still dependent on other parameters of the controlled system. A distinction should be made between a "desired servo gain factor" (MD32200 \$MA_POSCTRL_GAIN) and an "actual servo gain factor" (produced by the machine). Only when $\bar{a} l l$ the parameters of the control loop are matched will these servo gain factors be the same.
Other factors are:

- Speed setpoint adjustment (MD32260 \$MA_RATED_VELO, MD32250 \$MA_RATED_OUTVAL)
or automatic speed setpoint interface adjustment (with MD32250 \$MA_RATED_OUTVAL = 0 etc.)


### 4.3 Axis-specific NC machine data

- Correct actual value recording of the position encoder (no. of encoder pulses, high resolution, encoder mounting location, gear etc.)
- Correct actual speed recording on the drive (standardization, possibly tacho compensation, tacho generator)
Note:
Axes which interpolate together and are to perform a machining operation, must either have the same gain setting (i.e. have the identical following error $=45^{\circ}$ slope at the same velocity) or they must be matched via MD32910 \$MA_DYN_MATCH_TIME.
The actual servo gain factor can be checked by means of the following error (in the service display).
In the case of analog axes, a drift compensation must be performed prior to the control. The index $[\mathrm{n}]$ of the machine data has the following coding: [control parameter set no.]: 0-5


Description:
Position controller integral action time for the integral component in s The MD is only active if MD32220 \$MA_POSCTRL_INTEGR_ENABLE = TRUE.
A value of the MD less than 0.001 disables the integral component of the PI controller. The controller is then a $P$ controller, which works with disabled manipulated variable clamping (see also MD32230 \$MA_POSCTRL_CONFIG, bit0 = 1).


## Description: Enable of the integral component position controller; the position controller is then

 a PI controller in which the manipulated variable clamping is disabled (s.a. MD32230 \$MA_POSCTRL_CONFIG, bit0 = 1)Position overshoots may occur if the integral component is used. For this reason, this functionality may only be used in special cases.


| 32250 | RATED_OUTVAL | A01, A11 | A3, D1, G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\%$ | Rated output voltage | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | 1 | 0.0 | 0.0 | 200 |  |  |

a.)

Scaling of the manipulated variable with analog drives:
The value of the speed setpoint in percent is to be entered in this MD, in relation to the maximum speed setpoint at which the motor speed specified in MD32260 \$MA_RATED_VELO[n] is reached.
Related to:
MD32250 \$MA_RATED_OUTVAL[n] only makes sense in combination with MD32260
\$MA_RATED_VELO[n].
Example:

1. At a voltage of 5 V , the drive reaches a speed of
$1875 \mathrm{rpm}==>$ RATED_OUTVAL $=50 \%$, RATED_VELO $=11250$ [degrees $/ \mathrm{s}$ ]
2. At a voltage of 8 V , the drive reaches a speed of
$3000 \mathrm{rpm}==>$ RATED_OUTVAL $=80 \%$, RATED_VELO $=18000$ [degrees $/ \mathrm{s}$ ]
3. At a voltage of 1.5 V , the drive reaches a speed of
$562.5 \mathrm{rpm}==>$ RATED_OUTVAL $=15 \%$, RATED_VELO $=3375$ [degrees $/ \mathrm{s}$ ]
All three examples are possible for one and the same drive/converter. The ratio of the two values is decisive; it is the same in all three examples.
MD32250 \$MA_RATED_OUTVAL and MD32260 \$MA_RATED_VELO describe physical properties of converter and drive; they can therefore only be determined by means of a measurement or commissioning instructions (converter, drive).
b.)

Scaling of the manipulated variable with digital PROFIdrive drives:
Default value "0" declares MD32250 \$MA_RATED_OUTVAL and MD32260 \$MA_RATED_VELO as invalid. Scaling of the manipulated variable is automatically determined and adjusted from the drive parameters instead.
Otherwise (MD32250 \$MA_RATED_OUTVAL unequal to zero), the scaling of the manipulated variable is not determined from the drive (for example non-Siemens PROFIdrive drives), but set with RATED_VELO and RATED_OUTVAL, even in the case of these, irrespective of the scaling active on the drive side. In this case, the following applies: Scaling of the manipulated variable on the drive = RATED_VELO / RATED_OUTVAL Further scalings from drive parameters, such as torque scaling, are not active if MD32250 \$MA_RATED_OUTVAL is not equal to zero, the values based on it remain zero. In the case of simultaneous operation of analog and PROFIdrive drives, the settings for the analog axes must be adjusted as described in a.).


## Description:

Only applies when:
MD32250 \$MA_RATED_OUTVAL is set greater than 0 .
The drive speed (scaled on the drive) that is reached with the percentual speed setpoint specified in MD32250 \$MA_RATED_OUTVAL[n] must be entered in the MD.
Related to:
MD32260 \$MA_RATED_VELO[n] only makes sense in combination with MD32250 \$MA_RATED_OUTVAL[n].

| 32300 | MAX_AX_ACCEL |  |  | A11, A04 | M3, TE6, Z3, H1, K3, M1, A3,$\text { B1, B2, K1, V1, } 2.4$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{s}^{2}, \mathrm{rev} / \mathrm{s}^{2}$ | Maximum axis acceleration |  |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | 5 | $\begin{aligned} & \text { 2.0, 2.0, 2.0, 2.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0, 2.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0,... } \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te42 | 5 | $\begin{aligned} & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & \text { 3.6, 3.6, 3.6,... } \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce42 | 5 | $\begin{aligned} & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & 3.6,3.6,3.6, \ldots \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse42 | 5 | $\begin{aligned} & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0,... } \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me62 | 5 | $\begin{aligned} & \text { 2.0, 2.0, 2.0, 2.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0, 2.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0,... } \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te62 | 5 | $\begin{aligned} & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & \text { 2.0, 2.0, 2.0, 1.0, 1.0, } \\ & \text { 3.6, 3.6, 3.6,... } \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce62 | 5 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0, \ldots \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |


| $828 \mathrm{~d}-\mathrm{gse} 62$ | 5 | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0, \ldots$ | $1.0 \mathrm{e}-6$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{te} 82$ | 5 | $2.0,2.0,2.0,1.0,1.0$, <br> $2.0,2.0,2.0,1.0,1.0$, <br> $3.6,3.6,3.6, \ldots$ | $1.0 \mathrm{e}-6$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{me} 82$ | 5 | $2.0,2.0,2.0,2.0,1.0$, <br> $2.0,2.0,2.0,2.0,1.0$, <br> $2.0,2.0,2.0, \ldots$ | $1.0 \mathrm{e}-6$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gce} 82$ | 5 | $2.0,2.0,2.0,1.0,1.0$, <br> $2.0,2.0,2.0,1.0,1.0$, <br> $3.6,3.6,3.6, \ldots$ | $1.0 \mathrm{e}-6$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gse} 82$ | 5 | $2.0,2.0,2.0,1.0,1.0$, <br> $2.0,2.0,2.0,1.0,1.0$, <br> $2.0,2.0,2.0, \ldots$ | $1.0 \mathrm{e}-6$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |

Description: Maximum acceleration, i.e. change in setpoint velocity, which is to act upon the axis. The value limits both positive and negative axis acceleration.
The maximum angular or linear axis acceleration must be entered dependent upon machine data MD30300 \$MA_IS_ROT_AX.
In the case of linear interpolation of the axes in a grouping, the grouping is limited in such a way that no axis is overloaded. With regard to contour accuracy, the control dynamic behavior has to be taken into account.
Not relevant for error states that lead to quick stop.
Each field element corresponds to a $G$ code in the 59th $G$ code group.
Related to:

```
MD32310 $MA_MAX_ACCEL_OVL_FACTOR
MD32434 $MA_G00_ACCEL_FACTOR
MD32433 $MA_SOFT_ACCEL_FACTOR
MD20610 $MC_ADD_MOVE_ACCEL_RESERVE
MD20602 $MC_CURV_EFFECT_ON_PATH_ACCEL
```



## Description:

The overload factor limits the velocity jump of the machine axis on block transition.
The value entered is related to the value of MD32300 \$MA_MAX_AX_ACCEL (axis acceleration) and states by how much the maximum acceleration can be exceeded for one IPO cycle.
Related to:
MD32300 \$MA_MAX_AX_ACCEL (axis acceleration)

### 4.3 Axis-specific NC machine data

MD10070 \$MN_IPO_SYSCLOCK_TIME_RATIO (interpolator clock)
Each field element corresponds to a G code in the 59th G group.


## Description:

MD32320 \$MA_DYN_LIMIT_RESET_MASK is used to set the reset response of functions limiting dynamic response for specific axes and groups.
The MD is bit-coded, bit 0 (LSB) and bit 1 are currently allocated.
Bit $0=0$ :
Programmed ACC, VELOLIM and JERKLIM are reset to $100 \%$ with channel reset/M30 if the channel-specific MD22410 \$MC_F_VALUES_ACTIVE_AFTER_RESET is also zero.

For spindle mode, programmed ACC and VELOLIM are reset to 100\% with channel reset/M30 if MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET is zero and the channel-specific MD22400 \$MC_S_VALUES_ACTIVE_AFTER_RESET is also zero.
Bit $0=1$ :
Programmed ACC, VELOLIM and JERKLIM are retained beyond channel reset/M30.
Bit $1=0$ :
Programmed ACCLIMA, VELOLIMA and JERKLIMA are reset to $100 \%$ with channel reset/M30, if MD22410 \$MC_F_VALUES_ACTIVE_AFTER_RESET is also zero.
Bit 1 = 1:
Programmed ACCLIMA, VELOLIMA and JERKLIMA are retained beyond channel reset//M30.
Notes:
In MD22410 \$MC_F_VALUES_ACTIVE_AFTER_RESET, the reset responses of the dynamic
 specifically. If the MD is set, then the values are also retained.
For spindle mode, the values for ACC and VELOLIM are also retained if MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET is not equal to zero or the channel-specific MD22400 \$MC_S_VALUES_ACTIVE_AFTER_RESET is not equal to zero.


Description:
Enables the function of an axial jerk limitation.
The limitation is set via a time constant; it is always active.

The limitation works independently of the limitations "path-related maximum jerk", "knee-shaped acceleration characteristic" and the axial jerk limitation of the axes that are operated in JOG mode or positioning axis mode.
Related to:
MD32410 \$MA_AX_JERK_TIME (time constant for axial jerk limitation)


## Description:

Filter type for axial jerk limitation:
1: 2nd order filter (as in SW 1 through 4)
2: Moving averaging (SW 5 and higher)
3: Bandstop filter (SW 6 and higher)
Type 2 requires more computing time, but causes smaller contour errors for the same smoothing effect, or smoother movements at the same accuracy.

Type 2 is recommended; type 1 is set as a default value for reasons of compatibility. The maximum jerk is set in the time constant MD32410 \$MA_AX_JERK_TIME.

Recommended values for type 1:
Min. $0.03 \mathrm{~s} ; \max .0 .06 \mathrm{~s}$.
Recommended values for type 2:
Min. 1 position-control cycle; max. 16 position-control cycles
At a position-control cycle of 2 ms , this corresponds to 0.002 to 0.032 seconds.
Type 3 requires the setting of
MD32410 \$MA_AX_JERK_TIME
MD32412 \$MA_AX_JERK_FREQ
MD32414 \$MA_AX_JERK_DAMP.
To parameterize a simple bandstop filter, we recommend setting MD32410
\$MA_AX_JERK_TIME=0,
which automatically sets "denominator frequency = numerator frequency = blocking frequency $=$ MD32412 \$MA_AX_JERK_FREQ".
However, MD32410 \$MA_AX_JERK_TIME > 0 is used to set a specific denominator frequency, which makes it possible to implement a bandstop filter with amplitude increase for frequencies beyond the blocking frequency.
MD32402 \$MA_AX_JERK_MODE is only active if MD32400 \$MA_AX_JERK_ENABLE has been set to 1 .

Special cases, errors:
The machine data must be same for all axes of an axis container. Related to:

### 4.3 Axis-specific NC machine data

MD32400 \$MA_AX_JERK_ENABLE
MD32410 \$MA_AX_JERK_TIME
and for type 3:
MD32412 \$MA_AX_JERK_FREQ and
MD32414 \$MA_AX_JERK_DAMP

| 32410 | AX_JERK_TIME | A07, A04 | G1, TE1, S3, B2, G2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Time constant for axial jerk filter |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.001 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: Time constant of the axial jerk filter which causes a smoother axis setpoint characteristic. The jerk filter will only be active, if the time constant is higher than a position control cycle.
Not active in case of errors that cause a change in follow-up mode (for example EMERGENCY STOP)

Special cases:
Machine axes that are supposed to be interpolating with one another, must have the same effective jerk filtering (for example the same time constant for tapping without compensating chuck).
Related to:
MD32400 \$MA_AX_JERK_ENABLE (axial jerk limitation)


Description: Blocking frequency of axial jerk filter bandstop MD is only active if MD32402 \$MA_AX_JERK_MODE = 3

| 32414 | AX_JERK_DAMP |  | A07, A04 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Damping of axial jerk filter |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| 828d-me42 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-te42 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-gce42 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-gse42 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-me62 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-te62 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |



| 32415 | EQUIV_CPREC_TIME |  | A07, A04 | MD32410 <br> \$MA_AX_JERK_TIME, <br> \$MC_CPREC_WITH_FFW |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| s | Time constant for the programmable contour accuracy | DOUBLE | NEW CONF |  |  |
| - | - | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| - | 0 |  |  |  |  |

Description: The data states the jerk filter time constant at which the contour error with active feedforward control is negligibly small.

| 32420 | JOG_AND_POS_JERK_ENABLE |  | A04 | G1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Default setting of axis jerk limitation |  | BOOLEAN | Res |  |
| CTEQ |  |  |  |  |  |
| - | FALSE | 0 | - | 2/2 | M |

## Description:

Enables the function of the axis-specific jerk limitation for the operating modes JOG, REF and positioning axis mode.
1: Axial jerk limitation for JOG mode and positioning axis mode
0: No jerk limitation for JOG mode and positioning axis mode
The maximum jerk occurring is defined in MD32430 \$MA_JOG_AND_POS_MAX_JERK.
Related to:
MD32430 \$MA_JOG_AND_POS_MAX_JERK (axial jerk)

| 32429 | MAX_JERK_STOP | A04 | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{m} / \mathrm{s}^{3}, \mathrm{rev} / \mathrm{s}^{3}$ | Reserved: Maximum axial EMERGENCY JERK | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 5 | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 ., 0 ., \ldots$ | 0. | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description:
Reserved for maximum axial jerk in emergency situations. A value of 0 has the same effect as MAX_AX_JERK.
Each field element corresponds to a G code in the 59th G code group.

| 32430 | JOG_AND_POS_MAX_JERK |  |  | A04 | G1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{s}^{3}, \mathrm{rev} / \mathrm{s}^{3}$ | Axial jerk |  |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 100, 100, 100, 100, 100 | 1.e-9 | 1.0E+301 | 2/2 | M |
| 828d-te42 | - | 100, 100, 100, 100, 100 | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce42 | - | 100, 100, 100, 100, 100 | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse42 | - | 100, 100, 100, 100, 100 | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | M |

### 4.3 Axis-specific NC machine data

| $828 \mathrm{~d}-\mathrm{me} 62$ | - | $100,100,100,100$, <br> $100,100,100,100$ | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{te} 62$ | - | $100,100,100,100$, <br> $100,100,100,100$ | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gce} 62$ | - | $1000,0,1000.0$, <br> $1000.0,1000.0$, <br> $1000.0,1000.0$, <br> $1000.0,1000.0 .$. | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gse} 62$ | - | $1000.0,1000.0$, <br> $1000.0,1000.0$, <br> $1000.0,1000.0$, <br> $1000.0,1000.0 \ldots$ | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{te} 82$ | - | $100,100,100,100$, <br> $100,100,100,100 \ldots$ | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{me} 82$ | - | $100,100,100,100$, <br> $100,100,100,100 \ldots$ | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gce} 82$ | - | $100,100,100,100$, <br> $100,100,100,100$ | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| $828 \mathrm{~d}-$ gse82 | - | $100,100,100,100$, <br> $100,100,100,100$ | $1 . \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |

Description:
The jerk limit value limits the rate of change of axis acceleration in JOG and REF modes as well as in positioning axis mode with MD18960 \$MN_POS_DYN_MODE=0.
The setting and time calculation are made as for MD20600 \$MC_MAX_PATH_JERK (pathrelated maximum jerk).
Not relevant for:

- Path interpolation
- Error states that lead to quick stop.

Related to:
MD32420 \$MA_JOG_AND_POS_JERK_ENABLE (initial setting of axial jerk limitation)
MD18960 \$MN_POS_DYN_MODE

| 32431 | MAX_AX_JERK |  |  | A04 | B1, B2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{s}^{3}, \mathrm{rev} / \mathrm{s}^{3}$ | Maximum axial jerk for path movement |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 5 | $\begin{aligned} & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-te42 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & \text { 40., 40., 40., 20., 20., } \\ & \text { 1.e6, 1.e6, 1.... } \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-gce42 | 5 | $\begin{aligned} & \text { 40., } 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 1 . e 6,1 . e 6,1 . . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | I |
| 828d-gse42 | 5 | $\begin{aligned} & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | I |
| 828d-me62 | 5 | $\begin{aligned} & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-te62 | 5 | $\begin{aligned} & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 1 . e 6,1 . e 6,1 . . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | I |
| 828d-gce62 | 5 | $\begin{aligned} & \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ & \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ & \text { 1.e6, 1.e6, 1.e6... } \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | I |


| 828d-gse62 | 5 | $\begin{array}{\|l} \hline \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ \text { 1.e6, 1.e6, 1.e6... } \\ \hline \end{array}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | I |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-te82 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & \text { 1.e6, 1.e6, 1.... } \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-me82 | 5 | $\begin{aligned} & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 . \text {., } \\ & 40 ., 40 ., 40 ., . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | I |
| 828d-gce82 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 1 . e 6,1 . e 6,1 . . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-gse82 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . . \end{aligned}$ | 1.e-9 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |

## Description:

Maximum axial jerk for path motion
Each field element corresponds to a G code in the 59th G code group.

| 32432 | PATH_TRANS_JERK_LIM |  |  | A04 | B1, B2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{s}^{3}, \mathrm{rev} / \mathrm{s}^{3}$ | Maximum axial jerk at block transition in continuous-path mode |  |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-te42 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & \text { 1.e6, 1.e6, 1.... } \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-gce42 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 1 . e 6,1 . e 6,1 . . . \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-gse42 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . . \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-me62 | 5 | $\begin{aligned} & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-te62 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & \text { 1.e6, 1.e6, 1.... } \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-gce62 | 5 | $\begin{aligned} & \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ & \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ & \text { 1.e6, 1.e6, 1.e6... } \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-gse62 | 5 | $\begin{aligned} & \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ & \text { 1.e6, 1.e6, 1.e6, 1.e6, } \\ & \text { 1.e6, 1.e6, 1.e6... } \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | I |
| 828d-te82 | 5 | $\begin{aligned} & \text { 40., 40., 40., 20., 20., } \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & \text { 1.e6, 1.e6, 1.... } \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | I |
| 828d-me82 | 5 | $\begin{aligned} & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., 20 ., 20 ., \\ & 40 ., 40 ., 40 ., . . \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | I |

### 4.3 Axis-specific NC machine data

| $828 \mathrm{~d}-\mathrm{gce} 82$ | 5 | 40., 40., 40., 20., 20., <br> 40., 40., 40., 20., 20., <br> $1 . e 6,1 . e 6,1 . .$. | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | 1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 d-$ gse82 | 5 | $40 ., 40 ., 40 ., 20 ., 20 .$, <br> 40., 40., 40., 20., 20., <br> 40., 40., 40.,.. | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | 1 |

Description: The control limits the jerk (acceleration jump) at a block transition between contour sections of different curvature to the value set with active jerk limitation. Not relevant for:

Exact stop
There is an entry for each $G$ code from the $59 t h \mathrm{G}$ code group (dynamic $G$ code group).
Related to:
Path control, SOFT type of acceleration

| 32433 | SOFT_ACCEL_FACTOR | A04 | TE9, B1, B2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Scaling of acceleration limitation with SOFT | DOUBLE | NEW CONF |  |  |  |
| - | 3 |  |  |  |  |  |
| - | 5 | $1 ., 1 ., 1 ., 1 ., 1$. | $1 \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $3 / 3$ |  |

Description: $\begin{array}{ll}\text { Scaling of acceleration limitation with SOFT. } \\ & \text { Relevant axial acceleration limitation for SOFT =: }\end{array}$
(MD32433 \$MA_SOFT_ACCEL_FACTOR[..] * MD32300 \$MA_MAX_AX_ACCEL[..])
Each field element corresponds to a G code in the 59th G code group.

| 32434 | G00_ACCEL_FACTOR | A04 | TE9, B1, B2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Scaling of acceleration limitation with G00. | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1. | $1 \mathrm{e}-9$ | $1.0 \mathrm{E}+301$ | $3 / 3$ |  |

## Description:

Scaling of the acceleration limitation with GOO.
Relevant axial acceleration limitation for GOO =:
(MD32433 \$MA_G00_ACCEL_FACTOR[..] * MD32300 \$MA_MAX_AX_ACCEL[..])

| 32435 | G00_JERK_FACTOR | A04 | B1, B2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Scaling of jerk limitation with G00. | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1. | 1 e-9 | $1.0 \mathrm{E}+301$ | $3 / 3$ |  |

Description: Scaling of the jerk limitation with G00.
Relevant axial jerk limitation for $G 00=$ :
(MD32435 \$MA_G00_JERK_FACTOR[..] * MD32431 \$MA_MAX_AX_JERK[..])


| $828 \mathrm{~d}-\mathrm{gce} 42$ | 5 | $3000,3000,3000$, <br> $3000,3000,300$, <br> $300,3000,3000$, | 0.0 | $1.0 \mathrm{E}+301$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $3000,3000 \ldots$ |  |  |  |  |, | $2 / 2$ |
| :--- |

Description: $\begin{aligned} & \text { Velocity at and above which the permissible jerk of an axis in } \\ & \text { fashion. } \\ & \text { Jerk adjustment only becomes active if MD32439 \$MA_MAX_AX_JERK } \\ & \\ & \text { There is an entry for each dynamic G code group. } \\ & \text { See also MD32438 \$MA_AX_JERK_VEL1 and \$MA_MAX_AX_JERK_FACTOR. }\end{aligned}$

| 32438 | AX_JERK_VEL1 |  |  | A04 | B1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$, rev/min | Velocity threshold for linear jerk adjustment |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 5 | $\begin{aligned} & \text { 6000, 6000, 6000, } \\ & 6000,6000,6000 \\ & 6000,6000,6000 \\ & 6000,6000 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |
| 828d-te42 | 5 | $\begin{aligned} & \text { 6000, 6000, 6000, } \\ & 6000,6000,6000 \\ & 6000,6000,6000 \\ & 6000,6000 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | 1 |

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| 828d-gce42 | 5 | $6000,6000,6000$, <br> $600,6000,600$, <br> $600,6000,600$, | 0.0 | $1.0 \mathrm{E}+301$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $6000,6000 \ldots$ |  |  |  |  |, | $2 / 2$ |
| :--- |

Description: Velocity at and above which the permissible jerk of an axis switches from increasing in a linear fashion
to the saturation defined in MD32439 \$MA_MAX_AX_JERK_FACTOR.
The value of this velocity must be greater than the value set with MD32437 \$MA_AX_JERK_VELO.
Jerk adjustment becomes active only if MD32439 \$MA_MAX_AX_JERK_FACTOR is > 1.0 .
There is an entry for each dynamic $G$ code group.
See also MD32437 \$MA_AX_JERK_VELO and MD32439 \$MA_MAX_AX_JERK_FACTOR

| 32439 | MAX_AX_JERK_FACTOR | A04 | B1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Factor for jerk adjustment at high velocities | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 5 | $1.0,1.0,1.0,1.0,1.0$ | 1.0 | $1.0 \mathrm{E}+301$ |  |  |

Description: Factor for setting adaptive jerk adjustment for an axis.
Jerk adjustment becomes active only if the value of this MD is greater than 1.

```
The speed-dependent axial jerk is only used for defining the maximum path velocity and does not affect the maximum path acceleration and maximum path jerk. Therefore, speeddependent jerk adaptation only affects traversing that includes geometric torsion (change of the curvature). Both the curvature and torsion of linear movements are zero, and jerk adaptation has no effect.
There is an entry for each dynamic G code group.
See also MD32437 \$MA_AX_JERK_VEL0 and MD32438 \$MA_AX_JERK_VEL1.
```

| 32440 | LOOKAH_FREQUENCY | EXP, A04 | B1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Smoothing frequency for LookAhead |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 10. | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: Acceleration procedures in continuous-path mode with LookAhead which execute with a higher frequency than that parameterized in this MD are smoothed as a function of the parameterization in MD20460 \$MC_LOOKAH_SMOOTH_FACTOR.
It is always the minimum of all the axes participating in the path which is determined. If vibrations are aroused in the mechanics of this axis and if their frequency is known, then this MD should be set to a lower value than this frequency.

| 32450 | BACKLASH | A09 | K3, G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm, degrees | Backlash | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $0.0,0.0$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description: Backlash on reversal between positive and negative travel directions. Input of the compensation value is

- positive, if the encoder is leading the machine part (normal situation)
- negative, if the encoder is behind the machine part.

Backlash compensation is not active when 0 is entered.
Backlash compensation is always active after reference point approach in all operating modes.

Special cases:
A specific backlash on reversal must be entered for each measuring system.
Related to:
MD30200 \$MA_NUM_ENCS (number of measuring systems)
MD36500 \$MA_ENC_CHANGE_TOL
(Maximum tolerance at actual position value change)

| 32452 | BACKLASH_FACTOR |  |  | A09 | K3, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Evaluation factor for backlash |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | 6 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0 \end{aligned}$ | 0.01 | 100.0 | 2/2 | I |

Description:
Evaluation factor for backlash.
The machine data enables the backlash defined in MD32450 \$MA_BACKLASH to be changed as a function of the parameter set, in order to take a gear stage dependent backlash into account, for example.
Related to:
MD32450 \$MA_BACKLASH[n]
4.3 Axis-specific NC machine data



| 32456 | BACKLASH_DYN | A09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Compensation value of dynamic backlash compensation |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | 2 | $0.0,0.0$ | - | - | $2 / 2$ |  |  |  |

## Description:

Compensation value for dynamic backlash compensation value
The entry of the compensation value is

- positive if the encoder leading the machine part (normal case)
- negative if the encoder is following the machine part.

Backlash compensation becomes ineffective if 0 is entered.
The dynamic backlash compensation can only be activated after the reference point approach. Activation takes place via PLC user interface signals.
Special cases:
A separate compensation value must be entered for each measuring system.
Corresponds to:
MD32457 \$MA_BACKLASH_DYN_MAX_VELO
(limitation of the compensation value change)
MD32000 \$MA_MAX_AX_VELO
(maximum axis velocity)
MD30200 \$MA_NUM_ENCS
(number of measuring systems)
MD30200 \$MA_NUM_ENCS (number of measuring systems)

| 32457 | BACKLASH_DYN_MAX_VELO | A09 | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\%$ | Limitation of dynamic backlash compensation value change |  |  |  |  |  | DOUBLE | NEW CONF |  |
| - | - | 1.0 | - | - | $2 / 2$ |  |  |  |  |
| - | - |  |  |  |  |  |  |  |  |



| 32490 | FRICT_COMP_MODE | A09 | K3 |  |
| :---: | :---: | :---: | :---: | :---: |
| - | Type of friction compensation | BYTE | PowerOn |  |
| - |  |  |  |  |
| - | 1 1 0 | 4 | 2/2 | I |
| Description: | 0: No friction compensation |  |  |  |
|  | 1: Friction compensation with constant injected value or adaptive characteristic |  |  |  |
|  | 2: Friction compensation with | teris | u |  |
|  | 3: Friction compensation with adaptive characteristics, injection time depends on velocity setpoint |  |  |  |
|  | 4: Friction compensation with adaptive characteristics, injection time depends on position controller output |  |  |  |
|  | Not relevant for: |  |  |  |
|  | MD32500 \$MA_FRICT_COMP_ENABLE = 0 |  |  |  |
|  | Modes 1 and 2 related to: |  |  |  |
|  | MD32490 \$MA_FRICT_COMP_MODE |  |  |  |
|  | MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE |  |  |  |
|  | MD32520 \$MA_FRICT_COMP_CONST_MAX |  |  |  |
|  | MD32540 \$MA_FRICT_COMP_TIME |  |  |  |
|  | MD38010 \$MA_MM_QEC_MAX_POINTS |  |  |  |
|  | Modes 3 and 4 related to: |  |  |  |
|  | MD32571 \$MA_FRICT_VELO_STEP |  |  |  |
|  | MD32572 \$MA_FRICT_V_PULSE_DELAY_TIME |  |  |  |
|  | MD32573 \$MA_FRICT_V_PULSE_CONST_TIME |  |  |  |
|  | MD32574 \$MA_FRICT_V_PULSE_DECAY_TIME |  |  |  |
|  | MD32575 \$MA_FRICT_V_PULSE_SMOOTH_TIME |  |  |  |
|  | MD32576 \$MA_FRICT_TORQUE_STEP |  |  |  |
|  | MD32577 \$MA_FRICT_T_PULSE_DELAY_TIME |  |  |  |
|  | MD32578 \$MA_FRICT_T_PULSE_SMOOTH_TIME |  |  |  |
|  | MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL |  |  |  |
|  | MD32582 \$MA_FRICT_ADAPT_V_STEP_PLUS |  |  |  |
|  | MD32583 \$MA_FRICT_ADAPT_V_STEP_MINUS |  |  |  |
|  | MD32584 \$MA_FRICT_ADAPT_V_CONST_PLUS |  |  |  |
|  | MD32585 \$MA_FRICT_ADAPT_V_CONST_MINUS |  |  |  |
|  | MD32586 \$MA_FRICT_ADAPT_V_DECAY_PLUS |  |  |  |
|  | MD32587 \$MA_FRICT_ADAPT_V_DECAY_MINUS |  |  |  |
|  | MD32588 \$MA_FRICT_ADAPT_T_STEP |  |  |  |


| 32500 | FRICT_COMP_ENABLE |  | A09 | K3, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Friction compensation active |  | BOOLEAN | NEW |  |
| - |  |  |  |  |  |
| - | FALSE | 0 | - | 2/2 | I |



| 32520 | FRICT_COMP_CONST_MAX |  |  |  |  |  | EXP, A09 | K3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$, rev/min | Maximum friction compensation value |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | 1 | 0.0 | -MD_DBLMAX | 1.0 E+301 | $2 / 2$ |  |  |  |

Description: If adaptation is inactive (MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE=0), the maximum friction compensation is applied throughout the entire acceleration range.

If adaptation is active (MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE=1), the maximum friction compensation is applied in accordance with the adaptation curve.

In the 1st acceleration range ( a < MD32550), the switching amplitude = MD32520 * (a/MD32550).
In the 2nd acceleration range (MD32550 <= a <= MD32560), the switching amplitude = MD32520.
In the 3rd acceleration range (MD32560 < a < MD32570), the switching amplitude = MD32520 + (MD32530-MD32520)/(MD32570-MD32560) * (a - MD32560).
In the 4 th acceleration range (MD32570 < , the switching amplitude = MD32530.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 2 (neural QEC)
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE
Friction compensation active
MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE
Friction compensation adaptation active
MD32530 \$MA_FRICT_COMP_CONST_MIN
Minimum friction compensation value
MD32550 \$MA_FRICT_COMP_ACCEL1
Adaptation acceleration value 1
MD32560 \$MA_FRICT_COMP_ACCEL2
Adaptation acceleration value 2
MD32570 \$MA_FRICT_COMP_ACCEL3
Adaptation acceleration value 3
MD32540 \$MA_FRICT_COMP_TIME
Friction compensation time constant

| 32530 | FRICT_COMP_CONST_MIN |  |  |  |  |  | EXP, A09 | K3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}, \mathrm{rev} / \mathrm{min}$ | Minimum friction compensation value |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | 1 | 0.0 | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: The minimum friction compensation value is active only if "Friction compensation with adaptation" (MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE=1) is active.
The amplitude of the friction compensation value is entered in the 4 th acceleration range (MD32570 \$MA_FRICT_COMP_ACCEL3 <= a).
MD irrelevant for:
MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 2 (neural QEC)
Special cases:
In special cases, the value for $\operatorname{FRICT}$ _COMP_CONST_MIN may be even higher than for MD32520 \$MA_FRICT_COMP_CONST_MAX.
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE
Friction compensation active
MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE
Friction compensation adaptation active
MD32520 \$MA_FRICT_COMP_CONST_MAX
Maximum friction compensation value
MD32550 \$MA_FRICT_COMP_ACCEL1

### 4.3 Axis-specific NC machine data

```
Adaptation acceleration value 1
MD32560 $MA_FRICT_COMP_ACCEL2
Adaptation acceleration value 2
MD32570 $MA_FRICT_COMP_ACCEL3
Adaptation acceleration value 3
MD32540 $MA_FRICT_COMP_TIME
Friction compensation time constant
```

| 32540 | FRICT_COMP_TIME |  |  |  |  |  |  | EXP, A09 | K3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| s | Friction compensation time constant | DOUBLE | NEW CONF |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 1 | 0.015 | 0.0 | $1.0 E+301$ |  |  |  |  |  |

Description:
The friction compensation value is entered via a DT1 filter.
The add-on amplitude decays in accordance with the time constant.
MD irrelevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE
Friction compensation active
MD32520 \$MA_FRICT_COMP_CONST_MAX
Maximum friction compensation value

| 32550 | FRICT_COMP_ACCEL1 |  |  |  |  |  | EXP, A09 | K3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{s}^{2}, \mathrm{rev} / \mathrm{s}^{2}$ | Adaptation acceleration value 1 | DOUBLE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 1 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description:
The adaptation acceleration value is only required if "Friction compensation with adaptation" (MD32510=1) is active.

The adaptation acceleration values 1 to 3 are interpolation points for defining the adaptation curve. The adaptation curve is subdivided into 4 ranges, in each of which a different friction compensation value applies.
For the 1st range ( $a<\operatorname{MD} 3255$ ), the add-on amplitude $=a * M D 32520 /$ MD32550
MD irrelevant for:
MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE
Friction compensation active
MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE
Friction compensation adaptation active
MD32520 \$MA_FRICT_COMP_CONST_MAX
Maximum friction compensation value
MD32530 \$MA_FRICT_COMP_CONST_MIN
Minimum friction compensation value
MD32560 \$MA_FRICT_COMP_ACCEL2
Adaptation acceleration value 2
MD32570 \$MA_FRICT_COMP_ACCEL3
Adaptation acceleration value 3
MD32540 \$MA_FRICT_COMP_TIME

Friction compensation time constant

| 32560 | FRICT_COMP_ACCEL2 | EXP, A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{m} / \mathrm{s}^{2}, \mathrm{rev}^{2} / \mathrm{s}^{2}$ | Adaptation acceleration value 2 | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 1 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |

Description:
The adaptation acceleration value is only required if "Friction compensation with adaptation" (MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE=1) is active.
Adaptation acceleration values 1 to 3 are interpolation points for defining the adaptation curve. The adaptation curve is subdivided into 4 ranges, in each of which a different friction compensation value applies.
In the 1st acceleration range ( $\quad$ ( MD32550), the switching amplitude = MD32520 * (a/MD32550).
In the 2nd acceleration range (MD32550 <= a <= MD32560), the switching amplitude = MD32520.
In the 3rd acceleration range (MD32560 < a < MD32570), the switching amplitude = MD32520 + (MD32530-MD32520) /(MD32570-MD32560) * (a - MD32560).

In the 4th acceleration range (MD32570 <= a the switching amplitude = MD32530.
Not relevant for:
MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE
Friction compensation active
MD32510 \$MA_FRICT_COMP_ADAPT_ENABLE
Friction compensation adaptation active
MD32520 \$MA_FRICT_COMP_CONST_MAX
Maximum friction compensation value
MD32530 \$MA_FRICT_COMP_CONST_MIN
Minimum friction compensation value
MD32550 \$MA_FRICT_COMP_ACCEL1
Adaptation acceleration value 1
MD32570 \$MA_FRICT_COMP_ACCEL3
Adaptation acceleration value 3
MD32540 \$MA_FRICT_COMP_TIME
Friction compensation time constant

| 32570 | FRICT_COMP_ACCEL3 | EXP, A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{m} / \mathrm{s}^{2}, \mathrm{rev} / \mathrm{s}^{2}$ | Adaptation acceleration value 3 | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 1 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description: The adaptation acceleration value is only required if "Friction compensation with adaptation" (MD32510=1) is active.

Adaptation acceleration values 1 to 3 are interpolation points for defining the adaptation curve. The adaptation curve is subdivided into 4 ranges, in each of which a different friction compensation value applies.
In the 1st acceleration range ( $\quad$ < MD32550), the switching amplitude = MD32520 * (a/MD32550).

In the 2nd acceleration range (MD32550 <= a <= MD32560), the switching amplitude = MD32520.

```
In the 3rd acceleration range (MD32560 < a < MD32570), the switching amplitude =
MD32520 + (MD32530-MD32520)/(MD32570-MD32560) * (a - MD32560).
In the 4th acceleration range (MD32570 <= a ), the switching amplitude =
MD32530.
Not relevant for:
MD32510 $MA_FRICT_COMP_ADAPT_ENABLE = 0
MD32490 $MA_FRICT_COMP_MODE = 2
Related to:
MD32500 $MA_FRICT_COMP_ENABLE
Friction compensation active
MD32510 $MA_FRICT_COMP_ADAPT_ENABLE
Friction compensation adaptation active
MD32520 $MA_FRICT_COMP_CONST_MAX
Maximum friction compensation value
MD32530 $MA_FRICT_COMP_CONST_MIN
Minimum friction compensation value
MD32550 $MA_FRICT_COMP_ACCEL1
Adaptation acceleration value 1
MD32560 $MA_FRICT_COMP_ACCEL2
Adaptation acceleration value 2
MD32540 $MA_FRICT_COMP_TIME
Friction compensation time constant
```

| 32571 | FRICT_VELO_STEP |  |  |  |  |  | EXP, A09 | K3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}, \mathrm{rev} / \mathrm{min}$ | Amplitude of the velocity injection pulse of the friction <br> compensation | DOUBLE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 E+301$ |  |  |  |  |

The amplitude of the velocity injection pulse of the friction compensation is adapted as a function of the acceleration via weighting factors from the characteristics.

Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32490 \$MA_FRICT_COMP_MODE = 3/4
MD32582 \$MA_FRICT_ADAPT_V_STEP_PLUS
MD32583 \$MA_FRICT_ADAPT_V_STEP_MINUS


Description: The velocity injection pulse of the friction compensation is delayed by this time. The delay time is not adapted and is limited to 16 position controller cycles.

Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:

```
MD32500 $MA_FRICT_COMP_ENABLE = 1
MD32490 $MA_FRICT_COMP_MODE = 3/4
MD10050 $MN_SYSCLOCK_CYCLE_TIME
MD10060 $MN_POSCTRL_SYSCLOCK_TIME_RATIO
```

| 32573 | FRICT_V_PULSE_CONST_TIME | EXP, A09 | K3 |  |
| :---: | :---: | :---: | :---: | :---: |
| s | Active time of the velocity injection pulse of the friction compensation | DOUBLE | NEW CONF |  |
| - |  |  |  |  |
| - | 0.0 0 | 10.0 | 2/2 | 1 |
| Description: | The active time of the velocity injection pulse of the friction compensation is adapted as a function of the acceleration via weighting factors from the characteristics. |  |  |  |
|  | Not relevant for: |  |  |  |
|  | MD32500 \$MA_FRICT_COMP_ENABLE $=0$ |  |  |  |
|  | MD32490 \$MA_FRICT_COMP_MODE $=1 / 2$ |  |  |  |
|  | Related to: |  |  |  |
|  | MD32500 \$MA_FRICT_COMP_ENABLE $=1$ |  |  |  |
|  | MD32490 \$MA_FRICT_COMP_MODE $=3 / 4$ |  |  |  |
|  | MD32584 \$MA_FRICT_ADAPT_V_CONST_PLUS |  |  |  |
|  | MD32585 \$MA_FRICT_ADAPT_V_CONST_MINUS |  |  |  |


| 32574 | FRICT_V_PULSE_DECAY_TIME | EXP, A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Decay time of the velocity injection pulse of the friction <br> compensation | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.0 | 0 | 10.0 | $2 / 2$ |  |

Description: | The decay time of the velocity injection pulse of the friction compensation is |
| :--- |
| smoothed and adapted as a function of the acceleration via weighting factors from the |
|  |
| characteristics. |
|  |
| Not relevant for: |
|  |
|  |
|  |
|  |
|  |

| 32575 | FRICT_V_PULSE_SMOOTH_TIME | EXP, A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Rise time of the velocity injection pulse of the friction compensation | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.0 | 0 | 10.0 | $2 / 2$ |  |

Description: The rise time of the velocity injection pulse of the friction compensation. The rise time is smoothed and is not adapted.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE $=1 / 2$
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1

### 4.3 Axis-specific NC machine data

```
MD32490 $MA_FRICT_COMP_MODE = 3/4
MD32571 $MA_FRICT_VELO_STEP
MD32573 $MA_FRICT_V_PULSE_CONST_TIME
MD32574 $MA_FRICT_V_PULSE_DECAY_TIME
```

| 32576 | FRICT_TORQUE_STEP |  |  |  |  |  | EXP, A09 | K3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Amplitude of the torque injection pulse of the friction compensation |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 E+301$ |  |  |  |  |

Description: The amplitude of the torque injection pulse of the friction compensation is adapted as a function of the acceleration via weighting factors from the characteristics.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32490 \$MA_FRICT_COMP_MODE = 3/4
MD32588 \$MA_FRICT_ADAPT_T_STEP

| 32577 | FRICT_T_PULSE_DELAY_TIME | EXP, A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Delay time of the torque injection pulse of the friction compensation | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.0 | 0 | 0.1 | I |  |

Description:
The torque injection pulse of the friction compensation is delayed by this time. The delay time is not adapted and is limited to 16 position controller cycles.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32490 \$MA_FRICT_COMP_MODE = 3/4
MD10050 \$MN_SYSCLOCK_CYCLE_TIME
MD10060 \$MN_POSCTRL_SYSCLOCK_TIME_RATIO

| 32578 | FRICT_T_PULSE_SMOOTH_TIME | EXP, A09 | K3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Rise time of the torque injection pulse of the friction compensation |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0 | 10.0 |  |  |  |  |

Description: The rise time of the torque injection pulse of the friction compensation. The rise time is smoothed and is not adapted.

Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32576 \$MA_FRICT_TORQUE_STEP = 1


| 32580 | FRICT_COMP_INC_FACTOR |  |  |  |  |  | A09 | K3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Weighting of friction compensation value with short travel motions. |  |  |  |  |  | DOUBLE | NEW CONF |
| - | 1 | 0.0 | 0 | 100.0 | $7 / 2$ |  |  |  |$]$ I

Description:
The optimum friction compensation value determined by the circularity test can cause overcompensation of this axis if compensation is activated and axial positioning movements are short.

In such cases, a better setting can be achieved by reducing the amplitude of the friction compensation value and acts on all positioning blocks that are made within an interpolation cycle of the control.
The factor that has to be entered can be determined empirically and can be different from axis to axis because of the different friction conditions. The input range is between 0 and $100 \%$ of the value determined by the circularity test.
The default setting is 0 ; so that no compensation is performed for short traversing movements.
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE Friction compensation active

| 32581 | FRICT_ADAPT_TABLE_ACCEL |  |  | EXP, A09 | K3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{s}^{2}, \mathrm{rev} / \mathrm{s}^{2}$ | Acceleration interpolation points of friction compensation characteristics |  |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |  |
| - | 10 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0,0.0,0.0 \\ & \hline \end{aligned}$ | 0 | 1000000.0 | 2/2 | 1 |

Description:
Up to ten different acceleration values can be input for which the friction compensation values are to be adapted. The acceleration values must be entered in strictly monotonously increasing order. The first acceleration value must always be zero. A final acceleration value equal to zero reduces the number of adaptation interpolation points.
The following friction compensation values are adapted as a function of the acceleration:

- Amplitude of the velocity injection pulse
- Active time of the velocity injection pulse
- Decay time of the velocity injection pulse
- Amplitude of the torque injection pulse

Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32490 \$MA_FRICT_COMP_MODE = 3/4
MD32582 \$MA_FRICT_ADAPT_V_STEP_PLUS
MD32583 \$MA_FRICT_ADAPT_V_STEP_MINUS
MD32584 \$MA_FRICT_ADAPT_V_CONST_PLUS
MD32585 \$MA_FRICT_ADAPT_V_CONST_MINUS
MD32586 \$MA_FRICT_ADAPT_V_DECAY_PLUS
MD32587 \$MA_FRICT_ADAPT_V_DECAY_MINUS
MD32588 \$MA_FRICT_ADAPT_T_STEP

| 32582 | FRICT_ADAPT_V_STEP_PLUS | EXP, A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Weighting factor for the amplitude of the velocity injection pulse | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$ | -1.0 | 1.0 | $2 / 2$ |  |

Description:
A factor between -1.0 and 1.0 can be entered for each acceleration value from MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL with which the amplitude of the velocity injection pulse of the friction compensation is weighted. The weighting factors are active on sign change of the velocity in the positive direction.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32490 \$MA_FRICT_COMP_MODE = 3/4
MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL
MD32571 \$MA_FRICT_VELO_STEP

| 32583 | FRICT_ADAPT_V_STEP_MINUS | EXP, A09 | K3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Weighting factor for the amplitude of the velocity injection pulse |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | 10 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$ | -1.0 | 1.0 | $2 / 2$ |  |  |  |

## Description:

A factor between -1.0 and 1.0 can be entered for each acceleration value from MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL with which the amplitude of the velocity injection pulse of the friction compensation is weighted. The weighting factors are active on sign change of the velocity in the negative direction.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32490 \$MA_FRICT_COMP_MODE = 3/4
MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL
MD32571 \$MA_FRICT_VELO_STEP


| 32585 | FRICT_ADAPT_V_CONST_MINUS | EXP, A09 | K3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Weighting factor for the active time of the velocity injection pulse |  |  |  |  |  | DOUBLE | NEW CONF |
| - | 10 | $\begin{array}{l}0.0,0.0,0.0,0.0,0.0, \\ 0.0,0.0,0.0,0.0,0.0\end{array}$ | 0 | 1.0 | $2 / 2$ |  |  |  |$]$| I |
| :--- |
| - |

Description:
A factor between 0.0 and 1.0 can be entered for each acceleration value from MD32581 \$MA_FRICT ADAPT TABLE_ACCEL with which the active time of the velocity injection pulse of $\bar{t}$ he friction compensation is weighted. The weighting factors are active on sign change of the velocity in the negative direction.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1

### 4.3 Axis-specific NC machine data

```
MD32490 $MA_FRICT_COMP_MODE = 3/4
MD32581 $MA_FRICT_ADAPT_TABLE_ACCEL
MD32573 $MA_ FRICT_V_ PULSE_CONST_TIME
```

| 32586 | FRICT_ADAPT_V_DECAY_PLUS | EXP, A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Weighting factor for the decay time of the velocity injection pulse | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$ | 0 | 1.0 | $2 / 2$ |  |

Description:
A factor between 0.0 and 1.0 can be entered for each acceleration value from MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL with which the decay time of the velocity injection pulse of the friction compensation is weighted. The weighting factors are active on sign change of the velocity in the positive direction.
Not relevant for:
MD32500 \$MA_FRICT_COMP_ENABLE = 0
MD32490 \$MA_FRICT_COMP_MODE = 1/2
Related to:
MD32500 \$MA_FRICT_COMP_ENABLE = 1
MD32490 \$MA_FRICT_COMP_MODE = 3/4
MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL
MD32574 \$MA_ FRICT_V_PULSE_DECAY_TIME


| 32588 | FRICT_ADAPT_T_STEP | EXP, A09 | K3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Weighting factor for the amplitude of the torque injection pulse |  |  |  |  |  | DOUBLE | NEW CONF |
| - | 10 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$ | -1.0 | 1.0 | $2 / 2$ |  |  |  |

## Description:

[^12]```
Related to:
MD32500 $MA_FRICT_COMP_ENABLE = 1
MD32490 $MA_FRICT_COMP_MODE = 3/4
MD32581 $MA_FRICT_ADAPT_TABLE_ACCEL
MD32576 $MA_ FRICT_TORQUE_STEP
```

| 32610 | VELO_FFW_WEIGHT |  | A07, A09 | G1, TE1, K3, S3, A3, G2, S1, V1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Feedforward control factor f. velocity/speed feedforward control |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | 6 $1.0,1.0,1.0,1.0,1.0$, <br> 1.0 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |

Weighting factor for feedforward control. Is normally $=1.0$ on digital drives, since these keep the setpoint speed exactly .
On analog drives, this factor can be used to compensate the gain error of the drive actuator, so that the actual speed becomes exactly equal to the setpoint speed (this reduces the following error with feedforward control).
On both drive types, the effect of the feedforward control can be continuously reduced with a factor of <1.0, if the machine moves too abruptly and other measures (e.g. jerk limitation) are not to be used. This also reduces possibly existing overshoots; however, the error increases on curved contours, e.g. on a circle. With 0.0, you have a pure position controller without feedforward control.
Contour monitoring takes into account factors < 1.0 .
In individual cases, it can, however, become necessary to increase MD CONTOUR_TOL.

| 32620 | FFW_MODE |  | A07, A09 | G1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Feedforward control mode |  | BYTE | Res |  |
| - |  |  |  |  |  |
| - | 3 | 0 | 4 | 1/1 | M |

## Description:

FFW_MODE defines the feedforward control mode to be applied on an axis-specific basis:
$0=$ No feedforward control
1 = Speed feedforward control with PT1 balancing
2 = Torque feedforward control (only for SINAMICS) with PT1 balancing
3 = Speed feedforward control with Tt balancing
4 = Torque feedforward control (only for SINAMICS) with Tt balancing
The high-level language instructions FFWON and FFWOF are used to activate and deactivate feedforward control for specific channels on all axes.

To prevent feedforward control from being affected by these instructions on individual axes, you can define that it is always activated or always deactivated in machine data FFW_ACTIVATION_MODE (see also FFW_ACTIVATION_MODE).
If a feedforward control mode is selected (speed or torque feedforward control), MD32630 \$MA_FFW_ACTIVATION_MODE can be used to program in addition whether feedforward control can be activated or deactivated by the part program.
Note for SINAMICS drives with torque feedforward control selected:
Alarm 26016 refers to the current machine data if
the telegram used (see MD13060 \$MN_DRIVE_TELEGRAM_TYPE) does not support the torque feedforward control function. Remedy: Use telegram 136.
Related to:
MD32630 \$MA_FFW_ACTIVATION_MODE
MD32610 \$MA_VELO_FFW_WEIGHT
MD32650 \$MA_AX_INERTIA

### 4.3 Axis-specific NC machine data



## Description:

MD32630 \$FFW_ACTIVATION_MODE can be used to define whether the feedforward control for this axis/spindle can be switched on and off by the part program.
$0=$ The feedforward control cannot be switched on or off by the high-level language elements FFWON and FFWOF respectively.
For the axis/spindle, the state specified by MD32620 \$MA_FFW_MODE is therefore always effective.
$1=\quad$ The feedforward control can be switched on and off by the part program with FFWON and FFWOF respectively.
The instruction FFWON/FFWOF becomes active immediately
$2=$ The feedforward control can be switched on and off by the part program with FFWON and FFWOF respectively.
The instruction FFWON/FFWOF does not become active until the next axis standstill
The default setting is specified by the channel-specific MD20150
\$MC_GCODE_RESET_VALUES. This setting is valid even before the first NC block is executed.
Notes:
The last valid state continues to be active even after Reset (and therefore also with JOG) .

As the feedforward control of all axes of the channel is switched on and off by FFWON and FFWOF respectively, MD32630 \$MA_FFW_ACTIVATION_MODE should be set identically for axes interpolating with one naother.
Switching feedforward control on or off while the axis/spindle is traversing may cause compensation operations in the control loop. Interpolating axes are therefore stopped by the part program if such switching operations occur (internal stop Stop G09 is triggered).
Related to:
MD32620 \$MA_FFW_MODE
MD20150 \$MC_GCODE_RESET_VALUES

| 32640 | STIFFNESS_CONTROL_ENABLE |  |  | A01, A07 | TE3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Dynamic stiffness control |  |  | BOOLEAN | NEW |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | 1 | FALSE | 0 | - | 1/1 | M |
| 828d-te42 | 1 | FALSE | 0 | - | 1/1 | M |
| 828d-gce42 | 1 | FALSE | 0 | - | 1/1 | M |


| $828 \mathrm{~d}-\mathrm{gse} 42$ | 1 | FALSE | 0 | - | $1 / 1$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828d-me62 | 1 | FALSE | 0 | - | $1 / 1$ | M |
| 828d-te62 | 1 | FALSE | 0 | - | $1 / 1$ | M |
| 828d-gce62 | 1 | FALSE | 0 | - | $1 / 1$ | M |
| 828d-gse62 | 1 | FALSE | 0 | - | $1 / 1$ | M |
| 828d-te82 | 1 | FALSE | 0 | - | $1 / 1$ | M |
| 828d-me82 | 1 | FALSE | 0 | - | $1 / 1$ | M |
| 828d-gce82 | 1 | TRUE | 0 | - | $1 / 1$ | M |
| 828d-gse82 | 1 | TRUE | 0 | - | $1 / 1$ | M |

Description:
Activate dynamic stiffness control, if bit is set.
Higher servo gain factors are possible if stiffness control is active (MD32200 \$MA_POSCTRL_GAIN).
Notes:
The availability of this function is determined by the drive used (the drive has to support the DSC function).
Note on PROFIdrive drives:
Alarm 26017 refers to this machine data if:
a. The PROFIdrive telegram used (see MD13060 \$MN_DRIVE_TELEGRAM_TYPE) does not support the DSC function or does not contain an encoder $\overline{1}$ (such as Tel. 118), to which the DSC scaling for PZD XERR refers. Remedy: Use a sufficiently powerful telegram which also includes encoder 1 (e.g. Tel. 106, 116).
b. Specifically for SINAMICS drives, if inversion of the encoder signal is parameterized in MD32110 \$MA_ENC_FEEDBACK_POL=-1 with active DSC. Remedy: Remove inversion of the encoder signal from MD32110 \$MA_ENC_FEEDBACK_POL, and enter it in SINAMICS parameter P410 instead.


Description:
Configuration of the dynamic stiffness control (DSC):
$0: \quad$ DSC in drive works with indirect measuring system, i.e. motor measuring system (default scenario).
1: DSC in drive works with direct measuring system.
Notes:
The availability of this function is determined by the drive used (the drive must support the DSC function).
With SINAMICS (P1193 not equal to 0 ), the value of this machine data must be set to 0 .

### 4.3 Axis-specific NC machine data

| 32644 | STIFFNESS_DELAY_TIME |  |  | A01, A07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s | Dynamic stiffness control: Delay |  |  | DOUBLE | PowerOn |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-te42 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-gce42 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-gse42 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-me62 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-te62 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-gce62 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-gse62 | 1 | -0.0015 | -0.02 | 0.02 | 7/2 | M |
| 828d-te82 | 1 | 0.0 | -0.02 | 0.02 | 7/2 | M |
| 828d-me82 | 1 | -0.0015 | -0.02 | 0.02 | $7 / 2$ | M |
| 828d-gce82 | 1 | -0.0015 | -0.02 | 0.02 | 0/0 | S |
| 828d-gse82 | 1 | -0.0015 | -0.02 | 0.02 | 0/0 | S |

Description: Configuration of compensation dead time of the dynamic stiffness control (DSC) with optimized PROFIBUS/PROFINET cycle, unit: seconds

| 32650 | AX_INERTIA | EXP, A07, A09 | G1, K3, S3, G2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| kgm $^{2}$ | Inertia for torque feedforward control |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

## Description: Only with SINAMICS:

Inertia of axis. Used for torque feedforward control.
With torque feedforward control, an additional current setpoint proportional to the torque is directly injected at the input of the current controller. This value is formed using the acceleration and the moment of inertia. The equivalent time constant of the current control loop must be defined for this purpose and entered in MD32800 \$MA_EQUIV_CURRCTRL_TIME.
The total moment of inertia of the axis (drive + load) must also be entered in MD32650 \$MA_AX_INERTIA (total moment of inertia referred to motor shaft according to data supplied by machine manufacturer).
When MD32650 \$MA_AX_INERTIA and MD32800 \$MA_EQUIV_CURRCTRL_TIME are set correctly, the following error is almost zero even during acceleration (check this by looking at the "following error" in the service display).

The torque feedforward control is deactivated if MD32650 \$MA_AX_INERTIA is set to 0. However, because the calculations are performed anyway, torque feedforward control must always be deactivated with MD32620 \$MA_FFW_MODE = 0 or 1 or 3 (recommended). Because of the direct current setpoint injection, torque feedforward control is only possible on digital drives.
MD irrelevant for:
MD32620 \$MA_FFW_MODE = 0 or 1 or 3
Related to:
MD32620 \$MA_FFW_MODE
MD32630 \$MA_FFW_ACTIVATION_MODE
MD32800 \$MA_EQUIV_CURRCTRL_TIME

| 32652 | AX_MASS | EXP, A07, A09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| kg | Axis mass for torque feedforward control |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

## Description:

SINAMICS only:
Mass of axis for torque feedforward control.
The MD is used on linear drives (MD13080 \$MN_DRIVE_TYPE_DP=3) instead of MD32650 \$MA_AX_INERTIA.

| 32700 | ENC_COMP_ENABLE | A09 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Encoder/spindle error compensation. | BOOLEAN | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | FALSE, FALSE | 0 | - | $2 / 2$ |  |

Description: 1: LEC (leadscrew error compensation) is activated for the measuring system. This enables leadscrew and measuring system errors to be compensated.
The function is not enabled internally until the relevant measuring system has been referenced (NC/PLC interface signal DB390x DBX0.4 / .5 (Referenced/synchronized 1 or 2) = 1).
write protect function (compensation values) active.
0 : LEC is not active for the axis/measuring system.
Related to:
MD38000 \$MA_MM_ENC_COMP_MAX_POINTS number of interpolation points with LEC
NC/PLC interface signal DB390x DBX0.4 (Referenced/synchronized 1)
NC/PLC interface signal DB390x DBX0.5 (Referenced/synchronized 2)


## Description:

1: Sag compensation is enabled for this axis.
Inter-axis machine geometry errors (e.g. sag and angularity errors) can be compensated with sag compensation.
The function is not activated until the following conditions have been fulfilled:

- The "Interpolatory compensation" option is set
- The associated compensation tables have been loaded into the NC user memory and enabled (SD41300 \$SN_CEC_TABLE_ENABLE[t] = 1)
- The relevant position measuring system is referenced (NC/PLC interface signal DB390x DBX0.4 / . $5=1$ (Referenced/synchronized 1 or 2)):


### 4.3 Axis-specific NC machine data

```
0: Sag compensation is not enabled for the compensation axis.
Related to:
MD18342 $MN_MM_CEC_MAX_POINTS[t]
Number of interpolation points for sag compensation
SD41300 $SN_CEC_TABLE_ENABLE[t]
Enable evaluation of sag compensation table t
SD41310 $SN_CEC_TABLE_WEIGHT[t]
Weighting factor of the sag compensation table t
NC/PLC interface signal DB390x DBX0.4 / .5
(referenced/synchronized 1 or 2)
```



Description: Compensation data exist in:
0: inch system
1: metric system


