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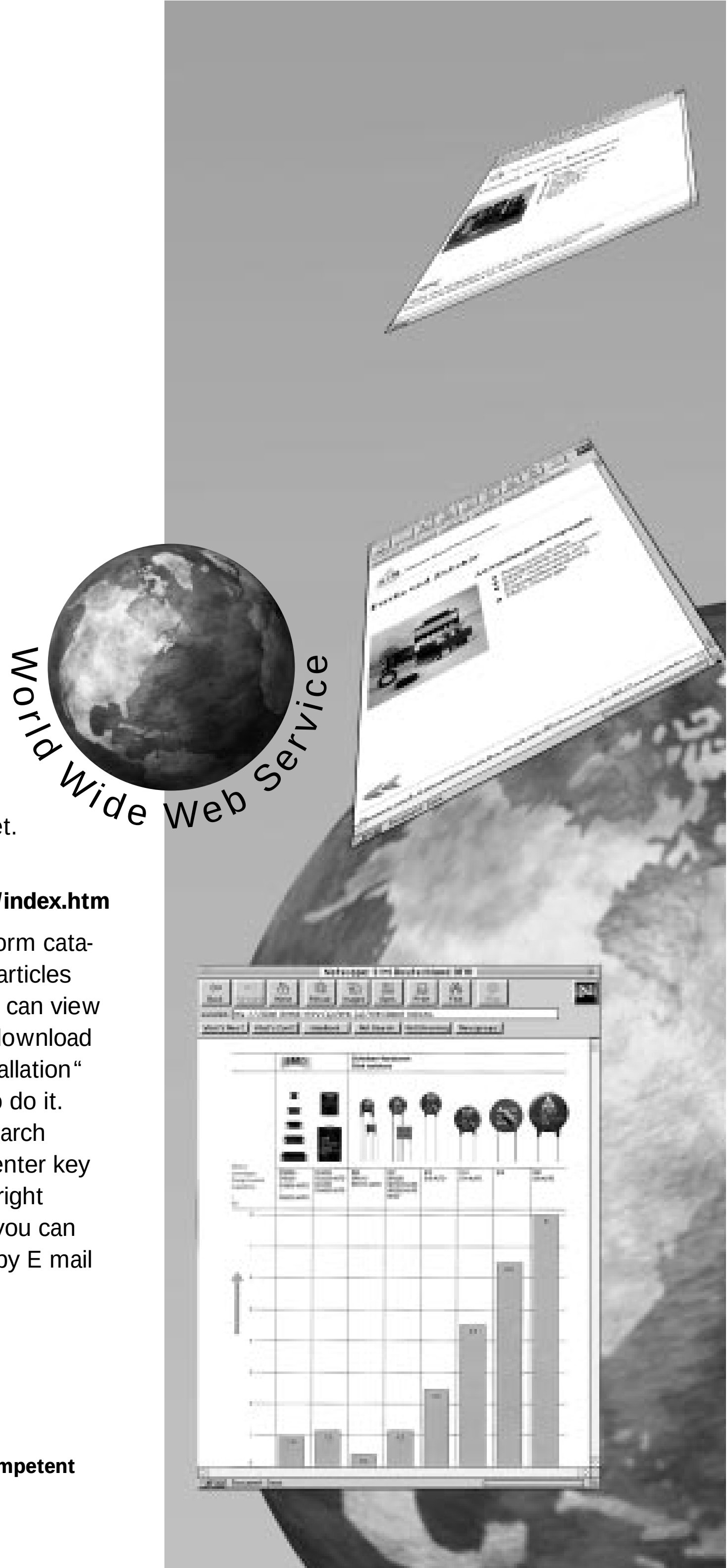

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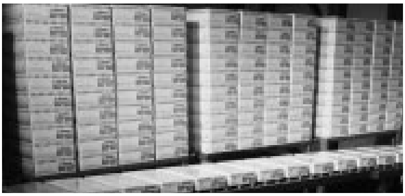

store for you, like SCS depots right there in our plants, extra stock with distributors, and experienced sales engineers on the spot around the world. An extensive range of non-SCS components is available too – just contact us.

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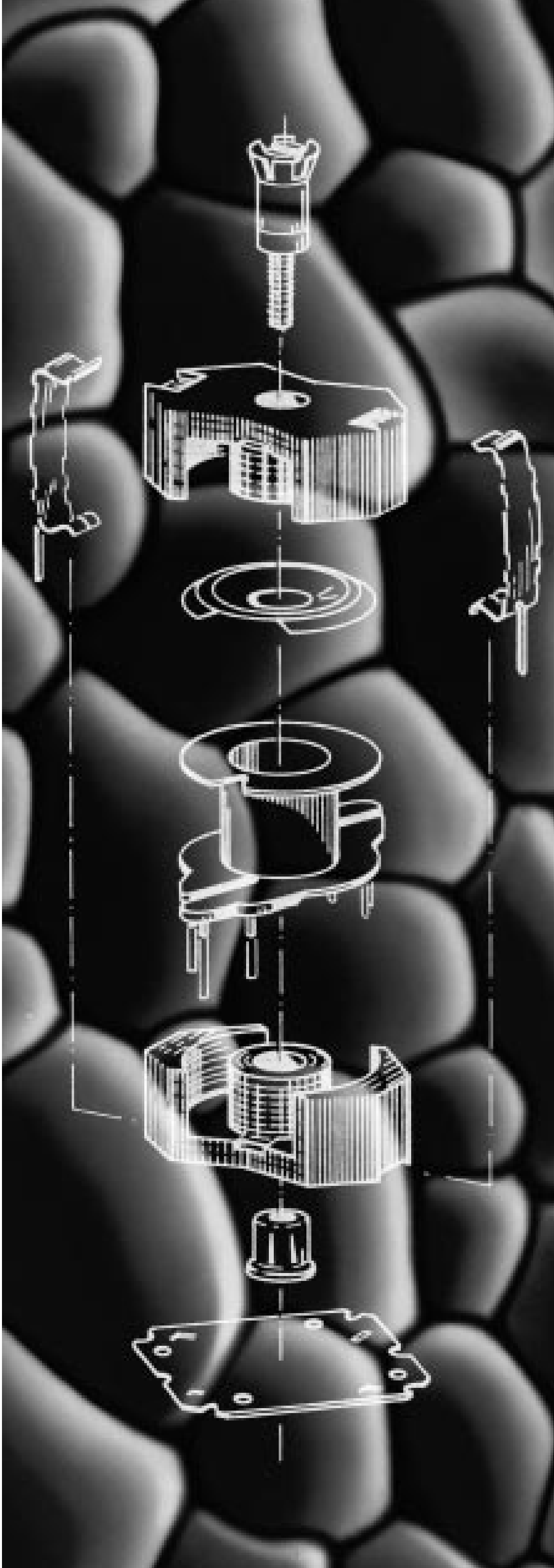
Siemens Matsushita Components

Ferrite cores and accessories

In place, in shape

With more than 4000 different ferrite cores we have the solution to tackle every application. Straight from SCS stock we can supply you 12 core shopes in as many as 26 materials, plus the matching accessories:

- **RM** for transformers with high packing density
- **PM** for power transformers
- **P** for transformers with extremely low leakage field
- **E cores**
  ETD, EC, ER with round center leg for compact transformers,
  EFD with flattened center leg for ultra flat transformers,
  wide range of standard E cores
- **U** for storage chokes, split diode and line transformers
- **Ring** for pulse, broadband and balun transformers plus chokes
- **Double-aperture** for broadband transformers up into the GHz region



SCS – dependable, fast and competent

1 Electromagnetic compatibility (EMC)

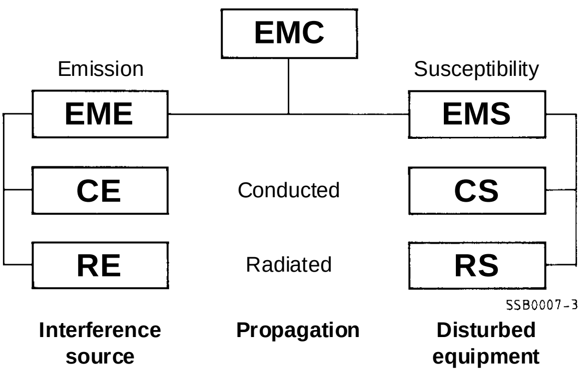
1.1 Introduction

For as long as electronic transmission equipment such as radio, television, and telephone has been in existence, it has had a history of susceptibility to interference from other electronic devices. Legal regulations on interference suppression (electromagnetic and radio frequency interference, EMI and RFI) have been in existence since 1928. These regulations protect transmission paths and reception equipment by limiting the emitted interference.

In view of the increasing number of electrical and electronic appliances in use, not only the principles of interference suppression must be observed, but also, in the sense of electromagnetic compatibility (EMC), it must be ensured that all equipment is able to operate simultaneously without problems. EMC is defined as the ability of electrical equipment to function satisfactorily in its electromagnetic environment without affecting other equipment in this environment to an impermissible extent.

The European Communities' EMC Directive (89/336/EEC) has now finally come into force on the 1. 1. 1996. It has been transformed into corresponding legislation in the individual member states of the EU (European Union). With this, it has become mandatory to design electronic equipment to comply with the protective aims of this Directive; i.e. to meet the requirements for electromagnetic emission and electromagnetic immunity as laid down in the corresponding EN standards (European Standards).

The concept of EMC includes both electromagnetic emission (EME) and electromagnetic immunity/susceptibility (EMS), see figure 1.



EMC = Electromagnetic compatibility
EME = Electromagnetic emission
EMS = Electromagnetic immunity/susceptibility
CE = Conducted emission
CS = Susceptibility to conducted emission
RE = Radiated emission
RS = Susceptibility to radiated emission

Fig. 1 EMC terms

An interference source may generate conducted or radiated electromagnetic energy, i.e. conducted emission (CE) or radiated emission (RE). This also applies to the propagation paths and to the electromagnetic susceptibility of disturbed equipment.

In order to work out economical solutions, it is necessary consider both phenomena, i.e. propagation and susceptibility, to an equal extent, and not just one aspect, e.g. conducted emission.

EMC components are used to reduce conducted electromagnetic interference to the limits in an EMC plan or to reduce this interference below the limit values specified in the EMC regulations. These components may be installed either in the source of potential interference or in the disturbed equipment (figure 2).

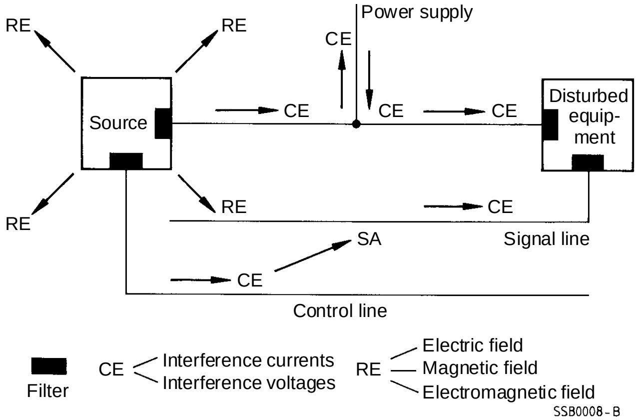


Fig. 2 Susceptibility model and filtering

S + M Components offers EMI suppression components with a well-balanced range of rated voltages and currents for power supply lines as well as for signal and control lines.

1.2 Interference sources and disturbed equipmentInterference source

An interference source is an electrical device or electrical equipment which emits electromagnetic interference. We can differentiate between two main groups of interference sources corresponding to the type of frequency spectrum emitted (figure 3).

Interference source (emission)

Discrete frequency spectrum (Sine-wave, low energy)	**Continuous frequency spectrum (Impulses, high energy)**
µP systems	Switchgear (contactors, relays)
RF generators	Household appliances
Medical equipment	Gas discharge lamps
Data processing systems	Power supplies and battery chargers
Microwave equipment	Ignition systems
Ultrasonic equipment	Welding apparatus
RF welding apparatus	Motors with brushes
Radio and TV receivers	Oscillating drives
Switch-mode power supplies	Atmospheric discharges
Frequency converters	
UPS systems	
Electronic ballast circuits	

Fig. 3 Sources of interference

Interference sources with discrete frequency spectra (e.g. high frequency generators and microprocessor systems) emit interference energy which is concentrated on narrow frequency bands.

Switchgear and electric motors in household appliances, however, distribute their interference energy over broad frequency bands and are considered to belong to the group of interference sources having a continuous frequency spectrum.

Disturbed equipment

Electrical devices, equipment and/or systems subject to interference and which can be adversely affected by it are termed disturbed equipment.

In the same way as interference sources, disturbed equipment can also be categorized corresponding to frequency characteristics. A distinction can be made between narrowband and broadband susceptibility (figure 4).

Narrowband systems include radio and TV sets, for example, whereas data processing systems are generally specified as broadband systems.

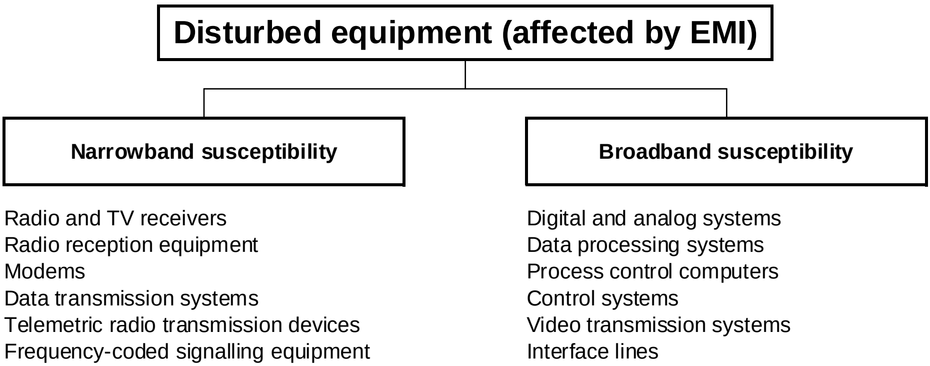


Fig. 4 Disturbed equipment

1.3 Propagation of electromagnetic interference and EMC measurement techniques

As previously mentioned, an interference source causes both conducted and radiated electromagnetic interference.

Propagation along lines can be detected by measuring the interference current and the interference voltage (figure 5).

The effect of magnetic and electric interference fields on their immediate vicinity is assessed by measuring the radiated magnetic and electric field components. This method of propagation is also frequently termed electric or magnetic coupling (near field).

In higher frequency ranges, characterized by the fact that device dimensions are in the order of magnitude of the wavelength under consideration, the interference energy is mainly radiated directly (far field).

Conducted and radiated propagation must also be taken into consideration when measuring the susceptibility of disturbed equipment.

Interference sources e.g. sine-wave generators as well as pulse generators with a wide variety of pulse shapes are used for such tests.

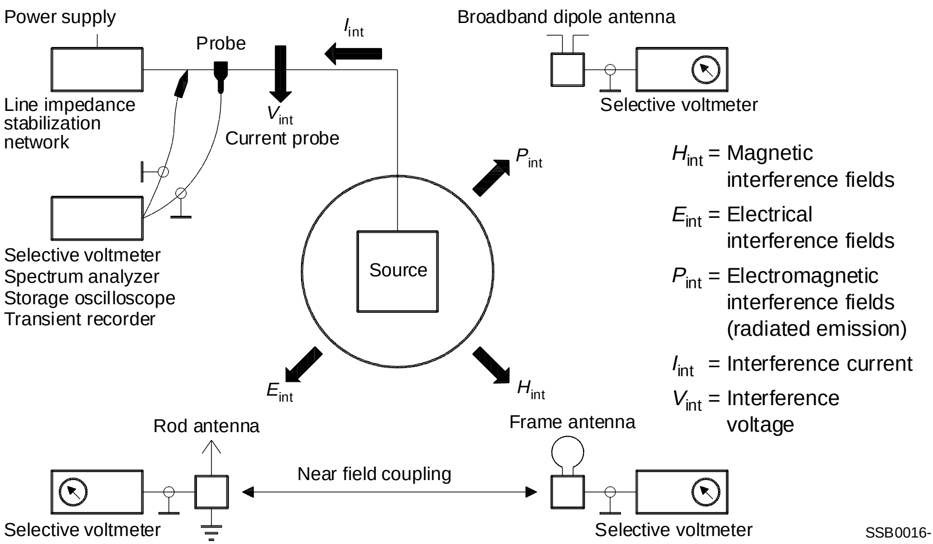


Fig. 5 Propagation of electromagnetic interference and EMC measurement techniques

1.4 EMC regulations und legislation

A wide range of legislation and of harmonized standards have come into force and been published in the field of EMC in the past few years. In the European Union, the EMC Directive 89/336/EEC of the Council of the European Communites has come into effect on the 1st of January 1996. As of this date, all electronic equipment must comply with the protective aims of the EMC Directive. The conformity with the respective standards must be guaranteed by the **manufacturer or importer** in the form of a declaration of conformity. A CE mark of conformity must be applied to all equipment.

As a matter of principle, all electrical or electronic equipment, plant and systems must meet the protection requirements of the EMC Directive and/or national EMC legislation. A declaration of conformity by the manufacturer or importer and a CE mark are required for most equipment. Exceptions to this rule and special rulings are described in detail in the EMC laws.

New, harmonized European standards have been drawn up in relation to the EEC's EMC Directive and the national EMC laws. These specify measurement techniques and limit values or test severities, both for interference emission and for the interference susceptibility (or rather, immunity to interference) of electronic devices, equipment and systems.

The subdivision of the European standards into various categories (cf. following table) makes it easier to find the rules that apply to the respective equipment.

The generic standards always apply to all equipment for which there is no specific product family standard or dedicated product standard.

The basic standards contain information on interference phenomena and general measuring methods.

The following standards and regulations form the framework of the conformity tests:

EMC standards	Germany	Europe	International
Generic standards define the EMC environment in which a device is to operate according to its intended use			
Emissionresidential industrial	DIN EN 50081-1 DIN EN 50081-2	EN 50081-1 EN 50081-2	—
Susceptibilityresidential industrial	DIN EN 50082-1 DIN EN 50082-2	EN 50082-1 EN 50082-2	—
Basic standards describe physical phenomena and measurement techniques			
Basic principles	DIN VDE 0843	EN 61000	IEC 1000
Measuring equipment	DIN VDE 0876		CISPR 16-1
Measuring emission methodssusceptibility	DIN VDE 0877	 EN 61000-4-1	CISPR 16-2 IEC 1000-4-1
Harmonics	DIN VDE 0838	EN 60555-2	IEC 1000-3-2
Interference factors e. g. ESD EM fields Burst Surge	 DIN VDE 0843-2 DIN VDE 0843-3 DIN VDE 0843-4 DIN VDE 0843-5	 EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5	 IEC 1000-4-2 IEC 1000-4-3 IEC 1000-4-4 IEC 1000-4-5
Product standards define limit values for emission and susceptibility			
ISM equipment emission susceptibility	DIN VDE 0875 T11 1)	EN 55011 1)	CISPR 11 1)
Household emission appliancessusceptibility	DIN VDE 0875 T14-1 DIN VDE 0875 T14-2	EN 55014-1 EN 55014-2	CISPR 14-1 CISPR 14-2
Lightingemission susceptibility	DIN VDE 0875 T15-1 DIN VDE 0875 T15-2	EN 55015-1 EN 55015-2	CISPR 15 IEC 3439
Radio andemission TV equipmentsusceptibility	DIN VDE 0872 T13 DIN VDE 0872 T20	EN 55013 EN 55020	CISPR 13 CISPR 20
High-voltage systemsemission	 DIN VDE 0873	 EN 55018	 CISPR 18
ITE equipmentemission susceptibility	DIN VDE 0878 DIN VDE 0878	EN 55022 EN 55022	CISPR 22 CISPR 22
Vehiclesemission susceptibility	DIN VDE 0879 DIN VDE 0839	EN 72245	CISPR 25 ISO 11451/ S2

1) Is governed by the safety and quality standards of the product families.

The following table shows the most important standards in the field of immunity to interference.

Standard	Test characteristics	Phenomena
Conducted interference		
EN 61000-4-4 IEC 1000-4-4	5/50 ns (single impulse) 15 kHz burst	Burst Cause: switching processes
EN 61000-4-5 IEC 1000-4-5	1,2 / 50 µs (open-circuit voltage) 8 / 20 µs (short-circuit current)	Surge (high-energy transients) Cause: lightning strikes mains lines, switching processes
EN 61000-4-6 (ENV 50141) IEC 801-6	1 V, 3 V, 10 V 150 kHz … 80 MHz	High-frequency coupling Narrow-band interference
Field-related interference		
EN 61000-4-3 (ENV 50140) IEC 801-3	3 V/m, 10 V/m 80 bis 1000 MHz	High-frequency interference fields
Electrostatic discharge (ESD)		
EN 61000-4-2 IEC 1000-4-2	Up to 8 kV 5 / 50 ns	Electrostatic discharge

The IEC 1000 or EN 61000 series of standards are planned as central EMC standards into which all EMC regulations (e.g. IEC 801, IEC 555) are to be intgrated in the next few years.

1.5 Propagation of conducted interference

In order to be able to choose suitable interference suppression components, the way in which conducted interference is propagated needs to be known (figure 6).

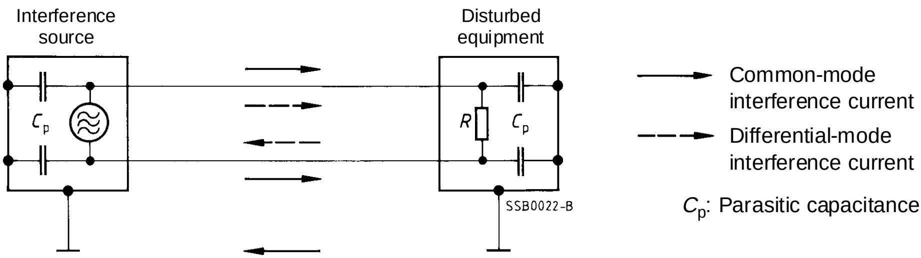


Fig. 6 Common-mode and differential-mode interference

An interference source which is at a floating potential primarily emits differential-mode, i.e. symmetrical interference which is propagated along the connected lines. On power lines, the interference current will flow towards the disturbed equipment on one wire and away from it on the other wire, just as the mains current does.

Symmetrical or differential-mode interference occurs mainly at low frequencies (up to several hundred kHz).

However, parasitic capacitances in interference sources and disturbed equipment or intended ground connections, also lead to an interference current in the ground circuit. This interference current flows towards the disturbed equipment through both the connecting lines and returns to the interference source through the ground lines.The currents on the connecting lines are in common mode and the interference is thus designated as common-mode or asymmetrical interference.

Since the parasitic capacitances will tend towards representing a short-circuit with increasing interference frequencies and the coupling to the connecting cables and the equipment itself will increase correspondingly, common-mode interference becomes dominant at multiple-MHz frequencies.

In European usage, the concept of an “unsymmetrical interference” is used, in addition to the two components described above, to describe interference. This term is used to describe the interference voltage between a line and reference ground potential.

Characteristic insertion loss values are specified for the individual filter types in order to facilitate the selection of a suitable S + M EMI suppression filter.

1.6 Filter circuits and line impedance

Interference suppression filters are virtually always designed as reflecting lowpass filters, i.e. they reach their highest insertion loss when they are - on the one hand - mismatched to the impedance of the interference source or disturbed equipment and - on the other hand - mismatched to the impedance of the line. Possible filter circuits for various line, interference source and disturbed equipment impedance conditions are shown in figure 7.

Line impedance	Impedance of source of interference / disturbed equipment
low	high
high	high
high unknown	high unknown
low	low
low unknown	low unknown

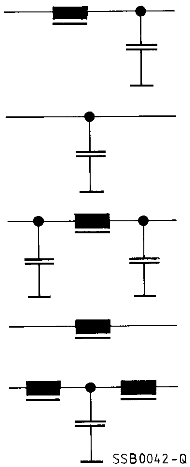


Fig. 7 Filter circuits and impedance relationships

It is, therefore, necessary to find out the internal impedances so that optimum filter circuit designs as well as economical solutions can be implemented.

The internal impedances of the power networks under consideration are usually known from calculations and extensive measurements, whereas the impedances of interference sources or disturbed equipment are, in most cases, not or only inadequately known.

For this reason, it is impossible to design the most suitable filter solution without measuring the equipment characteristics. In this context, we offer all our customers the competent assistance of our skilled staff, both on-site and in our EMC laboratory in Regensburg. (cf. “Services offered”, page 33).

2 Selection criteria for EMC components

To comply with currently valid regulations, a frequency range of 150 kHz to 1000 MHz has to be taken into consideration, in most cases, in order to ensure electromagnetic compatibility; in addition, however, factors such as low-frequency line interference should be considered.

EMC components must thus have favorable RF characteristics and are ususally required to be effective over a broad frequency range.

- For individual components (inductors) the RF characteristics are specified by stating the impedance as a function of frequency.
- As explained, EMC filters are selected by insertion loss. The insertion loss is defined as the logarithm of the ratio of the power supplied to a load impedance without the filter to the power supplied when a filter is connected (cf. chapter on EMC filters, page 204).

If the device under test (DUT) is terminated on both sides with an impedance of 50 Ω, for example, the result of the measurement is referred to as being the 50-Ω insertion loss.

Depending on the particular application intended, priorities for consideration of the three possible methods of insertion loss

– asymmetrical or common-mode attenuation
– symmetrical or differential-mode attenuation, or
– unsymmetrical attenuation

must be decided upon.

The measuring method using a 50-Ω insertion loss has been adapted from the field of communications engineering and is also specified in the relevant national and international standards.

Admittedly, it permits a comparison of different filters, yet provides little information on practical applications.

The reason is – as already mentioned in the previous section – that neither the interference source or disturbed equipment nor the connected power line system will have an impedance of 50 Ω at frequencies below 1 MHz.

Likewise, the attenuation of interference impulses cannot simply be determined on the basis of the insertion loss value. In this case, it is also necessary to take the non-linear response of the interference suppression chokes in the filters into consideration.

If sent the pulse shapes in question, we can specify filter-specific values on request.

3 Arrangement and installation of filters and filter components

When designing filter circuits using individual components, observe the following basic rules:

- The components should be arranged along the lines (see example in figure 8) to avoid capacitive and inductive coupling between components and between filter inputs and outputs.
- As insertion loss of a filter circuit in the MHz range is mainly determined by the capacitors connected to ground, the connecting leads of these capacitors should be as inductance-free as possible, i.e. short.
- Filter circuits which are to be installed in devices with limited space must be shielded.

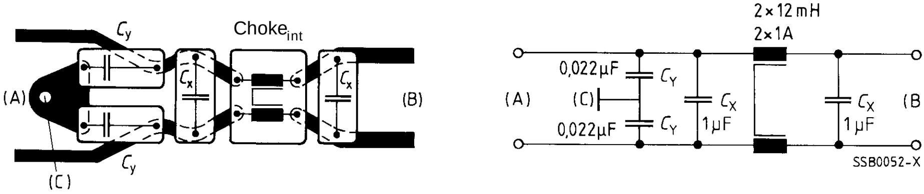


Fig. 8 Correct arrangement of filter components, e.g. on a PC board

When using off-the-shelf filters, observe the following rules:

- Ensure a proper electrically conductive connection between the filter case and/or filter ground and the metallic case of the interference source or disturbed equipment, and
- provide sufficient RF decoupling between the lines at the filter input (line causing the interference) and the filter output (filtered line), if necessary by using shielding partitions.

4 Approvals

All products by S + M Components are basically designed to conform to the German VDE regulations and/or EN standards. The respective regulations or standards are given for each component type. Many of our components have also been approval-tested in accordance with national and international regulations. The marks of conformity and quality assurance marks are listed in the data sheets.

Examples of marks of conformity:

VDE Germany	SEV Switzerland	DEMKO Denmark	SETI Finland	NEMKO Norway
SEMKO Sweden	ÖVE Austria	IMQ Italy	UL USA	CSA Canada

Example of a quality assurance mark:

CECC quality assurance mark

In future, capacitors, chokes and filters will be tested in accordance with the new European standards EN 132 400, EN 138 100 and EN 133 200 geprüft. The corresponding mark of approval is

EN …

5 Safety regulations

When selecting EMC components – in particular in case of power line applications – the safety regulations applicable to the relevant equipment must be observed.

Please note the following:

- Capacitors connected between power lines and ground (Y capacitors) may cause – in the event of faults (interruption of the protective earth) and if a person touches the device ground – a capacitive leakage current to flow between device ground – person – ground. This current must be limited or conducted to ground in such a way that – in the event of a fault – no dangerous voltages can occur on the accessible metal parts. The individuals rules applicable to the respective equipment (product specifications) are binding.
- Capacitors for use only in positions where failure in the form of a short-circuit would not lead to danger of an electric shock (X capacitors) are divided into subclasses corresponding to the peak voltages to which they are subjected in addition to the power line voltage. The selection criteria to be used are defined in the rules applicable to the respective equipment (product specifications).

Further information on the classification and the characteristics of X and Y capacitors is given in the chapter on EMI suppression capacitors.

6 Electrical characteristics

6.1 Rated voltage V_R

The rated voltage V_R is the maximum ac or dc voltage which can be continuously applied to the component at temperatures between the lower category temperature T_{min} and the upper category temperature T_{max}.

6.2 Test voltage V_P

The test voltage V_P is the ac or dc voltage which may be applied to the component for the specified test duration in the course of final inspection (100% end of line testing). This test may be repeated once as an incoming goods inspection test.

6.3 Rated current I_R

The rated current I_R is ac or dc current at which the component may be continuously operated under the nominal operating conditions.

For components with 1, 2 or 3 lines, the rated current is specified for simultaneous flow of the a current of this value through all lines. For four-line components (e.g. filters with three lines and neutral) the sum of the values of the currents in all four conductors must not exceed three times the rated current.

During ac operation, higher thermal loads may be caused due to waveforms which deviate from a pure sine wave. Where necessary, such cases must be taken into consideration.

6.4 Overcurrent

The rated current may be exceeded briefly. Details on permissible currents and load duration can be obtained upon request.

6.5 Pulse handling capability

Saturation effects (e.g in the ferrite cores used) may occur when high-energy pulses are applied to the components and these may lead to impaired interference suppression. The maximum permissible voltage-time integral area is used to characterize the pulse handling capability of chokes and filters. For standard components a range from 1 to 10 mVs can be assumed. More specific data can be obtained upon request.

6.6 Current derating I_{op}/I_R

At ambient temperatures above the operating temperature stated in the data sheet, the operating current of chokes and filters must be reduced according to the derating curve.

6.7 Rated inductance L_R

The rated inductance L_R is the inductance which has been used to designate the choke, as measured at the frequency f_L.

6.8 Stray inductance L_S

The stray inductance L_S (also termed leakage inductance) is the inductance measured through both coils when a current-compensated choke is short-circuited at one end. This affects symmetrical interference.

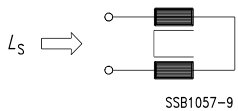


Fig. 9 Stray inductance

6.9 Inductance decrease $\Delta L/L_0$

The inductance decrease $\Delta L/L_0$ is the drop in inductance at a given current relative to the initial inductance L_0 measured at zero current. The data sheets specify this as a percentage. This decrease is caused by the magnetization of the core material, which is a function of the field strength, as induced by the operating current. Generally the decrease is less than 10 % .

6.10 DC resistance R_{typ}, R_{min}, R_{max}

The dc resistance is the resistance of a line as measured using direct current at a temperature of 20 °C, whereby the measuring current must be kept well below the rated current.

R_{typ} typical value
R_{min} minimum value
R_{max} maximum value

6.11 Winding capacitance, parasitic capacitance C_P

Parasitic capacitances (C_P), which impair the RF characteristics of the components, are related to the component geometry. These capacitances may affect the two lines mutually (symmetrically) as well as the line-to-ground circuit (asymmetrically). The design of all EMC components supplied by S + M Components minimizes the parasitic effects. Due to this, these components have excellent interference supression characteristics right up to high frequencies.

6.12 Quality factor Q

The quality factor Q is the quotient of the imaginary component of the impedance divided by the real component.

6.13 Measuring frequencies f_Q, f_L

f_Q is the frequency for which the quality factor Q of a choke is specified.
f_L is the frequency at which the inductance of a choke is determined.

6.14 Discharge resistor

Discharge resistors are meant to ensure that the energy stored in the capacitors is reduced to low levels within a short period, so that the voltage at the equipment terminals drops to below permissible maximum values.

6.15 Insertion loss

The insertion loss is a criterium for the effectivity of interference suppression components, as measured by using a standardized measurement circuit (figure 10).

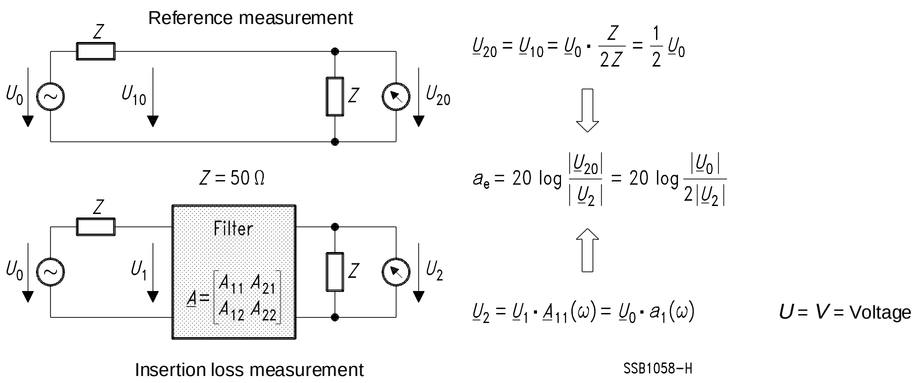


Fig. 10 Definition of insertion loss

The input terminals of the filter under test are connected to an RF generator with impedance Z (usually 50 Ω) . At the output end of the filter, the voltage is measured using a selective voltmeter having the same impedance Z. The insertion loss is then calculated from the quotient of the no-load generator voltage V_0 and double the filter output voltage V_2.

6.16 Leakage current

The use of capacitors connected from line to ground in filters will lead to a current flowing to protective earth in protection class I equipment when an ac supply voltage is applied. The maximum permissible leakage current is limited for safety reasons and specifed in the regulations applicable to the respecive equipment (product standards).

For filters, the data sheets state the maximum leakage current permissible in case of faults, i.e. open protective earth circuit, measured at 250 Vac, 50 Hz.

Measurement method (2-line filters):

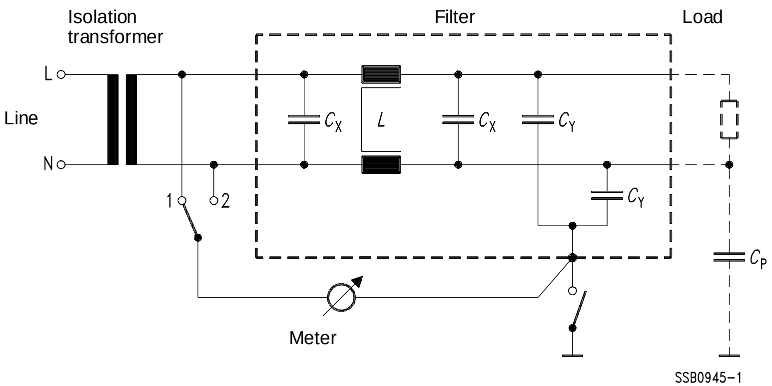


Fig. 11

For two-line filters, the larger of the two leakage currents measured when the switch is in positions 1 and 2 is stated.

Measurement method (3-phase filters):

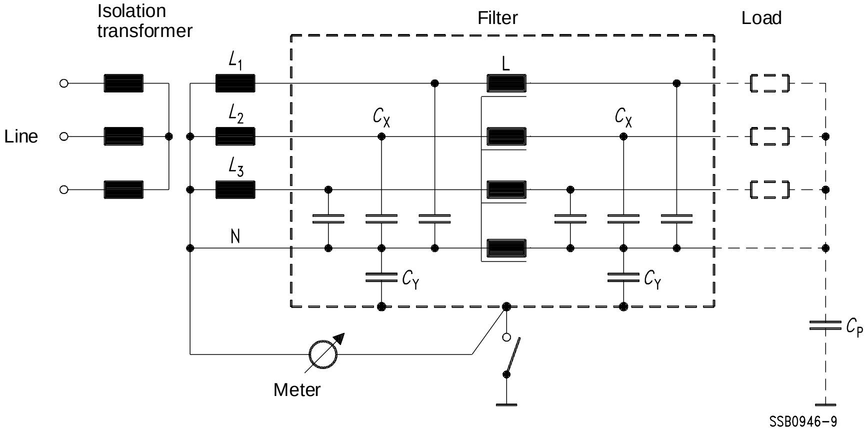


Fig. 12

The filter leakage current is added to the current flowing through the circuit capacitances C_P of the device to give the overall leakage current of the load.

7 Mechanical properties

7.1 Potting (economy potting, complete potting)

We distinguish between economy potting and complete potting.

Economy potting is used to fix the the core and windings in the case and the windings on the core. This is an economical technique which enables a single resin casting procedure to be used. Because of this, most chokes supplied by S + M Components are produced using this method.

Complete potting is only required when the thermal conductitvity of economy potting is not adequate or if the customer has special demands. Complete potting requires several process steps to ensure complete embedding of the core and the windings.

Economy potting

Complete potting

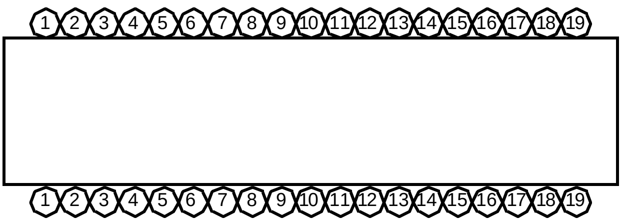
7.2 Types of winding

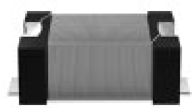
S + M Components uses different types of winding to suit the respective technical requirements:

– single-layer winding
– multilayer winding
– random winding

The different types of winding lead to different inductance characteristics, especially at high frequencies.

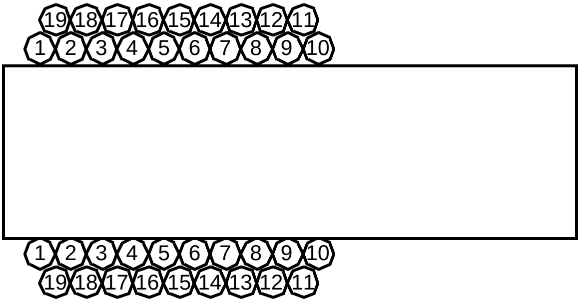
Single-layer winding:

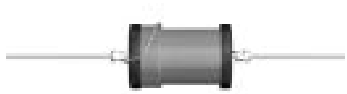




The winding pitch is equal to or greater than the wire diameter. The coil is wound in one direction only. The only capacitances (parasitic capacitances) are those between one turn to the next. In comparison to all other types of winding, this type of winding leads to the lowest possible capacitances and thus the highest resonance frequencies.

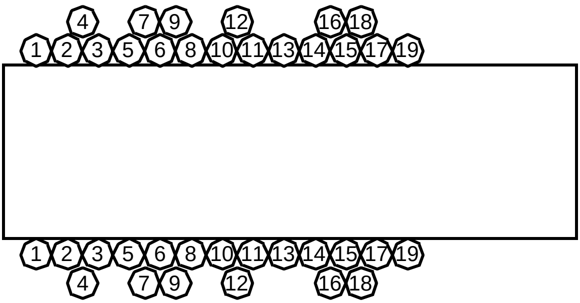
Multi-layer winding:





The winding pitch is equal to the wire diameter. The coil is wound with several layers. This leads to parasitic capacitances between the layers in addition to the turn-to-turn capacitances. In comparison to all other types of winding, this type leads to the highest capacitances and thus the lowest resonance frequencies.

Random winding:



The winding pitch is smaller than the wire diameter. The coil is wound in one direction only. This method of winding a coil does not permit the final position of a turn to be predetermined exactly. The cross section of this type of winding clearly shows a disorderly, “random” arrangement of the turns. This leads to the parasitic capacitances being only minimally greater than those achieved by single-layer winding, and the resonance frequencies are equal to those achieved by single-layer winding.

7.3 RF characteristics of various types of winding

Figure 13 shows the relation between the impedance and the frequency for two chokes of equal inductance. One of the chokes has a two-layer winding and the other is randomly wound. The choke with random windings has a considerably higher first resonance frequency. The spurious resonances are very much higher than 10 MHz. The impedance at frequencies above the first resonance frequency is approximately five times higher. This leads to better interference suppression at high frequencies.

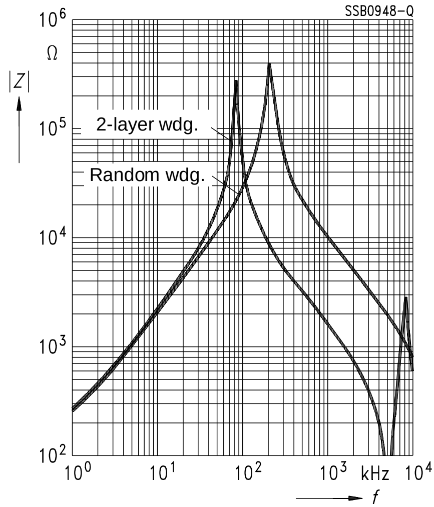


Fig. 13 Impedance |*Z*| versus frequency *f*
comparison between two-layer winding and random winding

The RF characteristics of all chokes supplied by S + M Components are within the specifications and reproducible, as the winding processes which we have developed for single-layer, multi-layer and random winding ensure that the characteristics of the inductors produced display very little variation.

The reproducibility of electrical characteristics of chokes is mainly determined by the production technique used. At S + M Components, coils are wound mainly by automatic machines (either fully or semi-automated). This permits even complicated winding patterns to be produced in large production runs with very little variation in product characteristics. In figure 14, the impedance curves of several chokes, some wound manually and some by machine, are shown for comparison. With the random winding used in this comparison, the advantages of machine winding are clearly noticeable.