```
Description:
    In sag compensation, the absolute value of the total compensation value (sum of
    compensation values of all active compensation relations) is monitored axially with
    machine data value CEC_MAX_SUM.
    If the determined total compensation value is larger than the maximum value, alarm
    2 0 1 2 4 ~ i s ~ t r i g g e r e d . ~ P r o g r a m ~ p r o c e s s i n g ~ i s ~ n o t ~ i n t e r r u p t e d . ~ T h e ~ c o m p e n s a t i o n ~ v a l u e
    output as the additional setpoint is limited to the maximum value.
    MD irrelevant to:
    - MSEC
    - Backlash compensation
    - Temperature compensation
Related to:
MD32710 $MA_CEC_ENABLE
Enable sag compensation
SD41300 $SN_CEC_TABLE_ENABLE[t]
Enable evaluation of sag compensation table t
NC/PLC interface signal DB390x DBX0.4 / . 5
(referenced/synchronized 1 or 2)
```



## Description:

In sag compensation, modification of the total compensation value (sum of the compensation values of all active compensation relations) is limited axially. The maximum change value is defined in this machine data as a percentage of MD32000 \$MA_MAX_AX_VELO (maximum axis velocity).
If the change in the total compensation value is greater than the maximum value, alarm 20125 is output. Program processing is however continued. The path not covered because of the limitation is made up as soon as the compensation value is no longer subject to limitation.
MD irrelevant to:

- MSEC
- Backlash compensation
- Temperature compensation

Related to:
MD32710 \$MA_CEC_ENABLE
Enable sag compensation
MD32000 \$MA_MAX_AX_VELO
Maximum axis velocity
SD41300 \$SN_CEC_TABLE_ENABLE[t]

Enable evaluation of sag compensation table $t$
NC/PLC interface signal DB390x DBX0.4 / . 5
(referenced/synchronized 1 or 2 )

| 32750 | TEMP_COMP_TYPE |  | A09 | K3, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Temperature compensation type |  | UBYTE | Pow |  |
| CTEQ |  |  |  |  |  |
| - | 0 | 0 | 0x7 | 2/2 | M |

Description:
The type of temperature compensation applicable to the machine axis is activated in MD32750 \$MA_TEMP_COMP_TYPE.

A distinction is made between the following types:
Bit $0=0$ :
Position-independent temperature compensation not active
Bit $0=1$ :
Position-independent temperature compensation active
Bit $1=0$ :
Position-dependent temperature compensation not active
Bit $1=1$ :
Position-dependent temperature compensation active
Bit $2=0$ :
Temperature compensation not active in tool direction
Bit 2 = 1 :
Temperature compensation active in tool direction
Related to:
SD43900 \$SA_TEMP_COMP_ABS_VALUE
Position-dependent temperature compensation value
SD43920 \$SA_TEMP_COMP_REF_POSITION
Reference point for position-dependent temperature compensation
SD43910 \$SA_TEMP_COMP_SLOPE
Gradient for position-dependent temperature compensation
MD32760 \$MA_COMP_ADD_VELO_FACTOR
Excessive velocity due to compensation

| 32760 | COMP_ADD_VELO_FACTOR | EXP, A09, A04 | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Excessive velocity due to compensation | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 0.01 | 0. | 0.10 | $2 / 2$ |  |

Description: The maximum distance that can be traversed because of temperature compensation in one IPO cycle can be limited by the axial MD32760 \$MA_COMP_ADD_VELO_FACTOR.
If the resulting temperature compensation value is above this maximum, it is traversed over several IPO cycles. There is no alarm.

The maximum compensation value per IPO cycle is specified as a factor referring to the maximum axis velocity (MD32000 \$MA_MAX_AX_VELO).

The maximum gradient of the temperature compensation tanbmax is also limited with this machine data.
Example of calculation of the maximum gradient tanb(max):

1. Calculation of the interpolator cycle time (see Description of Functions Velocities, Setpoint/Actual Value Systems, Cycle Times (G2))
Interpolator cycle time $=$ Basic system clock rate * factor for interpolation cycle
```
Interpolator cycle time = MD10050 $MN_SYSCLOCK_CYCLE_TIME ^ MD10070
$MN_IPO_SYSCLOCK_TIME_RATIO
Example:
MD10050 $MN_SYSCLOCK_CYCLE_TIME = 0.004 [s]
MD10070 $MN_IPO_SYSCLOCK_TIME_RATIO = 3
-> Interpolator cycle time = 0.004 * 3 = 0.012 [s]
2. Calculation of the maximum velocity increase resulting from a change made to the
temperature compensation parameter DvTmax
DvTmax = MD32000 $MA_MAX_AX_VELO * MD32760 $MA_COMP_ADD_VELO_FACTOR
Example: MD32000 $MA_MAX_AX_VELO = 10 000 [mm/min]
            MD32760 $MA_COMP_ADD_VELO_FACTOR = 0.01
    -> DvTmax = 10 000 * 0.01 = 100 [mm/min]
3. Calculation of the traverse distances per interpolator cycle
                                    0.012
    S1 (at vmax) = 10 000 x --------- = 2.0 [mm]
                                    60
                                    0.012
    ST (at DvTmax) = 100 x --------- = 0.02 [mm]
        6 0
4. Calculation of tanbmax
```



With larger values of SD43910 \$SA_TEMP_COMP_SLOPE, the maximum gradient (here 0.57 degrees) for the position-dependent temperature compensation value is used internally. There is no alarm.
Note:
Any additional excessive velocity resulting from temperature compensation must be taken into account when defining the limit value for velocity monitoring (MD36200 \$MA_AX_VELO_LIMIT) .

MD irrelevant for:
MD32750 \$MA_TEMP_COMP_TYPE = 0, sag compensation, LEC, backlash compensation
Related to:
MD32750 \$MA_TEMP_COMP_TYPE
SD43900 \$SA_TEMP_COMP_ABS_VALUE
SD43910 \$SA_TEMP_COMP_SLOPE
MD32000 \$MA_MAX_AX_VELO
MD36200 \$MA_AX_VELO_LIMIT
MD10070 \$MN_IPO_SYSCLOCK_TIME_RATIO
MD10050 \$MN_SYSCLOCK_CYCLE_TIME

| 32800 | EQUIV_CURRCTRL_TIME |  |  | EXP, A07, A09 | G1, | A3, G2, S1, V1 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s | Equiv. time const. current control loop for feedforward control |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 6 | $\begin{aligned} & 0.0005,0.0005, \\ & 0.0005,0.0005, \\ & 0.0005,0.0005 \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| 828d-te42 | 6 | 0.0005, 0.0005, $0.0005,0.0005$, $0.0005,0.0005$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |

### 4.3 Axis-specific NC machine data

| 828d-gce42 | 6 | 0.0005, 0.0005, 0.0005, 0.0005, $0.0005,0.0005$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gse42 | 6 | 0.0005, 0.0005, 0.0005, 0.0005, 0.0005, 0.0005 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me62 | 6 | $\begin{aligned} & 0.0005,0.0005, \\ & 0.0005,0.0005, \\ & 0.0005,0.0005 \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te62 | 6 | 0.0005, 0.0005, 0.0005, 0.0005, 0.0005, 0.0005 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| 828d-gce62 | 6 | 0.0005, 0.0005, 0.0005, 0.0005, $0.0005,0.0005$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse62 | 6 | $\begin{aligned} & \hline 0.0005,0.0005, \\ & 0.0005,0.0005, \\ & 0.0005,0.0005 \\ & \hline \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| 828d-te82 | 6 | 0.0005, 0.0005, $0.0005,0.0005$, $0.0005,0.0005$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me82 | 6 | $\begin{aligned} & 0.0005,0.0005, \\ & 0.0005,0.0005, \\ & 0.0005,0.0005 \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| 828d-gce82 | 6 | 0.0015, 0.0015, 0.0015, 0.0015, $0.0015,0.0015$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse82 | 6 | 0.0015, 0.0015, 0.0015, 0.0015, $0.0015,0.0015$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |

## Description:

The time constant is used for parameterizing the torque feedforward control and for calculating the dynamic following error model (contour monitoring).

In order to set the torque feedforward control correctly, the equivalent time constant of the current control loop must be determined exactly by measuring the step response of the current control loop.

Closed-loop control free of following errors can be set by inputting negative values when MD32620 \$MA FFW MODE=4 (but positioning overshoots may then occur).

Delay values taken into account automatically by the software internally are thus compensated again until the actually active minimum symmetrizing time "0" is reached.
Any other negative input values have no further effect.
Negative values input when MD32620 \$MA_FFW_MODE=2 are automatically converted internally to the input value "0", which means that they are not active in this case.

Related to:
MD32620 \$MA_FFW_MODE
Type of feedfoward control
MD32650 \$MA_AX_INERTIA
Moment of inertia for torque feedforward control
or MD32652 \$MA_AX_MASS
Axis mass for torque feedforward control
MD36400 \$MA_CONTOUR_TOL
Tolerance band contour monitoring


| 32890 | DESVAL_DELAY_ENABLE |  | A07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axial setpoint phase filter |  | BOOLEAN | NEW CONF |  |
| CTEQ |  |  |  |  |  |
| - | FALSE | - | - | 7/2 | M |

Description:
With the axial setpoint phase filter (deadtime/delay), the phase response can be changed independent of the amplitude response (on the other hand, the conventional jerk filter - refer to MD32402 \$MA_AX_JERK_MODE -influences the amplitude and phase response simultaneously).
1: Setpoint phase filter (delay) is active.
0: Setpoint phase filter (delay) is inactive.
Corresponds with:
MD32895 \$MA_DESVAL_DELAY_TIME (time constant for the axial setpoint phase filter)

| 32895 | DESVAL_DELAY_TIME |  | A07 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Time constant for the axial setpoint phase filter |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |
| - | 0.0 | 0.0 | 1.0E+301 | 7/2 | M |

Description:
The time constant for the phase filter (deadtime/delay) should be entered into the MD.
This means that the actual setpoint phase response can be set independently of the amplitude response

Time constants in the range from 0 up to 64 position controller clock cycles can be set, the phase filter for e.g. 2 ms position controller clock cycle, can delay setpoints by 0 to 128 ms .

### 4.3 Axis-specific NC machine data

```
Values entered outside these limits are implicitly limited to the specified limits
(without alarm).
Note: delays in the setpoint circuit, as a result of the system, slow down or have a
negative impact on the response, e.g. for thread tapping, safety retraction motion or
exact stop/block change; this means that the smallest time constants possible should
be set in the MD.
The MD is only effective, if MD32890 $MA_DESVAL_DELAY_ENABLE = 1.
Corresponds with:
MD32890 $MA_DESVAL_DELAY_ENABLE (axial setpoint phase filter)
```

| 32900 | DYN_MATCH_ENABLE | A07 | G21, S3, G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Dynamic response adaptation | BOOLEAN | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $2 / 2$ |  |$]$ M

## Description:

With dynamic response adaptation, axes with different servo gain factors can be set to the same following error with MD32910 \$MA_DYN_MATCH_TIME.
1: Dynamic response adaptation active.
0: Dynamic response adaptation inactive.
Related to:
MD32910 \$MA_DYN_MATCH_TIME[n]
(time constant of dyamic response adaptation)


Description:

The time constant of the dynamic response adaptation of an axis has to be entered in this MD.
Axes interpolating with each other but having different dynamic responses can be adapted to the "slowest" control loop by means of this value.

The difference of the equivalent time constant of the "slowest" control loop to the individual axis has to be entered here as the time constant of the dynamic response adaptation.
The MD is only active if MD32900 \$MA_DYN_MATCH_ENABLE = 1 .
Related to:
MD32900 \$MA_DYN_MATCH_ENABLE (dynamic response adaptation)


| 828 d -gce82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $1 / 1$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828 d -gse82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $1 / 1$ | M |

## Description:

In the case of PROFIdrive drives (provided that they transport the following drive actual values in the PROFIdrive message frame, e.g. MD13060 \$MN_DRIVE_TELEGRAM_TYPE = 116):

With the main run variables \$AA_LOAD, \$AA_POWER, \$AA_TORQUE, and \$AA_CURR, the following drive actual values cān be measūred:

- Drive utilization
- Drive active power
- Drive torque setpoint value
- Current actual value of the axis or spindle

To compensate any peaks, the measured values can be smoothed with a PT1 filter. The filter time constant is defined with MD32920 \$MA_AC_FILTER_TIME (filter smoothing time constant for adaptive control).
When measuring the drive torque setpoint value or the actual current value, the filter is active in addition to the filters available in the drive. The two filters are connected in series, if both signifcantly and slightly smoothed values are required in the system. The filter is switched off when a smoothing time of 0 seconds is entered.

| 32925 | LOAD_SMOOTH_FILTER_TIME |  |  | A10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s | Filter time constant for smoothed drive utilization |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-te42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-me62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-me82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-gce82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gse82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 0/0 | S |

## Description:

For PROFIdrive drives (assuming that these can communicate the drive utilization in the PROFIdrive telegram, e.g. MD13060 \$MN_DRIVE_TELEGRAM_TYPE = 116):
In order to equalize peaks, the measured data values can be smoothed using a PT1 filter.

| 32926 | POWER_SMOOTH_FILTER_TIME |  |  | A10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s | Filter time constant for smoothed active drive power |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-me62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-te62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-gce62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

### 4.3 Axis-specific NC machine data

| $828 \mathrm{~d}-\mathrm{me} 82$ | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{gce} 82$ | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $0 / 0$ | S |
| 828 d -gse82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $0 / 0$ | S |

Description: For PROFIdrive drives (assuming that these can communicate the active drive power in the PROFIdrive telegram, e.g. MD13060 \$MN_DRIVE_TELEGRAM_TYPE = 116):
In order to equalize peaks, the measured values can be smoothed using a PT1 filter.


Description:
Activation of low-pass filter at position controller output.
Activation of the low-pass filter is only enabled when the dynamic stiffness control
is inactive MD32640=0.


## Description:

Time constant of low-pass filter at position controller output
Related to:
MD32640 \$MA_STIFFNESS_CONTROL_ENABLE (dynamic stiffness control)


Description:
Factor to additionally dampen the speed control loop
Purpose:
Damping an oscillating axis by additionally entering a differential position, which is derived from the difference of the two measuring systems.
Prerequisite: the axis must have two measuring systems, one encoder must be directly connected, the other indirectly.
Explanation of the scaling:
An input value of " $100 \%$ " means the following: An additional torque corresponding to SINAMICS-p2003 is input, if

- for linear motors, there is a position difference of 1 mm
- for rotary axes, there is a position difference of 360 degrees on the load side
- for linear axes (rot. drive), there is a position difference corresponding to MD31030 \$MA_LEADSCREW_PITCH (e.g. standard 10 mm ).

| 32960 | POSCTRL_DUAL_FEEDBACK_TIME |  | EXP, A07 | G2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Time constant for dual-position feedback |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |
| - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

Position control with position information from two measuring systems (only active if time constant is set $>0$ ).
The direct measuring system (DM) becomes active with the delay time that can be set in this MD by means of PT1 filtering, at the same time the indirect measuring system (IM) becomes increasingly ineffective, so that, in total, exactly one measuring system acts at the position controller input at all times
Conditions:

- The axis must have two coupled measuring systems, of which one must be connected directly and the other indirectly to an encoder.
- The measuring systems must be calibrated, MD34102 \$MA_REFP_SYNC_ENCS = 1



### 4.3 Axis-specific NC machine data

1: differential FIPO
2: cubic FIPO
3: cubic FIPO, optimized for operation with feedforward control
Calculation time required and contour quality increase with increasing type of FIPO.

- The default setting is the cubic FIPO.
- If no feedforward control is used in the position control loop, the use of the differential FIPO reduces the calculation time while slightly increasing the contour error.
- If the position control cycle and the interpolation cycle are identical, fine interpolation does not take place, i.e. the different types of fine interpolator do not have different effects.

| 33050 | LUBRICATION_DIST |  |  |  |  |  | A03, A10 | A2, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Traversing path for lubrication from PLC |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | $1.0 e 8$ | 0.0 | $1.0 \mathrm{E}+301$ | $3 / 3$ |  |  |  |

## Description: <br> After the traversing path defined in the MD has been covered, the state of the axial

 interface signal "Lubrication pulse" is inverted, this can activate an automatic lubrication device.The traversing path is summated after Power on.
The "Lubrication pulse" can be used with axes and spindles.
Application example(s):
The machine bed lubrication can be carried out as a function of the relevant traversed path.
Note:
When 0 is entered, the NC/PLC interface signal DB390x DBX1002.0 (Lubrication pulse) is set in every cycle.
Related to:
NC/PLC interface signal DB390x DBX1002.0 (Lubrication pulse)


## Description:

Configuration of axis maintenance data recording:
Bit 0 :
Recording the entire traversing path, entire traversing time and number of axis
traversing procedures
Bit 1:

Recording the entire traversing path, entire traversing time and number of traversing procedures at high axis speed
Bit 2:
Recording the total sum of axis jerks, the time in which the axis is traversed with jerk, and the number of traversing procedures with jerk.

| 33100 | COMPRESS_POS_TOL |  |  | A10 | F2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm , degrees | Maximum deviation during compression |  |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 3/3 | 1 |
| 828d-te42 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 0/0 | 1 |
| 828d-gce42 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 0/0 | 1 |
| 828d-gse42 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 3/3 | I |
| 828d-me62 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 3/3 | 1 |
| 828d-te62 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 0/0 | 1 |
| 828d-gce62 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 0/0 | I |
| 828d-gse62 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 3/3 | 1 |
| 828d-te82 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 0/0 | I |
| 828d-me82 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 3/3 | I |
| 828d-gce82 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 0/0 | 1 |
| 828d-gse82 | - | 0.1 | 1.e-9 | $1.0 \mathrm{E}+301$ | 3/3 | 1 |

Description:
The value specifies the maximum permissible path deviation for each axis with compression.
The higher the value, the more short blocks can be compressed into a long block.
Not relevant for:
Active programmable contour/orientation tolerance (CTOL, OTOL, ATOL)


[^13]
### 4.3 Axis-specific NC machine data

| 34000 | REFP_CAM_IS_ACTIVE |  | A03, A11 | G1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axis with reference point cam |  | BOOLEAN | Res |  |
| - |  |  |  |  |  |
| - | TRUE | 0 | - | 2/2 | M |

Description: 1: There is at least one reference point cam for this axis
0: This axis does not have a reference point cam (e.g. rotary axis)
The referencing cycle starts immediately with phase 2 (see documentation)
Machine axes that have only one zero mark over the whole travel range or rotary axes that have only one zero mark per revolution do not require an additional reference cam that selects the zero mark (select MD34000 \$MA_REFP_CAM_IS_ACTIVE = 0).
The machine axis marked this way accelerates to the velocity specified in MD34040 \$MA_REFP_VELO_SEARCH_MARKER (reference point shutdown velocity) when the plus/minus traversing key is pressed, and synchronizes with the next zero mark.

| 34010 | REFP_CAM_DIR_IS_MINUS | A03, A11 | G1, R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Approach reference point in minus direction | BOOLEAN | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | $2 / 2$ |  |

Description:
0: MD34010 \$MA_REFP_CAM_DIR_IS_MINUS Reference point approach in plus direction 1: MD34010 \$MA_REFP_CAM_DIR_IS_MINUS Reference point approach in minus direction For incremental measuring systems:
If the machine axis is positioned in front of the reference cam, it accelerates, depending on the plus/minus traversing key pressed, to the velocity specified in MD34020 \$MA_REFP_VELO_SEARCH_CAM (reference point approach velocity) in the direction specified in MD3 $\overline{4} 010$ \$MA_REFP_CAM_DIR_IS_MINUS. If the wrong traversing key is pressed, reference point ${ }^{-}$apprōach ${ }^{-}$is $\left.\bar{n}\right)^{-}$started.
If the machine axis is positioned on the reference cam, it accelerates to the velocity specified in MD34020 \$MA_REFP_VELO_SEARCH_CAM and travels in the direction opposite to that specified in MD34010 \$MA_REFP_CAM_DIR_IS_MINUS.
For linear measuring systems with distance-coded reference marks:
If the machine axis has a reference cam (linear measuring systems with distance-coded reference marks do not necessarily require a reference cam) and the machine axis is positioned on the reference cam, it accelerates, irrespectively of the plus/minus traversing key pressed, to the velocity specified in MD34040 \$MA_REFP_VELO_SEARCH_MARKER (reference point creep velocity) in the direction opposite to that specified in MD34010 \$MA_REFP_CAM_DIR_IS_MINUS.

| 34020 | REFP_VELO_SEARCH_CAM |  | A03, A11, A04 | G1, R1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm/min, rev/min | Reference point approach velocity |  | DOUBLE | Reset |  |
| - |  |  |  |  |  |
| 828d-me42 | $\begin{aligned} & \text { 5000., 5000., 5000., } \\ & 720 ., 720 . \end{aligned}$ | (0./ 0.) | $\begin{array}{\|l\|} \hline \text { (MD_DBLMAX/ } \\ \text { MD_DBLMAX) } \\ \hline \end{array}$ | 2/2 | M |
| 828d-te42 | $\begin{aligned} & \text { 5000., } 5000 ., 720 ., \\ & 720 ., 720 . \end{aligned}$ | (0./ 0.) | $\begin{array}{\|l} \hline \text { (MD_DBLMAX/ } \\ \text { MD_DBLMAX) } \\ \hline \end{array}$ | 2/2 | M |
| 828d-gce42 | $\begin{aligned} & \text { 5000., } 5000 ., 720 ., \\ & 720 ., 720 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gse42 | $\begin{aligned} & \text { 5000., } 5000 ., 5000 ., \\ & 720 ., 5000 . \end{aligned}$ | (0./ 0.) | $\begin{array}{\|l\|} \hline \text { (MD_DBLMAX/ } \\ \text { MD_DBLMAX) } \\ \hline \end{array}$ | 2/2 | M |
| 828d-me62 | - $5000 ., 5000 ., 5000 .$, <br> $720 ., 720 ., 720 ., 720 .$, <br> 720. | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |


| 828d-te62 | - | $\begin{aligned} & \text { 5000., 5000., 720., } \\ & 720 ., 720 ., 5000 ., 720 ., \\ & 720 . \end{aligned}$ | (0./ 0.$)$ | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce62 | - | $\begin{array}{\|l} \hline(5000.0 / 10.0), \\ (5000.0 / 10.0), \\ (5000.0 / 10.0), \\ \text { (5000.0/10.0), }(500 \ldots \\ \hline \end{array}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gse62 | - | $\begin{aligned} & \hline(5000.0 / 10.0), \\ & (5000.0 / 10.0), \\ & (5000.0 / 10.0), \\ & (5000.0 / 10.0),(500 \ldots \\ & \hline \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | $2 / 2$ | M |
| 828d-te82 | - | 5000., 5000., 720., 720., 720., 5000., 5000., 720.... | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-me82 | - | $\begin{aligned} & \text { 5000., 5000., } 5000 ., \\ & 720 ., 720 ., 720 ., 720 ., \\ & 720 . . . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce82 | - | $\begin{aligned} & \text { 5000., 5000., 720., } \\ & 720 ., 720 ., 5000 ., 720 ., \\ & 720 . \\ & \hline \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse82 | - | $\begin{aligned} & \text { 5000., 5000., 5000., } \\ & 720 ., 5000 ., 720 ., 720 ., \\ & 720 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |

Description: The reference point approach velocity is the velocity at which the machine axis (phase 1). This value should be set at a magnitude large enough for the axis to be stopped to 0 before it reaches a hardware limit switch.
MD irrelevant for:
Linear measuring systems with distance-coded reference marks

| 34030 | REFP_MAX_CAM_DIST | A03, A11 | G1, R1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Maximum distance to reference cam |  |  |  |  |  | DOUBLE | Reset |
| - | - | 10000.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: If the machine axis travels a maximum distance defined in MD34030
\$MA_REFP_MAX_CAM_DIST from the starting position in the direction of the reference
cam, without reaching the reference cam (NC/PLC interface signal DB380x DBX1000.7
(Reference point approach delay) is reset), the axis stops and alarm 20000 "Reference cam not reached" is output.
Irrelevant to:
Linear measuring systems with distance-coded reference marks


### 4.3 Axis-specific NC machine data

| 828d-gce42 | 2 | $\begin{aligned} & 300.00,300.00, \\ & 300.00,300.00, \\ & 720.00,720.00, \\ & 720.00,720.00, \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | $2 / 2$ | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gse42 | 2 | $\begin{array}{\|l\|} \hline 300.00,300.00, \\ 300.00,300.00, \\ 300.00,300.00, \\ 720.00,720.00, \ldots \\ \hline \end{array}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | $2 / 2$ | M |
| 828d-me62 | 2 | $\begin{array}{\|l\|} \hline 300.00,300.00, \\ 300.00,300.00, \\ 300.00,300.00, \\ 720.00,720.00, \ldots \\ \hline \end{array}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | $2 / 2$ | M |
| 828d-te62 | 2 | $\begin{aligned} & 300.00,300.00, \\ & 300.00,300.00, \\ & 720.00,720.00, \\ & 720.00,720.00, \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce62 | 2 | (300.0/300.0)/ (1.0/ 1.0), (300.0/ 300.0)/ (1.0/ 1.0), (300.0/ .. | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | $2 / 2$ | M |
| 828d-gse62 | 2 | (300.0/300.0)/ (1.0/ 1.0), (300.0/ 300.0)/ (1.0/ 1.0), (300.0/ .. | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te82 | 2 | $\begin{aligned} & 300.00,300.00, \\ & 300.00,300.00, \\ & 720.00,720.00, \\ & 720.00,720.00, \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-me82 | 2 | $\begin{array}{\|l} \hline 300.00,300.00, \\ 300.00,300.00, \\ 300.00,300.00, \\ 720.00,720.00, \ldots \\ \hline \end{array}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | $2 / 2$ | M |
| 828d-gce82 | 2 | $\begin{aligned} & 300.00,300.00, \\ & 300.00,300.00, \\ & 720.00,720.00, \\ & 720.00,720.00, \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gse82 | 2 | $\begin{array}{\|l} \hline 300.00,300.00, \\ 300.00,300.00, \\ 300.00,300.00, \\ 720.00,720.00, \ldots \\ \hline \end{array}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | $2 / 2$ | M |

## Description:

1) For incremental measuring systems:

This is the velocity at which the axis travels during the time between initial detection of the reference cam and synchronization with the first zero mark (phase 2). Traversing direction: Opposite to the direction specified for the cam search (MD34010 \$MA_REFP_CAM_DIR_IS_MINUS)
If MD34050 \$MA_REFP_SEARCH_MARKER_REVERSE (direction reversal on reference cam) is enabled, then if the axis is synchronized with a rising reference cam signal edge on the cam, the axis traverses at the velocity defined in MD34020 \$MA_REFP_VELO_SEARCH_CAM.
2) Indirect measuring system with BERO on the load-side (preferred for spindles): At this velocity, a search is made for the zero mark associated with the BERO (zero mark selection per VDI signal). The zero mark is accepted if the actual velocity lies within the tolerance range defined in MD35150 \$MA_SPIND_DES_VELO_TOL as a deviation from the velocity specified in MD34040 \$MA_REFP_VELO_SEARCH_MARKER[n].
3) For linear measuring systems with distance-coded reference marks:

The axis crosses the two reference marks at this velocity. The maximum velocity must be low enough to ensure that the time required to travel the smallest possible reference mark distance [(x (minimum)] on the linear measuring system is longer than one position controller cycle.

```
The formula
            Basic dist. Meas.length
[x(minimum)] [mm] = ----------- * Grad.cycle - ----------------
2
Basic dist.
with Basic distance [multiple of graduation cycle] Graduation cycle [mm]
Measuring length [mm] yields: \(\mathrm{x}(\mathrm{minimum}) \quad[\mathrm{mm}]\)
```



```
Position controller cycle [ms]
This limiting value consideration also applies to the other measuring systems. Traversing direction:
```

- as defined in MD34010 \$MA_REFP_CAM_DIR_IS_MINUS;
- if the axis is already positioned on the cam, the axis is traversed in the opposite direction

| 34050 | REFP_SEARCH_MARKER_REVERSE | A03, A11 | G1, R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Direction reversal to reference cam | BOOLEAN | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | FALSE, FALSE | 0 | - | $2 / 2$ |  |$]$ M

Description:
This MD can be used to set the direction of search for the zero mark:
MD34050 \$MA_REFP_SEARCH_MARKER_REVERSE = 0
Synchronization with falling reference cam signal edge
The machine axis accelerates to the velocity specified in MD34040
\$MA_REFP_VELO_SEARCH_MARKER (reference point shutdown velocity) in the opposite direction to that specified in MD34010 \$MA_REFP_CAM_DIR_IS_MINUS (reference point approach in minus direction).
If the axis leaves the reference cam (NC/PLC interface signal DB380x DBX1000.7 (Reference point approach delay) is reset) the control is synchronized with the first zero mark.
MD34050 \$MA_REFP_SEARCH_MARKER_REVERSE = 1
Synchronization with rising reference cam signal edge
The machine axis accelerates to the velocity defined in MD34020
\$MA_REFP_VELO_SEARCH_CAM (reference point creep velocity) in the opposite direction to that specified in the MD34010 \$MA_REFP_CAM_DIR_IS_MINUS. If the axis leaves the reference cam (NC/PLC interface signal DB3 $\overline{8} 0 \mathrm{x} \overline{\mathrm{D}} \mathrm{BX} \overline{1} 000.7$ (Reference point approach delay) is reset), the machine axis decelerates to a halt and accelerates in the opposite direction towards the reference cam at the velocity specified in MD34040: \$MA_REFP_VELO_SEARCH_MARKER. When the reference cam is reached (NC/PLC interface signal DB380x DBX1000.7 (Reference point approach delay) is enabled) the control is synchronized with the first zero mark.
MD irrelevant to:
Linear measuring systems with distance-coded reference marks


### 4.3 Axis-specific NC machine data

| 828d-gce42 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 720.0,720.0,720.0, \\ & 720.0,720.0,720.0 \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gse42 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 20.0,20.0,720.0, \\ & 720.0,20.0,20.0 \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD DBLMAX) | 2/2 | M |
| 828d-me62 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 20.0,20.0,720.0, \\ & 720.0,20.0,20.0,20 \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te62 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 720.0,720.0,720.0, \\ & 720.0,20.0,20.0, \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce62 | 2 | $\begin{aligned} & (20.0 / 20.0) /(720.0 / \\ & 720.0),(20.0 / 20.0) / \\ & (720.0 / 720.0),(20.0 / \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse62 | 2 | $\begin{aligned} & (20.0 / 20.0) /(720.0 / \\ & 720.0),(20.0 / 20.0) / \\ & (720.0 / 720.0),(20.0 / \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-te82 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 720.0,720.0,720.0, \\ & 720.0,720.0,720.0 \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-me82 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 720.0,720.0,720.0, \\ & 720.0,720.0,720.0 \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | $2 / 2$ | M |
| 828d-gce82 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 720.0,720.0,720.0, \\ & 720.0,720.0,720.0 \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gse82 | 2 | $\begin{aligned} & 20.0,20.0,20.0,20.0, \\ & 20.0,20.0,720.0, \\ & 720.0,20.0,20.0,72 \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD DBLMAX) <br> MD_DBLMAX) | 2/2 | M |

## Description:

For incremental measuring systems:
If, after leaving the reference cam (NC/PLC interface signal DB380x DBX1000.7
(Reference point approach delay) is reset), the machine axis travels a distance defined in MD34060: \$MA_REFP_MAX_MARKER_DIST without detecting the zero mark, the axis stops and alarm 20002 "Zero mark missing" is output.
For linear measuring systems with distance-coded reference marks:
If the machine axis travels a distance defined in MD34060 \$MA_REFP_MAX_MARKER_DIST from the starting position without crossing two zero marks, the axis stops and alarm 20004 "Reference mark missing" is output.


| 828d-te62 | - | $\begin{aligned} & \text { 10000., 10000., 720., } \\ & \text { 720., 720., 10000., } \\ & 720 ., 720 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce62 | - | $\begin{aligned} & (10000.0 / 20.0), \\ & (10000.0 / 20.0), \\ & (10000.0 / 20.0), \\ & (10000.0 / 20 \ldots \ldots \\ & \hline \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gse62 | - | $\begin{aligned} & \hline(10000.0 / 20.0), \\ & (10000.0 / 20.0), \\ & (10000.0 / 20.0), \\ & (10000.0 / 20 \ldots \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te82 | - | $\begin{aligned} & \text { 10000., 10000., } 720 ., \\ & \text { 720., 720., 10000., } \\ & 10000 ., 720 . . . . \end{aligned}$ | (0./ 0.) | (MD_DBLMAXI MD_DBLMAX) | 2/2 | M |
| 828d-me82 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., 720., 720., } \\ & 720 ., 720 ., 720 \ldots . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce82 | - | $\begin{aligned} & \text { 10000., 10000., 720., } \\ & 720 ., 720 ., 10000 ., \\ & 720 ., 720 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse82 | - | $\begin{aligned} & \text { 10000., 10000., } \\ & \text { 10000., } 720 ., 10000 ., \\ & 720 ., 720 ., 720 . \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |

Description:
For incremental measuring systems:
The axis travels at this velocity between the time of synchronization with the first zero mark and arrival at the reference point.
For linear measuring systems with distance-coded reference marks:
The axis travels at this velocity between the time of synchronization (crossing two zero marks) and arrival at the target point.

| 34080 | REFP_MOVE_DIST | A03, A11 | G1, R1, S1, S3, G2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm, degrees | Reference point distance | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $-2.0,-2.0$ | $-1 e 15$ | $1 e 15$ | $2 / 2$ |  |

Description: 1. Standard measuring system (incremental with equidistant zero marks)
Reference point positioning movement: 3rd phase of the reference point approach:
The axis traverses from the position at which the zero mark is detected with the velocity REFP_AX_VELO_POS along the path REFP_MOVE_DIST + REFP_MOVE_DIST_CORR (relative to the marker).
REFP_SET_POS is set as the current axis position at the target point.
2. Irrelevant for distance-coded measuring system.

Override switch and selection jog/continuous mode ( MD JOG_INC_MODE_IS_CONT ) are active.

| 34090 | REFP_MOVE_DIST_CORR |  |  | $\begin{aligned} & \text { A03, A02, A08, } \\ & \text { A11 } \end{aligned}$ | G1, | G2 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm , degrees | Reference point offset/absolute offset |  |  | DOUBLE | NE |  |
| -, - |  |  |  |  |  |  |
| - | 2 | 0.0, 0.0 | -1e12 | 1 e 12 | 2/2 | I |
| Description: |  | encod <br> n of th pecifi DIST_C <br> t. MD3 | mark <br> , the <br> 0 \$MA <br> raver <br> P SET | positioned a E_DIST + MD3 distance, t ransferred i | $\begin{aligned} & y \mathrm{fr} \\ & 90 \\ & \mathrm{axi} \\ & 0 \text { th } \end{aligned}$ | ro <br> che va |

Machine data

During traversing by MD34080 \$MA_REFP_MOVE_DIST + MD34090 \$MA_REFP_MOVE_DIST_CORR, the override switch and MD11300 \$MN_JOG_INC_MODE_LEVELTRIGGRD (jog/continuous mode) are active.

- Distance-coded measuring system:

MD34090 \$MA_REFP_MOVE_DIST_CORR acts as an absolute offset. It describes the offset between the machine zēro and the first reference mark of the measuring system.

- Absolute encoder:

MD34090 \$MA_REFP_MOVE_DIST_CORR acts as an absolute offset.
It describes the offset between the machine zero and the zero point of the absolute measuring system.
Note:
In conjunction with absolute encoders, this MD is modified by the control during calibration processes and modulo offset.
With rotary absolute encoders (on linear and rotary axes), the modification frequency also depends on the setting of MD34220 \$MA_ENC_ABS_TURNS_MODULO.
Manual input or modification of this MD via the part program should therefore be followed by a Power ON Reset to activate the new value and prevent it from being lost. The following applies to an NCU-LINK:
If a link axis uses an absolute encoder, every modification of MD34090 \$MA_REFP_MOVE_DIST_CORR on the home NCU (servo physically available) is updated only locälly $\bar{a}$ nd not beyond the limits of the NCU. The modification is therefore not visible to the link axis. Writing MD34090 \$MA_REFP_MOVE_DIST_CORR through the link axis is rejected with alarm 17070.

| 34092 | REFP_CAM_SHIFT | A03, A11 | G1, R1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Electronic cam offset for incremental measuring systems |  |  |  |  |  | DOUBLE | Reset |
| - |  |  |  |  |  |  |  |  |
| - | 2 | $0.0,0.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: Electronic cam offset for incremental measuring systems with equidistant zero marks. When the reference cam signal occurs, the zero mark search does not start immediately but is delayed until after the distance from REFP_CAM_SHIFT.
This ensures the reproducibility of the zero mark search through a defined selection of a zero mark, even with temperature-dependent expansion of the reference cam.
Because the reference cam offset is calculated by the control in the interpolation cycle, the actual cam offset is at least REFP_CAM_SHIFT and at most REFP_CAM_SHIFT+ (MD34040 \$MA_REFP_VELO_SEARCH_MARKER*interpolation cycle)
The reference cam offset is effective in the search direction of the zero mark. The reference cam offset is only active if existing cam MD34000 \$MA_REFP_CAM_IS_ACTIVE=1.

| 34093 | REFP_CAM_MARKER_DIST | A03, A11 | R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm, degrees | Reference cam/reference mark distance | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $0.0,0.0$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description: The value displayed corresponds to the distance between exiting the reference cam and the occurrence of the reference mark. If the values are too small, there is a risk of not being able to determine the reference point due to temperature reasons or varying operating times of the cam signal. The distance travelled may serve as a clue for setting the electronic reference cam offset.
This machine data is a display data and can therefore not be changed.

| 34100 | REFP_SET_POS | A03, A11 | G1, S3, G2, R1, S1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Reference point for incremental system |  |  |  |  |  | DOUBLE | Reset |
| - | 4 | $0 ., 0 ., 0 ., 0$. | -45000000 | 45000000 | $2 / 2$ |  |  |  |
| - | 4 |  |  |  |  |  |  |  |

## Description:

- Incremental encoder with zero mark(s): The position value which is set as the current axis position after detection of the zero mark and traversal of the distance REFP_MOVE_DIST + REFP_MOVE_DIST_CORR (relative to zero mark). REFP_SET_POS of the reference point number, which is set at the instant that the edge of the reference cam signal rises (NC/PLC interface signal DB380x DBX2.4-.7 (Reference point value 1 to 4)), is set as the axis position.
- Distance-coded measuring system:

Target position which is approached when MD34330 \$MA_REFP_STOP_AT_ABS_MARKER is set to 0 (FALSE) and two zero marks have been crossed.

- Absolute encoder:

MD34100 \$MA_REFP_SET_POS corresponds to the correct actual value at the calibration position.

The reaction on the machine depends on the status of MD34210 \$MA_ENC_REFP_STATE: When MD34210 \$MA_ENC_REFP_STATE = 1, the value of MD34100 \$MA_REFP_SET_POS is transferred as the absolute value.
When MD34210 \$MA_ENC_REFP_STATE = 2 and MD34330 \$MA_REFP_STOP_AT_ABS_MARKER = 0 (FALSE), the axis approaches the target position stored in MD34100 \$MA_REFP_SET_POS. The value of MD34100 \$MA_REFP_SET_POS that has been set via NC/PLC interface signal DB380x DBX2.4-.7 (Reference point value 1 to 4) is used.
Related to:
NC/PLC interface signal DB380x DBX2.4-.7 (Reference point value 1 to 4)

| 34102 | REFP_SYNC_ENCS | A03, A02 | R1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Calibration of measuring systems | BYTE | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $2 / 2$ |  |

Description: Calibrating the measuring system to the reference measuring system can be activated for all measuring systems of this axis with this machine data.
The calibration procedure is made during reference point approach or when calibrated absolute encoders selected for the closed-loop control are switched on.
Values:
0: No measuring system calibration, measuring systems must be referenced individually
1: Calibration of all measuring systems of the axis to the position of the reference measuring system
In combination with MD30242 \$MA_ENC_IS_INDEPENDENT = 2, the passive encoder is calibrated to the active encoder but NOT referenced.

| 34104 | REFP_PERMITTED_IN_FOLLOWUP | A03, A02 | R1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Enable referencing in follow-up mode | BOOLEAN | Reset |  |  |
| - |  |  |  |  |  |
| - | - | FALSE | 0 | - | $1 / 1$ |


| 34110 | REFP_CYCLE_NR | A03 | G1, TE3, D1, R1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Sequence of axes in channel-specific referencing | DWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $1,2,3,4,5,6,7,8 \ldots$ | -1 | 31 |  |  |

## Description:

MD34110 \$MA_REFP_CYCLE_NR = 0 -----> axis-specific referencing
Axis-specific referencing is started separately for each machine axis with the NC/PLC interface signal DB380x DBX4.7 / 4.6 (Plus/minus travel keys).
Up to 8 axes (840D) can be referenced simultaneously.
The following alternatives are provided for referencing the machine axes in a specific sequence:

- The operator has to observe the correct sequence on startup.
- The PLC checks the sequence on startup or defines the sequence itself.
- The channel-specific referencing function is used.

MD34110 \$MA_REFP_CYCLE_NR = 1 -----> channel-specific referencing
Channel-specific referencing is started with the NC/PLC interface signal DB3200 DBX1. 0 (Activate referencing). The control acknowledges a successful start with the NC/PLC interface signal DB3300 DBX1.0 (Referencing active). Each machine axis assigned to the channel can be referenced with channel-specific referencing (this is achieved internally on the control by simulating the plus/minus traversing keys). The axisspecific MD34110 \$MA_REFP_CYCLE_NR can be used to define the sequence in which the machine axes are referenced:
-1 means:
The machine axis is not started by channel-specific referencing, and NC start is possible without referencing this axis.
0 means:
The machine axis is not started by channel-specific referencing, and NC start is not possible without referencing this axis.
1 means:
The machine axis is started by channel-specific referencing.
2 means:
The machine axis is started by channel-specific referencing if all machine axes identified by a 1 in MD34110 \$MA_REFP_CYCLE_NR are referenced.
3 means:
The machine axis is started by channel-specific referencing if all machine axes identified by a 2 in MD34110 \$MA_REFP_CYCLE_NR are referenced.
4 to 8 :
As above for further machine axes.
Setting the channel-specific MD20700 \$MC_REF_NC_START_LOCK (NC start disable without reference point) to zero has the effect of entering -1 for all the axes of a channel. MD irrelevant to:

Axis-specific referencing
Related to:
NC/PLC interface signal DB3200 DBX1.0 (Activate referencing)
NC/PLC interface signal DB3300 DBX1.0 (Referencing active)


- MD34200 \$MA_ENC_REFP_MODE = 0

If an absolute encoder is available: MD34100 \$MA_REFP_SET_POS is taken over Other encoders: Reference point approach not possible (SW $\overline{2} .2$ and higher)

- MD34200 \$MA_ENC_REFP_MODE = 1

Referencing of incremental, rotary or linear measuring systems:
Zero pulse on the encoder track
Referencing of absolute, rotary measuring systems:
Replacement zero pulse based on the absolute information

- MD34200 \$MA_ENC_REFP_MODE = 3

Referencing on $\bar{l} i n e a \bar{r}$ measuring systems with distance-coded reference marks: Linear measuring system with distance-coded reference marks (as specified by Heidenhain)

- MD34200 \$MA_ENC_REFP_MODE = 4 :

Reserved (BERO with $\overline{2}$-edge evaluation)

- MD34200 \$MA_ENC_REFP_MODE = 8:

Referencing for linear measuring systems with distance-coded reference marks: Linear measuring system with distance-coded reference marks over 4 zero marks (increased safety).

| 34210 | ENC_REFP_STATE | A07, A03, A02 | R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Adjustment status of absolute encoder | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 0,0 | 0 | 3 | $2 / 2$ |  |

Description:

- Absolute encoder:

This machine data contains the absolute encoder status
0: Encoder is not calibrated
1: Encoder calibration enabled (but not yet calibrated)
2: Encoder is calibrated
Default setting for recommissioning: Encoder is not calibrated.
3: No significance, has the same effect as "0"

- Incremental encoder:

This machine data contains the "Referenced status", which can be saved beyond Power On:
0: Default setting: No automatic referencing
1: Automatic referencing enabled, but encoder not yet referenced
2: Encoder is referenced and at exact stop, automatic referencing becomes active at the next encoder activation
3: The last axis position buffered before switch off is restored, no automatic referencing
Default setting for recommissioning: No automatic referencing

| 34220 | ENC_ABS_TURNS_MODULO |  |  |  |  |  | A03, A02 | R1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Modulo range for rotary absolute encoder |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| - | 2 | 4096,4096 | 1 | DWORD | PowerOn |  |  |  |
| - | 2 | 100000 | $2 / 2$ | M |  |  |  |  |

Description: Number of encoder revolutions a rotary absolute encoder is able to resolve (see also the maximum multiturn information of the absolute encoder, see encoder data sheet or PROFIdrive parameter P979).
The absolute position of a rotary axis is reduced to this resolvable range when an absolute encoder is switched on:
In other words, a MODULO transformation takes place if the actual position sensed is larger than the position permitted by MD ENC_ABS_TURNS_MODULO.
0 degrees $<=$ position $<=n * 360$ degrees (with $n=$ ENC_ABS_TURNS_MODULO)
Note:

### 4.3 Axis-specific NC machine data

With SW 2.2, the position is reduced to this range when the control/encoder is switched on. With SW 3.6 and higher, half of this value represents the maximum permissible travel distance with the control swiched off/the encoder inactive.
Special cases:
For PROFIdrive, any integer value is permissible.
The MD is relevant only for rotary encoders (on linear and rotary axes).
Corresponds to:
PROFIdrive parameter P979

| 34230 | ENC_SERIAL_NUMBER | A02 | R1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Encoder serial number | DWORD | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 2 | 0,0 | - | - | $2 / 2$ |  |  |

## Description:

The encoder serial number (EnDat encoders) can be read out here.
It is updated at PowerOn or when parking is deselected.
"0" is supplied for encoders which do not have a serial number available.
Manipulating this MD normally causes automatic absolute encoder maladjustment (MD34200 \$MA_ENC_REFP_MODE returns to "0").

| 34300 | ENC_REFP_MARKER_DIST | A03, A02 | R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm, degrees | Basic distance of reference marks of distance-coded encoders. | DOUBLE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | $10.0,10.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

## Description:

In addition to the incremental encoder track, a further encoder track is available with distance-coded measuring systems for determining the absolute encoder position. This encoder track has reference marks at defined, different distances. The basic distance between the fixed reference marks (which are the reference marks that are always the same distance from one another) can be taken from the data sheet, and directly transferred into machine data MD34300 \$MA_ENC_REFP_MARKER_DIST.
With the basic distance between the fixed reference marks (MD34300
\$MA_ENC_REFP_MARKER_DIST), the distance between two reference marks (MD34310
\$MA_ENC_MARKER_INC), and the number of encoder pulses (MD31020 \$MA_ENC_RESOL) on
angūlar measuring systems or the graduation cycle (MD31010 \$MA_ENC_GRID_POINT_DIST) on linear measuring systems, the absolute encoder position can be determined once two successive reference marks have been crossed.
MD34300 \$MA_ENC_REFP_MARKER_DIST is also used for a plausibility check of reference mark distances.
Examples of application:
For example: Heidenhain LS186 C
MD $31010=0.02 \mathrm{~mm}$ (graduation cycle)
MD $34300=20.00 \mathrm{~mm}$ (basic distance between the reference marks)
MD $34310=0.02 \mathrm{~mm}$ (distance between two reference marks corresponds to one graduation cycle).


MD irrelevant for:
Incremental measuring systems
Special cases:
On linear measuring systems with distance-coded reference marks supplied by Heidenhain, the interval between two reference marks is always equal to one graduation cycle.


Description:

- In the case of a distance-coded measuring system:

When setting a reference point, the actual position (determined by the distance-coded reference marks) on the linear measuring system is assigned to an exact machine axis position (referred to the machine zero point). The absolute offset between the machine zero point and the position of the lst reference mark on the linear measuring system must therefore be entered in MD34090 \$MA REFP MOVE DIST CORR (reference point/absolute offset). In addition, MD34320 \$MA_ENC_INVERS must be used to set whether the linear measuring system is connected in the same or the opposite direction to the machine system.
MD irrelevant to:
Incremental encoders without distance-coded reference marks.

| 34330 | REFP_STOP_AT_ABS_MARKER | A03 | G1, R1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Distance-coded linear measuring system without target point | BOOLEAN | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | TRUE, TRUE | 0 | - |  |  |

Description:

- Distance-coded measuring system:

REFP_STOP_AT_ABS_MARKER = 0 :
At the end of the reference cycle, the position entered in MD34100 \$MA_REFP_SET_POS is approached (normal case for phase 2).
REFP_STOP_AT_ABS_MARKER = 1:
The axis is braked after detection of the second reference mark (shortening of phase 2)

- Absolute encoder:

MD34330 \$MA_REFP_STOP_AT_ABS_MARKER defines the response of an axis with a valid calibration identifier ( $\overline{\mathrm{M}} \mathrm{D} 34 \overline{2} 10$ \$MA_ENC_REFP_STATE $=2$ ) with G74 or when a traversing key is actuated in JOG-REF:
REFP_STOP_AT_ABS_MARKER = 0 :
Axis traverses to the position entered in MD34100 \$MA_REFP_SET_POS
REFP_STOP_AT_ABS_MARKER = 1:
Axis does not traverse.
MD irrelevant for:
Incremental encoders with zero mark (standard encoders)
Related to:
MD34100 \$MA_REFP_SET_POS
(reference point distance/target point for distance-coded system)


## Description: Parameter setting for part program command WAITENC:

0 : Axis is not taken into account when waiting for synchronized / referenced or restored position with part program command WAITENC.

1: A delay is applied in part program command WAITENC until a synchronized / referenced or restored position is available for this axis.

| 34990 | ENC_ACTVAL_SMOOTH_TIME |  | A02 | V1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Smoothing time constant for actual values. |  | DOUBLE | Rese |  |
| - |  |  |  |  |  |
| - | $2 \quad 0.0,0.0$ | 0.0 | 0.5 | 3/3 | 1 |

Description:
Using low-resolution encoders, a more continuous motion of coupled path or axis motions can be achieved with smoothed actual values. The bigger the time constant, the better the smoothing of actual values and the larger the overtravel.
Smoothed actual values are used for:

- Thread-cutting (G33, G34, G35)
- Revolutional feedrate (G95, G96, G97, FPRAON)
- Display of actual position and velocity, or speed respectively.



## Description:

Spindle definition. The spindle is defined when the spindle number has been entered in this MD.

Example:
If the corresponding axis is to be spindle 1 , value " 1 " must be entered in this MD.
The spindle functions are possible only for modulo rotary axes. For this purpose
MD30300 \$MA_IS_ROT_AX and MD30310 \$MA_ROT_IS_MODULO must be set.
The axis functionality is maintained; transition to axis operation can be performed with M70.

The gear stage-specific spindle data are set in parameter blocks 1 to 5; parameter block 0 is used for axis operation (MD35590 \$MA_PARAMSET_CHANGE_ENABLE).
The lowest spindle number is 1 , the highest number depends on the number of axes in the channel.
If other spindle numbers are to be assigned, the function "spindle converter" must be used.
With multi-channel systems, the same numbers can be assigned in all channels, except for those spindles active in several channels (replacement axes/spindles MD 30550: \$MA_AXCONF_ASSIGN_MASTER_CHAN).

| 35010 | GEAR_STEP_CHANGE_ENABLE |  | A06, A11 | P3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Parameterize gear stage change |  | UDWORD | Res |  |
| CTEQ |  |  |  |  |  |
| - | 0x00 | 0 | 0x2B | 2/2 | M |

## Description: Meaning of bit places:

Bit $0=0$ and bit $1=0$ :
There is an invariable gear ratio between motor and load. The MD of the first gear stage is active. Gear stage change is not possible with M40 to M45.
Bit $0=1$ :
Gear stage change at undefined change position. The gear can have up to 5 gear stages, which can be selected with M40, M41 to M45. To support the gear stage change, the motor can carry out oscillating motions, which must be enabled by the PLC program. Bit $1=1$ :

Same meaning as bit $0=1$, although the gear stage change is carried out in a configured spindle position (SW 5.3 and higher). The change position is configured in MD35012 \$MA_GEAR_STEP_CHANGE_POSITION. The position is approached in the current gear stage before the gear stage change. If this bit is set, bit 0 is not taken into account! Bit 2: Reserved
Bit 3 = 1:
The gear stage change dialog between NCK and PLC is simulated. The setpoint gear stage is output to the PLC. A checkback signal from the PLC is not awaited. The acknowledgment is generated internally in the NCK.
Bit 4: Reserved
Bit 5 = 1 :
The second gear stage data set is used for tapping with G331/G332. The bit must be set for the master spindle used for tapping. Bit 0 or bit 1 must be set.
Related to:
MD35090 \$MA_NUM_GEAR_STEPS (number of gear stages 1st data set, see bit 5)
MD35092 \$MA_NUM_GEAR_STEPS2 (number of gear stages 2nd data set, see bit 5)
MD35110 \$MA_GEAR_STEP_MAX_VELO (max. speed for autom. gear stage change)
MD35112 \$MA_GEAR_STEP_MAX_VELO2 (max. speed for autom. gear stage change 2nd data set, see bit 5)
MD35120 \$MA_GEAR_STEP_MIN_VELO (min. speed for autom. gear stage change)
MD35122 \$MA_GEAR_STEP_MIN_VELO2 (min. speed for autom. gear stage change 2nd data set, see bit 5)


### 4.3 Axis-specific NC machine data

| 35014 | GEAR_STEP_USED_IN_AXISMODE | A01, A06, A11 | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Gear stage for axis mode with M70 |  |  |  |  |  | DWORD | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 5 | $2 / 2$ |  |  |  |  |

## Description:

With this MD, a gear stage can be defined which can be loaded into the axis mode during the transition with M70. The parameter set zero used in axis mode is to be optimized on this gear stage.
Significance of the values:
0: There is no implicit gear stage change with M70.
The current gear stage is retained.
1 ... 5:
There is a change into gear stage (1...5) during the execution of M70.
During the transition into axis mode without M70, there is monitoring for this gear stage and alarm 22022 is issued if necessary. The condition for a gear stage change is the general release of the function in MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE.
Secondary conditions:
When changing from axis mode into spindle mode, the configured gear stage continues to remain active. There is no automatic return to the last active gear stage in spindle mode.

| 35020 | SPIND_DEFAULT_MODE |  |  |  |  |  |  | A06, A10 | S1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Initial spindle setting | BYTE | Reset |  |  |  |  |  |  |
| CTEQ |  |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 3 | $2 / 2$ |  |  |  |  |$]$ M

## Description:

SPIND_DEFAULT_MODE activates the set operating mode of the spindle at the time specified in MD35030 \$MA_SPIND_DEFAULT_ACT_MASK. The appropriate spindle operating modes can be set with the following values:
0 Speed mode, position control deselected
1 Speed mode, position control activated
2 Positioning mode, no check for synchronized/referenced position on NC start
3 Axis mode, MD34110 \$MA_REFP_CYCLE_NR can be used to configure / deactivate forced referencing on $N C$ start
Corresponds with:
MD35030 \$MA_SPIND_DEFAULT_ACT_MASK (activate spindle initial setting)
MD20700 \$MC_REFP_NC_START_LOCK (NC start disable without reference point)

| 35030 | SPIND_DEFAULT_ACT_MASK |  |  | A06, A10 | S1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Time at which initial spindle setting is effective |  |  | UBYTE | Reset |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-te42 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-gce42 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-gse42 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-me62 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-te62 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-gce62 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-gse62 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-te82 | - | 0x00 | 0 | 0x03 | 7/2 | M |
| 828d-me82 | - | 0x00 | 0 | 0x03 | 7/2 | M |


| 828 d -gce82 | - | $0 \times 2$ | 0 | $0 \times 03$ | $1 / 1$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828 d -gse82 | - | $0 \times 2$ | 0 | $0 \times 03$ | $1 / 1$ | M |

## Description:

SPIND_DEFAULT_ACT_MASK specifies the time at which the operating mode defined in MD350 $\overline{2} 0$ \$MA_SPIND_DEFAULT_MODE becomes effective. The initial spindle setting can be assigned the following values at the following points in time:
0 POWER ON
1 POWER ON and NC program start
2 POWER ON and RESET (M2/M30)
Special cases:
If MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET = 1, the following supplementary conditions are applicable:

- SPIND_DEFAULT_ACT_MASK should be set to 0
- If this is not possible, the spindle must be at a standstill prior to activation. Related to:
MD35020 \$MA_SPIND_DEFAULT_MODE (initial spindle setting)
MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET (spindle active after reset)

| 35032 | SPIND_FUNC_RESET_MODE |  |  | A06, A10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Reset response of individual spindle functions |  |  | UDWORD | PowerOn |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-te42 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-gce42 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-gse42 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-me62 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-te62 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-gce62 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-gse62 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-te82 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-me82 | - | 0x00 | 0 | 0x01 | $7 / 2$ | M |
| 828d-gce82 | - | 0x00 | 0 | 0x01 | 0/0 | S |
| 828d-gse82 | - | 0x00 | 0 | 0x01 | 0/0 | S |

Description: This data allows the "GWPS in every operating mode" function to be selected/deselected.
SPIND_FUNC_RESET_MODE, bit $0=0$ : "GWPS in every operating mode" is deselected
SPIND_FUNC_RESET_MODE, bit $0=1$ : "GWPS in every operating mode" is selected

| 35035 | SPIND_FUNCTION_MASK |  |  | A06, A10 | K1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Spindle functions |  |  | UDWORD | Reset |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-te42 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-gce42 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-gse42 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-me62 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-te62 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-gce62 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-gse62 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-te82 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |
| 828d-me82 | - | 0x510 | 0 | 0x7FFFFFFF | 1/1 | M |

### 4.3 Axis-specific NC machine data

| 828 d -gce82 | - | $0 \times 400020$ | 0 | $0 x 7 F F F F F F F$ | $1 / 1$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828 d -gse82 | - | $0 \times 400020$ | 0 | $0 x 7 F F F F F F F$ | $1 / 1$ | M |

Description:
This MD allows spindle-specific functions to be set.
The MD is bit-coded, the following bits are assigned:
Bit 0 = 1: Gear stage changes are suppressed with activated DryRun function for block programming (M40, M41 to M45), programming via FC18, and synchronized actions.

Bit 1 = 1 : Gear stage changes are suppressed with activated program test function for block programming (M40, M41 to M45), programming via FC18, and synchronized actions.
Bit 2 = 1: Gear stage change for programmed gear stage will finally be carried out after deselection of DryRun or program test functions with REPOS.
Bit 3: reserved
Bit $4=1$
The programmed speed is transferred to SD 43200 \$SA_SPIND_S (incl. speed default settings via FC18 and synchronized actions).
S programmings that are not speed programmings are not written to the SD. These include, for example, $S$ value with constant cutting speed (G96, G961), $S$ value with revolution-related dwell time (G4).
Bit 5 = 1:
The content of SD 43200 \$SA_SPIND_S is applied as the speed setpoint for JOG. If the content is zero, then other JOG speed default settings become active (see SD 41200 JOG SPIND SET VELO).

Bit 6: reserved
Bit 7: reserved
Bit $8=1$ :
The programmed cutting speed is transferred to SD 43202 \$SA_SPIND_CONSTCUT_S (incl. default settings via FC18). S programmings, that are not cutting speed programmings, are not written to the SD. These include, for example, $S$ value outside of constant cutting speed (G96, G961, G962), S value with revolution-related dwell time (G4), S value in synchronized actions.

Bit 9: reserved
Bit $10=0$ :
SD 43206 \$SA SPIND SPEED TYPE is not changed by part program or channel settings, = 1 :

For the master spindle, the value of the 15th G group (type of feedrate) is transferred to SD 43206 \$SA_SPIND_SPEED_TYPE. For all other spindles, the corresponding SD remains unchanged.

Bit 11: reserved
Bit 12 = 1 :
Spindle override is active with zero mark search for M19, SPOS, and SPOSA

$$
=0:
$$

Previous response (default)
The following bits 16-20 can be used to set spindle-specific M functions which are output to the VDI interface
if the corresponding $M$ functionality has been generated implicitly for the program sequence.

Bit 16: reserved
Bit 17: reserved
Bit 18: reserved
Bit 19:"Output implicit M19 to PLC"
$=0:$ If MD20850 \$MC_SPOS_TO_VDI = 0 too, no auxiliary function M19 is generated for SPOS and SPOSA. As a result, the acknowledgment time for the auxiliary function is also eliminated. This can cause problems in the case of short blocks.
= 1: The implicit auxiliary function M19 is generated with the programming of SPOS and SPOSA and output to the PLC. The address is expanded in accordance with the spindle number.
Bit 20:"Output implicit M70 to PLC"
= 0: No generation of implicit auxiliary function M70. Note: A programmed auxiliary function M70 is always output to the PLC.
= 1: Auxiliary function M70 is generated implicitly and output to the PLC on transition to axis mode. The address is expanded in accordance with the spindle number. Bit 21: reserved
Bit $22=0:$ As of NCK version 78.00.00: The NC/PLC interface signal DB380x DBX2001.6 (invert M3/M4) is applied to the function for interpolatory tapping G331/G332.
Bit $22=1:$ Response is compatible with $S W$ releases prior to NCK version 78.00.00: The NC/PLC interface signal DB380x DBX2001.6 (invert M3/M4) is not applied to the function for interpolatory tapping G331/G332.
Bit 23: "Calculation of the acceleration reduction with velocity control DRIVE"
= 0: The currently active spindle speed limit is used as the maximum speed to calculate the acceleration reduction (compatibility mode).
= 1: Only machine data MD35100 \$MA_SPIND_VELO_LIMIT, MD35130
\$MA_GEAR_STEP_MAX_VELO_LIMIT and, with position control, MD35135
\$MA_GEAR_STEP_PC_MAX_VELO_LIMIT are used for the maximum speed to calculate the acceleration reduction."

MD corresponds with:
MD20850 \$MC_SPOS_TO_VDI
MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET
MD35020 \$MA_SPIND_DEFAULT_MODE
SD43200 \$SA_SPIND_S

| 35040 | SPIND_ACTIVE_AFTER_RESET |  |  | A06, A10 | S1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Own spindle RESET |  |  | BYTE | PowerOn |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-te42 | - | 0 | 0 | 2 | 7/2 | M |
| 828d-gce42 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-gse42 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-me62 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-te62 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-gce62 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-gse62 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-te82 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-me82 | - | 0 | 0 | 2 | $7 / 2$ | M |
| 828d-gce82 | - | 2 | 0 | 2 | 1/1 | M |
| 828d-gse82 | - | 2 | 0 | 2 | 1/1 | M |

## Description:

MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET defines the response of the spindle after channel reset NC/PLC interface signal DB3000 DBX0.7 (Reset) and program end (M2, M30).
This MD is only active in the spindle mode open-loop control mode. In positioning mode or oscillation mode, the spindle is always stopped.

MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET = 0:

- Spindle stops (with M2/M30 and channel and mode group reset).
- Program is canceled.
- For spindle mode, the programmed ACC and VELOLIM are reset to 100\% if MD22400 \$MC_S_VALUES_ACTIVE_AFTER_RESET and the axis-specific MD32320 \$MA_DYN_LIMIT_RESET_MASK $\overline{\text { do }}$ _ not specify anything else.
MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET= 1:
- Spindle does not stop.
- Program is canceled.
- For spindle mode, the programmed ACC and VELOLIM are retained.

MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET= 2 :

- Spindle does not stop at the M function configured via MD10714 \$MN_M_NO_FCT_EOP (e.g. M32).
- However, the spindle stops at channel or mode group reset.
- For spindle mode, the programmed ACC and VELOLIM are retained.

The NC/PLC interface signal DB380x DBX2.2 (Delete distance-to-go/Spindle reset) is always effective, independent of MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET.

Not relevant to:

- Spindle modes other than open-loop control mode.

Related to:
NC/PLC interface signal DB3000 DBX0.7 (Reset)
NC/PLC interface signal DB380x DBX2.2 (Delete distance-to-go/Spindle reset)


## Description:

Number of set gear stages.
The first gear stage is always available.
Corresponding MDs:
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stages available/functions)
MD35012 \$MA_GEAR_STEP_CHANGE_POSITION (gear stage change position)
MD35014 \$MA_GEAR_STEP_USED_IN_AXISMODE (gear stage for axis mode with M70)
MD35110 \$MA_GEAR_STEP_MAX_VELO (max. speed for gear stage change)
MD35120 \$MA_GEAR_STEP_MIN_VELO (min. speed for gear stage change)
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (max. speed of gear stage)
MD35140 \$MA_GEAR_STEP_MIN_VELO_LIMIT (min. speed of gear stage)
MD35200 \$MA_GEAR_STEP_SPEEDCTRL_ACCEL (acceleration in speed control mode)
MD35210 \$MA_GEAR_STEP_POSCTRL_ACCEL (acceleration in position control mode)
MD35310 \$MA_SPIND_POSIT_DELAY_TIME (positioning delay time)
MD35550 \$MA_DRILL_VELO_LIMIT (maximum speeds for tapping)
MD35092 \$MA_NUM_GEAR_STEPS2 (number of gear stages 2nd gear stage data set)

| 35092 | NUM_GEAR_STEPS2 | A06, A10 | S1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of gear stages of 2nd gear stage data set | DWORD | Reset |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 5 | 1 | 5 | $2 / 2$ |  |  |$]$ M

## Description:

Number of set gear stages of the second gear stage data set for the function 'Tapping with G331/G332'.

Activation (only makes sense for master spindle on tapping): MD 35010
\$MA_GEAR_STEP_CHANGE_ENABLE, bit 5 .

The number of gear stages must not be the same in the first and second gear stage data sets.

Corresponding MD:
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stages available/functions)
MD35112 \$MA_GEAR_STEP_MAX_VELO2 (2nd gear stage data set: max. speed for gear stage change)

MD35122 \$MA_GEAR_STEP_MIN_VELO2 (2nd gear stage data set: min. speed for gear stage change)

MD35212 \$MA_GEAR_STEP_POSCTRL_ACCEL2 (2nd gear stage data set: acceleration in position control mode)


Description:
MD35100 \$MA_SPIND_VELO_LIMIT defines the maximum spindle speed that the spindle (the spindle chuck with the workpiece or the tool) must not exceed. The NCK limits an excessive spindle setpoint speed to this value. If the maximum spindle actual speed is exceeded, even allowing for the spindle speed tolerance (MD35150
\$MA_SPIND_DES_VELO_TOL), there is a fault with the drive and the NC/PLC interface signal DB390x DBX2001.0 (speed limit exceeded) is set. Alarm 22100 "Maximum speed reached" is also output and all axes and spindles on the channel are decelerated (provided the encoder is still functioning correctly). The spindle has to be brought to a standstill before modifying the MD.
Corresponds with:
MD35150 \$MA_SPIND_DES_VELO_TOL (spindle speed tolerance)
SD43235 \$SD_SPIND_USER_VELO_LIMIT (speed limitation set by user)
NC/PLC interface signal DB390x DBX2001.0 (speed limit exceeded)
Alarm 22100 "Maximum speed reached"


- Programming a spindle speed which exceeds the highest numbered gear stage MD35110 \$MA_GEAR_STEP_MAX_VELO [MD35090] triggers a switch to the highest gear stage (MD $\overline{3} 5090$ ).

Related to:
MD35120 \$MA_GEAR_STEP_MIN_VELO (min. speed for automatic gear stage selection M40)
MD35090 \$MA_NUM_GEAR_STEPS (number of gear stages)
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stage change is possible)
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum speed of gear stage with speed control

```
MD35135 $MA_GEAR_STEP_PC_MAX_VELO_LIMIT (maximum speed of gear stage with position
control
MD35140 $MA_GEAR_STEP_MIN_VELO_LIMIT (min. speed of gear stage)
```

| 35112 | GEAR_STEP_MAX_VELO2 |  |  | A06, A11, A04 | S1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{rev} / \mathrm{min}$ | 2nd data set: Maximum speed for gear stage change |  |  | DOUBLE | NEW |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $\begin{array}{\|l\|} \hline 500 ., 500 ., 1000 ., \\ 2000 ., 4000 ., 8000 . \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |

## Description:

The 2nd gear stage data block for tapping with G331/G332 is activated with MD 35010: \$MA_GEAR_STEP_CHANGE_ENABLE bit 5 for the master spindle.

Related to:
MD35122 \$MA_GEAR_STEP_MIN_VELO2 (minimum speed for 2nd data block gear stage selection)
MD35092 \$MA_NUM_GEAR_STEPS2 (number of gear stages 2nd gear stage data block)
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stage change, 2nd data block is possible) MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum speed of gear stage with speed control) MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT (maximum speed of gear stage with position control)

MD35140 \$MA_GEAR_STEP_MIN_VELO_LIMIT (min. speed of gear stage)

| 35120 | GEAR_STEP_MIN_VELO |  |  | A06, A11, A04 | S1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| rev/min | Minimum speed for gear stage change |  |  | DOUBLE | NEW |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $\begin{aligned} & \text { 50., } 50 ., 400 ., 800 ., \\ & 1500 ., 3000 . \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |

## Description:

See MD35110 \$MA_GEAR_STEP_MAX_VELO for more information.
Note:

- Programming a spindle speed which undershoots the lowest speed of the first gear stage MD35120 \$MA_GEAR_STEP_MIN_VELO[1] triggers a switch to the first gear stage. Not relevant for:
- Programming of speed 0 (S0) if MD35120 \$MA_GEAR_STEP MIN_VELO[1] > 0

Related to:
MD35110 \$MA_GEAR_STEP_MAX_VELO (maximum speed for automatic gear stage selection M40)
MD35090 \$MA_NUM_GEAR_STEPS (number of gear stages)
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stage change is possible)
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum speed of the gear stage with speed control)

MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT (maximum speed of the gear stage with position control)

MD35140 \$MA_GEAR_STEP_MIN_VELO_LIMIT (min. speed of the gear stage)

| 35122 | GEAR_STEP_MIN_VELO2 | A06, A11, A04 | S1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| rev/min | 2nd data set: Minimum speed for gear stage change | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $\begin{array}{l}50 ., 50 ., 400 ., 800 ., \\ 1500 ., 3000 .\end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |$]$ M |  |
| :--- |

The minimum speed (lower switching threshold) of the gear stage for automatic gear stage change M40 G331 S.. is set in GEAR_STEP_MIN_VELO2 for interpolatory tapping G331, G332. The speed ranges of the gear stages must be defined so that there are no gaps between them or they can overlap.
The 2 nd gear stage data block for tapping with G331/G332 is activated with MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE bit 5 for the master spindle.
Related to:
MD35112 \$MA_GEAR_STEP_MAX_VELO2 (maximum speed for 2nd data block gear stage change)
MD35092 \$MA_NUM_GEAR_STEPS2 (number of gear stages 2nd gear stage data block)
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stage change, 2nd data block is possible) MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum speed of gear stage with speed control) MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT (maximum speed of gear stage with position control)

MD35140 \$MA_GEAR_STEP_MIN_VELO_LIMIT (min. speed of gear stage)

| 35130 | GEAR_STEP_MAX_VELO_LIMIT |  |  | A06, A11, A04 | A2, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| rev/min | Maximum speed of gear stage |  |  | DOUBLE | NEV |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $\begin{aligned} & \text { 500., } 500 ., 1000 ., \\ & 2000 ., 4000 ., 8000 . \end{aligned}$ | 1.0e-6 | $1.0 \mathrm{E}+301$ | 2/2 | M |

Description:
The maximum speed of the current gear stage for speed control mode (position control not active) is configured in MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT. The speed setpoints generated taking the override into account are limited to this speed.
Note:

- The configured speed cannot exceed the value from MD35100 \$MA_SPIND_VELO_LIMIT.
- If position control is active for the spindle, the speed is limited to the maximum speed of MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT.
- The NC/PLC interface signal "Setpoint speed limited" is set to indicate that the speed is being limited.
- The maximum speed entered here has no effect on the automatic gear stage selection M40 S..
- The upper switching threshold for the automatic gear stage selection M40 is configured in MD35110 \$MA_GEAR_STEP_MAX_VELO.
Related to:
MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT (maximum speed of the gear stage with position control)
MD35140 \$MA_GEAR_STEP_MIN_VELO_LIMIT (minimum speed of the gear stage)
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stage selection is possible)
MD35110 \$MA_GEAR_STEP_MAX_VELO (max. speed for automatic gear stage selection M40)
MD35120 \$MA_GEAR_STEP_MIN_VELO (min. speed for automatic gear stage selection M40)

| 35135 | GEAR_STEP_PC_MAX_VELO_LIMIT | A06, A11, A04 | S1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min | Maximum speed of the gear stage with position control |  |  |  |  | DOUBLE | NEW CONF |
| CTEQ |  |  |  |  |  |  |  |
| - | 6 | $0 ., 0 ., 0 ., 0 ., 0 ., 0$. | 0 | $1.0 \mathrm{E}+301$ |  |  |  |

Description: The maximum speed of the current gear stage is configured in MD35135
\$MA_GEAR_STEP_PC_MAX_VELO_LIMIT with position control active. The speed setpoints generated taking the override into account are limited to this speed.
If a value of 0 is set (default), $90 \%$ of the value from MD35130
\$MA_GEAR_STEP_MAX_VELO_LIMIT will become the maximum speed with position control active.

Note:

- The configured speed cannot exceed the value from MD35100 \$MA_SPIND_VELO_LIMIT.
- The NC/PLC interface signal "Setpoint speed limited" is set to indicate that the speed is being limited.
- The maximum speed entered here has no effect on the automatic gear stage selection M40 S..
- The upper switching threshold for the automatic gear stage selection M40 is configured in MD35110 \$MA_GEAR_STEP_MAX_VELO.
Related to:
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum speed of the gear stage with spee control)

MD35140 \$MA_GEAR_STEP_MIN_VELO_LIMIT (minimum speed of the gear stage)
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stage selection is possible)
MD35110 \$MA_GEAR_STEP_MAX_VELO (max. speed for automatic gear stage selection M40)
MD35120 \$MA_GEAR_STEP_MIN_VELO (min. speed for automatic gear stage selection M40)

| 35140 | GEAR_STEP_MIN_VELO_LIMIT | A06, A11, A04 | S1, V1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| rev/min | Minimum speed of gear stage | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $5 ., 5 ., 10 ., 20 ., 40 ., 80$. | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description: The minimum speed of the current gear stage is configured in MD35140
\$MA_GEAR_STEP_MIN_VELO_LIMIT. The minimum speed is applied only if the spindle is in speed control mode. The speed setpoints generated taking the override into account do not undershoot the minimum speed.
Note:

- If an $S$ value lower than the minimum speed is programmed, the setpoint speed is increased to the minimum speed.
- The NC/PLC interface signal "Setpoint speed increased" is set to indicate that the speed has been increased.
- The minimum speed entered here has no effect on the automatic gear stage selection M40 S..
- The lower switching threshold for the automatic gear stage selectionM40 is configured in MD35120 \$MA_GEAR_STEP_MIN_VELO.
Not relevant for:
- Spindle oscillation mode(gear stage change)
- Positioning and axis spindle modes
- Signals which cause the spindle to stop

Related to:
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum speed of gear stage with speed control)
MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT (maximum speed of gear stage with position control)
MD35010 \$MA_GEAR_STEP_CHANGE_ENABLE (gear stage change is possible)
MD35110 \$MA_GEAR_STEP_MAX_VELO (max. speed for automatic gear stage selection M40)
MD35120 \$MA_GEAR_STEP_MIN_VELO (min. speed for automatic gear stage selection M40)

| 35150 | SPIND_DES_VELO_TOL |  | $\begin{aligned} & \text { A03, A05, A06, } \\ & \text { A10, A04 } \end{aligned}$ | R1, S1, Z1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Spindle speed tolerance |  | DOUBLE | Reset |  |
| - |  |  |  |  |  |
| - | 0.1 | 0.0 | 1.0 | 2/2 | M |

Description: In spindle control mode, the set speed (programmed speed x spindle offset, allowing for limits) is compared with the actual speed.

- If the actual speed deviates from the set speed by more than MD35150 \$MA_SPIND_DES_VELO_TOL, the NC/PLC interface signal is DB390x DBX2001.5 (Spindle in setpoint range) is set to zero.
- If the actual speed deviates from the set speed by more than MD35150 \$MA_SPIND_DES_VELO_TOL, the path feed is disabled (positioning axes continue traversing).
- If the actual speed exceeds the maximum spindle speed (MD35100 \$MA_SPIND_VELO_LIMIT) by more than MD35150 \$MA_SPIND_DES_VELO_TOL, the NC/PLC interface signal is DB390x DBX2001.0 (Speed limit exceeded) is enabled and alarm 22050 "Maximum speed reached" is output. All axes and spindles on the channel are decelerated.

MD irrelevant to:

- Spindle oscillation mode
- Spindle positioning mode

Example:
MD 35150 \$MA_SPIND_DES_VELO_TOL = 0.1
The actual spindle speed must not deviate from the set speed by more than $+/-10 \%$. Related to:
MD35500 \$MA_SPIND_ON_SPEED_AT_IPO_START
(feed enable for spindle in setpoint range)
MD35100 \$MA_SPIND_VELO_LIMIT
(maximum spindle speed)
NC/PLC interface signal DB390x DBX2001.5 (Spindle in setpoint range)
NC/PLC interface signal DB390x DBX2001.0 (Speed limit exceeded)
Alarm 22050 "Maximum speed reached"

| 35160 | SPIND_EXTERN_VELO_LIMIT |  |  |  |  |  | A06, A04 | A3, S1, V1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min | Spindle speed limitation from PLC |  |  |  |  |  | DOUBLE | NEW CONF |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 1000.0 | $1.0 \mathrm{e}-6$ | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: A limiting value for the maximum spindle speed is entered in MD35160
\$MA_SPIND_EXTERN_VELO_LIMIT, which is taken into account exactly when the NC/PLC interface signal DB380x DBX3.6 (Velocity/speed limitation) is set.
The control limits a spindle speed which is too high to this value.

4.3 Axis-specific NC machine data

| $828 \mathrm{~d}-\mathrm{gse} 62$ | 6 | $30.0,30.0,25.0,20.0$, <br> $15.0,10.0$ | $1.0 \mathrm{e}-7$ | $1.0 \mathrm{E}+301$ | $1 / 1$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{te} 82$ | 6 | $30.0,30.0,25.0,20.0$, <br> $15.0,10.0$ | $1.0 \mathrm{e}-7$ | $1.0 \mathrm{E}+301$ | $1 / 1$ | M |
| $828 \mathrm{~d}-\mathrm{me} 82$ | 6 | $30.0,30.0,25.0,20.0$, <br> $15.0,10.0$ | $1.0 \mathrm{e}-7$ | $1.0 \mathrm{E}+301$ | $1 / 1$ | M |
| $828 \mathrm{~d}-$ gce82 | 6 | 100,100 | $1.0 \mathrm{e}-7$ | $1.0 \mathrm{E}+301$ | $1 / 1$ | M |
| 828 d -gse82 | 6 | 100,100 | $1.0 \mathrm{e}-7$ | $1.0 \mathrm{E}+301$ | $1 / 1$ | M |

Description: If the spindle is in speed control mode, the acceleration is entered in MD35200 \$MA_GEAR_STEP_SPEEDCTRL_ACCEL.
The spindle is in speed control mode with the function SPCOF.
Special cases:
The acceleration in speed control mode (MD35200 \$MA_GEAR_STEP_SPEEDCTRL_ACCEL) can be set so that the electric current limit is reached.
Related to:
MD35210 \$MA_GEAR_STEP_POSCTRL_ACCEL (acceleration in position control mode)
MD35220 \$MA_ACCEL_REDUCTION_SPEED_POINT (speed limit for reduced acceleration)

| 35210 | GEAR_STEP_POSCTRL_ACCEL | A06, A11, A04 | S1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| rev/s ${ }^{2}$ | Acceleration in position control mode | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $30.0,30.0,25.0,20.0$, <br> $15.0,10.0$ | $1.0 \mathrm{e}-7$ | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |$⿻ \mathrm{M} 9$

Description:
The acceleration in position control mode must be set so that the electric current limit is not reached.
Related to:
MD35200 \$MA_GEAR_STEP_SPEEDCTRL_ACCEL
MD35212 \$MA_GEAR_STEP_POSCTRL_ACCEL2

| 35212 | GEAR_STEP_POSCTRL_ACCEL2 |  |  | A06, A11, A04 | S1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{rev} / \mathrm{s}^{2}$ | 2nd data set: Acceleration in position control mode |  |  | DOUBLE | NE |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $\begin{aligned} & 30.0,30.0,25.0,20.0, \\ & 15.0,10.0 \end{aligned}$ | 1.0e-3 | $1.0 \mathrm{E}+301$ | 2/2 | M |

## Description:

Second gear stage data set for maximum acceleration capability of the gear stages in position control mode.
The acceleration in position control mode must be set so that the electric current limit is not reached.
The 2nd data set for tapping with G331/G332 is activated by MD35010
\$MA_GEAR_STEP_CHANGE_ENABLE, bit 5 for the master spindle.
Related to:
MD35210 \$MA_GEAR_STEP_POSCTRL_ACCEL
MD35200 \$MA_GEAR_STEP_SPEEDCTRL_ACCEL
MD35220 \$MA_ACCEL_REDUCTION_SPEED_POINT

| 35220 | ACCEL_REDUCTION_SPEED_POINT | A06, A04 | S1, S3, B2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Speed for reduced acceleration |  |  |  |  |  | DOUBLE | Reset |
| - |  |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | 1.0 | $2 / 2$ |  |  |  |$]$ M

## Description:

This machine data defines the threshold speed/velocity for spindles/positioning/path axes from which the acceleration reduction is to start. The reference is the defined maximum speed/velocity. The starting point is a percentage of the maximum values. The maximum speed for spindles is determined as the lowest value from machine data MD35100 \$MA_SPIND_VELO_LIMIT, MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT and, with position control, MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT.
Example: MD35220 \$MA_ACCEL_REDUCTION_SPEED_POINT $=0.7$, the maximum speed is 3000 rpm. Acceleration reduction starts at $v \_o n=2100 \mathrm{rpm}$, i.e. the maximum acceleration capacity is utilized in the speed range $0 . .2099 .99$ rpm. Reduced acceleration is used from 2100 rpm to the maximum speed.

Related to:
MD32000 \$MA_MAX_AX_VELO (maximum axis velocity)
MD35100 \$MA_SPIND_VELO_LIMIT (maximum spindle speed)
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum gear stage speed)
MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT (maximum gear stage speed with position control)

MD35230 \$MA_ACCEL_REDUCTION_FACTOR (reduced acceleration)

| 35230 | ACCEL_REDUCTION_FACTOR |  | A06, A04 | S1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Reduced acceleration |  | DOUBLE | Rese |  |
| CTEQ |  |  |  |  |  |
| - | 0.0 | 0.0 | 0.95 | 2/2 | M |

Description:
The machine data contains the factor by which the acceleration of the spindle/ positioning/path axes is reduced with reference to the maximum speed/velocity. The acceleration is reduced by this factor between the threshold speed/velocity defined in MD35220 \$MA_ACCEL_REDUCTION_SPEED_POINT and the maximum speed/velocity.
Example:
$a=10 \mathrm{rev} / \mathrm{s}^{2}$, v_on = 2100 rpm , MD35230 \$MA_ACCEL_REDUCTION_FACTOR = 0.3.
Acceleration and deceleration take place within the speed range 0...2099.99 rpm with an acceleration of $10 \mathrm{rev} / \mathrm{s}^{2}$. From a speed of 2100 rpm up to the maximum speed, the acceleration is reduced from $10 \mathrm{rev} / \mathrm{s}^{2}$ to $7 \mathrm{rev} / \mathrm{s}^{2}$.
MD irrelevant to:
Errors that lead to rapid stop.
Related to:
MD32300 \$MA_MAX_AX_ACCEL (axis acceleration)
MD35200 \$MA_GEAR_STEP_SPEEDCTRL_ACCEL
(acceleration in speed control mode)
MD35210 \$MA_GEAR_STEP_POSCTRL_ACCEL
(acceleration in position control mode)
MD35242 \$MA_ACCEL_REDUCTION_SPEED_POINT
(speed for reduced acceleration)

| 35240 | ACCEL_TYPE_DRIVE |  | A04 | B1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Acceleration curve DRIVE for axes ON/OFF |  | BOOLEAN | Res |  |
| CTEQ |  |  |  |  |  |
| - | FALSE | 0 | - | 1/1 | M |
| Description: | Basic setting of the acceleration response of the axis (positioning, oscillation, JOG, path motions): |  |  |  |  |
|  | FALSE: No acceleration reduction |  |  |  |  |
|  | TRUE: Acceleration reduction active |  |  |  |  |
|  | MD is active only when MD32420 \$MA_JOG_AND_POS_JERK_ENABLE = FALSE. |  |  |  |  |

The settings in MD35220 \$MA_ACCEL_REDUCTION_SPEED_POINT and MD35230
\$MA_ACCEL_REDUCTION_FACTOR are always active for spindles (in spindle mode).
Remark:
This MD also influences the path motion with SOFT, BRISK, TRAFO

| 35242 | ACCEL_REDUCTION_TYPE |  | A04 | B1, B2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Type of acceleration reduction |  | BYTE | Reset |  |
| CTEQ |  |  |  |  |  |
| - | 1 | 0 | 2 | 2/2 | M |

## Description:

Shape of acceleration reduction characteristic with DRIVE velocity control
0: Constant
1: Hyperbolic
2: Linear
The end point of the acceleration curve for spindles depending on MD35035 \$MA_SPIND_FUNCTION_MASK Bit23 is selected either from the maximum speed determined from MD35100 \$MA_SPIND_VELO_LIMIT, MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT and MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT or the relevant currently active speed limit.

| 35300 | SPIND_POSCTRL_VELO | A06, A04 | P3 pl, P3 sl, R1, S1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| rev/min | Position control activation speed | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | 6 | $\begin{array}{l}500.0,500.0,500.0, \\ 500.0,500.0,500.0\end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |$]$ M |  |
| :--- |

When positioning a spindle that is not in position control mode from a high speed, the position control is not activated until the spindle has reached or falls below the velocity defined in MD35300 \$MA_SPIND_POSCTRL_VELO.
The speed can be changed with FA[Sn] from the part program. Please refer to the documentation:
/FB1/ Function Manual, Basic Functions; Spindles (S1), section "Spindle mode 'positioning operation" for a description of the spindle behavior under various supplementary conditions (positioning from rotation, positioning from standstill). Note:
The active speed from MD35300 \$MA_SPIND_POSCTRL_VELO cannot exceed the max. speed set in MD35135 \$MA_GEAR_STEP_PC_MAX_VELO_LIMIT. If MD35135
\$MA_GEAR_STEP_解C_MAX_VELO_LIMIT $=0$, the value is limited to $90 \%$ of MD35130
\$MA_GEAR_STEP_MAX_VELO_LIMIT.
Related to:
MD35350 \$MA_SPIND_POSITIONING_DIR (direction of rotation during positioning from
standstill, if no synchronization is available)
MD35100 \$MA_SPIND_VELO_LIMIT (chuck speed)


## Description:

Positioning delay time.
After reaching the positioning end (exact stop fine), there is a waiting time equal to the time set in this MD. The position matching the currently set gear stage is selected. The delay time is activated for:

- Gear stage change at defined spindle position. After reaching the position configured in MD35012 \$MA_GEAR_STEP_CHANGE_POSITION, there is a waiting period equal to the time specifiē here. Af ter expiry of this time, the position control is switched off for an active direct measuring system, and the NC/PLC interface signals DB390x DBX2000.3 (Change gear) and DB390x DBX2000.0 - . 2 (Setpoint gear stage A-C) are output.
- Block search upon the output of an accumulated positioning block (SPOS, SPOSA, M19).

| 35350 | SPIND_POSITIONING_DIR |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Direction of rotation when positioning | A06 | S1 |  |  |
| CTEQ |  |  |  |  |  |
| - | - | 3 | 3 | 4 | Reset |

Description:

When SPOS or SPOSA is programmed, the spindle is switched to position control mode and accelerates with the acceleration defined in MD35210 \$MA_GEAR_STEP_POSCTRL_ACCEL (acceleration in position control mode) if the spindle is not synchronized. The direction of rotation is defined by MD35350 \$MA_SPIND_POSITIONING_DIR (direction of rotation for positioning from standstill).
MD35350 \$MA_SPIND_POSITIONING_DIR = 3 ---> Clockwise direction of rotation MD35350 \$MA_SPIND_POSITIONING_DIR = 4 ---> Counterclockwise direction of rotation Related to: MD35300 \$MA_SPIND_POSCTRL_VELO (position control activation speed)

| 35400 | SPIND_OSCILL_DES_VELO |  |  |  |  |  | A06, A04 | P3 pl, P3 sl, S1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min | Oscillation speed | DOUBLE | NEW CONF |  |  |  |  |  |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 500.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description:

During oscillation, the NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed) is used to select a motor speed for the spindle motor. This motor speed is defined in MD35400 \$MA_SPIND_OSCILL_DES_VELO. The motor speed defined in this MD is independent of the current gear stage. In the AUTOMATIC and MDI displays, the oscillation speed is displayed in the "Spindle setpoint" window until the gear is changed.
MD irrelevant to:
All spindle modes except oscillation mode
Special cases:
The acceleration during oscillation (MD35410 \$MA_SPIND_OSCILL_ACCEL) is valid for the oscillation speed defined in this MD.
Related to:
MD35410 \$MA_SPIND_OSCILL_ACCEL (acceleration during oscillation)
NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed)
NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC)

| 35410 | SPIND_OSCILL_ACCEL |  |  |  |  |  | A06, A04 | S1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/s ${ }^{2}$ | Acceleration during oscillation |  |  |  |  |  | DOUBLE | NEW CONF |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 16.0 | $1.0 \mathrm{e}-7$ | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: The acceleration specified here is only effective for the output of the oscillation speed (MD35400 \$MA_SPIND_OSCILL_DES_VELO) to the spindle motor. The oscillation speed is selected using the NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed).
MD irrelevant to:
All spindle modes except oscillation mode
Related to:
MD35400 \$MA_SPIND_OSCILL_DES_VELO (oscillation speed)

NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed)
NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC)

| 35430 | SPIND_OSCILL_START_DIR |  | A06 | S1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Start direction during oscillation |  | BYTE | Reset |  |
| CTEQ |  |  |  |  |  |
| - | 0 | 0 | 4 | 2/2 | M |

Description:
With the NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed), the spindle motor accelerates to the speed specified in MD35400: \$MA_SPIND_OSCILL_DES_VELO.
The start direction is defined by MD35430 \$MA_SPIND_OSCILL_START_DIR if the NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC) is not enabled.
MD35430 \$MA_SPIND_OSCILL_START_DIR = 0 ---> Start direction same as the last direction of rotation

MD35430 \$MA_SPIND_OSCILL_START_DIR = 1 ---> Start direction counter to the last
direction of rotation
MD35430 \$MA_SPIND_OSCILL_START_DIR = 2 ---> Start direction counter to the last
direction of rotation
MD35430 \$MA_SPIND_OSCILL_START_DIR = 3 ---> Start direction is M3
MD35430 \$MA_SPIND_OSCILL_START_DIR = 4 ---> Start direction is M4
MD irrelevant to:
All spindle modes except oscillation mode
Related to:
MD35400 \$MA_SPIND_OSCILL_DES_VELO (oscillation speed)
NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed)
NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC)

| 35440 | SPIND_OSCILL_TIME_CW |  |  |  |  |  |  | A06 | S1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| s | Oscillation time for M3 direction | DOUBLE | NEW CONF |  |  |  |  |  |  |
| CTEQ |  |  |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | $1.0 \mathrm{E}+301$ |  |  |  |  |  |

Description:
The oscillation time defined here is active in the M3 direction.
MD irrelevant to:

- All spindle modes except oscillation mode
- Oscillation via PLC (NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC) enabled)

Related to:
MD35450 \$MA_SPIND_OSCILL_TIME_CCW (oscillation time for M4 direction)
MD10070 \$MN_IPO_SYSCLOCK_TIME_RATIO (interpolator cycle)
NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed)
NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC)

| 35450 | SPIND_OSCILL_TIME_CCW |  |  |  |  |  | A06 | S1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Oscillation time for M4 direction | DOUBLE | NEW CONF |  |  |  |  |  |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 0.5 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

## Description:

The oscillation time defined here is active in the M4 direction.
MD irrelevant to:

- All spindle modes except oscillation mode
- Oscillation via PLC (NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC) enabled)

Related to:
MD35440 \$MA_SPIND_OSCILL_TIME_CW (oscillation time for M3 direction)
MD10070 \$MN_IPO_SYSCLOCK_TIME_RATIO (interpolator cycle)
NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed)
NC/PLC interface signal DB380x DBX2002.4 (Oscillation via PLC)

| 35500 | SPIND_ON_SPEED_AT_IPO_START |  |  | A03, A06, A10 | S1, Z1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Feedrate enable for spindle in the set range |  |  | BYTE | Reset |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-te42 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-gce42 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-gse42 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-me62 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-te62 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-gce62 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-gse62 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-te82 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-me82 | 1 | 1 | 0 | 2 | 7/2 | M |
| 828d-gce82 | 2 | 2 | 0 | 2 | 1/1 | M |
| 828d-gse82 | 2 | 2 | 0 | 2 | 1/1 | M |

Description:
For SW 4.2 and higher:
Byte $=0$ :
The path interpolation is not affected
Byte = 1:
The path interpolation is not enabled (positioning axes continue traversing) until the spindle has reached the specified speed. The tolerance range can be set in MD 35150: \$MA_SPIND_DES_VELO_TOL. If a measuring system is active, the actual speed is monitored, otherwise the set speed. Path axes traversing in continuous-path mode (G64) are not stopped.
Byte $=2$ :
In addition to 1 , traversing path axes are also stopped before machining begins, e.g. continuous-path mode (G64) and the change from rapid traverse (G0) to a machining block (G1, G2,..). The path is stopped at the last GO block, and does not start traversing until the spindle is within the set speed range. If the spindle speed is reprogrammed between two machining blocks, and the spindle speed is not yet in the setpoint range during transition from the first to the second machining block, the traversing path axes are also braked.
Restriction:
If the spindle is re-programmed by the PLC (FC18) or a synchronized action "shortly" before the end of the last $G 0$ block, the path decelerates on the basis of the dynamic limitations. Since the spindle programming is asynchronous, a traverse can be made into the machining block if necessary. If the spindle has reached the setpoint speed range, machining starts from this position.
Byte = 3:
No longer available for SW 5.3 and higher.
Related to:
MD35150 \$MA_SPIND_DES_VELO_TOL (Spindle speed tolerance)
NC/PLC interface signal DB390x DBX2001.5 (Spindle in setpoint range)

### 4.3 Axis-specific NC machine data



Description: When a spindle is stopped (M5), the path feed is disabled (positioning axes continue traversing) if MD35510 \$MA_SPIND_STOPPED_AT_IPO_START is enabled and the spindle is in control mode.
When the spindle has come to a standstill (NC/PLC interface signal DB390x DBX1.4 (Axis/ spindle stationary) enabled), the path feed is enabled.
Related to:
MD35500 \$MA_SPIND_ON_SPEED_AT_IPO_START (feed enable for spindle in setpoint range)


| 828d-te82 | 6 | 10000., 10000., 10000., 10000., 10000., 10000. | 0.1 | $1.0 \mathrm{E}+301$ | 1/1 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-me82 | 6 | 10000., 10000., 10000., 10000., 10000., 10000. | 0.1 | $1.0 \mathrm{E}+301$ | 1/1 | M |
| 828d-gce82 | 6 | $\begin{aligned} & \text { 2000., 2000., } 2000 . \text {, } \\ & 2000 ., 2000 ., 2000 . \end{aligned}$ | 0.1 | 1.0E+301 | 1/1 | M |
| 828d-gse82 | 6 | $\begin{aligned} & \hline 2000 ., 2000 ., 2000 ., \\ & 2000 ., 2000 ., 2000 . \end{aligned}$ | 0.1 | $1.0 \mathrm{E}+301$ | 1/1 | M |

Description:
Limit speed values for tapping without compensating chuck with G331/G332.
The maximum speed of the linear motor characteristic range (constant acceleration capacity) must be specified depending on the gear stage.

| 35590 | PARAMSET_CHANGE_ENABLE | EXP, A05 | TE3, A2, S1, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Parameter set can be changed | BYTE | PowerOn |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $1 / 1$ |  |

Description:
0: Parameter set changes cannot be controlled.
For axes and spindles in axis mode: The first parameter set is always active. In the case of spindles the parameter set is set as appropriate for the gear stage (1st gear stage uses 2nd parameter set). Exceptions: See below.
1: The parameter set applied in the servo is defined via the VDI interface or SCPARA. Parameter sets 1 to 6 can be selected. Sets are selected using the NC/PLC interface signal DB380x DBX9.0-.2 (selection of parameter set servo $A, B, C$ ) in the binary-coded value range 0 to 5. Binary values 6 and 7 select parameter set no. 6 . Exceptions: See below.
For 0 and 1:
With G33, G34, G35, G331, G332, the parameter set number for the axes involved is ativated in accordance with the master spindle gear stage, increased by one (corresponds with parameter set numbers 2 to 6).
For spindles, parameter sets 2 to 6 are always active, depending on the set gear stage plus one.
2: The parameter set is only ever defined via the VDI interface or SCPARA. Parameter sets 1 to 6 can be selected. Sets are selected using the NC/PLC interface signal DB380x DBX9.0-. 2 (selection of parameter set servo $A, B, C$ ) in the binary-coded value range 0 to 5. Binary values 6 and 7 select parameter set no. 6 .
Secondary conditions:
Changeover response is determined by whether the KV factor differs between the active parameter set and the new parameter set.
Changing a parameter set where the load gearbox factors differ between the active parameter set and the new parameter set will reset the referenced signal, provided that the axis has an indirect measuring system.
The parameter set contains the following axial machine data:
MD36200 \$MA_AX_VELO_LIMIT
MD32200 \$MA_POSCTRL_GAIN
MD32800 \$MA_EQUIV_CURRCTRL_TIME
MD32810 \$MA_EQUIV_SPEEDCTRL_TIME
MD32910 \$MA_DYN_MATCH_TIME
MD31050 \$MA_DRIVE_AX_RATIO_DENOM
MD31060 \$MA_DRIVE_AX_RATIO_NUMERA
Corresponds with:
NC/PLC interface signals DB380x DBX9.0 - . 2 (selection of parameter set servo A, B, C) and DB390x DBX9.0 - . 2 (selected parameter set servo A, B, C)

References:
/FB/, H2, "Output of Auxiliary Functions to PLC"

| 36000 | STOP_LIMIT_COARSE |  |  | A05 | TE1, A3, B1, G2, S1, Z1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Exact stop coarse |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | $\begin{aligned} & \text { 0.04, 0.04, 0.04, 0.4, } \\ & 0.04 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |
| 828d-te42 | - | $\begin{aligned} & 0.04,0.04,0.4,0.4 \\ & 0.04 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce42 | - | 0.04, 0.04, 0.4, 0.4, 0.4 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse42 | - | $\begin{aligned} & 0.04,0.04,0.04,0.4, \\ & 0.04 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me62 | - | $\begin{aligned} & 0.04,0.04,0.04,0.4 \\ & 0.04,0.04,0.04,0.04 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te62 | - | $\begin{array}{\|l} \hline 0.04,0.04,0.4,0.4 \\ 0.04,0.04,0.04,0.04 \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce62 | - | $\begin{aligned} & 0.04,0.04,0.04,0.04 \\ & 0.04,0.04,0.04,0.04 \ldots \\ & \hline \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse62 | - | $\begin{array}{\|l\|} \hline 0.04,0.04,0.04,0.04 \\ 0.04,0.04, ~ 0.04, ~ 0.04 . \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te82 | - | $\begin{aligned} & 0.04,0.04,0.4,0.4 \\ & 0.4,0.04,0.04,0.4 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me82 | - | $\begin{aligned} & \hline 0.04,0.04,0.04,0.4 \\ & 0.04,0.04,0.04,0.04 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce82 | - | $\begin{array}{\|l} 0.04,0.04,0.4,0.4, \\ 0.4, ~ 0.04, ~ 0.4, ~ 0.4 \\ \hline \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse82 | - | $\begin{aligned} & \text { 0.04, 0.04, 0.04, 0.4, } \\ & 0.04,0.4,0.4,0.4 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |

## Description:

Threshold for exact stop coarse
An NC block is considered as terminated if the actual position of the path axes is away from the setpoint position by the value entered for the exact stop limit. If the actual position of a path axis is not within this limit, the NC block is considered as not terminated, and further part program execution is not possible. The magnitude of the value entered influences the transition to the next block. The larger the value, the earlier the block change is initiated.
If the specified exact stop limit is not reached, then

- the block is considered as not terminated,
- further traversing of the axis is not possible,
- alarm 25080 Positioning monitoring is output after expiry of the time specified in MD36020 \$MA_POSITIONING_TIME (monitoring time for exact stop fine),
- the direction of movement +/- is indicated for the axis in the positioning display. The exact stop window is also evaluated for spindles in position control mode (SPCON instruction).
Special cases:
MD36000 \$MA_STOP_LIMIT_COARSE must not be set smaller than MD36010 \$MA_STOP_LIMIT_FINE (exact stop fine). To achieve the identical block change behavior as with the "exact stop fine" criterion, the exact stop coarse window may be identical to the exact stop fine window. MD36000 \$MA_STOP_LIMIT_COARSE must not be set equal to or greater than MD36030 \$MA STANDSTILL POS TOL (standstill tolerance).

Related to:
MD36020 \$MA_POSITIONING_TIME (delay time, exact stop fine)

| 36010 | STOP_LIMIT_FINE |  |  | A05 | TE1, A3, B1, D1, G2, S1, Z1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Exact stop fine |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | $\begin{aligned} & 0.01,0.01,0.01,0.1 \\ & 0.01 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te42 | - | $\begin{aligned} & \text { 0.01, 0.01, 0.1, 0.1, } \\ & 0.01 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce42 | - | 0.01, 0.01, 0.1, 0.1, 0.1 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse42 | - | $\begin{aligned} & 0.01,0.01,0.01,0.1 \\ & 0.01 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me62 | - | $\begin{array}{\|l\|} \hline 0.01,0.01,0.01,0.1 \\ 0.01,0.01,0.01,0.01 \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te62 | - | $\begin{array}{\|l\|} \hline 0.01,0.01,0.1,0.1, \\ 0.01,0.01,0.01,0.01 \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce62 | - | $\begin{aligned} & 0.01,0.01,0.01,0.01 \\ & 0.01,0.01,0.01,0.01 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse62 | - | $\begin{array}{\|l\|} \hline 0.01,0.01,0.01,0.01 \\ 0.01,0.01,0.01,0.01 \ldots \\ \hline \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te82 | - | $\begin{array}{\|l\|} \hline 0.01,0.01,0.1,0.1 \\ 0.1,0.01,0.01,0.1 \ldots \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me82 | - | $\begin{array}{\|l} 0.01,0.01,0.01,0.1 \\ 0.01,0.01,0.01,0.01 \ldots \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce82 | - | $\begin{array}{\|l} \hline 0.01,0.01,0.1,0.1, \\ 0.1,0.01,0.1,0.1 \\ \hline \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse82 | - | $\begin{array}{\|l\|} \hline 0.01,0.01,0.01,0.1, \\ 0.01,0.1,0.1,0.1 \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |

Description: Threshold for exact stop fine
See also MD36000 \$MA_STOP_LIMIT_COARSE (exact stop coarse)
Special cases:
MD36010 \$MA_STOP_LIMIT_FINE must not be set greater than MD36000 \$MA_STOP_LIMIT_COARSE (exact stop coarse).

MD36010 \$MA_STOP_LIMIT_FINE must not be set greater than or equal to MD36030 \$MA_STANDSTILL_POS_TOL (standstill tolerance).

Related to:
MD 36020: \$MA_POSITIONING_TIME (delay time, exact stop fine)


## Description:

With this factor,
MD36000 \$MA_STOP_LIMIT_COARSE,
MD36010 \$MA_STOP_LIMIT_FINE,
MD36030 \$MA_STANDSTILL_POS_TOL
can be re-assessed as a function of the parameter set. The relationship between these three values always remains the same.

Application examples:
Adapting the positioning behavior if the mass relationships change significantly with a gear change, or if it is desired to save on machine positioning time at the cost of accuracy in various operating conditions.

Related to:
MD36000 \$MA_STOP_LIMIT_COARSE,
MD36010 \$MA_STOP_LIMIT_FINE,
MD36030 \$MA_STANDSTILL_POS_TOL

| 36020 | POSITIONING_TIME | A05 | TE1, A3, B1, G2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Delay time exact stop fine |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description:

The following error must have reached the limit value for exact stop fine by the expiry of the time entered in this MD for traveling into the position (position setpoint has reached the destination).
The current following error is therefore continuously monitored for the time limit MD36010 \$MA_STOP_LIMIT_FINE. If this time is exceeded, alarm 25080 "Positioning monitoring" is output, and the axis stopped. The time entered in this MD should be long enough to ensure that the monitoring function is not triggered under normal operating conditions, taking into account any settling times.
Related to:
MD 36010: \$MA_STOP_LIMIT_FINE (exact stop fine)

| 36030 | STANDSTILL_POS_TOL |  |  | A05 | G1, A3, D1, G2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Standstill tolerance |  |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0.2, 0.2, 0.2, 1.0, 0.2 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te42 | - | 0.2, 0.2, 1.0, 1.0, 0.2 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce42 | - | 0.2, 0.2, 1.0, 1.0, 1.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse42 | - | 0.2, 0.2, 0.2, 1.0, 0.2 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-me62 | - | $\begin{aligned} & \begin{array}{l} 0.2,0.2,0.2,1.0,0.2, \\ 0.2,0.2,0.2 \end{array} \\ & \hline \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te62 | - | $\begin{aligned} & 0.2,0.2,1.0,1.0,0.2, \\ & 0.2,0.2,0.2 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce62 | - | $\begin{array}{\|l} \begin{array}{l} 0.2,0.2,0.2,0.2,0.2, \\ 0.2,0.2,0.2 \ldots . \end{array} \\ \hline \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse62 | - | $\begin{aligned} & \begin{array}{l} 0.2,0.2,0.2,0.2,0.2, \\ 0.2,0.2,0.2 . . \end{array} \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te82 | - | $\begin{array}{\|l\|} \hline 0.2,0.2,1.0,1.0,1.0, \\ 0.2,0.2,1.0 \ldots \\ \hline \end{array}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-me82 | - | $\begin{aligned} & 0.2,0.2,0.2,1.0,0.2, \\ & 0.2,0.2,0.2 \ldots \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce82 | - | $\begin{aligned} & 0.2,0.2,1.0,1.0,1.0, \\ & 0.2,1.0,1.0 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse82 | - | $\begin{aligned} & 0.2,0.2,0.2,1.0,0.2, \\ & 1.0,1.0,1.0 \end{aligned}$ | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

## Description:

This MD serves as a tolerance band for the following monitoring functions:

- After termination of a traversing block (position partial setpoint=0 at the end of the movement), whether the following error has reached the limit value for MD36030 \$MA_STANDSTILL_POS_TOL (standstill tolerance) is monitored after the programmable MD36040 \$MA_STANDSTILL_DELAY_TIME (delay time, standstill monitoring).
- After termination of a positioning action (exact stop fine reached), positioning monitoring is replaced by standstill monitoring. The axis is monitored for moving from its position by more than defined in MD36030 \$MA_STANDSTILL_POS_TOL (standstill tolerance).