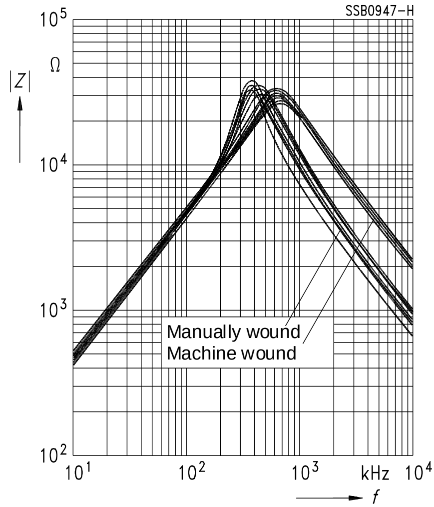


Fig. 14 Impedance |*Z*| versus frequency *f*.
Reproducibility and scatter achieved by manual and by machine winding techniques.

8 Climatic characteristics

8.1 Upper and lower category temperature T_{max} and T_{min}

The upper category temperature T_{max} und the lower category temperature T_{min} are defined as the highest and the lowest permissible ambient temperatures, respectively, at which the component can be operated continuously.

8.2 Rated temperature T_R

The rated temperature T_R is defined as the highest ambient temperature at which the component may be operated under nominal conditions.

8.3 Reference temperature for measurements

According to IEC 68-1, Section 5.1 a temperature of 20 °C is specified as the reference temperature for all electrical measurements, unless the data sheets specifically define other values.

8.4 IEC climatic category

IEC 68 -1, Appendix A, defines a method of specifying the climatic category by three groups of numbers delimited by slash characters.

Example: 55/085/56

– 55 °C
+ 85 °C
56 days

1st group of numbers:

Absolute value of the lower category temperature T_{min} as test temperature for
test Aa (cold) in accordance with IEC 68-2-1

2nd group of numbers:

Upper category temperature T_{max} as test temperature for
test Ba (dry heat) in accordance with IEC 68 -2-2
test duration: 16 h

3rd group of numbers:

Number of days denoting the test duration for
test Ca (damp heat, steady-state) in accordance with IEC 68-2-3
at (93 + 2/– 3) % rel. humidity and an ambient temperature of 40 °C

9 Dangerous substances in components

Dangerous substances (as defined by the German regulation “Gefahrstoffverordnung”) are only used in our production and to an extent where the state of the art leaves us no alternative. Wherever possible, we replace them by materials with safe characteristics. Where this is not possible, special staff entrusted with environmental protection and supervision of noxious materials monitor strict adherence to relevant laws and regulations in each of our factories.

As part of these efforts to manufacture our products without using dangerous substances as far as possible, we can guarantee for all components presented in this data book that they do not contain the following materials and compounds:

– acryl nitrile
– aliphatic chlorinated organic componds
– arsenic compounds
– asbestos
– lead carbonate and lead sulphide
– halogenated dioxines and furanes
– cadmium
– chlorinated fluorocarbons (CFC).

Nor are these used in component manufacture.

– formaldehyde
– pentachlorophenol (PCB)
– polychlorinated biphenyles (PCB)
– polychlorinated perphenyles (PCT)
– mercury compounds
– creosote
– ugilec and DBBT (PCB substitutes)
– organic tin compounds
– vinyl chloride

Just a few of our feed-through capacitors and filters are impregnated with a high-purity mineral oil. Materials other than oil are not added. The impregnating agent is stated in the technical data of the components concerned.

The packaging of our components is generally suitable for ESD areas and free of pollutants. Full details are available from our sales offices.

10 Disposal

In the light of the facts stated above on the topic of dangerous substances, all components presented in this book can be disposed of without problems. Most of our components will be accepted by the respective electronic scrap recycling companies for material recycling and/or thermal decompositon. Of course the corresponding local regulations must be observed.

11 EMC services and EMC laboratory

All electrical equipment and devices will generate electromagnetic interference (e.g. ignition sparks in motor vehicles) which will affect other electrical equipment and must therefore be kept to below specific limits. At the same time, all electrical equipment and devices are subjected to electromagnetic interference phenomena (e.g. interference impulses due to switching processes) which may cause malfunctions. In order to be able to operate a large number and variety of electrical devices simultaneously, the protection-oriented objective of “Electromagnetic compatibility” (EMC) must be achieved. The German EMC law and the European EMC Directive make this objective mandatory. European and national standards specify the technical requirements for equipment as well as the related measuring and testing methods. For example, they specify the mandatory limits for interference emissions and the severity of immunity tests.

We operate an extensively equipped EMC laboratory in Regensburg to support our customers in solving interference problems and for carrying out fundamental research on EMC component applications. **In this lab, the most economical interference suppression circuits for devices, plant and machinery are determined,** so that all legally binding or recommended limit values can be complied with.

11.1 Qualification

The S + M Components EMC laboratory in Regensburg is qualified in accordance with EN 45001 and is a member of the “Zuständige Stelle der Siemens AG” (ZFE TN GR ZS, Erlangen). Certification in accordance with the guidelines of the “Deutsche Akkreditierungsrat” (DAR - German certification commission) was carried out in October 1994.

The comprehensive equipment in the laboratory (e.g. measuring equipment, test generators, anechoic chamber), the many years of experience in the entire field of EMC (first anechoic chamber in Europe, in 1983) and our active co-operation in national and international EMC standardization bodies are an excellent foundation to our ability to meet customers’ demands. The test record which is compiled after successful conclusion of tests is recognized as a proof of conformity with the current EMC standards and regulations, which is a prerequisite for applying the CE mark to a device.

Our own development and production of EMC components ensure that all required interference suppression circuits can be implemented within a short period. A comprehensive stock of capacitors, chokes, filters and accessories is directly available on site.

Of course all devices, equipment and information entrusted to us by different customers will be treated with absolute discretion.

11.2 Services offered

S + M Components’ EMC laboratory in Regensburg can assist electrical equipment manufacturers from the design stage right up to the market launch by providing the following services:

- Advisory and training services accompanying the development phase:
  - EMC testing of working development models
  - Recommendation of EMC protection measures such as
    shielding, grounding, earthing
    EMC components (capacitors, chokes and filters)
    customer-specific solutions
    organisation measures

- EMC testing of prototypes:
  - EMC testing of equipment produced by manufacturing methods (preliminary or pilot series, prototypes)
  - recommendations for EMC measures, as above
- EMC tests to enable a declaration of conformity to be made for the CE mark:
  - test report only lists results, no recommendations or suggestions
  - EMC laboratory is certified by DAR (DATech)
  - member of the **“Zuständige Stelle”** of Siemens AG
    this responsible body can be called upon at short notice, if necessary

> **“Zuständige Stelle” (competent body):**
>
> needed in case of
>
> deviations from existing standards
> lack of applicable product standards
> reasons required for exceptions during EMC tests

- Field EMC tests:
  - equipment power supply > 200 A on 440/250V power line
  - equipment (plant) cannot be transported or transport too expensive
  - EMC environment permits on-site testing

Apart from offering the services of the EMC laboratory, S + M Components also offers direct co-operation of our development engineers on the equipment manufacturer’s premises. If necessary, standard components can be adapted to customers’ requirements, so that customer-specific solutions are available at very short notice. Our development engineers have comprehensive know-how in the entire field of EMC and many years of experience in EMC component applications. A close co-operation of the equipment manufacturer and S + M Components will achieve optimum and economical solutions very quickly.

- Our development engineers’ services at customers’ premises:
  - assistance in locating the interference sources
  - samples for interference suppression tests are specifically provided for the case at hand, the engineer brings along “experimental material“
  - optimum solutions are found quickly
  - customer-specific components can be developed faster

11.3 Equipment

The EMC laboratory has an anechoic chamber with a reflective groundplane (floor) for field strength measurements according to all corresponding measurement regulations and for measuring distances of up to 10 m. Two shielded enclosures with three measuring stations are provided for investigating conducted interference. Special facilities, such as large doors, exhaust fans, power supply up to 200 A and electrical and mechanical loads enable even very voluminous or high-powered equipment and systems to be tested here.

The basis of all EMC solutions is the reduction of conducted interference which comprises interference voltages and currents on and along the cables connected to the equipment under test. Three measuring stations enable several devices to be tested simultaneously. The measuring stations are located in shielded cabins to eliminate the possibility of interference by outside sources.

In order to have measuring and testing equipment for accurate and reproducible measurements available at all times, the respective equipment is calibrated once a year and regularly checked against our own comparative standards. Each of the three measuring stations can be used with its own measuring equipment or with the central automated measuring set-up. The results are documented using plotters and/or laser printers.

At high frequencies, parts of the equipment under test will act as antennae and interference is emitted as electromagnetic waves. The anechoic chamber guarantees a test environment that is free of external interference and in which extermely low interference field strengths can be detected and very large test field strengths are permitted.

The walls and the ceiling of the anechoic chamber are partially lined with shaft absorbers to create a reflection-free measuring environment. Fields of up to 20 V/mat a distance of 2 m can be generated for immunity tests. Depending on the measurement task, additional mobile absorbers can be installed as wall or floor absorbers. The chamber is also suitable for testing larger objects, e.g. EDP systems or motor vehicles. It has a turntable with a diameter of 4,8 m and a load-bearing capacity of approximately 4 tonnes. The turntable and the antenna mast are remote-controlled and can also be controlled by the measuring computers.

Our EMC laboratory is able to carry out tests in accordance with almost all valid national and international EMC standards. The table in section 1.4 “EMC requirements and legislation” on page 15 only lists the most important standards (product and measurement regulations). Of course we can carry out EMC tests in accordance with other corresponding EMC regulations.

The EMC laboratory Regensburg tests and measures (but not exclusively):

- all equipment in accordance with the generic standards for residential and industrial areas
- household appliances and similar electrical equipment
- measuring and control systems for industrial process control
- electrical production machinery and systems
- Information processing and telecommunications systems and equipment
- television and radio receivers
- installations and equipment for electrical power generation and electric railways
- motor vehicles
- Namur recommendations (chemical industry)
- MIL standards
- VG standards (defense equipment)
- FCC regulations.

For further information, refer to our brochure “EMC laboratory Regensburg”, ordering code: B450-P503-X-X-7400

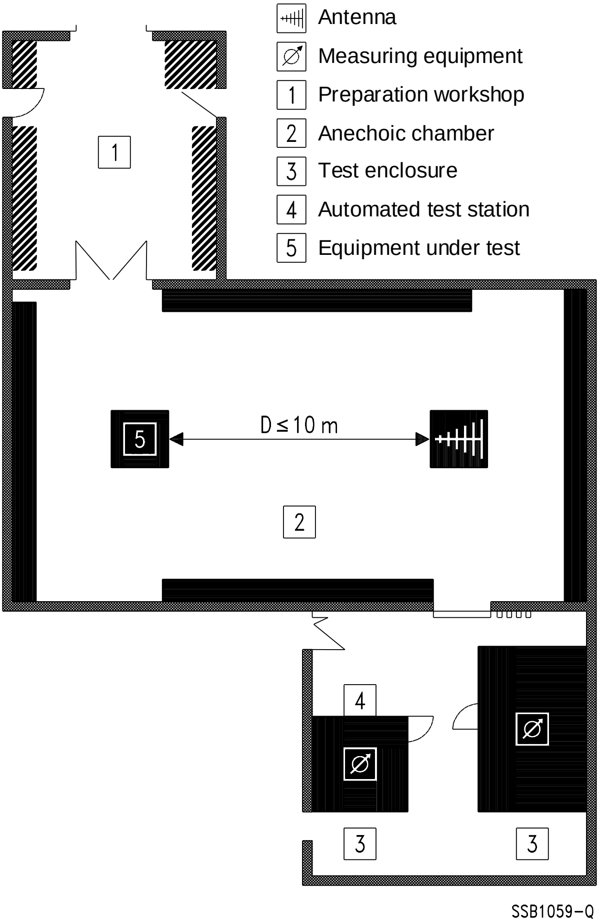


Fig. 15 Layout of the Regensburg EMC laboratory

Bundesamt für Post und Telekommunikation (BAPT)

Deutsche Akkreditierungsstelle Technik (DATech) e.V.

Deutsche Koordinierungsstelle für IT-
Normenkonformitätsprüfung und -zertifizierung (DEKITZ)

vertreten im

Deutschen AkkreditierungsRat

Akkreditierung

Hiermit wird bestätigt, daß das Prüflaboratorium der

Siemens Matsushita GmbH & Co. KG
Wernerwerkstraße 2
93049 Regensburg

die Kompetenz nach DIN EN 45001 besitzt, Prüfungen in den Bereichen

Elektromagnetische Verträglichkeit

auszuführen.

Die Akkreditierung ist gültig bis: **06.10.1999**

Die Anlage ist Bestandteil der Urkunde und besteht aus **11** Seiten.

DAR-Registriernummer: **TTI-P-G092/94-00**

Bundesamt für Post und Telekommunikation (BAPT)	Deutsche Akkreditierungsstelle Technik (DATech) e.V.	Deutsche Koordinierungsstelle für IT-Normenkonformitätsprüfung und -zertifizierung (DEKITZ)
Mainz, 07.10.1994	Frankfurt/M., 07.10.1994	Berlin, 07.10.1994
Präsident; Ltr. d. Akkr.-stelle	Geschäftsführer Ltr. d. Akkr.-stelle	Geschäftsführer; Vorsitzender

DATech, DEKITZ – Akkreditierungsstellen in der TGA - Trägergemeinschaft für Akkreditierung GmbH

SSB1061

Fig. 16 Certificate of the Regensburg EMC laboratory

1 General

The high demands made by the world market on the quality of products and services to be supplied by us have made a thorough and global quality assurance system indispensible.

The quality assurance system enforced in our EMC components division is certified in accordance with ISO 9001. It is based on quality directives binding at all company levels and for all departments. It is described in the quality assurance manual and takes into consideration:

– national and international standards (DIN, CECC, IEC),
– specifications harmonized with our customers' requirements,
– our own performance goals.

1.1 Total Quality Management and Zero Defect Concept

The strategic aim of Total Quality Management (TQM) is to satisfy the demands made by customers on products or services in terms of function, quality, punctuality and price/performance ratios.

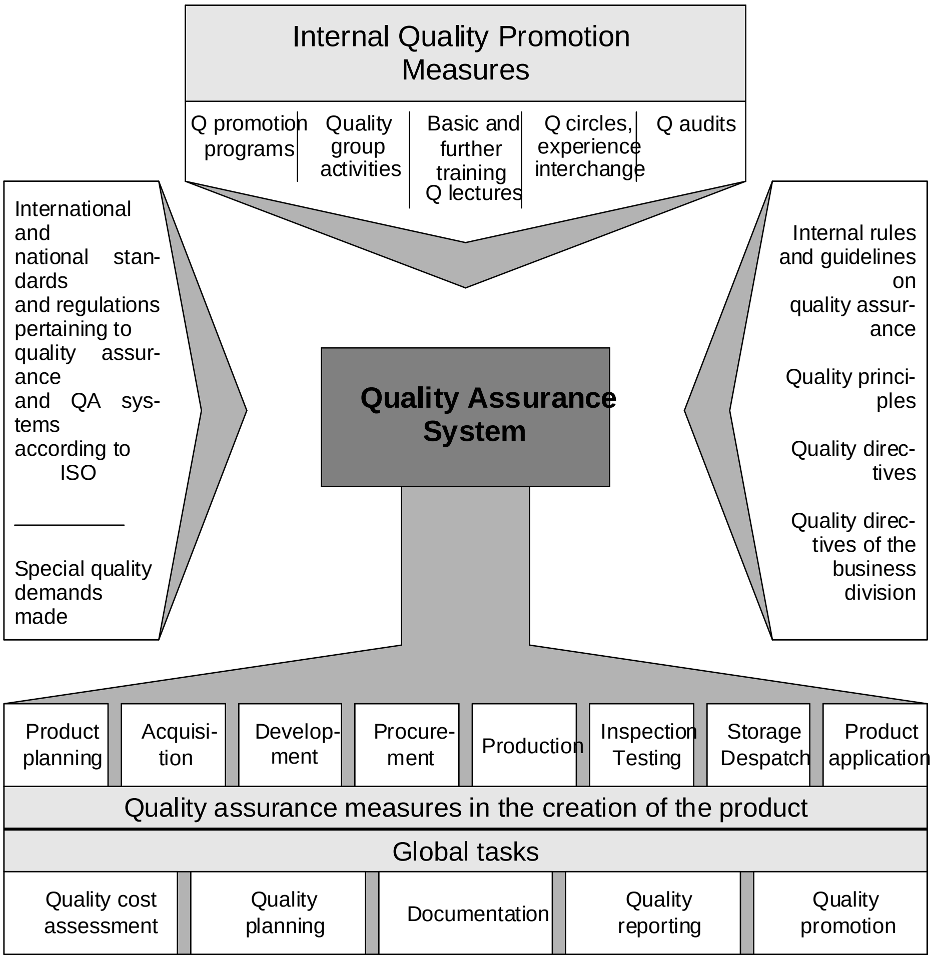
Working on the principle of "quality right from the very start", all instances and persons at S + M Components are involved in implementing this aim. Systematic planning, careful selection of suppliers and sure mastery of design and manufacturing processes are the major factors guaranteeing a constant high quality standard.

Internal quality promotion measures, such as training, quality groups, quality assurance circles and Q audits reinforce the feeling of responsibility in each employee, helping them to realize the significance of defects and thus avoid them.

Modern quality tools such as FMEA, SPC and Zero-Defect Programs with CEDAC[1] diagrams supplement and support measures for quality assurance and enhancement.

1) FMEA Failure Mode and Effects Analyses
SPC Statistical Process Control
CEDAC Cause and Effect Diagram with Addition of Cards

1.2 Quality assurance system



2 Quality assurance procedure

The quality department examines EMC components and approves them for production according to the following criteria:

- compliance with type specifications,
- process capability of available production equipment,
- test engineering.

The entire production process – from procurement of parts and materials, through the fabrication process to final inspection – is accompanied by quality assurance measures. The flow chart (refer to section) shows the quality inspections stipulated for each individual step.

2.1 Material procurement

The high quality of parts and materials required for the manufacture of high-grade products is attained through close cooperation with suppliers. Focal aspects of these quality assurance measures are the choice and qualification of suppliers, harmonization of specifications, incoming-goods inspection, quality assessment and problem management.

2.2 Product quality assurance

All essential manufacturing processes are subjected to permanent monitoring. Critical parameters, in particular, are subjected to statistical process control (SPC).

So-called “QC gates” are planned into the manufacturing process, i.e. there is an inspection for release at the end of the corresponding step. The permanent monitoring and evaluation of the test results are used to assess procedures and to determine how well the processes are mastered.

2.3 Final inspection

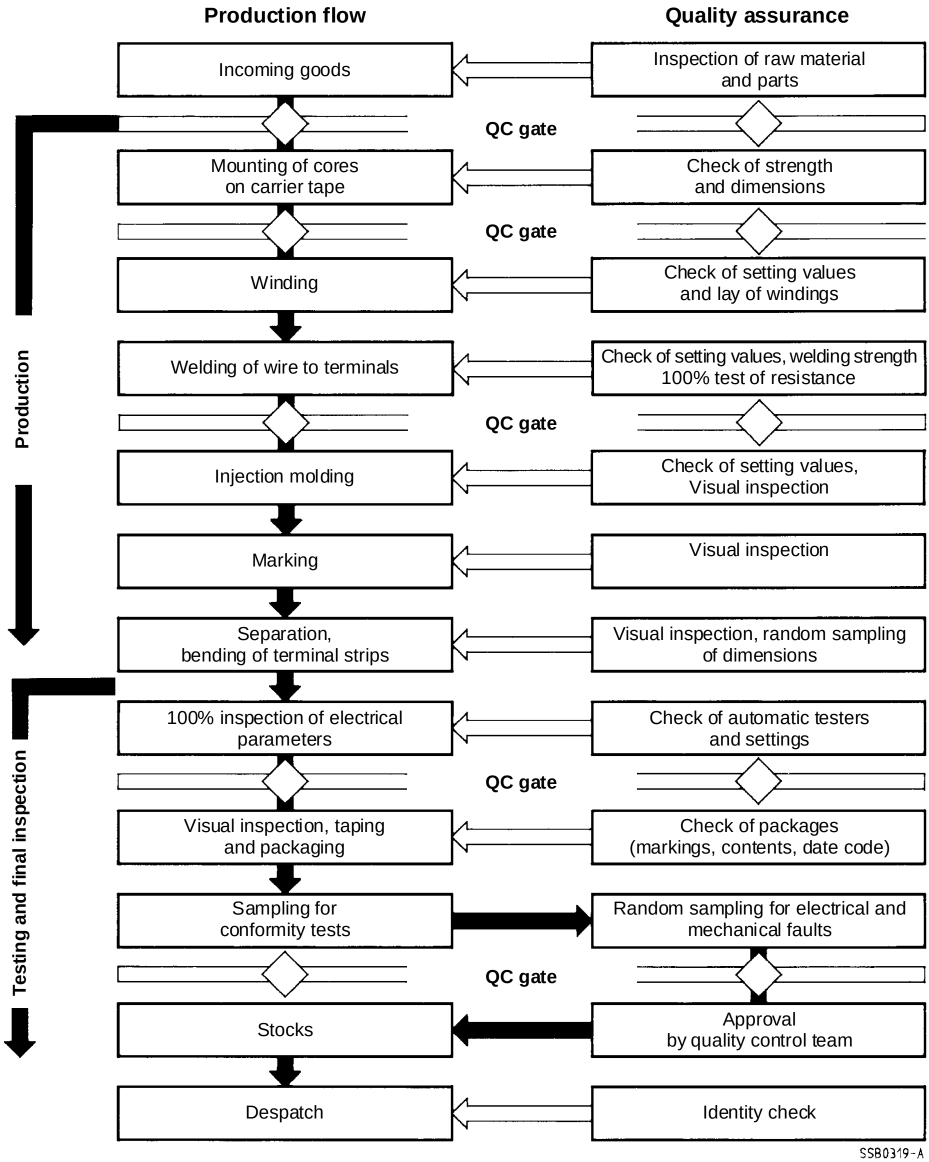
The EMC components are subjected to a specification-based final inspection. The essential electrical and physical parameters, as well as the finish, are checked.

2.4 Product monitoring

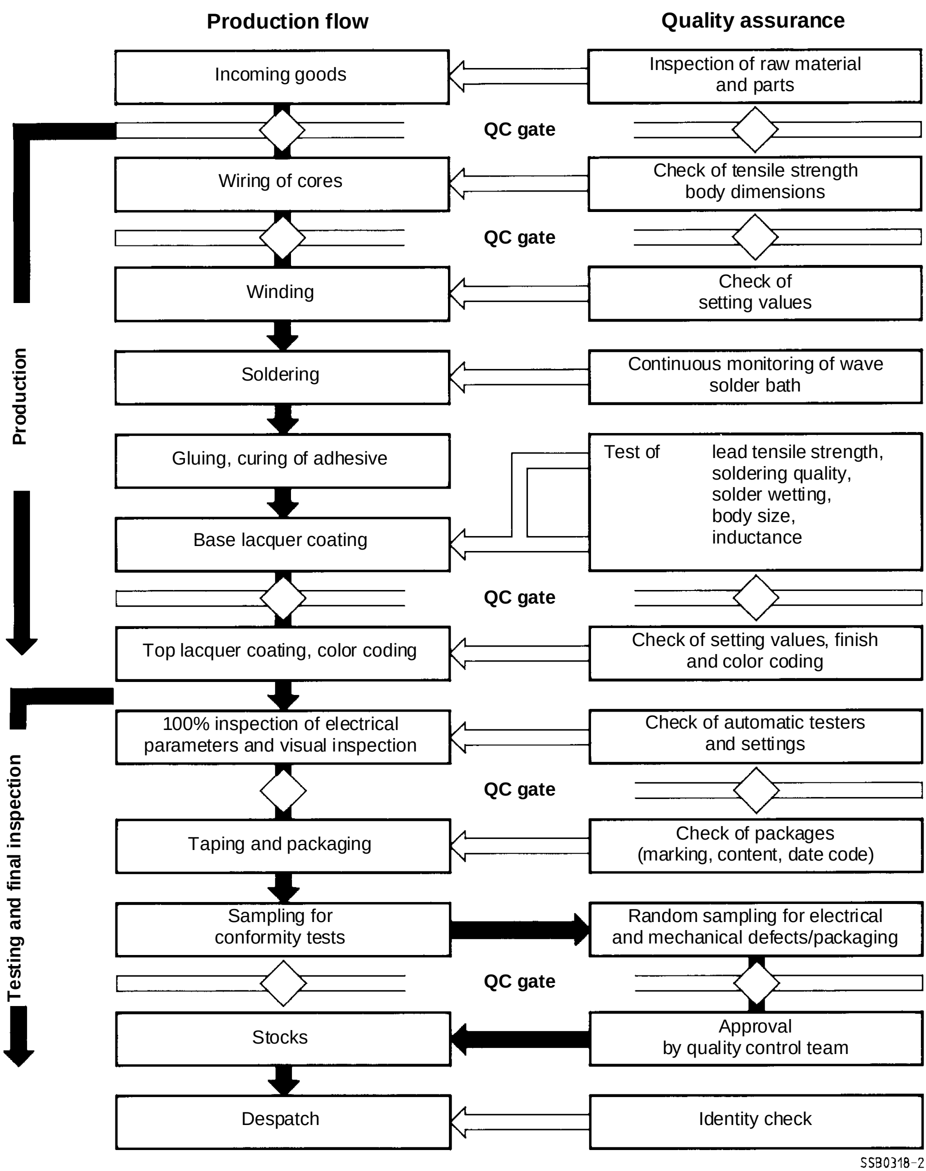
Our quality assurance department periodically carries out tests on random samples taken from current production lots to check the ability to survive certain climatic conditions, operational reliability, solderability and resistance to soldering heat in accordance with DIN, CECC and IEC specifications.

2.5 Manufacturing and quality assurance procedures

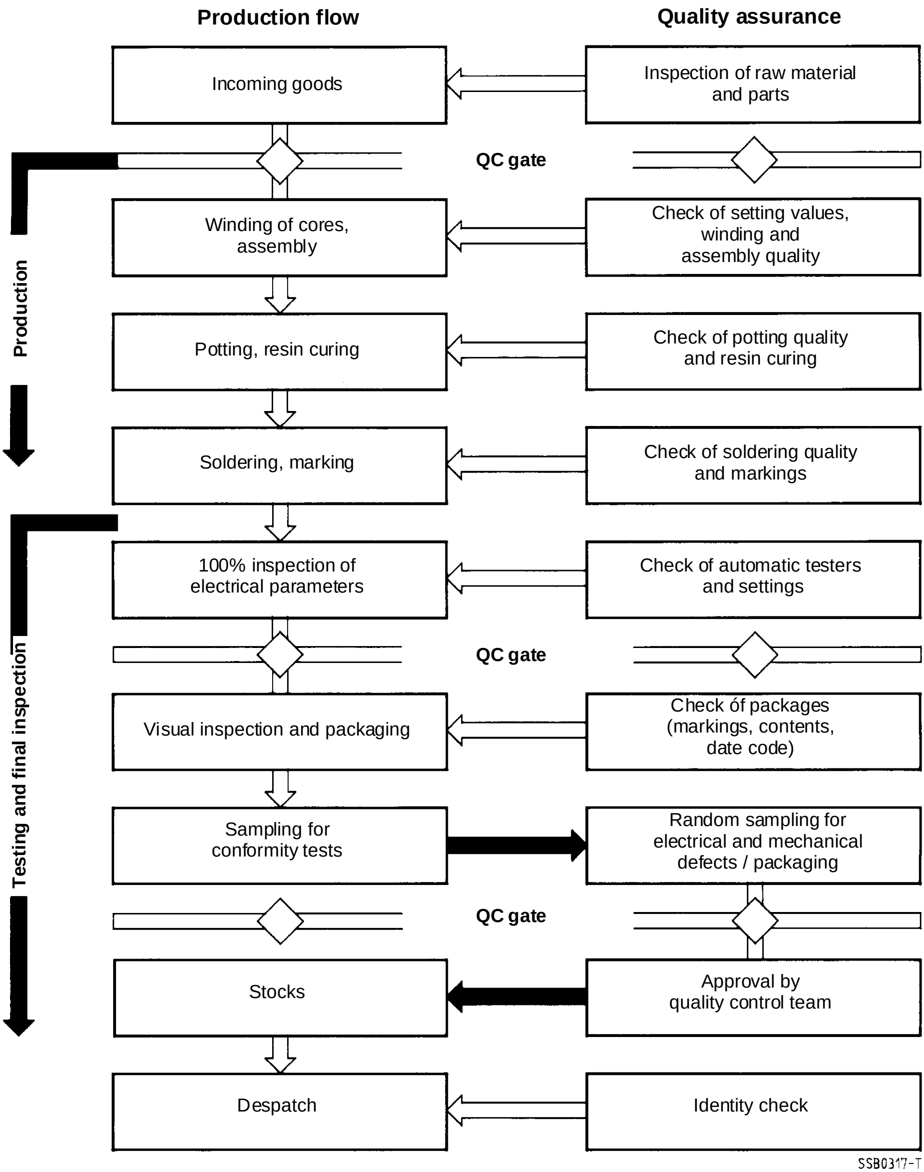
Example: RF chokes, SMD versions, series SIMID 02 and SIMID 03



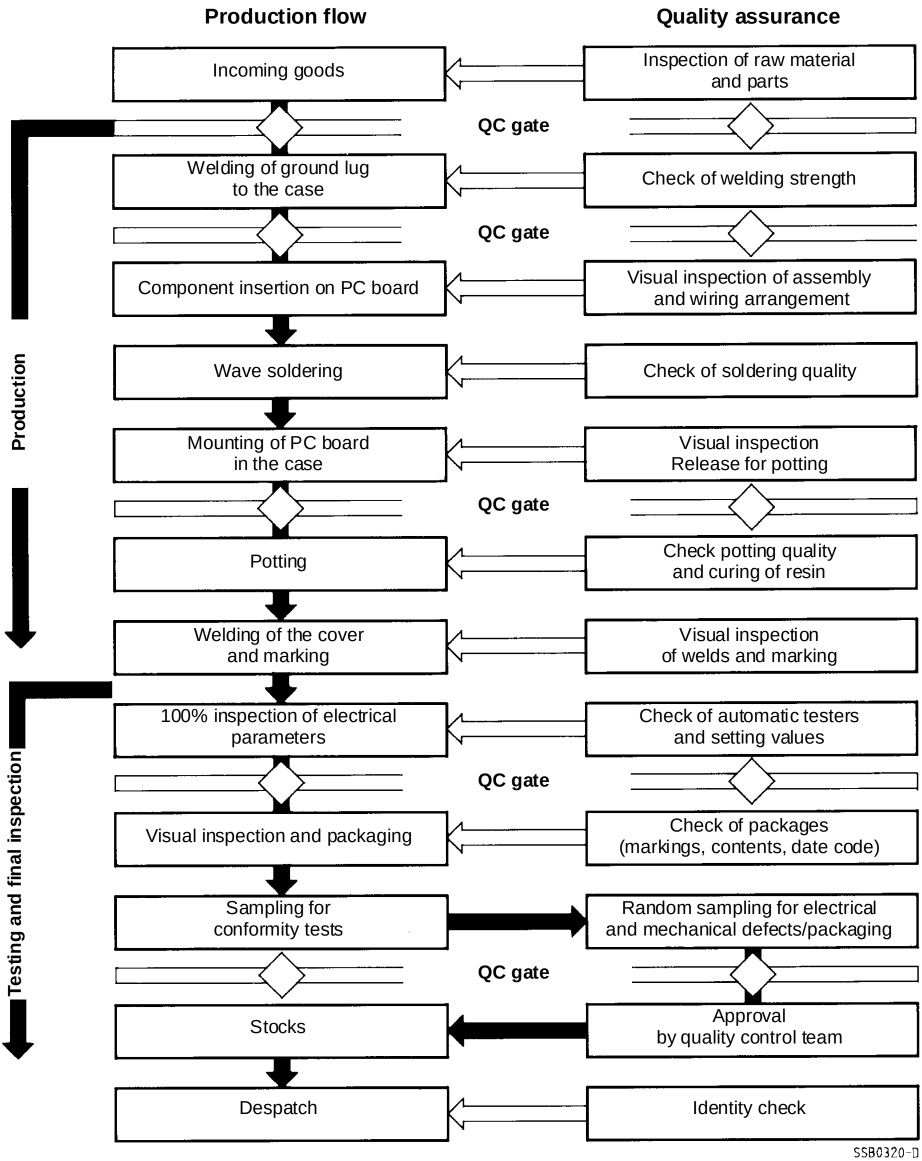
Example: RF chokes with axial/radial leads



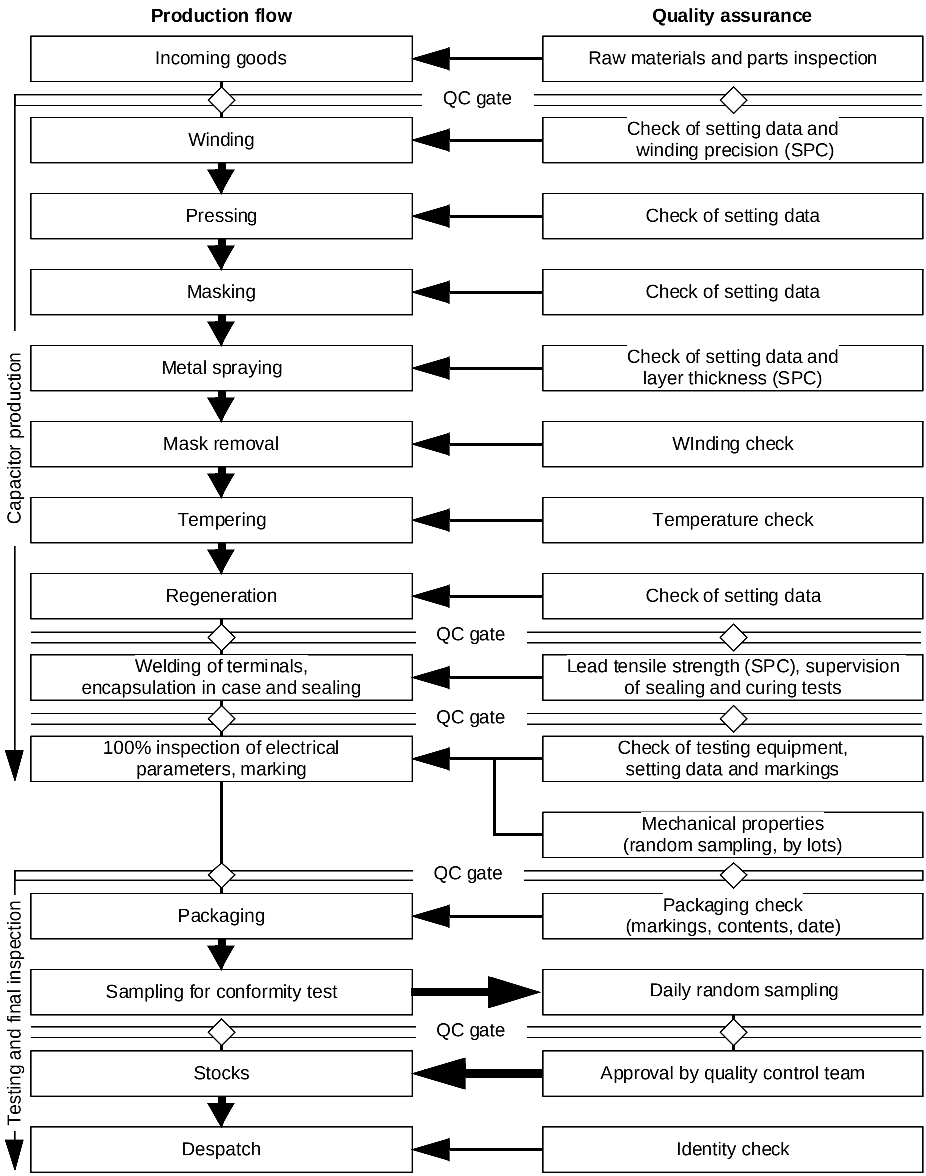
Example: Ring core chokes



Example: Power line filters, series SIFI



Example: EMI suppression capacitors



3 Delivery quality

The term “delivery quality” is used to indicate conformance with the mutually agreed specifications at the time of delivery.

3.1 Random sampling

The AQL (AQL = acceptable quality level) figures given in section are based on random sample inspection specification ISO 2859 - 1, single sampling plan for normal inspection, inspection level II. The contents of this standard correspond to MIL STD105 D and IEC 410.

The sampling instructions of this standard are such that a delivered lot will be accepted with a probability of ≥ 90 % if the percentage of defects does not exceed the stated AQL figure.

As a rule, the percentage of defects in deliveries from S + M Components is significantly below the AQL figure. The acceptance figure we apply to inoperatives, i.e. unusable components is c = 0.

3.2 Classification of defects

A defect exists if a component characteristic fails to meet the data sheet specifications or an agreed delivery specification. A distinction is made between inoperatives (totally unusable components) and other defectives.

Inoperatives:

- short circuit or open circuit
- breakage of case, terminals or coating
- wrong or missing identification of rated capacitance, rated voltage, rated inductance, rated current or part number
- mixing with other component types in one lot

Other defectives:

- defects in electrical characteristics (electrical characteristics outside of specified limits)
- defects in mechanical properties, e.g. wrong dimensions, damaged case, illegible marking, bent terminals.

3.3 AQL figures

The following AQL figures apply to the defects listed above:

	Capacitors, Chokes	Filters
inoperatives (electrical and mechanical)	0.065	0.1
sum of electrical defectives	0.25	0.25
sum of mechanical defectives	0.25	0.4

3.4 Incoming goods inspection

We recommend the use of a random sampling plan according to ISO 2859-1 (the contents correspond to MIL STD 105 D and IEC 410).

The customer and the supplier should mutually agree upon the test engineering that is to be used.

The following details are required for judging any possible claims:
test circuit, sample size, number of defectives found, sample defectives, packing slip.

Single sampling plan for normal inspection – inspection level II

Excerpt from ISO 2859 -1:

Sampling plan / N = Lot size	AQL 0,065	AQL 0,10	AQL 0,15	AQL 0,25
2 … 50	N-0	N-0	N-0	N-0
51 … 90	N-0	N-0	N or 80-0	50-0
91 … 150	N-0	N bzw. 125-0	80-0	50-0
151 … 280	N or 200-0	125-0	80-0	50-0
281 … 500	200-0	125-0	80-0	50-0
501 … 1 200	200-0	125-0	80-0	50-0
1 201 … 3 200	200-0	125-0	80-0	200-1
3 201 … 10 000	200-0	125-0	315-1	200-1
10 001 … 35 000	200-0	500-1	315-1	315-2
35 001 … 150 000	800-1	500-1	500-2	500-3
150 001 … 500 000	800-1	800-2	800-3	800-5
> 500 000	1250-2	1250-3	1250-5	1250-7

Columns 2 to 5: Left-hand figure = sample size
Right-hand figure = acceptable defects
Defect classification: refer to section

4 Service life

This is defined as the time it takes until a given fraction failure is attained. The fraction failure is the the ratio of the number of failures to the total number of inspected components of the respective type. The service life depends on the operating conditions, i.e. on the electrical and thermal loads to which the component is subjected.

The service life data are determined by carrying out endurance tests over extended periods and in some cases under more severe conditions (temperature, voltage, current) as well as from experience gathered in actual applications.

4.1 Failure criteria

Generally, the limit values specified in the corresponding applicable standards will apply.

4.2 Operating conditions

The ambient temperature, direct current loads and the inherent heating caused by alternating current loads have a decisive effect on the service life and usability of EMC components.

5 Reliability

Data on long-term reliability under severe or moderate operating conditions are gained from endurance tests which are carried out periodically. The data are based on the failures registered for components under a defined load, and long-term reliability of the individual types tested is based on a confidence level of 60 %. Our reliability data result from very large numbers of component testing hours.

5.1 Failure rate (long-term failure rate)

The failure rate is defined as the fraction failure divided by a specified operating period. The failure rate is expressed in fit (failures per 10^9 component test hours) or percentage failure in 1000 hours.

1 fit = $1 \cdot 10^{-9}$ failures/h (**fit** = **f**ailure **i**n **t**ime)

Example of a failure rate λ_{test} determined by a service life test:

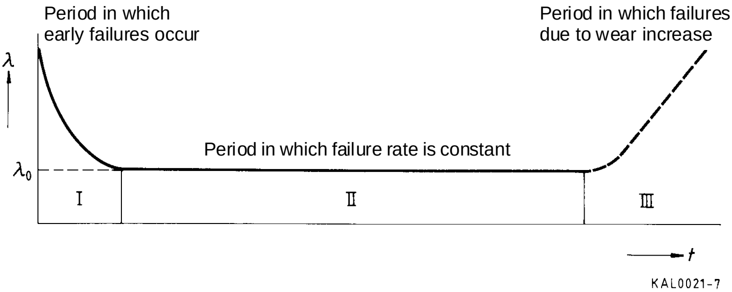
1)	Number of components tested	N	= 8 000
2)	Operating hours (duration of test)	t_b	= 25 000 h
3)	Number of failures	n	= 2

$$\lambda_{test} = \frac{n}{N} \cdot \frac{1}{t_b} = \frac{2}{8000} \cdot \frac{1}{25000} = \qquad = 0,001\ \%/1000\text{h}.$$

When failure rate values are stated, the corresponding failure criteria and the operating and ambient conditions must also be given.

The failure rate of components, when plotted against time, shows the following characteristic curve with the three periods

I: early failure period,
II: service period,
III: wear-out failure period



Unless otherwise specified, the given failure rate refers to the service period (phase II).
During phase II, an approximately constant failure rate λ_0 can be assumed.

5.2 Failure rate values

<table>
<tr><th>Product</th><th>Failure rate</th><th>Reference conditions</th></tr>
<tr><td>Surface-mount RF chokes
(SIMID 01, 02, 02-100, 02-T and 03)</td><td>5 fit</td><td rowspan="4">Rated current,
ambient temperatures ≤ 40 °C</td></tr>
<tr><td>RF chokes with wire leads
(MCC, SBC, BC, HBC, LBC und HLBC)</td><td>5 fit</td></tr>
<tr><td>Ring core chokes</td><td>5 fit</td></tr>
<tr><td>Surface-mount data line chokes</td><td>10 fit</td></tr>
</table>

6 Supplementary information

The specification of quality data – which refers to a fairly large number of components – does not constitute a guarantee of characteristics or properties in the legal sense. However, agreement on these specifications does not mean that the customer may not claim for replacement of individual defective components within the terms of delivery. S + M Components cannot, however, assume any further liability beyond the replacement of defective components. This applies in particular to any further consequences of component failure.