```
If the setpoint position is over- or undershot by the standstill tolerance, alarm
25040 "Standstill monitoring" is output and the axis stopped.
Special cases:
The standstill tolerance must be greater than the "exact stop limit coarse".
Related to:
MD36040 $MA_STANDSTILL_DELAY_TIME (delay time, standstill monitoring)
```

| 36040 | STANDSTILL_DELAY_TIME |  |  |  |  |  | A05 | TE1, A3, F1, G2 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Delay time for standstill monitoring | DOUBLE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | -0.4 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |  |


| 36042 | FOC_STANDSTILL_DELAY_TIME | A05 | F1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| s | Delay time for standstill monitoring w/ active torque or force <br> limitation. | DOUBLE | NEW CONF |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0.4 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |

Description:

Only for PROFIdrive telegrams including a torque/force limiting value:
Waiting time between the end of a movement and activation of standstill monitoring with active torque/force limitation.
If the configurable end of block criterion occurs within this time, then standstill monitoring is activated.

| 36050 | CLAMP_POS_TOL |  |  |  |  |  | A05 | A3, D1, Z1 |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Clamping tolerance |  |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0.5 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |  |

## Description:

With NC/PLC interface signal DB380x DBX2.3 (Blocking action active), blocking monitoring is activated. If the monitored axis is forced away from the setpoint position (exact stop limit) by more than the blocking tolerance, alarm 26000 "Blocking monitoring" is output and the axis stopped.
Threshold value for clamping tolerance (half width of window).
Special cases:
The clamping tolerance must be greater than the "exact stop limit coarse".
Related to:
NC/PLC interface signal DB380x DBX2.3 (Blocking action active)

| 36051 | CLAMP_POS_TOL_TIME |  |  |  |  |  | A05 | A3, D1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Alarm delay time for clamping monitoring |  |  |  |  |  |  |  |
| - | - | DOUBLE | NEW CONF |  |  |  |  |  |
| - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |  |  |  |

Description:
The MD defines the length of time for which the clamping tolerance can be exceeded before alarm 26000 "Clamping monitoring" is output.

If the clamping tolerance is exceeded before the expiry of this time, the user is first informed via the NC/PLC interface signal DB3900, ... DBX5006.3 (Clamping tolerance exceeded) (without alarm)

If the clamping tolerance is undershot before the expiry of this time, the clamping monitoring is reset with the NC/PLC interface signal DB3900, ... DBX5006.3 (Clamping tolerance exceeded) (without alarm)
See MD36050 \$MA_CLAMP_POS_TOL (clamping tolerance).

Related to:
NC/PLC interface signal DB380x DBX2.3 (Clamping process active)
NC/PLC interface signal DB3900, ... DBX5006.3 (Clamping tolerance exceeded)

| 36052 | STOP_ON_CLAMPING |  |  |  |  |  | A10 | A3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Special functions with clamped axis | UBYTE | NEW CONF |  |  |  |  |  |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | $0 \times 07$ |  |  |  |  |

## Description:

This MD defines how a blocked axis is taken into account.
Bit $0=0$ :
If a blocked axis is to be traversed again in continuous-path mode, it must be ensured via the part program that the path axes are stopped and that there is time for releasing the blockage.
Bit $0=1$ :
If a blocked axis is to be traversed again in continuous-path mode, the LookAhead function stops the path motion if required until the position controller is allowed to traverse the blocked axis again, i.e. until the controller enable is set again.
Bit 1 is relevant only if bit 0 is set:
Bit $1=0$ :
If a blocked axis is to be traversed again in continuous-path mode, the LookAhead function does not release the blockage.
Bit $1=1$ :
If a blocked axis is to be traversed again in continuous-path mode, a traversing command for the blocked axis is given in the preceding GO blocks so that the PLC releases the axis blockage again.
Bit $2=0$ :
If an axis is to be blocked in continuous-path mode, it must be ensured in the part program that the path axes are stopped to make sure that there is time for setting the blockage.
Bit 2 =1:
If an axis is to be blocked in continuous-path mode, the LookAhead function stops the path motion prior to or in the next non-G0 block, if the axis has not yet been blocked by that time, i.e. the PLC has not yet set the feedrate override to zero.



| 36100 | POS_LIMIT_MINUS |  |  | A03, A05, A11 |  | Z1 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm , degrees | 1st software limit switch minus |  |  | DOUBLE | NE |  |
| CTEQ |  |  |  |  |  |  |
| - | - | $\begin{aligned} & -1.0 \mathrm{e} 8,-1.0 \mathrm{e} 8,-1.0 \mathrm{e} 8, \\ & -1.0 \mathrm{e} 8,-1.0 \mathrm{e} 8,-1.0 \mathrm{e} 8, \\ & -1.0 \mathrm{e} 8,-1.0 \mathrm{e} 8 \ldots . \end{aligned}$ | ```-MD_DBLMAX, - MD_DBLMAX, - MD_DBLMAX, - MD_DBLMAX, - MD_DBLMAX, - MD_...``` | $\begin{aligned} & 1.0 \mathrm{E}+301,1.0 \mathrm{E} \\ & +301,1.0 \mathrm{E}+301, \\ & 1.0 \mathrm{E}+301,1.0 \mathrm{E} \\ & +301,1.0 \mathrm{E}+301, \\ & 1.0 \mathrm{E} . . . \end{aligned}$ | 2/2 | M |
| Description: | Same meaning limitation <br> The MD becom DB380x DBX10 <br> MD irrelevan <br> if axis is <br> Related to: <br> NC/PLC inter | as 1st software li in the negative s active after ref 0.2 (2nd software <br> t referenced. <br> ace signal DB380x | it switch plus rection. <br> rence point ap imit switch mi <br> BX1000.2 (2nd | however the proach if the nus) is not se <br> software limit | NC/ <br> t. <br> SW | ng <br> ac |



Description:
A software limit switch can be activated in addition to the hardware limit switch. The absolute position in the machine axis system of the positive range limit of each axis is entered.

The MD is active after reference point approach if NC/PLC interface signal DB380x DBX1000.3 (2nd software limit switch plus) has not been set.

MD irrelevant:
if axis is not referenced.
Related to:
NC/PLC interface signal DB380x DBX1000.3 (2nd software limit switch plus)

| 36120 | POS_LIMIT_MINUS2 |  |  |  |  |  | A03, A05 | TE1, A3, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | 2nd software limit switch minus | DOUBLE | NEW CONF |  |  |  |  |  |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | $-1.0 e 8$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

## Description:

Same meaning as 2nd software limit switch plus, but the traversing range limitation is in the negative direction.

The PLC can select whether software limit switch 1 or 2 is to be active by means of the interface signal.

For example:
DB380x DBX1000.2 $=0$ (1st software limit switch minus) active for 1 st axis
DB380x DBX1000.2 = 1 (2nd software limit switch minus) active for 1 st axis
MD irrelevant:
if axis is not referenced.
Related to:
NC/PLC interface signal DB380x DBX1000.2 (2nd software limit switch minus)

| 36130 | POS_LIMIT_PLUS2 |  | A03, A05 | TE1, A3, Z1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm , degrees | 2nd software limit switch plus |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |
| - | 1.0e8 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |

## Description:

This machine data can define a 2nd software limit switch position in the positive direction in the machine axis system. The PLC can select which of the two software limit switches 1 or 2 is to be active by means of an interface signal.

For example:
DB380x DBX1000.3 = 0 (1st software limit switch plus) active for 1st axis
DB380x DBX1000.3 = 1 (2nd software limit switch plus) active for lst axis
MD irrelevant:
if axis is not referenced.
Related to:
NC/PLC interface signal DB380x DBX1000.3 (2nd software limit switch plus)

| 36200 | AX_VELO_LIMIT |  |  | A05, A11, A04 | TE3, A3, G2, S1, V1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm/min, rev/min | Threshold value for velocity monitoring |  |  | DOUBLE | NEW CONF |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | 6 | $\begin{array}{\|l} \hline \text { 11500., 11500., } \\ \text { 11500., 11500., } \\ \text { 11500., 11500., } \\ \text { 11500., 11500., } \end{array}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te42 | 6 | 11500., 11500., <br> 11500., 11500., <br> 11500., 11500., <br> 11500., 11500., ... | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce42 | 6 | $\begin{aligned} & \hline 11500 ., 11500 ., \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., } \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse42 | 6 | 11500., 11500., <br> 11500., 11500., <br> 11500., 11500., <br> 11500., 11500., ... | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-me62 | 6 | $\begin{aligned} & \hline 11500 ., 11500 ., \\ & 11500 ., 11500 ., \\ & 11500 ., 11500 ., \\ & 11500 ., 11500 ., \text {... } \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-te62 | 6 | 11500., 11500., 11500., 11500., 11500., 11500., 11500., 11500., ... | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gce62 | 6 | - | (0./ 0.) | $\begin{array}{\|l} \hline \text { (MD_DBLMAX/ } \\ \text { MD_DBLMAX) } \\ \hline \end{array}$ | 2/2 | M |
| 828d-gse62 | 6 | - | (0./ 0.) | (MD_DBLMAXI <br> MD_DBLMAX) | 2/2 | M |
| 828d-te82 | 6 | $\begin{aligned} & \hline 11500 ., 11500 ., \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., } \\ & \text { 11500., } 11500 ., \end{aligned}$ | (0./ 0.) | (MD_DBLMAXI MD_DBLMAX) | 2/2 | M |
| 828d-me82 | 6 | $\begin{aligned} & \hline 11500 ., 11500 ., \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., ... } \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ <br> MD_DBLMAX) | 2/2 | M |
| 828d-gce82 | 6 | $\begin{aligned} & \hline 11500 ., 11500 ., \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., ... } \end{aligned}$ | (0./ 0.) | (MD_DBLMAX/ MD_DBLMAX) | 2/2 | M |
| 828d-gse82 | 6 | $\begin{aligned} & \text { 11500., 11500., } \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., } \\ & \text { 11500., 11500., ... } \end{aligned}$ | (0./ 0.) | (MD_DBLMAXI <br> MD_DBLMAX) | 2/2 | M |

Description: The threshold value for actual velocity monitoring is entered in this machine data. If the axis has at least one active encoder and if this encoder is below its limit frequency, alarm 25030 "Actual velocity alarm limit" is triggered when the threshold value is exceeded, and the axis is stopped.
Settings:

- For axes, a value should be selected that is $10-15$ \% higher than that in MD32000 \$MA_MAX_AX_VELO (maximum axis velocity).


### 4.3 Axis-specific NC machine data

When temperature compensation is active MD32750 \$MA_TEMP_COMP_TYPE, the maximum axis velocity is increased by an additional factor, which is obtained from MD32760 \$MA_COMP_ADD_VELO_FACTOR (velocity increase as a result of compensation). Therefore, the following should apply for the threshold value of the velocity monitoring: MD36200 \$MA_AX_VELO_LIMIT[n] > MD32000 \$MA_MAX_AX_VELO * (1,1 . . 1,15 + MD32760 \$MA_COMP_ADD_VELO_FACTOR)

- For spindles, a value should be selected for each gear stage that is 10-15 \% above MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT[n] (maximum speed of the gear stage).
The index of the machine data has the following coding: [control parameter set no.]: 0-5


Description:
This MD defines the maximum speed setpoint in percent. $100 \%$ is the maximum speed setpoint, this corresponds to 10 V for an analog interface or the maximum speed for PROFIdrive drives (manufacturer-specific adjustable parameter in the drive, e.g. p1082 and, if applicable, p2000 for SINAMICS.
The maximum speed setpoint depends on whether there are any setpoint limitations in the speed and current controller.
An alarm is output and the axis is stopped when the limit is exceeded.
The limit is to be selected so that the maximum velocity (rapid traverse) can be reached, and an appropriate additional control margin is available.
Note: If a value corresponding to the upper limit (200\%) is entered, this value is automatically corrected by the system to $199,9999 \%$. This correction is made for technical reasons.

| 36220 | CTRLOUT_LIMIT_TIME |  |  |  |  |  | EXP, A05 | A3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Delay time for speed setpoint monitoring | DOUBLE | NEW CONF |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 1 | 0.0 | 0.0 | 1.0 E+301 |  |  |  |  |

Description: This MD defines how long the speed setpoint may be within the limit CTRLOUT_LIMIT[n] (max. speed setpoint) until the monitoring function is triggered.
Monitoring (and with it also this machine data) is always active.
Reaching the limit renders the position control loop non-linear, which results in contour errors provided that the speed setpoint limited axis is participating in contour generation. That is why this MD has default value 0, i.e. the monitoring function responds as soon as the speed setpoint reaches the limit.

| 36300 | ENC_FREQ_LIMIT |  |  |  |  |  |  | EXP, A02, A05, <br> A06 | A3, D1, R1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Encoder limit frequency | DOUBLE | PowerOn |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 2 | $3.0 e 5,3.0 e 5$ | 0.0 | $1.0 \mathrm{E}+301$ |  |  |  |  |  |

## Description:

This MD is used to enter the encoder frequency, which,
in general, is a manufacturer specification (type plate, documentation).
For PROFIdrive:
No automatic, software-internal limitation for encoders on the PROFIdrive drive; here, the limit values of the measuring circuit module depend on the drive hardware used, i.e. known only by the drive. Therefore, it is the user who is responsible for taking into account the limit frequency of the measuring circuit module.


| 36310 | ENC_ZERO_MONITORING |  | EXP, A02, A05 | A3, R1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Zero mark monitoring |  | DWORD | NEW CONF |  |
| - |  |  |  |  |  |
| - | $2 \quad 0,0$ | 0 | - | 2/2 | M |

Description:
This MD is used to activate zero mark monitoring.
For PROFIdrive drives (the corresponding diagnostics system variables are not currently supplied for incremental measuring systems):
For PROFIdrive, the permissible deviation must be set in the drive, *not* in the NC. Zero mark monitoring reported by the drive is mapped to the NCK according to the following rule:

0: no zero mark monitoring
100: no zero mark monitoring together with suppression of all encoder monitoring operations, i.e. not only alarm 25020 but also alarms 25000 , 25010 etc. are suppressed.
$>0$ but less than 100: direct triggering of power ON alarm 25000 ( or 25001).
>100: attenuated error message: reset alarm 25010 (25011) is output instead of power ON alarm 25000 (25001).
For absolute measuring systems (MD30240 \$MA_ENC_TYPE=4):
Permissible deviation in $1 / 2$ coarse increments between the absolute and the incremental encoder track (one $1 / 2$ coarse increment is sufficient).

| 36312 | ENC_ABS_ZEROMON_WARNING |  |  |  |  |  |  | EXP, A02, A05 | A3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Zero mark monitoring warning level | DWORD | NEW CONF |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| 828 d-me42 | 2 | 10,10 | 0 | - |  |  |  |  |  |

### 4.3 Axis-specific NC machine data

| 828d-te42 | 2 | 10, 10 | 0 | - | 7/2 | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce42 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-gse42 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-me62 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-te62 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-gce62 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-gse62 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-te82 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-me82 | 2 | 10, 10 | 0 | - | 7/2 | M |
| 828d-gce82 | 2 | 10, 10 | 0 | - | 0/0 | S |
| 828d-gse82 | 2 | 10, 10 | 0 | - | 0/0 | S |

Description: Only for absolute measuring systems (MD30240 \$MA_ENC_TYPE=4):
This MD activates zero mark diagnostics.
0: no zero mark diagnostics
$>0$ : permissible deviation in $1 / 2$ coarse increments between the absolute and the incremental encoder track (one $1 / 2$ coarse increment is sufficient).

| 36314 | ENC_ABS_ZEROMON_INITIAL |  |  | EXP, A02, A05 | A3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Warning level for absolute encoder power ON |  |  | DWORD | NEW CONF |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-te42 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-gce42 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-gse42 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-me62 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-te62 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-gce62 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-gse62 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-te82 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-me82 | 2 | 1000, 1000 | 0 | - | 7/2 | M |
| 828d-gce82 | 2 | 1000, 1000 | 0 | - | 0/0 | S |
| 828d-gse82 | 2 | 1000, 1000 | 0 | - | 0/0 | S |

Description: Only for absolute measuring systems (MD30240 \$MA_ENC_TYPE=4):
Parameterization in $1 / 2$ coarse increments
At absolute encoder power ON (deselect parking and similar) this MD parameterizes the previously permissible position offset (comparison of the new absolute position with the information last saved in SRAM). When the warning level is exceeded, system variable \$VA_ENC_ZERO_MON_ERR_CNT is incremented in coarse increments by the value 10000 .


| $828 \mathrm{~d}-\mathrm{me} 62$ | - | $1.0,1.0,1.0,20.0,1.0$, <br> $1.0,1.0,1.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{te} 62$ | - | $1.0,1.0,20.0,20.0$, <br> $1.0,1.0,1.0,1.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828 d -gce62 | - | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gse} 62$ | - | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{te} 82$ | - | $1.0,1.0,20.0,20.0$, <br> $20.0,1.0,1.0,20.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{me} 82$ | - | $1.0,1.0,1.0,20.0,1.0$, <br> $1.0,1.0,1.0 \ldots$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| $828 \mathrm{~d}-$ gce82 | - | $1.0,1.0,20.0,20.0$, <br> $20.0,1.0,20.0,20.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| $828 \mathrm{~d}-$ gse82 | - | $1.0,1.0,1.0,20.0,1.0$, <br> $20.0,20.0,20.0$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |

Description:
Tolerance band for axial contour monitoring (dynamic following error monitoring).
The permissible deviation between the real and the modelled following error is entered in this MD.
The input of the tolerance band is intended to avoid spurious tripping of the dynamic following error monitoring caused by minor speed fluctuations, which occur during normal closed-loop control operations (e.g. during first cut).
Following error modelling and thus the input of this MD depend on the position control gain MD32200 \$MA_POSCTRL_GAIN
and, in the case of precontrol or simulation, on the accuracy of the controlled system model MD32810 \$MA_EQUIV_SPEEDCTRL_TIME (equivalent time constant for precontrol of speed control loop), as well as on the accelerations and velocities used.

| 36500 | ENC_CHANGE_TOL | A02, A05 | G1, K6, K3, A3, D1, G2, Z1 |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Tolerance at actual position value change. |  |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0.1 | 0.0 | $1.0 \mathrm{E}+301$ |  |  |  |  |  |

Description:

The permissible deviation between the actual values of the two measuring systems is entered in this MD.
This difference must not be exceeded when switching over the measuring system used for closed-loop control, in order to avoid compensating processes that are too strong. Otherwise, the error message 25100 "Axis \%1 Switchover of measuring system not possible" is generated and the switchover does not take place.
This MD is relevant only if MD30200 \$MA_NUM_ENCS = 2 .
MD36500 also limits, in the form of a ramp, the rate of change of the backlash compensation values in MD32450 \$MA_BACKLASH. The limitation depends on the setting of the position controller cycle. The lower the value in MD36500, the longer the duration of the backlash compensation during the change of direction.
This MD is relevant only if MD30200 \$MA_NUM_ENCS =1 or 2 .

| 36510 | ENC_DIFF_TOL | A02, A05 | A3, G2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Tolerance of measuring system synchronization |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: Permissible deviation between the actual values of the two measuring systems. This difference must not be exceeded during the cyclic comparison of the two measuring systems used, as otherwise error message 25105 (measuring systems deviate) would be generated.
The corresponding monitoring function is not active

Machine data

- with MD input value=0,
- if less than 2 measuring systems are active/available in the axis
- or if the axis has not been referenced (at least act. closed-loop control meas. system).
With modulo axes, it is always the absolute value of the shortest/direct position difference that is monitored.

| 36520 | DES_VELO_LIMIT | A02, A05 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Threshold for setpoint velocity monitoring |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 125.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description:
Maximum permissible setpoint velocity as a percentage of the maximum axis velocity/ spindle speed.
With MD36520 \$MA DES VELO LIMIT, the position setpoint is monitored for abrupt changes. If the permissible limit value is exceeded, alarm 1016 error code 550010 is output.

With axes, this machine data refers to MD32000 \$MA_MAX_AX_VELO.
With spindles, this MD refers to the lower of the speeds set in
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT of the current gear stage and MD35100 \$MA_SPIND_VELO_LIMIT.

| 36600 | BRAKE_MODE_CHOICE | EXP, A05 | A3, Z1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Deceleration response on hardware limit switch | BYTE | PowerOn |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $2 / 2$ |  |

Description: If a rising edge of the axis-specific hardware limit switch is detected while the axis is traversing, the axis is braked immediately.

The type of braking is determined by this machine data:
Value = 0:
Controlled braking along the acceleration ramp defined by MD32300 \$MA_MAX_AX_ACCEL (axis acceleration).
Value = 1:
Rapid braking (selection of setpoint $=0$ ) with reduction of following error.
Related to:
NC/PLC interface signal DB380x DBX1000.1 und . 0 (Hardware limit switch plus or minus)

| 36610 | AX_EMERGENCY_STOP_TIME | A05 | TE3, K3, A2, A3, N2, Z1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Maximum time for braking ramp in case of error. |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |
| - | - | 0.05 | 0.0 | 1.0 e 15 |  |  |  |

## Description:

This MD defines the braking ramp time that an axis or spindle requires to brake from maximum velocity/speed to a standstill in the event of errors (e.g. EMERGENCY STOP). At the same lead/brake acceleration, standstill is reached correspondingly earlier from lower velocities/speeds.
Mechanically robust axes are normally stopped abruptly with speed setpoint 0 ; values in the lower ms range are appropriate in these cases (default setting).
However, high moving masses or limited mechanical conditions (e.g. gear load capacity) often have to be taken into account for spindles. This means that the MD has to be changed to set a longer braking ramp.
Notice:

- With interpolating axes or axis/spindle couplings, it cannot be ensured that the contour or coupling will be maintained during the braking phase.
- If the time set for the braking ramp for error states is too long, the controller enable will be removed although the axis/spindle is still moving. Depending on the drive type used and the activation of the pulse enable, either an immediate stop with speed setpoint 0 will be initiated or the axis/spindle will coast down without power. The time selected in MD36610 \$MA_AX_EMERGENCY_STOP_TIME should therefore be shorter than the time in MD36620 \$MA_SERVO_DISABLE_DELAY_TIME (cutout delay, controller enable) so that the configured braking ramp can be fully active throughout the entire braking operation.
- The braking ramp may be ineffective or not maintained if the active drive follows its own braking ramp logic (e.g. SINAMICS).

Related to:
MD36620 \$MA_SERVO_DISABLE_DELAY_TIME (cutout delay controller enable)
MD36210 \$MA_CTRLOUT_LIMIT (maximum speed setpoint)

| 36620 | SERVO_DISABLE_DELAY_TIME |  | A05 | TE3 | N2, Z1 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| s | Cutout delay servo enable |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | 0.1 | 0.0 | 1.0e15 | 2/2 | M |

## Description:

Maximum time delay for removal of "controller enable" after faults. The speed enable (controller enable) of the drive is removed internally within the controller after the set delay time, at the latest.
The delay time entered becomes active as a result of the following events:

- Errors that lead to immediate stopping of the axes
- Removal of the interface signal DB380x DBX2.1 (Controller enable) from the PLC

As soon as the actual speed reaches the standstill range (MD36060
\$MA_STANDSTILL_VELO_TOL), the "controller enable" for the drive is removed. The time set should be long enough to enable the axis / spindle to brake down to a standstill from maximum traversing velocity or maximum speed. If the axis / spindle is stationary, the "controller enable" for the drive is removed immediately (i.e. the time defined in MD36620 \$MA_SERVO_DISABLE_DELAY_TIME is terminated prematurely). Application example(s):
Speed control of the drive should be retained long enough to enable the axis / spindle to brake down to standstill from maximum traversing velocity or maximum speed.
Notice:
If the cutout delay controller enable is set too short, controller enable will be removed although the axis/spindle is still moving. This axis/spindle then coasts down without power (which may be appropriate for grinding wheels, for example); otherwise the time set in MD36620 \$MA_SERVO_DISABLE_DELAY_TIME should be longer than the duration of the braking ramp for error states (MD36610 \$MA_AX_EMERGENCY_STOP_TIME). Related to:
NC/PLC interface signal DB380x DBX2.1 (Controller enable)
MD36610 \$MA_AX_EMERGENCY_STOP_TIME
For SINAMICS drives: Drive parameter P1082 (maximum speed / velocity)

| 36700 | DRIFT_ENABLE |  |  | EXP, A07, A09 | G2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Automatic drift compensation |  |  | BOOLEAN | NEW CONF |  |
| - |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | 1/1 | M |
| Description: | Only for sp Automatic 1: Autom | ial ana | ac | not active wi MD36700 \$MA for position | PR | dri |

### 4.3 Axis-specific NC machine data

With automatic drift compensation, while the axis is at a standstill, the control continually calculates the additional drift value still required to ensure that the following error reaches the value 0 (compensation criterion). The total drift value is, therefore, formed from the drift basic value (MD36720 \$MA_DRIFT_VALUE) and the drift additional value.

0: Automatic drift compensation not active.
The drift value is formed only from the drift basic value (MD36720 \$MA_DRIFT_VALUE). Not relevant for:

Non-position-controlled spindles
Related to:
MD36710 \$MA_DRIFT_LIMIT drift limit value for automatic drift compensation
MD36720 \$MA_DRIFT_VALUE drift basic value


## Description:

Only for special analog and hydraulic drives (not active with PROFIdrive drives):
The magnitude of the drift additional value calculated during automatic drift compensation can be limited with MD36710 \$MA_DRIFT_LIMIT.
If the drift additional value exceeds the limit value entered in MD36710
\$MA_DRIFT_LIMIT, alarm 25070 "Drift value too large" is output and the drift
additional value is limited to this value.
Not relevant for:
MD36700 \$MA_DRIFT_ENABLE $=0$

| 36720 | DRIFT_VALUE | EXP, A07, A09 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\%$ | Basic drift value | DOUBLE | NEW CONF |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 1 | 0.0 | $-1 e 15$ | $1 e 15$ | $1 / 1$ |  |  |

Description: Only for special analog and hydraulic drives (not active with PROFIdrive drives): The value entered in MD36720 \$MA_DRIFT_VALUE is always added as an offset to the manipulated variable. Whereas automatic drift compensation is active only for positioncontrolled axes, this machine data is always active.
Special case: the following applies to PROFIdrive drives:
This MD can also be used for "simple" drives that have drift problems due to driveinternal implementation as analog drives. To avoid erroneous settings, this static drift compensation only becomes active with PROFIdrive if MD32250 \$MA_RATED_OUTVAL != 0 (i.e. the MD has no effect in the case of automatic interface adjustment between the NC and the drive).

Note:
Drift compensation must not be active if the DSC function (MD32640
\$MA_STIFFNESS_CONTROL_ENABLE=1) is being used, otherwise unexpected speed oscillations will occū when DSC is enabled/disabled.

Standardization: The input value is related to the corresponding interface standardization in
MD32250 \$MA_RATED_OUTVAL,
MD32260 \$MA_RATED_VELO, and
MD36210 \$MA_CTRLOUT_LIMIT.

| 36730 | DRIVE_SIGNAL_TRACKING | A10 | B3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Acquisition of additional drive actual values | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | 1 | $1 / 1$ |  |

Description:
MD36730 \$MA_DRIVE_SIGNAL_TRACKING = 1 activates the acquisition of the following drive actual values (if they are made available by the drive):

- \$AA_LOAD Drive load
- \$AA_POWER Drive active power
- \$AA_TORQUE Drive torque setpoint
- \$AA_CURR Smoothed current setpoint (q-axis current) of drive

MD36730 \$MA_DRIVE_SIGNAL_TRACKING $=2$ activates the acquisition of the following drive actual values:
With PROFIdrive, it must be ensured that the stated values are also transmitted in the drive actual message frame (provide sufficient message frame length on the bus, assign the values to the message frame content in the drive, e.g. use message frame 116).

- \$VA_DP_ACT_TEL shows actual value message frame words

Note: Values 3 and 4 are reserved
Note: The value range of MD36730 \$MA_DRIVE_SIGNAL_TRACKING can be restricted because of reduced functions of control systems


| 36933 | SAFE_DES_VELO_LIMIT | A05, A04 | FBSI |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | SG setpoint speed limit | DOUBLE | Reset |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 4 | $0.0,0.0,0.0,0.0$ | 0 | 100 |  |  |  |
| ( |  |  |  |  |  |  |  |

Description:
Weighting factors for determining the setpoint velocity limit.
The active weighting factor is selected via the axis-specific NC/PLC interface DB380x DBX5010.0 - . 1 .
Parameterization:
To set this MD optimally, it may be necessary to make a number of changes to take the dynamic performance of the drives into account.
Effect of SI monitoring with NCK involvement:

- When $0 \%$ is entered, the setpoint velocity limit is inactive.
- When $100 \%$ is entered, the setpoint is limited to the active SG stage.
- The active actual velocity limit is weighted with the selected factor, and specified to the interpolator as the setpoint limit.
- If SBH is selected, setpoint 0 is specified.
- This data is not included in the cross-check with the drive.
- This data is not included in the axis-specific checksum MD36998 \$MA_SAFE_ACT_CHECKSUM[], as it involves a 1-channel function.
Effect of drive-autonomous SI monitoring:
- The precondition is that the connection has been activated in the NCK via SIC (MD37950 \$MA_SAFE_INFO_ENABLE, bit 0).
- When $0 \%$ is entered, the NCK influence on the setpoint limit is inactive. The setpoint limit corresponds to the value read from the drive via SIC.
- When values > 0\% are entered, the NCK influence on the setpoint velocity limit is active. It affects the setpoint limit read from the drive via SIC.
- The value read from the drive via SIC is weighted with the selected factor, and specified to the interpolator as the setpoint limit.
- The parameterizable setpoint limit in the drive (p9533) is active independently of the NCK limit.
Special cases:
- If the PLC user program does not contain any settings for selecting the weighting factor, the MD value from MD36933 \$MA_SAFE_DES_VELO_LIMIT[0] applies.



## Description:

This MD is only active with Safety Integrated axes and spindles.
It influences the channel-wide IPO response distribution of Safety Integrated:
$0=$ Default: All other axes/spindles in the channel are informed of the IPO stop response of this axis.
$1=$ For internal stops, the axes and machining spindles interpolating with the axis in question are also influenced via the triggered safety alarms.

Other axes/spindles in the channel, however, continue without disturbance. In the case of external stops (without an alarm) all other axes/spindles are not influenced by the safety axis/spindle stop. This allows, for example, the safe cancelation of the pulses of a spindle (using external stop A) so that the spindle can be turned manually but still move the axes safely with monitoring.
If the other axes/spindles stop together with the safety axis/spindle in certain machining situations, the user must implement this at his own responsibility using the PLC or synchronous action operations.

| 36968 | SAFE_BRAKETEST_CONTROL |  |  |  |  |  | A05 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Advanced settings for the brake test |  |  |  |  |  | UDWORD | PowerOn |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | - | 0 | $0 \times 4$ | M |  |  |  |

## Description:

Advanced settings for the NC-controlled and SINAMICS brake test.
Bit 2: Selection of the positioning behavior at the end of the SINAMICS brake test
= 0: Positioning at the current axis position
= 1: Positioning at the last programmed axis position

| 37000 | FIXED_STOP_MODE |  |  |  |  |  |  | A10 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Travel to fixed stop mode |  |  |  |  |  | UBYTE | PowerOn |  |
| CTEQ |  |  |  |  |  |  |  |  |  |
| - | - | - | $0 \times 0$ | $0 \times 1$ | $2 / 2$ |  |  |  |  |

Description: Activation of subfunctions of "Travel to fixed stop".
Bit 0: Reserved
Bit 1: Enable the Safe brake test (NC-controlled)
= 0: Safe brake test not available
$=1$ : Safe brake test can be executed under the control of the PLC
Note: The user must ensure that Travel to fixed stop and Safe brake test are not assigned simultaneously.

| 37002 | FIXED_STOP_CONTROL | A10 | F1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |
| - | Sequence control for travel to fixed stop | UBYTE | PowerOn |  |  |
| - | - | $0 \times 0$ | $0 \times 0$ | $0 \times 3$ | $2 / 2$ |

## Description:

Sequence control for travel to fixed stop.
Bit 0: behavior on pulse disable at fixed stop
$=0$ : travel to fixed stop is canceled
= 1: travel to fixed stop is interrupted, i.e. the drive is without power.
As soon as the pulse disable is canceled again, the drive continues with the limited torque.
Control of the torque injection see bit 1 .
Bit 1: behavior after pulse disable at the fixed stop
$=0$ : the torque is applied in steps.
$=1$ : the torque is applied in ramps (see MD37012 \$MA_FIXED_STOP_TORQUE_RAMP_TIME)

| 37010 | FIXED_STOP_TORQUE_DEF |  | A10 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| \% | Default fixed stop clamping torque |  | DOUBLE | PowerOn |  |
| CTEQ |  |  |  |  |  |
| - | 5.0 | 0.0 | 100.0 | 2/2 | M |
| Description: <br> The clamping torque is set in this machine data as a of the maximum motor torque (in the case of $\operatorname{FDD}$ this corresponds to the of the max. current setpoint). <br> The clamping torque becomes active as soon as the fixed stop is reached or the NC/PLC interface signal DB380x DBX1.1 (Acknowledge fixed stop reached) has been set. <br> The entered value is a default and is active only as long as <br> - no clamping torque has been programmed with command FXST[x] <br> - the clamping torque set in SD 43510: FIXED_STOP_TORQUE was not changed after fixed stop had been reached. | The clamping torque is set in this machine data as a of the maximum motor torque (in the case of FDD this corresponds to the \% of the max. current setpoint). <br> The clamping torque becomes active as soon as the fixed stop is reached or the NC/PLC interface signal DB380x DBX1.1 (Acknowledge fixed stop reached) has been set. <br> The entered value is a default and is active only as long as <br> - no clamping torque has been programmed with command FXST[x] <br> - the clamping torque set in SD 43510: FIXED_STOP_TORQUE was not changed after fixed stop had been reached. |  |  |  |  |

### 4.3 Axis-specific NC machine data

In the case of "Travel to fixed stop" with an analog drive (611-A) and fixed clamping torque, the torque limit set in the drive should be the same as the limit entered in MD37070 \$MA_FIXED_STOP_ANA_TORQUE.
Related to:
MD37070 \$MA_FIXED_STOP_ANA_TORQUE
SD 43510: FIXED_STOP_TORQUE

| 37012 | FIXED_STOP_TORQUE_RAMP_TIME | A10 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Time period until reaching the changed torque limit |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |

Description: Period in seconds until the changed torque limit is reached.
The value 0.0 deactivates the ramp function.

| 37014 | FIXED_STOP_TORQUE_FACTOR | A10 | TE3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Adaption factor torque limit | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

## Description:

Interface factor torque limit.
With this factor, the torque limit of linked slave axes (MD 37250) can be weighted additionally.
Even with different motors, the torque limits can be kept equal in all linked axes.

| 37020 | FIXED_STOP_WINDOW_DEF |  |  | A05, A10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Default fixed-stop monitoring window |  |  | DOUBLE | Pow |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | 1.0e15 | $2 / 2$ | M |

Description:

This machine data is used to enter the default for the standstill monitoring window at fixed stop.

Fixed stop monitoring becomes active as soon as the fixed stop is reached, i.e. NC/PLC interface signal DB390x DBX2.5 (Fixed stop reached) is set.
If the position at which the fixed stop is detected is left by more than the tolerance specified in MD37020 \$MA_FIXED_STOP_WINDOW_DEF alarm 20093 "Fixed stop monitoring has responded" is output and the " $\overline{\text { FXS" }} \overline{\text { function }}$ is deselected.
The value entered is a default setting and is active only as long as

- no fixed stop monitoring window is programmed with command FXSW[x],
- the fixed stop monitoring window is not changed via SD 43520: FIXED_STOP_WINDOW (after reaching of fixed stop).
Related to:
SD43520 \$SA_FIXED_STOP_WINDOW (fixed stop monitoring window)



## Description:

Threshold value for fixed stop detection.
The contour deviation is checked for this threshold as a criterion for reaching the fixed stop. Waiting until the set torque limit is reached is a further condition for digital drives.
This machine data is only active if MD37040 \$MA_FIXED_STOP_BY_SENSOR = 0.

The NC/PLC interface signal DB390x DBX2.5 (Fixed stop reached) is set if the axial contour deviation exceeds the threshold value set in MD37030 \$MA_FIXED_STOP_THRESHOLD. MD irrelevant to:

MD37040 \$MA_FIXED_STOP_BY_SENSOR = 1
Related to:
NC/PLC interface signal DB390x DBX2.5 (Fixed stop reached)



Errors occurring during travel to fixed stop can be read out from the status variable \$AA_FXS irrespective of the setting of the alarm screen.
Standard: 1 = Alarms 20091, 20094 and 25042 are triggered

| 37052 | FIXED_STOP_ALARM_REACTION |  | A05, A10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Reaction with fixed stop alarms |  | UBYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | - 0 | 0 | - | 1/1 | M |
| Description: | Behavior of VDI signal <br> Bit value $=0$ : "Mode gro <br> Bit value = 1: "Mode gro <br> Bit0: Alarm 20090 Travel <br> Bit1: Alarm 20091 Fixed <br> Bit2: Alarm 20092 Travel <br> Bit3: Alarm 20093 Stands <br> Bit4: Alarm 20094 Travel <br> All other bits without m <br> Standard: $0=$ All alarms | " | ase of $f$ <br> ted (dri <br> ve <br> sible <br> ctive <br> ed stop <br> d <br> s | top -ene <br> igge |  |


| 37060 | FIXED_STOP_ACKN_MASK | A10 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Waiting for PLC acknowledgments during travel to fixed stop |  |  |  |  |  | UBYTE | PowerOn |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | $0 \times 0$ | $0 \times 0$ | $0 \times 3$ | $2 / 2$ |  |  |  |

Description:
This machine data defines whether or not the NC waits for acknowledgment messages from the PLC when the "Travel to fixed stop" function is active.
Bit $0=0$
Once the NC has transmitted the interface signal DB390x DBX2.4 (Activate travel to fixed stop) to the PLC, it starts the programmed traversing.
Bit $0=1$
After the NC has transmitted the interface signal DB390x DBX2.4 (Activate travel to fixed stop) to the PLC, it waits for the PLC to acknowledge with the interface signal DB380x DBX3.1 (Enable travel to fixed stop) and then starts the programmed traversing.
Bit $0=1$ should be set for analog drives so that the motion is not started before the PLC has limited the torque in the drive.
Bit $1=0$
Once the NC has transmitted the interface signal DB390x DBX2.5 (Fixed stop reached) to the PLC, the program advances to the next block.
Bit $1=1$
After the NC has transmitted the interface signal DB390x DBX2.5 (Fixed stop reached) to the PLC, it waits for the PLC to acknowledge with the interface signal DB380x DBX1. 1 (Acknowledge fixed stop reached), outputs the programmed torque and then advances to the next block.
Bit 1 should be set for analog drives so that the PLC can switch the drive to torquecontrolled operation if a programmable clamping torque has to be specified.
With digital drives (PROFIdrive), the "Travel to fixed stop" function can be executed without any acknowledgments, thus allowing program run times to be reduced.
Related to:
NC/PLC interface signal DB390x DBX2.4 (Activate travel to fixed stop)
NC/PLC interface signal DB380x DBX3.1 (Enable travel to fixed stop)
NC/PLC interface signal DB390x DBX2.5 (Fixed stop reached)
NC/PLC interface signal DB380x DBX1.1 (Acknowledge fixed stop reached)

| 37070 | FIXED_STOP_ANA_TORQUE |  |  | A10 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| \% | Torque limit when approaching the fixed stop for analog drives |  |  | DOUBLE | PowerOn |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-te42 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-gce42 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-gse42 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-me62 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-te62 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-gce62 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-gse62 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-te82 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-me82 | - | 5.0 | 0.0 | 100.0 | 7/2 | M |
| 828d-gce82 | - | 5.0 | 0.0 | 100.0 | 0/0 | S |
| 828d-gse82 | - | 5.0 | 0.0 | 100.0 | 0/0 | S |


| Description: | Only for analog drives (not relevant for PROFIdrive digital drives): |
| :--- | :--- |
|  | This machine data defines an internal NC torque limit for analog drives. It is |
|  | specified as percentage of the maximum drive torque (corresponds to of max. current |
|  | setpoint with FDD). |
|  | This torque limit is active in the NC from the start of the motion (acceleration |
|  | torque) until the instant the fixed stop is reached. |
|  | The torque limit must have the same effect as the torque limit set in the drive. |
|  | This torque limit is required to ensure that: |
|  | - There are no step changes in torque during switchover from speed-controlled to |
|  | current-controlled or torque-controlled operation |


| 37080 | FOC_ACTIVATION_MODE |  |  |  |  |  | A10 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Initial setting of modal torque/force limitation |  |  |  |  |  | UBYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 \times 0$ | $0 \times 0$ | $0 \times 3$ | $2 / 2$ |  |  |  |

## Description:

The initial setting of the modal torque/force limitation is set with this MD after reset and PowerOn:
Bit 0: Response after PowerON
$=0$ : FOCOF
$=1$ : FOCON (modal)
Bit 1: Response after reset
$=0:$ FOCOF
$=1$ : FOCON (modal)
Default setting: FOCOF after reset and PowerOn

| 37090 | COLLISION_EXT_AXIS_MASK | EXP | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| - |  |  |  |  |  |  |
| - | Settings of the external collision avoidance | UDWORD | PowerOn |  |  |  |
| $828 d-m e 42$ | - | $0 \times 1$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ | M |
| $828 d-t e 42$ | - | $0 \times 1$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ | M |
| $828 d-$ gce42 | - | $0 \times 1$ | $0 \times 3$ | $7 / 2$ | M |  |
| $828 d-$-gse42 | - | $0 \times 1$ | $0 \times 3$ | $7 / 2$ | M |  |

### 4.3 Axis-specific NC machine data

| $828 \mathrm{~d}-\mathrm{me} 62$ | - | $0 \times 1$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{te} 62$ | - | $0 \times 1$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ | M |
| 828 d -gce62 | - | $0 \times 1$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ | M |
| $828 \mathrm{~d}-$ gse62 | - | $0 \times 1$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{te} 82$ | - | $0 \times 1$ | $0 \times 0$ | $0 \times 3$ | $7 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{me} 82$ | - | $0 \times 1$ | $0 \times 0$ | $7 / 2$ | M |  |
| $828 \mathrm{~d}-$ gce82 | - | $0 \times 3$ | $0 / 0$ | S |  |  |
| 828 -gse82 | - | $0 \times 0$ | $0 \times 3$ | S |  |  |

## Description:

Settings of the external collision avoidance:
Bit 0: Braking response
$=0$ : Braking signals are ignored
= 1 : Braking signals are effective
Bit 1: reserved


Description: General: decimal representation, with a b
a
0: Leading axis
1: Synchronized axis
b
0: No gantry axis
1: Axis in gantry grouping 1
2: Axis in gantry grouping 2
3: Axis in gantry grouping 3

A max. of 8 gantry groupings is possible.
Examples:
11: Axis is a synchronized axis in a gantry grouping 1
2: Axis is a leading axis in gantry a grouping 2
12: Axis is a synchronized axis in a gantry grouping 2
3: Axis is a leading axis in a gantry grouping 3
13: Axis is a synchronized axis in a gantry grouping 3
Special cases:

Alarm 10650 "Incorrect gantry machine data" and 10651 "Gantry unit not defined" in the case of an incorrect gantry axis definition.
Related to:
MD37110 \$MA_GANTRY_POS_TOL_WARNING (gantry warning limit)
MD37120 \$MA_GANTRY_POS_TOL_ERROR (gantry trip limit)
MD37130 \$MA_GANTRY_POS_TOL_REF (gantry trip limit during referencing)

| 37110 | GANTRY_POS_TOL_WARNING |  |  |  |  |  | A05, A10 | G1, Z3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Gantry warning limit |  |  |  |  |  | DOUBLE | Reset |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | -1 e 15 | 1 e 15 | $2 / 2$ |  |  |  |

With gantry axes, the difference between the actual position values of the leading and synchronized axes is constantly monitored.
MD37110 \$MA_GANTRY_POS_TOL_WARNING is used to define a limit value for the actual position value difference; when the limit is exceeded, warning 10652 "Warning limit exceeded" is output. However, the gantry axes are not stopped internally in the control. The warning threshold must therefore be selected so that the machine can withstand the actual position value deviation between the gantry axes without sustaining mechanical damage.
Furthermore, the NC/PLC interface signal DB390x DBX5005.3 (Gantry warning limit exceeded) to the PLC is set to "1". The PLC user program can thus initiate the necessary measures (e.g. program interruption at block end) when the warning limit is exceeded.
As soon as the actual current position value difference has dropped below the warning limit again, the message is canceled and the interface signal "Gantry warning limit exceeded" is reset.

Effect of the gantry warning limit on the gantry synchronization process:
The actual position value difference between the leading and synchronized axes is determined during gantry synchronization. If the deviation is less than the gantry warning limit, the synchronizing motion of the gantry axes is automatically started internally in the control.

Otherwise the synchronizing motion has to be initiated via the PLC interface (interface signal DB380x DBX5005.4 (Start gantry synchronization process))
Value $=0$
The setting MD37110 \$MA_GANTRY_POS_TOL_WARNING = 0 is the monitoring for violation of the warning limit deactivated.
The gantry synchronization is not initiated internally in the control.
Special cases:
Alarm 10652 "Warning limit exceeded" in response to violation of the gantry warning limit.

Related to:
MD37100 \$MA_GANTRY_AXIS_TYPE Gantry axis definition
MD37120 \$MA_GANTRY_POS_TOL_ERROR Gantry trip limit
MD37130 \$MA_GANTRY_POS_TOL_REF
Gantry trip limit during referencing
NC/PLC interface signal DB390x DBX5005.3 (Gantry warning limit exceeded)
NC/PLC interface signal DB380x DBX5005.4 (Start gantry synchronization process)


## Description:

With gantry axes, the difference between the actual position values of the leading and synchronized axes is continuously monitored. MD37120 \$MA_GANTRY_POS_TOL_ERROR defines the maximum permissible deviation in actual position value between the synchronized axis and the leading axis in the gantry axis grouping. Violation of this limit value is monitored only if the gantry axis grouping is already synchronized (NC/PLC interface signal DB390x DBX5005.5 (Gantry grouping is synchronized) = 1); otherwise the value set in MD37130 \$MA_GANTRY_POS_TOL_REF is used.
When this limit value is exceeded, alarm 10653 "Error limit exceeded" is output. The gantry axes are immediately stopped internally in the control to prevent any damage to the machine.
In addition, the NC/PLC interface signal DB390x DBX5005.2 (Gantry trip limit exceeded) to the PLC is set to "1".

Special cases:
Alarm 10653 "Error limit exceeded" in response to violation of the gantry trip limit.
Related to:
MD37100 \$MA_GANTRY_AXIS_TYPE Gantry axis definition
MD37110 \$MA_GANTRY_POS_TOL_WARNING Gantry warning limit
MD37130 \$MA_GANTRY_POS_TOL_REF
Gantry trip limit during referencing
NC/PLC interface signal DB390x DBX5005.5 (Gantry grouping is synchronized)
NC/PLC interface signal DB390x DBX5005.2 (Gantry trip limit exceeded)

| 37130 | GANTRY_POS_TOL_REF | A05, A10 | G1, Z3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Gantry trip limit during referencing |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | $-1 e 15$ | $1 e 15$ |  |  |  |  |
| $2 / 2$ | M |  |  |  |  |  |  |  |

## Description:

With gantry axes, the difference between the actual position values of the leading and synchronized axes is continuously monitored. MD37130 \$MA_GANTRY_POS_TOL_REF defines the maximum permissible difference between the actual position values of the synchronized axis and the leading axis that is monitored if the gantry axis grouping has not yet been synchronized (NC/PLC interface signal DB390x DBX5005.5 (Gantry grouping is synchronized) = 0).
Alarm 10653 "Error limit exceeded" is output if the limit value is exceeded. The gantry axes are immediately stopped internally in the control to prevent any damage to the machine.
In addition, the NC/PLC interface signal DB390x DBX5005.2 (Gantry trip limit exceeded) to the PLC is set to "1".

Special cases:
Alarm 10653 "Error limit exceeded" in response to violation of the gantry trip limit. Related to:

MD37100 \$MA_GANTRY_AXIS_TYPE Gantry axis definition
MD37110 \$MA_GANTRY_POS_TOL_WARNING Gantry warning limit
MD37120 \$MA_GANTRY_POS_TOL_ERROR Gantry trip limit
NC/PLC interface signal DB390x DBX5005.5 (Gantry grouping is synchronized)
NC/PLC interface signal DB390x DBX5005.2 (Gantry trip limit exceeded)


Description: Actual value difference between master axis and slave axis in the case of alarm 10653 . Leads to alarm 10657 after Power ON.


| 37150 | GANTRY_FUNCTION_MASK | A10 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Gantry functions | UDWORD | Reset |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 00$ | 0 | $0 \times 7$ | $2 / 2$ |  |$]$ M

Description:
Special gantry functions are set with this MD.
The MD is bit-coded, the following bits are assigned:
Bit $0==0$ :
Extended monitoring of the actual value difference is inactive.
An offset between master and slave axes occurring in tracking or BREAK_UP is not taken into account in the monitoring of the actual value difference.
Alarm 10657 is not output if alarm 10563 occurs before Power OFF.
Bit $0=1$ :
Extended monitoring of the actual value difference is active.
An offset between master and slave axes occurring in tracking or BREAK_UP is taken into account in the monitoring of the actual value difference.
Prerequisite: The gantry grouping must be rereferenced or resynchronized after control startup.
Alarm 10657 is output if alarm 10563 occurs before Power OFF.
Bit $1=0$ :
Zero mark search direction of the slave axis analogous to MD 34010
Bit $1=1$ :
Zero mark search direction of the slave axis same as for master axis
Bit $2=0$ :
Alarm 10655 "Synchronization in progress" is output
Bit $2=1$

### 4.3 Axis-specific NC machine data

Alarm 10655 "Synchronization in progress" is not output

| 37200 | COUPLE_POS_TOL_COARSE | A05, A10 | M3, S3, 2.4, 6.2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Threshold value for 'Synchronism coarse' |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | 1.0 e 15 |  |  |  |  |

Description: In synchronous mode, the positional difference between the leading and following axis(axes)/spindle(s) is monitored (only DV and AV mode or cmdpos and actpos in the case of CP programming).
The NC/PLC interface signal DB390x DBX5002.1 (synchronism coarse) is set if the current positional difference is within the tolerance band specified by the threshold value.
Furthermore, this threshold value can be used to define the criterion for block change on activation of synchronous mode or on modification of the speed ratio parameters when the coupling is active in cases where "synchronism coarse" is selected as the block change response condition (see channel-specific MD21320
\$MC_COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF, WAITC, CPBC).
Entering a value of "0" always sets the NC/PLC interface signal DB390x DBX5002.1
"synchronism coarse" to "1" in DV/AV mode or with cmd/actpos.
Corresponds with:
Channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous mode)
NC/PLC interface signal DB390x DBX5002.1 (synchronism coarse)

| 37202 | COUPLE_POS_TOL_COARSE_2 | A05, A10 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Second threshold value for 'synchronism monitoring coarse' |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | 1.0 e 15 | $2 / 2$ |  |  |  |$]$ M

Description: Generic coupling - second synchronism monitoring of the synchronism difference on the actual value side in the case of positional couplings - coarse threshold value.
Entering a value of "0" deactivates monitoring.
Entering a value other than "0" starts synchronism monitoring (2) once 'synchronism coarse' has been reached:
The NC/PLC interface signal DB390x DBX5007.5 (synchronism 2 coarse) indicates whether the synchronism difference on the actual value side violates the threshold value.
If the threshold value is violated, this is indicated by show alarm 22026, which can be canceled.

Corresponds with:
MD37200 \$MA_COUPLE_POS_TOL_COARSE
NC/PLC interface signal DB390x DBX5002.1 (synchronism coarse)

| 37210 | COUPLE_POS_TOL_FINE |  |  |  |  |  | A05, A10 | M3, S3, 2.4 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Threshold value for 'Synchronism fine' |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.5 | 0.0 | 1.0 e 15 | $2 / 2$ |  |  |  |

Description:
In synchronous mode, the positional difference between the leading and following axis(axes)/spindle(s) is monitored (only DV and AV mode or cmdpos and actpos in the case of CP programming).
The NC/PLC interface signal DB390x DBX5002.0 (synchronism fine) is set if the current positional difference is within the tolerance band specified by the threshold value.

Furthermore, this threshold value can be used to define the criterion for block change on selection of synchronous mode or on modification of the speed ratio parameters when the coupling is active in cases where "synchronism fine" is selected as the block change response condition (see channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF, WAITC, CPBC). Entering a value of "0" always sets the NC/PLC interface signal DB390x DBX5002.0 (synchronism fine) to "1" in DV/AV mode or with cmd/actpos.

Corresponds with:
Channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous mode)
NC/PLC interface signal DB390x DBX5002.0 (synchronism fine)


Description:
Generic coupling - second synchronism monitoring of the synchronism difference on the actual value side in the case of positional couplings - fine threshold value.

Entering a value of "0" deactivates monitoring.
Entering a value other than "0" starts synchronism monitoring (2) once 'synchronism fine' has been reached:

The NC/PLC interface signal DB390x DBX5007.4 (synchronism 2 fine) indicates whether the synchronism difference on the actual value side violates the threshold value.
If the threshold value is violated, this is indicated by show alarm 22025, which can be canceled.

Corresponds with:
MD37210 \$MA_COUPLE_POS_TOL_FINE
NC/PLC interface signal DB390x DBX5002.0 (synchronism fine)


Description:
In synchronous mode, the velocity difference between the leading and following axis(axes)/spindle(s) is monitored (only VV mode or cmdvel in the case of CP programming).
The NC/PLC interface signal DB390x DBX5002.1 (synchronism coarse) is set if the current velocity difference is within the tolerance band specified by the threshold value.

### 4.3 Axis-specific NC machine data

Furthermore, this threshold value can be used to define the criterion for block change on activation of synchronous mode or on modification of the speed ratio parameters when the coupling is active in cases where "synchronism coarse" is selected as the block change response condition (see channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF, WAITC, CPBC). Entering a value of "0" always sets the NC/PLC interface signal DB390x DBX5002.1 (synchronism coarse) to "1" in VV mode or with cmdvel.
Corresponds with:
Channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous mode)
NC/PLC interface signal DB390x DBX5002.1 (synchronism coarse)

| 37230 | COUPLE_VELO_TOL_FINE |  | A05, A10 | S3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm/min, rev/min | Velocity tolerance 'fine' |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| 828d-me42 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te42 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce42 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse42 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-me62 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te62 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce62 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse62 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-te82 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-me82 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce82 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse82 | 30.0 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |

Description: In synchronous mode, the velocity difference between the leading and following axis(axes)/spindle(s) is monitored (only VV mode or cmdvel in the case of CP programming).
The NC/PLC interface signal DB390x DBX5002.0 (synchronism fine) is set if the current velocity difference is within the tolerance band specified by the threshold value.
Furthermore, this threshold value can be used to define the criterion for block change on activation of synchronous mode or on modification of the speed ratio parameters when the coupling is active in cases where "synchronism fine" is selected as the block change response condition (see channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1 or language instruction COUPDEF, WAITC, CPBC).
Entering a value of "0" always sets the NC/PLC interface signal DB390x DBX5002.0 (synchronism fine) to "1" in VV mode or with cmdvel.
Corresponds with:
Channel-specific MD21320 \$MC_COUPLE_BLOCK_CHANGE_CTRL_1
(block change response in synchronous mode)
NC/PLC interface signal DB390x DBX5002.0 (synchronism fine)




Description: A master/slave speed setpoint linkage is configured by indicating the machine axis number of the master axis belonging to this slave.

Related to:
MD37252 \$MA_MS_ASSIGN_MASTER_TORQUE_CTR

| 37252 | MS_ASSIGN_MASTER_TORQUE_CTR | A10 | TE3 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Master axis number for torque control |  |  |  |  |
| - | DWORD |  |  |  |  |
| - | - | PowerOn |  |  |  |

Description: Torque distribution between master and slave axes is configured by stating the machine axis number of the master axis belonging to the slave.

Homogenous torque distribution is achieved by using the torque compensatory controller.
In order to do this, the controller has to know the torque actual values of the drives involved (with PROFIdrive, the message frame used must include and transfer these values, e.g. use message frame 116)
With default setting $=0$, the same master axis is used for torque control as for speed setpoint coupling MD37250 \$MA_MS_ASSIGN_MASTER_SPEED_CMD.
Related to:
MD37250 \$MA_MS_ASSIGN_MASTER_SPEED_CMD
MD37254 \$MA_MS_TORQUE_CTRL_MODE
MD37256 \$MA_MS_TORQUE_CTRL_P_GAIN
MD37258 \$MA_MS_TORQUE_CTRL_I_TIME
MD37268 \$MA_MS_TORQUE_WEIGHT_SLAVE

### 4.3 Axis-specific NC machine data

| 37253 | MS_FUNCTION_MASK | A10 | TE3 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Master/slave settings |  |  |  |  | UDWORD | NEW CONF |
| - |  |  |  |  |  |  |  |
| - | - | $0 \times 0$ | 0 | $0 \times 7 F F F F F F F$ |  |  |  |

## Description:

Parameterizing a master/slave coupling
Bit $0=0$ :
The scaling of MD37256 \$MA_MS_TORQUE_CTRL_P_GAIN, MD37260 \$MA_MS_MAX_CTRL_VELO is smaller than described in the documentation by the factor 1s/IPO cycle.
Bit $0=1$ :
The scaling of MD37256 \$MA_MS_TORQUE_CTRL_P_GAIN, MD37260 \$MA_MS_MAX_CTRL_VELO
corresponds to the documentation.
Bit $1=0$ :
With MASLDEF, the master axis for torque compensation control is the programmed
axis
Bit $1=1$ :
With MASLDEF, the master axis for torque compensation control is the axis configured in MD37252 \$MA_MS_ASSIGN_MASTER_TORQUE_CTR.

| 37254 | MS_TORQUE_CTRL_MODE | A10 | TE3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Torque compensatory controller interconnection |  |  |  |  |  | DWORD | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 3 |  |  |  |  |

Description:
The output of the torque compensatory controller is connected to
0: Master and slave axis
1: Slave axis
2: Master axis
3: No axis
when the torque control is active.
Related to:
MD37252 \$MA_MS_ASSIGN_MASTER_TORQUE_CTR
MD37250 \$MA_MS_ASSIGN_MASTER_SPEED_CMD
MD37254 \$MA_MS_TORQUE_CTRL_MODE

| 37255 | MS_TORQUE_CTRL_ACTIVATION |  |  |  | A10 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Torque compensatory controller activation |  |  |  |  |  | BYTE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $2 / 2$ |  |  |  |

Description:
The torque compensatory controller can be switched ON and OFF by means of MD37254 \$MA_MS_TORQUE_CTRL_MODE or via the NC/PLC interface signal DB380x DBX5000.4 (torque compensatory controller on).
In order to do this, the controller has to know the torque actual values of the drives involved (with PROFIdrive, the message frame used must include and transfer these values, e.g. use message frame 116).

In the case of the PLC, MD37254 \$MA_MS_TORQUE_CTRL_MODE is only used for configuring the interconnection of the torque compensatory controller.
0: Switch ON/OFF via MD37254 \$MA_MS_TORQUE_CTRL_MODE
1: Switch ON/OFF via the NC/PLC interface signal DB380x DBX5000.4 (torque
compensatory controller on)


| 37260 | MS_MAX_CTRL_VELO |  | A10 | TE3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| \% | Torque compensatory controller limit |  | DOUBLE | NEV |  |
| - |  |  |  |  |  |
| - | 100.0 | 0.0 | 100.0 | 2/2 | M |

Torque compensatory controller limitation
The speed setpoint value calculated by the torque compensatory controller is limited.
The limit that can be entered as a percentage refers to MD32000 \$MA_MAX_AX_VELO of the slave axis.

Related to:
MD37254 \$MA_MS_TORQUE_CTRL_MODE
MD37256 \$MA_MS_TORQUE_CTRL_P_GAIN
MD37258 \$MA_MS_TORQUE_CTRL_I_TIME
MD32000 \$MA_MAX_AX_VELO


### 4.3 Axis-specific NC machine data

1: Permanent coupling
This machine data activates the permanent coupling.
PLC interface signals and language commands do not have any effect.
Related to:
MD37252 \$MA_MS_ASSIGN_MASTER_TORQUE_CTR
MD37250 \$MA_MS_ASSIGN_MASTER_SPEED_CMD

| 37263 | MS_SPIND_COUPLING_MODE | A10 | TE3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Link response of a spindle | BYTE | NEW CONF |  |  |  |
| - | - | 0 | 0 | 1 |  |  |

## Description:

Link behavior of a speed-controlled spindle:
0: Link is closed/released in standstill only.
1: Link is closed/released already during motion.
The configuration is valid both for activation/deactivation via NC/PLC interface
signal DB380x DBX5000.7 (activate MS) and for MASLON, MASLOF, MASLOFs, MASLDEL


## Description:

```
A constant tension torque between the master and the slave axis can be entered as a
percentage of the normalization torque of the slave axis.
The value entered here is derived from the SINAMICS parameter P2003
Use of a tension torque requires an active torque compensatory controller (compare
MD37255 $MA_MS_TORQUE_CTRL_ACTIVATION).
Related to:
MD37252 $MA_MS_ASSIGN_MASTER_TORQUE_CTR
MD37266 $MA_MS_TENSION_TORQ_FILTER_TIME
MD37255 $MA_MS_TORQUE_CTRL_ACTIVATION
```

| 37266 | MS_TENSION_TORQ_FILTER_TIME | A10 | TE3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Filter time constant tension torque | DOUBLE | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | 100.0 | $2 / 2$ |  |

Description: The tension torque between the master and slave axes can be activated via a PT1 filter. Any change of MD37264 \$MA_MS_TENSION_TORQUE is then travelled out with the time constant of the filter.

As default, the filter is inactive; any torque change becomes active unfiltered.
Related to:
MD37264 \$MA_MS_TENSION_TORQUE

| 37268 | MS_TORQUE_WEIGHT_SLAVE | A10 | TE3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Torque weighting of slave axis |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 50.0 | 1.0 | 100.0 | $2 / 2$ |  |  |  |$]$ M

## Description:

The torque share that the slave axis contributes to the total torque can be configured via the weighting. This enables different torque shares to be implemented between the master and slave axes.
In the case of motors with the same rated torque, a $50 \%$ to $50 \%$ torque sharing is suggested.

```
The torque share of the master axis results implicitly from 100% - MD37268
$MA_MS_TORQUE_WEIGHT_SLAVE.
Related to:
MD37252 $MA_MS_ASSIGN_MASTER_TORQUE_CTR
MD37266 $MA_MS_TENSION_TORQ_FILTER_TIME
```

| 37270 | MS_VELO_TOL_COARSE |  |  |  |  |  | A10 | TE3, Z3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Master/slave speed tolerance coarse |  |  |  |  |  | DOUBLE | NEW CONF |
| - | - | 5.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Tolerance window, coarse, for the differential speed between the master and the slave.
If the speed difference is within the tolerance window, the NC/PLC interface signal DB390x DBX5000.4 (Master-Slave compensatory controller active) is set.
The tolerance value is entered as a percentage of MD32000 \$MA_MAX_AX_VELO.

| 37272 | MS_VELO_TOL_FINE |  |  |  |  |  | A10 | TE3, Z3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Master/slave speed tolerance fine |  |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 1.0 | DOUBLE | NEW CONF |  |  |  |  |

Description:

Tolerance window, fine, for the differential speed between the master and the slave.
If the speed difference is within the tolerance window, the NC/PLC interface signal DB390x DBX5000.3 (Master/Slave coarse) is set.

The tolerance value is entered as a percentage of MD32000 \$MA_MAX_AX_VELO.


Description: Inverting the traversing direction of a slave axis in the linked status.
0: Equidirectional to the master axis
1: Inverse to the master axis

| 37300 | NOCO_ENABLE | EXP, A01, A09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Activation of the nodding compensation values | UDWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 \times 07$ | $0 \times 00$ | $0 \times 07$ | $2 / 2$ |  |

Description:
Activation of the injection values of the nodding compensation
Bit $0=0$ :
MD37318 \$MA_NOCO_COMPLIANCE_1 not active
Bit 0 = 1:
MD37318 \$MA_NOCO_COMPLIANCE_1 active
Bit $1=0$ :
MD37328 \$MA_NOCO_COMPLIANCE_2 not active
Bit 1 = 1:
MD37328 \$MA_NOCO_COMPLIANCE_2 active
Bit 2 = 0:
MD37338 \$MA_NOCO_COMPLIANCE_3 not active
Bit 2 = 1:
MD37338 \$MA_NOCO_COMPLIANCE_3 active

### 4.3 Axis-specific NC machine data

```
Related to:
MD37318 $MA_NOCO_COMPLIANCE_1
MD37328 $MA_NOCO_COMPLIANCE_2
MD37338 $MA_NOCO_COMPLIANCE_3
```



Description: The time constant is used to smooth the injected values of the nodding compensation. The smoothing is not effective if the time constant is less than 0.1 of the position controller cycles.
Related to:
MD37310 \$MA_NOCO_INPUT_AX_1
MD37320 \$MA_NOCO_INPUT_AX_2
MD37330 \$MA_NOCO_INPUT_AX_3
MD37318 \$MA_NOCO_COMPLIANCE_1
MD37328 \$MA_NOCO_COMPLIANCE_2
MD37338 \$MA_NOCO_COMPLIANCE_3

| 37310 | NOCO_INPUT_AX_1 | EXP, A01, A09 | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Machine axis that causes a nodding motion |  |  |  |  |  | DWORD | NEW CONF |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 31 |  |  |  |  |  |

Description: Number of the machine axis that causes a nodding motion in this axis in order to activate the nodding compensation. The nodding compensation acts in combination with MD37318 \$MA_NOCO_COMPLIANCE_1.
Related to:
MD37302 \$MA_NOCO_FILTER_TIME
MD37312 \$MA_NOCO_ADAPT_AX_1
MD37318 \$MA_NOCO_COMPLIANCE_1

| 37312 | NOCO_ADAPT_AX_1 | EXP, A01, A09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Machine axis whose position affects the nodding motion |  |  |  |  |  | DWORD | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 31 |  |  |  |  |

Description: Number of the machine axis whose position affects the nodding motion in this axis.
The position-dependent adaptation of the nodding compensation takes place in
combination with MD 37316 \$MA_NOCO_ADAPT_POS_1 and MD37318 \$MA_NOCO_COMPLIANCE_1.
A position-dependent adaptation is only active if a machine axis number is
parameterized and there is a value greater than 1 in MD37314 \$MA_NOCO_ADAPT_NUM_1.
Related to:
MD37310 \$MA_NOCO_INPUT_AX_1
MD37314 \$MA_NOCO_ADAPT_NUM_1
MD37316 \$MA_NOCO_ADAPT_POS_1
MD37318 \$MA_NOCO_COMPLIANCE_1

| 37314 | NOCO_ADAPT_NUM_1 | EXP, A01, A09 | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of positions of the adaptation curve of the nodding <br> compensation | DWORD | NEW CONF |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1 | 1 | 3 | $2 / 2$ |  |  |$⿻$| M |
| :--- |

Description: Number of the axis positions used for the position-dependent adaptation of the nodding compensation.
A position-dependent adaptation is only active if the number of positions is greater than 1 and a machine axis number is parameterized in MD37312 \$MA_NOCO_ADAPT_AX_1.
Related to:
MD37310 \$MA_NOCO_INPUT_AX_1
MD37312 \$MA_NOCO_ADAPT_AX_1
MD37316 \$MA_NOCO_ADAPT_POS_1
MD37318 \$MA_NOCO_COMPLIANCE_1

| 37316 | NOCO_ADAPT_POS_1 | EXP, A01, A09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm |  |  |  |  |  |  |
| - | Positions of the adaptation curve of the nodding compensation | DOUBLE | NEW CONF |  |  |  |
| - | 3 | $0.0,0.0,0.0$ | - | - | $2 / 2$ |  |

## Description:

Positions of the machine axis from MD37312 \$MA_NOCO_ADAPT_AX_1 at which the compliance factors in MD37318 \$MA_NOCO_COMPLIANCE_1 are active.
A position-dependent adaptation is only active if the number of positions in MD37314 \$MA_NOCO_ADAPT_NUM_1 is greater than 1 and a machine axis number is parameterized in MD3 $\overline{7} 312$ \$ $\mathrm{MA} \_\mathrm{NO} \overline{\mathrm{C}} \mathrm{O}$ _A $\overline{\mathrm{D} A P T \_A X \_1 . ~}$
Related to:
MD37310 \$MA_NOCO_INPUT_AX_1
MD37312 \$MA_NOCO_ADAPT_AX_1
MD37314 \$MA_NOCO_ADAPT_NUM_1
MD37318 \$MA_NOCO_COMPLIANCE_1

| 37318 | NOCO_COMPLIANCE_1 | EXP, A01, A09 | - |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Compliance factor for nodding compensation      <br>       <br> -      |  |  |  |  |  | 3 | $0.0,0.0,0.0$ | -0.000999 | DOUBLE | NEW CONF |

Description:
Factor for compensating the nodding motion caused by MD37310 \$MA_NOCO_INPUT_AX_1.
Compliance factor $=$ compliance in the position (m)/ acceleration (m/s2)
If no position-dependent adaptation is active, only the value in MD37318
\$MA_NOCO_COMPLIANCE_1[0] is active.
With active position-dependent adaptation, as many values from MD37318
\$MA_NOCO_COMPLIANCE_1 are active as are parameterized in MD37314 \$MA_NOCO_ADAPT_NUM_1.
Related to:
MD37300 \$MA_NOCO_ENABLE
MD37302 \$MA_NOCO_FILTER_TIME
MD37310 \$MA_NOCO_INPUT_AX_1
MD37312 \$MA_NOCO_ADAPT_AX_1
MD37314 \$MA_NOCO_ADAPT_NUM_1
MD37316 \$MA_NOCO_ADAPT_POS_1

### 4.3 Axis-specific NC machine data

| 37320 | NOCO_INPUT_AX_2 | EXP, A01, A09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Machine axis that causes a nodding motion |  |  |  |  |  | DWORD | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 31 |  |  |  |  |

Description: Number of the machine axis that causes a nodding motion in this axis in order to activate the nodding compensation. The nodding compensation acts in combination with
MD37328 \$MA_NOCO_COMPLIANCE_2.
Related to:
MD37302 \$MA_NOCO_FILTER_TIME
MD37322 \$MA_NOCO_ADAPT_AX_2
MD37328 \$MA_NOCO_COMPLIANCE_2

| 37322 | NOCO_ADAPT_AX_2 | EXP, A01, A09 | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Machine axis whose position affects the nodding motion |  |  |  |  |  | DWORD | NEW CONF |  |
| - | $2 / 2$ |  |  |  |  |  | M |  |  |
| - | - | 0 | 0 | 31 | 2 |  |  |  |  |

## Description:

Number of the machine axis whose position affects the nodding motion in this axis. The position-dependent adaptation of the nodding compensation takes place in combination with MD 37326 \$MA_NOCO_ADAPT_POS_2 and MD37328 \$MA_NOCO_COMPLIANCE_2.
A position-dependent adaptation is only active if a machine axis number is parameterized and there is a value greater than 1 in MD37324 \$MA_NOCO_ADAPT_NUM_2. Related to:
MD37320 \$MA_NOCO_INPUT_AX_2
MD37324 \$MA_NOCO_ADAPT_NUM_2
MD37326 \$MA_NOCO_ADAPT_POS_2
MD37328 \$MA_NOCO_COMPLIANCE_2

| 37324 | NOCO_ADAPT_NUM_2 |  | EXP, A01, A09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of positions of the adaptation curve of the nodding compensation |  | DWORD | NEW CONF |  |
| - |  |  |  |  |  |
| - | 1 | 1 1 | 3 | 2/2 | M |

Description:
Number of the axis positions used for the position-dependent adaptation of the nodding compensation.
A position-dependent adaptation is only active if the number of positions is greater than 1 and a machine axis number is parameterized in MD37322 \$MA_NOCO_ADAPT_AX_2.
Related to:
MD37320 \$MA_NOCO_INPUT_AX_2
MD37322 \$MA_NOCO_ADAPT_AX_2
MD37326 \$MA_NOCO_ADAPT_POS_2
MD37328 \$MA_NOCO_COMPLIANCE_2

| 37326 | NOCO_ADAPT_POS_2 |  | EXP, A01, A09 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Positions of the adaptation curve of the nodding compensation |  | DOUBLE | NEW CONF |  |
| - |  |  |  |  |  |
| - | $3 \quad 0.0,0.0,0.0$ | - | - | 2/2 | M |

Description: Positions of the machine axis from MD37322 \$MA_NOCO_ADAPT_AX_2 at which the compliance factors in MD37328 \$MA_NOCO_COMPLIANCE_2 are active.

A position-dependent adaptation is only active if the number of positions in MD37324 \$MA_NOCO_ADAPT_NUM_2 is greater than 1 and a machine axis number is parameterized in MD3 $\overline{7} 322$ § MA _NOC̄ C _A $\overline{\mathrm{D} A P T \_A X \_2 . ~}$

Related to:
MD37320 \$MA_NOCO_INPUT_AX_2
MD37322 \$MA_NOCO_ADAPT_AX_2
MD37324 \$MA_NOCO_ADAPT_NUM_2
MD37328 \$MA_NOCO_COMPLIANCE_2


| 37330 | NOCO_INPUT_AX_3 | EXP, A01, A09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Machine axis that causes a nodding motion |  |  |  |  |  | DWORD | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 31 | $2 / 2$ |  |  |  |

Description: Number of the machine axis that causes a nodding motion in this axis in order to activate the nodding compensation. The nodding compensation acts in combination with MD37338 \$MA_NOCO_COMPLIANCE_3.
Related to:
MD37302 \$MA_NOCO_FILTER_TIME
MD37332 \$MA_NOCO_ADAPT_AX_3
MD37338 \$MA_NOCO_COMPLIANCE_3