Furthermore, it must be taken into consideration that the figures stated for service life and failure rate refer to the average production status and are therefore to be understood as mean values (statistical expectations) for a large number of delivery lots of identical components. These figures are based on application experience and on data obtained from preceding tests under normal conditions or, for purposes of accelerated aging, more severe conditions.

7 Handling of claims and complaints

A main aim of our quality assurance system is to prevent any defects occurring. The following details will help us to respond quickly to any complaints which you may need to make:

– description of fault
– when and how the fault was detected
– operating conditions
– length of operation before the fault occurred

If transport damage has occurred, please describe it in detail and, if possible, mark it so that it can be distinguished from any other damage that may occur when the articles are returned. The original packaging should also be examined and damage discovered should be described. To avoid further damage, wherever possible, use the original packaging to return the articles being claimed for.

When handling capacitors, please note:

Capacitors may still contain dangerous remnant charges. To avoid injury, never touch the terminals! Before packing capacitors, short-circuit the terminals with a permanent means of bridging them.

General

RF chokes are interference suppression chokes of particularly small size. The following versions are available:

SMDs	SIMID series	Page 53
Leaded, lacquer-coated	MCC … HLBC series	Page 90
With insulating sleeve	VHF chokes	Page 114

RF chokes are needed for low-frequency and high-frequency decoupling of signal and control circuits, for filtering supply voltages, for filters and all other applications where electromagnetic compatibility (EMC) has to be ensured.

Preferred fields of application include:

– Household appliances
– Entertainment electronics
– Personal computers
– Automotive electronics
– Antenna systems
– Telecommunications
– Remote control systems

VHF chokes are especially suitable for line-voltage-related applications because of their insulating sleeve. In cases where the additional insulation is not required, however, it is perfectly safe to connect SMD chokes of the SIMID series or lacquer-coated RF chokes to mains lines.

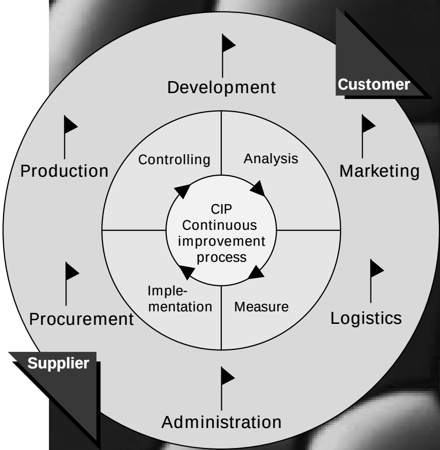
Series connections of several chokes of different self-resonance frequencies are not to be recommended bcause in the frequency range between the two self-resonance frequencies one of the chokes will have an inductive impedance, the other a capacitive impedance.

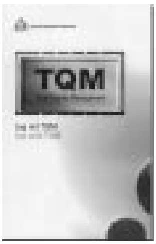
Siemens Matsushita Components

Quality without compromises

top with TQM

We’re not satisfied until you are. So our quality demands are quite tough. And they don’t start in production, they span the whole field from development to despatch. To watch over it all we implemented Total Quality Management, a system aimed at continuous improvement – in everything. That includes true-to-schedule delivery and service readiness, ISO 9000 for all plants, modern QA, commitment to the environment in manufacturing, materials and packing plus constant training of employees. All embedded in *top*, the worldwide quality campaign of the Siemens organization.





More about “top with TQM“ in this brochure!

SCS – dependable, fast and competent

Selector guide SMD chokes

Size (EIA standard))	Series	L_R µH	I_R mA	Features	Type	Page
0805	SIMID 08	0,010 … 1,0	130 … 540	Encapsulated High resonance frequency High *Q* factor	B82498 **NEW**	55
1008	SIMID 04	0,22 … 100	10 … 190	Encapsulated High resonance frequency High Q factor	B82494	58
1210	SIMID 01	0,010 … 10	90 … 700	Without encapsulation Very high resonance frequency	B82412	63
1210	SIMID 02	0,0082 … 100	65 … 700	Encapsulated Silver-plated terminals Different measuring frequencies for inductance and *Q* factor	B82422	68
1210	SIMID 02-100	0,0082 … 100	65 … 800	Encapsulated Tinned terminals Different measuring frequencies for inductance and *Q* factor	B82422--A****-+100	73
1210	SIMID 02-T	0,010 … 100	40 … 450	Encapsulated Tinned terminals Same measuring frequency for inductance and *Q* factor	B82422-T	78
1812	SIMID 03	1,0 … 1000	55 … 600	Encapsulated High current handling capability	B82432	83
2220	SIMID 05	1,0 ... 10000	25 ... 1800	Encapsulated Very high current handling capability	B82442 **NEW**	88

General technical data

Rated inductance L_R	Measured at frequency f_L, with impedance analyzer HP 4194A SIMID 08: measured with HP 4191A
Q factor Q_{min}	Measured at frequeny f_Q, with impedance analyzer HP 4191A / HP 4194A
Rated current I_R	Maximum permissible dc with an inductance decrease of $\Delta L/L_0 \leq 10$ % and/or a temperature increase of ≤ 20 K at rated temperature (see derating curves in the data sheets)
Self-resonance frequency $f_{res,\ min}$	Measured with network analyzer HP 8783D
DC resistance R_{max} or R_{typ}	Measured at 20 °C ambient temperature, measuring current < I_R
Climatic category	In accordance with IEC 68-1 SIMID 01 through SIMID 03: 55/125/56 (– 55 °C/+ 125 °C/56 days damp heat test) SIMID 04: 55/85/56 (– 55 °C/+ 85 °C/56 days damp heat test) SIMID 08: 20/85/56 (– 20 °C/+ 85 °C/56 days damp heat test)
Solderability	(215 ± 3) °C, (3 ± 0,3) s Wetting of soldering area: ≥ 95 % for SIMID 01, 02, 03 (silver-plated) ≥ 90 % for SIMID 02-100, 02-T, 04, 05 (tinned) (230 ± 5) °C, (3 ± 0,5) s Wetting of soldering area: ≥ 90 % for SIMID 08 (tinned)
Resistance to soldering heat	In accordance with IEC 68-2-20, test Tb 260 °C, 10 s
Permissible PCB bending	2 mm (100 mm long standard PCB)
Taping	SIMID 01 through SIMID 03 and SIMID 05 in accordance with IEC 286-3 SIMID 04 and SIMID 08 in accordance with EIA-481, for details on taping see page 433.

Preliminary data

SIMID 08 (Siemens Miniature Inductors)
Rated inductance 10 to 1000 nH
Rated current 0,12 to 0,54 A

Construction

- Size as per EIA standard: 0805
- Core: liquid crystal polymer (LCP)
- Molded epoxy encapsulation
- Winding: enamel copper wire, soldered
- Temperature index of wire enamel: 155 °C

Features

- High *Q* factor
- High resonance frequency
- Suitable for reflow (IR and vapor phase) and wave soldering
- Same measuring frequency for *L* and *Q*

Applications

- Antenna amplifiers
- Video cameras
- Mobile phones

Terminals

- Tinned
- Base material: phosphor bronze
- Suitable for soldering and conductive adhesion
- No leaching during wave soldering

Marking

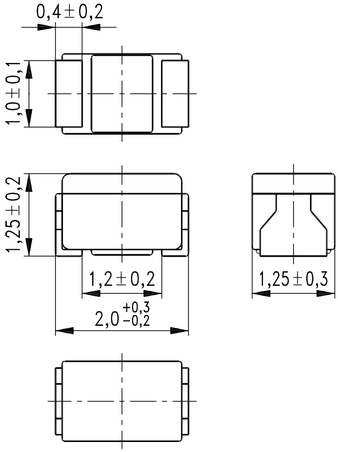
Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value,
quantity, date of packing

Delivery mode

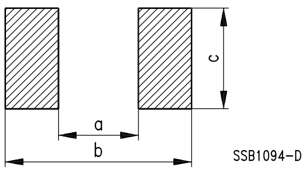
8-mm blister tape wound on 180-mm ∅ reel
For details on taping, packing and packing units see page 433.

Outline drawing

EIA size 0805,
approx. weight 8,5 mg



PCB layout recommendation



Dimensions (mm)

a	*b*	*c*
1,0 ... 1,2	3,0 ... 3,8	0,9 ... 1,3

Characteristics and ordering codes

For further technical data see page 54.

L_R nH	Toler-ance	Q_{min}	f_L; f_Q MHz	I_R mA	R_{typ} Ω	$f_{res, min}$ MHz	Ordering code[1)]
10	± 10 % ≙ K	12	100	540	0,15	2500	B82498-A3100-K
12		12	100	535	0,20	2500	B82498-A3120-K
15		15	100	535	0,20	2500	B82498-A3150-K
18		15	100	510	0,24	2000	B82498-A3180-K
22		15	100	495	0,24	2000	B82498-A3220-K
27		18	100	460	0,29	1800	B82498-A3270-K
33	± 10 % ≙ K ± 5 % ≙ J	18	100	430	0,28	1500	B82498-A3330-+
39		18	100	410	0,33	1500	B82498-A3390-+
47		18	100	390	0,38	1000	B82498-A3470-+
56		18	100	380	0,43	1000	B82498-A3560-+
68		18	100	370	0,42	800	B82498-A3680-+
82		18	100	350	0,53	800	B82498-A3820-+
100		10	25,2	300	0,58	800	B82498-A3101-+
120		10	25,2	280	0,74	600	B82498-A3121-+
150		10	25,2	235	1,12	600	B82498-A3151-+
180		10	25,2	210	1,23	600	B82498-A3181-+
220		10	25,2	200	1,41	500	B82498-A3221-+
270		10	25,2	165	1,50	300	B82498-A3271-+
330		10	25,2	185	1,67	200	B82498-A3331-+
390		10	25,2	175	1,74	150	B82498-A3391-+
470		10	25,2	165	1,97	150	B82498-A3471-+
560		10	25,2	150	2,07	100	B82498-A3561-+
680		10	25,2	150	2,32	100	B82498-A3681-+
820		10	25,2	140	2,60	80	B82498-A3821-+
1000		8	7,96	130	2,98	80	B82498-A3102-+

1) Replace the + by the code letter for the required inductance tolerance

SIMID 04 (Siemens Miniature Inductors)
Rated inductance 0,22 to 100 µH
Rated current 0,01 to 0,19 A

Construction

- Size as per EIA standard: 1008
- Ferrite core
- Molded epoxy encapsulation, types ≥ 27 µH shielded
- Soldered winding
- Temperature index of wire enamel: 155 °C

Features

- High *Q* factor
- High resonance frequency
- Suitable for reflow (IR and vapor phase) and wave soldering
- Same measuring frequency for *L* and *Q*

Applications

- Filtering of supply voltages, coupling, decoupling
- Antenna systems
- Automotive electronics
- Telecommunications

Terminals

- Tinned
- Base material: phosphor bronze, 2–4 µm Cu, ≥ 5 µm SnPb
- Suitable for soldering and conductive adhesion
- No leaching during wave soldering

Marking

Marking on component:
L value (in µH) and tolerance of *L* value (coded)

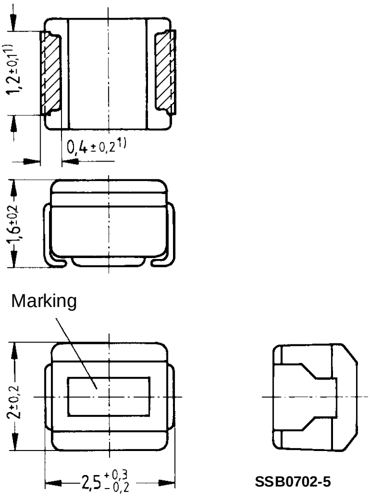
Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value,
quantity, date of packing

Delivery mode

8-mm blister tape wound on 180-mm ∅ reel
For details on taping, packing and packing units see page 433.

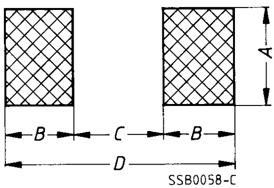
Outline drawing

EIA size 1008,
approx. weight 21 mg



SSB0702-5

PCB layout recommendation



Dimensions (mm)	*A*	*B*	*C*	*D*
Wave soldering	1,2	1,25	1,5	4,0
Reflow soldering	1,6	1,05	1,5	3,5

1) Soldering area, tinned

Characteristics and ordering codes

For further technical data see page 54.

L_R µH[1]	Toler-ance[2]	Q_{min}	f_Q MHz[3]	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code
0,22	± 20 % ≙ M	25	25,2	190	0,70	230	B82494-A1221-M
0,27		25	25,2	180	0,75	210	B82494-A1271-M
0,33		25	25,2	170	0,85	190	B82494-A1331-M
0,39		25	25,2	160	0,95	175	B82494-A1391-M
0,47		25	25,2	155	1,00	160	B82494-A1471-M
0,56		25	25,2	150	1,10	150	B82494-A1561-M
0,68		25	25,2	140	1,25	135	B82494-A1681-M
0,82		25	25,2	130	1,40	125	B82494-A1821-M
1,0		25	7,96	195	0,65	115	B82494-A1102-M
1,2		25	7,96	180	0,75	100	B82494-A1122-M
1,5		25	7,96	170	0,85	90	B82494-A1152-M
1,8		25	7,96	160	0,95	85	B82494-A1182-M
2,2		25	7,96	155	1,05	80	B82494-A1222-M
2,7		25	7,96	145	1,20	75	B82494-A1272-M
3,3		25	7,96	135	1,30	65	B82494-A1332-M
3,9		25	7,96	130	1,40	60	B82494-A1392-M
4,7		25	7,96	125	1,55	55	B82494-A1472-M
5,6		25	7,96	120	1,75	50	B82494-A1562-M
6,8		25	7,96	115	1,95	45	B82494-A1682-M
8,2		25	7,96	105	2,20	40	B82494-A1822-M

1) Frequency and voltage for measuring *L* same as for measuring *Q* or
1 MHz and 0,1 V_{rms} for $L \leq 10$ µH or 100 kHz and 0,01 V_{rms} for $L > 10$ µH
2) Closer tolerances upon request
3) Measuring voltage 0,3 V_{rms}

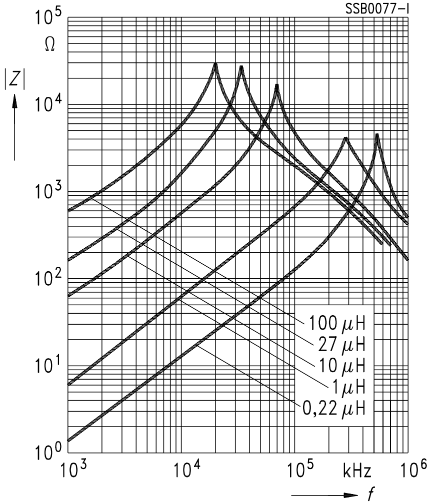
Characteristics and ordering codes

For further technical data see page 54.

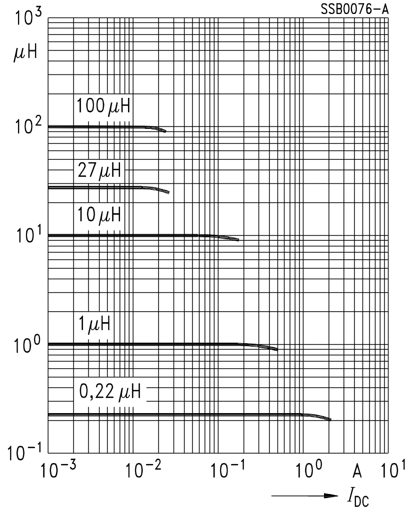
L_R µH1)	Toler-ance2)	Q_{min}	f_Q MHz3)	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code
10	±10 % ≙ K	25	2,52	80	3,7	32	B82494-A1103-K
12		25	2,52	75	4,1	30	B82494-A1123-K
15		25	2,52	70	5,0	28	B82494-A1153-K
18		25	2,52	65	5,4	25	B82494-A1183-K
22		25	2,52	60	6,0	22	B82494-A1223-K
27		40	2,52	18	4,5	20	B82494-G1273-K
33		40	2,52	14	5,2	18	B82494-G1333-K
39		40	2,52	13	5,7	15	B82494-G1393-K
47		40	2,52	12	6,6	14	B82494-G1473-K
56		40	2,52	10	7,1	13	B82494-G1563-K
68		25	2,52	17	6,5	13	B82494-G1683-K
82		25	2,52	14	7,4	13	B82494-G1823-K
100		25	0,796	10	8,4	12	B82494-G1104-K

1) Frequency and voltage for measuring *L* same as for measuring *Q* or
1 MHz and 0,1 V_{rms} for $L \leq 10$ µH or 100 kHz and 0,01 V_{rms} for $L > 10$ µH
2) Closer tolerances upon request
3) Measuring voltage 0,3 V_{rms}

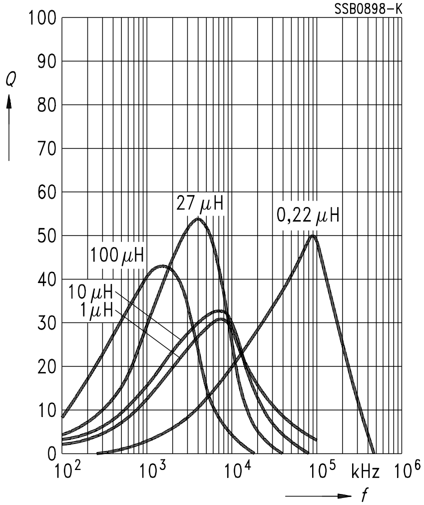
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



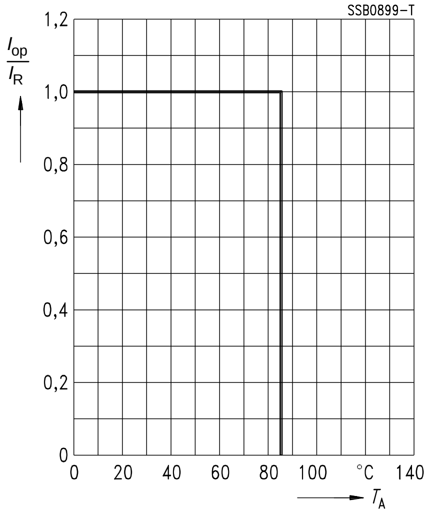
Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A

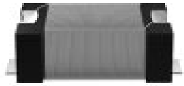


Q factor
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



Current derating I_{op}/I_R
versus ambient temperature T_A
(Rated temperature T_R = 85 °C)





SIMID 01 (Siemens Miniature Inductors)
Rated inductance 0,010 to 10 µH
Rated current 0,09 to 0,7 A

Construction

- Size as per EIA standard: 1210
- Ceramic or ferrite core
- Single-layer winding, US-welded, without encapsulation
- Temperature index of wire enamel: 200 °C

Features

- High *Q* factor
- High resonance frequency
- Suitable for reflow (IR and vapor phase) and wave soldering
- Different measuring frequencies for *L* and *Q*

Applications

- Filtering of supply voltages, coupling, decoupling
- Antenna systems
- Automotive electronics
- Telecommunications

Terminals

- Silver-plated
- Base material: CuSn6, 1–2 µm Cu, 4–6 µm Ag
- Suitable for soldering and conductive adhesion
- No leaching during wave soldering

Marking

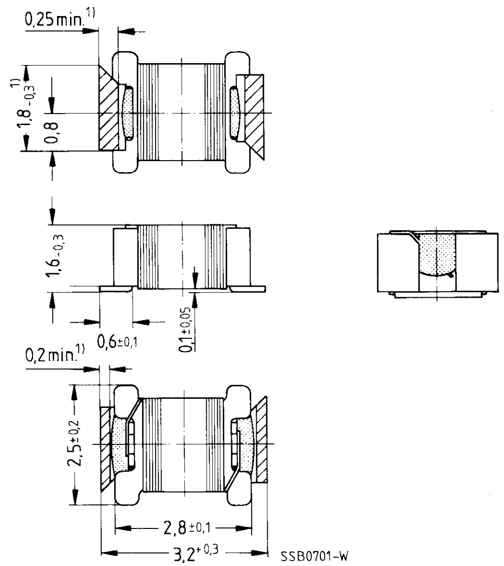
Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value,
quantity, date of packing

Delivery mode

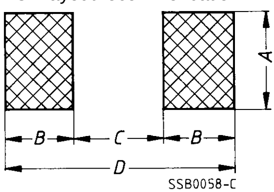
8-mm blister tape wound on 180-mm or 330-mm ∅ reel
For details on taping, packing and packing units see page 433.

Outline drawing

EIA size 1210,
approx. weight 40 mg



PCB layout recommendation



Dimensions (mm)	*A*	*B*	*C*	*D*
Wave soldering	2,3	1,60	2,1	5,3
Reflow soldering	2,7	1,15	2,1	4,4

1) Soldering area, silver-plated

Characteristics and ordering codes

For further technical data see page 54.

L_R µH	Toler-ance[1]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code[2] (180-mm ∅ reel)
Core material: ceramics								
0,010	± 20 %	10	25	100	700	0,10	2000	B82412-A3100-M
0,012	≙ M	10	25	100	700	0,10	2000	B82412-A3120-M
0,015		10	25	100	640	0,12	2000	B82412-A3150-M
0,018		10	30	100	640	0,12	2000	B82412-A3180-M
0,022	± 5 %	10	30	100	600	0,12	2000	B82412-A3220-+
0,027	≙ J	10	20	50	600	0,15	2000	B82412-A3270-+
0,033	± 10 % ≙ K	10	25	50	540	0,17	2000	B82412-A3330-+
0,039	± 20 %	10	25	50	500	0,18	1600	B82412-A3390-+
0,047	≙ M	10	25	50	470	0,22	1600	B82412-A3470-+
0,056		10	30	50	460	0,23	1400	B82412-A3560-+
0,068		10	30	50	440	0,25	1350	B82412-A3680-+
0,082		10	30	50	430	0,27	1000	B82412-A3820-+
0,10		10	30	50	400	0,30	1000	B82412-A3101-+
0,12		1	25	30	380	0,35	900	B82412-A3121-+
0,15		1	25	30	370	0,36	820	B82412-A3151-+
0,18		1	25	30	340	0,42	700	B82412-A3181-+
0,22		1	25	30	320	0,48	630	B82412-A3221-+
0,27		1	30	30	300	0,55	570	B82412-A3271-+
0,33		1	30	30	280	0,65	550	B82412-A3331-+
0,39		1	30	30	260	0,75	500	B82412-A3391-+
0,47		1	30	30	225	1,00	450	B82412-A3471-+
0,56		1	30	30	200	1,20	430	B82412-A3561-+
0,68		1	30	30	180	1,40	400	B82412-A3681-+
0,82		1	30	30	150	2,00	380	B82412-A3821-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm append code number "8". Example: B82412-A3100-M8

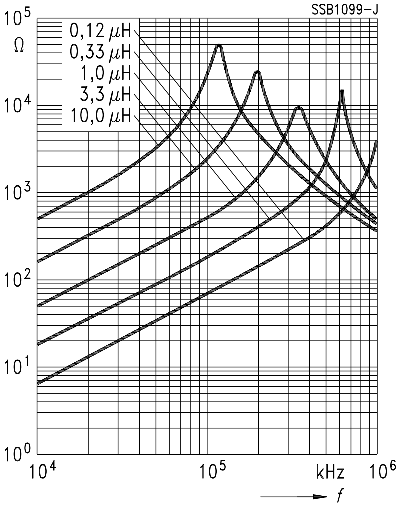
Characteristics and ordering codes

For further technical data see page 54.

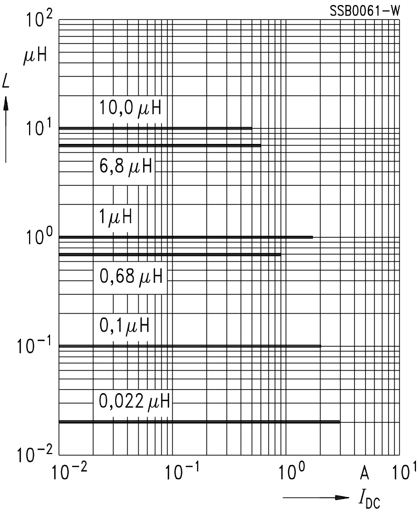
L_R µH	Toler-ance[1]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2] (180-mm ∅ reel)
Core material: ferrite								
1,0	± 5 % ≙ J ± 10 % ≙ K ± 20 % ≙ M	1	30	7,96	330	0,45	300	B82412-A1102-+
1,2		1	30	7,96	310	0,50	260	B82412-A1122-+
1,5		1	30	7,96	300	0,55	240	B82412-A1152-+
1,8		1	30	7,96	290	0,60	220	B82412-A1182-+
2,2		1	30	7,96	270	0,65	200	B82412-A1222-+
2,7		1	30	7,96	220	1,05	180	B82412-A1272-+
3,3		1	30	7,96	200	1,10	160	B82412-A1332-+
3,9		1	30	7,96	190	1,35	150	B82412-A1392-+
4,7		1	35	7,96	160	1,80	140	B82412-A1472-+
5,6		1	35	7,96	140	2,70	125	B82412-A1562-+
6,8		1	35	7,96	120	3,50	115	B82412-A1682-+
8,2		1	35	7,96	110	3,80	100	B82412-A1822-+
10		1	35	7,96	90	5,50	95	B82412-A1103-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm append code number "8". Example: B82412-A1102-K8

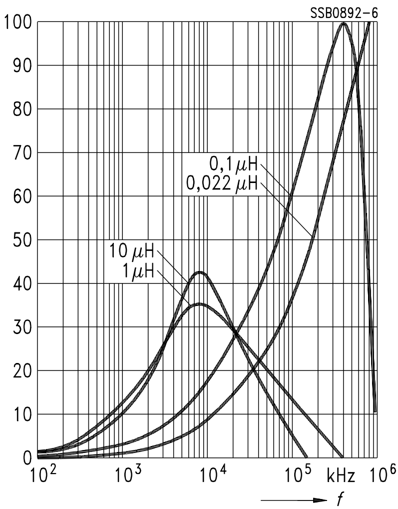
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



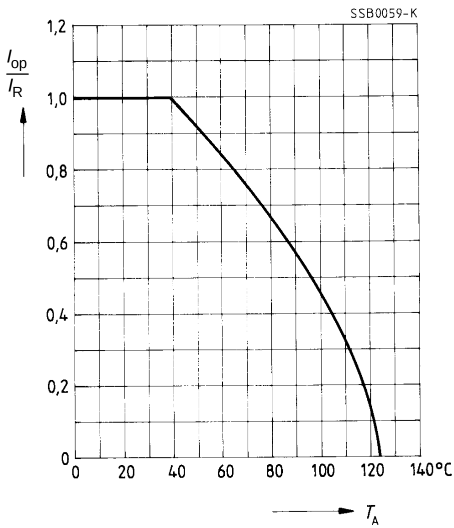
Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A



Q factor
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



Current derating I_{op}/I_R
versus ambient temperature T_A
(Rated temperature T_R = 40 °C)



SIMID 02 (Siemens Miniature Inductors)
Rated inductance 0,0082 to 100 µH
Rated current 0,065 to 0,7 A

Construction

- Size as per EIA standard: 1210
- Ceramic or ferrite core
- Winding US-welded, flame-retardant encapsulation
- Temperature index of wire enamel: 200 °C

Features

- High *Q* factor
- High resonance frequency
- Suitable for reflow (IR and vapor phase) and wave soldering
- Different measuring frequencies for *L* and *Q*

Applications

- Filtering of supply voltages, coupling, decoupling
- Antenna systems
- Automotive electronics
- Telecommunications

Terminals

- Silver-plated
- Base material: CuSn6, 1–2 µm Cu, 4–6 µm Ag
- Suitable for soldering and conductive adhesion
- No leaching during wave soldering

Marking

Marking on component:
Manufacturer,
L value (in nH) and tolerance of *L* value (coded),
date of manufacture (coded)

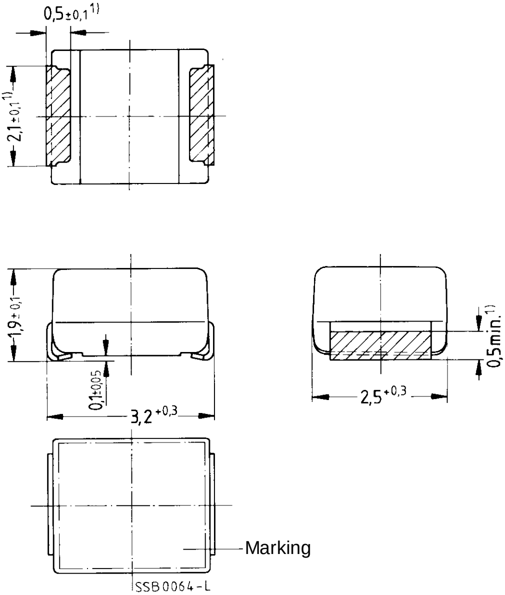
Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value,
quantity, date of packing

Delivery mode

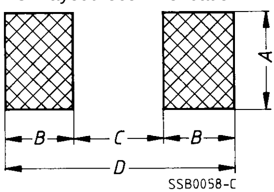
8-mm blister tape wound on 180-mm or 330-mm ∅ reel
For details on taping, packing and packing units see page 433.

Outline drawing

EIA size 1210,
approx. weight 50 mg



PCB layout recommendation



Dimensions (mm)	*A*	*B*	*C*	*D*
Wave soldering	2,3	1,6	2,1	5,3
Reflow soldering	2,7	1,15	2,1	4,4

1) Soldering area, silver-plated

Characteristics and ordering codes

For further technical data see page 54.

L_R µH	Toler-ance[1]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2] (180-mm ∅ reel)
Core material: ceramics								
0,0082	± 20 % ≙ M	10	20	100	700	0,10	2000	B82422-A3829-M
0,010	± 5 % ≙ J ± 10 % ≙ K ± 20 % ≙ M	10	20	100	700	0,10	2000	B82422-A3100-+
0,012		10	25	100	700	0,10	2000	B82422-A3120-+
0,015		10	25	100	640	0,12	2000	B82422-A3150-+
0,018		10	30	100	640	0,12	2000	B82422-A3180-+
0,022		10	30	100	570	0,15	2000	B82422-A3220-+
0,027		10	20	50	570	0,15	1900	B82422-A3270-+
0,033		10	20	50	530	0,19	1900	B82422-A3330-+
0,039		10	25	50	530	0,19	1450	B82422-A3390-+
0,047		10	25	50	480	0,21	1350	B82422-A3470-+
0,056		10	25	50	470	0,23	1300	B82422-A3560-+
0,068		10	25	50	440	0,26	1250	B82422-A3680-+
0,082		10	25	50	415	0,29	1150	B82422-A3820-+
0,10		10	25	50	400	0,30	1000	B82422-A3101-+
0,12		1	20	30	390	0,33	880	B82422-A3121-+
0,15		1	20	30	360	0,38	850	B82422-A3151-+
0,18		1	20	30	345	0,42	800	B82422-A3181-+
0,22		1	20	30	280	0,64	700	B82422-A3221-+
0,27		1	20	30	250	0,76	650	B82422-A3271-+
0,33		1	20	30	200	1,20	580	B82422-A3331-+
0,39		1	20	30	180	1,50	540	B82422-A3391-+
0,47		1	20	30	150	2,20	480	B82422-A3471-+
0,56		1	20	30	145	2,40	440	B82422-A3561-+
0,68		1	20	30	140	2,70	400	B82422-A3681-+
0,82		1	20	30	135	3,00	350	B82422-A3821-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm append code number "8". Example: B82422-A3100-K8

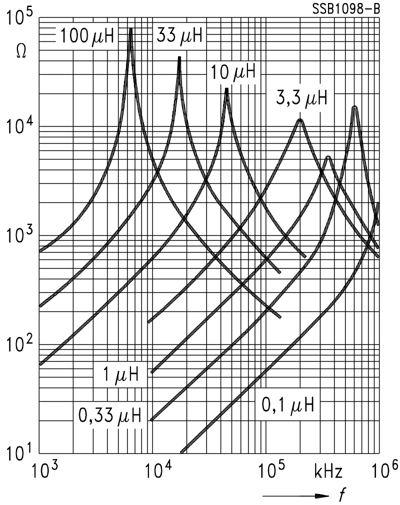
Characteristics and ordering codes

For further technical data see page 54.

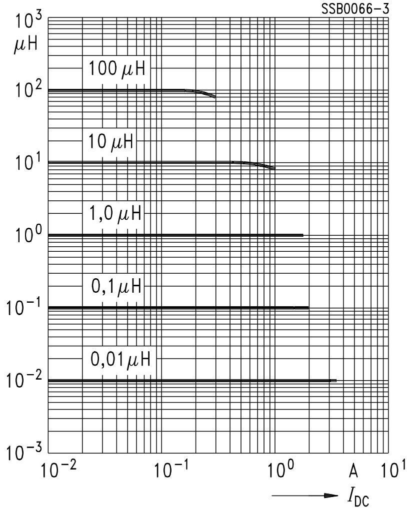
L_R µH	Toler-ance[1]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code[2] (180-mm ∅ reel)
Core material: ferrite								
1,0	± 5 % ≙ J ± 10 % ≙ K ± 20 % ≙ M	1	20	7,96	380	0,34	320	B82422-A1102-+
1,2		1	20	7,96	370	0,37	300	B82422-A1122-+
1,5		1	20	7,96	340	0,42	270	B82422-A1152-+
1,8		1	25	7,96	290	0,60	250	B82422-A1182-+
2,2		1	25	7,96	270	0,75	230	B82422-A1222-+
2,7		1	25	7,96	240	0,88	210	B82422-A1272-+
3,3		1	25	7,96	200	1,20	180	B82422-A1332-+
3,9		1	25	7,96	175	1,65	165	B82422-A1392-+
4,7		1	25	7,96	150	2,20	145	B82422-A1472-+
5,6		1	25	7,96	140	2,60	135	B82422-A1562-+
6,8		1	25	7,96	135	2,80	115	B82422-A1682-+
8,2		1	25	7,96	130	3,00	85	B82422-A1822-+
10		1	25	2,52	180	1,60	21	B82422-A1103-+
12		0,1	25	2,52	175	1,65	18,5	B82422-A1123-+
15		0,1	25	2,52	165	1,85	17,5	B82422-A1153-+
18		0,1	25	2,52	155	2,00	15,5	B82422-A1183-+
22		0,1	25	2,52	145	2,50	14,0	B82422-A1223-+
27		0,1	25	2,52	120	3,70	12,0	B82422-A1273-+
33		0,1	25	2,52	110	4,40	11,5	B82422-A1333-+
39		0,1	25	2,52	90	6,30	9,0	B82422-A1393-+
47		0,1	25	2,52	85	7,00	8,0	B82422-A1473-+
56		0,1	25	2,52	85	6,75	8,0	B82422-A1563-+
68		0,1	25	2,52	80	7,70	7,5	B82422-A1683-+
82		0,1	20	2,52	70	10,0	6,5	B82422-A1823-+
100		0,1	20	2,52	65	11,5	6,0	B82422-A1104-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm append code number "8". Example: B82422-A1102-K8

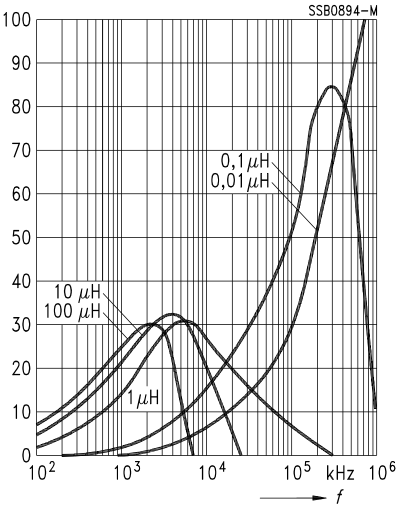
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



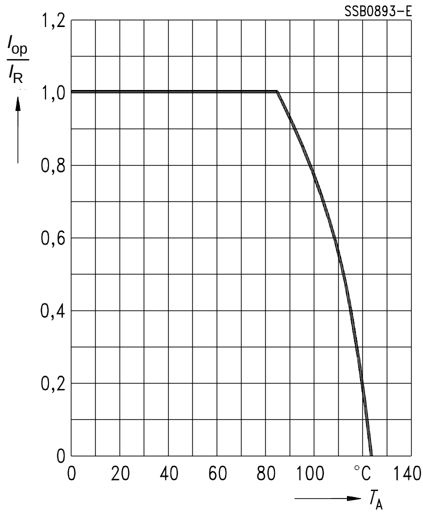
Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A

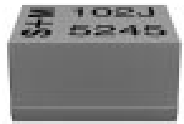


Q factor
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



Current derating I_{op}/I_R
versus ambient temperature T_A
(Rated temperature T_R = 85 °C)





SIMID 02-100 (Siemens Miniature Inductors)
European standard
Rated inductance 0,0082 to 100 µH
Rated current 0,065 to 0,8 A

Construction

- Size as per EIA standard: 1210
- Ceramic or ferrite core
- Winding laser-welded, flame-retardant encapsulation
- Temperature index of wire enamel: 180 °C

Features

- High *Q* factor
- High resonance frequency
- Suitable for reflow (IR and vapor phase) and wave soldering
- Different measuring frequencies for *L* and *Q*

Applications

- Filtering of supply voltages, coupling, decoupling
- Antenna systems
- Automotive electronics
- Telecommunications

Terminals

- Tinned
- Base material: CuSn6, 0,4 µm Cu, 0,1µm Ni, 5–7 µm Sn
- Suitable for soldering and conductive adhesion
- No leaching during wave soldering

Marking

Marking on component:
Manufacturer,
L value (in nH) and tolerance of *L* value (coded),
date of manufacture (coded)

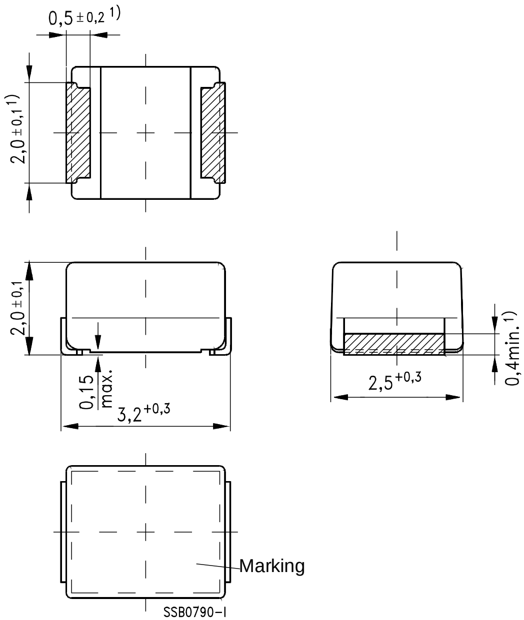
Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value,
quantity, date of packing

Delivery mode

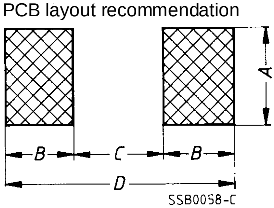
8-mm blister tape wound on 180-mm or 330-mm ∅ reel
For details on taping, packing and packing units see page 433.

Outline drawing

EIA size 1210,
approx. weight 50 mg



PCB layout recommendation



Dimensions (mm)	*A*	*B*	*C*	*D*
Wave soldering	2,3	1,60	2,1	5,3
Reflow soldering	2,7	1,15	2,1	4,4

1) Soldering area, tinned

Characteristics and ordering codes

For further technical data see page 54.

L_R µH	Tolerance[1]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code [2] (180-mm ∅ reel)
Core material: ceramics								
0,0082	± 5 % ≙ J ± 10 % ≙ K ± 20 % ≙ M	10	20	100	800	0,08	2500	B82422-A3829-+100
0,010		10	20	100	750	0,09	2500	B82422-A3100-+100
0,012		10	25	100	700	0,10	2500	B82422-A3120-+100
0,015		10	27	100	640	0,12	2500	B82422-A3150-+100
0,018		10	30	100	640	0,12	2500	B82422-A3180-+100
0,022		10	30	100	600	0,14	2500	B82422-A3220-+100
0,027		10	23	50	600	0,14	1850	B82422-A3270-+100
0,033		10	20	50	540	0,17	1700	B82422-A3330-+100
0,039		10	25	50	530	0,18	1450	B82422-A3390-+100
0,047		10	26	50	510	0,19	1350	B82422-A3470-+100
0,056		10	26	50	500	0,20	1200	B82422-A3560-+100
0,068		10	27	50	480	0,21	1150	B82422-A3680-+100
0,082		10	27	50	450	0,24	1050	B82422-A3820-+100
0,10		10	25	50	440	0,26	1000	B82422-A3101-+100
0,12		1	22	30	400	0,32	880	B82422-A3121-+100
0,15		1	25	30	390	0,33	850	B82422-A3151-+100
0,18		1	25	30	360	0,38	800	B82422-A3181-+100
0,22		1	25	30	280	0,64	700	B82422-A3221-+100
0,27		1	20	30	235	0,90	650	B82422-A3271-+100
0,33		1	22	30	200	1,3	580	B82422-A3331-+100
0,39		1	22	30	190	1,4	540	B82422-A3391-+100
0,47		1	22	30	150	2,2	480	B82422-A3471-+100
0,56		1	22	30	150	2,2	400	B82422-A3561-+100
0,68		1	22	30	145	2,4	180	B82422-A3681-+100
0,82		1	22	30	140	2,5	160	B82422-A3821-+100

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm append code number "8". Example: B82422-A3829-K108

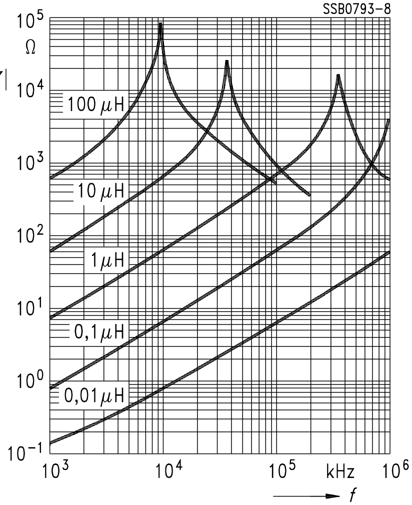
Characteristics and ordering codes

For further technical data see page 54.