```
MD37336 $MA_NOCO_ADAPT_POS_3
MD37338 $MA_NOCO_COMPLIANCE_3
```

| 37334 | NOCO_ADAPT_NUM_3 | EXP, A01, A09 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of positions of the adaptation curve of the nodding <br> compensation | DWORD | NEW CONF |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 1 | 3 |  |  |

Description:
Number of the axis positions used for the position-dependent adaptation of the nodding compensation.
A position-dependent adaptation is only active if the number of positions is greater than 1 and a machine axis number is parameterized in MD37332 \$MA_NOCO_ADAPT_AX_3.

Related to:
MD37330 \$MA_NOCO_INPUT_AX_3
MD37332 \$MA_NOCO_ADAPT_AX_3
MD37336 \$MA_NOCO_ADAPT_POS_3
MD37338 \$MA_NOCO_COMPLIANCE_3


Description:
Positions of the machine axis from MD37332 \$MA_NOCO_ADAPT_AX_3 at which the compliance factors in MD37338 \$MA_NOCO_COMPLIANCE_3 are active.
A position-dependent adaptation is only active if the number of positions in MD37334 \$MA NOCO ADAPT NUM 3 is greater than 1 and a machine axis number is parameterized in MD37332 \$MA_NOC̄_ADAPT_AX_3.
Related to:
MD37330 \$MA NOCO INPUT AX 3
MD37332 \$MA_NOCO_ADAPT_AX_3
MD37334 \$MA_NOCO_ADAPT_NUM_3
MD37338 \$MA_NOCO_COMPLIANCE_3

| 37338 | NOCO_COMPLIANCE_3 | EXP, A01, A09 | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Compliance factor of the nodding compensation |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0$ | -0.000999 | +0.000999 |  |  |  |  |

Description: Factor for compensating the nodding motion caused by MD37330 \$MA_NOCO_INPUT_AX_3.
Compliance factor = compliance in the position (m)/ acceleration (m/s2)
If no position-dependent adaptation is active, only the value in MD37338
\$MA_NOCO_COMPLIANCE_3[0] is active.
With active position-dependent adaptation, as many values from MD37338
\$MA_NOCO_COMPLIANCE_3 are active as are parameterized in MD37334 \$MA_NOCO_ADAPT_NUM_3.
Related to:
MD37300 \$MA_NOCO_ENABLE
MD37302 \$MA_NOCO_FILTER_TIME
MD37330 \$MA_NOCO_INPUT_AX_3
MD37332 \$MA_NOCO_ADAPT_AX_3
MD37334 \$MA_NOCO_ADAPT_NUM_3
MD37336 \$MA_NOCO_ADAPT_POS_3

| 37400 | EPS_TLIFT_TANG_STEP |  |  | A10 | T3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Tangent angle for corner recognition |  |  | DOUBLE | Res |  |
| CTEQ |  |  |  |  |  |  |
| 828d-me42 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te42 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce42 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse42 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me62 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te62 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce62 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse62 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-te82 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-me82 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce82 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gse82 | - | 5.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 2/2 | M |

## Description:

If TLIFT has been programmed and the axis is tracked tangentially, a step of the position setpoint larger than MD37400 \$MA_EPS_TLIFT_TANG_STEP causes an intermediate block to be inserted. The intermediate block traverses the axis to the position corresponding to the start tangent in the next block.
MD irrelevant if: TLIFT not activated
Related to:
TLIFT instruction


Description: Default offset (angle), which the tracked axis forms with the tangent. The angle acts
in addition to the angle programmed in the TANGON block.
MD irrelevant if tangential tracking not active.
Related to:
TANGON instruction

| 37500 | ESR_REACTION |  |  | EXP, A01, A10 | M3, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Axial mode of "Extended Stop and Retract" |  |  | BYTE | NEW |  |
| CTEQ |  |  |  |  |  |  |
| - | 0 | 0 | 0 | 22 | 7/2 | M |

### 4.3 Axis-specific NC machine data

Description: | Selection of the response to be triggered via system variable "\$AN_ESR_TRIGGER". |
| :--- |
| $0=$ No response Reaktion (or only external response through synchronized action |
| programming of rapid digital outputs). |
| $21=N C$-controlled retraction axis |
| $22=N C$ controlled stopping axis |

| 37510 | AX_ESR_DELAY_TIME1 | EXP, A01, A10 | P2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | Delay time ESR single axis | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description: If, for example, an alarm occurs, the deceleration time can be delayed by means of this MD, e.g. to allow in case of gear hobbing the retraction from the tooth gap first.

| 37511 | AX_ESR_DELAY_TIME2 | EXP, A01, A10 | P2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| s | ESR time for interpolatory deceleration of single axis | DOUBLE | NEW CONF |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ |  |

Description: The time for interpolatory braking specified here in MD37511 \$MA_AX_ESR_DELAY_TIME2 still remains after expiry of the time MD37510 \$MA_AX_ESR_DELAY_TIME1.
Rapid braking with subsequent tracking is initiated after expiry of the time MD37511 \$MA_AX_ESR_DELAY_TIME2.


Description:
Threshold value for VDI signals
If, with active EG axis link, the maximum velocities stored in MD 32000:
\$MA_MAX_AX_VELO have been reached for the current velocity of the axis by the
percentage set here, a warning (signal) for velocity is output.
Related to:
MD32000 \$MA_MAX_AX_VELO

| 37560 | EG_ACC_TOL |  |  |  |  |  |  | A05, A10 | M3, Z3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Threshold value for 'Axis accelerating' |  |  |  |  |  |  | DOUBLE | NEW CONF |
| - |  |  |  |  |  |  |  |  |  |
| 828 d-me42 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | $0 / 0$ | S |  |  |  |
| 828 d-te42 | - | 0.0 | $1.0 \mathrm{E}+301$ | $2 / 2$ | M |  |  |  |  |
| 828d-gce42 | - | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |  |  |  |  |


| 828d-gse42 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-me62 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te62 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-gce62 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 2$ | M |
| 828d-gse62 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-te82 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | 2/2 | M |
| 828d-me82 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gce82 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |
| 828d-gse82 | - | 25.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/2 | M |

## Description:

Threshold value for VDI signal "Axis accelerates"
If, with active EU axis link, the maximum accelerations stored in MD 32300:
\$MA_MAX_AX_ACCEL have been reached for the current acceleration of the axis by the percentage set here, a warning (signal) for acceleration is output.
Korrespondiert mit:
MD32300 \$MA_MAX_AX_ACCEL

| 37620 | PROFIBUS_TORQUE_RED_RESOL |  | EXP, A01 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| \% | Resolution PROFIdrive torque reduction |  | DOUBLE | NEW |  |
| - |  |  |  |  |  |
| - | 1.0 | 0.005 | 10.0 | 2/2 | M |

Description:
For PROFIdrive only:
Resolution of torque reduction on the PROFIdrive (LSB significance)
The MD is only relevant for controls with PROFIdrive drives. For these controls, it defines the resolution of the cyclic interface data "Torque reduction value" (only exists for MD13060 \$MN_DRIVE_TELEGRAM_TYPE = 101 ff. or 201 ff.), which is required for the "Travel to fixed stop" functionality.
The 1\% default value corresponds to the original significance. The torque limit is transferred on the PROFIdrive with increments of $1 \%$; the value 100 in the corresponding PROFIdrive message frame data cell corresponds to full torque reduction (i.e. without force).

By changing this MD to $0.005 \%$, for example, the value can be entered in increments of $0.005 \%$, i.e. the increments for the torque limit value become finer by a factor of 200 .
For limitation to the rated torque, the value 0 is transmitted in this case; complete torque reduction (i.e. without force) characterizes the transmittable value 10000 .
To avoid misadaptation, the setting value of the MD must be selected to match the interpretation configured on the drive side or the firmly defined interpretation of the torque reduction value. If the setting of the control on the drive (manufacturerspecific drive parameter) is known (i.e. with SIEMENS drives), the software automatically sets the MD; in other words, in this case the MD is merely used for display purposes.

| 37800 | OEM_AXIS_INFO |  |  | A01, A11 | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | OEM version information |  |  | STRING | PowerOn |  |
| - |  |  |  |  |  |  |
| - | 2 | , | - | - | 2/2 | M |

## Description:

A version information freely available to the user
(is indicated in the version screen)

| 37950 | SAFE_INFO_ENABLE |  | A01, A05 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | SIC/SCC and PROFIsafe enable |  | UDWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | - | 0 | 0x0001 | 7/2 | M |

### 4.3 Axis-specific NC machine data

Description: MD to enable the evaluation of the SIC/SCC telegram between the control and drive, and to enable the transfer of the PROFIsafe telegram between the F-PLC and the drive Bit 0: Enables the evaluation of the Safety Info Channel / Safety Control Channel (SIC/ SCC)

For axes with NC Safety functionality, only the drive-integrated brake test is supported via SIC/SCC
Bit 1: Enables PROFIsafe communication between the F-PLC and drive

| 37954 | SAFE_INFO_MODULE_NR |  |  | A01 | FBS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | SIC/SCC module number |  |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 2, 3, 4, 1, 5 | 1 | 31 | $2 / 2$ | M |
| 828d-te42 | - | 2, 3, 1, 5, 4 | 1 | 31 | $2 / 2$ | M |
| 828d-gce42 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | $2 / 2$ | M |
| 828d-gse42 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | $2 / 2$ | M |
| 828d-me62 | - | 2, 3, 4, 1, 5 | 1 | 31 | 2/2 | M |
| 828d-te62 | - | 2, 3, 1, 5, 4, 6 | 1 | 31 | 2/2 | M |
| 828d-gce62 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | $2 / 2$ | M |
| 828d-gse62 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | 2/2 | M |
| 828d-te82 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | 2/2 | M |
| 828d-me82 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | $2 / 2$ | M |
| 828d-gce82 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | $2 / 2$ | M |
| 828d-gse82 | - | 1, 2, 3, 4, 5, 6, 7, 8... | 1 | 31 | $2 / 2$ | M |

Description:
Number to select a logical basis address from MD13374 \$MN_SAFE_INFO_DRIVE_LOGIC_ADDR.

| 38000 | MM_ENC_COMP_MAX_POINTS |  |  | A01, A09, A02 | K3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of intermediate points for interpol. compensation (SRAM) |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-te42 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-gce42 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-gse42 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-me62 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-te62 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-gce62 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-gse62 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-te82 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-me82 | 2 | 200, 200 | 0 | 5000 | 7/2 | M |
| 828d-gce82 | 2 | 200, 200 | 0 | 5000 | ReadOnly | S |
| 828d-gse82 | 2 | 200, 200 | 0 | 5000 | ReadOnly | S |



When selecting the number of interpolation points and/or the distances between them, it is important to take into account the size of the resulting compensation table and the space required in the buffered NC user memory (SRAM). 8 bytes are required for each compensation value (interpolation point).
The index [n] has the following coding: [encoder no.]: 0 or 1
Special cases: Notice:
After any change in MD38000 \$MA_MM_ENC_COMP_MAX_POINTS, the buffered NC user memory is automatically re-allocated on system power-on.
All data in the buffered NC user memory are then lost (e.g. part programs, tool offsets etc.). Alarm 6020 "Machine data changed - memory reallocated" is output.

If reallocation of the $N C$ user memory fails because the total memory capacity available is insufficient, alarm 6000 "Memory allocation made with standard machine data" is output.
In this case, the $N C$ user memory division is allocated using the default values of the standard machine data.

References:
/FB/, S7, "Memory Configuration"
/DA/, "Diagnostics Guide"
Related to:
MD32700 \$MA_ENC_COMP_ENABLE[n] LEC active
References:
/FB/, S7, "Memory Configuration"

| 38010 | MM_QEC_MAX_POINTS |  |  | A01, A09 | K3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of values for quadrant error compens. with neural network |  |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-te42 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-gce42 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-gse42 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-me62 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-te62 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-gce62 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-gse62 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-te82 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-me82 | 1 | 0 | 0 | 1040 | 7/2 | M |
| 828d-gce82 | 1 | 20 | 0 | 1040 | ReadOnly | S |
| 828d-gse82 | 1 | 20 | 0 | 1040 | ReadOnly | S |

Description:
In quadrant error compensation with neural networks (QEC), the number of compensation values required has to be entered for each axis that is to be compensated.

The required number can be calculated as follows using the defined parameters: MD38010 \$MA_MM_QEC_MAX_POINTS _ (\$AA_QEC_COARSE_STEPS + 1) ^ \$AA_QEC_FINE_STEPS \$AA_QEC_COARSE_STEPS Coarse quantization of the characteristic (system variable) \$AA_QEC_FINE_STEPS Fine quantization of the characteristic (system variable)
For "direction-dependent" compensation, the number must be greater than or equal to double the value of this product.
When selecting coarse or fine quantization, the resulting size of the compensation table and its memory requirement in the buffered user memory must be taken into account. 4 bytes are required for each compensation value. If the value 0 is entered, no memory is reserved for the table; i.e. the table does not exist and the function cannot therefore be activated.

Special cases: Caution!

If MD38010 \$MA_MM_QEC_MAX_POINTS is altered, the buffered NC user memory is automatically re-allocated on system power-on. This deletes all the user data in the buffered user memory (e.g. drive and HMI machine data, code, tool offsets, part programs etc.).
Note:
For better handling, a large number should be chosen initially, because the exact number of interpolation points that are required is not known when the compensation is started for the first time. This number can be reduced to the required size as soon as the characteristics have been recorded and saved. After performing another power-on, the saved characteristics can be reloaded.
References:
/FB/, S7, "Memory Configuration"

## NC setting data

| 41010 | JOG_VAR_INCR_SIZE |  |  |  |  |  | - | H1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Size of the variable increment for JOG | DOUBLE | Immediately |  |  |  |  |  |
| - | - | 0. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |  |  |
| $7 / 7$ | U |  |  |  |  |  |  |  |

Description:
This setting data defines the number of increments when variable increment (INCvar) is selected. This increment size is traversed by the axis in JOG mode each time the traverse key is pressed or the handwheel is turned one detent position and variable increment is selected (PLC interface signal "Active machine function: INC variable" for machine or geometry axes is set to 1). The defined increment size also applies to DRF.

Note:
Please note that the increment size is active for incremental jogging and handwheel jogging. So, if a large increment value is entered and the handwheel is turned, the axis might cover a large distance (depends on setting in MD31090 \$MA_JOG_INCR_WEIGHT).
SD irrelevant to ......
JOG continuous
Related to ....
NC/PLC interface signal DB3300 DBX1001.5,1005.5,1009.5 (Geometry axis 1-3 active machine function: INC variable) or NC/PLC interface signal DB390x DBX5.5 (Active machine function: INC variable)

MD31090 \$MA_JOG_INCR_WEIGHT (weighting of an increment for INC/handwheel)


## Description:

1: Jog mode for JOG continuous
In jog mode (default setting) the axis traverses as long as the traverse key is held down and an axis limitation has not been reached. When the key is released the axis is decelerated to zero speed and the movement is considered complete.
0: Continuous operation for JOG continuous
In continuous operation the traverse movement is started with the first rising edge of the traverse key and continues to move even after the key is released. The axis can be stopped again by pressing the traverse key again (second rising edge).

SD irrelevant for ......
Incremental jogging (JOG INC)
Reference point approach (JOG REF)


## Description:

Bit $0=0$ :
The behavior depends on the following:

- in the case of an axis/spindle:
on the axial SD43300 \$SA ASSIGN FEED PER REV SOURCE
- in the case of a geometry axis with an active frame with rotation:
on the channel-specific SD42600 \$SC_JOG_FEED_PER_REV_SOURCE
- in the case of an orientation axis:
on the channel-specific SD42600 \$SC_JOG_FEED_PER_REV_SOURCE
Bit $0=1$ :
A JOG motion with revolutional feedrate shall be traversed depending on the master spindle.

The following must be considered:

- If a spindle is the master spindle itself, it will be traversed without revolutional feedrate.
- If the master spindle is in stop position and if SD43300
\$SA_ASSIGN_FEED_PER_REV_SOURCE (with an axis/spindle) or SD42600
\$SC_JOG_FEED_PER_REV_SOURCE (with a geometry axis with an active frame with rotation, or with an orientation axis) $=-3$, traversing will be carried out without revolutional feedrate.

Bit $1=0$ :
The axis/spindle, geometry axis or orientation axis will be traversed with revolutional feedrate even during rapid traverse (see bit 0 for selection).

Bit 1 = 1 :
The axis/spindle, geometry axis or orientation axis is always traversed without revolutional feedback during rapid traverse.
Bit $2=0$ :
The axis/spindle, geometry axis or orientation axis is traversed with revolutional feedrate during JOG handwheel travel, too (see bit 0 for selection).
Bit 2 = 1 :
The axis/spindle, geometry axis or orientation axis is always traversed without revolutional feedrate during JOG handwheel travel.
Bit $3=0$ :

The axis/spindle is traversed with revolutional feedrate during DRF handwheel travel, too (see bit 0 for selection).
Bit $3=1$ :
The axis/spindle is always traversed without revolutional feedrate during DRF handwheel travel.

| 41110 | JOG_SET_VELO |  |  |  |  |  | - | H1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Axis velocity in JOG |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description:
Value not equal to 0 :
The velocity value entered applies to linear axes traversed in JOG mode if linear feedrate (G94) is active for the relevant axis (SD41100 \$SN_JOG_REV_IS_ACTIVE = 0). The axis velocity is active for

- continuous jogging
- incremental jogging (INC1, ... INCvar)
- handwheel traversing.

The value entered is valid for all linear axes and must not exceed the maximum permissible axis velocity (MD32000 \$MA_MAX_AX_VELO).
In the case of DRF, the velocity defined by SD41110 \$SN_JOG_SET_VELO is reduced by MD32090 \$MA_HANDWH_VELO_OVERLAY_FACTOR.
Value = 0 :
If 0 has been entered in the setting data, the active linear feedrate in JOG mode is MD32020 \$MA_JOG_VELO "Jog axis velocity". Each axis can be given its own JoG velocity with this MD (axial MD).
SD irrelevant for .....

- Linear axes if SD41100 \$SN_JOG_REV_IS_ACTIVE = 1
- Rotary axes (SD41130 \$SN_JOG_ROT_AX_SET_VELO is active here)

Application example(s)
The operator can thus define a JOG velocity for a specific application. Related to ....
SD41100 \$SN_JOG_REV_IS_ACTIVE (revolutional feedrate with JOG active)
Axial MD32020 \$MA_JOG_VELO (JOG axis velocity)
Axial MD32000 \$MA_MAX_AX_VELO (maximum axis velocity)
Axial MD32090 \$MA_HANDWH_VELO_OVERLAY_FACTOR (ratio of JOG velocity to handwheel velocity (DRF))
SD41130 \$SN_JOG_ROT_AX_SET_VELO (JOG speed with rotary axes)


| $828 \mathrm{~d}-\mathrm{me} 82$ | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828 d -gce82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828 d -gse82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ | $U$ |

Description:

Value not equal to 0 :
The velocity value entered applies to axes traversed in JOG mode if revolutional
feedrate (G95) is active for the relevant axis (SD41100 \$SN_JOG_REV_IS_ACTIVE = 1).
The axis velocity is active for

- continuous jogging
- incremental jogging (INC1, ... INCvar)
- handwheel traversing. The value entered is valid for all axes and must not exceed the maximum permissible axis velocity (MD32000 \$MA_MAX_AX_VELO).

Value = 0:
If 0 has been entered in the setting data, the active revolutional feedrate in JOG mode is MD32050 \$MA_JOG_REV_VELO "revolutional feedrate with JOG".
Each axis can be given its own revolutional feedrate with this MD (axial MD).
SD irrelevant for ......

- For axes if SD41100 \$SN_JOG_REV_IS_ACTIVE = 0

Application example(s)
The operator can define a JOG velocity for a particular application.
Related to ....
Axial SD41100 \$SN_JOG_REV_IS_ACTIVE (revolutional feedrate for JOG active)
Axial MD32050 \$MA_JOG_REV_VELO (revolutional feedrate with JOG)
Axial MD32000 \$MA_MAX_AX_VELO (maximum axis velocity)

| 41130 | JOG_ROT_AX_SET_VELO |  | - | H1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| rev/min | Axis velocity for rotary axes in JOG mode |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |
| - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description:
Value not equal to 0 :
The velocity entered applies to rotary axes in JOG mode (to continuous jogging, incremental jogging, jogging with handwheel). The value entered is common to all rotary axes, and must not exceed the maximum permissible axis velocity (MD32000 \$MA_MAX_AX_VELO).
With DRF, the velocity set with SD41130 \$SN_JOG_ROT_AX_SET_VELO must be reduced by MD32090 \$MA_HANDWH_VELO_OVERLAY_FACTOR.
Value equal to 0:
If the value 0 is entered in the setting data, the velocity applied to rotary axes in JOG mode is the axial MD32020 \$MA_JOG_VELO (jog axis velocity). In this way, it is possible to define a separate JOG velocity for each axis.
Application example(s)
The operator can define a JOG velocity for a particular application.
Related to ....
MD32020 \$MA_JOG_VELO (JOG axis velocity)
MD32000 \$MA_MAX_AX_VELO (maximum axis velocity)
MD32090 \$MA_HANDWH_VELO_OVERLAY_FACTOR (ratio JOG velocity to handwheel velocity (DRF)

| 41200 | JOG_SPIND_SET_VELO | - | H1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| rev/min | Speed for spindle JOG mode |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 E+301$ |  |  |  |  |
| $7 / 7$ | U |  |  |  |  |  |  |  |

Description:
Value not equal to 0 :

The speed entered applies to spindles in JOG mode if they are traversed manually by the "Plus and minus traversing keys" or the handwheel. The speed is active for

- continuous jogging
- incremental jogging (INC1, ... INCvar)
- handwheel traversing. The value entered is valid for all spindles, and must not exceed the maximum permissible speed (MD32000 \$MA_MAX_AX_VELO).
Value = 0 :
If 0 has been entered in the setting data, MD32020 \$MA_JOG_VELO (JOG axis velocity) acts as the JOG velocity. Each axis can thus be given its own JOG velocity with this MD (axial MD).

The maximum speeds of the active gear stage (MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT) are taken into account when traversing the spindle with JOG.
SD irrelevant for ......
Application example(s). The operator can thus define a JOG speed for the spindles for a specific application.
Related to ....
Axial MD32020 \$MA_JOG_VELO (JOG axis velocity)
MD35130 \$MA_GEAR_STEP_MAX_VELO_LIMIT (maximum speeds of the gear stages)



| 41310 | CEC_TABLE_WEIGHT |  |  | - | K3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Weighting factor compensation table |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| 828d-me42 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-te42 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gce42 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse42 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-me62 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |


| 828d-te62 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & \text { 1.0, 1.0, 1.0... } \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce62 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gse62 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & \text { 1.0, 1.0, 1.0... } \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-te82 | 12 | $\begin{array}{\|l\|} \hline 1.0,1.0,1.0,1.0,1.0, \\ 1.0,1.0,1.0 \ldots \\ \hline \end{array}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-me82 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & \text { 1.0, 1.0, 1.0... } \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gce82 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 1/1 | M |
| 828d-gse82 | 12 | $\begin{aligned} & \text { 1.0, 1.0, 1.0, 1.0, 1.0, } \\ & 1.0,1.0,1.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 1/1 | M |

Description:
The compensation value stored in the table [t] is multiplied by the weighting factor. When selecting the weighting factor it should be ensured that the total compensation value in the compensation axis does not exceed the maximal value of
(MD18342 \$MN_CEC_MAX_SUM). With [t] = index of the compensation table (see MD18342 \$MN_MM_CEC_MAX_POINTS)
If, for example, the weight of the tools used on the machine or the workpieces to be machined are too different and this affects the error curve by changing the amplitude, this can be corrected by changing the weighting factor. In the case of sag compensation, the weighting factor in the table can be changed for specific tools or workpieces from the PLC user program or the NC program by overwriting the setting data. However, different compensation tables are to be used if the course of the error curve is substantially changed by the different weights.
Related to ....
SD41300 \$SN_CEC_TABLE_ENABLE[t] Evaluation of the sag compensation table t is enabled MD18342 \$MN_CEC_MAX_SUM Maximum compensation value for sag compensation

| 41320 | CEC_0 | - | K3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Compensation value 1 |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 12 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: The value of this SD is added to the compensation value \$AN_CEC[t,0]. Related to ....
\$AN_CEC[t,0] compensation value

| 41321 | CEC_1 | - | K3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Compensation value 2 |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 12 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

[^14]

Description: The value of the SD is used to calculate \$SN_CEC.
Is deleted after calculating \$SN_CEC.
Related to ....
\$SN_CEC_0[t], \$SN_CEC_1[t] compensation values

| 41331 | CEC_BAS_1 | - | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Distance to measuring point 2 in the basic axis | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 12 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  | U

Description: The value of the SD is used to calculate \$SN_CEC.
Is deleted after calculating \$SN_CEC.
Related to ....
\$SN_CEC_0[t], \$SN_CEC_1[t] compensation values

| 41335 | CEC_BAS_STORE_0 |  |  |  |  |  | - | K3 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Stored distance to measuring point 1 in the basic axis | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 12 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |  |  |

Description: Saves the value of \$SN_CEC_BAS after calculating \$SN_CEC.
Related to ....
\$SN_CEC_0[t], \$SN_CEC_0[t] compensation values

| 41336 | CEC_BAS_STORE_1 | - | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Stored distance to measuring point 2 in the basic axis | DOUBLE | Immediately |  |  |  |
| - | 12 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 .$. | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |

Description: Saves the value of \$SN_CEC_BAS after calculating \$SN_CEC.
Related to ....
\$SN_CEC_0[t], \$SN_CEC_1[t] compensation values


## Description:

The value of the SD is used to calculate \$SN_CEC.
Is deleted after calculating \$SN_CEC.
Related to ....
\$SN_CEC_0[t], \$SN_CEC_1[t] compensation values

| 41341 | CEC_COMP_1 |  |  | - | K3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Cylinder error 2 in the compensation axis |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| - | 12 | $\begin{aligned} & 0.0,0.0,0.0,0.0,0.0, \\ & 0.0,0.0,0.0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| Description: |  | he $S D$ is used to er calculating \$ \$SN_CEC_1[t] con | alculate \$SN CEC. <br> ensation val | C. |  |  |



| 41351 | CEC_COMP_STORE_1 | - | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Stored cylinder error 2 in the compensation axis | DOUBLE | Immediately |  |  |  |
| - | 12 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0 \ldots$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description:
Saves the value of $\$ S N \_C E C \_C O M P$ after calculating $\$$ SN_CEC.
Related to ....
\$SN_CEC_0[t], \$SN_CEC_1[t] compensation values

| 41355 | CEC_CALC |  |  | - | K3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | The 0/1 edge starts the calculation of \$SN_CEC_O[t] and \$SN_CEC_1[t]. |  |  | BOOLEAN | Immediately |  |
| - |  |  |  |  |  |  |
| - | 12 | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE... | 0 | - | 7/7 | U |
| Description: |  | lculation of \$ <br> [t], \$SN_CEC_B <br> [t], \$SN_CEC_ | C. <br> t] dis <br> $1[t]$ cyl | to measur error in | point in basic axis compensation axis | $\begin{aligned} & \text { axis } \\ & \text { xis } \end{aligned}$ |


| 41356 | CEC_CALC_ADD |  |  | - | K3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Absolute or additive calculation of \$SN_CEC_O[t] and \$SN_CEC_1[t] |  |  | BOOLEAN | Immediately |  |
| - |  |  |  |  |  |  |
| - | 12 | FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE... | 0 | - | 7/7 | U |

FALSE: Absolute, the calculated values of \$SN_CEC_0[t] and \$SN_CEC_1[t] are included as absolute values.

TRUE: Additive, the calculated values of $\$$ SN_CEC_0[t] and \$SN_CEC_1[t] are added to the existing values.

Related to ....
\$SN_CEC_BAS_0[t], \$SN_CEC_BAS_1[t] distance to measuring point in the basic axis
\$SN_CEC_COMP_0[t], \$SN_CEC_COMP_1[t] cylinder error in the compensation axis

| 41610 | CORR_TRAFO_LIN_MAX | EXP | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Maximum permissible offset value for offset vectors with <br> CORRTRAFO | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | $1.0 \mathrm{E}+301$ |  |  |  |

Description:
With the CORRTRAFO function for machine measurement, offset vectors can be modified in the kinematic model of a machine.

This setting data limits the maximum permissible change in each component of such a vector to the specified maximum value.

| 41611 | CORR_TRAFO_DIR_MAX | EXP | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| degrees | $\begin{array}{l}\text { Maximum permissible angle deviation for direction vectors with } \\ \text { CORRTRAFO }\end{array}$ | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | 90.0 | $7 / 2$ |  |  |$]$ M $\quad$.

Description: With the CORRTRAFO function for machine measurement, the direction vectors of rotary axes can be modified in the kinematic model of a machine.

This setting data limits the maximum permissible angle change of such a vector to the specified maximum value.


## Description:

The CORRTC function for tool carrier measurement can be used to modify offset vectors in the kinematic model of a tool carrier.

This setting data limits the maximum permissible change in each component of such a vector to the specified maximum value.

| 42000 | THREAD_START_ANGLE | - | K1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Starting angle for thread | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . .$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description:
In the case of multiple thread cutting, the offset of the individual threads can be programmed with the aid of this setting data.
This $S D$ can be changed by the part program with the command $S F$.
Note:
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)


Description:
The SD is active for thread cutting with G33 (G34, G35).
It has three elements that define the behavior of the thread axis during runup (1st element), during deceleration/smoothing "G33(G34, G35) to G00/G01" (2nd element) and during smoothing between 2 thread blocks (3rd element).
The first two values have the same properties for thread run-in and thread run-out: $<0$ :
The thread axis is started/decelerated with configured acceleration. Jerk is according to the current programming of BRISK/SOFT. Behavior is compatible with MD 20650 __THREAD_START_IS_HARD = FALSE used until now.
0 :
Starting/deceleration of the feed axis during thread cutting is stepped. Behavior is compatible with MD 20650 __THREAD_START_IS_HARD = TRUE used until now.
$>0$ :
The maximum thread starting or deceleration path is specified. The specified distance can lead to acceleration overload of the axis. The SD is written from the block when DITR (displacement thread ramp) is programmed. An overlong path has no effect.
Note:
MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be set so that the value written by the part program is transferred to the active file system on reset (this means the value is retained after reset.)
The 3rd value permits smoothing at a corner between 2 thread blocks in order to soften the transition. It is not rounded by smoothing if the dynamics of the machine permit a hard transition, for example on account of MD32310 \$MA_MAX_ACCEL_OVL_FACTOR:
-1:
The transition is made as geometrically soft as possible.
$0:$
The corner is left with hard retraction, the axes follow the specification of the control loops.
$>0$ :
Reserved for an expansion of the function.
The 3rd value defines the geometric tolerance that may be used at a corner between 2 thread blocks in order to soften the transition:
< or = 0:
The corner is left with hard retraction, the axes follow the specification of the control loops. > 0 :

The transition is made as geometrically soft as possible by using this tolerance.

| 42100 | DRY_RUN_FEED | - | V1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Dry run feedrate | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $5000 ., 5000 ., 5000 .$, <br> $5000 ., 5000 ., 5000 .$, <br> $5000 ., 5000 . \ldots$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

Description:
The feedrate for the active dry run is entered in this setting data. The setting data can be altered on the operator panel in the "Parameters" operating area.

The entered dry run feedrate is always interpreted as a linear feed (G94). If the dry run feedrate is activated via the PLC interface, the dry run feedrate is used as the path feed after a reset instead of the programmed feed. The programmed velocity is used for traversing if it is greater than the velocity stored here.
Application example(s)
Program testing
Related to ....
NC/PLC interface signal DB3200 DBX0.6 (Activate dry run feedrate)
NC/PLC interface signal DB1700 DBX0. 6 (Dry run feedrate selected)

| 42101 | DRY_RUN_FEED_MODE | - | V1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Mode for dry run velocity | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 12 |  |  |
| $7 / 7$ | U |  |  |  |  |  |

Description:
This SD can be used to set the method of operation of the dry run velocity set by SD42100 \$SC_DRY_RUN_FEED.
The following values are possible:
0 :
The maximum of SD42100 \$SC_DRY_RUN_FEED and the programmed velocity become active. This is the standard setting and corresponds to the behavior up to SW 5 .
1:
The minimum of SD42100 \$SC_DRY_RUN_FEED and the programmed velocity become active. 2:
SD42100 \$SC_DRY_RUN_FEED becomes active directly, irrespective of the programmed velocity.
The values 3...9 are reserved for extensions.
10:
As configuration 0 , except for thread cutting (G33, G34, G35) and tapping (G331, G332, G63). These functions are executed as programmed.
11:
As configuration 1, except for thread cutting (G33, G34, G35) and tapping (G331, G332, G63). These functions are executed as programmed.

12:
As configuration 2, except for thread cutting (G33, G34, G35) and tapping (G331, G332, G63). These functions are executed as programmed.

| 42110 | DEFAULT_FEED | - | V1, FBFA |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{mm} / \mathrm{min}$ | Path feed default value | DOUBLE | Immediately |  |  |
| - |  |  |  |  |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . . .$. | 0.0 | $1.0 E+301$ | $7 / 7$ |

Description: Default value for path feedrate, This setting data is evaluated when the part program starts taking into account the feedrate type active at this time (see MD20150 \$MC_GCODE_RESET_VALUES and MD20154 \$MC_EXTERN_GCODE_RESET_VALUES).

| 42120 | APPROACH_FEED | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Path feedrate in approach blocks | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . \ldots$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |$\quad$ U

Description: Default value for path feedrate in approach blocks (after repos., block search, SERUPRO etc).

The contents of this settting data are only used when it is non-zero. It is evaluated like an F word programmed for G94.

| 42121 | AX_ADJUST_FEED |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Path feed in adjustment movements |  |  |  |  |  | DOUBLE | Immediately |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . \ldots$. | - | - | $7 / 7$ |  |  |  |  |

## Description:

Default value for the path feed in adjustment movements of tangential axes on
activation of a tangential axis coupling during or after block search.
The content of this setting data is only used if it is not equal to zero and bit7 = 0 of MD \$MN_SEARCH_RUN_MODE is set.
It is evaluated as an F-word programmed in G94.


Description: Additional channel-specific rapid traverse override in \%. The value is calculated as a function of the OPI variable enablOvrRapidFactor on the path and during jogging of geometry axes . The value multiplies the other overrides relevant to rapid traverse (rapid traverse override of the machine control panel, override default through synchronized actions \$AC_OVR).


SERUPRO_SYNC_MASK activates this intermal WAIT marker, and defines for which other channels this channel is to wait.

Example for channel 3: SD42125 \$SC_SERUPRO_SYNC_MASK= 0×55
A new block is now inserted in the Serupro approach between the reapproach block and the target block, the function of which corresponds to the following programming: WAITM ( 101, 1,3,5,7), i.e. a WAIT marker synchronizes the channels 1, 3, 5 and 7. The WAIT markers used internally cannot be explicitly programmed by the user. NOTICE:

Similarly to the part program, the user can make the error of not setting the marker in a channel, so that the other channels naturally wait for ever!
Note:
The bit mask can contain a channel that does not exist (channel gaps) without a deadlock occurring.

Example for channel 3: SD42125 \$SC_SERUPRO_SYNC_MASK= 0x55 and channel 5 do not exist, so WAITM( 101, 1,3,7) is set.
Note: The block content corresponds to $\operatorname{WAITM}(101,1,3,5,7) "$, the user does not see this block content, he sees REPOSA!
Note:
SERUPRO_SYNC_MASK is evaluated as soon as the part program command REPOSA is interpreted.
SERUPRO_SYNC_MASK can still be changed if SERUPRO is in the state "search target found".

If REPOSA has already been executed, a change to SERUPRO_SYNC_MASK can only become active if a new REPOS is set. This occurs, for example, by:

- Starting a new ASUB.
- STOP-JOG-AUTO-START
- STOP - select a new REPOS mode RMI/RMN/RME/RMB - START

Note:
If one uses the prog. event for search and if the NCK is at alarm 10208 then a change of SERUPRO_SYNC_MASK is not active unless one sets a new REPOS.
SERUPRO_SYNC_MASK == 0 A block is NOT inserted.
Note:
If the bit for the current channel is not set in SD42125 \$SC_SERUPRO_SYNC_MASK then a block is NOT inserted.

Example:
If SD42125 \$SC_SERUPRO_SYNC_MASK= 0xE is programmed in channel 1, then a block is NOT inserted.

This assignment is reserved for a future function!

| 42140 | DEFAULT_SCALE_FACTOR_P | - | FBFA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Default scaling factor for address P | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $1,1,1,1,1,1,1,1 \ldots$ | - | - |  |  |

## Description:

The value in this machine data is active if no scaling factor $P$ has been programmed in the block.

Related to:
WEIGHTING_FACTOR_FOR_SCALE


Description: The value in this machine data is active if no factor for rotation $R$ is programmed in the block.


Description: Fixed feedrate values for programming with F1 - F9. If the machine data
\$MC_FEEDRATE_F1_F9_ON = TRUE is set with the programming of F1 - F9, the feedrate
values are read from SD42160 \$SC_EXTERN_FIXED_FEEDRATE_F1_F9[0] - SD42160 \$SC_EXTERN_FIXED_FEEDRATE_F1_F9[部, and ${ }^{\prime}$ activāted as the machining feedrate.
The rapid traverse feedrate must be entered in SD42160
\$SC_EXTERN_FIXED_FEEDRATE_F1_F9[0].

| 42162 | EXTERN_DOUBLE_TURRET_DIST | - | FBFA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Double turret head tool distance | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . \ldots$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

## Description:

Distance between both tools of a double turret head.
The distance is activated using G68 as additive zero point offset if MD10812 \$MN_EXTERN_DOUBLE_TURRET_ON is set to TRUE.


## Description:

Value = TRUE:
A preprocessing stop is made with every block if SBL2 (single block with stop after every block) is active. This suppresses the premachining of part program blocks. This variant of the SBL2 is not true-to-contour.
This means that a different contour characteristic might be generated as a result of the preprocessing stop than without single block or with SBL1.
Application: Debug mode for testing part programs.


| $828 \mathrm{~d}-\mathrm{te} 82$ | 2 | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0, \ldots$ | -1.0 e 8 | 1.0 e 8 | $7 / 7$ | U |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{me} 82$ | 2 | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0, \ldots$ | -1.0 e 8 | 1.0 e 8 | $7 / 7$ | U |
| $828 \mathrm{~d}-\mathrm{gce} 82$ | 2 | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0, \ldots$ | -1.0 e 8 | 1.0 e 8 | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gse} 82$ | 2 | $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0,1.0,1.0$, <br> $1.0,1.0,1.0, \ldots$ | -1.0 e 8 | 1.0 e 8 | $2 / 2$ | M |

Description:
This setting data defines the speed ratio for the fixed coupling configuration defined with the channel-specific MD21300 \$MC_COUPLE_AXIS_1[n].
The linear correlation between the leading and following spindles is determined by the speed ratio. The speed ratio is defined by the specification of the numerator and the denominator.
Speed ratio = numerator / denominator = SD42300 \$SC_COUPLE_RATIO[0] / SD42300 \$SC_COUPLE_RATIO[1]
The speed ratio parameters can be altered in the NC part program with the language instruction COUPDEF provided that this is not locked by the channel-specific MD21340 \$MC_COUPLE_IS_WRITE_PROT_1.
However, the parameterized values of SD42300 \$SC_COUPLE_RATIO_1 are not changed. The calculation of the speed ratio is initiated with Power On.

| 42440 | FRAME_OFFSET_INCR_PROG |  |  | - | K1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Work offsets in frames |  |  | BOOLEAN | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | FALSE | 0 | - | 3/3 | U |
| 828d-te42 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gce42 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gse42 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-me62 | - | FALSE | 0 | - | 3/3 | U |
| 828d-te62 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gce62 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gse62 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-te82 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-me82 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gce82 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gse82 | - | FALSE, FALSE | 0 | - | 3/3 | U |

Description: 0: When incremental programming is used on an axis, only the programmed position delta is traversed after a frame change. Work offsets in FRAMES are only traversed when an absolute position is specified.
1: When incremental programming is used on an axis, changes to work offsets are traversed after a frame change (standard response up to software version 3).
Related to ....
SD42442 \$SC_TOOL_OFFSET_INCR_PROG

| 42442 | TOOL_OFFSET_INCR_PROG |  | - | W1, |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Tool length compensations |  | BOOLEAN | Imm |  |
| - |  |  |  |  |  |
| 828d-me42 | FALSE | 0 | - | 3/3 | U |


| 828d-te42 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce42 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gse42 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-me62 | - | FALSE | 0 | - | 3/3 | U |
| 828d-te62 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gce62 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gse62 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-te82 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-me82 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gce82 | - | FALSE, FALSE | 0 | - | 3/3 | U |
| 828d-gse82 | - | FALSE, FALSE | 0 | - | 3/3 | U |

Description: 0: When incremental programming is used on an axis, only the programmed position delta is traversed after a frame change. Tool length offsets in FRAMES are only traversed when an absolute position is specified.
1: When incremental programming is used on an axis, changes to tool length offsets are traversed after a tool change (standard response up to SW version 3).
Related to ....
SD42440 \$SC_FRAME_OFFSET_INCR_PROG

| 42444 | TARGET_BLOCK_INCR_PROG | - | BA |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Set down mode after search run with calculation | BOOLEAN | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | M |  |

Description: If the first programming of an axis after "Search run with calculation to end of block" is incremental, the incremental value is added as a function of SD42444
\$SC_TARGET_BLOCK_INCR_PROG to the value accumulated up to the search target :
SD = TRUE: Incremental value is added to accumulated position
$S D=F A L S E:$ Incremental value is added to current actual value
The setting data is evaluated on $N C$ start for output of the action blocks.

| 42450 | CONTPREC | - | B1, K6 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm | Contour accuracy | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0.1,0.1,0.1,0.1,0.1$, <br> $0.1,0.1,0.1 .$. | 0.000001 | 999999. | $7 / 7$ |  |

Description:
Contour accuracy. This setting data can be used to define the accuracy to be maintained for the path of the geometry axes on curved contours. The lower the value and the lower the servogain factor of the geometry axes, the greater the reduction of path feed on curved contours.
Related to ....
MD20470 \$MC_CPREC_WITH_FFW
SD42460 \$SC_MINFEED

| 42460 | MINFEED | - | B1, K6 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm/min | Minimum path feedrate for CPRECON | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $1 ., 1 ., 1 ., 1 ., 1 ., ~ 1 ., ~ 1 ., ~$ <br> $1 . . .$. | $1 . \mathrm{e}-6$ | $1 . e 9$ | $7 / 7$ |  |

```
Description: Minimum path feedrate with the "Contour accuracy" function active. The feedrate is not
limited to below this value unless a lower F value has been programmed or the axis
dynamics do not permit it.
Related to ....
MD20470 $MC_CPREC_WITH_FFW
SD42450 $SC_CONTPREC
```

| 42465 | SMOOTH_CONTUR_TOL |  |  | - | B1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Maximum contour tolerance on smoothing |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \end{aligned}$ | 0.000001 | 999999. | 7/7 | U |
| Description: | This setting <br> Related to: <br> MD20480 \$MC_S <br> SD42466 \$SC_ | data defines the ma <br> MOOTHING_MODE, MOOTH_ORI_TOL | ximum to | for sme | $g$ th |  |




## Description:

The setting data defines the limit angle from which the compressor COMPCAD interprets a block transition as a corner. Practical values lie between 10 and 40 degrees. Values from 0 to 89 degrees inclusive are permitted.
The angle only serves as an approximate measure for corner detection. The compressor can also classify flatter block transitions as corners and eliminate larger angles as outliers on account of plausibility considerations.


Description:
The setting data defines a typical tool radius. It is only evaluated in compressor COMPCAD. The lower the value, the greater the precision, but the slower the program execution.


Description:
The setting data specifies a typical tool radius. It is evaluated for the COMPSURF compressor only. A smaller value results in greater precision but also slower program execution.


[^15]Related to:
MD28072 \$MC_MM_MAXNUM_SURF_GROUPS

| 42475 | COMPRESS_CONTUR_TOL |  |  | - | F2, P |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Maximum contour deviation with compressor |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| 828d-me42 |  $0.05,0.05,0.05,0.05$, <br>  $0.05,0.05,0.05,0.05 \ldots$ |  | $0.000001$ | 999999. | 7/7 | U |
| 828d-te42 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \end{aligned}$ | 0.000001 | 999999. | 0/0 | S |
| 828d-gce42 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \end{aligned}$ | 0.000001 | 999999. | $7 / 7$ | U |
| 828d-gse42 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \end{aligned}$ | 0.000001 | 999999. | $7 / 7$ | U |
| 828d-me62 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \end{aligned}$ | 0.000001 | 999999. | $7 / 7$ | U |
| 828d-te62 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \\ & \hline \end{aligned}$ | 0.000001 | 999999. | 0/0 | S |
| 828d-gce62 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \\ & \hline \end{aligned}$ | 0.000001 | 999999. | 7/7 | U |
| 828d-gse62 | - | $\begin{aligned} & \hline 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \\ & \hline \end{aligned}$ | 0.000001 | 999999. | $7 / 7$ | U |
| 828d-te82 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \end{aligned}$ | 0.000001 | 999999. | 0/0 | S |
| 828d-me82 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \\ & \hline \end{aligned}$ | 0.000001 | 999999. | $7 / 7$ | U |
| 828d-gce82 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \\ & \hline \end{aligned}$ | 0.000001 | 999999. | $7 / 7$ | U |
| 828d-gse82 | - | $\begin{aligned} & 0.05,0.05,0.05,0.05 \\ & 0.05,0.05,0.05,0.05 \ldots \end{aligned}$ | 0.000001 | 999999. | 7/7 | U |

Description: This setting data defines the maximum contour tolerance in the compressor.


| $828 \mathrm{~d}-\mathrm{me} 82$ | - | $0.05,0.05,0.05,0.05$, <br> $0.05,0.05,0.05,0.05 \ldots$ | 0.000001 | 90. | $7 / 7$ | U |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828 d -gce82 | - | $0.05,0.05,0.05,0.05$, <br> $0.05,0.05,0.05,0.05 \ldots$ | 0.000001 | 90. | $7 / 7$ | U |
| $828 \mathrm{~d}-\mathrm{gse} 82$ | - | $0.05,0.05,0.05,0.05$, <br> $0.05,0.05,0.05,0.05 \ldots$. | 0.000001 | 90. | $7 / 7$ | U |

Description:
This setting data defines the maximum tolerance in the compressor for turning the tool orientation. This data defines the maximum permissible angular displacement of the tool rotation.
This data is only active if an orientation transformation is active.
Turning the tool orientation is only possible with 6-axis machines.

| 42478 | SURF_PERF_ADJUST | EXP, C09 | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Adaptation of the CPU time utilization with COMPSURF. | DOUBLE | Immediately |  |  |
| - | - | $0.005,0.005,0.005$, <br> $0.005,0.005,0.005$, <br> $0.005,0.005 \ldots$ | 0.0001 | 0.1 | $1 / 1$ |
| - |  |  |  |  |  |

Description: Represents a compromise between computational utilization and accuracy. The higher the value, the lower the computational utilization, the lower the value the higher the accuracy.
A sharper surface can be achieved, especially by COMPSURF with "Smoothing off" (MIN_SURF_RADIUS = 0).

| 42480 | STOP_CUTCOM_STOPRE | - | W1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Alarm response with tool radius compensation and preproc. stop | BOOLEAN | Immediately |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U |
| - | - |  |  |  |  |

Description: If this setting data is TRUE, block execution is stopped by preprocessing stop and active tool radius compensation, and does not resume until after a user acknowledgment (START).
If it is FALSE, machining is not interrupted at such a program point.


Description:

## FALSE:

If there is a preprocessing stop (either programmed or generated internally by the control) before the deselection block (G40) when tool radius compensation is active, then firstly the starting point of the deselection block is approached from the last end point before the preprocessing stop. The deselection block itself is then executed, i.e. the deselection block is usually replaced by two traversing blocks. Tool radius compensation is no longer active in these blocks. The behavior is thus identical with that before the introduction of this setting data.
TRUE:

If there is a preprocessing stop (either programmed or generated internally by the control) before the deselection block (G40) when tool radius compensation is active, the end point of the deselection point is traversed in a straight line from the last end point before the preprocessing stop.

| 42494 | CUTCOM_ACT_DEACT_CTRL | - | W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Approach \& retraction behavior with 2-1/2D tool radius compens. | DWORD | Immediately |  |  |  |
| - | - | $2222,2222,2222$, <br> $2222,2222,2222$, <br> $2222,2222 \ldots$ | - | - | U |  |

This setting data controls the approach and retraction behavior with tool radius compensation if the activation or deactivation block does not contain any traversing information. It is only evaluated with 2-1/2D TRC
(CUT2D or CUT2DF).
The decimal coding is as follows:
N N N N
| | | ___ Approach behavior for tools with tool point direction
| | (turning tools)
| | |__ Approach behavior for tools without tool point direction
| | (milling tools)
| |__ Retract behavior for tools with tool point direction
|
$\qquad$ (turning tools)

Retract behavior for tools without tool point direction (milling tools)

If the position in question contains a 1, approach or retraction is always performed, even if G41/G42 or G40 stands alone in a block.

For example:
N100 x10 y0
N110 G41
N120 x20
If a tool radius of 10 mm is assumed in the above example, position x10y10 is approached in block N110.

If the position in question contains the value 2 , the approach or retraction movement is only performed if at least one geometry axis is programmed in the activation/ deactivation block. To obtain the same results as the above example with this setting, the program must be altered as follows:
N100 x10 y0
N110 G41 x10
N120 x20
If axis information $x 10$ is missing in block N110, activation of TRC is delayed by one block, i.e. the activation block would now be N120.
If the position in question contains a 3, retraction is not performed in a deactivation block (G40) if only the geometry axis perpendicular to the compensation plane is programmed. In this case, the motion perpendicular to the compensation plane is performed first. This is followed by the retraction motion in the compensation plane. In this case, the block after G40 must contain motion information in the compensation plane. The approach motions for values 2 and 3 are identical.
If the position in question contains a value other than 1,2 or 3 , i.e. in particular the value 0, an approach or retraction movement is not performed in a block that does not contain any traversing information.

About the term "Tools with tool point direction":

These are tools with tool numbers between 400 and 599 (turning and grinding tools), whose tool point direction has a value between 1 and 8. Turning and grinding tools with tool point direction 0 or 9 or other undefined values are treated like milling tools. Note:
If the value of this setting data is changed within a program, we recommend programming a preprocessing stop (stopre) before the description to avoid the new value being used in program sections before that point. The opposite case is not serious, i.e. if the setting data is written, subsequent $N C$ blocks will definitely access the new value.

| 42496 | CUTCOM_CLSD_CONT |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Tool radius compensation behavior with closed contour | BOOLEAN | Immediately |  |  |  |  |  |
| - | - | TRUE, TRUE | 0 | - |  |  |  |  |

Description: FALSE:
CASE A: If two intersections arise on correction of the inner side with an (almost) closed contour consisting of two successive circle blocks or a circle and a linear block, by default the intersection is chosen that is located on the first partial contour nearer to the beginning of the block.
A contour is considered (almost) closed if the distance between the starting point of the first block and the end point of the second block is less than $10 \%$ of the active compensation radius, but not greater than 1000 path increments (corresponds to 1 mm with 3 decimal places).
CASE B: If on correction of the inner side and a block transition between a straight line and a circle with an angle of aperture of more than approx. 315 degrees, the offset curve of the straight line intersects the offset curve of the circle at two points, by default the point of intersection is chosen that is located on the first partial contour nearer to the beginning of the block.

In this situation, the two curves involved are almost completely excluded. TRUE: With two successive curves (as described above), whose offset curves intersect twice, the intersection is chosen that lies nearer to the end of the first curve. Whereby a slight contour violation at the beginning of the block of the first curve and at the end of the block of the second curve is accepted in order to be able to completely process both curves.
But only if the absolute value of the contour violation caused by this is less than the effective contour tolerance. For the effective contour tolerance, see the description "Contour/orientation tolerance" in FB1. The currently effective tolerance can be read with \$AC_CTOL. If a tolerance of zero is programmed in this way, a permanently assigned tolerance of 0.002 mm applies.
The tolerance value is applied that is valid for activation of the tool radius correction with G41 or G42.


| 42502 | IS_SD_MAX_PATH_ACCEL | - | B2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Evaluate SD42500 \$SC_SD_MAX_PATH_ACCEL | BOOLEAN | Immediately |  |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | $7 / 7$ |  |

## Description:

```
SD42500 $SC_SD_MAX_PATH_ACCEL is included in the limit calculations if SD42502
$SC_IS_SD_MAX_PATH_ACCEL=TRUE
Related to ...
SD42500 $SC_SD_MAX_PATH_ACCEL
```



Description: As well as MD20600 \$MC_MAX_PATH_JERK, the maximum path-related jerk can also limit the jerk.
Related to ...
MD20600 \$MC_MAX_PATH_JERK
SD42512 \$SC_IS_SD_MAX_PATH_JERK

| 42512 | IS_SD_MAX_PATH_JERK | - | B2 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Evaluate SD42510 \$SC_SD_MAX_PATH_JERK | BOOLEAN | Immediately |  |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | $7 / 7$ |  |


| Description: | SD42510 \$SC_SD_MAX_PATH_JERK is included in the limit calculations if SD42512 |
| :--- | :--- |
|  | \$SC_IS_SD_MAX_PATH_JERK=TRUE |
|  | Related to ... |
|  | SD42510 \$SC_SD_MAX_PATH_JERK (SD for additional limitation of (tangential) path jerk) |


| 42520 | CORNER_SLOWDOWN_START | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Start of feed reduction at G62. |  |  |  |  |  | DOUBLE | Immediately |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . \ldots$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: Traverse path distance from which the feed is reduced before the corner with G62.

| 42522 | CORNER_SLOWDOWN_END | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | End of feed reduction at G62. |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . \ldots$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  | U

Description: Traverse path distance up to which the feed remains reduced after a corner with G62.

| 42524 | CORNER_SLOWDOWN_OVR | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\%$ | Feed override reduction at G62 | DOUBLE | Immediately |  |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . \ldots$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |
| - |  |  |  |  |  |

Description: Override used to multiply the feed at the corner with G62.

| 42526 | CORNER_SLOWDOWN_CRIT | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Corner detection at G62 | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 .$, <br> $0 . \ldots$. | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |

## Description: <br> Angle from which a corner is taken into account when reducing the feed with G62.

For example SD42526 \$SC_CORNER_SLOWDOWN_CRIT $=90$ means that all corners of 90 degrees or a more acute angle are traversed slower with G62.

| 42528 | CUTCOM_DECEL_LIMIT |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Feed lowering on circles with tool radius compensation |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-te42 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-gce42 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-gse42 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-me62 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-te62 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-gce62 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-gse62 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-te82 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-me82 | - | $\begin{aligned} & 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., 0 ., \\ & 0 . . . . \end{aligned}$ | 0. | 1. | 3/3 | U |
| 828d-gce82 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |
| 828d-gse82 | - | 0.1, 0.1 | 0. | 1. | 3/3 | U |

## Description:

The setting data limits feed lowering of the tool center point on concave circle segments with tool radius compensation active and CFC or CFIN selected.
With CFC, the feed is defined at the contour. On concave circular arcs, feed lowering of the tool center point is created by the ratio of the contour curvature to the tool center point path curvature. The setting data is limiting this effect, reducing backing off and overheating of the tool.
For contours with varying curvatures, a mid-range curvature is used.
0: Provides the previous behavior: If the ratio between contour radius and tool center point path radius is less than or equal to 0.01 the feed is applied to the tool center point path. Less pronounced feed reductions are executed.
$>0$ : Feed lowering is limited to the programmed factor. At 0.01 , this means that the feed of the tool center point path is possibly only 1 percent of the programmed feed value.
1: On concave contours, the tool center point feed equals the programmed feed (the behavior then corresponds to CFTCP).


## Description:

The revolutional feedrate in JOG mode for geometry axes on which a frame with rotation acts.
$0=\quad$ No revolutional feedrate is active.
>0= Machine axis index of the rotary axis/spindle from which the revolutional feedrate is derived.
-1= The revolutional feedrate is derived from the master spindle of the channel in which the axis/spindle is active.
$-2=\quad$ The revolutional feedrate is derived from the axis with machine axis index $==$ 0 .
-3= The revolutional feedrate is derived from the master spindle of the channel in which the axis/spindle is active. No revolutional feedrate is active if the master spindle is at a standstill.
Related to ....
SD43300: \$SA_ASSIGN_FEED_PER_REV_SOURCE (revolutional feedrate for position axes/ spindles)

| 42690 | JOG_CIRCLE_CENTRE |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Center of the circle |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| - | 3 | $\begin{aligned} & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0,0,0,0,0,0, \\ & 0,0,0,0 \ldots \end{aligned}$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description:
This setting data is used to define the circle center point in the workpiece coordinate system during JOG of circles.
Only the relevant center point coordinates of the geometry axes in the active plane are evaluated, not the coordinate of the geometry axis vertical to the plane. This setting data is written via the user interface.

By default the coordinate of an axis with diameter programming is in the diameter. This can be changed with MD20360 \$MC_TOOL_PARAMETER_DEF_MASK Bit $13=1$ by indicating a radius.

| 42691 | JOG_CIRCLE_RADIUS |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Circle radius |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

## Description:

With this setting data, the circle radius in the machine, the maximum circle during inner machining or the minimum circle during outer machining are defined when jogging circles. This setting data is written via the user interface.

| 42692 | JOG_CIRCLE_MODE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | JOG of circles mode | DWORD | Immediately |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 x f$ | $7 / 7$ |  |  |  |

Description: This setting data sets the following during JOG of circles:
Bit $0=0$ :
Travel to + creates traversing on a circular path in counterclockwise direction; travel to - creates traversing in clockwise direction.
Bit $0=1$ :
Travel to + creates traversing on a circular path in clockwise direction; travel to creates traversing in counterclockwise direction.
Bit $1=0$ :
The tool radius is not taken into account in checking the limitation produced by the specified circle or by the circle segment limited by the start and end angles.
Bit $1=1$ :
The tool radius is taken into account in checking the limitation produced by the specified circle or by the circle segment limited by the start and end angles.
Bit $2=0$ :
Internal machining is performed. The circle radius in SD42691 \$SC_JOG_CIRCLE_RADIUS is the maximum possible radius.
Bit $2=1$ :
External machining is performed. The circle radius in SD42691 \$SC_JOG_CIRCLE_RADIUS is the minimum possible radius.
Bit $3=0$ :
Given a full circle, the radius is enlarged starting from the circle center point in the direction of the ordinate (2nd geometry axis) of the plane.
Bit 3 = 1 :
Given a full circle, the radius is enlarged starting from the circle center point in the direction of the abscissa (1st geometry axis) of the plane.
This setting data should be written via the user interface.


## Description:

This setting data defines the start angle during JOG of circles.
The start angle refers to the abscissa of the current plane. Traversing is only possible within the range
between the start and the end angle. SD42692 \$SC_JOG_CIRCLE_MODE bit 0 defines the direction from the start to the end angle. If start and end angle equal zero, no limitation is active.
This setting data is written via the user interface.

| 42694 | JOG_CIRCLE_END_ANGLE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees |  |  |  |  |  |  |  |  |
| - | Circle end angle | DOUBLE | Immediately |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 360 | $7 / 7$ |  |  |  |

Description: This setting data defines the end angle during JOG of circles.

The end angle refers to the abscissa of the current plane. Traversing is only possible within the range
between the start and the end angle. SD42692 \$SC_JOG_CIRCLE_MODE bit 0 defines the direction from the start to the end angle. If start and end angle equal zero, no limitation is active.
This setting data is written via the user interface.

| 42700 | EXT_PROG_PATH |  |  |  |  |  | - | K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Program path for external subroutine call EXTCALL | STRING | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | - | - | - | U |  |  |  |

Description: The total path results from the string chaining of SD42700 \$SC_EXT_PROG_PATH + the programmed subprogram identifier.

| 42750 | ABSBLOCK_ENABLE | - | K1 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Enable base block display | BOOLEAN | Immediately |  |  |
| - | - | TRUE, TRUE, TRUE, <br> TRUE, TRUE, TRUE, <br> TRUE, TRUE... | 0 | - | U/7 |
| - | - |  |  |  |  |

Description: Value 0: Disable basic blocks with absolute values (basic block display)
Value 1: Enable basic blocks with absolute values (basic block display)

| 42800 | SPIND_ASSIGN_TAB | - | S1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Spindle number converter. | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 21 | $0,1,2,3,4,5,6,7,8$, <br> $9,10,11,12,13,14$, <br> $15,16,17,0 . .$. | 0 | 20 | U |  |

Description:
The spindle converter converts the programmed (= logical) spindle number to the physical (= internal, configured) spindle number.
The index of the setting data (SD) corresponds to the programmed spindle number or the programmed address extension.
The SD contains the physical spindle which actually exists.
Special cases, errors, ......
Notes:

- The zero index (SPIND_ASSIGN_TAB[0]) is only used to display the master spindle (= logical spindle number) selected in the channel, and it must not be overwritten.
- Changes to the spindle converter take effect immediately. Therefore it is not advisable to change the spindle converter for spindles used in a part program from the HMI or PLC while a part program is running.
- After "delete SRAM", the numbers of the logical and physical spindles are identical.

$\left(\$ T C \_D P 3[. . ., \ldots]\right.$ to $\left.\$ T C \_D P 5[\ldots, \ldots]\right)$ and the components of the base dimensions (\$TC_DP21[..., ...] to \$TC_DP23[..., ...]) whose associated axes
are mirrored, are also mirrored, i.e. their sign is inverted. The wear values
are not mirrored. If the wear values are to be mirrored too,
SD42910 \$SC_MIRROR_TOOL_WEAR must be set.
FALSE:
The sign for tool length components is unaffected by whether a frame with mirror image machining is active.


| 42920 | WEAR_SIGN_CUTPOS | - | W1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Sign of tool wear depending on tool point direction | BOOLEAN | Immediately |  |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | - | $7 / 7$ |  |
| - |  |  |  |  |  |  |

Description:
TRUE:
In the case of tools with a relevant tool point direction (turning and grinding tools), the sign for wear of the tool length components depends on the tool point direction.
The sign is inverted in the following cases (marked with an X):
Tool point direction Length 1 Length 2
1
2 X
3 X X
4 X
5
6
7 X
8 X
9
The sign for wear value of length 3 is not influenced by this setting data.
The SD42930 \$SC_WEAR_SIGN acts in addition to this setting data.
FALSE:
The sign for wear of the tool length components is unaffected by the tool point direction.

| 42930 | WEAR_SIGN | - | W1 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Sign of wear |  |  |  |  |  |  |
| - | - | FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE, <br> FALSE, FALSE... | 0 | BOOLEAN | Immediately |  |  |
| - |  |  |  |  |  |  |  |

## Description:

## TRUE:

The sign for wear of the tool length components and the tool radius are inverted, i.e. if a positive value in entered, the total dimension is decreased.
FALSE:
The sign for wear of the tool length components and the tool radius is not inverted.

| 42935 | WEAR_TRANSFORM | - | W1, W4 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Transformations for tool components | UDWORD | Immediately |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | $0 \times 0$ | $0 \times 03$ |  |  |
| $7 / 7$ | U |  |  |  |  |  |

## Description:

This setting data is bit-coded.
It determines which of the three wear components
wear
(\$TC_DP12 - \$TC_DP14),
additive offsets fine (\$TC_SCPx3 - \$TC_SCPx5),
and additive offsets coarse (\$TC_ECPx3 - \$TC_ECPx5)
are subject to adapter transformation and transformation by an orientable tool holder, if one of the two $G$ codes TOWMCS or TOWWCS from $G$ code group 56 is active. If initialsetting $G$ code TOWSTD is active, this setting data will not become active.
Then, the following assignment is valid:
Bit $0=$ TRUE: Do not apply transformations to \$TC_DP12 - \$TC_DP14.
Bit $1=$ TRUE: Do not apply transformations to \$TC_SCPx3 - \$TC_SCPx5.
Bit 2 = TRUE: Do not apply transformations to \$TC_ECPx3 - \$TC_ECPx5.
The bits not mentioned here are (currently) not assigned.

| 42940 | TOOL_LENGTH_CONST |  |  | - | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Change of tool length components with change of active plane |  |  | DWORD | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te42 | - | 18, 18 | - | - | 2/2 | M |
| 828d-gce42 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-gse42 | - | 0, 0, 0, 0, 0, 0, 0, $0 \ldots$ | - | - | 2/2 | M |
| 828d-me62 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te62 | - | 18, 18 | - | - | 2/2 | M |
| 828d-gce62 | - | 0, 0, 0, 0, 0, 0, 0, 0... | - | - | 2/2 | M |
| 828d-gse62 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te82 | - | 18, 18 | - | - | 2/2 | M |
| 828d-me82 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-gce82 | - | 0, 0, 0, 0, 0, 0, 0, $0 \ldots$ | - | - | 2/2 | M |
| 828d-gse82 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |

## Description:

If this setting data is not equal to 0 , the assignment of tool length components (length, wear, base dimensions) to geometry axes is not changed when the machining plane (G17 - G19) is changed.
The assignment of tool length components to geometry axes can be derived from the value of the setting data according to the following tables.
The assignment of the tool orientation components is not affected by this setting data. Setting data SD42945 \$SC_TOOL_ORI_CONST_M and SD42947 \$SC_TOOL_ORI_CONST_T may have to be set accordingly.
A distinction is made between turning and grinding tools (tool types 400 to 599) and other tools (typically milling tools) in the assignment.
Representation of this information in tables assumes that geometry axes 1 to 3 are called $X, Y$ and $Z$. For assignment of an offset to an axis, not the axis identifier but the axis sequence is relevant.
Assignment for turning tools and grinding tools (tool types 400 to 599):
Content Length 1 Length 2 Length 3

| 17 | Y | X | Z |
| :--- | :--- | :--- | :--- |
| $18 *$ | X | Z | Y |
| 19 | Z | Y | X |
| -17 | X | Y | Z |
| -18 | Z | X | Y |
| -19 | Y | Z | X |

* Any value which is not 0 and is not one of the six values listed, is treated as value 18.

For values that are the same but with a different sign, assignment of length 3 is always the same, lengths 1 and 2 are reversed. Assignment for all tools which are neither turning nor grinding tools (tool types < 400 or > 599):
Content Length 1 Length 2 Length 3

| $17 *$ | $Z$ | $Y$ | $X$ |
| :---: | :---: | :---: | :---: |
| 18 | $Y$ | $X$ | $Z$ |
| 19 | $X$ | $Z$ | $Y$ |
| -17 | $Z$ | $X$ | $Y$ |
| -18 | $Y$ | $Z$ | $X$ |
| -19 | $X$ | $Y$ | $Z$ |

* Any value which is not 0 and is not one of the six values listed, is treated as value 17.
For values that are the same but with a different sign, assignment of length 1 is always the same, lengths 2 and 3 are reversed.

If the 100 s digit of the settings data is 1 , the sign of the second length component is inverted.
If the setting data SD42950 \$SC_TOOL_LENGTH_TYPE has the value 3, this setting data is only active with milling tools. Together with setting data SD42942
\$SC_TOOL_LENGTH_CONST_T, the length assignments can then be set separately for turning and milling tools.


| $828 \mathrm{~d}-\mathrm{te62}$ | - | 18,18 | - | - | $2 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 \mathrm{~d}-\mathrm{gce} 62$ | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{gse62}$ | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $2 / 2$ | M |
| 828 d -te82 | - | 18,18 | - | - | $2 / 2$ | M |
| $828 \mathrm{~d}-\mathrm{me82}$ | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $2 / 2$ | M |
| 828 d -gce82 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $2 / 2$ | M |
| $828 \mathrm{~d}-$ gse82 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $2 / 2$ | M |

## Description:

This setting data is only evaluated if SD42950 \$SC_TOOL_LENGTH_TYPE has the value 3. Under this condition, it has the following meaning:

If this setting data is not equal to zero, the assignment of the tool length components (length, wear and base dimensions) of turning and grinding tools (tool types 400 to 599) to geometry axes is not changed when the machining plane (G17-G19) is changed. The assignment of tool orientation components is not affected by this setting data. Setting data SD42957 \$SC_TOOL_ORI_CONST_T may have to be set correspondingly.
The assignment of tool orientation components to the geometry results from the value of the setting data according to the following table.

The representation of this information in tables assumes that geometry axes 1 to 3 are called X, Y and Z. For assignment of an offset to an axis, not the axis identifier but the axis sequence is relevant.
Content Length 1 Length 2 Length 3

| 17 | $Y$ | $X$ | $Z$ |
| :--- | :---: | :---: | :---: |
| $18 *$ | $X$ | $Z$ | $Y$ |
| 19 | $Z$ | $Y$ | $X$ |
| -17 | $X$ | $Y$ | $Z$ |
| -18 | $Z$ | $X$ | $Y$ |
| -19 | $Y$ | $Z$ | $X$ |

* Any value which is not 0 and is not one of the six values listed, is evaluated as value 18.
For values that are the same but with a different sign, assignment of length 3 is always the same, lengths 1 and 2 are reversed.

If the 100 s digit of the settings data is 1 , the sign of the second length component is inverted.

| 42950 | TOOL_LENGTH_TYPE |  |  | - | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Assignment of tool length compensation independent of tool type |  |  | DWORD | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te42 | - | 2, 2 | - | - | 2/2 | M |
| 828d-gce42 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-gse42 | - | 0, 0, 0, 0, 0, 0, 0, $0 \ldots$ | - | - | 2/2 | M |
| 828d-me62 | - | 0, 0, 0, 0, 0, 0, 0, 0... | - | - | 2/2 | M |
| 828d-te62 | - | 2, 2 | - | - | 2/2 | M |
| 828d-gce62 | - | 0, 0, 0, 0, 0, 0, 0, 0... | - | - | 2/2 | M |
| 828d-gse62 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te82 | - | 2, 2 | - | - | 2/2 | M |
| 828d-me82 | - | 0, 0, 0, 0, 0, 0, 0, 0... | - | - | 2/2 | M |
| 828d-gce82 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-gse82 | - | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |

[^16]Value
0: Standard assignment. A distinction is made between turning and grinding tools (tool types 400 to 599) and other tools (milling tools).
1: The tool length components are assigned irrespective of the actual tool type, always as for milling tools.
2. The tool length components are assigned irrespective of the actual tool type, always as for turning and grinding tools.
3. The tool length components are assigned separately, on the one hand for turning and grinding tools (tool types 400 to 599) and, on the other hand, for all other tools (milling tools). The assignment of tool components is specified as follows: Milling tools:

The assignment of tool length components is specified by SD42940
\$SC_TOOL_LENGTH_CONST.
Turning and grinding tools:
The assignment of tool length components is specified by SD42942 \$SC_TOOL_LENGTH_CONST_T.
The setting data also affects the wear values assigned to the length components. If SD42940 \$SC_TOOL_LENGTH_CONST is set, the tables defined there access the table for milling and turning tools defined by SD42950 \$SC_TOOL_LENGTH_TYPE irrespective of the actual tool type if the value of the latter is 1 or 2 .


## Description:

If this setting data is not equal to zero, a clockwise, orthogonal tool coordinate system is defined for milling tools (all tool types except 400 to 599), which remains unchanged when the machining plane is changed (G17-G19. It has no relevance for turning and grinding tools.
The orientation coordinate system is determined by the orientation vector and a normal orientation vector extending perpendicularly to it. It is completed by a third vector, the binormal vector, which derives from the cross product of the normal orientation vector and the orientation vector.
The basic orientation is determined by the units and tens digits of the setting data. Apart from the value 0, only the values 17,18 and 19 are permissible. All other values are treated as if their value were 17.

|  | Orientation | Normal orient- | Binormal |
| :---: | :---: | :---: | :---: |
| Content | vector | ation vector | vector |
| $17 *$ | $(0,0,1)$ | $(0,1,0)$ | $(1,0,0)$ |

18
$(0,1,0)$
$(1,0,0)$
$(0,0,1)$
19
$(1,0,0)$
$(0,0,1)$
(0, 1, 0)

* Each value not equal to 0 that is not one of the listed values is evaluated as if it were the value 17.
If $n$ is the content of the 100 s digit of the setting data, the coordinate system is rotated around the orientation vector by the angle $n * 90$ degrees. $n$ may have the values 0 to 3. Larger values are evaluated as if they were 0 .
If the sign of the setting data is negative, the coordinate system is rotated around the axis by 180 degrees, which is defined by the original position of the normal orientation vector (that is, before any rotation due to $n$ being unequal to 0). Example:

If the content of the setting data is -18 , then:
Orientation vector ( $0,-1,0)$
Normal orientation vector (1, 0, 0)
Binormal vector (0, 0, -1)
Handling of tools with an explicitly programmed tool orientation by means of cutting edge data (\$TC_DPV..):

This setting data is normally ignored for tools for which the orientation is defined in this way. This means that the programmed orientation vectors are assigned to the geometry axes in response to the active machining plane (G17 - G19).
If the setting data is also active for such tools, the 1000 s digit must be equal to 1. However, the 100 s digit and the sign are not evaluated. This means that the setting data only defines how the orientation components are assigned to the geometry axis directions. No additional rotations are performed.

| 42956 | TOOL_ORI_CONST_T |  | - | W1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Change in the tool orientation component for turning tools on plane change |  | DWORD | Immediately |  |
| - |  |  |  |  |  |
| 828d-me42 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te42 | 18, 18 | - | - | 2/2 | M |
| 828d-gce42 | 0, 0, 0, 0, 0, 0, 0, 0... | - | - | 2/2 | M |
| 828d-gse42 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-me62 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te62 | 18, 18 | - | - | 2/2 | M |
| 828d-gce62 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-gse62 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-te82 | 18, 18 | - | - | 2/2 | M |
| 828d-me82 | 0, 0, 0, 0, 0, 0, 0, 0... | - | - | 2/2 | M |
| 828d-gce82 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |
| 828d-gse82 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 2/2 | M |

## Description:

If this setting data is not equal to zero, the assignment of the tool orientation components of turning and grinding tools (tool types 400 to 599) to the geometry axes is not changed if the machining plane changes (G17-G19. It has no relevance for tools other than turning and grinding tools.
The orientation coordinate system is determined by the orientation vector and a normal orientation vector lying at right-angles to it. It is completed by a third vector, the binormal vector, which is given by the cross product of the normal orientation vector and the orientation vector.
The basic orientation is determined by the units and tens digits of the setting data. Apart from the value 0, only the values 17,18 and 19 are permissible. All other values are treated as if their value were 18.

Orientation Normal orient- Binormal

Content
vector
ation
vector
$(0,1,0)$
$(1,0,0)$
$(0,0,1)$
vector
17
(0, 0, 1)
$(1,0,0)$
18*
19
$(0,1,0)$
$(0,0,1)$

* Each value not equal to 0 , which is not one of the listed values is evaluated as if it were the value 18.
If $n$ is the content of the 100 s digit of the setting data, the coordinate system is rotated around the orientation vector by the angle $n * 90$ degrees. $n$ may have the values 0 to 3. Larger values are evaluated as if they were 0 .
If the sign of the setting data is negative, the coordinate system is rotated around the axis by 180 degrees, which is defined by the original position of the normal orientation vector (that is before any rotation on account of $n$ being unequal to 0). Example:
If the content of the setting data is -18 , then:
Orientation vector (0, -1, 0)
Normal orientation vector $(1,0,0)$
Binormal vector (0, 0, -1)
Handling of tools with an explicitly programmed tool orientation by using cutting edge data (\$TC_DPV..):
This setting data is normally ignored for tools for which the orientation is defined in this way. This means that the programmed orientation vectors are assigned to the geometry axes according to the active machining plane (G17 - G19).
If the setting data is also active for such tools, then the 1000 s digit must be equal to 1. However, the 100 s digit and the sign are not evaluated. This means that the setting data only defines how the orientation components are assigned to the geometry axis directions. No additional rotations are executed.


| 42970 | TOFF_LIMIT |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Upper limit of correction value via \$AA_TOFF | - | F2 |  |  |
| - |  |  |  |  |  |
| - | 3 | $10.0,10.0,10.0,10.0$, <br> $10.0,10.0,10.0,10.0$, <br> $10.0,10.0,10.0 \ldots$ | 0.0 | DOUBLE | Immediately |

## Description:

Upper limit of the offset value which can be defined by means of synchronized actions via the \$AA_TOFF system variable.
This limit value influences the absolutely effective amount of offset through \$AA_TOFF.
Whether the offset value is within the limit range can be checked via the \$AA_TOFF_LIMIT system variable.

| 42972 | TOFF_LIMIT_MINUS |  |  |  |  |  | - | F2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Lower limit of the offset value \$AA_TOFF | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0,0.0,0.0$, <br> $0.0,0.0,0.0, \ldots$ | - MD_DBLMAX | 0.0 | $7 / 7$ |  |  |  |

## Description:

Lower limit of the offset value which can be specified through synchronous actions via the system variable \$AA_TOFF.
This limit value acts on the active correction through \$AA_TOFF in the minus direction. This limit value is only effective if $\$ \mathrm{MC}$ _TOFF_MODE Bit6 $=1$ is set. Whether the offset value is within the limit range can be checked via the \$AA_TOFF_LIMIT system variable.


## Description:

TRUE:
On activating an orientable tool holder, the fine offset values are considered.
FALSE:
On activating an orientable tool holder, the fine offset are not considered.


## Description:

TRUE:
With active tool radius compensation, narrow slots are detected and traversed.
FALSE:
With active tool radius compensation, narrow slots are ignored


| $828 \mathrm{~d}-\mathrm{me82}$ | - | $1000,1000,1000$, <br> $1000,1000,1000$, <br> $1000,1000 \ldots$ | - | - | $2 / 2$ | M |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 828 d -gce82 | - | 2000,2000 | - | - | $2 / 2$ | M |
| 828d-gse82 | - | 2000,2000 | - | - | $2 / 2$ | M |

## Description:

This setting data defines the direction of the geometry axes on the machining plane (XY in the case of G17) in the case of the frame definition by means of (TOROTY, TOROTX) or for PAROT.
When a frame is calculated, the tool direction ( $Z$ in the case of G17) is uniquely defined so that the tool direction and vertical axis (Z in the case of G17) of the frame are parallel and lie perpendicular on the machining plane.
Rotation around the tool axis is free at first. This free rotation can be defined using this setting data so that the newly defined frame deviates as little as possible from a previously active frame.

In all cases in which the setting data is not zero, an active frame remains unchanged if the tool direction ( $Z$ in the case of G17) of the old and the new frame are the same. SD42980 \$SC_TOFRAME_MODE>= 2000:
In the case of TOROT (or TOROTY and TOROTX), the rotations and translations of the frame chain are used to calculate a frame in the tool reference system frame (\$P_TOOLFRAME) berechnet.
Machine data 21110 \$MC_X_AXIS_IN_OLD_X_Z_PLANE is not evaluated.
The explantory notes below refer to the G17 plane with the XY axes in the machining plane and the tool axis being $Z$.
SD42980 \$SC_TOFRAME_MODE = 2000:
Rotation around the $Z$ axis is selected so that the angle between the new $X$ axis and the old $X-Z$ plane has the same absolute value as the angle between the new $Y$ axis and the old Y-Z plane. This setting corresponds to the mean value of both settings which would result for values 2001 and 2002 of this setting data.
It is also applied if the value of the units digit is greater than 2 .
SD42980 \$SC_TOFRAME_MODE = 2001:
The new $X$ direction is selected so that it lies in the $X-Z$ plane of the old coordinate system. The angular difference between the old and new $Y$ axes is minimal with this setting.
SD42980 \$SC_TOFRAME_MODE = 2002:
The new $Y$ direction is selected so that it lies in the $Y$-Z plane of the old coordinate system. The angular difference between the old and new $X$ axes is minimal with this setting.
None of the other settings of $\operatorname{SD} 42980$ \$SC_TOFRAME_MODE (0,1,2,...1000,1001..) should be used for recommissioning.
For compatibility reasons, the following settings remain valid:
0 : The orientation of the coordinate system is determined by the value of machine data 21110 \$MC_X_AXIS_IN_OLD_X_Z_PLANE.
1: The new $X$ direction is selected so that it lies in the $X-Z$ plane of the old coordinate system. The angular difference between the old and new $Y$ axes is minimal with this setting.
2: The new $Y$ direction is selected so that it lies in the $Y-Z$ plane of the old coordinate system. The angular difference between the old and new $X$ axes is minimal with this setting.
3: The average of the two settings resulting from 1 and 2 is selected.

Addition of 100: In the case of a plane change from G17 to G18 or G19, a tool matrix is generated, in which the new axis directions are parallel to the old directions. The axes are swapped cyclically accordingly (standard transformation on plane changes). If the hundreds digit equals zero, a matrix is supplied in the cases of G18 and G19 which is derived from the unit matrix by simply rotating through 90 degrees around the $X$ axis (G18) or through 90 degrees around the $Y$ axis (G19). Thus in each case one axis is antiparallel to an initial axis. This setting is required to remain compatible with old software versions.

Addition of 1000: The tool-frame is linked to any active basic frames and settable frames. The response is thus compatible with earlier software versions (before 5.3). If the thousands digit is not set, the tool frame is calculated so that any active basic frames and settable frames are taken into account.

| 42984 | CUTDIRMOD | C08 | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Modification of \$P_AD[2] or \$P_AD[11] | STRING | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | - | - | - |  |  |

Description:
States whether the tool point direction and cutting direction are to be modified on reading the corresponding system variables \$P_AD[2] and \$P_AD[11].
Modification is made by rotating the vector of the tool point direction or cutting direction by a specific angle in the active machining plane (G17-G19). The resulting output value is always the tool point direction or cutting direction created by the rotation or to which the rotated value is closest. the angle of rotation can be defined by one of the following six options:
1: The string is empty. The stated data are output unchanged.
2: The contents of the string is "P_TOTFRAME". The resulting rotation is determined from the total frame.

3: The contents of the string is a valid frame name (e.g. \$P_NCBFRAME[3]). The resulting rotation is then calculated from this frame.

4: The contents of the string has the form "Frame1 : Frame2". The resulting rotation is determined from the part frame chain that is created by chaining all frames from Frame1 to Frame2 (in each case inclusive). Frame1 and Frame2 are valid frame names such as \$P_PFRAME or \$P_CHBFRAME[5]"
5: The contents of the frame is the valid name of a rotary axis (machine axis). The resulting rotation is determined from the programmed end position of this rotary axis. Additionally, an offset can be stated (in degrees, e.g. "A+90).

6: The rotation is programmed explicitly (in degrees).
Optionally, the first character of the string can be written as sign (+ or -). A plus sign will not have any effect on the angle calculation, but a minus sign will invert the sign of the calculated angle.

| 42990 | MAX_BLOCKS_IN_IPOBUFFER |  |  |  |  |  | - | K1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Maximum number of blocks in IPO buffer |  |  |  |  |  | DWORD | Immediately |
| - | - | $-1,-1,-1,-1,-1,-1,-1$, <br> $-1 \ldots$. | - | - | $2 / 2$ |  |  |  |

Description:
This setting data can be used to limit the maximum number of blocks in the interpolation buffer to the maximum number specified in MD28060 \$MC_MM_IPO_BUFFER_SIZE.

A negative value means that no limitation of the number of blocks is active in the interpolation buffer, and the number of blocks is determined solely by MD28060 \$MC_MM_IPO_BUFFER_SIZE (default setting).

| 42995 | CONE_ANGLE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Taper angle | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | - | -90 | 90 | $7 / 7$ |  |

Description: This setting data writes the taper angle for taper turning. This setting data is written via the operator interface.

| 42996 | JOG_GEOAX_MODE_MASK | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | JOG of geometry axis mode | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $0,0,0,0,0,0,0,0 \ldots$ | 0 | $0 \times 7$ |  |  |

Description:
This setting data sets the following during JOG of geometry axes:
Bit $0=1$ :
A traversing request for the 1st geometry axis is inverted, i.e. a traversing request to + triggers a traversing motion to - .
Bit $1=1$ :
A traversing request for the 2nd geometry axis is inverted, i.e. a traversing request to + triggers a traversing motion to -.
Bit $2=1$ :
A traversing request for the 3rd geometry axis is inverted, i.e. a traversing request to + triggers a traversing motion to -.

| 42998 | CUTMOD_PLANE_TOL | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Deviation tool tip/machining plane | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | $5.0,5.0,5.0,5.0,5.0$, <br> $5.0,5.0,5.0 \ldots$ | 0.0 | 89.0 | $2 / 2$ |  |

Description: This setting data specifies by how many degrees the tip of a tool can be rotated as a maximum from the machining plane when calling the CUTMOD or CUTMODK function, i.e. the maximum deviation of the angle gamma from one of the two standard positions 0 or 180 degrees.
If the value of this setting data is 0 , the absolute value of the specified angle is a maximum of 89 degrees.


Description: If no axial scaling factor I, J, or $K$ is programmed in the G51 block, SD43120
\$SA_DEFAULT_SCALE_FACTOR_AXIS is active. The scaling factor is only active if MD22914 \$MC_AXES_SCALE_ENABLE is set.
Related to:
MD22914 \$MC_AXES_SCALE_ENABLE,
MD22910 \$MC_WEIGHTING_FACTOR_FOR_SCALE

| 43200 | SPIND_S |  | - | S1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{rev} / \mathrm{min}$ | Speed for spindle start by VDI |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |
| 828d-me42 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-te42 | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |


| 828d-gce42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gse42 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-me62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-te62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gce62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse62 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-te82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-me82 | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gce82 | - | 10.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse82 | - | 10.0 | 0.0 | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description: Spindle speed at spindle start by NC/PLC interface signals DB380x DBX5006.1 (Spindle start clockwise rotation) and DB380x DBX5006.2 (Spindle start counterclockwise rotation).

Example: SD43200 \$SA_SPIND_S[S1] = 600
Spindle 1 is started at a speed of 600 rpm upon detection of the positive edge of one of the above-mentioned VDI starting signals.

Speed programming values are entered in the SD by setting bit $4=1$ in MD35035 \$MA_SPIND_FUNCTION_MASK.

The SD becomes active in JOG mode as a default speed by setting bit 5=1 in MD35035 \$MA_SPIND_FUNCTION_MASK (exception: the value is zero).
Related to:
MD35035 \$MA_SPIND_FUNCTION_MASK
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43202 | SPIND_CONSTCUT_S |  |  |  |  |  | - | S1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{min}$ | Const cut speed for spindle start by VDI | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: Definition of the constant cutting speed for the master spindle.
The setting data is evaluated at spindle start by the NC/PLC interface signals DB380x DBX5006.1 (Spindle start clockwise rotation) and DB380x DBX5006.2 (Spindle start counterclockwise rotation)
Cutting speed programming values are entered in the $S D$ by setting bit $8=1$ in MD35035 \$MA_SPIND_FUNCTION_MASK.
Related to:
MD35035 \$MA_SPIND_FUNCTION_MASK
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43206 | SPIND_SPEED_TYPE |  |  |  |  |  | A06 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Spindle speed type for spindle start through VDI | DWORD | Immediately |  |  |  |  |  |
| - | - | 94 | 93 | 973 | $7 / 7$ |  |  |  |

Description: Definition of the spindle speed type for the master spindle.
The range of values and the functionality correspond to the 15 th $G$ group "feed type". Permissible values are the $G$ values: 93, 94, 95, 96, 961, 97, 971 and 973.

The stated values make a functional distinction between the following variants:
==> 93, 94, 95, 97 and 971: The spindle is started at the speed in SD 43200
\$SA_SPIND_S.
==> 96 and 961: The speed of the spindle is derived from the cutting speed of SD 43202 \$SA_SPIND_CONSTCUT_S and the radius of the transverse axis.
==> 973: G973 behaves like G97, but the spindle speed limitation is not active The default value is 94 (corresponds to G94)
The default value becomes active if the $S D$ is written with impermissible values.

| 43210 | SPIND_MIN_VELO_G25 |  |  |  |  |  | - | S1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min |  |  |  |  |  |  |  |  |
| - | Programmed spindle speed limitation G25 | DOUBLE | Immediately |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description:
A minimum spindle speed limit below which the spindle must not fall is entered in SPIND_MIN_VELO_G25. The NCK limits the set spindle speed to this value if it is too low.
The spindle speed may only fall below the minimum as a result of:

- Spindle offset $0 \%$
- M5
- SO
- NC/PLC interface signal DB380x DBX4.3 (Spindle stop)
- NC/PLC interface signal DB380x DBX2.1 (Servo enable)
- NC/PLC interface signal DB3300 DBX3.7 (Channel status: Reset)
- NC/PLC interface signal DB380x DBX2.2 (Delete distance-to-go/Spindle reset)
- NC/PLC interface signal DB380x DBX2002.5 (Oscillation speed)
- Cancel S value

SD irrelevant to .....
other spindle modes used in open-loop control mode (SPOS, M19, SPOSA)
Related to:
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43220 | SPIND_MAX_VELO_G26 |  |  |  |  |  | - | S1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min | Programmable upper spindle speed limitation G26 | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 1000.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: A maximum spindle speed is entered in SD43220 \$SA_SPIND_MAX_VELO_G26, which the spindle must not exceed. The NCK limits an excessive spindle speed setpoint to this value.
SD irrelevant for ......
all spindle modes except open-loop control mode.
Special cases, errors, ......
The value in SD43210 \$SA_SPIND_MIN_VELO_G26 can be altered by means of:

- G26 S.... in the part program
- Operator commands via HMI

The value in SD43210 \$SA_SPIND_MIN_VELO_G26 is retained after a reset or Power Off. Related to ....
SD43210 \$SA_SPIND_MIN_VELO_G25 (programmed spindle speed limit G25)
SD43230 \$SA_SPIND_MAX_VELO_LIMS (programmed spindle speed limit G96/961)
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43230 | SPIND_MAX_VELO_LIMS |  |  |  |  |  |  | - | S1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| rev/min | Spindle speed limitation with G96 |  |  |  |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 100.0 | 0.0 | $1.0 E+301$ |  |  |  |  |  |

Description: Limits the spindle speed with G96, G961, G97 to the stated maximum value [degrees/ second]. This setting data can be written from the block with LIMS.
Note:
MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be set so that the value written by the part program is transferred into the active file system on reset (that is the value is retained after reset).

Related to ....
SD43210 \$SA_SPIND_MIN_VELO_G25 (programmed spindle speed limit G25)
SD43230 \$SA_SPIND_MAX_VELO_LIMS (programmed spindle speed limit with G96/961)
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43235 | SPIND_USER_VELO_LIMIT |  |  |  |  |  | A06 | S1, Z1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min | Maximum spindle speed |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | $1.0 \mathrm{e}+8$ | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description: The user can enter a maximum spindle speed.
The NCK limits an excessive spindle setpoint speed to this value. The $S D$ is effective immediately.
Corresponds with:
MD35100 \$MA_SPIND_VELO_LIMIT (maximum spindle speed)
MD35110 \$MA_GEAR_STEP_MAX_VELO (maxmum speed for gear stage change)

| 43240 | M19_SPOS | , A12 | S1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| degrees | Spindle position for spindle positioning with M19. |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | -10000000.0 | 10000000.0 |  |  |  |  |

Description:
Spindle position in [ DEGREES ] for spindle positioning with M19. The position approach mode is defined in SD43250 \$SA_M19_SPOSMODE. Default positions must lie in the range $0<=$ pos < MD30330 \$MA_MODULO_RANGE. Path defaults (SD43250 \$SA_M19_SPOSMODE = 2) can be positive or negative and are only limited by the input format.

| 43250 | M19_SPOSMODE | , A12 | S1 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Spindle position approach mode for spindle positioning with M19. |  |  |  |  |  | DWORD | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 5 |  |  |  |  |

Description: Spindle position approach mode for spindle positioning with M19.
In which signify:
0: DC (default) approach position on the shortest path.
1: AC approach position normally.
2: IC approach incrementally (as path), sign gives the traversing direction
3: DC approach position on the shortest path.
4: ACP approach position from the positive direction.
5: ACN approach position from the negative direction.

| 43300 | ASSIGN_FEED_PER_REV_SOURCE | - | V1, P2, S1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Revolutional feedrate for positioning axes/spindles | DWORD | Immediately |  |  |  |
| CTEQ |  |  |  |  |  |  |
| - | - | 0 | -3 | 31 |  |  |

Description: $0=$ No revolutional feedrate is active.
$>0=$ Machine axis index of the rotary axis/spindle, from which the revolutional feedrate is derived.
$-1=\quad$ The revolutional feedrate is derived from the master spindle of the channel in which the axis/spindle is active
$-2=$ The revolutional feedrate is derived from the axis with machine axis index $==$ 0 or the axis with an index in MD10002 \$MN_AXCONF_LOGIC_MACHAX_TAB == 0 .
$-3=\quad$ The revolutional feedrate is derived from the master spindle of the channel in which the axis/spindle is active. No revolutional feedrate is active if the master spindle is at a standstill.
Related to ....
SD42600 \$SC_JOG_FEED_PER_REV_SOURCE (revolutional feedrate for geometry axes on which a frame with rōtatiōn acts ín JOG mode.)

MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43320 | JOG_POSITION |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | JOG position | DOUBLE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0.0 | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |  |

Description: Position to be approached in JOG. Depending on MD10735 \$MN_JOG_MODE_MASK bit 4 axial frames and, with an axis configured as geometry axis, the tool length offset are considered.

| 43340 | EXTERN_REF_POSITION_G30_1 |  |  |  |  |  | , A12 | FBFA |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Reference point position for G30.1 | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description:
Reference point position for G30.1.
This setting data will be evaluated in CYCLE328.

| 43350 | AA_OFF_LIMIT |  |  |  |  |  | - | S5, FBSY |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Upper limit of offset value \$AA_OFF with clearance control |  |  |  |  |  | DOUBLE | PowerOn |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | 100000000.0 | 0.0 | $1 e 15$ | $7 / 7$ |  |  |  |

## Description:

The upper limit of the offset value, which can be defined by means of synchronized actions via the variable \$AA_OFF.
This limit value acts on the absolutely effective amount of offset by means of \$AA_OFF.
It is used for clearance control in laser machining:
The offset value is limited so that the laser head cannot get caught in the plate recesses.
Whether the offset value lies within the limit range can be queried via system variable \$AA_OFF_LIMIT.

| 43400 | WORKAREA_PLUS_ENABLE | - | A3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Working area limitation active in positive direction |  |  |  |  |  | BOOLEAN | Immediately |
| CTEQ |  |  |  |  |  |  |  |  |
| - | - | FALSE | 0 | - | U |  |  |  |

Description: 1: The working area limitation of the axis concerned is active in the positive direction.
0 : The working area limitation of the axis concerned is switched off in the positive direction.

The setting data is parameterized via the operator panel in the operating area "Parameters" by activating/deactivating the working area limitation.

SD irrelevant for ......
G code: WALIMOF

| 43410 | WORKAREA_MINUS_ENABLE |  | - | A3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Working area limitation active in the negative direction |  | BOOLEAN | Immediately |  |
| CTEQ |  |  |  |  |  |
| - | FALSE | 0 | - | 7/7 | U |

Description: 1: The working area limitation of the axis concerned is active in the negative direction

0: The working area limitation of the axis concerned is switched off in the negative direction.

The setting data is parameterized via the operator panel in the operating area
"Parameters" by activating/deactivating the working area limitation.
SD irrelevant for ......
G code: WALIMOF

| 43420 | WORKAREA_LIMIT_PLUS | - | A3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Working area limitation plus |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | $1.0 \mathrm{e}+8$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |  |  |

Description:
The working area defined in the basic coordinate system in the positive direction of the axis concerned can be limited with axial working area limitation.
The setting data can be changed on the operator panel in the operating area "Parameters".
The positive working area limitation can be changed in the program with G26.
SD irrelevant for ......
G code: WALIMOF
Related to ....
SD43400 \$SA_WORKAREA_PLUS_ENABLE
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43430 | WORKAREA_LIMIT_MINUS | - | A3 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Working area limitation minus |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | $-1.0 \mathrm{e}+8$ | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |  |  |

Description: The working area defined in the basic coordinate system in the negative direction of the axis concerned can be limited with axial working area limitation.

The setting data can be changed on the operator panel in the operating area "Parameters".

The negative working area limitation can be changed in the program with G 25 .
SD irrelevant for .....
G code: WALIMOF
Related to ....
SD43410 \$SA_WORKAREA_MINUS_ENABLE
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43500 | FIXED_STOP_SWITCH | - | F1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Selection of travel to fixed stop | BYTE | Immediately |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 7$ |  |

Description:
The "Travel to fixed stop" function can be selected and deselected with this setting data.
SD=0 Deselect "Travel to fixed stop"
SD=1 Select "Travel to fixed stop"
The setting data can only be overwritten by the part program with the command FXS [x]=1/0 when software version $2 . x$ is installed.
The status of the setting data is indicated on the operator panel in the "Parameters" area.

| 43510 | FIXED_STOP_TORQUE | - | F1 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\%$ |  |  |  |  |  |  |
| - | Fixed stop clamping torque | DOUBLE | Immediately |  |  |  |
| - | - | 5.0 | 0.0 | 800.0 | $7 / 7$ |  |

Description:

The clamping torque is entered in this setting data as a of the maximum motor torque (corresponds to \% of max. current value with FDD).
The setting data is active only if the fixed stop has been reached.
The fixed stop is considered reached when,

- with MD: MD37060 \$MA_FIXED_STOP_ACKN_MASK, bit 1 = 0 (no acknowledgment required), the interface signal DB390 $\bar{x}$ DBX2 .5 ( $\overline{\text { Fixed }}$ stop reached) is set by the NC
- with MD37060 \$MA_FIXED_STOP_ACKN_MASK, bit $1=1$ (acknowledgment required), the interface signal DB390x DBX2.5 (Fixed stop reached) is set by the NC and acknowledged by interface signal DB380x DBX1.1 (Acknowledge fixed stop reached)
The status of the setting data is indicated on the operator panel in the "Parameters" area.
The FXST[x] command effects a block-synchronous change to this setting data. It can also be changed by the user or via the PLC. Otherwise the value is transferred from MD37010 \$MA_FIXED_STOP_TORQUE_DEF to the setting data when "Travel to fixed stop" is active.

Related to ....
MD37010 \$MA_FIXED_STOP_TORQUE_DEF (default setting for clamping torque)

| 43520 | FIXED_STOP_WINDOW |  |  |  |  |  | - | F1 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Fixed stop monitoring window |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 1.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description:
The fixed stop monitoring window is entered in this setting data.
The setting data is active only if the fixed stop has been reached.
The fixed stop is considered reached when,

- with MD37060 \$MA_FIXED_STOP_ACKN_MASK, bit $1=0$ (no acknowledgment required) interface signal DB390x DBX2.5 (Fixed stop reached) is set by the NC
- with MD37060 \$MA_FIXED_STOP_ACKN_MASK, bit $1=1$ (acknowledgment required) interface signal DB390 $\bar{x}$ DBX $\overline{2} .5$ (Fixed stop reached) is set by the NC and acknowledged by interface signal DB380x DBX1.1 (Acknowledge fixed stop reached)
If the position at which the fixed stop was detected leaves the tolerance band by more than the amount specified in SD43520 \$SA_FIXED_STOP_WINDOW, then alarm 20093 "Fixed stop monitoring has responded" is output and the "FXS" function is deselected.
The status of the setting data is indicated on the operator panel in the "Parameters" area.
The FXSW[x] command effects a block-synchronous change to this setting data. It can also be changed by the user or via the PLC.
The value is otherwise transferred from MD37020 \$MA_FIXED_STOP_WINDOW_DEF to the setting data when "Travel to fixed stop" is active.
Related to ....
MD37020 \$MA_FIXED_STOP_WINDOW_DEF (default setting for fixed stop monitoring window)

| 43600 | IPOBRAKE_BLOCK_EXCHANGE |  |  |  |  |  | A06, A10 | K1 |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\%$ | Block change criterion 'braking ramp' | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0 | 100.0 |  |  |  |  |
| $7 / 7$ | U |  |  |  |  |  |  |  |

Description: Specifies the application time at single axis interpolation for the block change criterion braking ramp: At 100\%, the block change criterion is fulfilled at the time of application of the braking ramp. At $0 \%$, the block change criterion is identical with IPOENDA.

Note:
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB can be set so that the value written by the part program is Ēransferēed into the active file system on reset (i.e. the value is retained even after reset).

| 43610 | ADISPOSA_VALUE | A06, A10 | P2 |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Tolerance window 'braking ramp' |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | 0.0 | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

## Description:

In case of single-axis interpolation, this value defines the size of the tolerance window which the axis must have reached in order to enable a block change in case of the block-change criterion 'braking ramp with tolerance window valid' and when reaching the corresponding \% value of the braking ramp (SD43600 \$SA_IPOBRAKE_BLOCK_EXCHANGE).
Note:
By means of the MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB, the user can specify that the value written by the part program is transferred into the active file system in case of a reset (i.e. the value is retained even after the reset).

| 43700 | OSCILL_REVERSE_POS1 |  | - | P5 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Oscillation reversal point 1 |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |
| 828d-me42 | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te42 | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce42 | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse42 | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-me62 | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te62 | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |



| 43710 | OSCILL_REVERSE_POS2 |  |  | - | P5 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | Oscillation reversal point 2 |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 717 | U |
| 828d-me62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gse62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-te82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-me82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gce82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gse82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |

Description: Position of the oscillating axis at reversal point 2.
Note:
MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)
Application example(s)
NC language: OSP2[Axis]=Position
Related to ....
SD43700 \$SA_OSCILL_REVERSE_POS1
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB


| 828d-te42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 828d-gce42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-me62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gse62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-te82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-me82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gce82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |

Description:
Hold time of the oscillating axis at reversal point 1.
Note:
MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)
Application example(s)
NC language: OST1[Axis]=Position
Related to ....
SD43730 \$SA_OSCILL_DWELL_TIME2
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43730 | OSCILL_DWELL_TIME2 |  |  | - | P5 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s | Hold time at oscillation reversal point 2 |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gse42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-me62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 717 | U |
| 828d-gse62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-te82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-me82 | - | 0.0 | -MD_DBLMAX | 1.0E+301 | $7 / 7$ | U |
| 828d-gce82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 717 | U |
| 828d-gse82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |

Description: Hold time of the oscillating axis at reversal point 2.
Note:
MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)
Application example(s)
NC language: OST2[Axis]=Position
Related to ....
SD43720 \$SA_OSCILL_DWELL_TIME1
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB


| 43750 | OSCILL_NUM_SPARK_CYCLES |  |  | - | P5 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of spark-out strokes |  |  | DWORD | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0 | 0 | - | 0/0 | S |
| 828d-te42 | - | 0 | 0 | - | 0/0 | S |
| 828d-gce42 | - | 0 | 0 | - | $7 / 7$ | U |
| 828d-gse42 | - | 0 | 0 | - | $7 / 7$ | U |
| 828d-me62 | - | 0 | 0 | - | 0/0 | S |
| 828d-te62 | - | 0 | 0 | - | 0/0 | S |
| 828d-gce62 | - | 0 | 0 | - | 717 | U |
| 828d-gse62 | - | 0 | 0 | - | 717 | U |
| 828d-te82 | - | 0 | 0 | - | $7 / 7$ | U |
| 828d-me82 | - | 0 | 0 | - | $7 / 7$ | U |
| 828d-gce82 | - | 0 | 0 | - | $7 / 7$ | U |
| 828d-gse82 | - | 0 | 0 | - | $7 / 7$ | U |

[^17]Related to ....
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB

| 43760 | OSCILL_END_POS |  |  | - | P5 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm, degrees | End position of the reciprocating axis |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| 828d-me42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse42 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-me62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-te62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 0/0 | S |
| 828d-gce62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-gse62 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |
| 828d-te82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-me82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gce82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ | U |
| 828d-gse82 | - | 0.0 | -MD_DBLMAX | $1.0 \mathrm{E}+301$ | 7/7 | U |

Description: Position the oscillating axis travels to after ending the sparking-out strokes. Note:

MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)
Application example(s)
NC language: OSE[Axis]=Position
Related to ....
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB


## Description:

Bit mask:
Bit no. | Meaning in OSCILL_CTRL_MASK