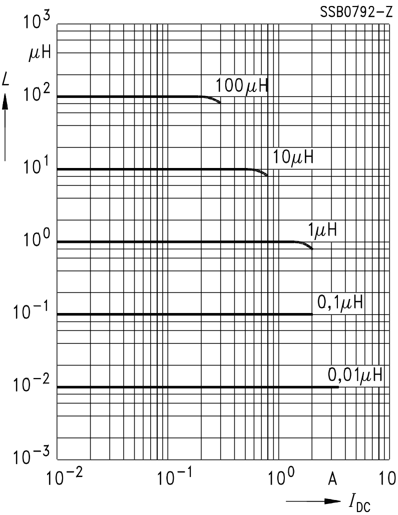
L_R µH	Toler-ance[1)]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code [2)] (180-mm ∅ reel)
Core material: ferrite								
1,0	± 5 % ≙ J ± 10 % ≙ K ± 20 % ≙ M	1	20	7,96	380	0,34	320	B82422-A1102-+100
1,2		1	20	7,96	370	0,37	300	B82422-A1122-+100
1,5		1	20	7,96	340	0,42	270	B82422-A1152-+100
1,8		1	25	7,96	290	0,60	250	B82422-A1182-+100
2,2		1	25	7,96	270	0,75	125	B82422-A1222-+100
2,7		1	25	7,96	240	0,88	110	B82422-A1272-+100
3,3		1	27	7,96	200	1,20	110	B82422-A1332-+100
3,9		1	27	7,96	190	1,40	110	B82422-A1392-+100
4,7		1	27	7,96	150	2,20	110	B82422-A1472-+100
5,6		1	27	7,96	140	2,60	100	B82422-A1562-+100
6,8		1	27	7,96	135	2,80	90	B82422-A1682-+100
8,2		1	27	7,96	130	3,00	90	B82422-A1822-+100
10		1	27	2,52	180	1,60	25	B82422-A1103-+100
12		0,1	27	2,52	175	1,65	23	B82422-A1123-+100
15		0,1	27	2,52	165	1,85	20	B82422-A1153-+100
18		0,1	27	2,52	155	2,00	17	B82422-A1183-+100
22		0,1	27	2,52	140	2,65	16	B82422-A1223-+100
27		0,1	27	2,52	120	3,70	15	B82422-A1273-+100
33		0,1	27	2,52	105	4,50	13	B82422-A1333-+100
39		0,1	27	2,52	90	6,30	12	B82422-A1393-+100
47		0,1	27	2,52	85	7,00	11	B82422-A1473-+100
56		0,1	27	2,52	85	6,75	9	B82422-A1563-+100
68		0,1	27	2,52	80	7,70	9	B82422-A1683-+100
82		0,1	27	2,52	70	10,0	8	B82422-A1823-+100
100		0,1	27	2,52	65	11,5	7	B82422-A1104-+100

11) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm insert code number "8". Example: B82422-A1102-K108

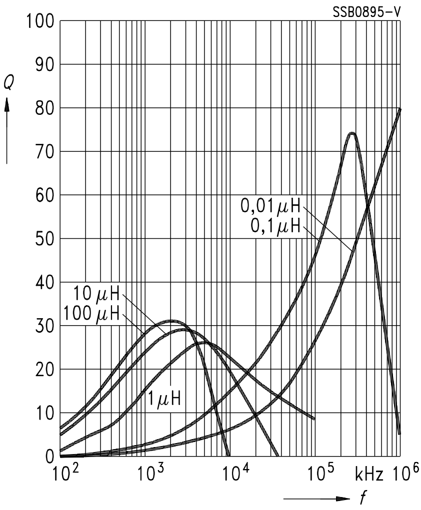
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



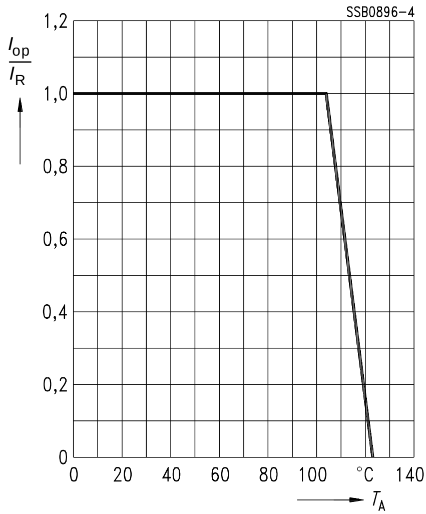
Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A



Q factor
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



Current derating I_{op}/I_R
versus ambient temperature T_A
(Rated temperature T_R = 105 °C)



SIMID 02-T (Siemens Miniature Inductors)
World standard
Rated inductance 0,010 to 100 µH
Rated current 0,04 to 0,45 A

Construction

- Size as per EIA standard: 1210
- Ceramics or ferrite core
- Winding laser-welded, flame-retardant encapsulation
- Temperature index of wire enamel: 180 °C

Features

- High *Q* factor
- High resonance frequency
- Suitable for reflow (IR and vapor phase) and wave soldering
- Same measuring frequency for *L* and *Q*

Applications

- Filtering of supply voltages, coupling, decoupling
- Antenna systems
- Automotive electronics
- Telecommunications

Terminals

- Tinned
- Base material: CuSn6, 0,4 µm Cu, 0,1µm Ni, 5–7 µm Sn
- Suitable for soldering and conductive adhesion
- No leaching during wave soldering

Marking

Marking on component:
Manufacturer,
L value (in µH) and tolerance of *L* value (coded),
date of manufacture (coded)

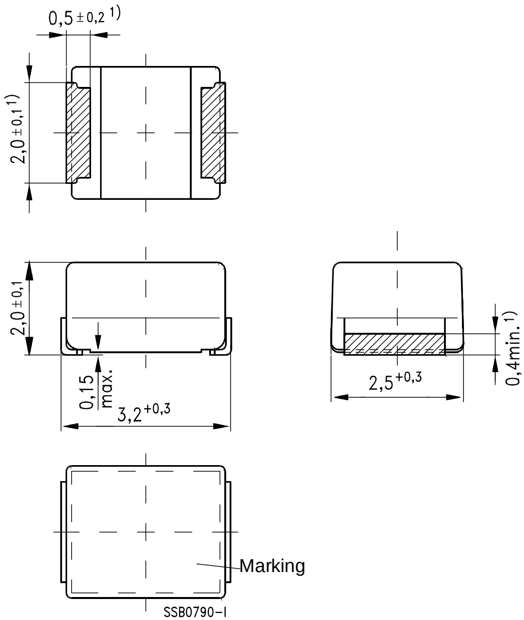
Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value,
quantity, date of packing

Delivery mode

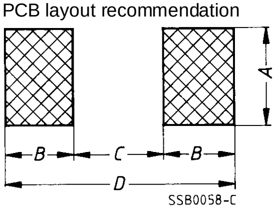
8-mm blister tape wound on 180-mm or 330-mm ∅ reel
For details on taping, packing and packing units see page 433.

Outline drawing

EIA size 1210,
approx. weight 50 mg



PCB layout recommendation



Dimensions (mm)	*A*	*B*	*C*	*D*
Wave soldering	2,3	1,60	2,1	5,3
Reflow soldering	2,7	1,15	2,1	4,4

1) Soldering area, tinned

Characteristics and ordering codes

For further technical data see page 54.

L_R µH	Toler-ance[1]	Q_{min}	f_L; f_Q MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2] (180-mm ∅ reel)
Core material: ceramics							
0,010	± 5 % ≙ J ± 10 % ≙ K	15	100	450	0,10	2500	B82422-T3100-+
0,012		17	100	450	0,11	2500	B82422-T3120-+
0,015		19	100	450	0,13	2500	B82422-T3150-+
0,018		21	100	450	0,14	2000	B82422-T3180-+
0,022		23	100	450	0,16	2000	B82422-T3220-+
0,027		23	100	450	0,17	1700	B82422-T3270-+
0,033		25	100	450	0,18	1700	B82422-T3330-+
0,039		25	100	450	0,19	1300	B82422-T3390-+
0,047		26	100	450	0,20	1300	B82422-T3470-+
0,056		26	100	450	0,21	1100	B82422-T3560-+
0,068		27	100	450	0,23	1000	B82422-T3680-+
0,082		27	100	450	0,26	1000	B82422-T3820-+
0,10		28	100	450	0,31	900	B82422-T3101-+
Core material: ferrite							
0,12	± 5 % ≙ J ± 10 % ≙ K	30	25,2	450	0,15	900	B82422-T1121-+
0,15		30	25,2	450	0,18	700	B82422-T1151-+
0,18		30	25,2	450	0,19	500	B82422-T1181-+
0,22		30	25,2	450	0,20	500	B82422-T1221-+
0,27		30	25,2	450	0,21	500	B82422-T1271-+
0,33		30	25,2	450	0,23	500	B82422-T1331-+
0,39		30	25,2	450	0,25	400	B82422-T1391-+
0,47		30	25,2	450	0,30	400	B82422-T1471-+
0,56		30	25,2	450	0,31	300	B82422-T1561-+
0,68		30	25,2	450	0,34	300	B82422-T1681-+
0,82		30	25,2	450	0,38	300	B82422-T1821-+
1,0		30	7,96	400	0,6	300	B82422-T1102-+
1,2		30	7,96	390	0,7	250	B82422-T1122-+
1,5		30	7,96	370	0,7	200	B82422-T1152-+
1,8		30	7,96	350	0,8	140	B82422-T1182-+
2,2		30	7,96	320	0,8	100	B82422-T1222-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm append code number "8". Example: B82422-T3100-K8

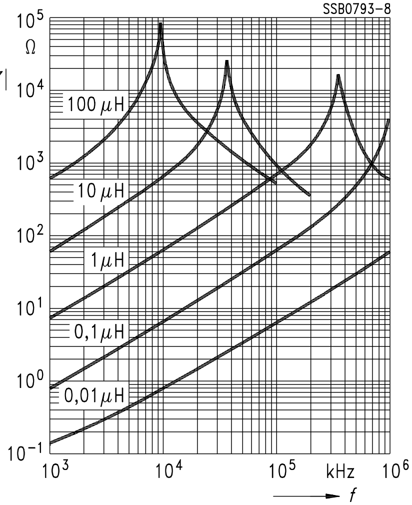
Characteristics and ordering codes

For further technical data see page 54.

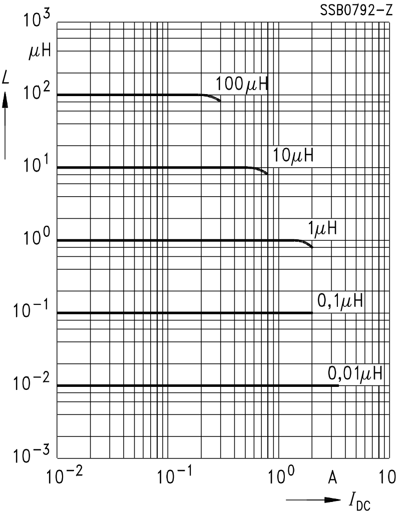
L_R µH	Toler-ance[1]	Q_{min}	f_L; f_Q MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code[2] (180-mm ∅ reel)
Core material: ferrite							
2,7	± 5 % ≙ J ± 10 % ≙ K	30	7,96	290	0,9	70	B82422-T1272-+
3,3		30	7,96	260	1,2	60	B82422-T1332-+
3,9		30	7,96	250	1,3	60	B82422-T1392-+
4,7		30	7,96	220	1,5	50	B82422-T1472-+
5,6		27	7,96	200	1,6	45	B82422-T1562-+
6,8		27	7,96	180	1,8	40	B82422-T1682-+
8,2		27	7,96	170	2,0	35	B82422-T1822-+
10		27	2,52	150	2,1	30	B82422-T1103-+
12		27	2,52	140	2,5	25	B82422-T1123-+
15		27	2,52	130	2,8	20	B82422-T1153-+
18		27	2,52	120	3,0	20	B82422-T1183-+
22		27	2,52	110	3,5	20	B82422-T1223-+
27		27	2,52	80	4,5	20	B82422-T1273-+
33		27	2,52	70	5,6	17	B82422-T1333-+
39		27	2,52	65	6,4	16	B82422-T1393-+
47		27	2,52	60	7,0	15	B82422-T1473-+
56		27	2,52	55	8,0	12	B82422-T1563-+
68		27	2,52	50	9,0	9	B82422-T1683-+
82		25	2,52	45	10	9	B82422-T1823-+
100		20	0,796	40	11	8	B82422-T1104-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance
For reel size ∅ 330 mm append code number "8". Example: B82422-T1272-K8

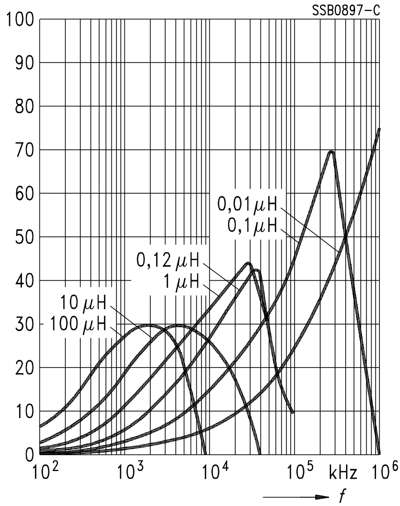
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



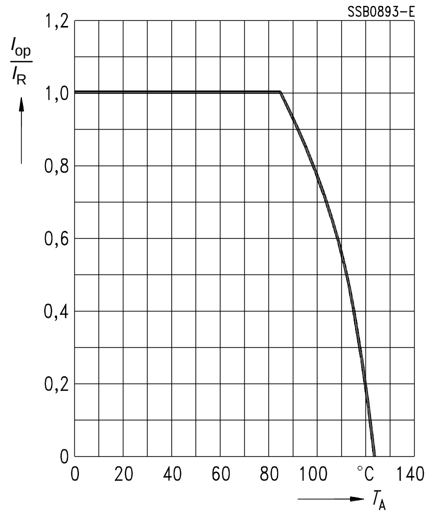
Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A



Q factor
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



Current derating I_{op}/I_R
versus ambient temperature T_A
(Rated temperature T_R = 85 °C)



SIMID 03 (Siemens Miniature Inductors)
Rated inductance 1,0 to 1000 µH
Rated current 0,055 to 0,6 A

Construction

- Size as per EIA standard: 1812
- Ferrite core
- Winding US-welded, flame-retardant encapsulation
- Temperature index of wire enamel: ≥180 °C

Features

- High current handling capability
- High *Q* factor
- High resonance frequency
- Suitable for reflow (IR and vapor phase) and wave soldering
- Different measuring frequencies for *L* and *Q*

Applications

- Filtering of supply voltages, coupling, decoupling
- Antenna systems
- Automotive electronics
- Telecommunications

Terminals

- Silver-plated
- Base material: CuSn6, 1–2 µm Cu, 4–6 µm Ag
- Suitable for soldering and conductive adhesion
- No leaching during wave soldering

Marking

Marking on component:
Manufacturer,
L value (in nH) and tolerance of *L* value (coded),
date of manufacture (coded)

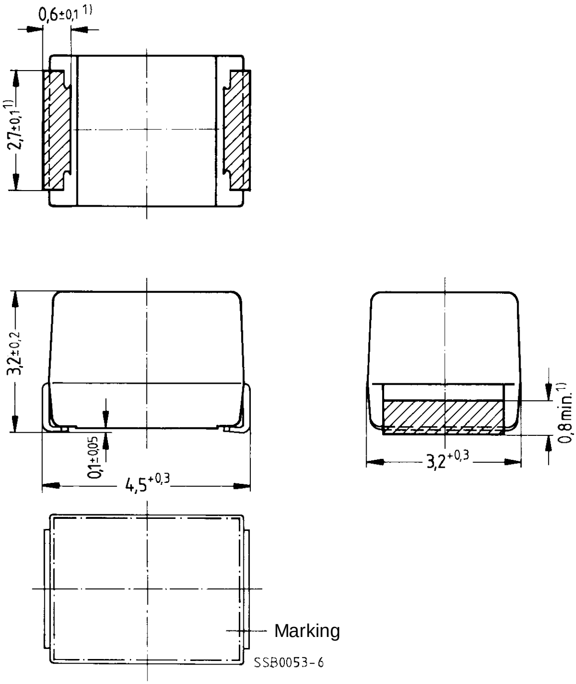
Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value,
quantity, date of packing

Delivery mode

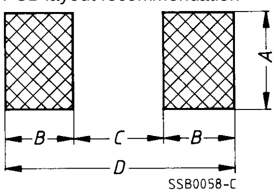
12-mm blister tape wound on 330-mm ∅ reel
For details on taping, packing and packing units see page 433.

Outline drawing

EIA size 1812,
approx. weight 130 mg



PCB layout recommendation



Dimensions (mm)	*A*	*B*	*C*	*D*
Wave soldering	3,1	1,7	3,2	6,6
Reflow soldering	3,6	1,3	3,2	5,8

1) Soldering area, silver-plated

Characteristics and ordering codes

For further technical data see page 54.

L_R µH	Tolerance[1]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code[2]
1,0	± 10 % ≙ K ± 20 % ≙ M	1	25	7,96	600	0,28	260	B82432-A1102-+
1,2		1	25	7,96	560	0,32	250	B82432-A1122-+
1,5		1	25	7,96	535	0,35	230	B82432-A1152-+
1,8		1	25	7,96	490	0,41	210	B82432-A1182-+
2,2		1	30	7,96	480	0,43	190	B82432-A1222-+
2,7		1	30	7,96	450	0,49	170	B82432-A1272-+
3,3		1	30	7,96	425	0,55	155	B82432-A1332-+
3,9		1	30	7,96	410	0,59	145	B82432-A1392-+
4,7		1	30	7,96	390	0,65	110	B82432-A1472-+
5,6		1	30	7,96	375	0,71	100	B82432-A1562-+
6,8		1	30	7,96	360	0,78	75	B82432-A1682-+
8,2		1	30	7,96	330	0,92	23	B82432-A1822-+
10		1	45	2,52	320	0,98	22	B82432-A1103-+
12		0,1	45	2,52	300	1,10	19	B82432-A1123-+
15		0,1	45	2,52	280	1,25	17	B82432-A1153-+
18		0,1	45	2,52	270	1,35	15	B82432-A1183-+
22		0,1	45	2,52	260	1,45	13	B82432-A1223-+
27		0,1	45	2,52	245	1,65	12	B82432-A1273-+
33	± 5 % ≙ J ± 10 % ≙ K ± 20 % ≙ M	0,1	45	2,52	230	1,85	10,5	B82432-A1333-+
39		0,1	45	2,52	220	2,05	10,0	B82432-A1393-+
47		0,1	40	2,52	210	2,3	9,5	B82432-A1473-+
56		0,1	40	2,52	200	2,5	9,0	B82432-A1563-+
68		0,1	40	2,52	190	2,8	8,0	B82432-A1683-+
82		0,1	35	2,52	175	3,2	7,0	B82432-A1823-+
100		0,1	40	2,52	145	4,7	6,5	B82432-A1104-+
120		0,1	35	0,796	140	5,2	6,0	B82432-A1124-+
150		0,1	35	0,796	130	6,1	5,5	B82432-A1154-+
180		0,1	35	0,796	120	6,9	5,0	B82432-A1184-+
220		0,1	30	0,796	115	7,5	4,6	B82432-A1224-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance

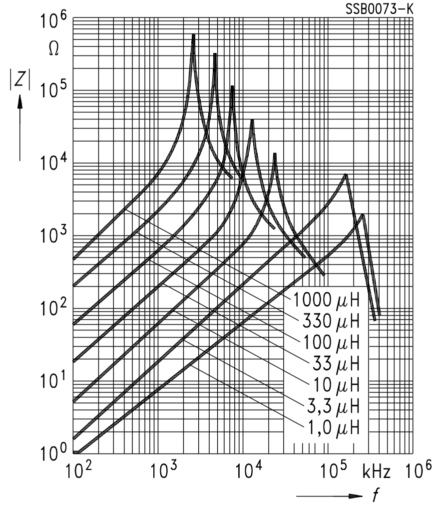
Characteristics and ordering codes

For further technical data see page 54.

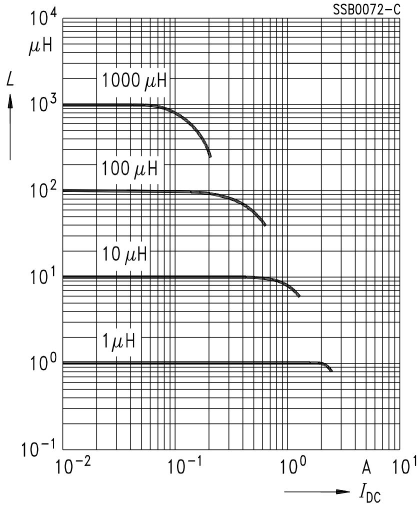
L_R µH	Toler-ance[1]	f_L MHz	Q_{min}	f_Q MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2]
270	± 5 % ≙ J	0,1	30	0,796	90	12,5	4,4	B82432-A1274-+
330	± 10 % ≙ K	0,1	30	0,796	85	14,1	4,1	B82432-A1334-+
390	± 20 % ≙ M	0,1	35	0,796	80	15,3	3,8	B82432-A1394-+
470		0,1	35	0,796	75	17,5	3,5	B82432-A1474-+
560		0,1	30	0,796	70	23,0	2,8	B82432-A1564-+
680		0,1	30	0,796	65	25,0	2,6	B82432-A1684-+
820		0,1	30	0,796	60	28,0	2,5	B82432-A1824-+
1000		0,1	30	0,796	55	32,0	2,3	B82432-A1105-+

1) Closer tolerances and special versions upon request.
2) Replace the + by the code letter for the required inductance tolerance

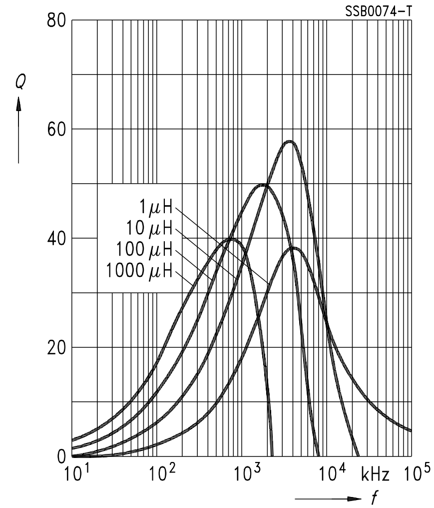
Impedance |*Z*|
versus frequency *f*
measured with impedance analyzer
HP 4191A / HP 4194A



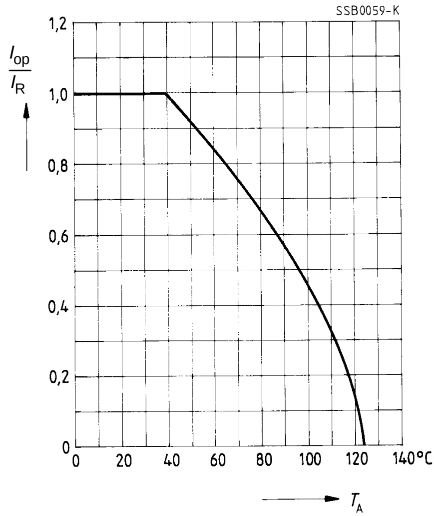
Inductance *L*
versus dc load I_{DC}
measured with LCR meter HP 4275A



Q factor
versus frequency *f*
measured with impedance analyzer
HP 4194A



Current derating I_{op}/I_R
versus ambient temperature T_A
(Rated temperature T_R = 40 °C)



Preliminary data

SIMID 05 (Siemens Miniature Inductors)
Rated inductance 1 to 10000 µH
Rated current 0,025 to 1,8 A

Construction

- Size as per EIA standard: 2220
- Upright ferrite drum core
- Winding laser-welded, flame-retardant encapsulation
- Temperature index of wire enamel: 180 °C

Features

- Very high current handling capability
- High inductance ratings
- Suitable for reflow (IR and vapor phase) and wave soldering

Applications

- Filtering of supply voltages, coupling, decoupling
- DC/DC converters
- Automotive electronics
- Telecommunications

Terminals

- Tinned
- Base material: CuSn6, 0,4 µm Cu, 0,1 µm Ni, 5–7 µm Sn
- No leaching during wave soldering

Marking

Marking on component:
Manufacturer, date of manufacture (coded)
L value (in µH) and tolerance of *L* value (coded),

Minimum marking on reel:
Manufacturer, part number, ordering code,
L value and tolerance of *L* value, quantity, date of packing

Delivery mode

12-mm blister tape wound on 330-mm ∅ reel
For details on taping, packing and packing units see page 433.

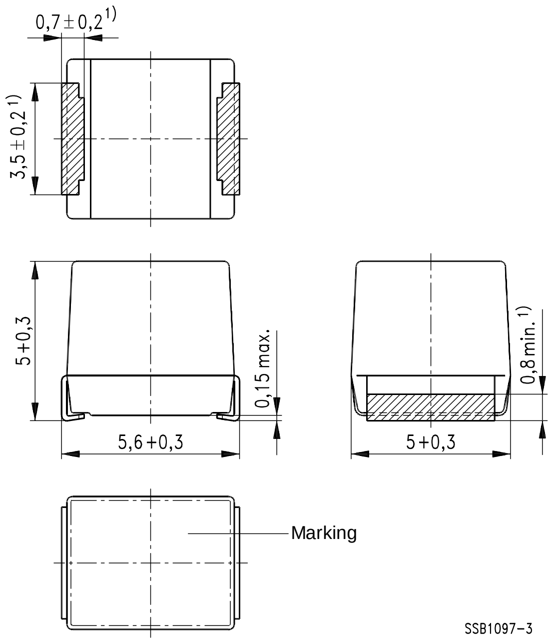
Characteristics and ordering code

L_R µH	I_R mA	Ordering code
1,0 ... 10 000	25 ... 1800	B82442-A1***-+

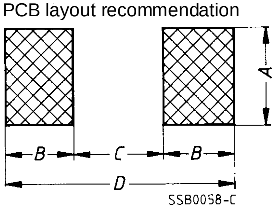
Available from 1/97.

Outline drawing

EIA size 2220,
approx. weight 400 mg



PCB layout recommendation



Dimensions (mm)	*A*	*B*	*C*	*D*
Wave/reflow soldering	4,5	2,0	4,0	8,0

1) Soldering area, tinned

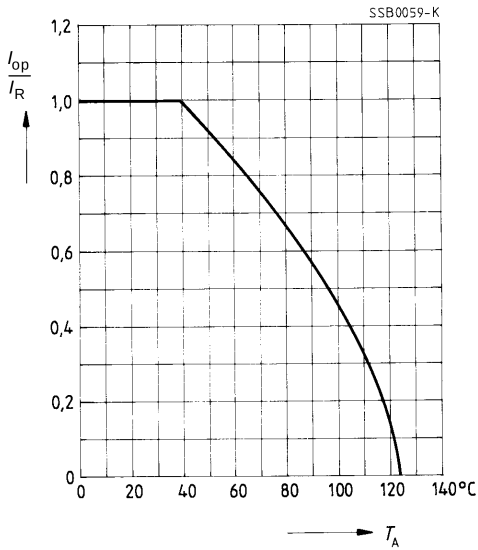
Selector guide leaded chokes

Series	I_R	L_R	Dimen-sions $\varnothing \times l$ (max.)	Min. lead spacing (mm)		Features	Type	Page
	A	µH	mm	axial	radial			
MCC	0,085 ... 1,12	0,1 … 100	3,3 × 7,0	10	5	Low inductance ratings High resonance frequency Low total height	B78108-T B78148-T	93
SBC	0,055 ... 0,725	1 … 1000	3,0 × 6,8	10	5	Small size Relatively high rated current	B82141	97
BC	0,055 ... 1,2	1 … 4700	4,0 × 9,2	12,5	5	For general-purpose application	B78108-S B78148-S	101
HBC	0,85 ... 2,0	1 … 27	4,0 × 9,2	12,5	5	Very high rated current Relatively small size	B82143	105
LBC	0,02 ... 2,2	1 … 100000	5,2 × 12,0	15	–	Very wide inductance range High rated current	B82144	108
HLBC	0,11 ... 0,86	100 … 10000	6,5 × 12,0	15	–	Very high rated current High inductance ratings	B82145	111

General technical data

Rated inductance L_R	Measuring frequency: $L \leq 10\ \mu H$ = 1 MHz $10\ \mu H < L \leq 4700\ \mu H$ = 100 kHz $L > 4700\ \mu H$ = 10 kHz Measuring current: ≤ 1 mA Distance between measuring clamps: 25,4 mm
Q factor Q_{min}	Measured with quality test set-up HP 4342A
Rated current I_R	Maximum permissible dc referred to 40 °C ambient temperature, for derating see next page
Inductance decrease $\Delta L/L_0$	≤ 10 % (referred to initial value) at I_R at 20 °C ambient temperature
DC resistance R_{max}	Measured at 20 °C ambient temperature, distance between measuring clamps: 25,4 mm
Resonance frequency $f_{res,\ min}$	Measured with Scalar Network Analyzer ZAS from Rohde & Schwarz
Climatic category	In accordance with IEC 68-1 55/125/56 (– 55 °C/+125 °C/56 days damp heat test)
Solderability	In accordance with IEC 68-2–20, test Ta 235 °C, 2 s, ≥ 90 % wetting
Resistance to soldering heat	In accordance with IEC 68-2-20, test Tb 260 °C, 10 s
Tensile strength of leads	In accordance with IEC 68-2-21, test Ua ≥ 20 N

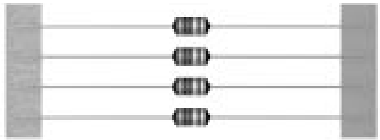
General technical data

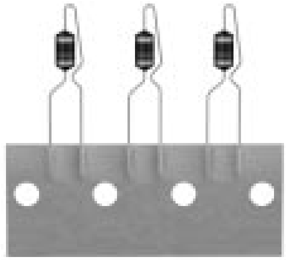
Current derating I_{op}/I_R versus ambient temperature T_A (Rated temperature T_R = 40 °C)	

Mounting information

When bending the leads, take care that the start-of-winding areas at the face ends (protected by glue and lacquer) are not subjected to any mechanical stress.

MCC choke (Mini Cylinder Core)
Rated current 0,08 to 1,1 A
Rated inductance 0,1 to 100 µH





Construction

- Ceramic or ferrite cylinder core
- Winding: enamel copper wire
- Flame-retardant lacquer coating

Features

- Low total height
- Low inductance
- High resonance frequency

Applications

- RF blocking
- Decoupling and interference suppression
- For antenna systems, automotive electronics, telecommunications, entertainment electronics

Terminals

- Central axial leads, tinned
- Radially bent to 5 mm lead spacing

Marking

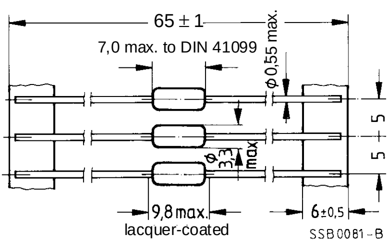
Inductance indicated by color bands in accordance with IEC 62

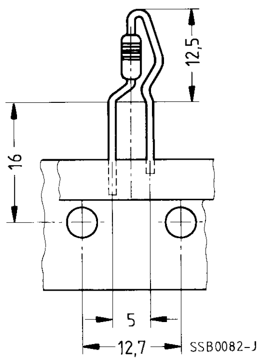
Delivery mode

Taped and reeled
For details on taping, packing and packing units see page 435.

Outline drawing

B78108-T (axial leads, taped) B78148-T (central radial leads, taped)





Minimum lead spacing 10 mm
Approx. weight 0,25 g

Characteristics and ordering codes

For further technical data see page 91.

L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2]
Ceramic cylinder core							
0,10	± 10 % ≙ K	40	25,2	1120	0,13	600	B781∗8-T3101-K
0,12		40	25,2	1080	0,145	570	B781∗8-T3121-K
0,15		38	25,2	1020	0,155	500	B781∗8-T3151-K
0,18		35	25,2	1000	0,17	460	B781∗8-T3181-K
0,22		35	25,2	990	0,195	420	B781∗8-T3221-K
0,27		35	25,2	910	0,215	380	B781∗8-T3271-K
0,33		35	25,2	830	0,24	330	B781∗8-T3331-K
0,39		35	25,2	790	0,27	300	B781∗8-T3391-K
0,47		35	25,2	750	0,315	280	B781∗8-T3471-K
0,56		35	25,2	700	0,34	260	B781∗8-T3561-K
0,68		35	25,2	530	0,48	240	B781∗8-T3681-K
0,82		35	25,2	500	0,55	230	B781∗8-T3821-K
Ferrite cylinder core							
1,0	± 10 % ≙ K	35	25,2	630	0,25	180	B781∗8-T1102-K
1,2		40	7,96	610	0,25	170	B781∗8-T1122-K
1,5		40	7,96	570	0,30	150	B781∗8-T1152-K
1,8		40	7,96	540	0,30	130	B781∗8-T1182-K
2,2		40	7,96	520	0,35	120	B781∗8-T1222-K
2,7		40	7,96	480	0,40	110	B781∗8-T1272-K
3,3		40	7,96	420	0,50	110	B781∗8-T1332-K
3,9		40	7,96	400	0,55	100	B781∗8-T1392-K
4,7		40	7,96	380	0,65	90	B781∗8-T1472-K
5,6		45	7,96	260	1,30	75	B781∗8-T1562-K
6,8		45	7,96	250	1,45	70	B781∗8-T1682-K
8,2		50	7,96	240	1,60	65	B781∗8-T1822-K
10		50	7,96	230	1,70	60	B781∗8-T1103-K

1) Closer tolerances upon request
2) Replace the asterisk ∗ by code number "0" for axial taping or by "4" for radial taping

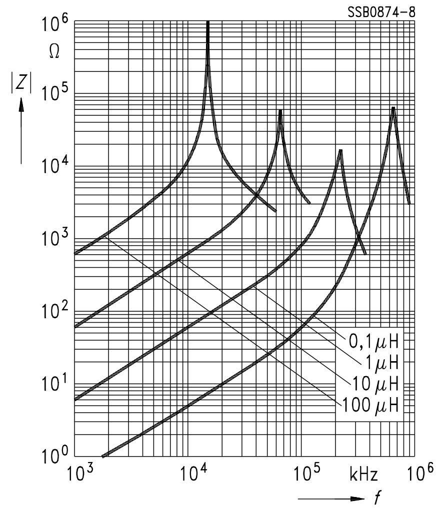
Characteristics and ordering codes

For further technical data see page 91.

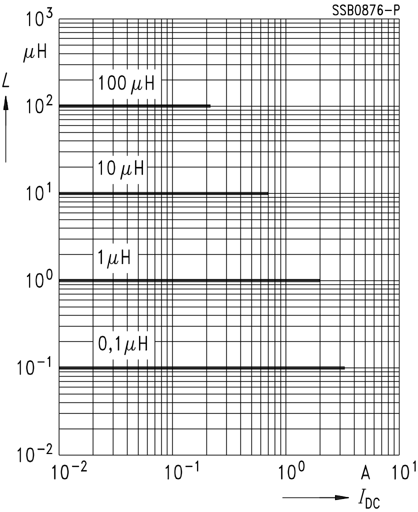
L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2]
Ferrite cylinder core							
12	± 10 % ≙ K	55	2,52	190	2,40	50	B781*8-T1123-K
15		55	2,52	185	2,70	45	B781*8-T1153-K
18		55	2,52	175	2,90	40	B781*8-T1183-K
22		60	2,52	170	3,20	30	B781*8-T1223-K
27		60	2,52	160	3,60	27	B781*8-T1273-K
33		60	2,52	150	4,10	24	B781*8-T1333-K
39		60	2,52	140	4,50	22	B781*8-T1393-K
47		60	2,52	100	8,50	20	B781*8-T1473-K
56		60	2,52	100	8,80	18	B781*8-T1563-K
68		60	2,52	95	10,0	15	B781*8-T1683-K
82		60	2,52	90	11,5	14	B781*8-T1823-K
100		60	2,52	85	12,5	11	B781*8-T1104-K

1) Closer tolerances upon request
2) Replace the asterisk * by code number "0" for axial taping or by "4" for radial taping

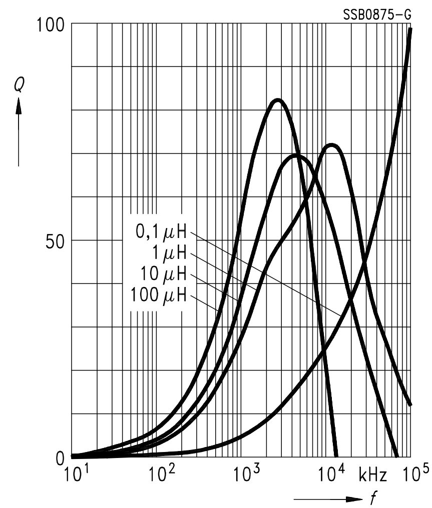
Impedance |*Z*|
versus frequency *f*
measured with impedance analyzer
HP 4191A / HP 4194A



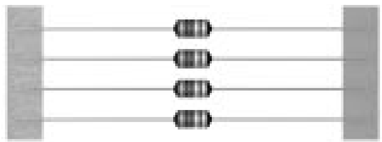
Inductance *L*
versus dc load I_{DC}
measured with LCR meter HP 4275A

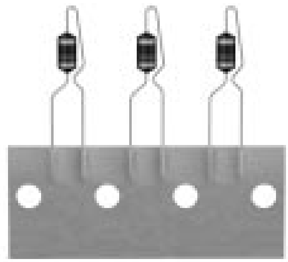


Q factor
versus frequency *f*
measured with impedance analyzer HP 4194A



SBC choke (Small Bobbin Core)
Rated current 0,055 to 0,725 A
Rated inductance 1 to 1000 µH





Construction

- Mini ferrite drum core
- Winding: enamel copper wire
- Flame-retardant lacquer coating

Features

- Small size
- Relatively high rated current

Applications

- RF blocking and filtering
- Decoupling and interference suppression
- For electronic household appliances, automotive and entertainment electronics

Terminals

- Central axial leads, tinned
- Radially bent to 5 mm lead spacing

Marking

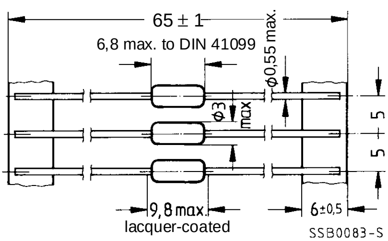
Inductance indicated by color bands in accordance with IEC 62

Delivery mode

Taped and reeled
For details on taping, packing and packing units see page 435.

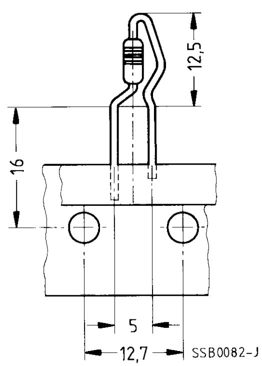
Outline drawing

B82141-A (axial leads, taped)



Minimum lead spacing 10 mm
approx. weight 0,22 g

B82141-B (central radial leads, taped)



Characteristics and ordering codes

For further technical data see page 91.

L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2]
1,0	± 10 % ≙ K	40	7,96	725	0,19	180	B82141-+1102-K
1,2		40	7,96	700	0,20	160	B82141-+1122-K
1,5		40	7,96	670	0,22	155	B82141-+1152-K
1,8		45	7,96	660	0,23	145	B82141-+1182-K
2,2		45	7,96	630	0,25	130	B82141-+1222-K
2,7		45	7,96	610	0,27	110	B82141-+1272-K
3,3		50	7,96	580	0,30	90	B82141-+1332-K
3,9		50	7,96	560	0,32	70	B82141-+1392-K
4,7		50	7,96	530	0,36	60	B82141-+1472-K
5,6		50	7,96	510	0,38	50	B82141-+1562-K
6,8		50	7,96	480	0,43	40	B82141-+1682-K
8,2		50	7,96	450	0,52	30	B82141-+1822-K
10		55	2,52	410	0,60	25	B82141-+1103-K
12		55	2,52	385	0,67	20	B82141-+1123-K
15		55	2,52	365	0,74	17	B82141-+1153-K
18		55	2,52	350	0,81	14	B82141-+1183-K
22		55	2,52	335	0,90	12	B82141-+1223-K
27		55	2,52	315	1,00	11	B82141-+1273-K
33		55	2,52	300	1,12	10	B82141-+1333-K
39		55	2,52	285	1,21	8,5	B82141-+1393-K

1) Closer tolerances upon request
2) Replace the + by code letter "A" for axial taping or by "B" for radial taping

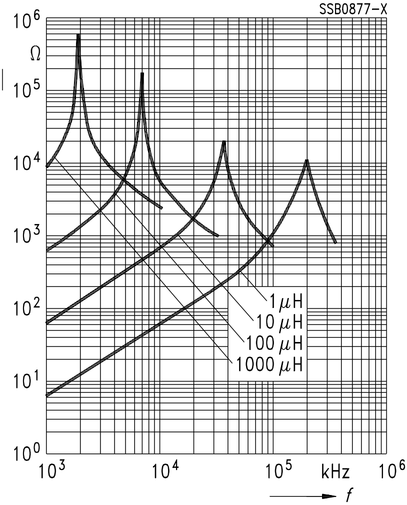
Characteristics and ordering codes

For further technical data see page 91.

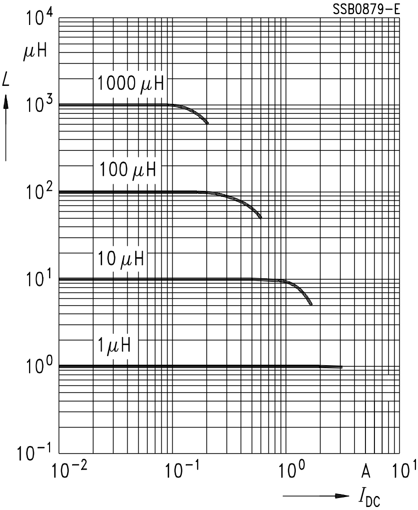
L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code[2]
47	± 5 % ≙ J	55	2,52	200	2,40	7,7	B82141-+1473-J
56		55	2,52	195	2,60	6,8	B82141-+1563-J
68		55	2,52	185	2,90	5,7	B82141-+1683-J
82		55	2,52	175	3,20	5,5	B82141-+1823-J
100		60	0,796	170	3,50	5,3	B82141-+1104-J
120		60	0,796	160	3,80	5,0	B82141-+1124-J
150		60	0,796	150	4,30	4,6	B82141-+1154-J
180		60	0,796	135	5,30	4,2	B82141-+1184-J
220		60	0,796	130	5,80	3,8	B82141-+1224-J
270		60	0,796	115	7,80	3,2	B82141-+1274-J
330		60	0,796	105	9,10	3,0	B82141-+1334-J
390		60	0,796	95	11,0	2,7	B82141-+1394-J
470		60	0,796	90	12,0	2,3	B82141-+1474-J
560		60	0,796	75	16,5	2,2	B82141-+1564-J
680		60	0,796	65	22,0	2,0	B82141-+1684-J
820		60	0,796	60	25,0	1,8	B82141-+1824-J
1000		60	0,796	55	33,0	1,5	B82141-+1105-J

1) Closer tolerances upon request
2) Replace the + by code letter "A" for axial taping or by "B" for radial taping

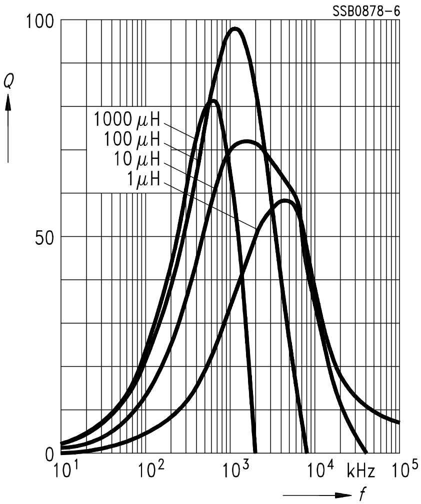
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



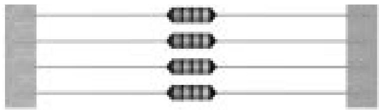
Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A

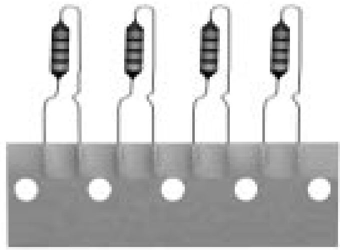


Q factor
versus frequency f
measured with impedance analyzer HP 4194A



BC choke (Bobbin Core)
Rated current 0,055 to 1,2 A
Rated inductance 1 to 4700 µH





Construction

- Ferrite drum core
- Winding: enamel copper wire
- Flame-retardant lacquer coating

Features

- Wide inductance range
- Suitable for general-purpose application
- Special versions available

Applications

- RF blocking and filtering
- Decoupling and interference suppression
- For antenna systems, automotive electronics, energy-saving lamps, entertainment electronics

Terminals

- Central axial leads, tinned
- Radially bent to 5 mm lead spacing

Marking

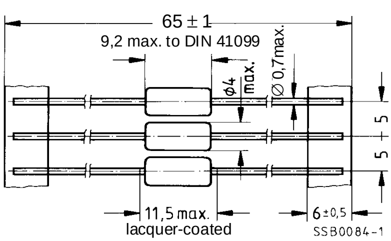
Inductance indicated by color bands in accordance with IEC 62

Delivery mode

Taped and reeled
For details on taping, packing and packing units see page 435.

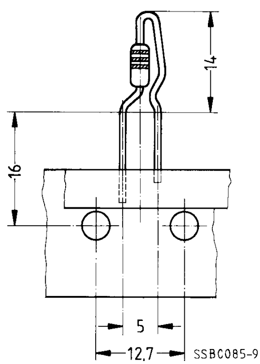
Outline drawing

B78108-S (axial leads, taped)



Minimum lead spacing 12,5 mm
Approx. weight 0,38 g

B78148-S (central radial leads, taped)



Characteristics and ordering codes

For further technical data see page 91.

L_R µH	Tolerance[1]	Q_{min}	f_O MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code[2]
1,0	± 10 % ≙ K	55	7,96	1200	0,16	205	B781*8-S1102-K
1,2		55	7,96	1150	0,18	185	B781*8-S1122-K
1,5		55	7,96	1100	0,20	165	B781*8-S1152-K
1,8		55	7,96	1030	0,22	155	B781*8-S1182-K
2,2		55	7,96	1000	0,25	140	B781*8-S1222-K
2,7		60	7,96	940	0,26	125	B781*8-S1272-K
3,3		60	7,96	900	0,29	115	B781*8-S1332-K
3,9		60	7,96	850	0,31	105	B781*8-S1392-K
4,7		60	7,96	820	0,34	95	B781*8-S1472-K
5,6		60	7,96	780	0,38	85	B781*8-S1562-K
6,8		65	7,96	670	0,51	75	B781*8-S1682-K
8,2		65	7,96	690	0,48	50	B781*8-S1822-K
10		70	2,52	680	0,49	35	B781*8-S1103-K
12		70	2,52	650	0,55	30	B781*8-S1123-K
15		60	2,52	610	0,60	20	B781*8-S1153-K
18		60	2,52	580	0,67	17	B781*8-S1183-K
22		55	2,52	560	0,74	13	B781*8-S1223-K
27		55	2,52	530	0,83	10	B781*8-S1273-K
33		55	2,52	500	0,92	9,0	B781*8-S1333-K
39		50	2,52	470	1,02	8,0	B781*8-S1393-K

1) Closer tolerances upon request
2) Replace the asterisk * by code number "0" for axial taping or by "4" for radial taping

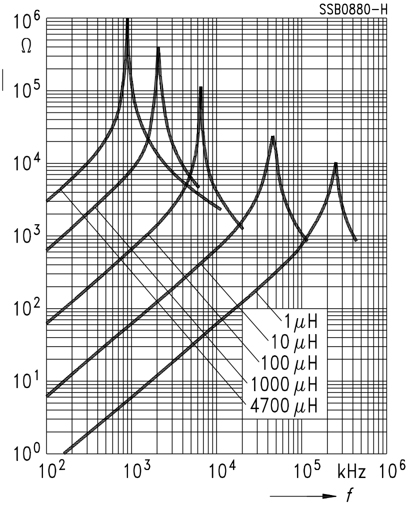
Characteristics and ordering codes

For further technical data see page 91.

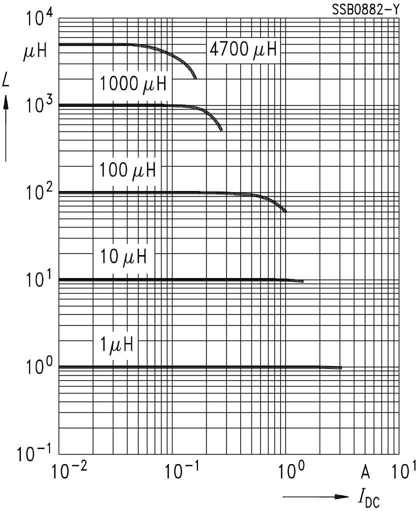
L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R mA	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code[2]
47	± 5 % ≙ J	45	2,52	450	1,10	7,5	B781*8-S1473-J
56		40	2,52	430	1,23	7,0	B781*8-S1563-J
68		40	2,52	410	1,35	6,5	B781*8-S1683-J
82		35	2,52	390	1,54	6,0	B781*8-S1823-J
100		70	0,796	370	1,70	5,0	B781*8-S1104-J
120		70	0,796	300	2,40	4,5	B781*8-S1124-J
150		70	0,796	280	2,80	4,2	B781*8-S1154-J
180		70	0,796	270	3,00	3,9	B781*8-S1184-J
220		70	0,796	250	3,30	3,7	B781*8-S1224-J
270		70	0,796	200	5,70	2,8	B781*8-S1274-J
330		70	0,796	190	6,40	2,7	B781*8-S1334-J
390		70	0,796	180	7,00	2,4	B781*8-S1394-J
470		70	0,796	170	7,90	2,2	B781*8-S1474-J
560		60	0,796	160	8,80	2,0	B781*8-S1564-J
680		55	0,796	150	10,0	1,9	B781*8-S1684-J
820		50	0,796	140	12,0	1,6	B781*8-S1824-J
1000		50	0,252	130	14,0	1,6	B781*8-S1105-J
1200		50	0,252	115	17,5	1,3	B781*8-S1125-J
1500		50	0,252	100	23,0	1,25	B781*8-S1155-J
1800		50	0,252	95	26,0	1,2	B781*8-S1185-J
2200		40	0,252	80	34,7	1,1	B781*8-S1225-J
2700		40	0,252	75	40,0	1,0	B781*8-S1275-J
3300		40	0,252	62	59,5	0,9	B781*8-S1335-J
3900		40	0,252	59	66,0	0,8	B781*8-S1395-J
4700		35	0,252	55	78,0	0,7	B781*8-S1475-J

1) Closer tolerances upon request
2) Replace the asterisk * by code number "0" for axial taping or by "4" for radial taping

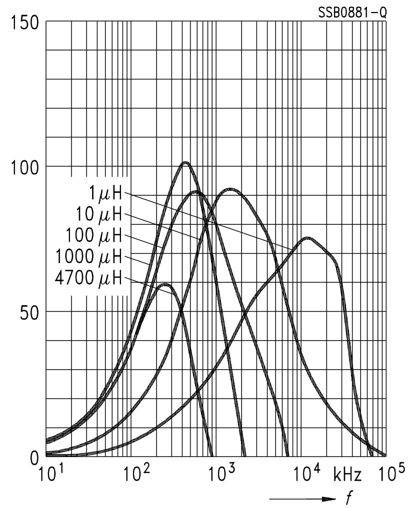
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



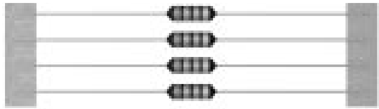
Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A

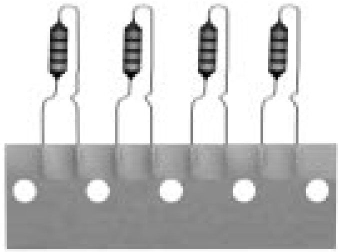


Q factor
versus frequency f
measured with impedance analyzer HP 4194A



HBC choke (High-Current Bobbin Core)
Rated current 0,85 to 2 A
Rated inductance 1 to 27 µH





Construction

- Ferrite drum core
- Winding: enamel copper wire
- Flame-retardant lacquer coating

Features

- Very high rated current
- Low dc resistances

Applications

- Decoupling
- Interference suppression
- For electronic household appliances, automotive and entertainment electronics

Terminals

- Central axial leads, tinned
- Radially bent to 5 mm lead spacing

Marking

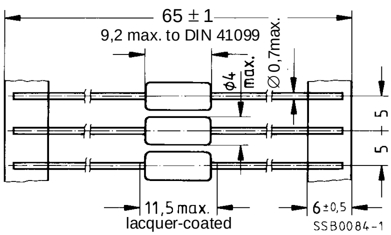
Inductance indicated by color bands in accordance with IEC 62

Delivery mode

Taped and reeled
For details on taping, packing and packing units see page 435.

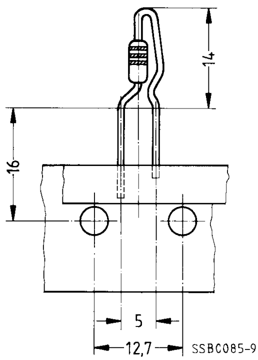
Outline drawing

B82143-A (axial leads, taped)



Minimum lead spacing 12,5 mm
Approx. weight 0,38 g

B82143-B (central radial leads, taped)



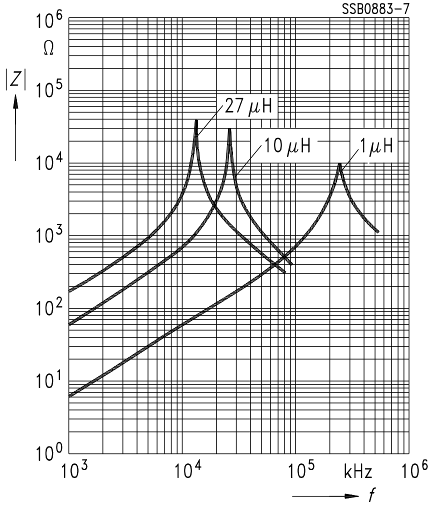
Characteristics and ordering codes

For further technical data see page 91.

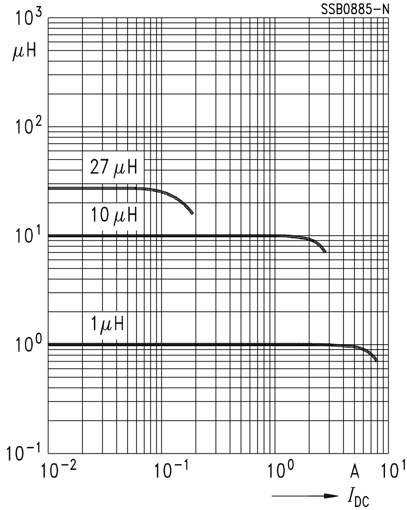
L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R A	R_{max} mΩ	$f_{res,\,min}$ MHz	Ordering code[2]
1,0	± 10 % ≙ K	50	7,96	2,00	80	195	B82143-+1102-K
1,2		50	7,96	1,80	90	180	B82143-+1122-K
1,5		50	7,96	1,70	100	165	B82143-+1152-K
1,8		50	7,96	1,65	110	155	B82143-+1182-K
2,2		50	7,96	1,60	120	140	B82143-+1222-K
2,7		50	7,96	1,50	130	125	B82143-+1272-K
3,3		50	7,96	1,45	140	115	B82143-+1332-K
3,9		50	7,96	1,40	150	105	B82143-+1392-K
4,7		50	7,96	1,30	170	60	B82143-+1472-K
5,6		50	7,96	1,25	190	45	B82143-+1562-K
6,8		40	7,96	1,20	220	35	B82143-+1682-K
8,2		40	7,96	1,15	240	25	B82143-+1822-K
10		40	7,96	1,10	250	21	B82143-+1103-K
12		35	2,52	1,05	270	17	B82143-+1123-K
15		35	2,52	1,00	300	16	B82143-+1153-K
18		35	2,52	0,95	330	15	B82143-+1183-K
22		35	2,52	0,90	370	13	B82143-+1223-K
27		35	2,52	0,85	420	11	B82143-+1273-K

1) Closer tolerances upon request
2) Replace the + by code letter "A" for axial taping or by "B" for radial taping

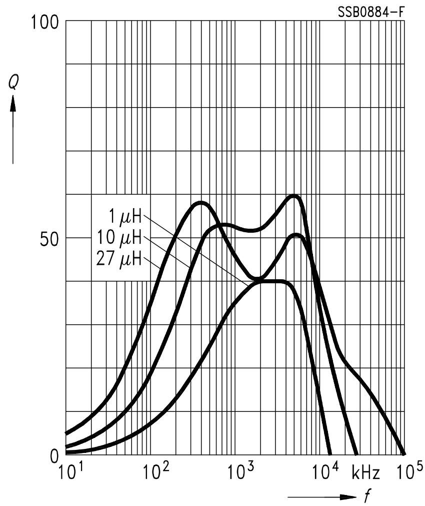
Impedance |*Z*|
versus frequency *f*
measured with impedance analyzer
HP 4191A / HP 4194A

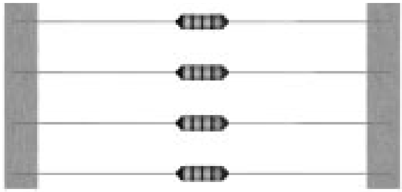


Inductance *L*
versus dc load I_{DC}
measured with LCR meter HP 4275A



Q factor
versus frequency *f*
measured with impedance analyzer HP 4194A





LBC choke (Large Bobbin Core)
Rated current 0,02 to 2,2 A
Rated inductance 1 to 100000 µH

Construction

- Large ferrite drum core
- Winding: enamel copper wire
- Flame-retardant lacquer coating

Features

- Very wide inductance range
- High rated current
- Special versions available

Applications

- RF blocking and filtering
- Decoupling and interference suppression
- For telecommunications (16-kHz blocking filter), automotive electronics, energy-saving lamps, entertainment electronics

Terminals

- Central axial leads, tinned

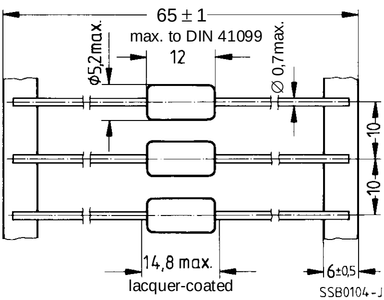
Marking

Inductance indicated by color bands in accordance with IEC 62

Delivery mode

Taped and reeled
For details on taping, packing and packing units see page 435.

Outline drawing



Minimum lead spacing 15 mm

Approx. weight 1,1 g

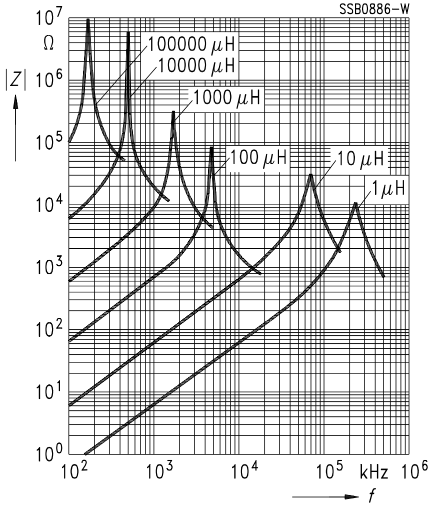
Characteristics and ordering codes

For further technical data see page 91.

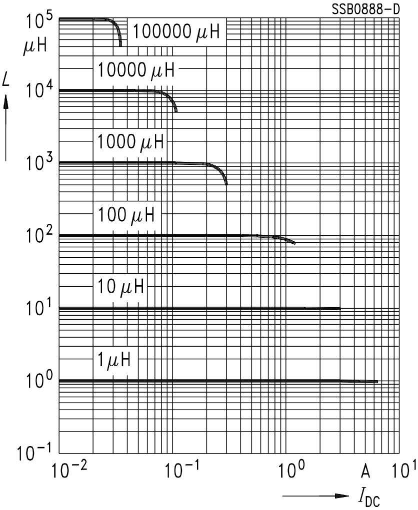
L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R A	R_{max} Ω	$f_{res,\,min}$ MHz	Ordering code
1,0	± 10 % ≙ K	40	7,96	2,20	0,08	200	B82144-A2102-K
1,5		40	7,96	2,10	0,09	190	B82144-A2152-K
2,2		40	7,96	1,90	0,11	140	B82144-A2222-K
3,3		40	7,96	1,75	0,13	120	B82144-A2332-K
4,7		40	7,96	1,60	0,16	100	B82144-A2472-K
6,8		40	7,96	1,50	0,19	80	B82144-A2682-K
10		60	2,52	1,40	0,22	60	B82144-A2103-K
15		60	2,52	1,25	0,28	20	B82144-A2153-K
22		50	2,52	1,10	0,35	12	B82144-A2223-K
33	± 5 % ≙ J	40	2,52	0,90	0,43	8,0	B82144-A2333-J
47		40	2,52	0,80	0,50	5,0	B82144-A2473-J
68		30	2,52	0,70	0,60	4,5	B82144-A2683-J
100		50	0,796	0,60	0,70	3,5	B82144-A2104-J
150		50	0,796	0,50	0,90	3,0	B82144-A2154-J
220		50	0,796	0,40	1,60	2,4	B82144-A2224-J
330		50	0,796	0,33	1,90	2,0	B82144-A2334-J
470		40	0,796	0,28	2,50	1,5	B82144-A2474-J
680		30	0,796	0,24	2,80	1,3	B82144-A2684-J
1000		60	0,252	0,20	3,80	1,2	B82144-A2105-J
1500		60	0,252	0,16	6,00	1,0	B82144-A2155-J
2200		60	0,252	0,12	9,00	0,8	B82144-A2225-J
3300		60	0,252	0,11	12,0	0,6	B82144-A2335-J
4700		60	0,252	0,09	20,0	0,5	B82144-A2475-J
6800		60	0,252	0,08	30,0	0,4	B82144-A2685-J
10000		50	0,0796	0,06	42,0	0,35	B82144-A2106-J
15000		50	0,0796	0,05	68,0	0,30	B82144-A2156-J
22000		50	0,0796	0,04	120	0,26	B82144-A2226-J
33000		50	0,0796	0,035	150	0,22	B82144-A2336-J
47000		40	0,0796	0,03	230	0,18	B82144-A2476-J
68000		40	0,0796	0,025	290	0,15	B82144-A2686-J
100000		40	0,0796	0,02	360	0,12	B82144-A2107-J

1) Closer tolerances upon request

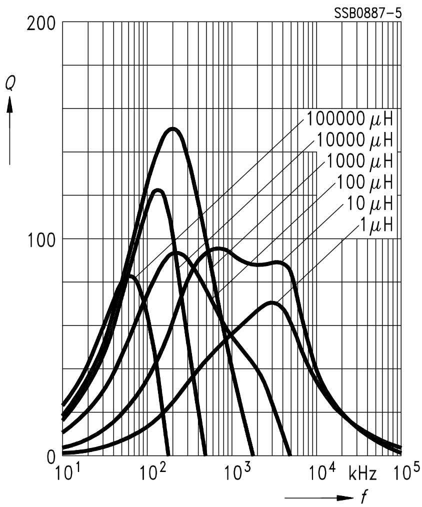
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A

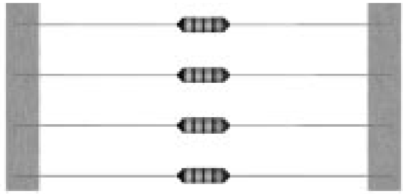


Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A



Q factor
versus frequency f
measured with impedance analyzer HP 4194A





HLBC choke (High-Current Large Bobbin Core)
Rated current 0,11 to 0,86 A
Rated inductance 100 to 10000 µH

Construction

- Large ferrite drum core
- Winding: enamel copper wire
- Flame-retardant lacquer coating

Features

- High rated current at high inductance ratings

Applications

- Decoupling
- Interference suppression
- For energy-saving lamps and entertainment electronics

Terminals

- Central axial leads, tinned

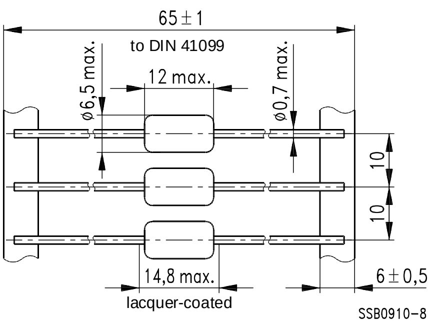
Marking

Inductance indicated by color bands in accordance with IEC 62

Delivery mode

Taped and reeled
For details on taping, packing and packing units see page 435.

Outline drawing



Minimum lead spacing 15 mm

Approx. weight 1,3 g

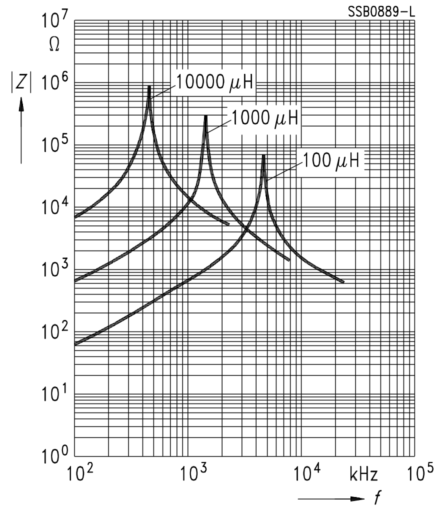
Characteristics and ordering codes

For further technical data see page 91.

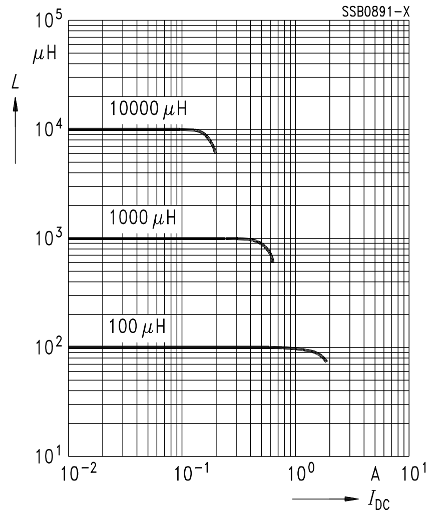
L_R µH	Toler-ance[1]	Q_{min}	f_O MHz	I_R mA	R_{max} Ω	$f_{res, min}$ MHz	Ordering code
100	± 5 % ≙ J	50	0,796	860	0,70	3,5	B82145-A1104-J
150		40	0,796	770	0,90	3,0	B82145-A1154-J
220		30	0,796	690	1,10	2,5	B82145-A1224-J
330		30	0,796	630	1,30	2,1	B82145-A1334-J
470		30	0,796	510	1,90	1,8	B82145-A1474-J
680		20	0,796	440	2,50	1,5	B82145-A1684-J
1000		60	0,252	370	3,60	1,3	B82145-A1105-J
1500		60	0,252	300	5,40	1,0	B82145-A1155-J
2200		60	0,252	250	8,00	0,8	B82145-A1225-J
3300		60	0,252	200	12,5	0,6	B82145-A1335-J
4700		60	0,252	170	18,0	0,5	B82145-A1475-J
6800		60	0,252	130	28,5	0,4	B82145-A1685-J
10000		50	0,0796	110	35,0	0,35	B82145-A1106-J

1) Closer tolerances upon request

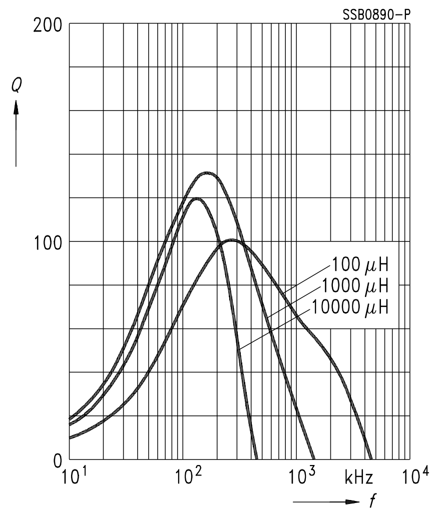
Impedance $|Z|$
versus frequency f
measured with impedance analyzer
HP 4191A / HP 4194A



Inductance L
versus dc load I_{DC}
measured with LCR meter HP 4275A



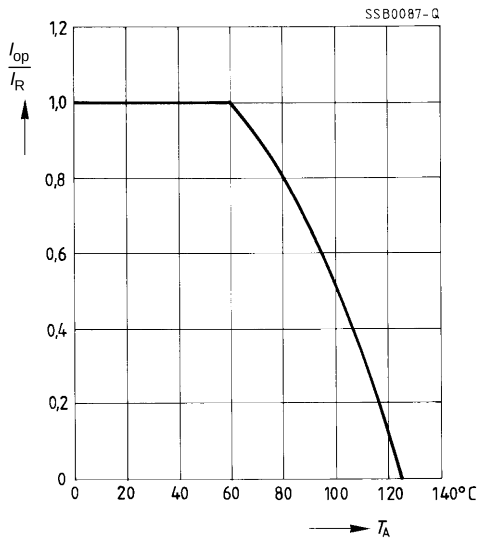
Q factor
versus frequency f
measured with impedance analyzer HP 4194A



Selector guide

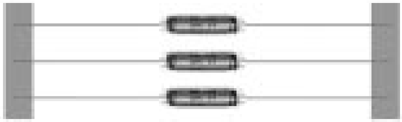
I_R A	L_R µH	Dimensions $d_{max} \times l_{max}$ mm	Min. lead spacing mm	Features	Type	Page
0,15 ... 4	1 ... 80	5,0 × 14	17,5	Central axial leads Taped Carbonyl iron core	B82131	116
0,15 ... 6	1... 160	5,5 × 19	22,5		B82132	
0,15 ... 6	3 ... 350	7,5 × 24	27,5		B82133	
0,15 ... 4	7 ... 420	7,5 × 29	32,5		B82134	
0,1... 6	7 ... 1200	6,0 × 26	30	Central axial leads Taped Ferrite core	B82111-E	120
2 ... 10	3 ... 25	7,0 × 24 ... 9,5 × 34	—	Axial leads, winding ends brought out as leads Ferrite core	B82111-B	122
0,2 ... 2	120 ... 3900	10 × 32	35	Central axial leads Ferrite core High *L* ratings	B82500	125
1	—	6,7 × 15	17,5	Axial leads Choke with 6-aperture core for broadband RFI suppression	B82114	127

General technical data

Test voltage V_P	2500 Vac, 1min 1500 Vac, 1min (B82500-C)
Rated inductance L_R	Measuring frequency: $L \leq 10$ µH = 1 MHz 10 µH < $L \leq 1000$ µH = 100 kHz $L > 1000$ µH = 10 kHz
Inductance tolerance	± 20 %
Rated current I_R	Referred to 60 °C ambient temperature, for derating see below
Inductance decrease $\Delta L/L_0$	≤ 10 % (referred to initial value) at dc load I_R at 20 °C
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Resonance frequency f_{res}	Typical value, measured with Scalar Network Analyzer ZAS from Rohde & Schwarz
Climatic category	In accordance with IEC 68-1 55/125/56 (– 55 °C/+ 125 °C/56 days damp heat test)
Current derating I_{op}/I_R in versus ambient temperature T_A (Rated temperature T_R = 60 °C)	

Mounting information

When bending the leads, take care that the bending point is **at least 3 mm** apart from the face ends of the core and that the start-of-winding-areas are not subjected to any mechanical stress.



VHF chokes with carbonyl iron core
Rated voltage 500 V dc/ac
Rated current 0,15 to 6 A
Rated inductance 1 to 420 µH

Construction

- Cylinder core of carbonyl iron
- Winding: single-layer, enamel copper wire
- Polyester insulating sleeve

Features

- High resonance frequency
- Wide inductance range

Applications

- RF blocking and filtering
- Interference suppression in small-size equipment
- Decoupling in telecommunications and entertainment electronics

Marking

L_R and I_R in clear text and VDE mark

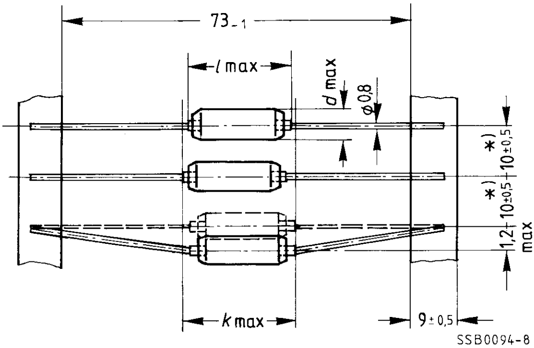
Delivery mode

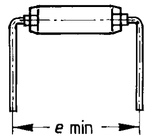
Taped and reeled
For details on taping, packing and packing units see page 438.

Approvals

Mark of conformity	Standard
	VDE 0565-2

Outline drawing





∗) Tolerance over 10 spacings ± 2 mm

Lead spacing e_{min} (mm)	Type
17,5	B82131
22,5	B82132
27,5	B82133
32,5	B82134

Characteristics and ordering codes

For further technical data see page 115.

I_R A	L_R µH	R_{typ} mΩ	f_{res} MHz	Dimensions (mm) d_{max}	l_{max}	k_{max}	e_{min}	Approx. weight g	Ordering code
0,15	80	11000	22	5	14	15,4	17,5	0,8	B82131-A5151-M
	160	17000	20	5,5	19	20,4	22,5	0,9	B82132-A5151-M
	350	21000	11	7,5	24	25,4	27,5	2,3	B82133-A5151-M
	420	19000	12	7,5	29	30,4	32,5	2,6	B82134-A5151-M
0,3	40	4100	31	5	14	15,4	17,5	0,8	B82131-A5301-M
	70	5700	29	5,5	19	20,4	22,5	0,9	B82132-A5301-M
	160	6500	16	7,5	24	25,4	27,5	2,2	B82133-A5301-M
	210	6400	18	7,5	29	30,4	32,5	2,8	B82134-A5301-M
0,4	27	2000	40	5	14	15,4	17,5	0,8	B82131-A5401-M
	50	3000	37	5,5	19	20,4	22,5	1,0	B82132-A5401-M
	130	4800	18	7,5	24	25,4	27,5	2,8	B82133-A5401-M
	150	3500	18	7,5	29	30,4	32,5	2,8	B82134-A5401-M
0,7	14	760	53	5	14	15,4	17,5	0,8	B82131-A5701-M
	23	730	55	5,5	19	20,4	22,5	1,0	B82132-A5701-M
	55	1200	26	7,5	24	25,4	27,5	2,4	B82133-A5701-M
	60	770	34	7,5	29	30,4	32,5	3,0	B82134-A5701-M

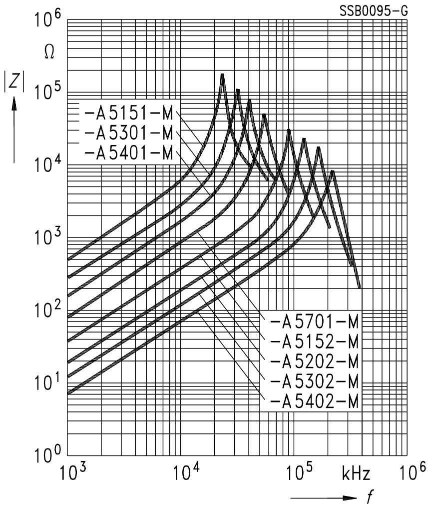
Characteristics and ordering codes

For further technical data see page 115.

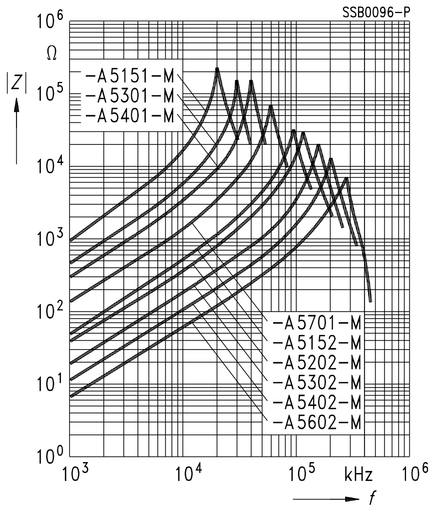
I_R A	L_R µH	R_{typ} mΩ	f_{res} MHz	Dimensions (mm) d_{max}	l_{max}	k_{max}	e_{min}	Approx. weight g	Ordering code
1,5	6	190	84	5	14	15,4	17,5	0,8	B82131-A5152-M
	8	160	90	5,5	19	20,4	22,5	1,1	B82132-A5152-M
	25	320	40	7,5	24	25,4	27,5	2,5	B82133-A5152-M
	30	300	44	7,5	29	30,4	32,5	3,2	B82134-A5152-M
2	3	90	113	5	14	15,4	17,5	0,8	B82131-A5202-M
	6	110	108	5,5	19	20,4	22,5	1,1	B82132-A5202-M
	14	130	57	7,5	24	25,4	27,5	2,8	B82133-A5202-M
	20	150	59	7,5	29	30,4	32,5	3,3	B82134-A5202-M
3	2	38	147	5	14	15,4	17,5	1,0	B82131-A5302-M
	3	35	151	5,5	19	20,4	22,5	1,2	B82132-A5302-M
	10	77	69	7,5	24	25,4	27,5	2,9	B82133-A5302-M
	12	90	75	7,5	29	30,4	32,5	3,5	B82134-A5302-M
4	1	14	199	5	14	15,4	17,5	1,1	B82131-A5402-M
	2	20	186	5,5	19	20,4	22,5	1,4	B82132-A5402-M
	5	34	87	7,5	24	25,4	27,5	3,0	B82133-A5402-M
	7	33	94	7,5	29	30,4	32,5	4,3	B82134-A5402-M
6	1	10	243	5,5	19	20,4	22,5	1,4	B82132-A5602-M
	3	19	108	7,5	24	25,4	27,5	3,2	B82133-A5602-M

Impedance |*Z*| versus frequency *f*
measured as per VDE 0565-2
(typical values)

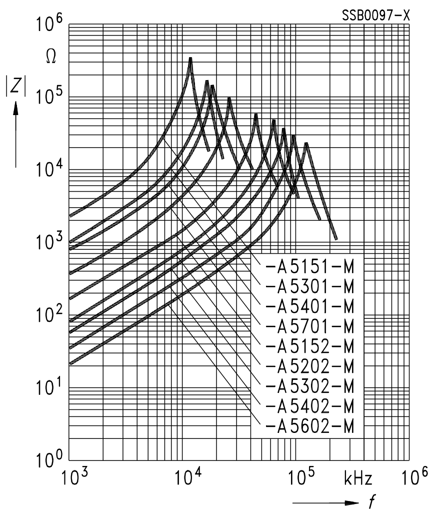
B82131-



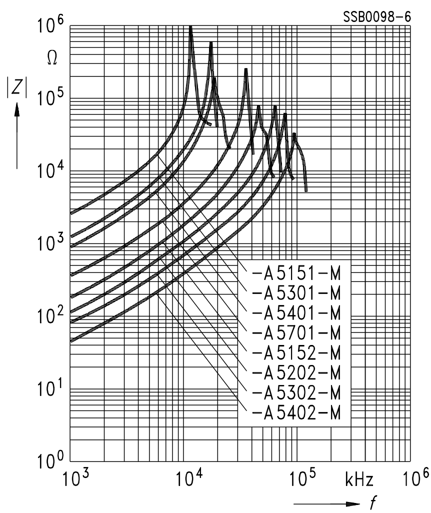
B82132-

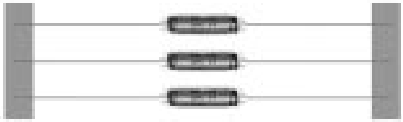


B82133-



B82134-





VHF chokes with ferrite core
Rated voltage 500 V dc/ac
Rated current 0,1 to 6 A
Rated inductance 7 to 1200 µH

Construction

- Ferrite cylinder core
- Winding: single-layer, enamel copper wire
- Polyester insulating sleeve

Features

- High resonance frequency
- Wide inductance range

Applications

- RF blocking and filtering
- Interference suppression in small-size equipment
- Decoupling and telecommunications and entertainment electronics

Marking

L_R and I_R in clear text and VDE mark

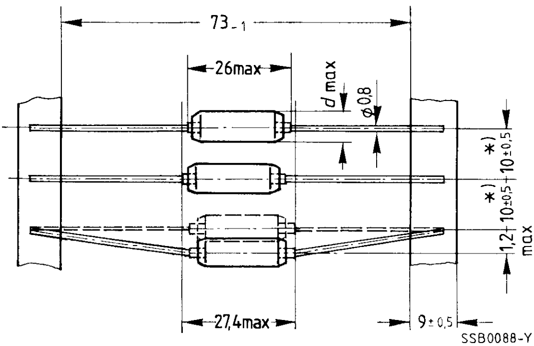
Delivery mode

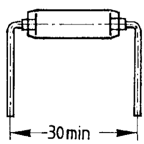
Taped and reeled
For details on packing and packing units see page 438.

Mark of conformity / test standard

VDE mark	VDE 0565-2

Outline drawing





*) Tolerance over 10 spacings ± 2 mm

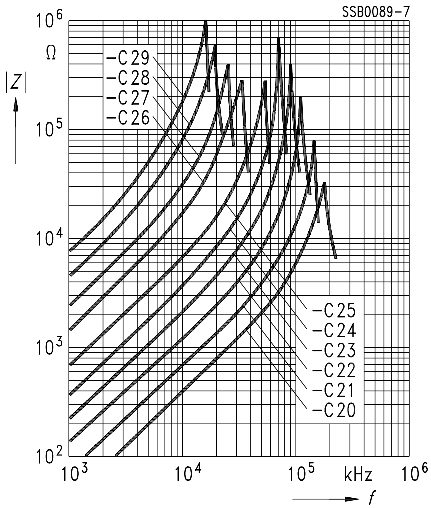
Characteristics and ordering codes

For further technical data see page 115.

I_R A	L_R µH	R_{typ} mΩ	f_{res} MHz	Approx. weight g	Dimensions d_{max} mm	Ordering code
0,1	1200	34000	16	2,2	6,0	B82111-E-C29
0,2	680	14000	19	2,2	6,0	B82111-E-C28
0,3	470	6500	25	2,3	6,0	B82111-E-C27
0,5	220	2600	32	2,3	6,5	B82111-E-C26
1	100	650	55	2,5	6,5	B82111-E-C25
1,5	56	300	70	2,7	6,5	B82111-E-C24
2	40	180	90	3,0	7,0	B82111-E-C23
3	22	70	110	3,3	7,0	B82111-E-C22
4	12	40	140	3,5	7,5	B82111-E-C21
6	7	20	180	3,6	7,5	B82111-E-C20

Impedance |*Z*|
versus frequency *f*
(typical values)

B82111-E-



VHF chokes with ferrite core
Rated voltage 500 V dc/ac
Rated current 2 to 10 A
Rated inductance 3 to 25 µH

Construction

- Ferrite cylinder core
- Winding: single-layer, enamel copper wire, winding ends brought out as leads
- Polyester insulating sleeve

Features

- High resonance frequency
- High rated current

Applications

- RF blocking and filtering
- Interference suppression in small-size equipment

Marking

L_R and I_R im in clear text and VDE mark

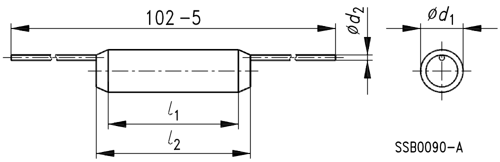
Delivery mode

Bulk

Approvals

Mark of conformity	Standard
	VDE 0565-2

Outline drawing



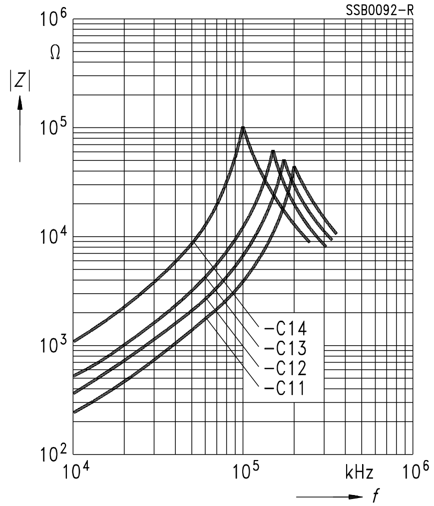
Characteristics and ordering codes

For further technical data see page 115.