```
0(LSB)-1 | 0: Stop at the next reversal point if the
    | oscillating movement is switched off
    |
    | 1: Stop at reversal point 1 if the
    | oscillating movement is switched off
    | 2: Stop at reversal point 2 if the
    | oscillating movement is switched off
    3: Do not approach a reversal point when the oscillating movement is
switched off
    | if no sparking-out strokes are programmed
| 1: Approach end position after sparking out
| 1: If the oscillating movement is canceled by delete distance-to-go,
    | then the sparking-out strokes are to be executed afterwards
    | and the end position approached if necessary
------------------------------------------------------------------------------------------
| 1: If the oscillating movement is canceled by delete distance-to-go,
    | then the corresponding reversal point
    | is approached on switch off
| 1: Changed feedrate does not become active until the next reversal point
| 1: Path override is active if the feed rate is 0,
    | otherwise speed override is active
| | 1: In the case of rotary axes DC (shortest path)
------------------------------------------------------------------------------------------
| 1: Execute sparking-out stroke as single stroke not as double stroke
---------------------------------------------------------------------------------------
| 1: On starting, first approach the starting position, see
    | SD43790 $SA_OSCILL_START_POS
Application example(s)
NC language: OSCTRL[Axis]=(setting options, reset options)
Related to ....
        MD10709 $MN_PROG_SD_POWERON_INIT_TAB
        MD10710 $MN_PROG_SD_RESET_SAVE_TAB
```

| 43780 | OSCILL_IS_ACTIVE |  | - | P5 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activate oscillation movement |  | BOOLEAN | Immediately |  |
| - |  |  |  |  |  |
| 828d-me42 | FALSE | 0 | - | 0/0 | S |
| 828d-te42 | FALSE | 0 | - | 0/0 | S |
| 828d-gce42 | FALSE | 0 | - | $7 / 7$ | U |
| 828d-gse42 | FALSE | 0 | - | 717 | U |
| 828d-me62 | FALSE | 0 | - | 0/0 | S |
| 828d-te62 | FALSE | 0 | - | 0/0 | S |
| 828d-gce62 | FALSE | 0 | - | $7 / 7$ | U |


| 828d-gse62 | - | FALSE | 0 | - | $7 / 7$ | U |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $828 d-t e 82$ | - | FALSE | 0 | - | $7 / 7$ | U |
| 828d-me82 | - | FALSE | 0 | - | $7 / 7$ | U |
| 828d-gce82 | - | FALSE | 0 | - | $7 / 7$ | U |
| 828d-gse82 | - | FALSE | 0 | - | $7 / 7$ | U |

Description:
Switching the oscillating movement on and off
Note:
MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)
Application example(s)
NC language: $\quad O S[A x i s]=1, ~ O S[A x i s]=0$
Related to ....
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB
MD10710 \$MN_PROG_SD_RESET_SAVE_TAB


Description: Position approached by the oscillating axis at the start of oscillation if this is set in SD43770 \$SA_OSCILL_CTRL_MASK.
Note:
MD 10710 \$MN_PROG_SD_RESET_SAVE_TAB can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)

| 43900 | TEMP_COMP_ABS_VALUE | - | K3 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Position-independent temperature compensation value | DOUBLE | Immediately |  |  |  |
| - | - | 0.0 | - MD_DBLMAX | $1.0 \mathrm{E}+301$ |  |  |

Description:
The position-independent temperature compensation value is defined by SD43900
\$SA_TEMP_COMP_ABS_VALUE.

The machine axis traverses this additional compensation value as soon as the positionindependent temperature compensation has been activated (MD32750 \$MA_TEMP_COMP_TYPE =
1 oder 3).
SD irrelevant for ......
MD32750 \$MA_TEMP_COMP_TYPE = 0 or 2

Related to ....
MD32750 \$MA_TEMP_COMP_TYPE Temperature compensation type
MD32760 \$MA_COMP_ADD_VELO_FACTOR Velocity overshoot caused by compensation

| 43910 | TEMP_COMP_SLOPE |  |  |  |  |  | - | K3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Lead angle for position-dependent temperature compensation | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

Description:
In the case of position-dependent temperature compensation, the error curve characteristic of the temperature-dependent actual-value deviation can often be approximated by a straight line. This straight line is defined by a reference point P_O and a slope tan- $\beta$.
SD43910 \$SA_TEMP_COMP_SLOPE defines the slope tan-ß. This slope can be changed by the PLC user program ${ }^{-}$as $a^{-}$function of the current temperature.
The axis traverses additionally the compensation value calculated for the relevant actual position as soon as the position-dependent temperature compensation becomes active (MD32750 \$MA_TEMP_COMP_TYPE = = 2 or 3 ).
MD32760 \$MA_COMP_ADD_VELO_FACTOR limits the maximum angle of slope tan-ß_max of the error curve. This maximum angle of slope cannot be exceeded.
SD irrelevant for ......
MD32750 \$MA_TEMP_COMP_TYPE $=0$ or 1
Special cases, errors, ......
When SD43910 \$SA_TEMP_COMP_SLOPE is greater than tan- $\beta_{\text {_max, }}$ the slope tan- $\beta_{\text {_ }}$ max is used to calculate the position-dependent temperature compensation value internally. No alarm is output.
Related to ....
MD32750 \$MA_TEMP_COMP_TYPE
SD43920 \$SA_TEMP_COMP_REF_POSITION
Temperature compensation type
temperature compēnsation
MD32760 \$MA_COMP_ADD_VELO_FACTOR Velocity overshoot caused by compensation

| 43920 | TEMP_COMP_REF_POSITION |  |  |  |  |  | - | K3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Ref. position of position-dependent temperature compensation | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.0 | - MD_DBLMAX | $1.0 \mathrm{E}+301$ | $7 / 7$ |  |  |  |

## Description:

In the case of position-dependent temperature compensation, the error curve characteristic of the temperature-dependent actual-value deviation can often be approximated by a straight line. This straight line is defined by a reference point P_O and a slope tan- $\beta$.
SD43920 \$SA_TEMP_COMP_REF_POSITION defines the position of the reference point P_0. This reference position can be changed by the PLC user program as a function of the current temperature.
The axis traverses additionally the compensation value calculated for the relevant actual position as soon as the position-dependent temperature compensation becomes active (MD32750 \$MA_TEMP_COMP_TYPE = 2 or 3 ).
SD irrelevant for .....
MD32750 \$MA_TEMP_COMP_TYPE = 0 or 1
Related to ....
MD32750 \$MA_TEMP_COMP_TYPE Temperature compensation type
SD43910 \$SA_TEMP_COMP_SLOPE Angle of slope for position-dependent temperature compensation

## Machine and setting data cycles



Description: Display resolution in mm

| 51001 | DISP_RES_MM_FEED_PER_REV | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Display resolution in mm feedrate/rev | BYTE | Immediately |  |  |  |
| - | - | 3 | 0 | 6 | $7 / 3$ |  |

Description: Display resolution in mm feedrate/rev


Description: Display resolution in mm feedrate/min

| 51003 | DISP_RES_MM_FEED_PER_TOOTH |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Display resolution in mm feedrate/tooth |  | BYTE | Imm |  |
| - |  |  |  |  |  |
| - | 3 | 0 | 6 | 7/3 | M |

Description: Display resolution in mm feedrate/tooth

| 51004 | DISP_RES_MM_CONST_CUT_RATE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Display resolution constant cutting speed m/min | BYTE | Immediately |  |  |  |
| - | - | 3 | 0 | 6 | $7 / 3$ |  |

Description: Display resolution constant cutting speed $\mathrm{m} / \mathrm{min}$

| 51010 | DISP_RES_INCH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display resolution in inch | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 6 | $7 / 3$ |  |

Description: Display resolution in inch

| 51011 | DISP_RES_INCH_FEED_P_REV | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Display resolution in inch feedrate/rev | BYTE | Immediately |  |  |  |
| - | - | 4 | 0 | 6 | $7 / 3$ |  |

[^18]| 51012 | DISP_RES_INCH_FEED_P_TIME | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Display resolution in inch feedrate/min | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 6 |  |  |

Description: Display resolution in inch feedrate/min

| 51013 | DISP_RES_INCH_FEED_P_TOOTH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Display resolution in inch feedrate/tooth | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 6 |  |  |

Description: Display resolution in inch feedrate/tooth

| 51014 | DISP_RES_INCH_CUT_RATE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display resolution constant cutting speed ft/min | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 6 | $7 / 3$ |  |

Description: Display resolution constant cutting speed ft/min

| 51018 | DISP_RES_SCALE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display resolution scaling | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 3 | 0 | 6 | $7 / 3$ |  |

Description: Display resolution scaling

| 51019 | DISP_RES_ROT_WO | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display resolution of rotation in work offsets | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 6 | $7 / 3$ |  |

## Description:

Display resolution of rotation in work offsets
If the value of the data is 0, MD51020 \$MNS_DISP_RES_ANGLE is used.

| 51020 | DISP_RES_ANGLE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Display resolution of angle | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 3 | 0 | 6 |  |  |

Description: Display resolution of angle

| 51021 | DISP_RES_SPINDLE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display resolution of spindles | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 6 | $7 / 3$ |  |$]$ M

Description: Decimal places in speed entry field

| 51022 | DISP_RES_ROT_AX_FEED | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Display resolution of rotary axis feedrate | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 6 |  |  |

Description: Display resolution of rotary axis feedrate


| 51025 | FRAMES_ACT_IMMEDIATELY |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activate active offset immediately |  |  | BYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | 1 |  | 0 | 1 | 4/3 | M |


| 51026 | AXES_SHOW_GEO_FIRST | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Actual value display with leading geometry axes |  |  |  |  |  | BYTE | PowerOn |
| - | - | 1 | 0 | 1 | $4 / 3$ |  |  |  |$]$ M $\quad$|  |  |
| :--- | :--- |
| - | - |

Description: When the machine data value is 1 , the geometry axes of the channel are displayed first.

| 51027 | ONLY_MKS_DIST_TO_GO |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Distance-to-go display in the Work window | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $4 / 3$ |  |  |  |


| 51028 | BLOCK_SEARCH_MODE_MASK |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Bit mask for available block search modes | BYTE | PowerOn |  |  |  |  |  |
| - | - | 51 | - | - |  |  |  |  |

## Description:

Bit mask for available search modes
Bit 0: Block search with calculation without approach
Bit 1: Block search with calculation with approach
Bit 3: Skip EXTCALL programs
Bit 4: Block search without calculation

Machine data

Bit 5: Block search with test run


Description: The machine data defines how many skip levels are made available for operation.

| 51030 | SPIND_MAX_POWER | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\%$ | Maximum value of spindle power rating display |  |  |  |  |  | DWORD | PowerOn |
| - | - | 100 | 0 | 255 |  |  |  |  |
| - | - | $4 / 3$ | M |  |  |  |  |  |

Description: Maximum value of the permissible spindle power as a percentage; the display bar in the machine image "spindle diagnosis" is shown green in the range between 0 and the value set in SPIND_MAX_POWER.
In the case of a SINAMICS drive, the drive parameter r0033 "Torque utilization smoothed" is shown in the load bar.

| 51031 | SPIND_POWER_RANGE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\%$ | Display range of spindle power rating display | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 100 | 0 | 255 | $4 / 3$ |  |

Description: Scale end value for spindle power rating in percent; value must be equal to or greater than SPIND_MAX_POWER.
The display bar in the machine image is shown in red in the range between the values of SPIND_MAX_POWER and SPIND_POWER_RANGE.


## Description:

Teach mode to be activated
Bit 0: default teach-in
Taught-in block is transferred to the program using the Accept softkey.
Bit 1: transfer of teach block can be blocked by the PLC.
SINUMERIK 840D sl:
DB19. DBX13.0 $=0$ block is transferred.
DB19.DBX13.0 $=1$ block is not transferred.
SINUMERIK 828D:
DB1700. DBX1000.0 $=0$ block is transferred.
DB1700. DBX1000.0 = 1 block is not transferred.
Bit 2: block selection only explicitly
Bits 16-31 are reserved for the OEM.

| 51035 | WRITE_FRAMES_FINE_LIMIT | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Input limit for all WO fine |  |  |  |  |  | DOUBLE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.999 | - | - | $4 / 3$ |  |  |  |

## Description:

Input limit for all work offsets fine


| 51037 | ENABLE_COORDINATE_ACS | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Enable settable coordinate system | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 3$ |  |

Description: Activate settable coordinate system
$0=$ WCS coordinate system is displayed
$1=$ SZS coordinate system is displayed
(SZS is WCS reduced by the offset components defined in MD24030)

| 51038 | SET_ACT_VALUE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Set actual value selection | BYTE | PowerOn |  |  |  |
| - | - | 1 | 0 | 1 | $7 / 3$ |  |

## Description:

Set actual value selection
$0=$ Set actual value is not offered.
$1=i f$ a user frame (settable work offset e.g. G54) is active, it will be used. In G500 Set actual values is not offered (system frame is no longer used).


Description: Options for machine - program influence:
Bit 0: program test function available

| 51040 | SWITCH_TO_MACHINE_MASK |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | $\begin{array}{l}\text { Automatic operating area switchover to machine }\end{array}$ |  |  |  |  |  | BYTE | PowerOn |
| - | - | 0 | - | - | $7 / 3$ |  |  |  |$]$ M

Description:
Automatic area switchover dependent upon machine
Bit 0: No automatic switch to Machine operating area when the program is selected in the Program Manager.
Bit 1: No automatic switch to Machine operating area when the operating mode is changed over via the machine control panel (MCP).
Bit 2: No automatic switch to Machine operating area when the program is selected in
the Programs operating area.
Bit 3: No automatic start of block search when the program is selected / executed in the Programs operating area.

| 51041 | ENABLE_PROGLIST_USER | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Activation of PLC program list, USER area |  |  |  |  |  | BYTE | Immediately |
| - | - | 0 | 0 | 1 | $7 / 3$ |  |  |  |

Description: Activates the PLC program list of the USER area. The programs entered there can be selected by the PLC for processing.

| 51042 | ENABLE_PROGLIST_INDIVIDUAL | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Activation of PLC program list, INDIVIDUAL area | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 3$ |  |

Description: Activates the PLC program list of the INDIVIDUAL area. The programs entered here can be selected by the PLC for processing.

| 51043 | ENABLE_PROGLIST_MANUFACT | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Activation of PLC program list, MANUFACTURER area | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 3$ |  |

Description: Activates the PLC program list of the MANUFACTURER area. The programs entered here can be selected by the PLC for processing.

| 51044 | ACCESS_SHOW_SBL2 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Display protection level SBL2 | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $4 / 3$ |  |

Description: Display protection level SBL2

| 51045 | ACCESS_TEACH_IN | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protection level TEACH IN | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $4 / 3$ |  |

## Description: Protection level TEACH IN

| 51046 | ACCESS_CLEAR_RPA | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level delete $R$ variables | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 |  |  |

Description:
Protection level delete $R$ variables

| 51047 | ACCESS_READ_GUD_LUD | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Read user variable protection level | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 |  |  |

## Description:

Read user variable protection level

| 51048 | ACCESS_WRITE_GUD_LUD | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write protection level of user variables |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | M |  |  |  |
| Description: | Write protection level of user variables |  |  |  |  |  |  |  |


| 51049 | ACCESS_WRITE_PRG_COND | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Write program control protection level | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $4 / 3$ |  |  |

Description: Write program control protection level

| 51050 | ACCESS_WRITE_PROGRAM | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write part program protection level |  |  |  |  |  | BYTE | PowerOn |
| - | - | 4 | 0 | 7 | $4 / 3$ |  |  |  |$]$ M

## Description: Write part program protection level

| 51051 | ACCESS_WRITE_RPA | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protection level write R variables | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $4 / 3$ |  |

Description: Protection level write $R$ variables

| 51052 | ACCESS_WRITE_SEA |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Protection level write setting data | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | M |  |  |  |


| 51053 | ACCESS_WRITE_BASEFRAME | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write basic work offset protection level |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 |  |  |  |


| 51054 | ACCESS_WRITE_CYCFRAME | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Write cycle frame protection level | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | 7 | 0 | 7 | $4 / 3$ | M |
| Description: | $-\quad$ Write cycle frame protection level |  |  |  |  |


| 51055 | ACCESS_WRITE_EXTFRAME | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Write external WO protection level | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $4 / 3$ |  |  |

[^19]| 51056 | ACCESS_WRITE_PARTFRAME | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Write table reference protection level |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 |  |  |  |  |

Description: Write table reference protection level

| 51057 | ACCESS_WRITE_SETFRAME | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write basic reference protection level |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $4 / 3$ |  |  |  |

Description: Write basic reference protection level

| 51058 | ACCESS_WRITE_TOOLFRAME | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write basic tool reference protection level |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $4 / 3$ |  |  |  |

Description: Write basic tool reference protection level

| 51059 | ACCESS_WRITE_TRAFRAME | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Write transformation frame protec. level |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 |  |  |  |  |

Description: Write transformation frame protec. level

| 51060 | ACCESS_WRITE_USERFRAME | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Write settable work offset protection level | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $4 / 3$ |  |  |

Description: Write settable work offset (G54 ... G599) protection level

| 51061 | ACCESS_WRITE_WPFRAME | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Write workpiece reference protection level | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $4 / 3$ |  |  |

Description: Write workpiece reference protection level

| 51062 | ACCESS_WRITE_FINE | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write protection level for fine offset of all work offsets |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 6 | 0 | 7 | $4 / 3$ |  |  |  |

## Description: Write protection level for fine offset of all work offsets

| 51063 | ACCESS_SET_ACT_VALUE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Set actual value protection level | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $4 / 3$ |  |

[^20]

| 51065 | NUM_DISPLAYED_CHANNELS |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Number of channels displayed simultaneously |  |  | BYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | 1 |  | 1 | 4 | 4/3 | M |

Description: Setting of the number of channels to be displayed simultaneously in the machine operating area and in the multi-channel editor.

| 51066 | ORDER_DISPLAYED_CHANNELS |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Channel numbers of the channels displayed |  |  | STRING | Pow |  |
| - |  |  |  |  |  |  |
| - | 1; | 1; | - | - | 4/3 | M |

Contains the numbers of the channels to be displayed under machine in the multichannel view, in the desired order and separated by commas, semicolons or spaces.

| 51067 ENABLE_HANDWHEEL_WINDOW - -   <br> - Show handwheel window BYTE PowerOn   <br> - - 1 0 1 $4 / 2$ |
| :--- |
| - |
| Description: |


| 51068 | SPIND_DRIVELOAD_FROM_PLC1 | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Machine axis index of spindle 1 utilization display from PLC | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | 0 | 0 | 31 | $4 / 2$ |


| 51070 | ACCESS_CAL_TOOL_PROBE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Protection level for calibration of the tool probe (ShopTurn) | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 |  |  |  |  |


| 51071 | ACCESS_ACTIVATE_CTRL_E | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protection level of Ctrl-Energy | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | 1 | 0 | 7 |  |


| 51072 | ACCESS_EDIT_CTRL_E | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level of Ctrl-Energy for changing profiles | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 2 | 0 | 7 |  |  |

Description: Protection level of Ctrl-Energy: Definition of energy-saving profiles


Description: This machine data defines the protection level from which the machine/machine collision monitoring can be activated or deactivated under jog.

| 51161 | ACCESS_WRITE_CA_MACH_AUTO | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Write protection level, collision monitoring machine automatic |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 3 | 0 | 7 |  |  |  |  |

Description: $\begin{aligned} & \text { This machine data defines the protection level from which the machine/machine } \\ & \text { collision monitoring can be activated or deactivated under automatic. }\end{aligned}$

| 51162 | ACCESS_WRITE_CA_TOOL | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Write protection level collision monitoring tool | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | 7 | $7 / 4$ |  |

## Description: <br> This machine data defines the protection level from which the collision monitoring for

 tools can be activated or deactivated.| 51198 | ACCESS_READ_TM_ALL_PARAM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protection level tool management details - read all parameters | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | 7 | $7 / 4$ |  |

Description: Protection level tool management details - read all parameters


## Description: Protection level of tool management for writing grinding data

| 51200 | ACCESS_WRITE_TM_GEO | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write tool offset geometry data protection level |  |  |  |  |  | BYTE | PowerOn |
| - | - | 5 | 0 | 7 | $7 / 4$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: Write tool offset geometry data protection level

| 51201 | ACCESS_WRITE_TM_WEAR |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write tool offset wear data protection level |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 6 | 0 | 7 | M |  |  |  |

Description: Write tool offset wear data protection level

| 51202 | ACCESS_WRITE_TM_WEAR_DELTA | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level for tool offset restricted writing of wear data | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $7 / 4$ |  |  |

Description: Protection level for restricted writing of tool wear values
S. MD51213: TM_WRITE_WEAR_DELTA_LIMIT

| 51203 | ACCESS_WRITE_TM_SC | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write tool offset sum offset protection level |  |  |  |  |  | BYTE | PowerOn |
| - | - | 7 | 0 | 7 | $7 / 4$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: Write tool offset sum offset protection level

| 51204 | ACCESS_WRITE_TM_EC |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Write tool offset use offsets protection level |  |  | BYTE | Pow |  |
| - |  |  |  |  |  |  |
| - | - 7 | 7 | 0 | 7 | $7 / 4$ | M |


| 51205 | ACCESS_WRITE_TM_SUPVIS |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Write tool offset monitoring data protection level |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 7 | 7 0 | 7 | 7/4 | M |
| Description: | One authorization applies to all limit values: quantity, service life, wear and the monitoring type. |  |  |  |  |


| 51206 | ACCESS_WRITE_TM_ASSDNO | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Write tool offset unique D number protection level |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 |  |  |  |  |

Description: Write tool offset unique D number protection level

| 51207 | ACCESS_WRITE_TM_WGROUP | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write tool offset wear groups protection level |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $7 / 4$ |  |  |  |

Description: Write tool offset wear groups (magazine location / magazine) protection level

| 51208 | ACCESS_WRITE_TM_ADAPT | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Write tool offset adapter data protection level | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 7 | 0 | 7 | $7 / 4$ |  |  |

Description: Write tool offset tool adapter geometry data protection level

| 51209 | ACCESS_WRITE_TM_NAME | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Write tool offset tool name protection level |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 |  |  |  |


| 51210 | ACCESS_WRITE_TM_TYPE | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Write tool offset tool type protection level | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |  |

Description: Write tool offset tool type protection level

| 51211 | ACCESS_READ_TM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Read tool offset data protection level | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | -7 | 0 | 7 | $7 / 4$ |  |  |


| 51212 | TM_WRITE_WEAR_ABS_LIMIT | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Maximum tool wear value |  |  |  |  |
| - |  |  |  |  |  |
| - | - | 0.999 | 0 | 10 | POUBLE |

## Description:

Using TM_WRITE_WEAR_ABS_LIMIT, the max. possible value of a tool wear is limited absolutely, independently of the current protection level (keyswitch position), i.e. also independently of ACCESS_WRITE_TM_WEAR. Absolute and incremental wear limitation can be combined, i.e. the wear can be changed incrementally up to the absolute limit.
See MD51213.
The value 0 disables the limitation of the wear input.

| 51213 | TM_WRITE_WEAR_DELTA_LIMIT |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Maximum difference value restricted tool wear input |  |  |  |  | DOUBLE | PowerOn |  |
| - | - | 0 | 0 | 10 |  |  |  |  |

Description: When entering tool offsets, the value of the change from the previous value to the new value cannot exceed the value set here.
With TM_WRITE_WEAR_DELTA_LIMIT, the change to a tool wear can be limited
incrementally, if the current protection level is the same as or higher than the one set in ACCESS_WRITE_TM_WEAR_DELTA. With the current protection level being the same or higher than ACCESS_WRITE_TM_WEAR, an incremental limitation is no longer performed. Absolute and
incremental wear limitation can be combined, i.e. the wear can be changed up to the absolute limit. See MD51212
The value 0 disables limitation of the wear input.

| 51214 | TM_WRITE_LIMIT_MASK |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Validity of the restricted tool wear input |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 7 | 0 | 7 | $7 / 4$ | M |
| Description: | Validity of the restricted tool wear input |  |  |  |  |
|  | Bit 0: use for cutting edge data, wear |  |  |  |  |
|  | Bit 1: use for SC data, sum offsets |  |  |  |  |
|  | Bit 2: use for EC data, use offsets |  |  |  |  |
|  | Bit $0+1+2$ : use for all data, wear, SC, EC |  |  |  |  |


| 51215 | ACCESS_WRITE_TM_ALL_PARAM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protection level TM details - write all parameters | BYTE | PowerOn |  |  |  |
| - | - | 1 | 0 | 7 | $7 / 4$ |  |
| - | - |  |  |  |  |  |

Description: Protection level TM details - write all parameters

| 51216 | ACCESS_TM_TOOL_CREATE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protection level TM create tool | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |

Description: Protection level TM create tool

| 51217 | ACCESS_TM_TOOL_DELETE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Protection level TM delete tool | BYTE | PowerOn |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |  |  |
| - | - |  |  |  |  |  |  |  |

Description: Protection level TM delete tool

| 51218 | ACCESS_TM_TOOL_LOAD | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Protection level TM load tool | BYTE | PowerOn |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |

Description: Protection level TM load tool

| 51219 | ACCESS_TM_TOOL_UNLOAD | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level TM unload tool | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 |  |  |

Description: Protection level TM unload tool

| 51220 | ACCESS_TM_TOOL_MOVE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level TM relocate tool | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 |  |  |

Description: Protection level TM relocate tool

| 51221 | ACCESS_TM_TOOL_REACTIVATE | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level TM reactivate tool | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |  |

Description: Protection level TM reactivate tool

| 51222 | ACCESS_TM_TOOL_MEASURE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level TM measure tool | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 |  |  |


| 51223 | ACCESS_TM_TOOLEDGE_CREATE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Protection level TM create tool cutting edge | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |

Description: Protection level TM create tool cutting edge

| 51224 | ACCESS_TM_TOOLEDGE_DELETE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Protection level TM delete tool cutting edge | BYTE | PowerOn |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |

Description: Protection level TM delete tool cutting edge

| 51225 | ACCESS_TM_MAGAZINE_POS | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Protection level TM position magazine | BYTE | PowerOn |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 4 | 0 | 7 | $7 / 4$ |  |  |

## Description: Protection level TM position magazine



Description: Function mask for simulation

```
Bit 0: No automatic start when simulation is selected
Bit 1: Deactivate simulation
Bit 4: Ignore frame components in X and Y (compatibility)
Bit 5: Turning tool can be rotated in the tool spindle
Bit 6: Enable handwheel as simulation override (values from DB19.DBW400)
Bit 7: Interpret handwheel values from DB19.DBW400 as absolute values
Bit 10: Hide zero point symbol
```



Description:
Function mask for all technologies
Bit $0: G$ code programming without multi-channel data
If bit $0=1$, no multi-channel data will be offered for job lists which only contain G code programs.

Bit 1: Enable print function of Editor
Bit 2: With external program selection (e.g. via PLC), set start disable (program check).

| 51230 | ENABLE_LADDER_DB_ADDRESSES |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | DB address activation in the PLC ladder viewer |  | BOOLEAN | Immediately |  |
| - |  |  |  |  |  |
| - | - 1 | 1 0 | 1 | 7/2 | M |

Description: $\quad$ DB address activation in the PLC ladder viewer

| 51231 | ENABLE_LADDER_EDITOR |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Activation of PLC ladder add-on tool for INT100/101 |  | BOOLEAN | Imm |  |
| - |  |  |  |  |  |
| - | 1 | 1 0 | 1 | 7/2 | M |

Description: Activation of PLC ladder add-on tool for INT100/101

| 51232 | ENABLE_LADDER_EDITOR_ADV |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Activation of PLC ladder editor for the complete PLC project |  |  |  |  |  | BOOLEAN | Immediately |
| - | - | 1 | 0 | 1 | M |  |  |  |
| - | - |  |  |  |  |  |  |  |

Description: Activation of PLC ladder editor for the complete PLC project

| 51233 | ENABLE_GSM_MODEM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | GSM modem activation for Easy Message | BOOLEAN | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 1 | $7 / 2$ | 1 |  |

Description: GSM modem activation for Easy Message

| 51235 | ACCESS_RESET_SERV_PLANNER | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Protection level for acknowledgment of maintenance tasks | BYTE | Immediately |  |  |  |
| - | - | 0 | 7 | $7 / 2$ | M |  |

Description:
Protection level for acknowledgment of maintenance tasks

| 51300 | MAXNUM_WAITM_USER | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of wait marks available to the end user |  |  |  |  |  | BYTE | PowerOn |
| - |  |  |  |  |  |  |  |  |
| - | - | 100 | 0 | 100 |  |  |  |  |

## Description: Number of wait marks available to the end user



| 51601 | MEA_CAL_EDGE_NUM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of geometry data fields of gauging block, workpiece probe | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 3 | $7 / 2$ |  |  |

Description: The gauging block is exclusively used to calibrate the workpiece probe of the Turning technology!



| 51618 | MEA_CM_ROT_AX_POS_TOL | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| degrees | Tolerance of rotary axis positions - measuring with orientable <br> toolholder | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0.5 | -1 | 1 | $7 / 3$ |  |  |

## Description:

Parameter for measuring with orientable tool carrier
Entries in parameter $\$ M N \_M E A \_C M \_R O T \_A X \_P O S \_T O L$ are effective only if
\$MNS_MEA_FUNCTION_MASK bit2 or bit1 $\overline{6}$ is set by MD51740.
The real angle position of the rotary axes can deviate from the programmed one (exact stop fine window).
This deviation depends on the position control features of the axis. The maximum deviation expected on the concrete axis
must be entered in this parameter. When the tolerance is exceeded, alarm 61442 "Toolholder not in parallel with the geometry axes" is displayed.

| 51740 | MEA_FUNCTION_MASK | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Function mask for measuring cycles, workpiece and tool <br> measuring | DWORD | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 67 | - | - |  |  |  |

Description:
Function mask for measuring cycles
Bit 0: Workpiece measurement, calibration status monitoring
0: Calibration monitoring not active
1: Calibration monitoring active
Between calibration and measurement, the following states are monitored:

- Working plane (G17, 18, 19)
- Probe type (3D probe, type 710, mono probe, type 712, L probe, type

713, star probe, type 714)

- Length reference of the probe (center of the probe ball, probe ball
circumference)
- The following alarms 61341, 61419, 61420 can be output.

Note: - these monitoring functions are always active when "measuring in JOG".

- See also SD54740 \$SNS_MEA_FUNCTION_MASK, bit 4.

Bit 1: Workpiece measurement, milling technology, length reference of the workpiece probe

0: Tool length in the infeed axis, relative to the center of the probe
ball (TCP)
1: Tool length in the infeed axis, relative to the circumference of the
probe ball
Bit 2: Workpiece measurement, taking into account the orientation of tool carriers (kinematic type "T", swivel head) for the tool offset

0 : The tool components are corrected according to the orientation of the tool carrier
when measuring. This is valid for the orientations $0^{\circ}, 90^{\circ}, 180^{\circ}$, and
$270^{\circ}$.
1: The tool components are corrected according to the orientation of the
tool carrier
in the initial setting.
Bit 4: Workpiece measurement, milling technology, probe is permanently mounted on the machine

0: When measuring, the workpiece probe is located in a tool spindle.
1: The workpiece probe is permanently mounted on the machine.
Not all measurement variants are available. If an inadmissible measurement variant is selected,
alarm 61373 is output.
Bit 5: Workpiece measurement, correction in WO coarse if no fine offset is set up
0 : Only the measurement difference is entered in the coarse offset of the wo (compatibility).

1: The absolute offset corrected by the measurement different is entered
in the coarse offset of the wo.
Bit 6: Effect of the feedrate override in measuring blocks (MEAS) of measuring cycles
0 : Measuring blocks (MEAS) are traversed in the measuring cycles with
the current feedrate override (compatibility).

```
1: Measuring blocks (MEAS) are traversed in the measuring cycles with 100\% feedrate override if the feedrate override is set \(>0\). Bit 15: Workpiece measurement, traverse measuring block with path behavior G60, exact stop at the end of the block
0 : The measuring block is traversed in continuous-path mode G64.
1: The measuring block is traversed with path behavior G60, exact stop at the end of the block.
Bit 16: Tool measurement, turning technology, taking into account the orientation of the tool carrier (kinematic type "T", swivel head)
0 : The tool component is corrected according to the orientation of the tool carrier when measuring.
1: The tool component is corrected according to the orientation of the tool carrier in the initial setting.
```

| 51742 | MEA_ACCESS_EXEC | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Meas. cycles: Limitation of protection levels when writing system <br> variables | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 10 | $1,1,1,1,1,1,1,1 \ldots$ | 1 | 7 | $7 / 1$ |  |

Description: Limitation of the protection levels when writing system variables during the execution of measuring cycles.
MD51742 limits one range of the current protection level between the setting of the protection level
in MD11160 \$NM_ACCESS_EXEC_CST and the setting in MD51742 when executing the measuring cycles.
The field elements [0] to [9] are used as follows:
[0] Measure all kinematics
[1] to [9] reserved
For the meaning of the numerical values (protection level) see MD11160


Description: This parameter defines the measuring path in front of and behind the measuring setpoint.
It is only used by old ShopMill measuring cycles (powerline).

| 51751 | J_MEA_M_DIST_MANUELL | - | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Measuring path, for "Measure in JOG" |  |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 10 | -10000 | 10000 | $7 / 5$ |  |  |  |  |

Description: $\begin{aligned} & \text { This parameter defines the measuring path in front of and behind the measuring } \\ & \text { setpoint. }\end{aligned}$ setpoint.


## Description: This parameter defines the measuring path in front of and behind the measuring setpoint.




Description: Feedrate in the working plane w. active collision detection

| 51758 | J_MEA_COLL_MONIT_POS_FEED | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{mm} / \mathrm{min}$ | Infeed rate with active collision detection, for "Measure in JOG" | DOUBLE | Immediately |  |  |
| - |  |  |  |  |  |
| - | - | 1000 | 0 | 100000 | $7 / 5$ |




| 51780 | J_MEA_T_PROBE_DIAM_RAD |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm |  |  |  |  |  |  |  |  |
| - | Diameter of the tool probe for radius measurement | DOUBLE | Immediately |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 10000 | $7 / 5$ |  |  |  |

Description: Effective grinding wheel diameter of the tool probe for radius measurement on milling

| 51781 | MEA_T_PROBE_THICKNESS | - | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| mm | Tool probe thickness |  |  |  |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 10000 |  |  |  |  |  |
| $7 / 5$ | I |  |  |  |  |  |  |  |  |

Description: Tool probe thickness for automatic approach of turning tools to the probes at milling/ turning machines

| 51784 | J_MEA_T_PROBE_APPR_AX_DIR |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Approach direction in the plane on the tool probe, for "Measure in <br> JOG" | DWORD | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 6 | $-1,-1,-1,-1,-1,-1$ | -2 | 2 | $7 / 5$ |  |  |  |  |

Description: Approach direction in the plane on the tool probe, for "Measure in JOG"
$=-2$ negative direction 2 nd measuring axis
$=-1$ negative direction 1 st measuring axis
$=0$ or 1 positive direction 1st measuring axis
$=2$ psoitive direction 2nd measuring axis


Description: Measuring path for tool probe calibration and tool measuring with stationary spindle,
in front of and behind the expected switching position.

| 51840 | GRIND_FUNCTION_MASK |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Function mask for grinding cycles | DWORD | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - |  |  |  |  |

Description: Function mask for grinding cycles
Bit 0: Reference point for recording dresser/grinding wheel is a work offset
0 : Deselect work offset as reference point
1: Select work offset as reference point
Bit 1: Reserved

| 52000 | DISP_COORDINATE_SYSTEM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Coordinate system position | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 47 | $7 / 3$ |  |

## Description:

With this MD, you adapt the operator panel's coordinate system to the machine's coordinate system. Depending on the selected position, all help screens, the sequence graphic, the simulation, and the input fields with the circular direction specified will change automatically in the user interface.
The machine data is evaluated in the cycles.
Also note MD52210 \$MCS_FUNCTION_MASK_DISP, bit 1.

| 52001 | DISP_COORDINATE_SYSTEM_2 | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - | Coordinate system for turning on milling machines | BYTE | PowerOn |  |  |
| - |  |  |  |  |  |
| - | - | 0 | 0 | 47 |  |



| 52005 | DISP_PLANE_MILL | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Plane selection Milling | BYTE | Immediately |  |  |  |
| - | - | 0 | 0 | 19 | $7 / 3$ |  |$\quad$ M $\quad$.

```
Description: Plane selection Milling
0: plane selection on the operator panel
17: always G17
18: always G18
19: always G19
```

| 52006 | DISP_PLANE_TURN |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Plane selection Turning |  |  |  |  |  | BYTE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 18 | 0 | 19 | ReadOnly |  |  |  |

## Description:

Plane selection Turning
0: plane selection on the operator panel
17: always G17
18: always G18
19: always G19

| 52010 | DISP_NUM_AXIS_BIG_FONT | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number of actual values with large font |  |  |  |  |  | BYTE | PowerOn |
| - | - | 3 | 0 | 31 | $7 / 3$ |  |  |  |$]$ M $\quad$|  |  |
| :--- | :--- |
| - | - |

Description: Number of actual values with large font


| Description: | Adapt the number of actual values with large font if the number of geometry axes changes, e.g. due to transformations like TRANSMIT or TRACYL. <br> $0=$ Only MD52010 "DISP_NUM_AXIS_BIG_FONT" is valid. The number is assigned as a fixed value. <br> $1=$ Only the geometry axes are displayed in large font. MD 52010 "DISP_NUM_AXIS_BIG_FONT" is ignored. <br> 2 = The number of geometry axes plus the content of MD 52010 "DISP_NUM_AXIS_BIG_FONT" are displayed in large font. |
| :---: | :---: |



Description: This MD specifies whether the axis identifiers of the orientation axes are Euler angle names or channel geometry axis names.
Possible values are:
$=0$ Orientation axis name from the channel block geometry axis name with the index 3 to 5
$=1$ Orientation axis name is the name of the Euler angle from the general machine data

| 52032 | STAT_DISPLAY_BASE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Number basis for display of articulated joint STAT | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 16 | $4 / 3$ |  |  |  |

## Description:

Numerical basis for displaying the articulated joint STAT
If the value of the data is greater than 0, MD51032 \$MNS_STAT_DISPLAY_BASE is ignored for this channel.
00: MD51032 is active
02: Representation as binary value
10: Representation as decimal value
16: Representation as hexadecimal value
The machine data activates not only the STAT display channel-specifically on the main screen, but also the display during "TEACH IN".

| 52033 | TU_DISPLAY_BASE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number basis for display of rotary axis position TU | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 16 | $4 / 3$ |  |

## Description:

Numerical basis for displaying the rotary axis position TU
If the value of the data is greater than 0, MD51033 \$MNS_TU_DISPLAY_BASE is ignored for this channel.
00: MD51033 is active
02: Representation as binary value
10: Representation as decimal value
16: Representation as hexadecimal value
The machine data activates not only the TU display channel-specifically on the main screen, but also the display during "TEACH IN".

| 52200 | TECHNOLOGY |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Technology |  |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 4 | 7/1 | M |
| Description: | Technolog <br> 0 : no spe <br> 1: turnin <br> 2: millin <br> 3: cylind <br> 4: surface <br> Also note | cor | Y_ |  |  |  |


| 52201 | TECHNOLOGY_EXTENSION |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Extended technology | BYTE | PowerOn |  |  |  |  |  |
| - | - | 0 | 0 | 4 | M |  |  |  |

Description: Advanced technology
0 : no specific configuration
1: turning
2: milling
Also note MD52200 \$MCS TECHNOLOGY.
Example:
Turning machine with milling technology
MD 52200 \$MCS_TECHNOLOGY = 1
MD 52201 \$MCS_TECHNOLOGY_EXTENSION = 2



| 52210 | FUNCTION_MASK_DISP | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Function mask for display | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 3 | - | - | $7 / 3$ |  |$]$ M

## Description: Function mask for display

Bit 0: Dimension system for programs always in the basic system
Bit 1: Face view when turning in the school coordinate system
Bit 2: Hide softkey "T,S,M" in the jog area

Bit 3: Generate automatic end-of-program in MDI (using the "Delete blocks" softkey)
Bit 4: Display follow-on tool in the T, F, S window
Bit 5: Hide "Act. values Machine" softkey
Bit 6: Hide tool radius/diameter in the T,F,S window
Bit 7: Hide tool lengths in the T,F,S window
Bit 8: Hide tool icon in the T, F,S window
Bit 9: Display "Simple input" selection
Bit 10: Do not offer channel in the job lists
Bit 11: For Work activate the display of the logical spindles
Bit 12: Hide mould making view for $G$ code
Bit 13: Hide channel axes which are currently located in another channel
0: Display channel axes which are currently located in another channel in grey
1: Hide channel axes which are currently located in another channel
Bit 14: Display overlay of the DRF under the machine
Bit 15: Display overlay of the tool (\$AA_TOFF) under the machine


Description:
Function mask for displaying overview of work offsets
Bit 0: Show Machine position
Bit 1: Reserved
Bit 2: Display DRF offset
Bit 3: Display \$AA_OFF position offset
Bit 4: Display \$P_PARTFRAME
Bit 5: Display \$P_SETFRAME
Bit 6: Display \$P_EXTSFRAME
Bit 7: Display \$P_ISO1FRAME
Bit 8: Display \$P_ISO2FRAME
Bit 9: Display \$P_ISO3FRAME
Bit 10: Display \$P_ACTBFRAME
Bit 11: Display \$P_IFRAME
Bit 12: Display \$P_TOOLFRAME
Bit 13: Display \$P_WPFRAME
Bit 14: Display \$P_TRAFRAME
Bit 15: Display \$P_PFRAME
Bit 16: Display \$P_ISO4FRAME
Bit 17: Display \$P_CYCFRAME
Bit 18: Display sum of work offsets
Bit 19: Display offset of active tool
Bit 20: Display Work position
Bit 21: Display BCS position
Bit 22: Display \$P_GFRAME
Bit 23: Display TOFF
Bit 24: Display overlay \$AA_TOFF


0 : The WO selection/deselection softkey is not available in the work offset table of the settable WOs.

1: The WO selection/deselection softkey is available in the work offset table of the settable WOs.
Bit 10: Enable swivel plane/align tool with kinematic transformation
0: Swivel plane/align tool with kinematic transformation not enabled
1: Swivel plane/align tool with kinematic transformation enabled
Bit 11: Disable position check for drilling and milling tools (ShopTurn)
$0:$ Cutting edge position check is active for drilling and milling tools
1: No cutting edge position check for drilling and milling tools
The cutting edge position check can be disabled for drilling and milling tools if this is necessary on account of the machine design.
Bit 12: Reserved
Bit 13: Approach tool change point $Y$ in the MCS (ShopTurn)
0 : The tool change point in the Work is only approached to 0 in the $Y$ direction if MD52241 \$MCS_TOOL_CHANGE_POS_Y $=0$.
1: Tool change point in the MCS is always approached in the $Y$ direction (see MD52241 \$MCS_TOOL_CHANGE_POS_Y).
Bit 14: With approach logic only check tool position with cutting edge (ShopTurn)
0: The approach logic always checks the tool position.
1: The approach logic only checks the tool position if a cutting edge is active.
Bit 15: Do not set \$MC_TOOL_CARRIER_RESET_VALUE after block search
0 : The current tool carrier is written in the machine data
\$MC_TOOL_CARRIER_RESET_VALUE in the block search cycle PROG_EVENT.SPF
1: The current tool carrier is not written in the machine data
\$MC_TOOL_CARRIER_RESET_VALUE in the block search cycle PROG_EVENT.SPF
Bit 16: Do not automatically execute swivel plane after block search
0 : The section for standard cycles: swivel plane is executed in the block search cycle PROG_EVENT.SPF
1: The section for standard cycles: swivel plane is not executed in the block search cycle PROG_EVENT.SPF
Bit 17: Do not automatically execute align turning tool after block search
0 : The section for align turning tool is executed in the block search cycle PROG_EVENT.SPF
1: The section for align turning tool is not executed in the block search cycle PROG_EVENT.SPF

| 52214 | FUNCTION_MASK_MILL | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Function mask for milling | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | - | - | $7 / 3$ |  |

## Description:

Function mask for milling
Bit 0: Enable cylinder surface transformation (ShopMill)
0 : Softkey not enabled for cylinder surface transformation
1: Cylinder surface transformation enabled
Bit 1: Offer fixed table for blank clamping (on milling machines)
0: Fixed table not offered for blank clamping
1: Offer fixed table for blank clamping
(This bit must only be set if a milling machine has a rotary axis and a fixed table for blank clamping.)
Bit 2: Special handling of side mill/saw for polyhedron

0: No special handling of side mill/saw for polyhedron
1: Special handling of side mill/saw for polyhedron
With this tool type, the first infeed is selected so that the upper edge of the tool exactly touches reference point $Z 0$.
At the end of machining, it is completely drawn out laterally from the blank spigot. This can create an internal polyhedron on a shaft.
Bit 3: Enable inside/rear machining (ShopTurn)
0: Inside/rear machining not enabled
1: Enable inside/rear machining in ShopTurn screenforms (applies in ShopTurn screenforms which define the machining planes)
Bit 4: Enable spindle clamping (C axis) (ShopTurn)
0: The parameter "Clamp/release spindle" is not shown in drilling or milling screenforms. ShopTurn clamps the spindle automatically if this is advantageous for machining.

1: The parameter "Clamp/release spindle" is shown in drilling and milling screenforms. The operator decides on the machining for which the spindle is clamped.
If you have implemented the function "Clamp/release spindle" by using the machine manufacturer cycle CUST_TECHCYC.SPF, you can activate the parameter "Clamp/release spindle"
in drilling and milling screenforms with this machine data.
Bit 5: Enable spindle control of tool spindle via user interface
0: Enable spindle control via the NC/PLC interface
1: Enable spindle control via user interface
Bit 6: Enable spindle control of turning spindle via user interface
0 : Enable spindle control via the NC/PLC interface
1: Enable spindle control via user interface
Bit 7: Offer fixed table for blank clamping (on drilling machines)
0 : Fixed table not offered for blank clamping
1: Offer fixed table for blank clamping
(This bit must only be set if a drilling machine has a rotary axis and a fixed table for blank clamping.)

| 52216 | FUNCTION_MASK_DRILL | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Function mask for drilling | DWORD | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 | - | - | $7 / 3$ |  |  |

Description: Function mask for drilling
Bit 0: CYCLE84 Show input fields, Technology
0: Hide input fields
1: Show input fields
Bit 1: CYCLE840 Show input fields, Technology
0: Hide input fields
1: Show input fields
Bit 2: Thread tapping also without encoder (ShopMill/ShopTurn)
0: Thread tapping only possible with encoder
1: Thread tapping also possible without encoder
The setting depends on whether the machine has an encoder for the tool spindle.
Bit 3: Constant cutting speed in relation to the diameter of the centering
(ShopMill/ShopTurn)
0: Constant cutting speed in relation to the diameter of the tool
1: Constant cutting speed in relation to the diameter of the centering

the thread first cut is not calculated with the synchronization point.
Bit 13: Stock removal along the contour with CYCLE95 (828D programGUIDE without Advanced Technology)
0 : The screenform for CYCLE952 is opened with the softkey contour turning/stock removal.
1: The screenform for CYCLE95 is opened with the softkey contour turning/stock removal.
Secondary conditions:

- 828D
- programGUIDE
- Without Advanced Technology option

| 52229 | ENABLE_QUICK_M_CODES |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - | Enable fast M functions | BYTE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - |  |  |  |  |  |

## Description:

Enable fast $M$ functions
Bit 0: Coolant OFF
Bit 1: Coolant 1 ON
Bit 2: Coolant 2 ON
Bit 3: Coolant 1 and 2 ON

| 52230 | M_CODE_ALL_COOLANTS_OFF | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | M code for all coolants OFF | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 9 | 0 | 32767 |  |  |

## Description:

M code for all coolants OFF

| 52231 | M_CODE_COOLANT_1_ON | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | M code for coolant 1 ON | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 8 | 0 | 32767 |  |  |

## Description: M code for coolant 1 ON

| 52232 | M_CODE_COOLANT_2_ON | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | M code for coolant 2 ON | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 7 | 0 | 32767 | $7 / 3$ |  |

Description: M code for coolant 2 ON

| 52233 | M_CODE_COOLANT_1_AND_2_ON | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | M code for both coolants ON | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | -1 | -1 | 32767 |  |  |

[^21]| 52240 | NAME_TOOL_CHANGE_PROG |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Tool change program for G code steps |  | STRING | Immediately |  |
| - |  |  |  |  |  |
| - | - - | - | - | 7/3 | M |
| Description: | Tool change program for G When inserting a tool usin into the program. <br> If the MD contains a text, the T command. <br> For example, the tool chan manufacturer specific tool |  | softkey, <br> y insert <br> be enter |  | ran <br> bl <br> - |



Description:
Tool change position $Y$ in Machine (ShopTurn)
In ShopTurn, the tool change point in $X$ and $Z$ can be specified in the Machine or Work. When the tool change point is approached, the $Y$ axis is simultaneously traversed to the value in the Machine specified in this MD.

| 52242 | TURN_TOOL_FIXING |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Tool adapter for turning tools |  | BYTE | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 2 | 7/3 | M |
| Description: | $\begin{aligned} & \text { Tool adapter for tu } \\ & 0=\text { turning tool in } \\ & 1=\text { turning tool fi } \\ & 2=\text { turning tool in } \end{aligned}$ | nd | at the |  |  |



Description: Parking position of the $Y$ axis with counterspindle in the Machine


| 52250 | M_CODE_CHUCK_OPEN |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | M code for Open chuck with non-rotating spindle |  |  |  |  |  | STRING | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 2 | - | - | $7 / 3$ | M |  |  |  |

Description: $\quad$| M code for Open chuck with non-rotating spindle. |
| :--- |
| Example: "M34" or "M1 $=34 "$ |
| Elements: |
| $[0]:$ Main spindle |
| $[1]:$ Counterspindle |,$\quad l$



| 52252 | M_CODE_CHUCK_CLOSE | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | M code for Close chuck | STRING | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 2 | - | - | - | M |  |  |

Description: M code for Close chuck

Example: "M34" or "M1=34"
Elements:
[0]: Main spindle
[1]: Counterspindle

| 52253 | M_CODE_TAILSTOCK_FORWARD |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | M code for quill forward |  |  | STRING | Immediately |  |
| - |  |  |  |  |  |  |
| - | 2 | - | - | - | 7/3 | M |

Description: M code for quill forward.
E.g.: "M55" or "M1=55"

Elements:
[0]: Quill opposite main spindle
[1]: Quill opposite counterspindle

| 52254 | M_CODE_TAILSTOCK_BACKWARD |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | M code for quill backward |  |  | STRING | Immediately |  |
| - |  |  |  |  |  |  |
| - | 2 | - | - | - | 7/3 | M |

Description: $\quad \mathrm{M}$ code for quill backward.
E.g.: "M54" or "M1=54"

Elements:
[0]: Quill opposite main spindle
[1]: Quill opposite counterspindle

| 52260 | MACHINE_JOG_INTERRUPT_PRIO |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Priority for start ASUB under machine JOG |  |  | BYTE | Imm |  |
| - |  |  |  |  |  |  |
| - | 1 | 1 | 1 | 8 | 7/3 | S |

Description: Priority for start ASUB under machine JOG

| 52270 | TM_FUNCTION_MASK |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Function mask for tool management |  | DWORD | PowerOn |  |
| - |  |  |  |  |  |
| - | 0 | - | - | 7/3 | M |

Description:
Function mask for tool management
Bit 0: Create tool on magazine location not allowed. Tools can only be created outside the magazine.

Bit 1: Load/unload disabled if machine is not in reset. Tools can only be loaded/ unloaded if the appropriate channel is in reset state.

Bit 2: Load/unload disabled on emergency stop. Tools can only be loaded/unloaded if emergency stop is not active.
Bit 3: Load/unload or relocate tool to/from buffer is disabled. Tools cannot be loaded/ unloaded or relocated in the buffer (spindle/gripper).
Bit 4: Loading is executed directly into the spindle. Tools are loaded exclusively directly into the spindle.
Bit 5: Use grinding configuration file for creating the tool lists. Only grinding tools are offered.

Bit 6: Relocating a tool to/from the buffer (spindle/gripper) is permitted despite a block (see bit3).

Bit 7: Create tool using the tool number. Specify the tool's $T$ number when creating the tool.

Bit 8: Hide Relocate tool. The function 'Relocate tool' is hidden on the user interface.
Bit 9: Hide Position magazine. The function 'Position magazine' is hidden on the user interface.

Bit 10: Reactivate tool using Position magazine. Prior to reactivation, the tool is positioned on the loading position.
Bit 11: Reactivate tool in all monitoring modes. When reactivating a tool, all monitoring modes enabled in the NC are
reactivated for this tool, even the monitoring modes, which have not been set for the relevant tool, but are available in the background only.
Bit 12: Hide Reactivate tool. The function 'Reactivate tool' is hidden on the user interface.

| 52271 | TM_MAG_PLACE_DISTANCE |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Distance betw. indiv. magazine locations |  | DOUBLE | PowerOn |  |
| - |  |  |  |  |  |
| - | 70 | 0 | 10000 | 7/3 | M |

Description:
Distance between individual magazine locations.
Is used for graphical display of magazine and tools in tool management.

| 52272 | TM_TOOL_LOAD_DEFAULT_MAG | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Default magazine for tool loading | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 30 | $7 / 3$ |  |

## Description: Default magazine for tool loading 0 = no default magazine



Description: Default magazine for tool relocation
0 = no default magazine

| 52274 | TM_TOOL_LOAD_STATION |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Number of load station | BYTE | PowerOn |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 16 |  |  |  |  |

## Description: Number of the loading station

0 = All configured stations are taken into account

| 52281 | TOOL_MCODE_FUNC_ON | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | M code for tool-specific function ON | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 4 | $-1,-1,-1,-1$ | -1 | 32767 |  |  |

$\begin{array}{ll}\text { Description: } & M \text { code for tool-specific function } O N \\ & \text { Value }-1 \text { means that the } M \text { function is not output. If both } M \text { commands of a function }\end{array}$ equal -1, the corresponding field will not be displayed in the user interface

| 52282 | TOOL_MCODE_FUNC_OFF | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | M code for tool-specific function OFF | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 4 | $-1,-1,-1,-1$ | -1 | 32767 |  |  |

Description: M code for tool-specific function OFF
Value - 1 means that the $M$ function is not output. If both $M$ commands of a function equal -1, the corresponding field will not be displayed in the user interface

| 52290 | SIM_DISPLAY_CONFIG <br> Location of status display of the channel in the simulation (OP019 <br> only) |  |  |  |  |  |  | - | BYTE | Immediately |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |  |  |
| - | - | 0x0F | - | - | M |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |  |

Description: Location of status display of the channel in the simulation
Only one of the 4 corners can be selected:
Bit 0 = Top left corner
Bit 1 = Top right corner
Bit 2 = Bottom left corner
Bit 3 = Bottom right corner
This MD is active only on the OPO19.

| 52740 | MEA_FUNCTION_MASK | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | $\begin{array}{l}\text { Function mask for measuring cycles, workpiece and tool } \\ \text { measuring }\end{array}$ | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 65536 | - | - | $7 / 3$ |  |$]$ M $\quad$.

## Description:

Function mask for measuring cycles
Bit 0: Workpiece measurement, probe input
0 : Workpiece probe connected to probe input 1
1: Workpiece probe connected to probe input 2
Bit 1: Workpiece measurement, turning technology, use of a third geometry axis (Y axis) in turning technology by the turning measurement cycles.

0 : No use or support of the $Y$ axis.
1: Default values for the turning measuring cycles refer to the $Y$ axis.
This means that the $Y$ axis can be used as a measuring or bypassing axis by the turning measuring cycles.

The tool length or work offset is always corrected in the components of the second geometry axis (X axis) during measurement in the $Y$ axis.

Note: The default values for the $Y$ axis are related to the diameter.
Bit 2: Correction angle is calculated with/without orientation transformation
0 : Correction angle (_MEA_CORR_ANGLE[1]) is calculated only with an active orientation transformation (TCARR, CYCLE800 or TRAORI)

1: Correction angle (_MEA_CORR_ANGLE[1]) is calculated even without an active orientation transformation and SD42940 \$SC_TOOL_LENGTH_CONST 1000s digit = 1 (calculation of tool
orientation) is set
Bit 16: Tool measurement, probe input
0: Tool probe connected to probe input 1
1: Tool probe connected to probe input 2
Bit 17: Tool measurement turning, recoding of the cutting edge positions
$0:$ No recoding
1: Internal recoding, cutting edge positions mirrored on the $X$ axis
Tool turret rotated through $180^{\circ}$, $Z$ axis not mirrored

| 52750 | J_MEA_FIXPOINT |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Z value for measuring fixed point |  |  | DOUBLE |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | - | - | 7/3 | 1 |


| 52751 | J_MEA_MAGN_GLAS_POS |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Zoom-in position for tool measurement |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | 2 | 0 | - | - | 7/3 | M |

## Description:

Zoom-in position for tool measurement
[0] = Position in the 1st axis
[1] = Position in the 2nd axis

\left.| 52780 | J_MEA_T_PROBE_APPR_MODE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Approach mode tool measurement in JOG | BYTE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 |  |  |  |  |$\right]$| M |
| :--- |

## Description:

Approach mode tool measurement in JOG
$=0$ : technology-dependent approach to the tool probe
Turning technology: manual approach
Milling technology : automatic approach
=1: technology independent approach to the tool probe
Manual approach to the tool probe
=2: technology-independent approach to the tool probe
Automatic approach to the tool probe

| 52800 | ISO_M_ENABLE_POLAR_COORD | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Polar coordinates | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | M |  |

## Description: Polar coordinates

0: OFF
1: ON

| 52802 | ISO_ENABLE_INTERRUPTS |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Interrupt process |  |  |  |  |  |  | BYTE | Immediately |
| - | - | 0 | 0 | 1 | $7 / 3$ |  |  |  |  |
| - | - |  |  |  |  |  |  |  |  |

## Description:

Interrupt process
0: OFF
1: ON


Description: Maching skipped during tapping G74/G84 at DRYRUN
0: OFF
1: ON

| 52806 | ISO_SCALING_SYSTEM |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Basic system | BYTE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $7 / 7$ |  |  |  |

## Description: <br> Basic system:

[^22]| 52808 | ISO_SIMULTAN_AXES_START | - | - |  |
| :--- | :--- | :--- | :--- | :--- |
| - | Simultaneous approach to the boring position on all programmed <br> axes | BYTE | Immediately |  |
| - | - | 0 | 0 | 1 |
| - | - | 0 | M |  |
| Description: | Simultaneous approach to the boring position on all programmed axes <br> $0:$ OFF <br> $1:$ ON |  |  |  |


| 52810 | ISO_T_DEEPHOLE_DRILL_MODE |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Deep hole drilling with chipbreaking/stock removal |  | BYTE | Immediately |  |
| - |  |  |  |  |  |
| - | - 0 | 0 0 | 1 | 7/3 | M |
| Description: |  | of deep hole drill rilling with chipbrea rilling with stock r |  |  |  |


| 52818 | ISO_M_FUNCTION_MASK | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Function mask for ISO milling mode | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | - | - | $7 / 3$ |  |$]$ M

## Description:

Function mask for ISO milling mode

| 52819 | ISO_T_FUNCTION_MASK | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Function mask for ISO turning mode | DWORD | Immediately |  |  |  |
| - | - | 0 | - | - | $7 / 3$ |  |

Description: Function mask for ISO turning mode

| 52840 | GRIND_FUNCTION_MASK | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Function mask for grinding | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | - | - | $7 / 3$ |  |$]$ M

## Description:

Function mask for grinding
Bit 7: Retraction while profiling with G1
0: Retraction while profiling with rapid traverse (GO)
1: Retraction while profiling with feedrate (G1)

| 52842 | GRIND_DIAMETER_LENGTH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Number of diameter length | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 1 | 2 | $7 / 3$ |  |

Description: Grinding technology: Number of the tool length for the grinding wheel diameter:
1: Length 1 is grinding wheel diameter
2: Length 2 is grinding wheel diameter

| 52843 | GRIND_WIDTH_LENGTH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Number of grinding wheel width | BYTE | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 2 | 1 | 2 |  |  |


| Description: | Grinding technology: Number of the tool length for the grinding wheel width: |
| :--- | :--- |
|  | $1:$ Length 1 is grinding wheel width |

2: Length 2 is grinding wheel width

| 53030 | AXIS_MAX_POWER | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\%$ | Maximum value of axis power rating display |  |  |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | DWORD | PowerOn |  |  |

Description: $\quad$| Maximum value of permissible axis power rating in percent. |
| :--- |
|  |
| The display bar is shown green in the range between 0 and the value of AXIS_MAX_POWER. |

| 53031 | AXIS_POWER_RANGE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\%$ | Display range of axis power rating display | DWORD | PowerOn |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 100 | 0 | 255 |  |  |
| $4 / 3$ | M |  |  |  |  |  |

Description: Scale end value for the axis power display as a percentage. The value must be greater than or equal to AXIS_MAX_POWER.
The bar display is shown red in the area between the values of AXIS_MAX_POWER and AXIS_POWER_RANGE.

| 53220 | AXIS_MCS_POSITION |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Position of axis in the Machine |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| - | 3 | 0 | - | - | 7/3 | M |

## Description:

Position of axis in the Machine:
The 3 field elements specify the position in $X, Y, Z$.
For linear axes, the value corresponds to the zero point of the axis in the Machine. For rotary axes, the position of the rotary axis is defined in the Machine.

| 53230 | SIM_START_POSITION |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm, degrees | Axis position at start of simulation |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 0 | - | - |  |  |  |  |

## Description:

Axis position at start of simulation
Simulation is only possible if a value not equal to 0 has been set for at least one geometry axs.

| 53240 | SPINDLE_PARAMETER |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Spindle chuck data |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 3 | 0 | - | - | $7 / 7$ |  |  |  |

## Description: Spindle chuck data:

[0]: Chuck dimension
[1]: Stop dimension
[2]: Jaw dimension

| 53241 | SPINDLE_CHUCK_TYPE |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Spindle jaw type |  | BYTE | Immediately |  |
| - |  |  |  |  |  |
| - | 0 | - | - | 7/7 | U |

Description: Spindle jaw type:
0 = Clamping from outside
1 = Clamping from inside

| 53242 | TAILSTOCK_PARAMETER |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Tailstock data |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 2 | 0 | - | - | $7 / 7$ |  |  |  |

## Description: Tailstock data:

[0]: Tailstock diameter
[1]: Tailstock length

| 53250 | CLAMPING_TOLERANCE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm, degrees | Permissible tolerance when an axis jams |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.1 | 10 | M |  |  |  |  |

Description:
Permissible tolerance when an axis jams.
When jamming, an axis can be pushed somewhat out of its position.
With this machine date you define up to which tolerance level the axis does not have to be repositioned.

| 54215 | TM_FUNCTION_MASK_SET |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Function mask for tool management |  | DWORD | Pow |  |
| - |  |  |  |  |  |
| - | 0 | - | - | 7/4 | M |

## Description:

Function mask for tool management
Bit 0: Diameter display for rotating tools. It is not the radius value but the diameter that is displayed for rotating tools.
Bit 1: Default direction of rotation for all turning tools is M4. Direction of rotation M4 is assigned by default when turning tools are created.
Bit 2: Create tool without suggesting name.
Bit 3: Input disable for tool name and tool type in the case of loaded tools. Once tools have been loaded, the tool name and the tool type can no longer be changed.
Bit 4: Input disable for loaded tools if the channel is not in reset.
Bit 5: Accrue tool wear entries additively. Tool wear data entries are added to the existing wear value.
Bit 6: Entry of tool ID in numerical format. The tool ID may only be entered using numbers.
Bit 7: Hide tool monitoring parameters. The tool monitoring parameters are hidden on the user interface.
Bit 8: Diameter display for transverse axis geometry. The geometry value for the transverse axis is displayed as a diameter value.
Bit 9: Diameter display for transverse axis wear. The wear value for the transverse axis is displayed as a diameter value.

Bit 10: Enable loading/relocation of tool in buffer locations. The magazine number can be entered in the load dialog box. The magazine number 9998 is then used to access the buffer location.
Bit 11: Creation of new tools in gripper locations is disabled.
Bit 12: Measuring tools are not unloaded when the "Unload all" function is executed.
Bit 13: The wear value is not deleted on entry of a tool geometry value.
Bit 14: Load or relocate tool. The search for an empty location is made without assignment with the last used magazine.
0: The search for an empty location always starts with the last used magazine. 1: The search for an empty location follows the set search strategy.

| 54480 | AST_MMC_HANDLER_NAME |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Assignment of an HMI Operate instance for AST commands | STRING | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | - | - | - | $1 / 1$ |  |  |  |

Description: Name of the assigned HMI Operate (master)
One Operate must be defined as the master.

| 54481 | AST_MMC_DEFAULT_IS_PCU | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Selection of HMI Operate internally (NCU) / externally (PCU) for <br> AST | BOOLEAN | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $1 / 1$ |  |

Description: Selection of HMI Operate internally (NCU) / externally (PCU) for AST
Selection of the Operate type

| 54600 | MEA_WP_BALL_DIAM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Effective diameter of the probe sphere for the workpiece probe | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 10000 |  |  |
| $7 / 7$ | U |  |  |  |  |  |

Description: Effective sphere diameter of the probe sphere for the workpiece probe. The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54601 | MEA_WP_TRIG_MINUS_DIR_AX1 | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Trigger point of the 1st measuring axis in negative direction | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | -100000 | 100000 | $7 / 7$ |  |  |

Description: Trigger point of the 1st measuring axis (abscissa) in negative traversing direction (X at G17) of the workpiece probe.
The term "negative traversing direction" refers to the currently active workpiece zero point reference!
The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54602 | MEA_WP_TRIG_PLUS_DIR_AX1 | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Trigger point of the 1st measuring axis in positive direction | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | -100000 | 100000 | $7 / 7$ |  |  |

Description: Trigger point of the 1st measuring axis (abscissa) in positive traversing direction (X at G17) of the workpiece probe.
The term "positive traversing direction" refers to the currently active workpiece zero point reference!

The value of this parameter is created by the operation "Calibrate workpiece probe"!



| 54605 | MEA_WP_TRIG_MINUS_DIR_AX3 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm |  |  |  |  |  |  |  |  |
| - | Trigger point of the 3rd measuring axis in negative direction | DOUBLE | Immediately |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | -100000 | 100000 | $7 / 7$ |  |  |  |

Description: Trigger point of the 3rd measuring axis (applicate) in negative traversing direction
(Z at G17) of the workpiece probe.
The term "negative traversing direction" refers to the currently active workpiece zero point reference!

The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54606 | MEA_WP_TRIG_PLUS_DIR_AX3 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm |  |  |  |  |  |  |
| - | Trigger point of the 3rd measuring axis in positive direction | DOUBLE | Immediately |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | -100000 | 100000 |  |  |
| $7 / 7$ | U |  |  |  |  |  |

Description: Trigger point of the 3rd measuring axis (applicate) in positive traversing direction (Z at G17) of the workpiece probe.
The term "positive traversing direction" refers to the currently active workpiece zero point reference!
The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54607 | MEA_WP_POS_DEV_AX1 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm | Position deviation of the probe sphere in the 1st measuring axis | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | -100000 | 100000 | $7 / 7$ |  |

Description: The position deviation in the lst measuring axis represents a geometrical offset of the center point of the probe sphere
related to the electrical center point of the probe in this axis!
The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54608 | MEA_WP_POS_DEV_AX2 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Position deviation of the probe sphere in the 2nd measuring axis | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | -100000 | 100000 |  |  |
| $7 / 7$ | U |  |  |  |  |  |

Description: The position deviation in the 2 nd measuring axis represents a geometrical offset of the center point of the probe sphere
related to the electrical center point of the probe in this axis!
The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54609 | MEA_WP_STATUS_RT |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Calibration status axis positions |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | 7/7 | U |

Description: Calibration status of the axis positions reserved for internal use!
The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54610 | MEA_WP_STATUS_GEN | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |  |
| - | Calibration status in general | DOUBLE | Immediately |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | - | - | $7 / 7$ |  |  |

## Description: Calibration status in general reserved for internal use! The value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54611 | MEA_WP_FEED | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Measuring feed for calibration | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 40 | $0,0,0,0,0,0,0,0 \ldots$ | 0 | 100000 | $7 / 7$ |  |

## Description:

Measure workpiece measuring feed for calibration
This measuring feed is used for all subsequent workpiece measuring programs in conjunction with the probe field.

| 54615 | MEA_CAL_EDGE_BASE_AX1 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Calibration groove base of the 1st measuring axis |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $0,0,0$ | -100000 | 100000 |  |  |  |  |

$\begin{array}{ll}\text { Description: } & \text { Calibration groove base of the lst measuring axis (abscissa, } Z \text { at G18) } \\ \text { This parameter is a geometrical component of the calibration groove and must be }\end{array}$ supplied by the user!

| 54617 | MEA_CAL_EDGE_PLUS_DIR_AX1 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Calibration groove edge in positive direction of the 1st measuring <br> axis | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 3 | $0,0,0$ | -100000 | 100000 |  |  |

Description: Calibration groove edge in positive direction of the lst measuring axis (abscissa, $Z$ at G18)
This parameter is a geometrical component of the calibration groove and must be supplied by the user!


| 54619 | MEA_CAL_EDGE_BASE_AX2 |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Calibration groove base of the 2nd measuring axis |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | 3 | 0, 0, 0 | -100000 | 100000 | 7/7 | U |

Description: Calibration groove base of the 2nd measuring axis (ordinate, X at G18) supplied by the user!

| 54620 | MEA_CAL_EDGE_UPPER_AX2 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Calibration groove upper edge of the 2nd measuring axis |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 3 | $0,0,0$ | -100000 | 100000 | $7 / 7$ |  |  |  |

Description:
Calibration groove upper edge of the 2 nd measuring axis (ordinate, $X$ at $G 18$ )
This parameter is a geometrical component of the calibration groove and must be supplied by the user!

| 54621 | MEA_CAL_EDGE_PLUS_DIR_AX2 | - | - |  |
| :--- | :--- | :--- | :--- | :--- |
| mm | Calibration groove edge in positive direction of the 2nd measuring <br> axis | DOUBLE | Immediately |  |
| - | 3 | -100000 | 100000 | U |
| - | Calibration groove edge in positive direction of the 2nd measuring axis (ordinate, X <br> at G18) <br> This parameter is a geometrical component of the calibration groove and must be <br> Supplied by the user! |  |  |  |


| 54622 | MEA_CAL_EDGE_MINUS_DIR_AX2 |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Calibration groove edge in negative direction of the 2nd measuring <br> axis | DOUBLE | Immediately |  |  |  |  |  |  |
| - | 3 | $0,0,0$ | -100000 | 100000 | $7 / 7$ |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |

Description: Calibration groove edge in negative direction of the 2 nd measuring axis (ordinate, $X$ at G18)
This parameter is a geometrical component of the calibration groove and must be supplied by the user!

| 54625 | MEA_TP_TRIG_MINUS_DIR_AX1 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm |  |  |  |  |  |  |
| - | Trigger point of the 1st measuring axis in negative direction | DOUBLE | Immediately |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 |  |  |

Description: |  | Trigger point of the lst measuring axis in negative direction (abscissa, $X$ at $G 17, Z$ |
| :--- | :--- |
|  | The trigger point refers to the machine coordinate system (Machine). |
|  | Prior to calibration the approximate trigger point must be entered in the machine |
|  | coordinate system! |
|  | The exact value of this parameter is created by the operation "Calibrate workpiece |
| probe"! |  |

| 54626 | MEA_TP_TRIG_PLUS_DIR_AX1 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm |  |  |  |  |  |  |
| - | Trigger point of the 1st measuring axis in positive direction | DOUBLE | Immediately |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 |  |  |
| $7 / 7$ | U |  |  |  |  |  |

Description: Trigger point of the lst measuring axis in positive direction (abscissa, X at G17, $Z$ at G18)
The trigger point refers to the machine coordinate system (Machine).
Prior to calibration the approximate trigger point must be entered in the machine coordinate system!
The exact value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54627 | MEA_TP_TRIG_MINUS_DIR_AX2 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Trigger point of the 2nd measuring axis in negative direction |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 |  |  |  |  |

Description: Trigger point of the 2nd measuring axis in negative direction (ordinate, $Y$ at $G 17$, $X$ at G18)

The trigger point refers to the machine coordinate system (Machine).
Prior to calibration the approximate trigger point must be entered in the machine coordinate system!
The exact value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54628 | MEA_TP_TRIG_PLUS_DIR_AX2 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Trigger point of the 2nd measuring axis in positive direction | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 |  |  |

Description: Trigger point of the 2nd measuring axis in positive direction (ordinate, $Y$ at $G 17$, $X$ at G18)
The trigger point refers to the machine coordinate system (Machine).
Prior to calibration the approximate trigger point must be entered in the machine coordinate system!
The exact value of this parameter is created by the operation "Calibrate workpiece probe"!

| 54629 | MEA_TP_TRIG_MINUS_DIR_AX3 | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Trigger point of the 3rd measuring axis in negative direction | DOUBLE | Immediately |  |  |
| - | 6 | -100000 | 100000 | $7 / 7$ | U |
| - | 6 | $0,0,0,0,0,0$ |  |  |  |

Description: Trigger point of the 3rd measuring axis in negative direction (applicate, $Z$ at $G 17$, $Y$ at G18)
The trigger point refers to the machine coordinate system (Machine).

Prior to calibration the approximate trigger point must be entered in the machine coordinate system!
The exact value of this parameter is created by the operation "Calibrate workpiece probe"!


| 54631 | MEA_TP_EDGE_DISK_SIZE |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Tool probe edge length/wheel diameter |  |  |  |  |  | DOUBLE | Immediately |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 1000 | $7 / 7$ |  |  |  |  |
| - | 6 |  | U |  |  |  |  |  |  |

Description: Effective edge length or grinding wheel diameter of the tool probe.
This data is important for the "Milling" technology when measuring the length of milling tools.


| 54633 | MEA_TP_TYPE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Tool probe type cube / wheel / probe head | DOUBLE | Immediately |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 999 | $7 / 7$ |  |

Description: Tool probe type

```
    0: Compatibility (measuring cycles: cube, turning surface shows probe head, milling
surface shows wheel)
101: Wheel in XY, working plane G17
201: Wheel in ZX, working plane G18
301: Wheel in YZ, working plane G19
2: Probe head
3: Cube
```

| 54634 | MEA_TP_CAL_MEASURE_DEPTH | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Distance between the upper tool probe edge and the lower milling <br> tool edge | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 6 | $2,2,2,2,2,2$ | -1000 | 1000 | $7 / 7$ |  |  |

Description: Distance between the upper tool probe edge and the lower milling tool edge.
For tool probe calibration this distance defines the calibration depth and
for milling tool measuring the measuring depth!
This parameter does not apply to turning tool measuring!


Description: Calibration status general, reserved for internal use
The value of this parameter is assigned when the "Calibrate tool probe" procedure is executed.

| 54636 | MEA_TP_FEED | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm/min | Measuring feed for tool probe calibration in the Machine | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 100000 |  |  |
| $7 / 7$ | U |  |  |  |  |  |

Description: Measuring feed for tool probe calibration in Machine
This measuring feed is used for all subsequent tool measuring programs in conjunction with the probe field.

| 54640 | MEA_TPW_TRIG_MINUS_DIR_AX1 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Trigger point of the 1st measuring axis in negative direction |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 |  |  |  |  |
| $7 / 7$ | U |  |  |  |  |  |  |  |

Description: Trigger point of the lst measuring axis in negative direction (abscissa, X at G17, Z at G18)

The trigger point refers to the workpiece coordinate system (Work).
Prior to calibration the approximate trigger point must be entered in the workpiece coordinate system!
The exact value of this parameter is created by the operation "Calibrate tool probe"!

| 54641 | MEA_TPW_TRIG_PLUS_DIR_AX1 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm |  |  |  |  |  |  |
| - | Trigger point of the 1st measuring axis in positive direction | DOUBLE | Immediately |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 |  |  |

```
Description: Trigger point of the 1st measuring axis in positive direction (abscissa, X at G17, Z
at G18)
The trigger point refers to the workpiece coordinate system (Work).
Prior to calibration the approximate trigger point must be entered in the workpiece
coordinate system!
The exact value of this parameter is created by the operation "Calibrate tool probe"!
```

| 54642 | MEA_TPW_TRIG_MINUS_DIR_AX2 | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Trigger point of the 2nd measuring axis in negative direction | DOUBLE | Immediately |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 | $7 / 7$ |
| - | 6 |  |  |  |  |

Description: Trigger point of the 2nd measuring axis in negative direction (ordinate, $Y$ at $G 17$, $X$ at G18)

The trigger point refers to the workpiece coordinate system (Work).
Prior to calibration the approximate trigger point must be entered in the workpiece coordinate system!
The exact value of this parameter is created by the operation "Calibrate tool probe"!

| 54643 | MEA_TPW_TRIG_PLUS_DIR_AX2 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Trigger point of the 2nd measuring axis in positive direction |  |  |  |  |  | DOUBLE | Immediately |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 | $7 / 7$ |  |  |  |
| - |  |  |  |  |  |  |  |  |

Description: Trigger point of the 2nd measuring axis in positive direction (ordinate, $Y$ at $G 17$, $X$ at G18)

The trigger point refers to the workpiece coordinate system (Work).
Prior to calibration the approximate trigger point must be entered in the workpiece coordinate system!
The exact value of this parameter is created by the operation "Calibrate tool probe"!

| 54644 | MEA_TPW_TRIG_MINUS_DIR_AX3 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm |  |  |  |  |  |  |
| - | Trigger point of the 3rd measuring axis in negative direction | DOUBLE | Immediately |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | -100000 | 100000 | $7 / 7$ |  |

Description: Trigger point of the 3rd measuring axis in negative direction (applicate, Z at Gl7, Y at G18)
The trigger point refers to the workpiece coordinate system (Work).
Prior to calibration the approximate trigger point must be entered in the workpiece coordinate system!
The exact value of this parameter is created by the operation "Calibrate tool probe"!


| 54646 | MEA_TPW_EDGE_DISK_SIZE | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Tool probe edge length/wheel diameter |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 1000 |  |  |  |  |
| $7 / 7$ | U |  |  |  |  |  |  |  |

Description: Effective edge length or grinding wheel diameter of the tool probe.
Milling tools are normally measured with wheel-shaped probes while turning tools
are measured with square probes.

| 54647 | MEA_TPW_AX_DIR_AUTO_CAL | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |  |
| - | Automatic tool probe calibration, enable axes/directions | DWORD | Immediately |  |  |  |  |
| - | 6 | $133,133,133,133$, <br> 133,133 | - | - | $7 / 7$ |  |  |

Description:
Enabling axes and traversing directions for "Automatic calibration" in the workpiece coordinate system (Work) of milling tool probes.
The default setting refers in $X$ and $Y$ to the plus and minus direction respectively, in $Z$ only to the minus direction.
The parameter is divided into six components, the functions of which are assigned to calibration data records 1 to 6.
Meaning of the parameter components
Decimal position:
Units $\quad$ 1st geometry axis (X)
Tens: 2nd geometry axis (Y)
Hundreds: 3rd geometry axis (Z)
Value:
=0: axis not enabled
=1: only minus direction possible
=2: only plus direction possible
=3: both directions possible

| 54648 | MEA_TPW_TYPE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Tool probe type cube $/$ wheel / probe head | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | - | - |  |  |

Description: Tool probe type
0: Compatibility (measuring cycles: cube, turning interface shows probe head, milling interface shows disc)
101: Disk in XY, working plane G17
201: Disk in ZX, working plane G18
301: Disk in YZ, working plane G19
2: Probe head
3: Cube

| 54649 | MEA_TPW_CAL_MEASURE_DEPTH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm | Distance between the upper tool probe edge and the lower milling <br> tool edge | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 6 | $2,2,2,2,2,2$ | 0 | 999 | $7 / 7$ |  |

Description: Distance between the upper tool probe edge and the lower milling tool edge.

```
For tool probe calibration this distance defines the calibration depth and
for milling tool measuring the measuring depth!
This parameter does not apply to turning tool measuring!
```

| 54650 | MEA_TPW_STATUS_GEN |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Calibration status in general |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | - | - | U |  |  |  |

Description:
Calibration status general, reserved for internal use The value of this parameter is assigned when the "Calibrate tool probe" procedure is executed.

| 54651 | MEA_TPW_FEED |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Measuring feed for tool probe calibration in the Work |  |  |  |  |  |  |  |
| - | DOUBLE | Immediately |  |  |  |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 100000 | $7 / 7$ |  |  |  |

Description: Measuring feed for tool probe calibration in Work
This measuring feed is used for all subsequent tool measuring programs in conjunction with the probe field.

| 54652 | MEA_INPUT_TOOL_PROBE_SUB | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Tool probe available/active on the counterspindle | BYTE | Immediately |  |  |  |
| - | 6 | $0,0,0,0,0,0$ | 0 | 11 | $7 / 2$ |  |

Description:
CNC measurement input for tool probe with reference to the counterspindle \$SNS_MEA_INPUT_TOOL_PROBE_SUB [ [n]
=0: Toolsetter no. $=\mathrm{n}+1$, with reference to the main spindle, CNC measurement input corresponds to the value of \$MCS_MEA_FUNCTION_MASK, bit16 (Input values 1 to 9 have the same functional effect as input 0!)
=10: Toolsetter no. $=\mathrm{n}+1$, with reference to the counterspindle, units digit $=0$ corresponds to CNC measurement input 1
=11: Toolsetter no. $=\mathrm{n}+1$, with reference to the counterspindle, units digit $=1$ corresponds to CNC measurement input 2

| 54670 | MEA_CM_MAX_PERI_SPEED |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{m} / \mathrm{min}$ | Max. permissible peripheral speed of the tool to be measured |  |  |  |  |  | DOUBLE | Immediately |
| - | 2 | 100,100 | 0 | 10000 | $7 / 7$ |  |  |  |
| - | 2 | U |  |  |  |  |  |  |

Description:
Max. permissible peripheral speed of the tool to be measured when the spindle rotates. Monitoring parameter for tool measuring with rotating spindle

| 54671 | MEA_CM_MAX_REVOLUTIONS | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| rev/min | Maximum tool speed for tool measuring |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 2 | 1000,1000 | 0 | 100000 | $7 / 7$ |  |  |  |

Description: Max. permissible tool speed for tool measuring with rotating spindle.
The speed is automatically reduced when this value is exceeded.
Monitoring parameter for tool measuring with rotating spindle

| 54672 | MEA_CM_MAX_FEEDRATE | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Maximum feed for contact of the tool with the probe |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |
| - | 2 | 20,20 | 0 | 100000 |  |  |  |

Description: Max. permissible feed for contact of the tool to be measured with the probe when the spindle rotates.
Monitoring parameter for tool measuring with rotating spindle

| 54673 | MEA_CM_MIN_FEEDRATE | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Minimum feed for 1st contact of the tool with the probe |  |  |  |  |  | DOUBLE | Immediately |
| - | 2 | 1,1 | 0 | 100000 | $7 / 7$ |  |  |  |
| - | 2 |  | U |  |  |  |  |  |

Description: Min. feed for first contact of the tool to be measured with the probe when the spindle rotates.
Too small feeds for large tool radii are thus avoided!
Monitoring parameter for tool measuring with rotating spindle

| 54674 | MEA_CM_SPIND_ROT_DIR | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Direction of spindle rotation for tool measuring | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 2 | 4,4 | 3 | 4 | $7 / 7$ |  |  |

Description: Direction of spindle rotation for tool measuring with rotating spindle (default: $4=$ M4)
Notice: if the spindle is already rotating when the measuring cycle is called, the direction of rotation is maintained
independently of \$SNS_MEA_CM_SPIND_ROT_DIR!
Monitoring parameter for tool measuring with rotating spindle

| 54675 | MEA_CM_FEEDFACTOR_1 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Feedrate factor 1, for tool measuring | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 10,10 | - | - |  |  |

Description: Feedrate factor 1 , for tool measuring with rotating spindle
$=0$ : single probing with the feedrate calculated by the cycle (but at least with the value of \$SNS_MEA_CM_MIN_FEEDRATE)
>=1: first probing with calculated feedrate (but at least with the value of \$SNS_MEA_CM_MIN_FEEDRATE).
Monitoring parameter for tool measuring with rotating spindle

| 54676 | MEA_CM_FEEDFACTOR_2 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Feedrate factor 2, for tool measuring | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 2 | 0,0 | - | - | $7 / 7$ |  |

Description: Feedrate factor 2, for tool measuring with rotating spindle
$=0$ : second probing with the feedrate calculated by the cycle (only effective with MEA_CM_FEEDFACTOR_1 > 0)
>=1: second probing with calculated feedrate, feedrate factor 2
Third probing with calculated feedrate (tool speed is influenced by SD54749
\$SNS_MEA_FUNCTION_MASK_TOOL, Bit 12)
Notice: - Feedrate factor 2 should be smaller than feedrate factor 1!
not performed!
Monitoring parameter for tool measuring with rotating spindle


| 54689 | MEA_T_PROBE_MANUFACTURER | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Tool probe type (manufacturer) | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 | $7 / 5$ |  |

## Description:

Tool probe type (manufacturer)
These indications are required for tool measuring with rotating spindle.
=0: no indication
=1: TT130 (Heidenhain)
=2: TS27R (Renishaw)


Description: $\quad \begin{aligned} & \text { Measurement result offset for tool measuring with rotating spindle. } \\ & =0 \text { : no offset } \\ & \\ & =1: \text { cycle-internal offset (only effective with SD54690 } \\ & \\ & \$ \text { SNS_MEA_T_PROBE_MANUFACTURER<>0) } \\ & \end{aligned}$

| 54692 | MEA_T_CIRCULAR_ARC_DIST | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Distance between meas. pts with meas. function "Check teeth <br> individually" | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0.25 | 5 | $7 / 7$ |  |  |  |

Description: The data value is used for measuring the tool radius with the function "Check teeth individually".
The distance (measured at the circumference of the tool) between the points at which measurements are made to find the "highest point on the longest tooth" must be entered. If the data value is ZERO, then the search for the "highest point on the longest tooth" is not made with a stationary spindle,
instead the value is measured by sampling while the spindle is rotating.

| 54693 | MEA_T_MAX_STEPS |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Max. number of contacts for measuring function "Check teeth <br> individually" | BYTE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 10 | 0 | 15 | U |  |  |  |  |

Description: | Maximum number of contacts for finding the "highest point on the longest tooth" when |
| :--- |
| measuring the tool radius. |
| If the data value is ZERO, then the search for the "highest point on the longest tooth" |
| is not made with a stationary spindle, |
| instead the value is measured by sampling while the spindle is rotating. | l$l$

| 54695 | MEA_RESULT_OFFSET_TAB_RAD1 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Offset table (measure tool radius with rotating spindle) |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 5 | $0,0,0,0,0$ | - | - |  |  |  |  |

Description: Parameter for user-defined measurement result offset for tool measuring with rotating spindle
\$SNS_MEA_RESULT_OFFSET_TAB_RAD1[0] ... this element always has value ZERO
\$SNS_MEA_RESULT_OFFSET_TAB_RAD1[1] ... 1st tool radius
\$SNS_MEA_RESULT_OFFSET_TAB_RAD1[2] ... 2nd tool radius
\$SNS_MEA_RESULT_OFFSET_TAB_RAD1[3] ... 3rd tool radius
\$SNS_MEA_RESULT_OFFSET_TAB_RAD1[4] ... 4th tool radius

| 54696 | MEA_RESULT_OFFSET_TAB_RAD2 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Offset table 1st peripheral speed (radius) | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 5 | $0,0,0,0,0$ | - | - | $7 / 5$ |  |  |  |

Description: Parameter for user-defined measurement result offset for tool measuring with rotating spindle
\$SNS_MEA_RESULT_OFFSET_TAB_RAD2[0] ... 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD2[1] ... offset value for radius regarding 1st
radius and 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD2[2] ... offset value for radius regarding 2nd
radius and 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD2[3] ... offset value for radius regarding 3rd
radius and 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD2[4] ... offset value for radius regarding 4th
radius and 1st peripheral speed

| 54697 | MEA_RESULT_OFFSET_TAB_RAD3 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Offset table 2nd peripheral speed (radius) |  |  |  |  |  | DOUBLE | Immediately |
| - | 5 | $0,0,0,0,0$ | - | - | $7 / 5$ |  |  |  |
| - | 5 |  |  |  |  |  |  |  |

Description: Parameter for user-defined measurement result offset for tool measuring with rotating spindle
\$SNS_MEA_RESULT_OFFSET_TAB_RAD3[0] ... 2nd peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD3[1] ... offset value for radius regarding 1st
radius and 2 nd peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD3[2] ... offset value for radius regarding 2nd
radius and $2 n d$ peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD3[3] ... offset value for radius regarding 3rd
radius and 2nd peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_RAD3[4] ... offset value for radius regarding 4th
radius and 2nd peripheral speed



| 54706 | MEA_RESULT_OFFSET_TAB_LEN2 |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Offset table 1st peripheral speed (length) |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | 5 | 0, 0, 0, 0, 0 | - | - | 7/5 | U |

Description: Parameter for user-defined measurement result offset for tool measuring with rotating spindle
\$SNS_MEA_RESULT_OFFSET_TAB_LEN2[0] ... 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_LEN2[1] ... offset value for radius regarding 1st
radius and 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_LEN2[2] ... offset value for radius regarding 2nd
radius and 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_LEN2[3] ... offset value for radius regarding 3rd radius and 1st peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_LEN2[4] ... offset value for radius regarding 4th radius and 1st peripheral speed

| 54707 | MEA_RESULT_OFFSET_TAB_LEN3 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Offset table 2nd peripheral speed (length) |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 5 | $0,0,0,0,0$ | - | - | U |  |  |  |

Description: Parameter for user-defined measurement result offset for tool measuring with rotating spindle
\$SNS_MEA_RESULT_OFFSET_TAB_LEN3[0] ... 2nd peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_LEN3[1] ... offset value for radius regarding 1st
radius and 2 nd peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_LEN3[2] ... offset value for radius regarding 2nd radius and 2nd peripheral speed \$SNS_MEA_RESULT_OFFSET_TAB_LEN3[3] ... offset value for radius regarding 3rd radius and 2nd peripheral speed \$SNS_MEA_RESULT_OFFSET_TAB_LEN3[4] ... offset value for radius regarding 4th radius and 2nd peripheral speed

| 54708 | MEA_RESULT_OFFSET_TAB_LEN4 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Offset table 3rd peripheral speed (length) | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | 5 | $0,0,0,0,0$ | - | - | U |  |  |  |

Description: Parameter for user-defined measurement result offset for tool measuring with rotating spindle

```
$SNS_MEA_RESULT_OFFSET_TAB_LEN4[0]
$SNS_MEA_RESULT_OFFSET_TAB_LEN4 [1]
radius and 3rd peripheral speed
$SNS_MEA_RESULT_OFFSET_TAB_LEN4 [2]
radius and 3rd peripheral speed
$SNS_MEA_RESULT_OFFSET_TAB_LEN4 [3]
radius and 3rd peripheral speed
$SNS_MEA_RESULT_OFFSET_TAB_LEN4 [4]
radius and 3rd peripheral speed radius and \(3 r d\) peripheral speed
```

... 3rd peripheral speed
... offset value for radius regarding 1st
... offset value for radius regarding 2 nd
... offset value for radius regarding 3 rd
... offset value for radius regarding 4 th

| 54709 | MEA_RESULT_OFFSET_TAB_LEN5 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm |  |  |  |  |  |  |  |  |
| - | Offset table 4th peripheral speed (length) | DOUBLE | Immediately |  |  |  |  |  |
| - | 5 | $0,0,0,0,0$ | - | - | $7 / 5$ |  |  |  |

Description:
Parameter for user-defined measurement result offset for tool measuring with rotating spindle
\$SNS_MEA_RESULT_OFFSET_TAB_LEN5[0] ... 4th peripheral speed
\$SNS_MEA_RESULT_OFFSET_TAB_LEN5[1] ... offset value for radius regarding 1st radius and 4 th peripheral speed \$SNS_MEA_RESULT_OFFSET_TAB_LEN5[2] ... offset value for radius regarding 2nd radius and 4 th peripheral speed \$SNS_MEA_RESULT_OFFSET_TAB_LEN5[3] ... offset value for radius regarding 3rd radius and 4 th peripheral speed \$SNS_MEA_RESULT_OFFSET_TAB_LEN5[4] . . . offset value for radius regarding 4th radius and 4th peripheral speed


| 54740 | MEA_FUNCTION_MASK | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Function mask for measuring cycles, workpiece and tool <br> measuring | DWORD | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | - | - | $7 / 5$ | U |  |  |

## Description:

Function mask for measuring cycles
Bit 0: Repeat measurement, workpiece measurement with offset in a tool,
after tolerance exceeded for dimension difference (TDIF) or confidence range
(TSA)
0 : When one of the tolerances is exceeded, the measurement is not repeated and an appropriate alarm
is displayed (alarm 61303 or 61306).
1: When one of the tolerances is exceeded, a measurement is repeated up to four times.

When, for all repeat measurements, one of the tolerances is exceeded, then an appropriate alarm is displayed (alarm 61303 or 61306).

Bit 1: Repeat measurement, workpiece measurement with offset in a tool, program stop at M0,

After every repeat measurement with tolerance of dimension difference (TDIF) or confidence range (TSA) exceeded and alarm output

Bit 1 only effective in conjunction with bit $0=1$.
$0:$ If one of the tolerances is exceeded, the measurement is not repeated and an appropriate alarm
is displayed (alarm 61303 or 61306).
1: If one of the tolerances is exceeded, the measurement is repeated up
to four times.
In the case of a tolerance being repeatedly exceeded, using an appropriate alarm output and M0, the measurement is interrupted (alarm 62303 or 62306).

With "NC-START", the alarm can be acknowledged, and the next repeat measurement started.
Bit 2: Workpiece measurement with offset in a tool, programmed stop at M0 after tolerance exceeded
from lower limit workpiece (TLL) or upper limit workpiece (TUL) and alarm
output
0: If one of the tolerances is exceeded, an appropriate reset alarm is displayed
(alarm 61304 or 61305). A tool correction (offset) is not executed.
1: If one of the tolerances is exceeded, then using an appropriate alarm output
and M0, the sequence is canceled (alarm 62304 or 62305).
Using "NC-START" these alarms can be acknowledged, and the sequence restarted. The correction (offset) in the tool is executed. Bit 3: Accept the calibrated radius of the workpiece probe in the tool data

0 : Do not accept the calibrated radius of the workpiece probe in the tool data.

1: Accept the calibrated radius of the workpiece probe in the tool data. Bit 4: For mixed technologies, turning-milling or milling-turning, the plane between calibrating and
measuring can be different.
0 : When measuring workpieces, it is not permissible to have different planes for calibration and measurement.

If the planes differ, alarm 61341 is output during the cycle runtime.
1: When measuring workpieces, different planes for calibration and measurement are permissible.

For example: Calibration in G17 and measurement under turning in G18.
Bit 16: Repeat measurement, tool measurement, after tolerances of the dimension difference are exceeded (TDIF)
or confidence range (TSA) exceeded
0: If one of the tolerances is exceeded, the measurement is not repeated, and an appropriate alarm is displayed (alarm 61303 or 61306).

1: When one of the tolerances is exceeded, the measurement is repeated up to four times.
If, for all repeat measurements, one of the tolerances is exceeded, then an appropriate alarm is displayed (alarm 61303 or 61306).

Bit 17: Repeat measurement, tool measurement, programmed stop at M0 after tolerance exceeded, dimension difference (TDIF) or confidence range (TSA) and alarm output

0 : If one of the tolerances is exceeded, the measurement is not repeated, and an appropriate alarm is displayed (alarm 61303 or 61306).

1: If one of the tolerances is exceeded, the measurement is repeated up
to four times.
In the case that the tolerance is exceeded again, using an appropriate alarm output and M0 measurement is canceled (alarm 62303 or 62306).

Using "NC-START", the alarm can be acknowledged, and the next repeat measurement started.
Bit 19: Tool measurement, milling technology, reducing the spindle speed at the last probing

0: The last probing is realized without reducing the spindle speed.
1: At the last probing, the spindle speed is automatically reduced.

| 54750 | MEA_ALARM_MASK |  |  | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Expert mode for cycle alarms |  | DWORD | Immediately |  |
| - |  |  |  |  |  |
| - | 0 | - | - | 7/5 | U |
| Description: | Bit 2: With special transformations (e.g. robot transformations) it may be useful to deactivate the traversing distance reduction of the measurement block related to the software limit positions, and the corresponding alarms. <br> Bit 3-15 Reserved for workpiece measurement <br> Bit 16-31 Reserved for tool measurement |  |  |  |  |



Machine data

Bit24 Select Calibrate with/without positional deviation
Bit25 Enable Select Work offset when measuring the angularity of the spindle
Bit26 Select Do not enable tool offset
Bit27 Do not enable: Select tolerance of linear vectors with measurement of complete kinematics
Bit28 Enable Select adapt tool length
If WO compensation bit $6 . .10$ is not selected, then list "Measure only"..
If WO compensation bit 6.10 is selected, then always also list compensation in active WO in the input screen
For averaging, display the following parameters: _K _TMV, _EVNUM

1) Input measuring feed applies to automatic and JOG

| 54762 | MEA_FUNCTION_MASK_TOOL | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Setting for input screen, measuring cycles in Automatic, tool <br> measuring | DWORD | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 | - | - | $7 / 5$ |  |  |

## Description:

Setting for input screen, Measuring cycles in Automatic, Tool measurement
54762 MEA_FUNCTION_MASK_TOOL
Bit3 Enable selection of tool probe calibration data field
Bit4 Select Calibrate input measuring feed (VMS) 1)
Bit5 Select Input feed and spindle speeds for contacting
Bit7 Select Measure in Machine and Work
Bit8 Select Measure absolute and incremental
Bit9 Select Tool offset geometry and wear
Bit10 Select measuring function "Check teeth individually"
Bit11 Select Spindle reversal when calibrating on the plane
Bit12 Select Number of measurements (_NMSP)
Bit13 Select Empirical values (_EVNUM)
Bit14 Select offset correction with selection of direction

1) Measuring feed input applies to Automatic and Jog

| 54764 | MEA_FUNCTION_MASK_TURN | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Setting for input screen, Measuring cycles in Automatic, <br> Workpiece turning | DWORD | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 | - | - | $7 / 5$ |  |  |

Description: 54764 MEA_FUNCTION_MASK_TURN
Setting for input screen, Measuring cycles Turning in Automatic
Bit0 Measure inside/outside diameter with reversal
Bit1 Measure inside/outside diameter "travel under turning center"?

| 54780 | J_MEA_FUNCTION_MASK_PIECE |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Settings for input screen Workpiece measurement in JOG |  |  | DWORD | Immediately |  |
| - |  |  |  |  |  |  |
| - | - | 131584 | - | - | 7/5 | U |
| Description: | Settings for input screen Workpiece measuring in JOG |  |  |  |  |  |
|  | Bit2 Activate compensation for electronic workpiece probe |  |  |  |  |  |
|  | Bit3 Select probe calibration data fie |  |  | nable |  |  |
|  | Bit5 Select wo as basis for measuring |  |  |  |  |  |