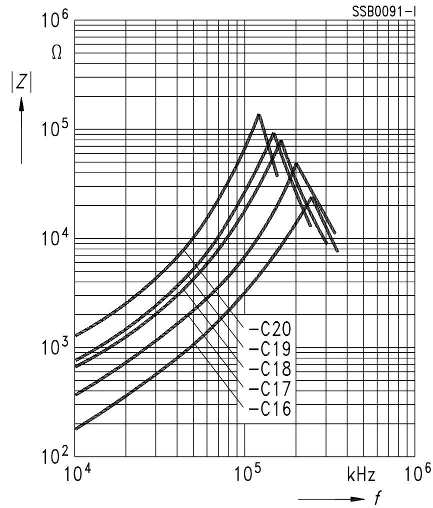
I_R A	L_R µH	R_{typ} mΩ	f_{res} MHz	Dimensions (mm) $l_{1-1,5}$	 l_{2-3}	 $d_{1\ max.}$	 d_2	Approx. weight g	Ordering code
2	17	63	100	18,3	24	7,0	0,45	3,0	B82111-B-C14
3	8	25	145	18,3	24	7,0	0,63	3,0	B82111-B-C13
3	13	24	170	24,5	29	6,5	0,67	3,5	B82111-B-C19
3	20	54	125	24,5	29	6,0	0,5	3,5	B82111-B-C20
3	25	46	85	28,5	34	8,5	0,63	6,0	B82111-B-C24
4	6	17	170	18,3	24	7,5	0,75	3,0	B82111-B-C12
4	11	20	150	24,5	29	6,5	0,71	6,0	B82111-B-C18
4	15	24	120	28,5	34	8,5	0,75	7,0	B82111-B-C23
6	4	14	205	18,3	24	7,5	0,8	4,0	B82111-B-C11
6	6	10	200	24,5	29	7,0	0,95	5,0	B82111-B-C17
6	9	12	150	28,5	34	9,0	0,95	8,0	B82111-B-C22
9	3	6	220	24,5	29	7,5	1,2	5,0	B82111-B-C16
10	5	5	175	28,5	34	9,5	1,3	10,0	B82111-B-C21

Impedance |*Z*| versus frequency *f*
(typical values)

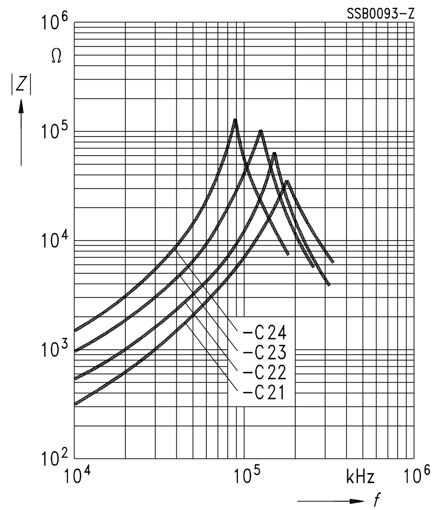
B82111-B-C11 ... -C14



B82111-B-C16 ... -C20



B82111-B-C21 ... -C24



VHF chokes with ferrite core
Rated voltage 250 V dc/ac
Rated current 0,2 to 2 A
Rated inductance 120 to 3900 µH

Construction

- Ferrite cylinder core
- Winding: low-capacitance, multi-layer, enamel copper wire
- Polyester insulating sleeve

Features

- High resonance frequency
- High inductance ratings

Applications

- RF blocking and filtering
- Interference suppression in small-size equipment

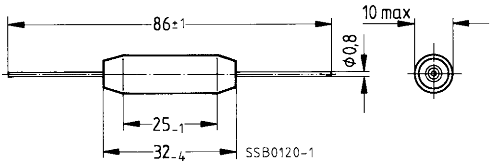
Marking

L_R and I_R in clear text

Delivery mode

Bulk

Outline drawing



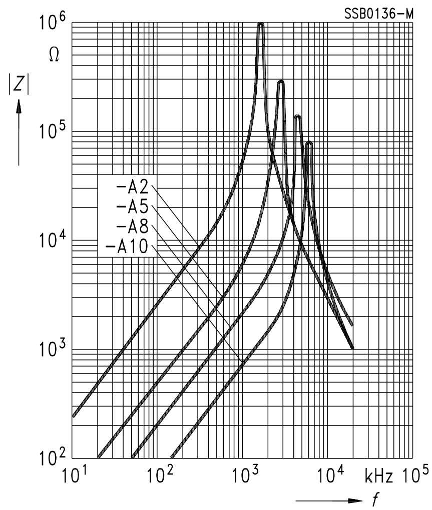
Characteristics and ordering codes

For further technical data see page 115.

I_R A	L_R µH	f_{res} MHz	R_{typ} Ω	Approx. weight g	Ordering code
0,2	3900	1,8	20	7	B82500-C-A2
0,5	820	3,0	2,5	7	B82500-C-A5
1,0	330	4,2	0,6	7	B82500-C-A8
2,0	120	5,8	0,15	7	B82500-C-A10

Impedance |*Z*|
versus frequency *f*
(typical values)

B82500-C-



VHF chokes for power line applications
Rated voltage 500 V dc/ac [1)]
Rated current max. 1 A

Construction

- Round 6-aperture ferrite core
- With or without insulating sleeve

Features

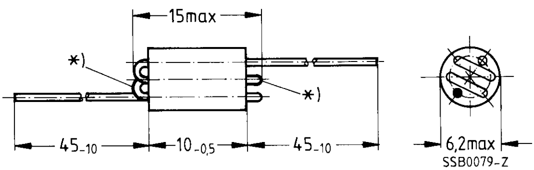
- The selected core material provides maximum impedance in the relevant frequency range of 50 to 200 MHz
- An insulating sleeve is slipped over the middle nose to exclude any turn-to-turn short circuits

Applications

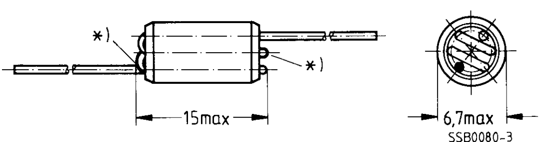
- Broadband interference suppression in electrical systems and equipment in the RF and VHF range
- Reduction of radiated interference in broadcasting and TV receivers

Outline drawings

B82114-R-A … (without insulating sleeve)



B82114-R-C … (with insulating sleeve)



Tinned leads,
wire diameter 0,5 + 0,15 mm

*) Insulating sleeve

1) 500 Vac only with insulating sleeve

Technical data

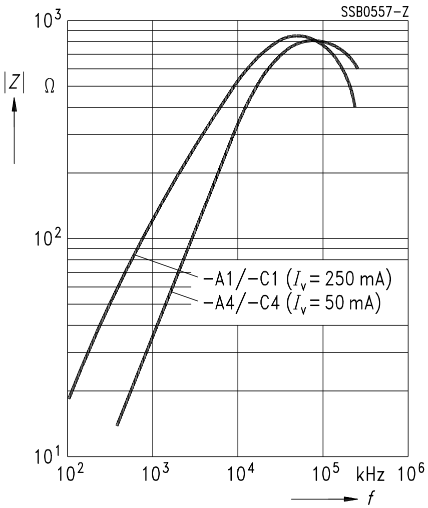
Test voltage	2500 Vac, 1 min (only with insulation)
Rated current	max. 1 A
Climatic category	In accordance with IEC 68-1 B82114-R-A: 55/120/21 (– 55 °C/+120 °C/21 days damp heat test) B82114-R-C: 55/125/56 (– 55 °C/+125 °C/56 days damp heat test)

Characteristics and ordering codes

f_{res} MHz	|Z| at f_{res} Ω	Color code	Number of turns	Approx. weight g	Version	Ordering code
60	900	brown	2,5	1,3	non-insulated insulated	B82114-R-A4 B82114-R-C4
100	800	green	2,5	1,3	non-insulated insulated	B82114-R-A1 B82114-R-C1

Impedance |*Z*|
versus frequency *f* (typical values)
I_v: dc magnetic bias

B82114-R-



Chokes for Data and Signal Lines

Selector guide

Design	V_R Vac	L_R mH	I_R A	Features Applications	Type	Page
Double chokes SMD	42	0,011 ... 0,47	0,5	Small size For CAN bus, digital exchanges, automotive electronics, automation engineering	B82790- -C0***-N2 -S0***-N2 **NEW**	132
Double chokes SMD	42	4,7 ... 10	0,2 ... 0,5	High inductance Telephone lines, RFI suppression in model rail-ways and in sensors for measurement and control	B82790- -C0***-N3 **NEW**	135
Quad chokes SMD	42	0,47 ... 4,7	0,2 ... 0,5	Telephone lines (ISDN)	B82790- -C2***-N3 **NEW**	137
Double chokes, leaded	42	2,2 ... 38	0,1	High inductance Telephone lines (ISDN, analog)	B82791- -G15 B82791- -H15	139
Quad chokes, leaded	42	0,2 ... 6	0,1	Telecommunications (Digital engineering, ISDN)	B82791- -G14	142

Chokes for Data and Signal Lines

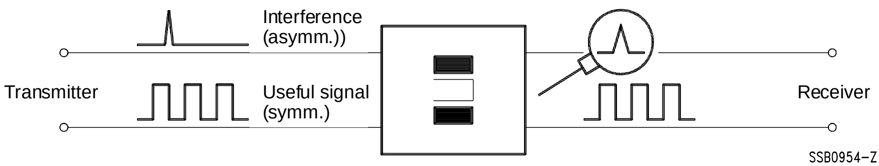
General

In order to avoid data transmissions being disturbed by RFI fields, shielded cables have been mainly used up to now. A more favorably priced solution can, however, be obtained by using symmetrical (balanced) data transmission lines in combination with data line chokes. These are chokes with extremely good symmetry characteristics.

The main advantage is the low space requirements even where high inductance values are needed to protect against the common-mode interference components. This is achieved mainly due to the parallel-wire windings, which are extremely favorable for the choke symmetry. These lead to very low stray inductances, a desirable quality required to keep the distortion of the symmetrical data signals as low as possible.

Further advantages are the low cable and installation costs which can be attained, especially if twisted-pair or twisted-quad cable are used (e.g. existing telephone lines in buildings).

The data line chokes suppress common-mode (asymmetrical) interference induced on the lines at frequencies from 10 kHz on, whereas they permit data signals up to some 100 kHz to pass unaffected.

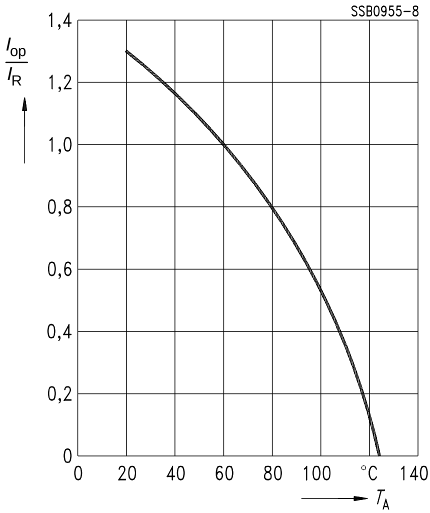


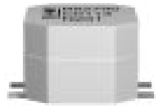
Data line chokes can be used to improve the performance of, and protect, all interfaces with ground-symmetrical, i.e. balanced, data transmission, e.g. 20 mA current loops, RS422, RS423 or RS485, as well as for telecommunications interfaces (ISDN), bus systems in automobile electronics (CAN-bus) and building cabling.

To ensure that the chokes can be effective, care must be taken that the sum of all the currents flowing through the choke, taking into account the current direction, is always zero (in this context, also refer to the general section on current-compensated ring core chokes – page 178).

Data line chokes are available in two-line or line-wire designs, both as wire-lead components or SMDs with very compact dimensions and low weight.

General technical data

Rated voltage V_R	42 Vac (50/60 Hz) 80 Vdc
Rated inductance L_R	Measured with HP4275A or Wayne Kerr 3245 bridge Measuring frequency$L \leq 1$ mH = 100 kHz $L > 1$ mH = 10 kHz The rated inductance L_R of double and quad chokes is specified per winding.
Inductance tolerance	± 30 %
Inductance decrease $\Delta L/L_0$	< 10 % at dc magnetic bias with I_R
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature (VDE 0565-2)
Stray inductance L_S	Typical values, measured at 100 kHz and 0,1 mA for $L \leq 1$ mH 10 kHz and 0,1 mA for $L > 1$ mH
DC resistance R_{typ}	Typical values, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Current derating I_{op}/I_R versus ambient temperature T_A	



Rated voltage 42 Vac/80 Vdc
Rated current 0,5 A
Rated inductance 11 to 470 µH

Construction

- Current-compensated ring core double choke with ferrite core
- SMD case
- Bifilar winding (B82790-C…)
- Sector winding (B82790-S…)

Features

- Small size
- Case flame-retardant as per UL 94 V-0
- Suitable for automatic placement
- Suitable for reflow soldering (IR and vapor phase)

Applications

- B82790-C:
  Suppression of asymmetrical interference coupled in on lines, whereas data signals up to some MHz can pass unaffectedly.
- B82790-S:
  Suppression of asymmetrical and symmetrical interference coupled in on lines. The high-frequency portions of the symmetrical data signal are decreased so far that EMC problems can be significantly reduced.

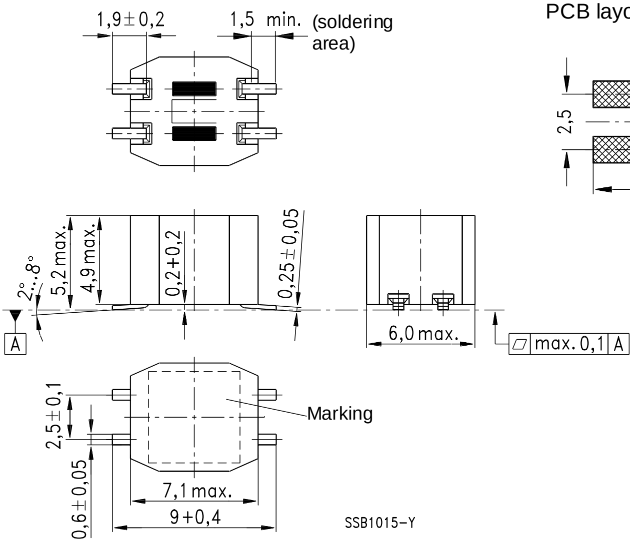
Marking

Manufacturer, ordering code, date code

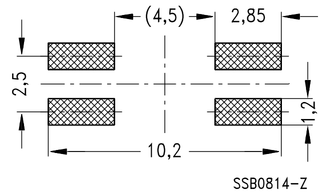
Delivery mode

16-mm blister tape wound on 330-mm ∅ reel
For details on taping, packing and packing units see page 433.

Outline drawing



PCB layout recommendation



Technical data

DC resistance R_{typ}	Typical values, measured at 20 °C ambient temperature
Inductance tolerance	± 30 %
Resistance to soldering heat	In accordance with IEC 68-2-20, test Tb 260 °C, 10 s
Solderability	In accordance with IEC 68-2-58 (215 ± 3) °C, (3 ± 0,3) s, wetting of soldering area ≥ 95 %
Weight	approx. 0,3 g

For further technical data see page 131.

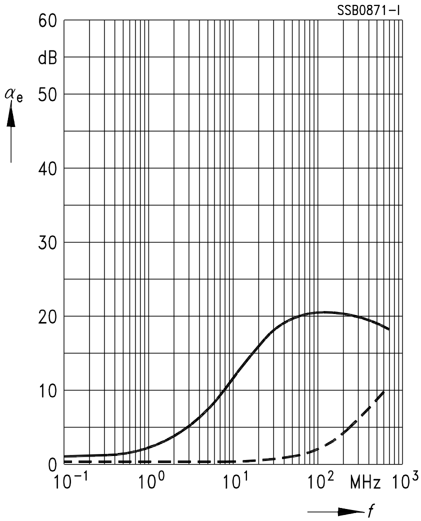
Characteristics and ordering codes

L_R µH	$L_{S,typ}$	V_P Vdc, 2 s	R_{typ} mΩ	Ordering code
11	50 nH	250	120	B82790-C0113-N201
51	2 µH	250	300	B82790-S0513-N201
470	200 nH	750	250	B82790-C0474-N215

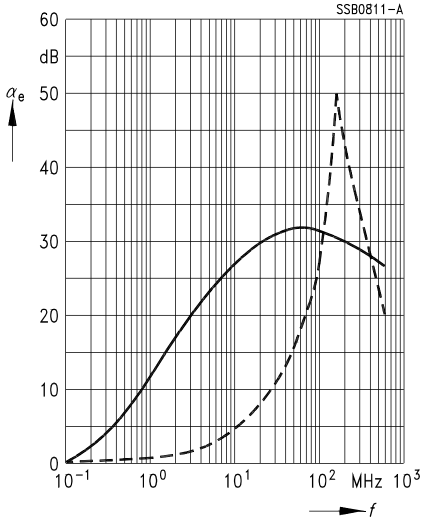
Insertion loss a_e (typical values at Z = 50 Ω)

———————— asymmetrical, both branches in parallel (common mode)
– – – – – – – symmetrical (differential mode)

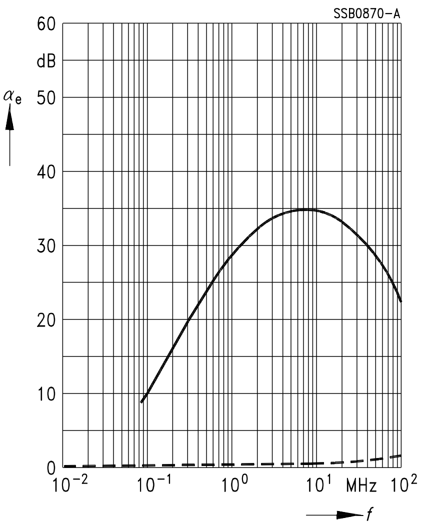
B82790-C0113-N201



B82790-S0513-N201

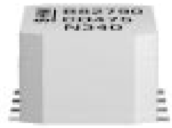


B82790-C0474-N215



Preliminary data

Rated voltage 42 Vac/80 Vdc
Rated current 0,2 to 0,5 A
Rated inductance 4,7 to 10 mH



Construction

- Current-compensated ring core double choke with ferrite core
- SMD case

Features

- Case flame-retardant as per UL 94 V-0
- Suitable for automatic placement
- Suitable for reflow soldering (IR and vapor phase)

Applications

- Suppression of asymmetrical interference coupled in on lines, whereas data signals up to some MHz can pass unaffectedly.

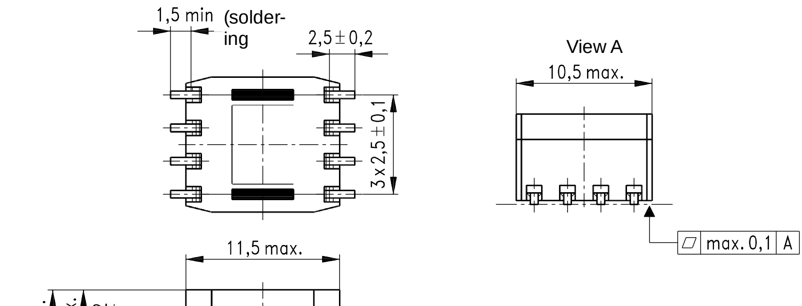
Marking

Manufacturer, ordering code, date code

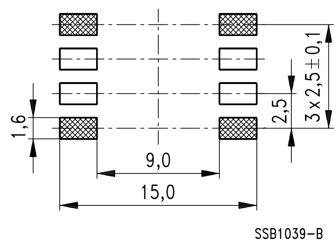
Delivery mode

Blister tape (in preparation)

Outline drawing



PCB layout recommendation



Technical data

DC resistance R_{typ}	Typical values, measured at 20 °C ambient temperature
Inductance tolerance	± 30 %
Resistance to soldering heat	In accordance with IEC 68-2-20, test Tb 260 °C, 10 s
Solderability	In accordance with IEC 68-2-58 (215 ± 3) °C, (3 ± 0,3) s, wetting of soldering area ≥ 95 %
Weight	approx. 2 g

For further technical data see page 131.

Characteristics and ordering codes

L_R mH	I_R A	L_{Smax} nH	V_P Vdc, 2 s	R_{typ} mΩ	Ordering code
4,7	0,5	400	1000	400	B82790-C0475-N340
6,8	0,5	500	750	500	B82790-C0685-N340
10	0,2	600	750	1100	B82790-C0106-N340

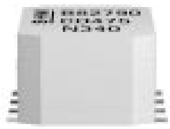
Available from October1996.

Chokes for Data and Signal Lines
Quad Chokes SMD

B82790-C2*-N3**

Preliminary data

Rated voltage 42 Vac/80 Vdc
Rated current 0,2 to 0,5 A
Rated inductance 0,47 to 4,7 mH



Construction

- Current-compensated ring core quad choke with ferrite core
- SMD case

Features

- Case flame-retardant as per UL 94 V-0
- Suitable for automatic placement
- Suitable for reflow soldering (IR and vapor phase)

Applications

- Suppression of asymmetrical interference coupled in on lines, whereas data signals up to some MHz can pass unaffectedly.

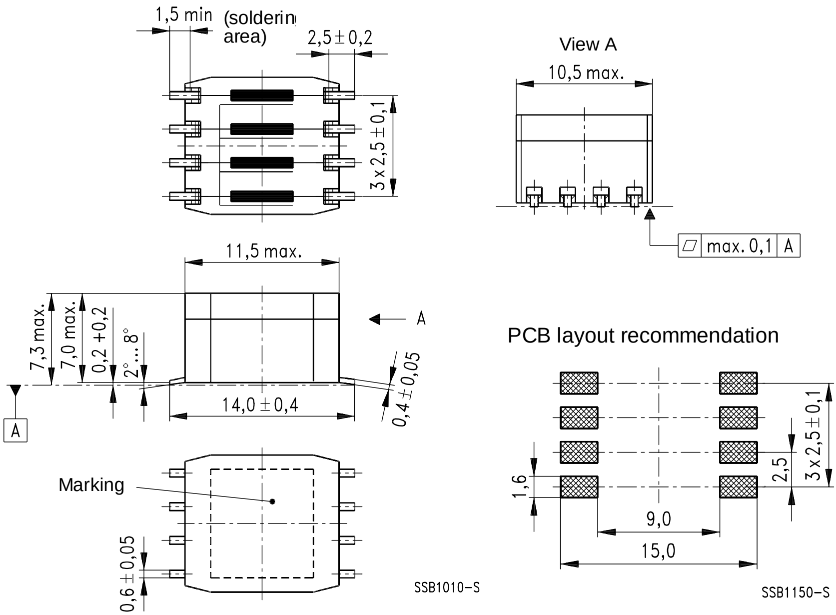
Marking

Manufacturer, ordering code, date code

Delivery mode

Blister tape (in preparation)

Outline drawing



Technical data

DC resistance R_{typ}	Typical values, measured at 20 °C ambient temperature
Inductance tolerance	± 30 %
Resistance to soldering heat	In accordance with IEC 68-2-20, test Tb 260 °C, 10 s
Solderability	In accordance with IEC 68-2-58 (215 ± 3) °C, (3 ± 0,3) s, wetting of soldering area ≥ 95 %
Weight	approx. 2 g

For further technical data see page 131.

Characteristics and ordering codes

L_R mH	I_R A	$L_{S\,max}$ nH	V_P Vdc, 2 s	R_{typ} mΩ	Ordering code
0,47	0,5	200	750	250	B82790-C2474-N315
1,0	0,5	250	750	250	B82790-C2105-N340
4,7	0,2	400	750	800	B82790-C2475-N340

Available from October 1996.

Rated voltage 42 Vac/80 Vdc
Rated current 0,1 A
Rated inductance 2,2 to 38 mH

Construction

- Current-compensated ring core double choke with ferrite core
- Plastic case

Features

- Vertical or horizontal version
- Case flame-retardant as per UL 94 V-0

Applications

- Suppression of asymmetrical interference coupled in on data lines, already effective at 10 kHz, e.g. in
  – telephone lines (analog, ISDN)
  – interfaces with balanced-to-ground data transmission
  – EIB bus
  – automation engineering

Terminals

- Pins fitting standard PCB grid

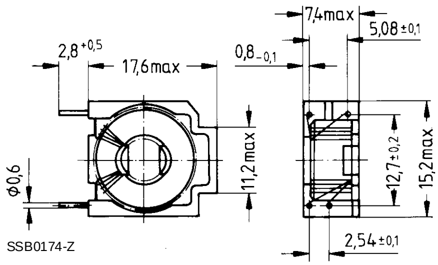
Marking

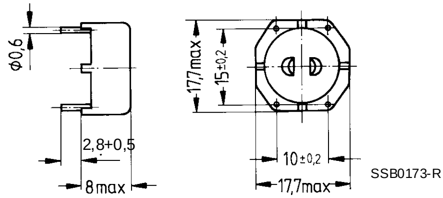
Ordering code, rated inductance
manufacturer, date code

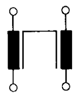
Outline drawing

Vertical version
B82791-H15

Horizontal version
B82791-G15







Technical data

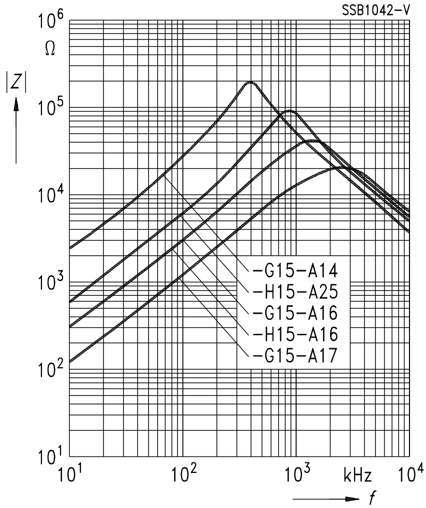
Inductance tolerance	± 30 % for -G15-A16 and -H15-A16: + 35 %/– 25 %
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Weight	approx. 4 g

For further technical data see page 131.

Characteristics and ordering codes

L_R mH	L_{Smax} µH	V_P Vdc, 2 s	R_{typ} mΩ	Ordering code
38	3,5	750	3300	B82791-G15-A14
10	2,5	1200	1300	B82791-H15-A25
4,7	1,5	1200	900	B82791-G15-A16
4,7	1,5	1200	900	B82791-H15-A16
2,2	1,0	1200	400	B82791-G15-A17

Impedance $|Z|$
versus frequency f
B82791-



Chokes for Data and Signal Lines Quad Chokes

B82791-G14

Rated voltage 42 Vac/80 Vdc
Rated current 0,1 A
Rated inductance 0,2 to 6 mH

Construction

- Current-compensated ring core quad choke with ferrite core
- Plastic case

Features

- Suitable for automatic insertion
- Case flame-retardant as per UL 94 V-0

Applications

- Suppression of asymmetrical interference coupled in on data lines, already effective at 10 kHz, e.g. in
  – telephone lines (analog, ISDN)
  – interfaces with balanced-to-ground data transmission

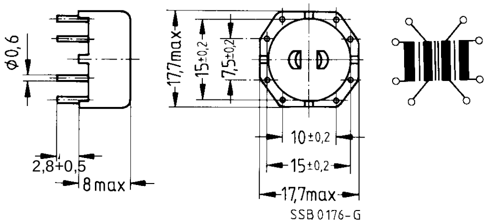
Terminals

- Pins fitting standard PCB grid

Marking

Ordering code, rated voltage, rated current, rated inductance, manufacturer, date code

Outline drawing



Technical data

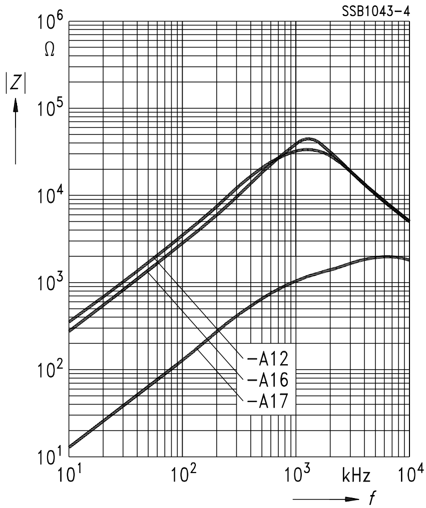
Inductance tolerance	± 30 %
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Weight	approx. 4 g

For further technical data see page 131.

Characteristics and ordering codes

L_R mH	L_{Smax} µH	V_P Vdc, 2 s	R_{typ} mΩ	Ordering code
6	3	750	920	B82791-G14-A12
4,7	2,5	750	900	B82791-G14-A16
0,2	1,5	750	180	B82791-G14-A17

Impedance |*Z*|
versus frequency *f*
B82791-G14-



Selector guide

Design	I_R A	L_R mH	Features Applications	Type	Page
I core chokes	0,2 … 2	0,68 … 82	Pins fitting standard PCB grid With encapsulation	B82502	148
	0,5 … 10	0,1 … 47	Tab connectors Without encapsulation	B82503	150
	1 … 25	0,065 … 27	Screw terminals or terminal clamps With encapsulation	B82504	152
	4 … 40	0,056 … 5,6	Screw terminals With encapsulation	B82505	154
	6 … 60	0,08 … 5,0		B82506	156
	25 … 75	0,08 … 1,4	Screw terminals Without encapsulation	B82507	158
	60 … 270	0,03 … 0,87		B82508	160
	250 … 700	0,016 … 0,12		B82510	162
Ring core chokes with powder core	0,3 … 3	0,033 … 1,2	Attenuation of symm. interference High inductance	B82623	167
	1 … 6	0,025 … 0,8	Attenuation of symm. interference High current handling capability	B82624	169
	1 … 10	0,18 … 40	Attenuation of symm./asymm. interference and of harmonics	B82615 … B82627 **NEW**	171
Current-compensated ring core chokes	0,3 … 10	0,4 … 82	Double chokes Attenuation of asymm. interference Pins fitting standard PCB grid	B82721 … B82725	180
	6 … 25	1,3 … 6	Triple chokes Attenuation of asymm. interference High power	B82747	191
	50 … 200	0,12 … 1,3		B82745	194
	16 … 75	0,9 … 1,8	Quad chokes Attenuation of asymm. interference For converters and UPS	B82765	197
Current-compensated D core chokes	0,4 … 5	3,3 … 47	Double chokes With ferrite D core Attenuation of asymm. interference Pins fitting standard PCB grid Vertical design	B82731, B82732, B82734 **NEW**	200

General

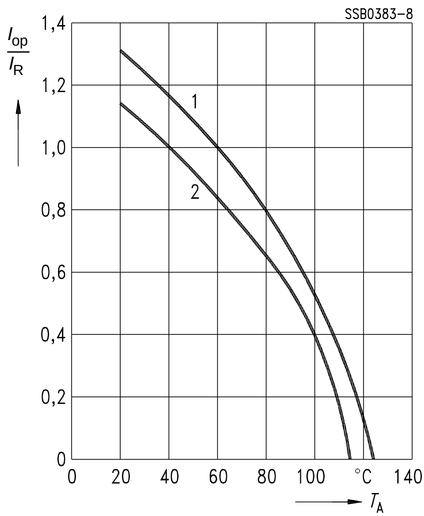
I core chokes are used to attenuate both symmetrical and unsymmetrical interference voltages. They attenuate both common-mode and differential-mode interference currents equally well. Their inductance is highly independent of magnetic bias by the operating current. Low parasitic capacitance of the coils is achieved by winding them in several sections when using wire of a circular cross-section, or by using a single-layer winding of flat or rectangular cross-section wire, wound on edge.

The open core design causes a high degree of shear, i.e. the effective permeability is lowered while the saturation limit is raised towards higher values than with closed cores. This prevents the core material reaching saturation due to the flux induced by the load current. However, it is important to note that, with I core chokes, the electromagnetic stray fields induced by the load current (e.g. 50 Hz AC) as well as by the interference currents are much stronger than those of chokes with closed cores.

The majority of I core chokes have laminated iron-silicon cores with coils wound on plastic coil formers.

Simple means of fixing are provided for mounting the chokes. Encapsulated versions with terminal pins fitting the standard PCB grid are also available.

General technical data

Rated inductance L_R	Measured at 20 °C, measuring current 0,1 mA Measuring frequency: $L \leq 1$ mH = 100 kHz $L > 1$ mH = 10 kHz
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 40 °C or 60 °C ambient temperature
Rated voltage V_R	The specified rated voltage is the insulating voltage that occurs during operation between the winding and accessible metal parts (VDE 0565-2).
DC resistance R_{typ}	Typical values, measured as per VDE 0565-2 at 20 °C
Test voltage V_P	2800 Vac, 2 s (winding/core) 2800 Vac, 2 s (winding/case)
Climatic category	In accordance with IEC 68-1 With encapsulation: 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test) Without encapsulation: 40/110/21 (– 40 °C/+ 110 °C/21 days damp heat test) Exception B82503: 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Standards	The chokes comply with VDE 0565-2
Current derating I_{op}/I_R versus ambient temperature T_A Curve 1: Choke with encapsulation (Rated current referred to T_A = 60 °C) Curve 2: Choke without encapsulation (Rated current referred to T_A = 40 °C)	

Rated voltage 500 Vac/600 Vdc
Rated current 0,2 to 2 A
Rated inductance 0,68 to 82 mH

Construction

- Rectangular plastic case
- Resin potting

Features

- Low power dissipation
- Broadband interference suppression
- Compact design

Applications

- Attenuation of symmetrical and unsymmetrical interference
- High-performance power supplies
- Industrial applications

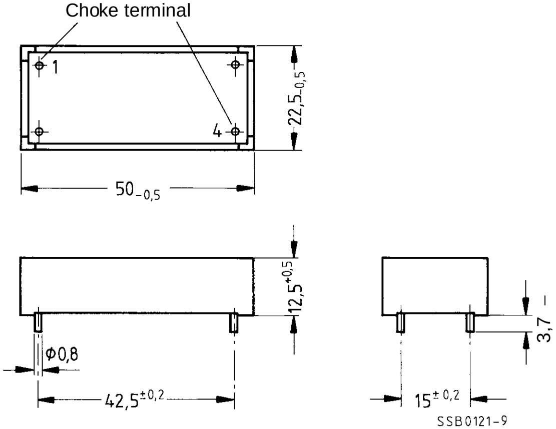
Terminals

- Pins fitting standard PCB grid

Marking

Manufacturer, ordering code,
rated inductance, rated voltage, rated current

Outline drawing



Technical data

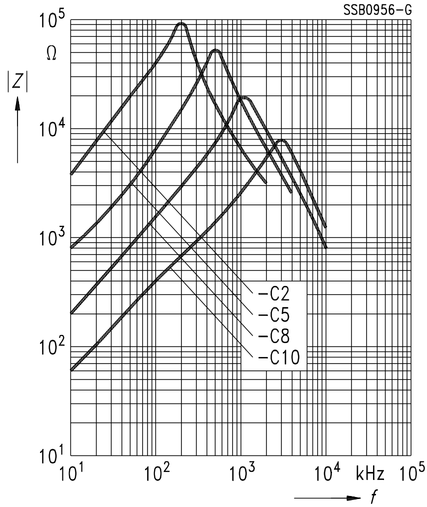
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Permissible operating current at 400 Hz	$0,75 \cdot I_R$
Weight	approx. 40 g

For further technical data see page 147.

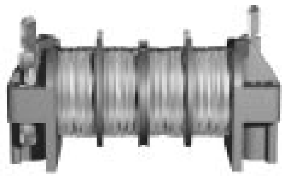
Characteristics and ordering codes

I_R A	L_R mH	R_{typ} Ω	Ordering code
0,2	82	45	B82502-W-C2
0,5	15	8,5	B82502-W-C5
1	3,3	1,9	B82502-W-C8
2	0,68	0,55	B82502-W-C10

Impedance |*Z*|
versus frequency *f*
B82502-W-



Rated voltage 400 Vac/450 Vdc
Rated current 0,5 to 10 A
Rated inductance 0,1 to 47 mH



Construction

- Chokes with winding of enamel copper wire

Features

- Low power dissipation
- Broadband interference suppression

Applications

- Attenuation of symmetrical and unsymmetrical interference
- High-performance power supplies
- Industrial applications

Terminals

- Tab connectors

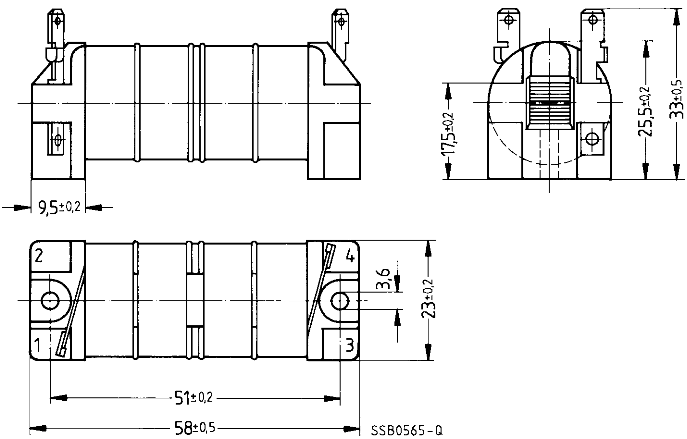
Marking

Manufacturer, ordering code,
rated inductance, rated current, VDE mark

Approvals

Mark of conformity	Standard
	VDE 0565-2

Outline drawing



Technical data

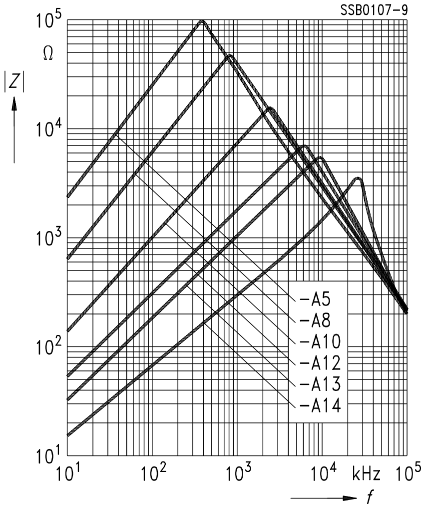
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Permissible operating current at 400 Hz	$0{,}75 \cdot I_R$
Weight	approx. 70 to 90 g

For further technical data see page 147.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} Ω	Ordering code
0,5	47	10	B82503-U-A5
1	15	2,7	B82503-U-A8
2	3,3	0,7	B82503-U-A10
4	0,68	0,2	B82503-U-A12
6	0,33	0,1	B82503-U-A13
10	0,1	0,03	B82503-U-A14

Impedance |*Z*|
versus frequency *f*
B82503-U-



Rated voltage 500 Vac/600 Vdc
Rated current 1 A to 25 A
Rated inductance 0,065 to 27 mH

Construction

- Reactangular plastic case
- Resin potting

Features

- Low power dissipation
- Broadband interference suppression

Applications

- Attenuation of symmetrical and unsymmetrical interference
- High-performance power supplies
- Industrial applications

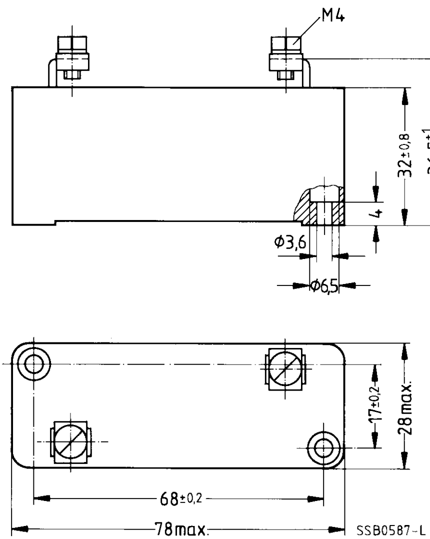
Terminals

- Terminal clamps or spring washers

Marking

Ordering code, rated inductance, rated voltage, rated current dc resistance, manufacturer, date of manufacture

Outline drawing



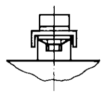


Figure 1

Type with terminal clamps

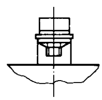


Figure 2

Type with spring washers

Technical data

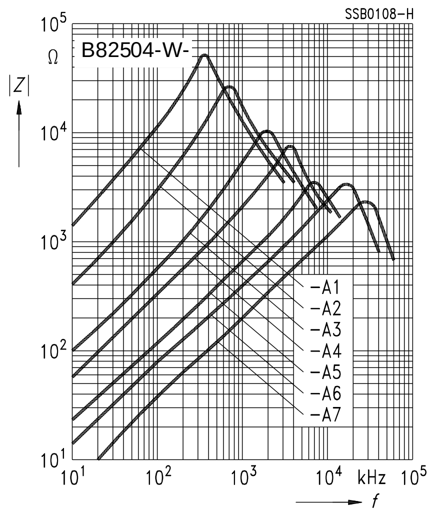
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Permissible operating current at 400 Hz	$0{,}6 \cdot I_R$
Weight	approx. 170 g to 230 g

For further technical data see page 147.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} Ω	Terminals Figure	Ordering code
1	27	5,25	1	B82504-W-A1
2	7,5	1,3	1	B82504-W-A2
4	2,0	0,33	1	B82504-W-A3
6	0,6	0,15	1	B82504-W-A4
10	0,2	0,054	1	B82504-W-A5
16	0,14	0,024	2	B82504-W-A6
25	0,065	0,009	2	B82504-W-A7

Impedance |*Z*|
versus frequency *f*



Rated voltage 500 Vac/600 Vdc
Rated current 4 A to 40 A
Rated inductance 0,056 to 5,6 mH

Construction

- Rectangular plastic case
- Resin potting

Features

- Low power dissipation
- Broadband interference suppression

Applications

- Attenuation of symmetrical and unsymmetrical interference
- High-performance power supplies
- Industrial applications

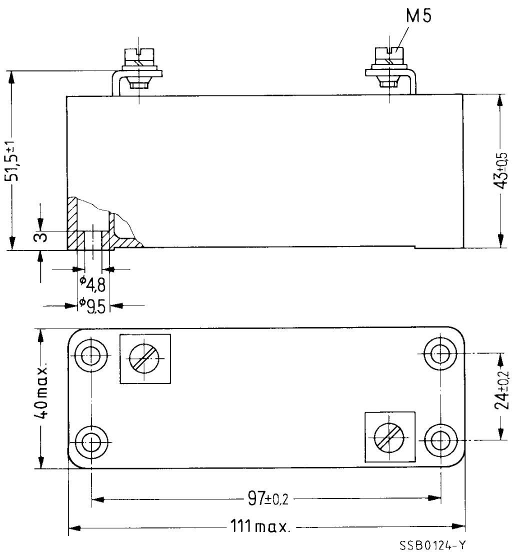
Terminals

- Screw terminals

Marking

Ordering code, rated inductance, rated voltage, rated current, dc resistance, manufacturer, date of manufacture

Outline drawing



Technical data

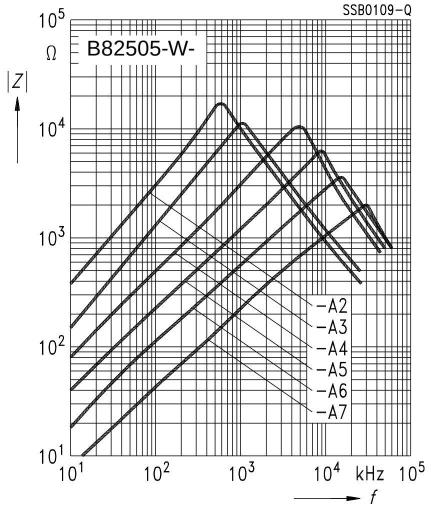
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Permissible operating current at 400 Hz	$0{,}6 \cdot I_R$
Weight	approx. 600 g

For further technical data see page 147.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} mΩ	Ordering code
4	5,6	480	B82505-W-A2
6	2,2	220	B82505-W-A3
10	1,2	75	B82505-W-A4
16	0,33	35	B82505-W-A5
25	0,15	15	B82505-W-A6
40	0,056	6	B82505-W-A7

Impedance |*Z*|
versus frequency *f*



Rated voltage 500 Vac/600 Vdc
Rated current 6 A to 60 A
Rated inductance 0,08 to 5 mH

Construction

- Rectangular plastic case
- Resin potting

Features

- Low power dissipation
- Broadband interference suppression
- Easy to install

Applications

- Attenuation of symmetrical and unsymmetrical interference
- High-performance power supplies
- Industrial applications

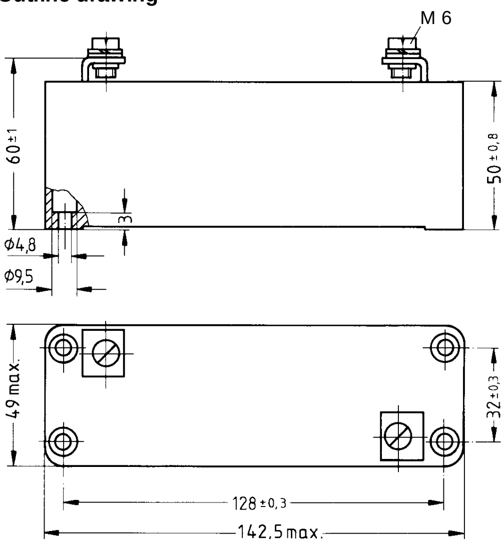
Terminals

- Screw terminals

Marking

Ordering code, rated inductance, rated voltage, rated current, dc resistance, manufacturer, date of manufacture

Outline drawing



SSB0101-U

Technical data

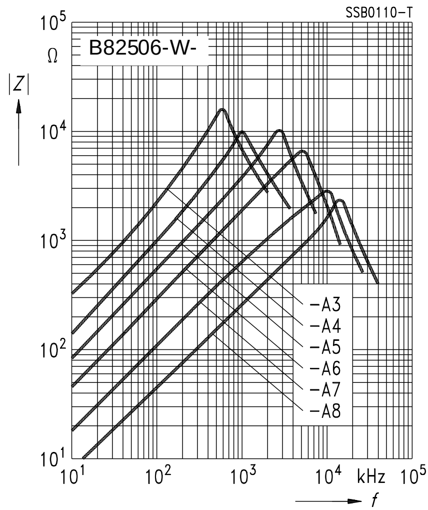
Inductance tolerance	± 20 %
Rated current I_N	Referred to 50 Hz and 60 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Permissible operating current at 400 Hz	$0{,}45 \cdot I_R$
Weight	approx. 900 to 1250 g

For further technical data see page 147.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} mΩ	Ordering code
6	5,0	350	B82506-W-A3
10	2,5	125	B82506-W-A4
16	1,5	50	B82506-W-A5
25	0,5	20	B82506-W-A6
40	0,2	8	B82506-W-A7
60	0,08	3,5	B82506-W-A8

Impedance |*Z*|
versus frequency *f*



Rated voltage 500 Vac/600 Vdc
Rated current 25 A to 75 A
Rated inductance 0,08 to 1,4 mH

Construction

- Flat copper wire
  wound on edge

Features

- Low power dissipation
- Broadband interference suppression

Applications

- Attenuation of symmetrical and
  unsymmetrical interference
- High-performance power supplies
- Industrial applications

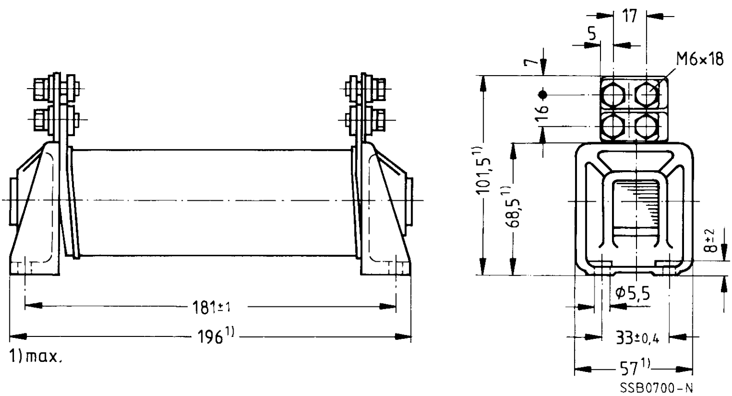
Terminals

- Screw terminals, 4 screws per terminal

Marking

Manufacturer, ordering codde,
rated inductance, rated voltage, rated current

Outline drawing



Technical data

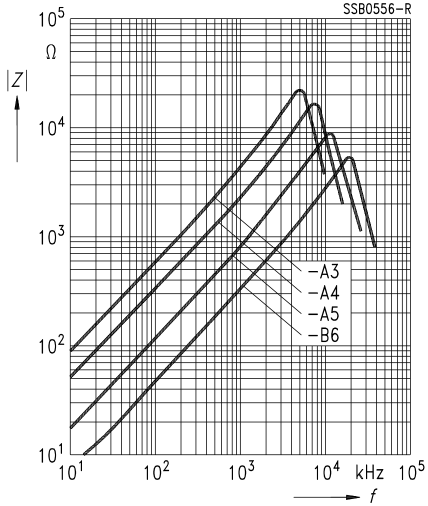
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/110/21 (– 40 °C/+ 110 °C/21 days damp heat test)
Permissible operating current at 400 Hz	$0{,}4 \cdot I_R$
Weight	approx. 2,5 kg

For further technical data see page 147.

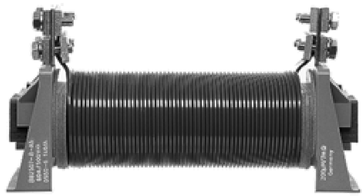
Characteristics and ordering codes

I_R A	L_R mH	R_{typ} mΩ	Ordering code
25	1,4	30	B82507-B-A3
35	0,55	16	B82507-B-A4
60	0,2	7	B82507-B-A5
75	0,08	2	B82507-B-B6

Impedance |*Z*|
versus frequency *f*
B82507-B-



Rated voltage 500 Vac/600 Vdc
Rated current 60 A to 230 Aac / 60 A to 270 Adc
Rated inductance 30 to 870 µH



Construction

- Flat copper wire wound on edge

Features

- Low power dissipation
- Broadband interference suppression

Applications

- Attenuation of symmetrical and unsymmetrical interference
- High-performance power supplies
- Industrial applications

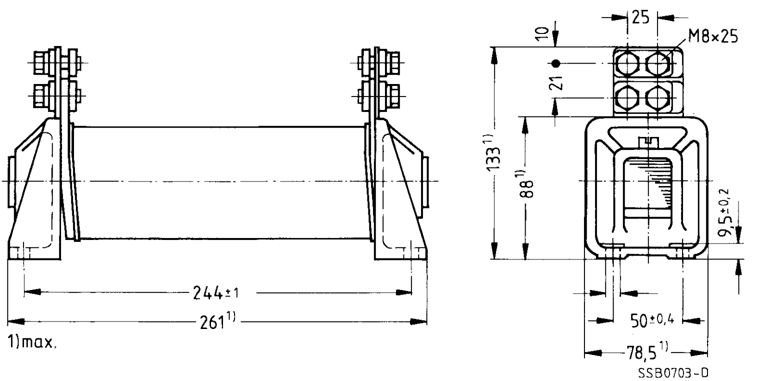
Terminals

- Screw terminals, 4 screws per terminal

Marking

Manufacturer, ordering code, rated inductance, rated voltage, rated current, dc resistance

Outline drawing



Technical data

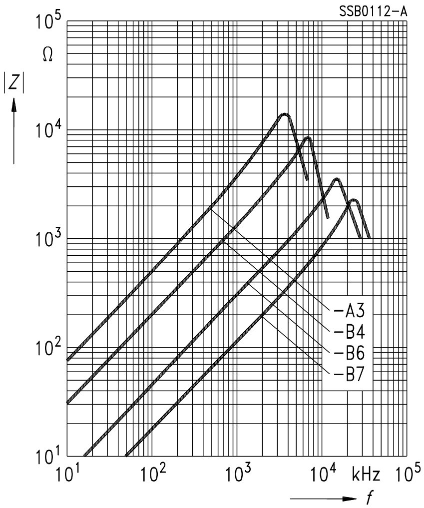
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/110/21 (– 40 °C/+ 110 °C/21 days damp heat test)
Permissible operating current at 400 Hz	$0{,}3 \cdot I_R$
Weight	approx. 6,8 kg

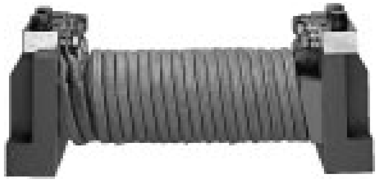
For further technical data see page 147.

Characteristics and ordering codes

I_R A	L_R µH	R_{typ} mΩ	Ordering code
60	870	10	B82508-B-A3
75	300	4	B82508-B-B4
160 Adc / 125 Aac	80	1	B82508-B-B6
270 Adc / 230 Aac	30	0,4	B82508-B-B7

Impedance |*Z*|
versus frequency *f*
B82508-B-





Rated voltage 750 Vac/900 Vdc
Rated current 200 to 550 Aac/250 to 700 Adc
Rated inductance 16 to 120 µH

Construction

- Chokes with winding of copper litz wire with rectangular cross section, braided with glass-fiber yarn

Features

- Low power dissipation
- Broadband interference suppression

Applications

- Attenuation of symmetrical and unsymmetrical interference
- High-performance power supplies
- Industrial applications

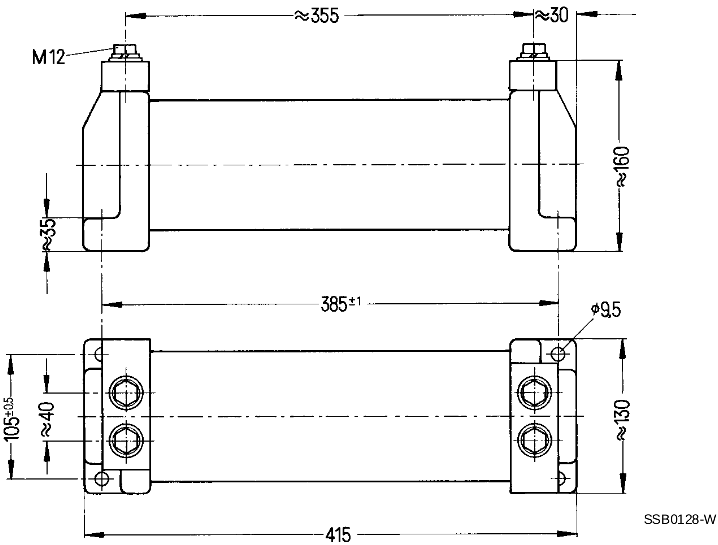
Terminals

- Screw terminals, 2 screws per terminal

Marking

Manufacturer, ordering code, rated inductance, rated voltage, rated current, dc resistance

Outline drawing



Technical data

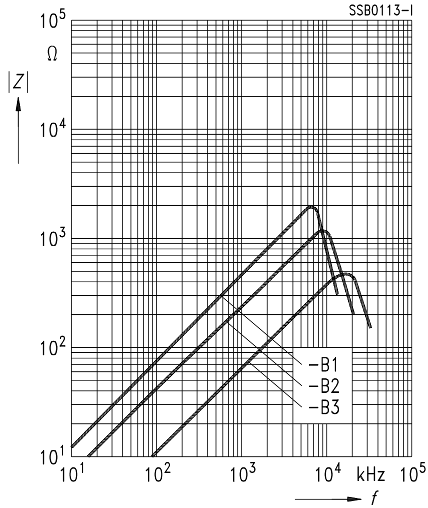
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/110/21 (– 40 °C/+ 110 °C/21 days damp heat test)
Permissible operating current at 400 Hz	see diagram

For further technical data see page 147.

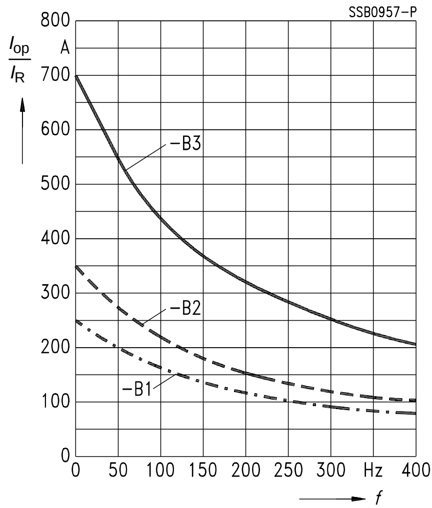
Characteristics and ordering codes

I_R	L_R µH	R_{typ} mΩ	Approx. weight kg	Ordering code
250 Adc / 200 Aac	120	1	18,5	B82510-A-B1
350 Adc / 275 Aac	70	10,5	19	B82510-A-B2
700 Adc/ 550 Aac	16	0,15	20	B82510-A-B3

Impedance |Z|
versus frequency f
B82510-A-



Permissible operating current I_{op}/I_R
versus operating frequency f
B82510-A-



General

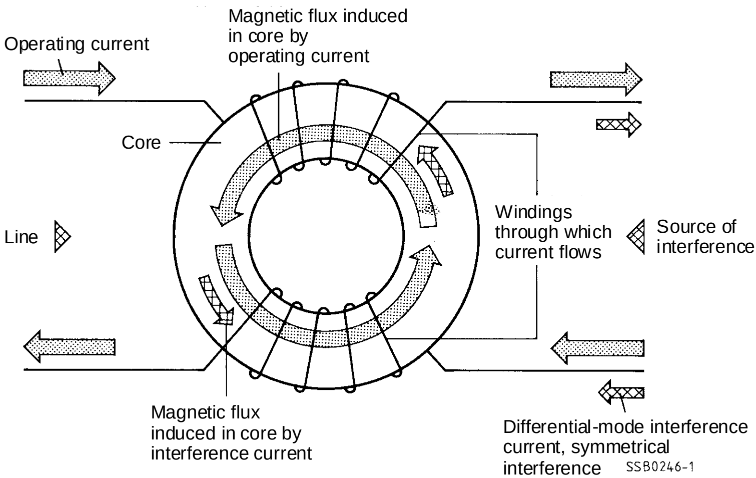


Fig. 1 Ring core choke with powder core
Double choke shown as an example

Ring core chokes with iron powder core are primarily used to attenuate symmetrically propagated interference voltages and currents (differential mode) in cases where the use of X capacitors is ineffective, inadequate or undesired.

In order to avoid saturation, these chokes are equipped with a closed ring core of powdered iron with low permeability. They are often installed together with current-compensated chokes to improve differential mode interference attenuation, especially at low frequencies.

Single chokes with powder core attenuate common-mode and differential-mode RF interference on the connected line.

As both windings of double chokes are connected in series, their effect on differential-mode interference corresponds, in practice, to roughly 3,5 times their rated inductance.

Common-mode interference is also attenuated by double chokes with powder core; maximally half the rated inductance of one winding is effective. As with I core chokes – the rated inductance is only minimally affected by operating current bias. Due to the closed core, the stray field, however, is substantially lower than that of a corresponding I core choke.

Harmonic chokes

Harmonic interference suppression chokes are a special form of powder core choke.

As of the 1st January 1996, all electronic equipment must meet the protective objectives of the EU Directive on EMC. The European generic standard EN 50081, which deals with interference emissions, specifies the respective requirements.

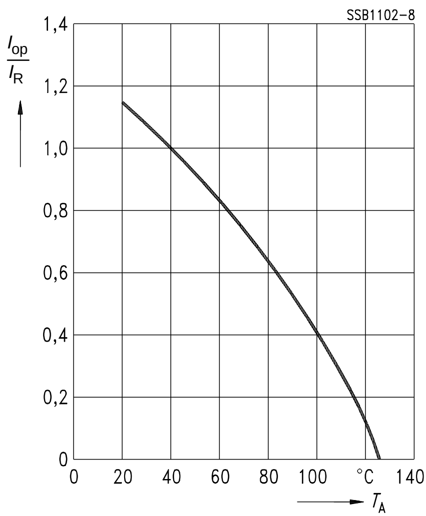
It is often not easy to stay within the specified limits when using modern switch-mode power supplies. These may couple higher-order harmonic frequencies of the line frequency back into the ac line. As the use of interference suppression circuits with active components is usually too complicated in devices with a capacity of up to 500 Watts, a passive-component solution in the form of a choke with high inductance at low frequencies may be useful here for suppressing differential-mode interference (3rd to 41st harmonic frequencies in the range of 150 Hz to 2050 Hz).

S + M Components is offering special passive components for attenuating these harmonics, these are called harmonic chokes.

Double chokes for harmonic interference suppression provide the additional advantage of attenuating both higher harmonics **as well as** high-frequency interference, i.e. current-compensated power line input chokes may be reduced in size or even be eliminated altogether.

Harmonic interference suppression chokes have a wide range of applications in consumer electronics (e.g. in TV receivers), in household appliances and in personal computers.

General technical data

Rated inductance L_R	Measured at 20 °C, measuring current 0,1 mA Measuring frequency: $L \leq 1$ mH = 100 kHz $L > 1$ mH = 10 kHz The rated inductance of double chokes is specified per winding
Inductance tolerance	± 30 %; for harmonic chokes ± 20 %
DC resistance R_{typ}	Typical values, measured as per VDE 0565-2 at + 20 °C
Inductance decrease $\Delta L/L_0$	< 20 % at dc load with I_R; for harmonic chokes < 50 %
Rated voltage V_R	250 Vac / 350 Vdc
Test voltage V_P	In accordance with EN 132402 1500 Vac, 2 s for single chokes (winding/core) for double chokes (winding/winding)
Climatic category	In accordance with IEC 68-2 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Thermal properties	Temperature rise test as per VDE 0565-2
Ambient temperature	40 °C
Standards	The chokes comply with EN 138100 and VDE 0565-2
Current derating I_{op}/I_R versus ambient temperature T_A	

Rated voltage 250 Vac / 350 Vdc
Rated current 0,3 A to 3 A
Rated inductance 0,033 to 1,2 mH

Construction

- Ring core double choke with powder core
- Plastic case
- Complete resin potting

Features

- Case and sealing flame-retardant as per UL 94 V-0
- High symmetrical attenuation
- Low stray inductance

Applications

- Attenuation of symmetrical interference

– in entertainment electronics
– in industrial machines

Terminals

- Pins fitting standard PCB grid

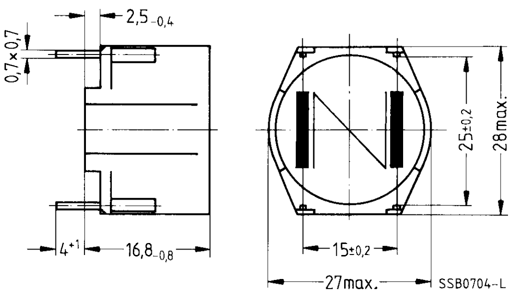
Marking

Ordering code, rated inductance, rated voltage,
rated current, dc resistance
manufacturer, date of manufacture

Approvals

Marks of conformity	Standards
	VDE 0565-2 UL 1283

Outline drawing



Technical data

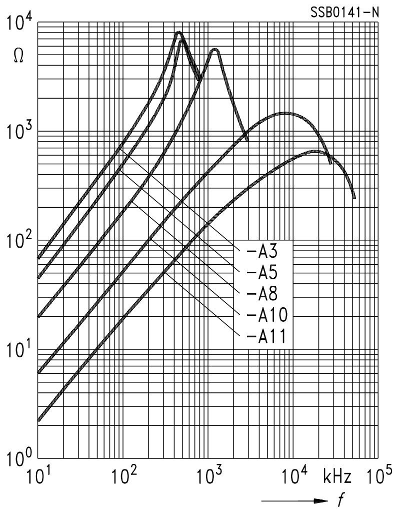
Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and + 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Weight	approx. 15 g

For further technical data see page 166.

Characteristics and ordering codes

I_R A	L_R µH	R_{typ} mΩ	Ordering code
0,3	1200	2100	B82623-G1-A3
0,5	1000	1200	B82623-G1-A5
1	330	440	B82623-G1-A8
2	82	110	B82623-G1-A10
3	33	40	B82623-G1-A11

Impedance |*Z*|
versus frequency *f*
B82623-G1-



Rated voltage 250 Vac/ 350 Vdc
Rated current 1 A to 6 A
Rated inductance 25 to 800 µH

Construction

- Ring core double choke with powder core
- Plastic case
- Complete resin potting

Features

- Case and sealing flame-retardant as per UL 94 V-0
- High symmetrical attenuation
- Low stray inductance

Applications

- Attenuation of symmetrical interference

– in entertainment electronics
– in industrial machines

Terminals

- Pins fitting standard PCB grid

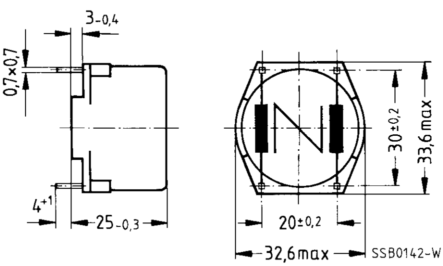
Marking

Ordering code, rated inductance, rated voltage,
rated current, dc resistance
manufacturer, date of manufacture

Approvals

Marks of conformity	Standards
	VDE 0565-2
	UL 1283

Outline drawing



Technical data

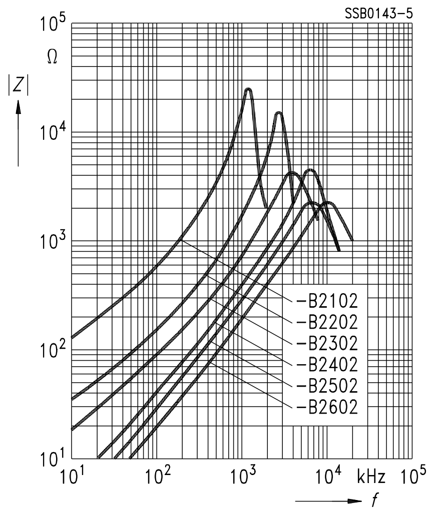
Inductance tolerance	± 30 %
Rated current I_R	Referred to 50 Hz and + 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at + 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Weight	approx. 43 g

For further technical data see page 166.

Characteristics and ordering codes

I_R A	L_R µH	R_{typ} mΩ	Ordering code
1	800	1000	B82624-B2102-N1
2	200	250	B82624-B2202-N1
3	100	120	B82624-B2302-N1
4	50	60	B82624-B2402-N1
5	40	45	B82624-B2502-N1
6	25	35	B82624-B2602-N1

Impedance |*Z*|
versus frequency *f*
B82624-



Chokes for Power Lines B82615
Ring Core Chokes with Powder Core … B82627

Harmonic chokes
Rated voltage 250 Vac / 350 Vdc
Rated current 1 A to 10 A
Rated inductance 0,18 to 40 mH

Construction

- Ring core choke with powder core
- Two sizes (B826∗5 and B826∗7)
- Single and double chokes in each size
- Plastic case
- Complete resin potting

Features

- Case and sealing flame-retardant as per UL 94 V-0
- Higth attenuation of symmetrical interference at low frequencies

Applications

- Reduction of current harmonics, e.g. in

– washing machines
– TV sets, PCs
– household applicances

Terminals

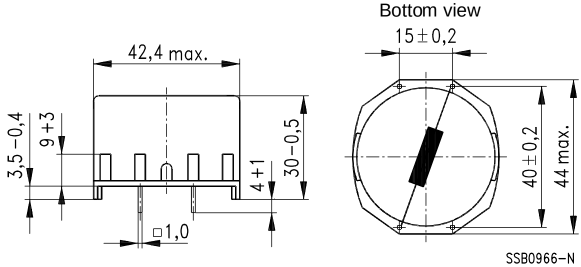
- B82615 and B82625:
  Pins fitting standard PCB grid
- B82617 and B82627:
  lead wires brought out of case,
  approx. 20 mm of wire ends tinned

Marking

Ordering code, rated inductance, rated current,
dc resistance
manufacturer, date of manufacture

Harmonic single choke

Outline drawing



Technical data

Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz und + 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at + 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Weight	approx. 110 g

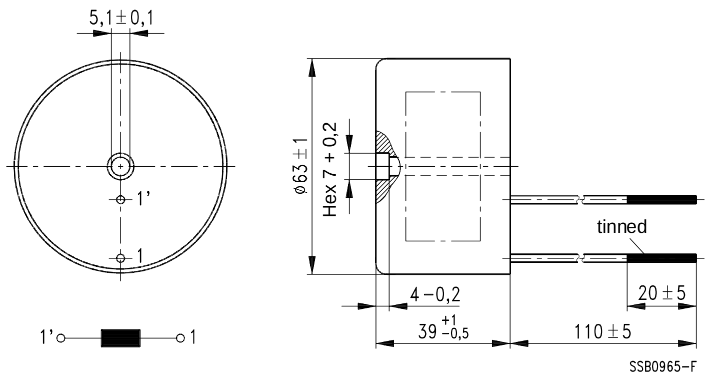
For further technical data see page 166.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} mΩ	Ordering code
1	20	3000	B82615-B2102-M1
2	5,0	900	B82615-B2202-M1
3	2,5	400	B82615-B2302-M1
4	1,5	220	B82615-B2402-M1
5	1,0	150	B82615-B2502-M1
6	0,7	100	B82615-B2602-M1

Harmonic single choke

Outline drawing



Technical data

Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and + 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at + 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Weight	approx. 380 g

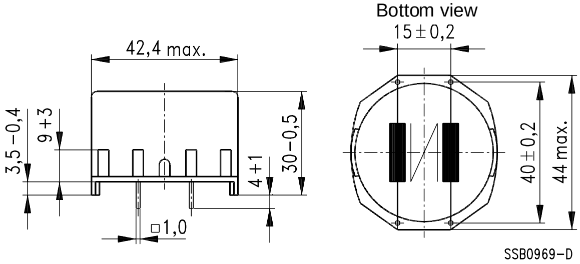
For further technical data see page 166.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} mΩ	Ordering code
1	40	3200	B82617-F2102-M1
2	18	1200	B82617-F2202-M1
3	9,5	700	B82617-F2302-M1
4	5,5	410	B82617-F2402-M1
5	3,5	280	B82617-F2502-M1
6	2,4	185	B82617-F2602-M1
8	1,4	100	B82617-F2802-M1
10	1,0	65	B82617-F2103-M1

Harmonic double choke

Outline drawing



Technical data

Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and + 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at + 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Weight	approx. 120 g

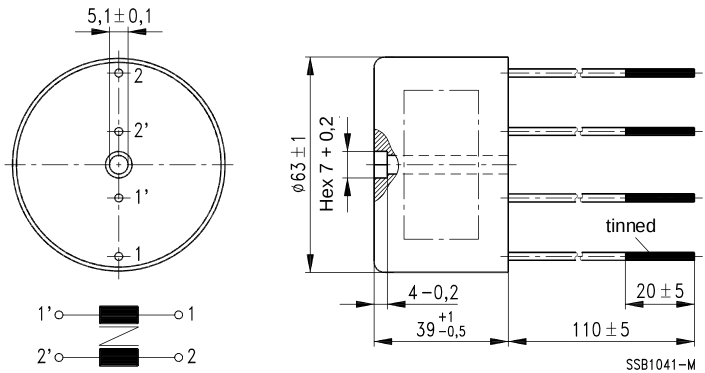
For further technical data see page 166.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} mΩ	Ordering code
1	5	1400	B82625-B2102-M1
2	1,2	450	B82625-B2202-M1
3	0,7	200	B82625-B2302-M1
4	0,4	110	B82625-B2402-M1
5	0,25	75	B82625-B2502-M1
6	0,18	50	B82625-B2602-M1

Harmonic double choke

Outline drawing



Technical data

Inductance tolerance	± 20 %
Rated current I_R	Referred to 50 Hz and + 40 °C ambient temperature
DC resistance R_{typ}	Typical value, measured at + 20 °C ambient temperature
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Weight	approx. 380 g

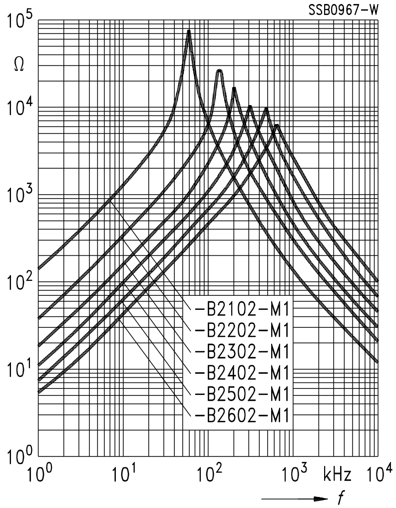
For further technical data see page 166.

Characteristics and ordering codes

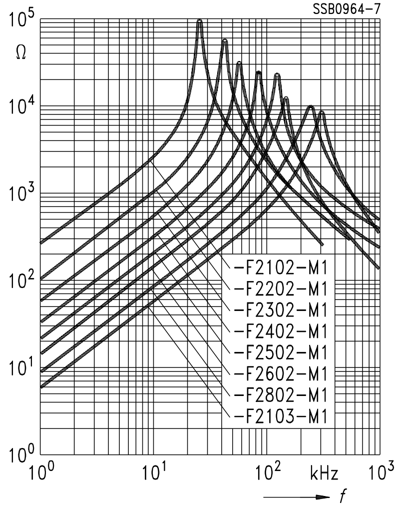
I_R A	L_R mH	R_{typ} mΩ	Ordering code
1	10,0	2000	B82627-F2102-M1
2	4,5	650	B82627-F2202-M1
3	2,5	380	B82627-F2302-M1
4	1,5	200	B82627-F2402-M1
5	0,9	140	B82627-F2502-M1
6	0,6	90	B82627-F2602-M1
8	0,35	50	B82627-F2802-M1
10	0,25	35	B82627-F2103-M1

Impedance |*Z*|
versus frequency *f*

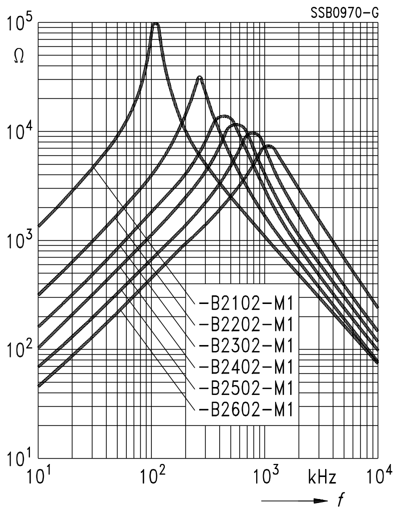
B82615-



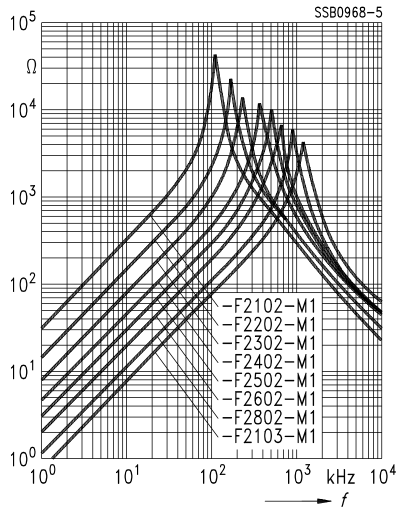
B82617-



B82625-



B82627-



General

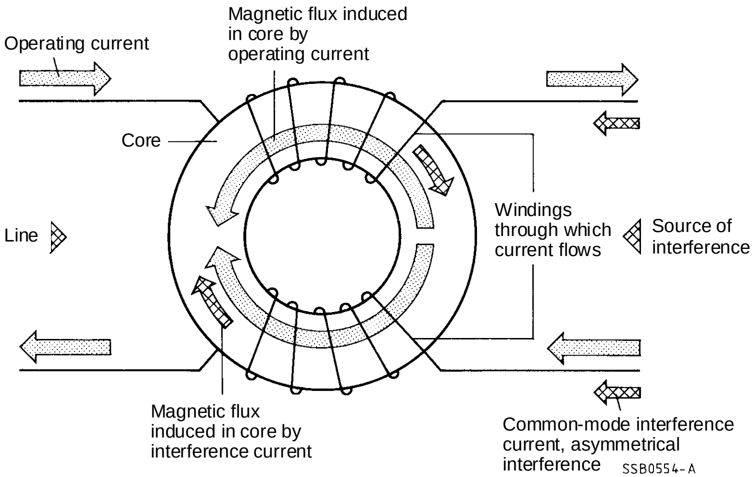


Fig. 2 Current-compensated ring core choke
Double choke shown as an example

Compact electrical and electronic equipment primarily generates common-mode interference. In order to be able to meet the safety requirements (keeping within the leakage current limits and thus limiting the capacitance of Y capacitors) specified in the safety standards, chokes with a high asymmetrically effective inductance must be used.

Current-compensated chokes with a closed core topology are especially suitable for this purpose. The problem of core material saturation due to the useful current is solved in these designs by winding two coils with equal numbers of turns on the core. These coils are connected in such a way that the magnetic flux induced by the useful current flowing in the upper coil is opposite to that induced by the current flowing through the lower coil, so that the two fluxes cancel, i.e. compensate one another (cf. figure 2).

This enables the use of highly permeable ring cores, so that high inductance ratings per winding are obtained. When current-compensated double chokes with ferrite cores are used, the full inductance attenuates common-mode interference.

The operating current is only affected by the stray inductance (order of magnitude: 1 % of the rated value) and the ohmic resistance, which is generally low. As a result, the suppression of differential-mode interference by current-compensated chokes is accordingly low. In many cases, a combination with symmetrically connected capacitors or powder core chokes is therefore required.

In comparison to I core chokes, current-compensated chokes have higher inductances, very low stray fields and smaller dimensions at comparable current ratings.

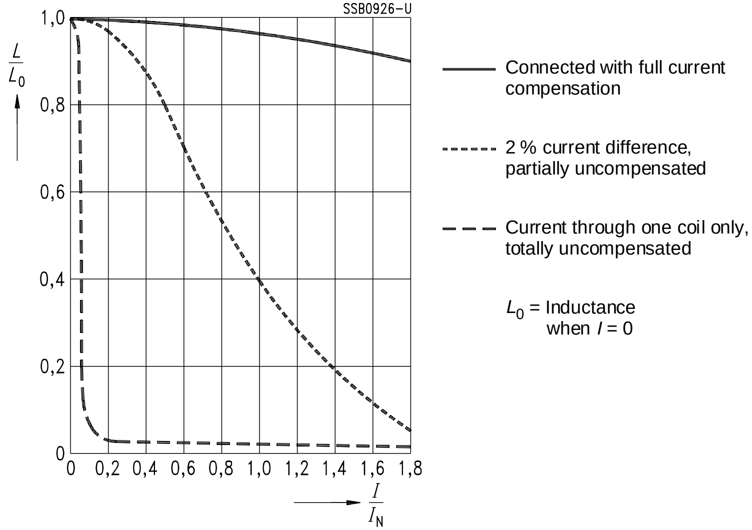


Fig. 3 Effect of current differences on current compensation

When using current-compensated chokes, care must be taken to ensure that the sum of all currents flowing through the choke (added vectorially) is zero, i. e. that the entire current flows to the load through the choke and from the load back through the choke. If only a small percentage of the rated current is conducted along another path, e.g. via the ground connection, the choke is no longer compensated and the core will be at least partially saturated. This causes a drop in the inductance.

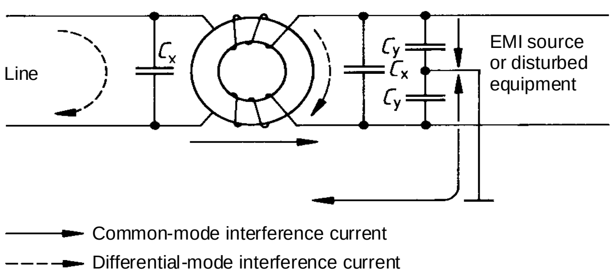
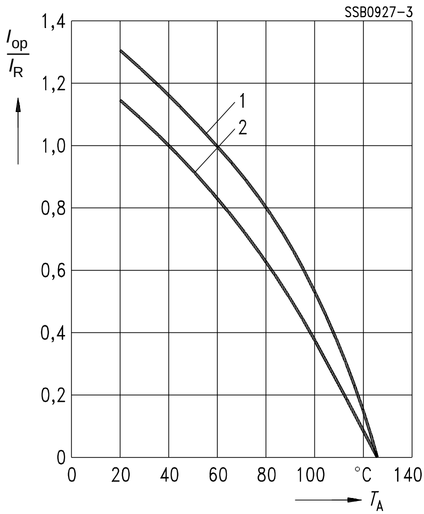


Fig. 4 Interference suppression filter circuit with a current-compensated choke

These chokes are available as double current-compensated chokes for ac equipment and as triple and quadruple chokes with current compensation for three-phase equipment without or with connected N conductor.

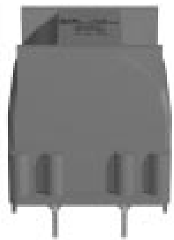
General technical data

Rated voltage V_R	Double chokes250 Vac Triple chokes440/250 Vac Quad chokes440/250 Vac
Test voltage V_P	Double chokes1500 Vac, 2 s Triple chokes2500 Vac, 2 s Quad chokes2500 Vac, 2 s
Rated inductance L_R	Measured at 20 °C, measuring current 0,1 mA Measuring frequency:100 kHz for ≤ 1 mH 10 kHz for > 1 mH The inductance is specified per winding.
Inductance decrease $\Delta L/L_0$	< 10 % at dc loading with I_R
Climatic category	In accordance with IEC 68-1 40/125/56 (– 40 °C/+ 125 °C/56 days damp heat test)
Standards	The chokes comply with VDE 0565-2, EN 138100 and IEC 938
Current derating I_{op}/I_R versus ambient temperature T_A Curve 1: Choke rated for T_A = 60 °C Curve 2: Choke rated for T_A = 40 °C	

Construction

- Current-compensated ring core double choke with ferrite core
- Polycarbonate case
- Resin potting
- B82724-E without potting (eco choke)
- Sector winding

Example of horizontal version



Example of vertical version

Features

- Case and potting flame-retardant as per UL 94 V-0
- High resonance frequency owing to special winding technique
- > 1 % stray inductance for symmetrical interference suppression

Applications

Application	Type
Electronic ballasts in lamps	B82721 B82722
Switch-mode power supplies in TV sets	B82721 … B82725
Washing machines	B82724 B82725
Power supplies	B82724 B82725
Chargers	B82725

Terminals

- Pins 0,7 × 0,7 mm or 1 × 1 mm (B82725)
- Pins fitting standard PCB grid

Marking

Ordering code, rated current, rated inductance, graphic symbol, mark of conformity, manufacturer, date code (except B82721)

Approvals

Marks of conformity	Standards
	VDE 0565-2 UL 1283 (except B82724-E)

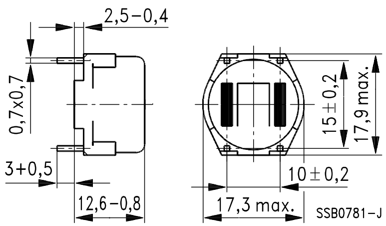
Selector guide

Type	B82721-A B82721-K		B82722-A B82722-J	B82723-A B82723-J	B82724-A B82724-J	B82724-E	B82724-B	B82725-A
Page	182		183	184	185	186	187	188
Rated current I_R, 50 Hz A	Rated inductance (mH) DC resistance per winding (mΩ)							
0,3			47 2500					
0,4	39 2000	27 1700						
0,5		18 1500	27 1200	56 2200	82 2700	82 2100		
0,7		10 600						
1,0			10 480	27 750	33 810	33 650	47 880	68 1300
1,2		6,8 280						
1,4					27 500	27 370		
1,5		3,3 180						
2,0		1,0 90	2,2 130	5,6 160	6,8 190	6,8 190	10 230	18 350
2,6		0,4 60						
3,0			1,2 56					
3,6		0,4 35						
4,0				2,7 60	3,3 66	3,3 55	3,9 58	6,8 87
6,0							1,8 23	3,9 41
8,0								2,7 22
10								1,8 14

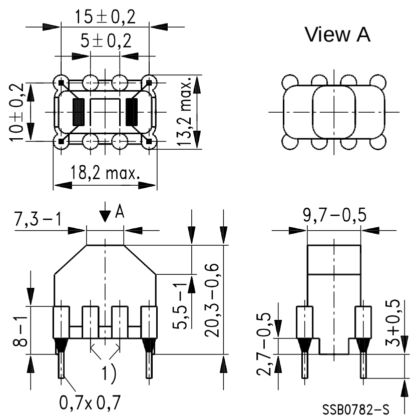
Special ratings on request

Outline drawings

B82721-A
Horizontal version



B82721-K
Vertical version



Technical data

Rated voltage V_R	250 Vac
Test voltage V_p	1500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 40 °C ambient temperature
Inductance tolerance	± 30 %
Weight	approx. 10 g

For further technical data see page 179. For impedance = f (*f*) see page 189.