```
Bit6 Select WO compensation in basic frame, enable
Bit7 Select WO compensation in channel basic frame, enable
Bit8 Select WO compensation in global basic frame, enable
Bit9 Select WO compensation in settable frame, enable
Bit16 Select Workpiece measurement with spindle reversal
Bit17 Select Align workpiece probe in switching direction
Bit28 Select adapt tool length, enable
```



| 55200 | MAX_INP_FEED_PER_REV |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm/rev | Upper limit feedrate/rev |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | - | 1 | 0 | 15 | 7/4 | M |


| 55201 | MAX_INP_FEED_PER_TIME |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| mm/min | Upper limit feedrate/min |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |
| - | 10000 | - | - | $7 / 4$ | M |

Description: Feedrate input upper limit for $\mathrm{mm} / \mathrm{min}$

| 55202 | MAX_INP_FEED_PER_TOOTH |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm |  |  |  |  |  |  |  |  |
| - | Upper limit feedrate/tooth | DOUBLE | Immediately |  |  |  |  |  |
| - | - | 1 | 0 | 5 | $7 / 4$ |  |  |  |

## Description:

Feedrate input upper limit for mm/tooth

| 55212 | FUNCTION_MASK_TECH_SET | - | - |  |
| :---: | :---: | :---: | :---: | :---: |
| - | Function mask Cross-technology | BYTE | Immediately |  |
| - |  |  |  |  |
| - | 6 | - | $7 / 4$ | M |
| Description: | Function mask for all <br> Bit 0: Tool preselecti <br> Bit 1: Calculate thread <br> Bit 2: Refer to Table <br> Bit 3: Delete programs <br> 0: Generated <br> 1: Generated p <br> cycle | depth cycles (con iatel |  | YCLE952) <br> the cal |


| 55214 | FUNCTION_MASK_MILL_SET |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Function mask Milling |  | DWORD | Immediately |  |
| - |  |  |  |  |  |
| - | 5 | - | - | 7/4 | M |

Description: Function mask for milling
Bit 0: Default setting - milling cycles with synchronous operation
Bit 2: Depth calculation in milling cycles without parameter SC


Description: Function mask for drilling
Bit 0: Tapping CYCLE84: Reverse direction of spindle rotation during cycle
Bit 1: Boring CYCLE86: Take into consideration rotation of the tool plane when positioning the spindle
Bit 2: Boring CYCLE86: When positioning the spindle, take into account swiveled table kinematics (toolholder)

Bit 3: Tapping CYCLE84: Monitoring machine data 31050 and 31060 of the spindle Bit 4: Tapping CYCLE840: Monitoring machine data 31050 and 31060 of the spindle Bit 6: Boring CYCLE86: Adapt spindle position to the orientation of the tool Tool orientation can be realized using TOOLCARR or TRAORI before the cycle is called.

If bit6=1, bits 1 and 2 are no longer effective.
Bit 7: Boring CYCLE86: Adapt the direction of the retraction path in the plane to active mirroring
0: Retraction in the plane is realized as programmed
1: When mirroring is active, when retracting in the plane, the direction is adapted in the cycle to the active mirroring.

| 55218 | FUNCTION_MASK_TURN_SET | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Function mask Turning | DWORD | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1 | - | - | $7 / 4$ |  |  |

## Description:

Function mask for turning
Bit 0 : New thread table for thread cutting
Bit 1: Reserved (CYCLE93)
Bit 2: Reserved (CYCLE93)
Bit 3: Chamfer in CYCLE930 as chamfer length (CHF)
Bit 4: Retraction from inside machining (CYCLE951)
0: Compatibility as before
If the necessity for rounding the corner is detected in the cycle, the tool is retracted from the inside machining, otherwise it is not.

1: It is generally retracted from the inside machining in the cutting axis.
Bit 5: Disable new smoothing behavior in thread cutting cycles
0 : The new smoothing behavior is active in the threading cycles between thread
blocks (G33, G34, G35 ...).
This improves the dynamic response adaptation in thread blocks that serve
for run-in, run-out or as a transition element of the thread
by using a larger proportion of the block length for the dynamic response adaptation.

The prerequisite for this function is the setting data setting SD 42010 \$SC_THREAD_RAMP_DISP[2]=-1.

1: The new smoothing behavior is not active between thread blocks (compatibility).

| 55220 | FUNCTION_MASK_MILL_TOL_SET |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Function mask for high-speed settings CYCLE832 | DWORD | Immediately |  |  |  |  |  |
| - | - | 0 | - | - | $7 / 5$ |  |  |  |

Description:
Function mask for high-speed settings CYCLE832
Bit 0: Display input fields, technology
=0: Hide input fields, technology
=1: Display input fields technology
Bit 1: Enter orientation tolerance (OTOL) as factor of tolerance (CTOL) or directly enter
Bit 1 is only relevant for machines with orientation transformation that has been setup
=0: Orientation tolerance (OTOL) is calculated as factor of the entered tolerance
=1: Directly enter orientation tolerance (OTOL) into the input screen
The factor to calculate the orientation tolerance is saved in the following setting data
\$SCS_MILL_TOL_FACTOR_ROUGH for the machining type, roughing G group 59 DYNROUGH \$SCS_MILL_TOL_FACTOR_SEMIFIN for the machining type, semi-finishing G group 59 DYNSEMIFIN
\$SCS_MILL_TOL_FACTOR_FINISH for the machining type, finishing G group 59 DYNFINISH
Bit 2: A mould-making function can be selected in the High Speed Settings mask
=0: The best available mould-making function is used automatically

- Top Surface option not active -> Advanced Surface
- Top Surface option active -> Top Surface
=1: The mould-making function (Advanced Surface or Top Surface) can be selected in the mask (only if the Top Surface option is active)
Bit 3: High Speed Settings mask without Advanced Surface option
$=0$ : The High Speed Settings mask is only offered with the Advanced Surface option
=1: The High Speed Settings mask is also offered without the Advanced Surface option
Bit 4: Display smoothing selection
=0: Do not display smoothing selection (corresponds to smoothing = yes)
=1: Display smoothing selection

| 55221 | FUNCTION_MASK_SWIVEL_SET |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Function mask for swivel CYCLE800 |  |  | DWORD | Imm |  |
| - |  |  |  |  |  |  |
| - | - | 256 | - | - | 7/3 | M |

Description:
Function mask for swivel CYCLE800
The settings of the function mask (bits 0 to 4) for swivel act on all swivel data records

Bit 0: Show "No swivel" input field
=0: Hide "No swivel" input field
=1: Show "No swivel" input field
Bit 1: Retract "fixed point 1/2" instead of "Z", "Z XY"
=0: Selection text retract "Z" or retract "Z XY"
=1: Selection text retract "fixed point 1" or retract "fixed point 2"
Bit 2: Permit selection of "deselection" of the swivel data record
=0: Do not permit selection of "deselection" of the swivel data record (hide)
=1: Permit selection of "deselection" of the swivel data record
Bit 3: Show active swivel plane under swivel in JOG
=0: Hide active swivel plane under swivel in JOG
=1: Show active swivel plane under swivel in JOG
Bit 4: Evaluate input values for swiveling in the pole position of the machine kinematics
=0: Evaluation of the input values with swiveling in pole position
=1: No evaluation of the input values with swiveling in pole position (compatibility) Starting from the initial position of the machine kinematics, the input values when swiveling are evaluated so that continuous swiveling around the pole axis is possible Pole axis is the rotary axis of the swivel data record that rotates around the tool axis

Example: rotary axis C rotates around Z for G17./
Additional settings of the pole axis:
Angular range (traversing range) of $>360$ degrees in the swivel data record Bit 5 Align tool (turning technology) using frame calculation (TCOFRY) or absolute (TCOABS)

The tool orientation of the orientable tool carrier is calculated
either using a frame calculation (TCOFRY for G18) or in absolute terms with TCOABS For $B$ axis kinematics of a turning machine, the tool spindle in the initial setting of the kinematics
can be set up parallel to either Z or to X. See also "Swivel data" under Commissioning. For new systems being commissioned, it is recommended you set bit 5=1:
=0: Align tool using frame calculation (TCOFRY for G18, compatibility)
=1: Align tool absolutely (TCOABS)
Bit 6: Do not offer "direct" swivel mode under swivel in JOG
=0: "Direct" swivel mode is offered under swivel in JOG
=1: "Direct" swivel mode is not offered under swivel in JOG
Bit 7: Swivel plane: Direction selection in initial setting of the kinematics
Behavior with swivel plane in initial setting of the kinematics if the NCK calculates two solutions:
=0 With selected direction + or -, both calculated solutions of the rotary axes are approached. (Compatibility)
=1 With selected direction + or -, only one of the calculated solutions of the rotary axes is approached.
Compatibility for PowerLine up to SW 7.x and for SolutionLine up to SW 1.x
Bit 8: Work offset of the rotary axes of the swivel data record traversed as an offset
$=0$ Work offset of the rotary axes of the swivel data record is only taken into account
in the WCS (compatibility)
$=1$ Work offset of the rotary axes of the swivel data record traversed as an offset
Setting is in conjunction with MD21186 \$MC_TOCARR_ROT_OFFSET_FROM_FR
Bit 9: Swivel data set TC permanently assigned to the tool
$=0$ Display number of the swivel data record TC
$=1$ Do not display number of the swivel data record TC
Assignment of the swivel data record to the tool is performed in SGUD _TC_GNO
if technology cylindrical grinding is set in MD52200 \$MCS_TECHNOLOGY = 3
Example:
TC GNO can be written by the machine manufacturer in the tool change program L6

Bit 10: Swivel plane: Show input field "positioning direction"
=0: The input field "positioning direction" is hidden.
=1: The input field "positioning direction" is displayed with swivel tables and swivel head / table combinations.
Bit 11: Positioning of both solutions of an AB kinematics
=0 Compatibility. Positioning of only one solution with specific swivel angles
$=1$ Positioning of both solutions calculated by the NCK
Bit11 should be set =1 with kinematics, on which - in the basic position - none of the two rotary axes rotates around
the tool axes (AB kinematics with tool axes in $Z$ direction)
Bit 12: Swivel plane, tool alignment: reset behavior taking the rotary axis positions into account
$=0$ Compatibility. Reset state refers to the end positions of the rotary axes in the swivel data record
$=1$ Reset state refers to the current positions of the rotary axes in the swivel data record
If bit12=0, a linear axis identifier is written in the parameters \$TC_CARR21/22.
The tool carrier is thus initialized with the end positions of the rotary axes (\$TC_CARR13/14) on reset (TCOABS).
If Bit12=1, the names of the rotary axes of the swivel data record are written in the parameters \$TC_CARR21/22.
The tool carrier is thus initialized with the actual values of the rotary axes on reset (TCOABS).
Bit 13: Activation of the extended evaluation of the rotations with axis-by-axis swiveling in the pole position.
$=0$ No evaluation of the rotations with swiveling in the pole position (compatibility) The settings of bits 4,7 and 11 apply
$=1$ Extended evaluation of the rotations with swiveling in the pole position
With kinematics with 2 rotary axes, one of the rotary axes can be the pole axis. A rotary axis is then in the pole position, if it rotates around the tool axis. In contrast to bit4, the input values are still evaluated if bit13 is set if the 1 st rotary axis is not in the initial position.
Example: Table kinematics with 1st rotary axis $A$ (rotates around $X$ ) and 2 nd rotary axis B (rotates around Y) G17

After axis-by-axis swiveling around $Y$ and then around $X=90^{\circ}$, the 2 nd rotary axis is in pole position.
Setting for swivel data record: Rotary axis reference must be set to the rotary axis that is not the pole axis (in the example: rotary axis 1).
When the bit is set, the input rotations are evaluated so that continuous swiveling around the pole axis/tool axis is possible. The following applies: the "+" solution of CYCLE800 has no additional rotation, whereas the "-" solution has an additional $180^{\circ}$ rotation in the Actframe in the tool axis.
If bit13 is set, the settings of bits 4,7 and 11 have no effect.

| 55230 | CIRCLE_RAPID_FEED |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Positional feed on circular paths | DOUBLE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 10000 | 100 | 100000 | $7 / 4$ |  |  |  |  |

Description: Rapid traverse feedrate in $\mathrm{mm} / \mathrm{min}$ for positioning on circle path

| 55232 | SUB_SPINDLE_REL_POS |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| mm | Retract position Z for counterspindle | DOUBLE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - |  |  |  |  |  |

## Description: $\quad$ z retraction position for the counterspindle

| 55260 | MAJOG_SAFETY_CLEARANCE | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Safety clearance for machine JOG |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 1 | 0.1 | 100 |  |  |  |  |

Description: Safety clearance for machine JOG

| 55261 | MAJOG_RELEASE_PLANE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Retraction plane for machine JOG | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 100 | - | - |  |  |

Description: Retraction plane for machine JOG

| 55300 | EASY_SAFETY_CLEARANCE | - | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Simple input: Safety clearance |  |  |  |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 1 | - | - | $7 / 4$ |  |  |  |  |

## Description:

Simple input: safety clearance
The input field for the safety clearance is not available in the simple input screens.
Instead, the value of this setting date is always used.

| 55301 | EASY_DWELL_TIME | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| s | Simple input: dwell time |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.6 | -100 | 100 |  |  |  |  |

## Description:

Simple input: dwell time in seconds
The input fields for dwell times are not available in the simple input screens.
Instead, the value of this setting data is always used.

| 55305 | EASY_DRILL_DEEP_FD1 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\%$ | Simple input: percentage 1st feedrate deep-hole drilling | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 90 | 0 | 100 | $7 / 7$ |  |

## Description:

Simple input: percentage 1st feedrate deep-hole drilling
The input field for this percentage is not available in the simple input screens.
Instead, the value of this setting data is always used.

| 55306 | EASY_DRILL_DEEP_DF | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ |  |  |  |  |  |  |  |
| - | Simple input: percentage infeed deep-hole drilling | DOUBLE | Immediately |  |  |  |  |
| - | - | 90 | 0 | 100 |  |  |  |
| $7 / 7$ | U |  |  |  |  |  |  |


| Description: | Simple input: percentage infeed deep-hole drilling |
| :--- | :--- |
|  | The input field for this percentage is not available in the simple input screens. |

Instead, the value of this setting data is always used.

| 55307 | EASY_DRILL_DEEP_V1 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Simple input: min. depth infeed deep-hole drilling |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 1.2 | - | - | $7 / 4$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description:
Simple input: min. depth infeed deep-hole drilling
The input field for the minimum depth infeed is not available in the simple input screens.
Instead, the value of this setting data is always used.

| 55308 | EASY_DRILL_DEEP_V2 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Simple input: absolute retraction value deep-hole drilling |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | - | - | $7 / 4$ | M |  |  |  |

Description: Simple input: absolute retraction value deep-hole drilling
The input field for the absolute retraction value is not available in the simple input screens.
Instead, the value of this setting data is always used

| 55309 | EASY_THREAD_RETURN_DIST |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | Simple input: return distance thread tapping |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | 2 | 2 | - | - | $7 / 4$ | M |

Description: Simple input: return distance thread tapping
The input field for the return distance is not available in the simple input screens. Instead, the value of this setting data is always used.

| 55400 | MILL_ENGRAVE_POINT_RAD |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Engraving cycle CYCLE60: Circ. path radius for generating the <br> char. "point" | DOUBLE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 10 | $7 / 7$ |  |  |  |  |

Description: Input value equals zero: The character "point" is realised by a simple linear insertion movement of the tool
(Default setting for conventional engraving tools, compatibility).
Input value greater than zero: The character "point" is executed as a circle with the radius value from this setting data
(Setting for certain special tools).


Machine data

Bit 3: Display alarm 61426: Kinematics measurement with CYCLE9960/996. Hide 1 = Alarm 61426

| 55420 | MILL_SWIVEL_RESET_RETRACT |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - | Initial setting swivel: retract |  |  |  |  |  | BYTE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 5 | M |  |  |  |

## Description:

> Initial setting swivel: retract With this setting data, the stat plane" when activating the "Init $\begin{aligned} & 0=\text { no change } \\ & 1=\text { no } \\ & 2=\text { Z } \\ & 3=\text { Z XY } \\ & 4=\text { Tool direction max. } \\ & 5=\text { Tool direction inc. }\end{aligned}$

With this setting data, the status adopted by the toggler "Retract" in the mask "Swivel plane" when activating the "Initial setting" softkey can be set:

| 55421 | MILL_SWIVEL_RESET_TRACK | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Initial setting swivel: tool correction |  |  |  |  |  | BYTE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 2 |  |  |  |  |

## Description:

Initial setting swivel: Tool correction
With this setting data, the status adopted by the toggler "Tool correction" in the mask
"Swivel plane" after activating the softkey "Initial setting" can be set:
$0=$ no change
$1=$ do not correct
2 = correct

| 55422 | MILL_SWIVEL_RESET_MODE |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| - | Initial setting swivel: swivel mode |  | BYTE | Immediately |  |
| - |  |  |  |  |  |
| - | 0 | 0 | 1 | 7/5 | M |

## Description:

Initial setting for swivel: Swivel mode
With this setting data, the state of the "Swivel mode" toggler in the "Swivel plane" mask can be set with the "Initial setting" softkey:

0 = axis by axis
1 = direct

| 55441 | MILL_TOL_FACTOR_ROUGH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Rotary axes tolerance factor for roughing CYCLE832 of G group <br> 59 | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 10 | 0 | 1000 | U |  |

Description:
Rotary axes tolerance factor for roughing CYCLE832 of G group 59

| 55442 | MILL_TOL_FACTOR_SEMIFIN | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Rotary axes tolerance factor for prefinishing CYCLE832 of G <br> group 59 | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 10 | 0 | 1000 | $7 / 5$ |  |

## Description: Rotary axes tolerance factor for prefinishing CYCLE832 of G group 59

| 55443 | MILL_TOL_FACTOR_FINISH |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Rotary axes tolerance factor for finishing CYCLE832 of G group 59 |  |  | DOUBLE | Imm |  |
| - |  |  |  |  |  |  |
| - | - | 10 | 0 | 1000 | 7/5 | U |


| 55446 | MILL_TOL_VALUE_ROUGH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm |  |  |  |  |  |  |
| - | Tolerance value for roughing CYCLE832 (High Speed Settings) | DOUBLE | Immediately |  |  |  |
| - | - | 0.1 | 0 | 10 | $7 / 5$ |  |

Description: Tolerance value for roughing CYCLE832

| 55447 | MILL_TOL_VALUE_SEMIFIN |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Tolerance value for smooth-finishing CYCLE832 (High Speed <br> Settings) | DOUBLE | Immediately |  |  |  |  |  |  |
| - | - | 0.05 | 0 | 10 | $7 / 5$ |  |  |  |  |
| - | - | U |  |  |  |  |  |  |  |

Description: Tolerance value for prefinishing CYCLE832

| 55448 | MILL_TOL_VALUE_FINISH |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Tolerance value for finishing CYCLE832 (High Speed Settings) |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| - | DOUBLE | Immediately |  |  |  |  |  |  |
| - | - | 0.01 | 0 | 10 | $7 / 5$ |  |  |  |

Description: Tolerance value for finishing CYCLE832

| 55460 | MILL_CONT_INITIAL_RAD_FIN | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Contour pocket milling: approach circle radius finishing |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 100 |  |  |  |  |

Description: This data affects the radius of the approach circle during contour pocket finishing.
0 : the radius is selected to maintain a safety clearance to the finishing allowance in
the starting point.
$>0$ : the radius is selected to maintain the value of this setting data to the finishing allowance in the starting point.

| 55481 | DRILL_TAPPING_SET_GG12 | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Setting tapping G group 12: block change behavior at exact stop | DOUBLE | Immediately |  |  |  |
| - | 2 | 0 | 0 | 3 | $7 / 4$ |  |

Description: Settings for tapping G group 12 cycle CYCLE84 and CYCLE840:
G group 12: block change behavior at exact stop (G60)

| 55482 | DRILL_TAPPING_SET_GG21 | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |
| - | Setting tapping G group 21: acceleration profile | DOUBLE | Immediately |  |  |
| - | 2 | 0 | 0 | 3 |  |

Description: Settings for tapping G group 21 cycle CYCLE84

Machine data

G group 21: acceleration profile (SOFT, BRISK, ...)

| 55483 | DRILL_TAPPING_SET_GG24 | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Setting tapping G group 24: precontrol |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 2 | 0 | 0 | 2 |  |  |  |  |

Description: Settings for tapping G group 24 cycle CYCLE84 and CYCLE840:
G group 24: precontrol (FFWON, FFWOF )

| 55484 | DRILL_TAPPING_SET_MC | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Setting tapping: spindle operation at MCALL | DOUBLE | Immediately |  |  |
| - | 2 | 0 | 0 | 1 | $7 / 4$ |
| - | 2 |  |  |  |  |

Description: Setting for tapping cycle CYCLE84 spindle operation at MCALL
$0=$ reactivate spindle operation at MCALL
$1=$ maintain position-controlled spindle operation at MCALL

| 55489 | DRILL_MID_MAX_ECCENT | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Max. center offset f. center boring |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.5 | 0 | 10 |  |  |  |  |

Description: Maximum center offset for center boring


## Description: Preboring depth for drill and thread milling

| 55500 | TURN_FIN_FEED_PERCENT |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| \% | Roughing feedrate for complete machining in \% |  |  | BYTE | Imm |  |
| - |  |  |  |  |  |  |
| - | - | 100 | 1 | 100 | 7/4 | M |

Description: When selecting Complete machining (roughing and finishing), the percentage of the entered feedrate $F$ as specified in this setting data is used for finishing.

| 55505 | TURN_ROUGH_O_RELEASE_DIST |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Return distance stock removal for external machining | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 1 | -1 | 100 |  |  |  |  |

Description: Using this setting data, you enter the clearance, by which the tool is retracted from the contour when removing stock from an outer corner. This is not applicable for removing stock from a contour
1: The safety clearance is used as clearance.

| 55506 | TURN_ROUGH_I_RELEASE_DIST | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Return distance stock removal for internal machining | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0.5 | -1 | 100 |  |  |

```
Description: Using this setting data, you enter the clearance, by which the tool is retracted from
the contour when removing stock from an inner corner. This is not applicable for
removing stock from a contour.
-1: The safety clearance is used as clearance.
```



Description: If a tool clearance time occurs in a cycle, e.g. deep hole drilling, grooving, the value of this setting data is used

- negative value in spindle revolutions
- positive value in seconds

| 55540 | TURN_PART_OFF_CTRL_DIST |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Path for cut-off check |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.1 | 0 | 10 | M |  |  |  |

Description: Path for cut-off check

| 55541 | TURN_PART_OFF_CTRL_FEED |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Feedrate for cut-off check |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0 | - | - | M |  |  |  |



| 55542 | TURN_PART_OFF_CTRL_FORCE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Force for cut-off check in $\%$ | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 10 | 1 | 100 | $7 / 4$ |  |  |  |

Description: Force in percent for cut-off check

| 55543 | TURN_PART_OFF_RETRACTION | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| mm | Retraction path prior to cut-off with counterspindle | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 4$ |  |

Description: Retraction path prior to cut-off with counterspindle

| 55550 | TURN_FIXED_STOP_DIST | - | - |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| mm | Counterspindle: path for travel to fixed stop      <br>       <br> -     $\quad-\quad 10$ |  |  |  |  |  | 0.001 | 1000 | Immediately |

Description: In this setting data you specify the distance to the programmed target position, after which the counterspindle travels with a special feedrate during travel to fixed stop (see 55551 \$SCS_TURN_FIXED_STOP_FEED).

| 55551 | TURN_FIXED_STOP_FEED |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Counterspindle: feedrate for travel to fixed stop |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 0 | - | - | $7 / 4$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: In this setting data you specify the feedrate with which the counterspindle travels to after which the tool travels in this feedrate.

| 55552 | TURN_FIXED_STOP_FORCE | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Counterspindle: force for travel to fixed stop in $\%$ |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 10 | 1 | 100 | $7 / 4$ |  |  |  |

Description: In this setting data you specify at which percentage of the driving force the counterspindle is to stop during travel to fixed stop.

| 55553 | TURN_FIXED_STOP_RETRACTION | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| mm | Counterspindle: retraction path prior to chucking after fixed stop | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 | 0 | 1 | $7 / 4$ |  |  |

Description: Retraction path prior to chucking after travel to fixed stop

| 55580 | TURN_CONT_RELEASE_ANGLE | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| degrees | Contour turning: retraction angle | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 45 | 0 | 90 | $7 / 4$ |  |  |

Description: This setting data defines the angle by which the tool is retracted from the contour during contour turning roughing.

| 55581 | TURN_CONT_RELEASE_DIST |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Contour turning: retraction value | DOUBLE | Immediately |  |  |  |  |  |  |
| - | - | 1 | 0.01 | 10 | $7 / 4$ |  |  |  |  |
| - | - | M |  |  |  |  |  |  |  |

Description: This setting data defines the value by which the tool is retracted in both axes during contour turning roughing.

| 55582 | TURN_CONT_TRACE_ANGLE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| degrees | Contour turning: minimum angle for rounding along contour |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 5 | 0 | 90 |  |  |  |  |
| - |  |  |  |  |  |  |  |  |

Description: $\begin{array}{ll}\text { This setting data specifies the angle between the cutting edge and the contour, at } \\ \text { which the contour is rounded in order to remove residual material. }\end{array}$

| 55583 | TURN_CONT_VARIABLE_DEPTH | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\%$ | Contour turning: percentage for variable cutting depth | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 20 | 0 | 50 |  |  |

Description: Percentage for variable cutting depth during contour turning

| 55584 | TURN_CONT_BLANK_OFFSET |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Contour turning: blank allowance |  |  |  |  |  | DOUBLE | Immediately |  |
| - | - | 1 | 0 | 100 | $7 / 4$ |  |  |  |  |
| - | - | M |  |  |  |  |  |  |  |

Description: This setting data specifies the distance to the blank, after which contour turning is switched from G0 to G1 in order to adjust any possible blank allowances.

| 55585 | TURN_CONT_INTERRUPT_TIME |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| s | Contour turning: feed interrupt time (neg. values = revolutions) |  |  |  |  |  | DOUBLE | Immediately |
| - | - | - | - | $7 / 4$ | M |  |  |  |
| - | -1 | - |  |  |  |  |  |  |

## Description:

Feed interrupt time during contour turning, contour grooving and plunge turning

- negative value in spindle revolutions
- positive value in seconds

This setting data is effective only if setting data 55586 is \$SCS_TURN_CONT_INTER_RETRACTION $=0$.

| 55586 | TURN_CONT_INTER_RETRACTION | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Contour turning: retraction path after feed interrupt |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 1 | 0 | 10 | $7 / 4$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: Retraction path feed interrupt during contour turning, contour grooving and plunge turning:
>0: retraction path after feed interrupt (setting data 55585
\$SCS_TURN_CONT_INTERRUPT_TIME is ineffective!)
=0: no retraction path

| 55587 | TURN_CONT_MIN_REST_MAT_AX1 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\%$ | Contour turning:minimum difference dimension residual <br> machining axis 1 <br> -$\quad-\quad$ DOUBLE | Immediately |  |  |  |  |  |  |
| - | 50 | 0 | 1000 | $7 / 4$ |  |  |  |  |

Description: This MD defines the limit value for stock removal of residual material in the direction of the 1st axis.
Example:
If this MD is set to $50 \%$ and if the finishing allowance is 0.5 mm , the residual material which is thinner than 0.25 mm is not removed in a separate machining step, but during finishing.

| 55588 | TURN_CONT_MIN_REST_MAT_AX2 |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| $\%$ | Contour turning: minimum difference dimension residual <br> machining axis 2 | DOUBLE | Immediately |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 50 | 0 | 1000 | $7 / 4$ |  |  |  |

Description: This MD defines the limit value for stock removal of residual material in the direction of the 2 nd axis.
Example:
If this MD is set to $50 \%$ and if the finishing allowance is 0.5 mm , the residual material which is thinner than 0.25 mm is not removed in a separate machining step, but during finishing.

| 55595 | TURN_CONT_TOOL_BEND_RETR |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Contour plunge turning: retraction path due to tool bending |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 0.1 | 1 | M |  |  |  |  |

Description: Retraction due to tool bending during plunge turning

| 55596 | TURN_CONT_TURN_RETRACTION | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Contour plunge turning: retraction depth prior to turning |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 0.1 | 0 | 1 |  |  |  |  |

Description: Retraction depth prior to plunge turning

| 55613 | MEA_RESULT_DISPLAY | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |  |
| - | Selection of measurement result display | BYTE | Immediately |  |  |  |  |
| - | - | 0 | 0 | 10 | $7 / 7$ |  |  |

## Description:

Measurement results screen display
=0: No measurement results screen
=1: The measurement results screen is visible for a fixed time of 8 seconds
=3: When the measurement results screen is visible, the cycle is stopped by an internal MO;
on NC start the measuring cycle is resumed and the measurement results screen is deselected.
=4: The measurement results screen only appears in the case of cycle alarms 61303, 61304, 61305, 61306.

| 55614 | MEA_RESULT_MRD | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Program control of the display of the measurement result image <br> MRD | BYTE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1 | 0 | 1 | U |  |  |

Description: Setting of the program control of the display of the measurement result image MRD
$0=$ Hide measurement result image
$1=$ Show measurement result image

| 55618 | MEA_SIM_ENABLE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - |  |  |  |  |  |  |
| - | Setting measuring cycles under a simulated environment | BYTE | Immediately |  |  |  |
| - | - | 1 | 0 | 9 |  |  |

## Description:

Setting measuring cycles under a simulated environment
=0: The measuring cycles are terminated without function.
=1: The measuring cycles are executed.

- Simulation in HMI Operate:

The traversing motion is visualized.
No measurement results and measurement result display are available.

- SinuTrain:

Measurement results and measurement result display are available.
The traversing motion is visualized using simultaneous recording.
-For systems, that only operate with simulated axes
(e.g. virtual machine, test rack) :

Measurement results and measurement results display are available.
The traversing motion is visualized with simultaneous recording.
In this case, the following settings must be observed:
MD10360 \$MN_FASTIO_DIG_NUM_OUTPUTS >=1
MD13230 \$MN_MEAS_PROBE_SOURCE = 1 to 4

```
= 2 to 8: reserved
= 9 internal
```



| 55622 | MEA_EMPIRIC_VALUE_NUM | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - |  |  |  |  |  |  |
| - | Number of empirical values | DWORD | Immediately |  |  |  |
| - | - | 20 | 0 | 20 | $7 / 5$ |  |

## Description:

Number of empirical values


Description: In its default setting the empirical value memory consists of 20 memory elements.
Using parameter \$SCS_MEA_EMPIRIC_VALUE_NUM the number of memory elements can be defined! Currently, however, these 20 memory elements cannot be changed!
In the empirical value memory, empirical values can be stored which are cleared with the currently calculated
difference between the setpoint and the actual value.
Using parameter _EVNUM the empirical value element to be cleared is addressed!

| 55624 | MEA_AVERAGE_VALUE_NUM |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| - |  |  |  |  |  |  |  |  |
| - | Number of mean values | DWORD | Immediately |  |  |  |  |  |
| - | - | 20 | 0 | 20 | $7 / 5$ |  |  |  |

Description: Number of mean values

| 55625 | MEA_AVERAGE_VALUE |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Mean value memory |  |  |  |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 20 | 0 | -100000 | 100000 | $7 / 7$ |  |  |  |  |

## Description:

In its default setting the mean value memory consists of 20 memory elements.
Using parameter \$SCS_MEA_AVERAGE_VALUE_NUM the number of memory elements
can be defined! Currently, however, these 20 memory elements cannot be changed!
In the mean value memory, the mean values calculated in connection with functionality
"Automatic tool offset with mean value creation" are stored.
Using parameter _EVNUM the mean value element to be used is addressed!

| 55628 | MEA_TP_FEED_MEASURE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Feed for calibrating a tool probe | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 300 | 0 | 100000 |  |  |
| $1 / 7$ | U |  |  |  |  |  |

MEA_TP_FEED_MEASURE
Feed for calibrating a tool probe with stationary spindle in AUTO and JOG

| 55630 | MEA_FEED_MEASURE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Feed for calibrating a workpiece probe | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 300 | 0 | 100000 |  |  |

Description: MEA_FEED_MEASURE
Feed for calibrating a workpiece probe in Automatic and JOG

| 55631 | MEA_FEED_MEASURE_DEG | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| rev/min | Measurement feedrate of workpiece probe during positioning of a <br> rotary axis | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1 | 0 | 100000 | $7 / 7$ |  |  |

Description: Measurement feedrate of workpiece probe during positioning of a rotary axis

| 55632 | MEA_FEED_RAPID_IN_PERCENT | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| $\%$ | Rapid traverse velocity in per cent, for intermediate positioning | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 50 | 0 | 100 | $7 / 7$ |  |

## Description:

Traverse velocities for positioning in the measuring cycle between the measuring positions,
with rapid traverse velocity in per cent, with collision detection not active
Note:
If necessary, adapt the value of the rapid traverse velocity in per cent to the probe type used and to the
machine characteristics! This means that the maximum deflection of the actual probe
type must be considered!!
Explanations:
In the measuring cycles any intermediate positions are calculated prior to the actual set of measurements. These positions can be approached

- with collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=1 or
- without collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=0).

Depending on this setting different velocities are used for the approach:

- with collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=1): With SD55634 \$SCS_MEA_FEED_PLAN_VALUE the traversing feed is performed in the plane and with SD55636 \$SCS_MEA_FEED_FEEDAX_VALUE during traversing in the feed axis (applicate).
If the probe switches when these intermediate positions are approached, the movement is stopped and the alarm "Probe collision" is output.
- without collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=0): The intermediate positions are approached with the maximum axis velocity (rapid traverse) in per cent as specified in SD55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT. With SD55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT=0 and SD55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT=100 the maximum axis velocity is effective.

| 55634 | MEA_FEED_PLANE_VALUE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Traverse velocity for intermediate positioning in the plane |  |  |  |  | DOUBLE | Immediately |  |
| - |  |  |  |  |  |  |  |  |
| - | - | 1000 | 0 | 100000 |  |  |  |  |


| Description: | MEA_FEED_MEASURE |
| :--- | :--- |
|  | Traversing velocity for the intermediate positioning in the plane in Automatic and JOG |



Description: Traversing speed for intermediate positioning in the measuring cycle in the infeed axis, with or without collision detection
Note:
If necessary, adapt the value of the speed in the infeed axis to the probe type used and to the
machine characteristics! This means that the maximum deflection of the actual probe type must be considered!!
Explanations:
In the measuring cycles any intermediate positions are calculated prior to the actual set of measurements. These positions can be approached

- with collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=1) or
- without collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=0).

Depending on this setting different speeds are used for the approach:

- with collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=1): With SSD55636 \$SCS_MEA_FEED_FEEDAX_VALUE the traversing feed is performed in the infeed axis (applicate).
If the probe switches when these intermediate positions are approached, the movement is stopped and the alarm "Probe collision" is output.
- without collision detection (SD55740 \$SCS_MEA_FUNCTION_MASK Bit0/Bit16=0): The intermediate positions are approached with the maximum axis velocity (rapid traverse) in per cent as specified in SD55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT. With SD55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT=0 and SD55 $\overline{6} 32$ \$SCS_MEA_FEED_RAPID_IN_PERCENT=100 the maximum axis velocity is effective.

| 55637 | MEA_FEED_POS_DEG |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| rev/min | Feedrate when positioning a rotary axis between individual <br> measurements | DOUBLE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | - | 10 | 0 | 100000 | U |  |  |  |  |

Description: Feedrate when positioning a rotary axis between individual measurements


Machine data

The use of "Rapid measuring feed" depends of SD55740 \$SCS_MEA_FUNCTION_MASK Bit4!

| 55640 | MEA_FEED_CIRCLE | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| $\mathrm{mm} / \mathrm{min}$ | Circular feed for measuring circle segment and measuring ball / 3 <br> balls | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | - | 1000 | 0 | 100000 | $7 / 7$ |  |  |

## Description:

MEA_FEED_CIRCLE
Circular feed for measuring circle segment and measuring ball / 3 balls

| 55642 | MEA_EDGE_SAVE_ANG | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| degrees | Additional safe angle for measuring corner | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 10 | $7 / 7$ |  |

Description: Set \$SCS_MEA_EDGE_SAVE_ANG=10 for compatibility programs.
The set angle is added to the measured angle as a safety angle.


| 55645 | MEA_KIN_MODE |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Free component of the linear vector | BYTE | Immediately |  |  |  |  |  |  |
| - |  |  |  |  |  |  |  |  |  |
| - | 2 | 0 | 0 | 20 | $7 / 4$ |  |  |  |  |

## Description: <br> Free component of the linear vector

Units digit
0 = calculate all components of the linear vector
1 = take over free component for X from \$SCS_MEA_KIN_VALUE
2 = take over free component for $Y$ from \$SCS_MEA_KIN_VALUE
3 = take over free component for $Z$ from \$SCS_MEA_KIN_VALUE
4 = retain free component for $X$ from active transformation
5 = retain free component for $Y$ from active transformation
6 = retain free component for $Z$ from active transformation
Tens digit
$0 x=$ vector chain closed, only with tool carrier (55645[0] for the head chain,
55645[1] for the table chain)
$1 x=$ vector chain open, only with tool carrier (55645[0] for the head chain, 55645[1] for the table chain)

| 55646 | MEA_KIN_VALUE | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| mm | Measure kinematics completely: value of the linear vector |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | 2 | - | - | $7 / 4$ |  |  |  |  |

Description: Perform complete kinematics measurement: Value of the linear vector

```
SD55646[0] Value for rotary axis 1
SD55646[1] Value for rotary axis 2
See SD55645
```

| 55647 | MEA_KIN_MIN_ANG_TRIANGLE |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| degrees | Minimum interior angle of the measurement triangle |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 10 | 2 | 60 | $7 / 4$ |  |  |  |
| - | - | U |  |  |  |  |  |  |

Description:
Perform complete kinematics measurement
Valid for 3 measuring points only. Minimum interior angle of the measuring triangle.
Value range 2 to 60 degrees


| 55649 | MEA_KIN_BALL_VEC | - | - |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Perform komplete kinematics measurement: Vector of the ball <br> mounting | DOUBLE | Immediately |  |  |  |  |
| - |  |  |  |  |  |  |  |
| - | 3 | 0 | - | - | $7 / 4$ |  |  |

Description: Perform komplete kinematics measurement: Vector of the ball mounting

| 55700 | MEA_SIMULTAN_LIMIT |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Simultaneous measuring, overrun travel |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 1 | 0.5 | 5 | $7 / 5$ |  |  |  |
| - | - | U |  |  |  |  |  |  |

## Description: Maximum permissible difference between switching points of the 1st and 2nd probes with simultaneous measuring (MD51740 bit14)

| 55730 | MEA_PROTOCOL_USER_EXT | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | File extension for application protocol | STRING | Immediately |  |  |
| - |  |  |  |  |  |
| - | - | TXT | - | - | U |



0 : No collision monitoring
1: For positioning operations executed by the measuring cycles between the measurement points,
motion is interrupted, as soon as the probe supplies a switching signal.
An alarm message is output (Alarm 61302).
Bit 1: Workpiece measurement with 3D-probe, coupling of the spindle alignment with the coordinate rotation around the
infeed axis of the active plane (Z axis for G17)
In JOG mode, the coupling is always activated.
0: no coupling between the spindle alignment and coordinate rotation The trigger data are automatically corrected.

1: For 3 D and star probes (tool type 710, 714) the spindle is aligned depending
on the coordinate rotation around the infeed axis of the active plane.
The positioning direction of the spindle is defined by SD55740 \$SCS_MEA_FUNCTION_MASK bit2.

Caution
The coupling or the correction calculation is cancelled via the measuring cycle without issuing an alarm message if one of the following conditions applies:

- No TRAORI orientation transformation and no tool holder that can be oriented, TCARR (CYCLE800) is active and, in addition to the rotation around $Z$, additional rotations are active that are not
identical between measurement and calibration.
- The working spindle is not position-controlled (SPOS not possible).
- The spindle position between calibration and measurement is not identical.

Bit 2: Workpiece measurement, for coupling of the spindle position, reverse the positioning direction,

Function refers to SD55740 \$SCS_MEA_FUNCTION_MASK, bit1 = 1
0 : Spindle positioning is based on the standard.
1: Spindle positioning is realized in the opposite direction (adapted angular values).

Example:
Angle of the coordinate rotation in the plane $90^{\circ}$
if bit2 $=0$ then spindle is positioned to $270^{\circ}$
if bit2 $=1$ then spindle is positioned to $90^{\circ}$
Bit 3: Workpiece measurement, number of repeated measurements if the probe does not switch

In the JOG mode, the measurement is not repeated.
0 : Measurements are repeated up to 4 times, then a measuring cycle alarm (alarm 61301) is output.

1: Measurement is not repeated if the probe does not switch, a measuring cycle alarm
is output (alarm 61301).
Bit 4: Workpiece measurement, lst probing for each measurement with fast measuring feedrate

0 : When measuring, the measurement velocity saved in the calibration data is effective.

1: "Fast measuring feed rate (SD 55638 \$SCS_MEA_FEED_FAST_MEASURE)
is used. After the first probing, the probe retracts through 2 mm .
After this, the measurement is realized with the measurement velocity saved in the calibration data.

The "Fast measurement feedrate" function is not executed if the measurement distance < 1mm!

Bit 5: Workpiece measurement, fast retraction after measuring
0 : The retraction after measurement is realized with the same velocity
as for
intermediate positioning (SD 55634 \$SCS_MEA_FEED_PLANE_VALUE).
Is only active when collision monitoring is active (SD55740
\$SCS_MEA_FUNCTION_MASK, bit0 = 1).
1: The retraction after measurement is realized with the percentage rapid traverse velocity defined in SD 55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT

Is only active when collision monitoring is active (SD 55740
\$SCS_MEA_FUNCTION_MASK, bit0 = 1).
Bit 6: Workpiece measurement, probe activation-deactivation while the spindle is being positioned

0 : Workpiece probe is not deactivated before positioning the spindle.
1: Spindle positioning is realized centrally in the manufacturer's cycle CUST_MEACYC.

The machine manufacturer has the option of activating and reactivating the probe before and after spindle positioning.
Bit 7: Kinematic measurement, scaling based on the input values of the rotary axis vectors

0: Scaling based on the calculated rotary axis vectors (V1xyz, V2xyz)
1: Scaling based on the rotary axis vectors saved in the swivel data set (V1xyz, V2xyz)

The swivel data set is displayed under start-up, "Swivel cycle data".
Bit 8: Kinematic measurement: measuring with active swivel (TCARR) or active TRAORI
0 : Measurement without active swivel (TCARR) or without active TRAORI
In the cycle, when measuring, the corresponding orientation transformation is deactivated, and reactivated after the measurement has been made.

1: Measurement with active swivel (TCARR) or with active TRAORI
For measurement, the corresponding orientation transformation remains
active.
If no orientation transformation is active, then alarm 61167 is output.
Bit 9: Measure kinematics, user-specific scaling of rotary axis vectors V1xyz and V2xyz
0 : Scaling of rotary axis vectors V1xyz und V2xyz as unit vector
1: User-specific scaling of rotary axis vectors V1xyz and V2xyz
With user-specific scaling, one vector component is always 1 or -1 .
The other two vector components are correspondingly converted by a factor.
Bit 10: Complete kinematic measurement with reference
0: Measuring without reference (compatibility)
1: Measuring with reference with swivel heads
The reference comprises the "Measure reference head" functions and "Adjust head to reference head". See CYCLE9960
Bit 11: Measure kinematics, number of measuring points for measuring the calibration ball

0: 10 Measuring points for measuring on circular path (compatibility)
1: 8 Measuring points for measuring on circular path
10 measuring points are always approached for paraxial measurement
Bit 15: Workpiece measurement, calibration radius with starting point at the centre of the ring, JOG mode

0 : The starting point for calibration, radius need not be precisely located at the centre of the calibration ring.

1: The starting point for calibration, radius must be precisely located at the centre of the calibration ring.
Bit 16: Collision monitoring using tool probe for intermediate positioning.
In JOG mode, collision monitoring is always activated.
0: No collision monitoring
1: For positioning operations which are executed by measuring cycles between the measurement
points, motion is interrupted as soon as the probe supplies a switching signal.

An alarm message is output (alarm 61302).
Bit 17: Workpiece measurement, number of repeated measurements if the probe does not switch.

In JOG mode, a measurement is not repeated.
0 : Measurements are repeated a maximum of 4 times, then a measuring cycle alarm (alarm 61301) is output.

1: The measurement is not repeated if the probe does not switch, a
measuring cycle alarm
is output (alarm 61301).
Bit 19: Tool measurement: retraction velocity from the measuring point
0 : The retraction from the measuring point is realized with the same
velocity as for
intermediate positioning (SD55634 \$SCS_MEA_FEED_PLANE_VALUE).
1: The retraction velocity is realized with the percentage rapid traverse velocity specified in SD55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT and is only effective when collision monitoring is active (SD55740 \$SCS_MEA_FUNCTION_MASK, bit16 = 1).
Bit 28: Selection of new or continuous protocol for standard protocol measurement in JOG

0: New protocol (default)
1: Continuous, that means it is always appended to an existing protocol
Bit 29: File format selection for standard protocol measurement in JOG 0: Text format (default)
1: Table format

| 55774 | J_MEA_PROTOCOL_FILE | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Name and path of protocol file for measurement in JOG | STRING | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | l/NC:/WKS.DIR/ <br> TEMP.WPD/ <br> J_MEAPROT.TXT | - | - | U |  |

Description: Name and path of protocol file for measurement in JOG

| 55800 | ISO_M_DRILLING_AXIS_IS_Z |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Drilling axis depends on the plane / always $Z$ |  |  | BYTE | Imm |  |
| - |  |  |  |  |  |  |
| - | 0 | 0 | 0 | 1 | 7/6 | U |

## Description:

Selection of the drilling axis
0 : drilling axis is vertical to the active plane
1: drilling axis is always "Z", independently of the active plane

| 55802 | ISO_M_DRILLING_TYPE |  | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| - | Tapping type | BYTE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | 0 | 3 | $7 / 6$ |  |

## Description:

Tapping type
0: tapping without compensating chuck
1: tapping with compensating chuck
2: deep hole tapping with chip breakage
3: deep hole tapping with stock removal


| 55806 | ISO_M_RETRACTION_DIR |  |  |  | - | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | Retraction direction at G76/87 |  |  |  | BYTE | Immediately |  |
| - |  |  |  |  |  |  |  |
| - | - | 0 |  | 0 | 4 | $7 / 6$ | U |
| Description: |  | direction G18(-Z) G18(+Z) G18(-Z) G18(+X) G18(-X) | n for p G19 (-Y) G19 (+Y) G19 (-Y) G19 (+Z) G19 (-Z) | on | d reve | ters | $6 /$ |


\left.| 55807 | ISO_M_TAPPING_SET_MC |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| - | Setting tapping G84: Spindle mode/position control |  |  |  |  | DOUBLE | Immediately |  |
| - | - | 0 | 0 | 1 |  |  |  |  |$\right]$| M |
| :--- |
| - |

## Description:

Setting when rigid tapping (G84)
$0=$ with G84, reactivate spindle mode
1= with G84, remain in position-controlled spindle mode

| 55808 | ISO_T_RETRACTION_FACTOR |  |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\%$ |  |  |  |  |  |  |  |  |  |
| - | Factor for retraction speed | DWORD | Immediately |  |  |  |  |  |  |
| - | - | 100 | 0 | 200 | $7 / 6$ |  |  |  |  |

Description:
Factor (1-200\%) for retraction speed at tapping G84/G88


| 55818 | ISO_M_FUNCTION_MASK | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Function mask for ISO milling mode | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | - | - |  |  |

## Description: Function mask for ISO milling mode

| 55819 | ISO_T_FUNCTION_MASK | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: |
| - | Function mask for ISO turning mode | DWORD | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | - | 0 | - | - |  |  |
| $7 / 4$ | M |  |  |  |  |  |

## Description:

## Function mask for ISO turning mode <br> Bit 0: Execution of residual corner cut

0: Complete residual corner cut is executed (compatibility)
1: Without complete residual corner cut
Bit 1: Stock removal roughing (G71/G72) without tool nose radius compensation
$0:$ Roughing with active tool nose radius compensation (with G41/G42,
compatibility)
1: Roughing without tool nose radius compensation (with G40)

| 55820 | FRICT_OPT_RADIUS |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Circle radius for optimizing friction compensation |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 5 | 0 | 5000 | $7 / 4$ |  |  |  |

Description: MEA_FEED_CIRCLE
Circle radius for optimizing friction compensation

| 55821 | FRICT_OPT_RADIUS_ROT | - | - |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| degrees | Circle radius for optimizing friction compensation |  |  |  |  |  | DOUBLE | Immediately |
| - |  |  |  |  |  |  |  |  |
| - | - | 5 | 0 | 5000 |  |  |  |  |
| M |  |  |  |  |  |  |  |  |

## Description:

MEA_FEED_CIRCLE
Circle radius for optimizing friction compensation


## Description:

Setting data contains feedrate values for optimizing friction compensation.

| 55823 | FRICT_OPT_FEED_ROT | - | - |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| rev/min | Feedrates for optimizing friction compensation for rotary axes | DOUBLE | Immediately |  |  |  |
| - |  |  |  |  |  |  |
| - | 9 | $\begin{array}{l}0.2,0.4,1.0,1.5,2.0,3.0, \\ 3.9,5.0,5.9\end{array}$ | 0 | 100 | $7 / 4$ |  |$]$| M |
| :--- |

Description: Setting data contains the feedrate values for optimizing friction compensation for rotary axes.

| 55824 | FRICT_OPT_STEP | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Step number for optimizing friction compensation |  |  |  |  |
| - | - | DWORD | Immediately |  |  |
| - | - | 0 | 1000 | $7 / 4$ | M |


| 55826 | FRICT_OPT_ACT_STEP | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | Current step number for optimizing friction compensation |  |  |  |  |
| - |  |  |  |  |  |
| - | - | DWORD | Immediately |  |  |
| - | 0 | 0 | 1000 | $7 / 4$ | M |
| Description: |  |  |  |  |  |



| 55844 | GRIND_MEA_KIN_TOL |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Kinematik measurement: Tolerance of kinematic vectors |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 1 | 0 | 10 | $7 / 4$ |  |  |  |
| - | - | U |  |  |  |  |  |  |

Description: Measure kinematics: Tolerance of kinematic vectors
When the kinematics are measured (CYCLE496), it is checked whether the measured vectors lie within the tolerance value of setting data \$SCS_GRIND_MEA_KIN_TOL.

| 55880 | GRIND_CONT_RELEASE_ANGLE | - | - |  |
| :--- | :--- | :--- | :--- | :--- |
| degrees | Grinding - profiling: retraction angle | DOUBLE | Immediately |  |
| - | - | 45 | 0 | 90 |
| - | - | $7 / 4$ | M |  |
| Description: |  |  |  |  |


| 55881 | GRIND_CONT_RELEASE_DIST |  |  |  |  |  | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| mm | Grinding - profiling: retraction value |  |  |  |  |  | DOUBLE | Immediately |
| - | - | 1 | 0 | 10 | $7 / 4$ |  |  |  |
| - | - | M |  |  |  |  |  |  |

Description: This setting data defines the value by which the tool is retracted in both axes during profiling.

| 55884 | GRIND_CONT_BLANK_OFFSET |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| mm | Grinding - profiling: blank allowance | - | - |  |  |
| - |  |  |  |  |  |
| - | - | 1 | DOUBLE | Immediately |  |

## SINAMICS parameters

The description of the SINAMICS parameters can be found in the following documentation:

- SINUMERIK 828D, SINAMICS S120 List Manual, Parameter Description /828D_LH3/


## Appendix A

## A. 1 List of abbreviations

| Abbreviation | Derivation of the abbreviation | Meaning |
| :---: | :---: | :---: |
| ADI4 | Analog Drive Interface for 4 Axis |  |
| AC | Adaptive Control |  |
| ALM | Active Line Module | Infeed module for drives |
| AP | User program |  |
| AS | Automation system |  |
| ASCII | American Standard Code for Information Interchange | American coding standard for the exchange of information |
| ASIC | Application Specific Integrated Circuit | User switching circuit |
| ASUP | Asynchronous subprogram |  |
| AUTO |  | Operating mode "Automatic" |
| AUXFU | Auxiliary Function | Auxiliary functions |
| STL | Statement list |  |
| BA | Operating mode |  |
| Mode group | Mode group |  |
| BERO | Proximity limit switch with feedback oscillator |  |
| BI | Binector Input |  |
| HHU | Handheld unit |  |
| BICO | Binector Connector | Interconnection technology for the drive |
| BIN | Binary Files | Binary files |
| BIOS | Basic Input Output System |  |
| BCS | Basic coordinate system |  |
| BO | Binector Output |  |
| OPI | Operator Panel Interface |  |
| CAD | Computer-Auded Design |  |
| CAM | Computer-Aided Manufacturing |  |
| CC | Compile Cycle | Compile cycles |
| Cl | Connector Input |  |
| CF-Card | Compact Flash-Card |  |
| CNC | Computerized Numerical Control | Computerized numerical control |
| CO | Connector Output |  |
| COM Board | Communication Board |  |
| CP | Communication Processor |  |
| CPU | Central Processing Unit | Central processing unit |
| CR | Carriage Return |  |
| CRC | Cyclic Redundancy Check | Checksum test |
| CRT | Cathode Ray Tube | Picture tube |

## A. 1 List of abbreviations

| Abbreviation | Derivation of the abbreviation | Meaning |
| :---: | :---: | :---: |
| CSB | Central Service Board | PLC module |
| CTS | Clear To Send | Signals that data is ready to be sent for serial data interfaces |
| CUTCOM | Cutter Radius Compensation | Tool radius compensation |
| DB | Data block | Data block in the PLC |
| DBB | Data-block byte | Data block-byte in the PLC |
| DBW | Data-block word | Data-block word in the PLC |
| DBX | Data-block bit | Data-block bit in the PLC |
| DDE | Dynamic Data Exchange | Dynamic data exchange |
| DDS | Drive Data Set | Drive data set |
| DIN | Deutsche Industrie Norm (German Industry Standard) |  |
| DIR | Directory | Directory |
| DLL | Dynamic Link Library |  |
| DO | Drive Object | Drive object |
| DPM | Dual Port Memory |  |
| DRAM | Dynamic Random Access Memory | Dynamic memory block |
| DRF | Differential Resolver Function | Differential resolver function (handwheel) |
| DRIVE-CLiQ | Drive Component Link with IQ |  |
| DRY | Dry Run | DRY run feedrate |
| DSB | Decoding Single Block | Decoding single block |
| DSC | Dynamic Servo Control / Dynamic Stiffness Control |  |
| DSR | Data Send Ready | Signals the availability of serial data interfaces |
| DW | Data word |  |
| DWORD | Double word (currently 32 bits) |  |
| 1 | Input |  |
| I/O | Input/Output |  |
| ENC | Encoder | Actual value encoder |
| EPROM | Erasable Programmable Read Only Memory | Erasable, electronically programmable read-only memory |
| ePS Network Services |  | Services for Internet-based remote machine maintenance |
| EQN |  | Type designation for an absolute encoder with 2048 sine signals per revolution |
| ESR | Extended stop and retract |  |
| ETC | ETC key | Expansion of the softkey bar in the same menu |
| FB | Function block |  |
| FBS | Flat screen |  |
| FC | Function Call | Function block in the PLC |
| FDD | Feed Disable | Feed disable |
| FdStop | Feed Stop | Feed stop |
| FEPROM | Flash-EPROM | Read and write memory |
| FIFO | First In - First Out | Method of storing and retrieving data in a memory |


| Abbreviation | Derivation of the abbreviation | Meaning |
| :---: | :---: | :---: |
| FIPO | Fine interpolator |  |
| FM | Function Module |  |
| FM-NC | Function Module Numerical Control | Numerical control |
| FPU | Floating Point Unit | Floating-point unit |
| FRA | Frame block |  |
| FRAME | Data set | Coordinate conversion with the components work offset, rotation, scaling, mirroring |
| CRC | Cutter radius compensation |  |
| FST | Feed Stop | Feed stop |
| CSF | Control system flowchart (PLC programming method) |  |
| FW | Firmware |  |
| GC | Global Control | PROFIBUS: Broadcast telegram |
| GD | Global data |  |
| GEO | Geometry, e.g. geometry axis |  |
| GP | Basic program |  |
| GS | Gear stage |  |
| GUD | Global User Data | Global user data |
| HD | Hard Disk | Hard disk |
| HEX | Abbreviation for hexadecimal number |  |
| AuxF | Auxiliary function |  |
| HMI | Human Machine Interface | SINUMERIK user interface |
| MSD | Main spindle drive |  |
| HT | Handheld Terminal | Handheld unit |
| HW | Hardware |  |
| COMM | Commissioning |  |
| IF | Drive module pulse enable |  |
| IK (GD) | Implicit communication (global data) |  |
| IKA | Interpolative Compensation | Interpolatory compensation |
| IM | Interface Modul | Interface module |
| INC | Increment | Increment |
| INI | Initializing Data | Initializing data |
| IGBT | Insulated Gate Bipolar Transistor |  |
| IPO | Interpolator |  |
| ISO | International Organization for Standardization | International Organization for Standardization |
| JOG | "Jogging" operating mode |  |
| KD | Coordinate rotation |  |
| KDV | Crosswise data comparison | Crosswise data comparison between the NC and PLC |
| $\mathrm{K}_{\mathrm{V}}$ | Servo-gain factor | Gain factor of control loop |
| LAD | Ladder diagram | PLC programming method |
| LCD | Liquid Crystal Display | Liquid crystal display |
| LED | Light Emitting Diode | Light emitting diode |
| LF | Line Feed |  |

## A. 1 List of abbreviations

| Abbreviation | Derivation of the abbreviation | Meaning |
| :---: | :---: | :---: |
| LMS |  | Position measuring system |
| LSB | Least Significant Bit | Least significant bit |
| LUD | Local User Data | User data |
| MAC | Media Access Control |  |
| MAIN | Main program | Main program (OB1, PLC) |
| MB | Megabyte |  |
| MCI | Motion Control Interface |  |
| MCIS | Motion Control Information System |  |
| MCP | Machine Control Panel | Machine control panel |
| MD | Machine data |  |
| MDI | "Manual Data Automatic" operating mode | Manual input |
| MCS | Machine coordinate system |  |
| MPF | Main Program File | Main program (NC part program) |
| MPI | Multi Point Interface | Multi-point interface |
| NC | Numerical Control | Numerical control |
| NCK | Numerical Control Kernel | Numerical control kernel |
| NCSD | NC Start Disable | NC start disable |
| NCU | Numerical Control Unit | NC hardware unit |
| IF | Interfaces | Interface signal |
| WO | Zero offset |  |
| NX | Numerical Extension | Axis expansion module |
| OB | Organization block in the PLC |  |
| OEM | Original Equipment Manufacturer |  |
| OP | Operation Panel | Operator panel |
| OPI | Operation Panel Interface | Interface for connection to the operator panel |
| OSI | Open Systems Interconnection | Standard for computer communications |
| OPT | Options | Options |
| PIQ | Process Image Output |  |
| PII | Process Image Input |  |
| P bus | Peripheral bus |  |
| PC | Personal Computer |  |
| PCMCIA | Personal Computer Memory Card International Association | Standard for plug-in memory cards |
| PCU | Programmable Control Unit |  |
| Pl | Programm Instanz |  |
| PG | Programming device |  |
| PLC | Programmable Logic Control | Programmable Logic Controller |
| PN | PROFINET |  |
| PO | POWER ON |  |
| POU | Program organization unit | Unit in the PLC user program |
| PPU | Panel Processing Unit | Panel-based control |
| PTP | Point to Point | Point-to-point |
| PZD | Process data for drives |  |


| Abbreviation | Derivation of the abbreviation | Meaning |
| :---: | :---: | :---: |
| QEC | Quadrant Error Compensation | Quadrant error compensation |
| QEC | Quadrant error compensation |  |
| RAM | Random Access Memory | Program memory that can be read and written to |
| REF POINT |  | Function "Reference point approach" in JOG mode |
| REPOS |  | Function "Repositioning" in JOG mode |
| RID | Read In Disable | Read-in disable |
| RPA | R-Parameter Active | Memory area on the NC for R parameter numbers |
| RPY | Roll Pitch Yaw | Rotation type of a coordinate system |
| RTC | Real Time Clock | Real-time clock |
| RTS | Request To Send | RTS, control signal of serial data interfaces |
| SBL | Single Block | Single block |
| SBR | Subroutine | Subroutine (PLC) |
| SBT | Safe Brake Test | Safe Brake Test |
| SCC | Safety Control Channel |  |
| SD | Setting-Datum |  |
| SDB | System data block |  |
| SDI | Safe Direction | Safe Motion Direction |
| SBT | Safe Brake Test | Safe Brake Control |
| SEA | Setting Data Active | Identifier (file type) for setting data |
| SERUPRO | Search-Run by Program Test | Search run by program test |
| SFC | System Function Call |  |
| SGE | Safety-related input |  |
| SGA | Safety-related output |  |
| SH | Safe Stop |  |
| SIC | Safety Info Channel |  |
| SK | Softkey |  |
| SKP | Skip | Skip block |
| SLM | Smart Line Module |  |
| SLP | Safe Limited Position | Safely-Limited Position |
| SLS | Safely Limited Speed | Safely-Limited Speed |
| SM | Stepper Motor |  |
| SOS | Safe Operating Stop | Safe Operating Stop |
| SS1 | Safe Stop 1 | Safe Stop 1 (time-monitored, ramp-monitored) |
| SS2 | Safe Stop 2 | Safe Stop 2 |
| SPF | Subprogram file | Subprogram (NC) |
| SPL | Safe Programmable Logic |  |
| PLC | Programmable Logic Controller |  |
| SRAM | Static Random Access Memory | Static memory block |
| TNRC | Tool nose radius compensation |  |
| LEC | Leadscrew error compensation |  |
| SSI | Serial synchronous interface | Serial synchronous interface |
| STO | Safe Torque Off | Safe Torque Off |
| STW | Control word |  |

## A. 1 List of abbreviations

| Abbreviation | Derivation of the abbreviation | Meaning |
| :---: | :---: | :---: |
| GWPS | Grinding wheel peripheral speed |  |
| SW | Software |  |
| SYF | System Files | System files |
| SYNACT | SYNACT Synchronized Action | Synchronized action |
| TB | Terminal Board (SINAMICS) |  |
| TEA | Testing Data Aktive | Identifier for machine data |
| TCP | Tool Center Point | Tool tip |
| TCU | Thin Client Unit |  |
| TEA | Testing Data Active | Identifier for machine data |
| TM | Terminal Module (SINAMICS) |  |
| TO | Tool Offset | Tool offset |
| TOA | Tool Offset Active | Identifier (file type) for tool offsets |
| TRANSMIT | Transform Milling into Turning | Coordinate conversion on turning machines for milling operations |
| TTL | Transistor-Transistor-Logik | Interface type |
| UFR | User Frame | Zero offset |
| SR | Subroutine |  |
| USB | Universal Serial Bus |  |
| UPS | Uninterruptible Power Supply |  |
| VDI |  | Internal communication interface between NC and PLC |
| FDD | Feed drive |  |
| VPM | Voltage Protection Module |  |
| VSM | Voltage Sensing Module |  |
| WAB |  | Function "Smooth Approach and Retraction" |
| WCS | Workpiece coordinate system |  |
| T | Tool coordinate system: |  |
| TLC | Tool length compensation |  |
| WPD | Work Piece Directory | Workpiece directory |
| T | Tool |  |
| TM | Tool management |  |
| TC | Tool change |  |
| ZWS |  | Buffer location |
| ZOA | Zero Offset Active | Identifier (file type) for zero offset data |
| ZSW | Status word (of drive) |  |

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[^0]:    Description:
    File name with path name under which the list of mounted drives is stored.

[^1]:    Description:
    Bit mask for channel-specific data management frames, the axial frames of which can be mapped onto other axial frames.
    The mapping takes place via MD32075 \$MA_MAPPED_FRAME[AXn] = "AXm".

[^2]:    Description:
    Normal vector programming from software version 3.2

[^3]:    Description: Path of output device for ISOPRINT

[^4]:    Description:
    For PROFIBUS/PROFINET only:
    Logical I/O address that is to be recorded.

[^5]:    Description:
    The machine data determines the size of the setpoint value buffer between interpolator

[^6]:    Description:
    Maximum number of facets permitted for all internally created protection zones.
    Only applies if MAXNUM_3D_PROT_AREAS is greater than zero and bit 0 in
    PROT_AREA_TOOL_MASK is set.
    Typical values would then be 1000 for milling machines with a modeled tool, and 5000
    for lathes with various tool types in a turret.

[^7]:    Description:
    For SW-internal function optimization.

[^8]:    Description:
    Look Ahead special functions:
    Bit $0=1$ :
    The Safety Integrated setpoint limitation is already taken into account in Look Ahead.
    Bit $1=1$ :
    The Safety Integrated setpoint limitation is taken into account in detail in the block.

[^9]:    Description:
    When, for example, an alarm occurs, this MD can be used to delay deceleration in order,

[^10]:    Description:
    This machine data designates an offset of the workpiece carrier for the first (MD24500 \$MC_TRAFO5_PART_OFFSET_1) or second (MD24600 \$MC_TRAFO5_PART_OFFSET_2) 5-axis transformation of a channel, and has a specific meaning for the different machine types:
    Machine type 1 (two-axis swivel head for tool):
    Vector from machine reference point to zero point of workpiece table. This will
    generally be a zero vector if both coincide.
    Machine type 2 (two-axis rotary table for workpiece):
    Vector from the second rotary joint of workpiece rotary table to zero point of table. Machine type 3 (single-axis rotary table for workpiece and single-axis swivel head for tool):
    Vector from rotary joint of workpiece table to zero point of table.

[^11]:    Description:
    The type of speed setpoint output is entered into this MD:

[^12]:    A factor between -1.0 and 1.0 can be entered for each acceleration value from MD32581 \$MA_FRICT_ADAPT_TABLE_ACCEL with which the amplitude of the torque injection pulse of the friction compensation is weighted.

    Not relevant for:
    MD32500 \$MA_FRICT_COMP_ENABLE = 0
    MD32490 \$MA_FRICT_COMP_MODE = 1/2

[^13]:    Description:
    The value specifies the maximum permitted path deviation for smoothing with G645. This is only relevant to tangential block transitions that are not accelerationcontinuous.
    For smoothing of corner with G645 tolerance MD33100 \$MA_COMPRESS_POS_TOL becomes active like with G642.

[^14]:    Description:
    The value of this $S D$ is added to the compensation value \$AN_CEC[t,1].
    Related to ....
    \$AN_CEC[t,1] compensation value

[^15]:    Description:
    The setting data dimensions the COMPSURF function in respect of axis groups for following machining. Values greater than \$MC_MM_MAXNUM_SURF_GROUPS are limited without an alarm.

[^16]:    Description:
    This setting data defines the assignment of the tool length components to the geometry axes irrespective of the tool type. It can assume any value between 0 and 3. Any other value is interpreted as 0.

[^17]:    Description:
    Number of sparking-out strokes performed after ending the oscillating movement
    Application example(s)
    NC language: OSNSC[Axis]=Stroke number
    Note:
    MD $10710 \$ M N \_P R O G \_S D \_R E S E T \_S A V E \_T A B$ can be be set so that the value written by the part program is transferred to the active file system on reset (that is the value is retained after reset.)

[^18]:    Description:
    Display resolution in inch feedrate/rev

[^19]:    Description:
    Write external work offset protection level

[^20]:    Description: Set actual value protection level

[^21]:    Description:
    M code for coolant $1+2$ ON

[^22]:    0 : not defined
    1: METRIC
    2: INCH