Characteristics and ordering codes

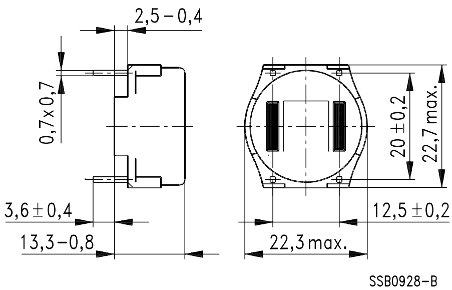
I_R A	L_R mH	$L_{S,\ typ}$ µH	R_{typ} mΩ	Ordering code Horizontal version	Vertical version
0,4	39	450	2000	B82721-A2401-N20	B82721-K2401-N20
0,4	27	270	1700	B82721-A2401-N21	B82721-K2401-N21
0,5	18	260	1500	B82721-A2501-N1	B82721-K2501-N1
0,7	10	90	600	B82721-A2701-N20	B82721-K2701-N20
1,2	6,8	70	280	B82721-A2122-N20	B82721-K2122-N20
1,5	3,3	37	190	B82721-A2152-N1	B82721-K2152-N1
2,0	1,0	13	90	B82721-A2202-N1	B82721-K2202-N1
2,6	0,4	6	60	B82721-A2262-N1	B82721-K2262-N1
3,6	0,4	6	35	B82721-A2362-N1	B82721-K2362-N1

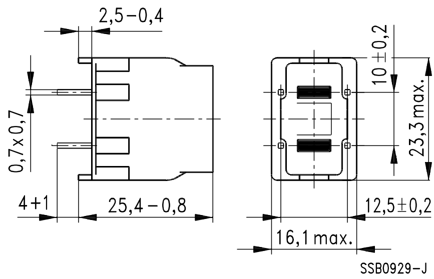
1) Vertical chokes with lead spacing 5 mm × 10 mm on request

Outline drawings

B82722-A
Horizontal version

B82722-J
Vertical version





Technical data

Rated voltage V_R	250 Vac
Test voltage V_p	1500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
Weight	approx. 10 g

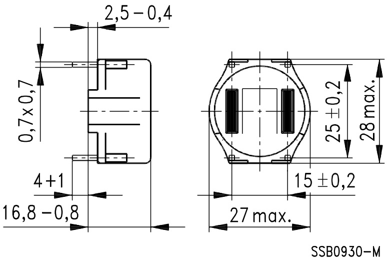
For further technical data see page 179. For impedance = f (*f*) see page 189.

Characteristics and ordering codes

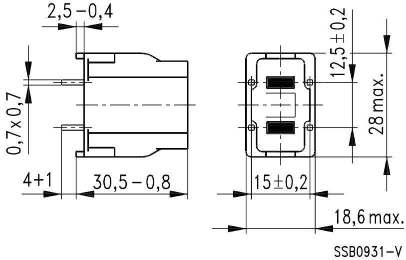
I_R A	L_R mH	$L_{S,\,typ}$ µH	R_{typ} mΩ	Ordering code Horizontal version	Vertical version
0,3	47	760	2500	B82722-A2301-N1	B82722-J2301-N1
0,5	27	430	1200	B82722-A2501-N1	B82722-J2501-N1
1	10	140	480	B82722-A2102-N1	B82722-J2102-N1
2	2,2	30	130	B82722-A2202-N1	B82722-J2202-N1
3	1,2	17	56	B82722-A2302-N1	B82722-J2302-N1

Outline drawings

B82723-A
Horizontal version



B82723-J
Vertical version



Technical data

Rated voltage V_R	250 Vac
Test voltage V_p	1500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
Weight	approx. 15 g

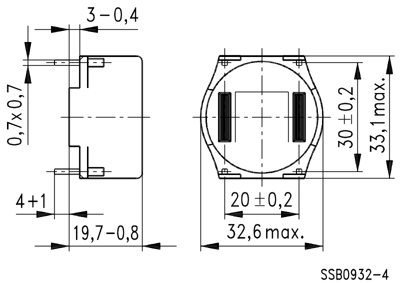
For further technical data see page 179. For impedance = f (f) see page 189.

Characteristics and ordering codes

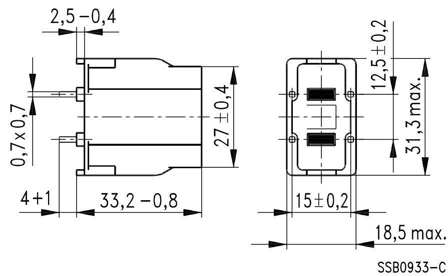
I_R	L_R	$L_{S,\ typ}$	R_{typ}	Ordering code	
A	mH	µH	mΩ	Horizontal version	Vertical version
0,5	56	870	2200	B82723-A2501-N1	B82723-J2501-N1
1	27	440	750	B82723-A2102-N1	B82723-J2102-N1
2	5,6	80	160	B82723-A2202-N1	B82723-J2202-N1
4	2,7	30	60	B82723-A2402-N1	B82723-J2402-N1

Outline drawings

B82724-A
Horizontal version



B82724-J
Vertical version



Technical data

Rated voltage V_R	250 Vac
Test voltage V_p	1500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
Weight	approx. 25 g

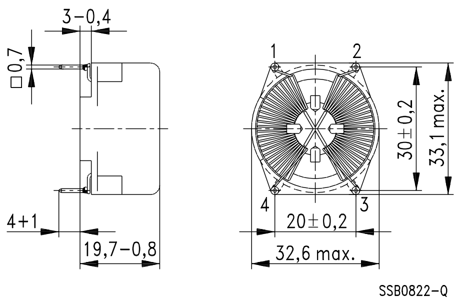
For further technical data see page 179. For impedance = f (f) see page 190.

Characteristics and ordering codes

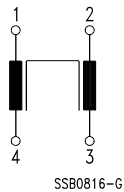
I_R	L_R	$L_{S,\ typ}$	R_{typ}	Ordering code	
A	mH	µH	mΩ	Horizontal version	Vertical version
0,5	82	1000	2700	B82724-A2501-N1	B82724-J2501-N1
1	33	420	810	B82724-A2102-N1	B82724-J2102-N1
1,4	27	310	500	B82724-A2142-N1	B82724-J2142-N1
2	6,8	80	190	B82724-A2202-N1	B82724-J2202-N1
4	3,3	40	66	B82724-A2402-N1	B82724-J2402-N1

Choke without potting and glue (eco choke)
Recyclable
Better RF properties than potted standard chokes

Outline drawing



Pin configuration



Technical data

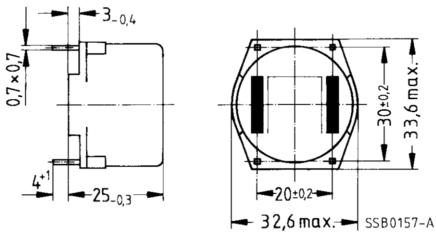
Rated voltage V_R	250 Vac
Test voltage V_p	1500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 40 °C ambient temperature
Inductance tolerance	– 30/ + 50 %
Weight	approx. 25 g

For further technical data see page 179. For impedance = f (*f*) see page 190.

Characteristics and ordering codes

I_R A	L_R mH	$L_{S,\,typ}$ µH	R_{typ} mΩ	Ordering code
0,5	82	950	2100	B82724-E2501-N1
1	33	400	650	B82724-E2102-N1
1,4	27	280	370	B82724-E2142-N1
2	6,8	75	190	B82724-E2202-N1
4	3,3	35	55	B82724-E2402-N1

Outline drawing



Technical data

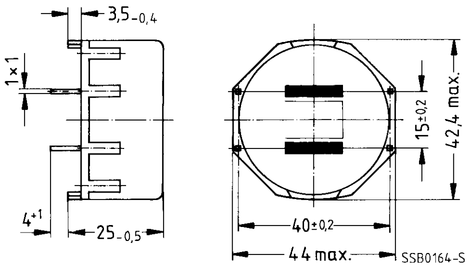
Rated voltage V_R	250 Vac
Test voltage V_p	1500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
Weight	approx. 40 g

For further technical data see page 179. For impedance = f (f) see page 190.

Characteristics and ordering codes

I_R A	L_R mH	$L_{S,\ typ}$ µH	R_{typ} mΩ	Ordering code
1	47	550	880	B82724-B2102-N1
2	10	110	230	B82724-B2202-N1
4	3,9	40	58	B82724-B2402-N1
6	1,8	16	23	B82724-B2602-N1

Outline drawing



Technical data

Rated voltage V_R	250 Vac
Test voltage V_p	1500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
Weight	approx. 60 g

For further technical data see page 179. For impedance = f (f) see page 190.

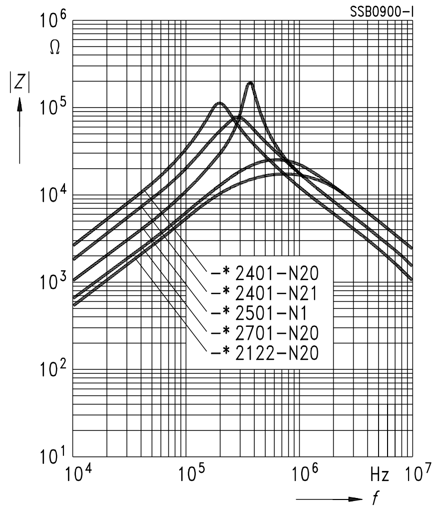
Characteristics and ordering codes

I_R A	L_R mH	$L_{S,\,typ}$ µH	R_{typ} mΩ	Ordering code[1]
1	68	900	1300	B82725-A2102-N1
2	18	230	350	B82725-A2202-N1
4	6,8	80	87	B82725-A2402-N1
6	3,9	45	41	B82725-A2602-N1
8	2,7	30	22	B82725-A2802-N1
10	1,8	20	14	B82725-A2103-N1

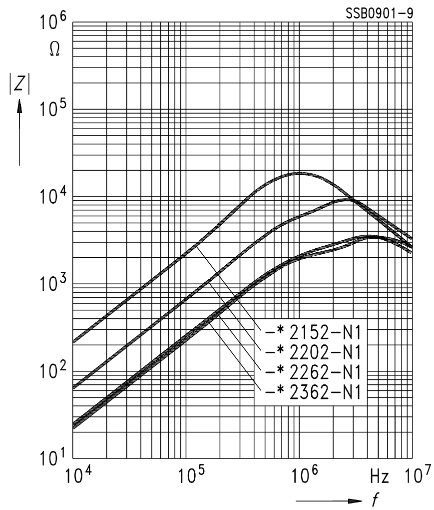
1) Chokes with 8 pins on request

Impedance |*Z*| versus frequency *f*
(measured with windings in parallel)

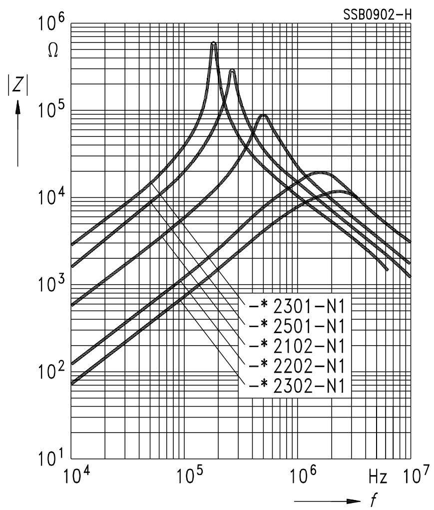
B82721-⋆
⋆ = A or K



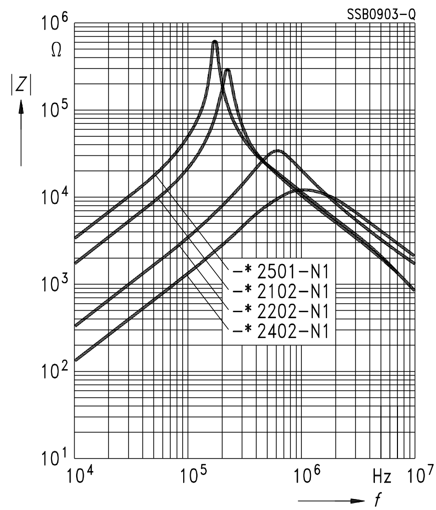
B82721-⋆
⋆ = A or K



B82722-⋆
⋆ = A or J

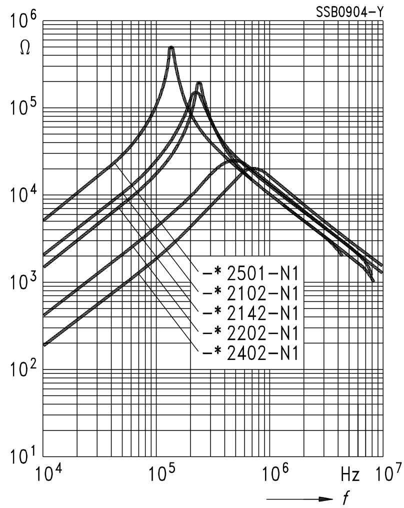


B82723-⋆
⋆ = A or J

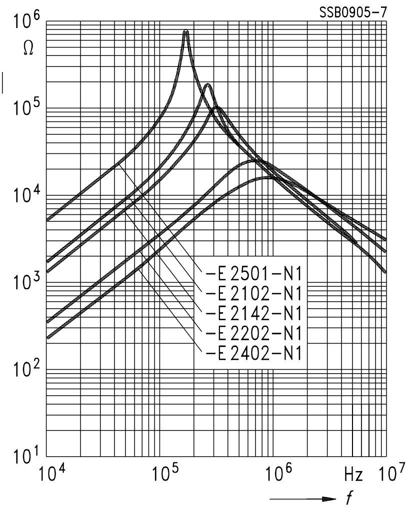


Impedance |*Z*| versus frequency *f*
(measured with windings in parallel)

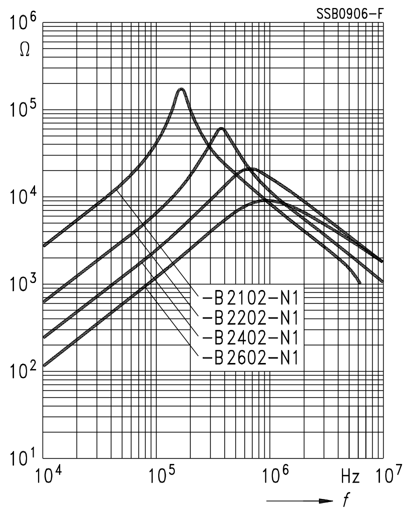
B82724-⁎
⁎ = A or J



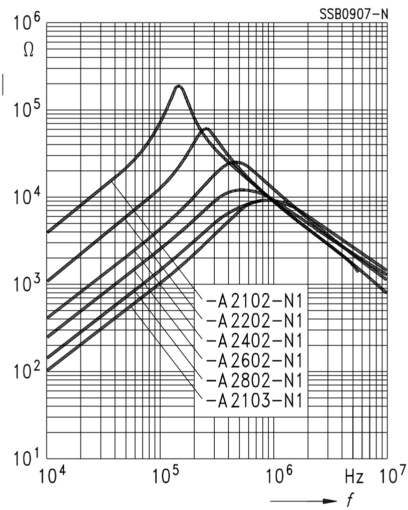
B82724-E



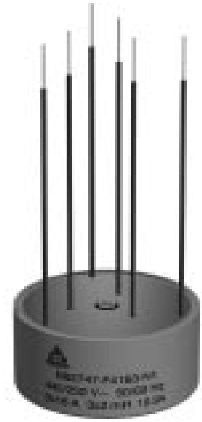
B82724-B



B82725-A



Rated voltage 440/250 Vac
Rated current 6 to 25 A
Rated inductance 1,3 to 6,0 mH



Construction

- Current-compensated ring core triple choke with ferrite core
- Polycarbonate case
- For through-hole fixing
- Resin potting
- Sector winding

Features

- Case and sealing flame-retardant as per UL 94 V-0
- > 1 % stray inductance for symmetrical interference suppression
- High power

Applications

- Switch-mode power supplies for converters, UPS
- Power supplies

Terminals

- Unidirectional tinned leads

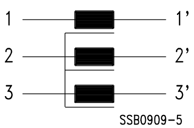
Marking

Manufacturer, ordering code, rated current, rated inductance rated voltage, climatic category, mark of conformity, date code

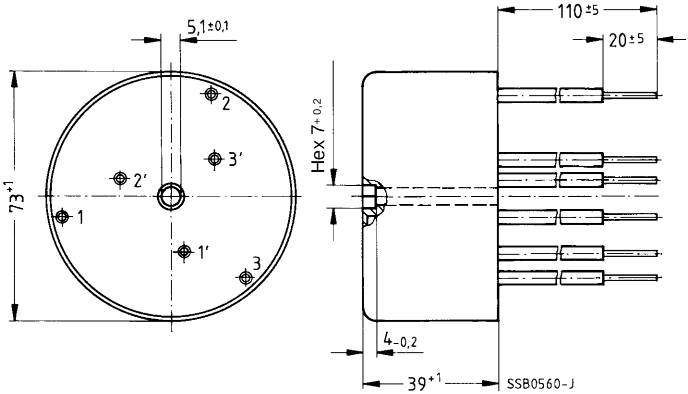
Approvals

Marks of conformity	Standards
VDE UL	VDE 0565-2 UL 1283

Circuit diagram



Outline drawing



Technical data

Test voltage V_p	2500 Vac, 2 s (line/line)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
$\Delta L/L_0$	< 20 % at dc loading with I_R
Weight	approx. 350 g

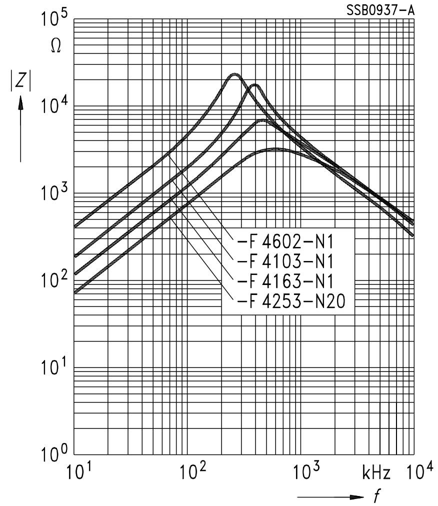
For further technical data see page 179.

Characteristics and ordering codes

I_R A	L_R mH	$L_{S,\,typ}$ µH	R_{typ} mΩ	Ordering code	Marks of conformity (VDE)	Marks of conformity (UR)
6	6,0	550	50	B82747-F4602-N1	×	×
10	3,0	110	20	B82747-F4103-N1	×	×
16	2,0	40	12	B82747-F4163-N1	×	×
25	1,3	16	7,5	B82747-F4253-N20	—	—

× = mark of conformity received

Impedance |*Z*|
versus frequency *f*
(measured with windings in parallel)
B82747-



Rated voltage 440/250 Vac
Rated current 50 to 200 A
Rated inductance 0,12 to 1,3 mH

Construction

- Current-compensated ring core triple choke with ferrite core
- Aluminum case
- Fixing by means of base plate
- Resin potting
- Sector winding

Features

- Sealing flame-retardant as per UL 94 V-0
- High power

Applications

- Switch-mode power supplies for converters, UPS
- Power supplies, medical equipment
- Track vehicles, chargers

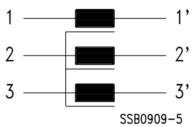
Terminals

- Litz wires or stud terminals

Marking

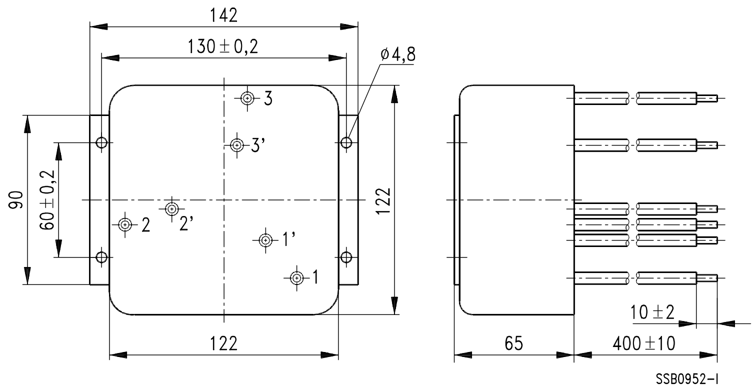
Manufacturer, ordering code, rated current, rated inductance rated volage, climatic category, terminal markings

Circuit diagram

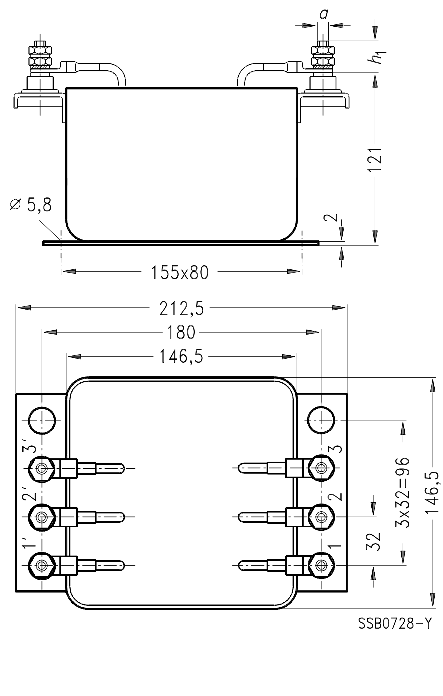


Outline drawings

B82745-C5-A7



B82745-C2-A10, -A13



Type	*a*	h_1
B82745-C2-A10	M 10	30 mm
B82745-C2-A13	M 8	20 mm

Technical data

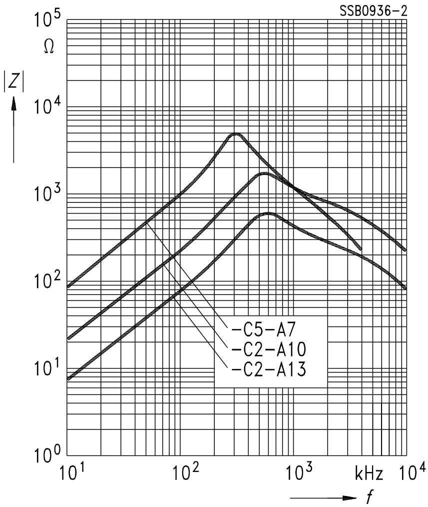
Test voltage V_p	2500 Vac, 2 s (line/line) 2500 Vac, 2 s (line/case)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
$\Delta L/L_0$	< 20 % at dc loading with I_R

For further technical data see page 179.

Characteristics and ordering codes

I_R A	L_R mH	R_{typ} mΩ	Weight kg	Terminals	Ordering codes
50	1,3	3,75	1,7	Litz wire 4,2 mm^2	B82745-C5-A7
100	0,33	0,65	6,0	Stud terminal M 10	B82745-C2-A10
200	0,12	0,28	6,3	Stud terminal M 8	B82745-C2-A13

Impedance |*Z*|
versus frequency *f*
(measured with windings in parallel)
B82745-



Rated voltage 440/250 Vac
Rated current 16 to 75 A
Rated inductance 0,9 to 1,8 mH

Construction

- Current-compensated ring core quad choke with ferrite core
- Aluminum case
- Fixing by means of base plate
- Resin potting
- Sector winding

Features

- Sealing flame-retardant as per UL 94 V-0

Applications

- Switch-mode power supplies for converters, UPS
- Power supplies, medical equipment
- Track vehicles, chargers

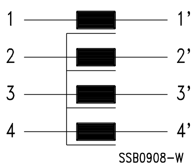
Terminals

Unidirectional tinned leads or litz wires

Marking

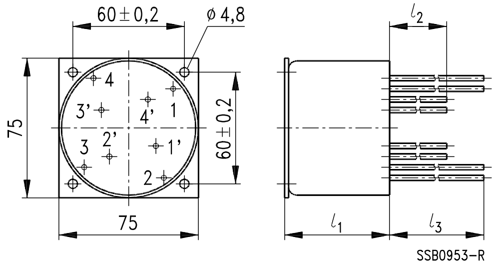
Manufacturer, ordering code, rated current, rated inductance rated voltage, climatic category, terminal markings

Circuit diagram



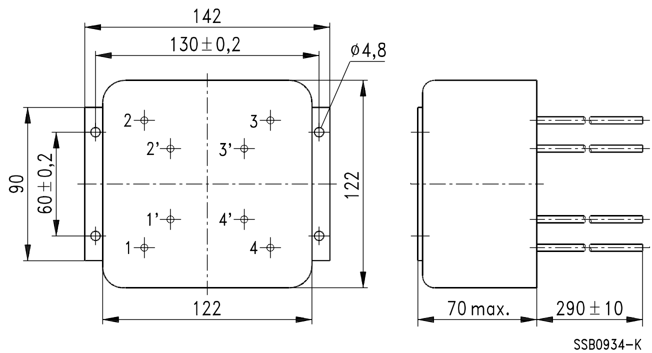
Outline drawings

B82765-C1-A5, -C2-A6

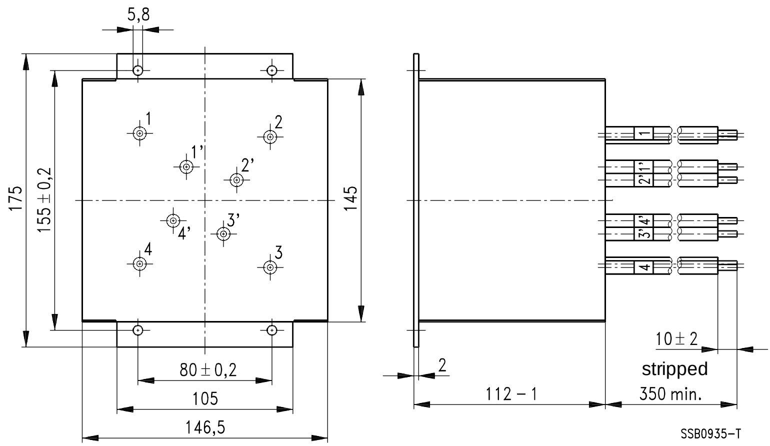


Type B82765-	l_1 mm	l_2 mm	l_3 mm
-C1-A5	47	160	160
-C2-A6	58	110	360

B82765-C5-A7



B82765-C6-A11



Technical data

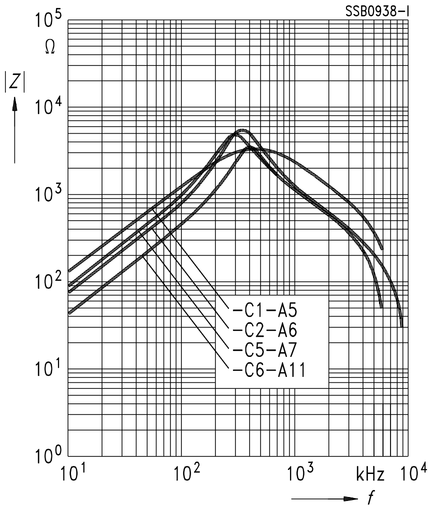
Test voltage V_p	2500 Vac, 2 s (line/line) 2500 Vac, 2 s (line/case)
Rated current I_R	Referred to 50 Hz and 60 °C ambient temperature
Inductance tolerance	± 30 %
$\Delta L/L_0$	< 20 % at dc loading with I_R

For further technical data see page 179.

Characteristics and ordering codes

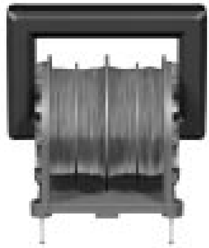
I_R A	L_R mH	R_{typ} mΩ	Weight kg	Terminals	Ordering code
16	1,8	20	0,45	2 × 1,18 mm ∅ CuL	B82765-C1-A5
25	1,3	7	0,75	Litz wire 4,2 mm^2	B82765-C2-A6
50	1,3	3,75	1,7	Litz wire 11,5 mm^2	B82765-C5-A7
75	0,9	2,5	6,5	Litz wire 16,7 mm^2	B82765-C6-A11

Impedance |*Z*|
versus frequency *f*
(measured with windings in parallel)
B82765-



Preliminary data

Rated voltage 250 Vac/250 Vdc
Rated current 0,4 to 4,6 A
Rated inductance 3,3 to 47 mH



Construction

- Current-compensated double choke with closed, rectangular ferrite core
- Closed polycarbonate coil former with 4 sections
- Without encapsulation
- 2-section winding
- Creepage distances and clearances > 3 mm
- 3 different versions available

Features

- Coil former flame-retardant as per UL 94 V-0
- Recycleable owing to omission of encapsulation and glue
- High resonance frequency due to 2-section winding
- Low leakage due to closed core shape
- High pulse strength
- Low whirring noise
- Approx. 1 % stray inductance for symmetrical interference suppression

Applications

- Electronic ballasts for lamps
- Switch-mode power supplies for TV sets, washing machines
- Power supplies

Terminals

- Pins 0,5 × 0,5 mm or 0,7 × 0,7 mm (B82734)
- Pins fitting standard PCB grid

Marking

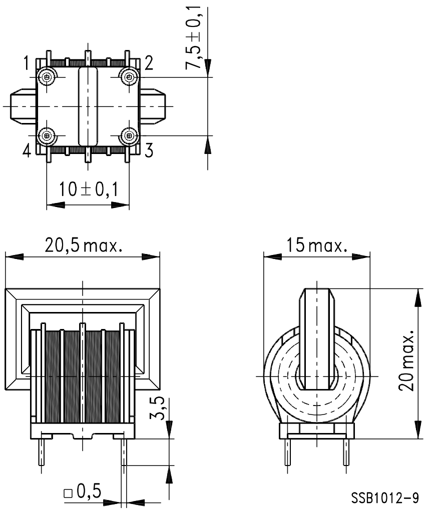
Ordering code, rated current, rated inductance,
mark of conformity, manufacturer, date code

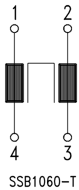
Approvals

Marks of conformity	Standards
	VDE 0565-2 (pending)
	UL 1283(pending)

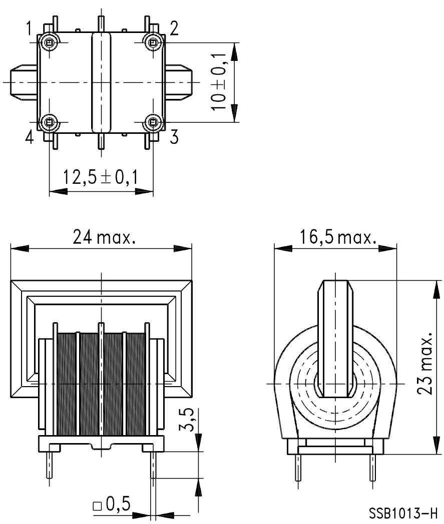
Outline drawings

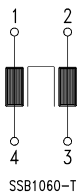
B82731



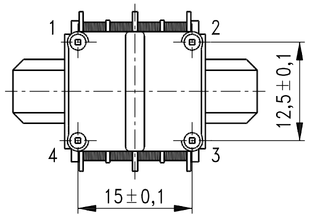


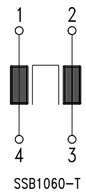
B82732

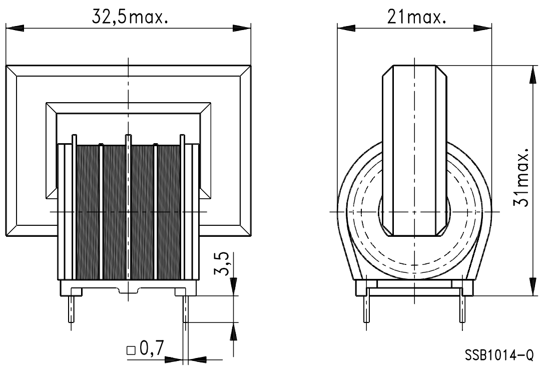




B82734







Technical data

Test voltage V_p	1500 Vac, 2 s (line/line)
Rated voltage I_R	Referred to 50 Hz and 40 °C ambient temperature
Inductance tolerance	+30/–50 %

For further technical data see page 179.

Characteristics and ordering codes

Version (core size)	I_R A	L_R mH	Ordering code
D20/13,5	0,4 ... 1,5	3,3 ... 47	B82731-R2∗∗∗-A∗∗
D23/15,5	0,6 ... 2,2	3,3 ... 47	B82732-R2∗∗∗-A∗∗
D31/22	1,3 ... 4,6	3,3 ... 47	B82734-R2∗∗∗-A∗∗

Available from 5/96.

Selector guide

EMC filters	Current range A	No. of lines	Terminals: Tab connect.	Pins	IEC connect.	Litz wires	Clamps	Studs	Lugs	Frequency range: LF	MF	HF	New	From page
General-purpose filters														
B84111-A … B84115-E	1 ... 20	2	●			●				●	●			209
B84111-A-K … B84115-E-K	1 … 6	2			●					●	●			209
B84112-B-P30	3	2		●							●			214
B84101-C	0,5 … 6	2					●				●			238
B84102-C, -K	0,5 ... 6	2					●				●			241
B84110-A	0,5 … 6	2		●							●			247
B84110-B	1,4	2		●							●			251
B84103	1 … 6	2	●		●					●	●			254
Filters for installations and systems														
B84299-K6*	2 … 36	2				●				●	●			257
B84299-K2*	10 … 25	2					●				●	●		264
B84299-K5*	6 ... 50	3 + N					●				●			269
B84299-K3*	6 … 75	3 + N					●				●	●		273
B84131	6 … 125	3 + N	●					●			●			281
B84108	10 … 20	3 + N	●								●		●	287
B84134-F	12	3 + N	●							●	●		●	290
B84134-A, -B	25 … 50	3 + N						●		●	●	●	●	293
Filters for converters and power electronics														
B84142	8 … 25	2					●			●	●		●	306
B84143-A, -B	8 … 1600	3					●		●	●	●		●	310
B84144	16 … 1600	3 + N					●		●		●		●	328
Filters for installations and shielded rooms														
B84312	0,1 … 1	2					●			●	●		●	340
B84204 ... B84226	5 … 200	3					●		●	●	●		●	349
B84299-C, -G	6 ... 100									●				349

General

In order to fulfill the legal EMC regulations and to protect sensitive electronics against conducted interference, suppression filters are the optimum solution. Easy mounting conditions are achieved by combining interference suppression chokes and capacitors in RF-tested low-volume units.

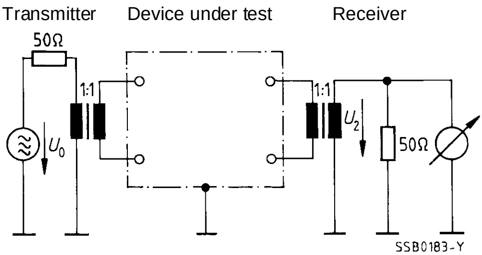
To select correct filters to suit the respective application, the following parameters should be considered:

1. Voltage, operating current, line frequency
2. Permissible leakage current
3. RF characteristics of the interference source and of the disturbed equipment
4. EMC requirements
5. Mechanical construction of the interference suppression filter.

In the field of interference suppression, the effectiveness of filters is largely determined by the RF characteristics of the interference source and of the disturbed equipment. Depending on the system design, the interference voltage occurs as a so-called symmetrical component between the lines or as an unsymmetrical or asymmetrical component between lines and ground (case). How the interference voltage is divided depends on the internal impedance of the interference source. If the filters are used to protect against pulses from the power supply system, the RF impedance of the connected network is also a factor to be taken into consideration.

Statements on the insertion loss of interference suppression filters taking all possible applications into consideration would therefore require many diagrams. Because of this, it is international standard practice to state only one insertion loss value, measured on a system with a defined characteristic impedance. In Germany, a characteristic impedance of Z = 50 Ω is mainly used. The corresponding test set-up for measuring the insertion loss is shown below:

a) Symmetrical insertion loss measurement (differential mode)

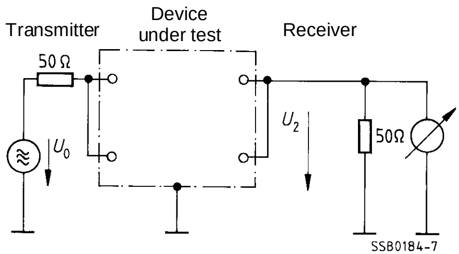


U = V = Voltage

cf. C.I.S.P.R. 17 (1981) Fig. B5

Insertion loss $\alpha_e = 20 \lg \frac{U_0}{2 \cdot U_2} [\mathrm{dB}]$

b) Asymmetrical measurement (common mode), branches connected in parallel

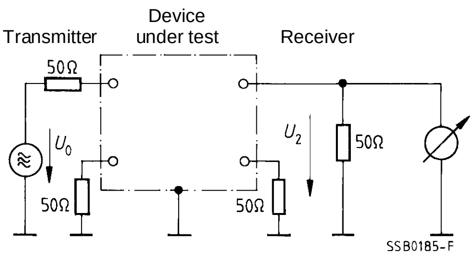


U = V = Voltage

cf. C.I.S.P.R. 17 (1981) Fig. B6

Asymmetrical measurement with lines connected in parallel is widely used in the United States. Some diagrams in this data book show the results of this measurement in addition to those obtained according to a) and c).

c) Unsymmetrical measurement, adjacent branch terminated



U = V = Voltage

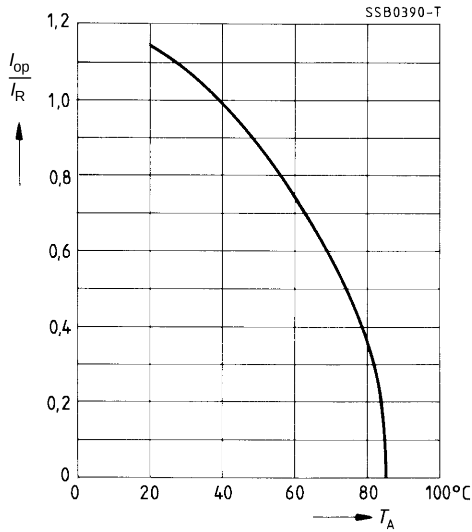
cf. C.I.S.P.R. 17 (1981) Fig. B7

The termination of the adjacent line with a defined resistance value has not yet been standardized. As far as this data book contains attenuation characteristics determined by other measuring arrangements, the deviations are indicated where the relevant diagrams are shown.

General technical data

The filters are dimensioned for continuous operation at rated voltage and rated frequency. Their design allows operation at full rated current and ambient temperatures up to 40 °C. The operating currents permissible at other ambient temperatures are plotted in the following graph.

Current derating I_{op}/I_R versus ambient temperature T_A



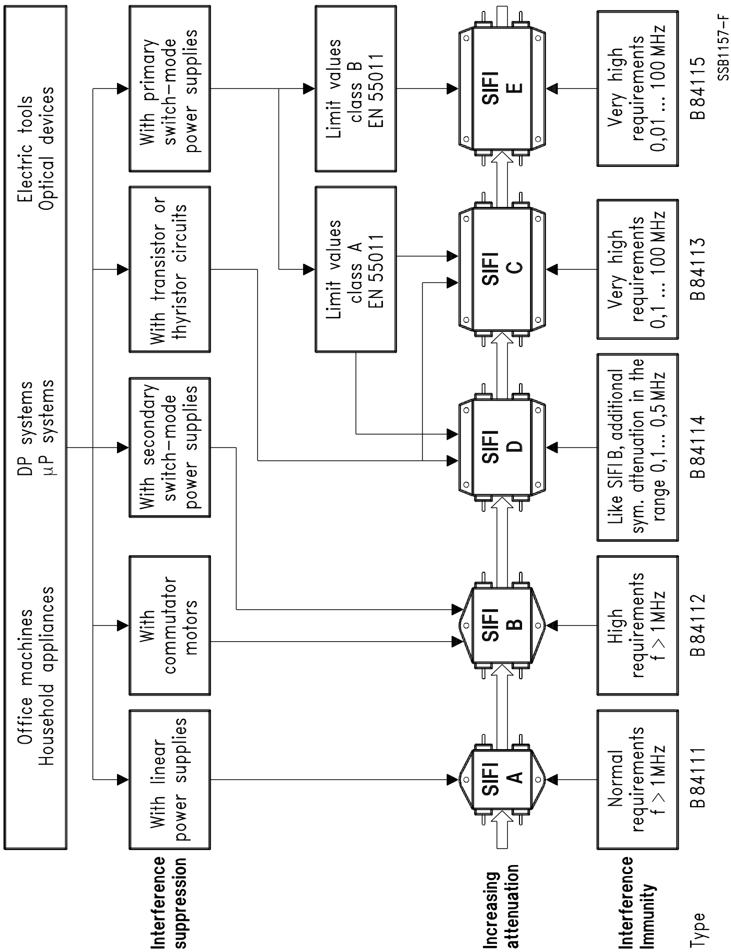
Overvoltages

In addition to the operating voltage permitted (= rated voltage V_R) in VDE specification 0565-3, overvoltages up to 1,1 times the rated voltage V_R are allowed for EMI suppression filters. These overvoltages are only permissible as occasional line fluctuations up to 2 hours per day.

(The limit of “2 hours per day” is only meant to be a general guide value to indicate clearly that such overvoltages are only permissible as exceptions).

Selector guide for SIFI filters

Page



232

220

226

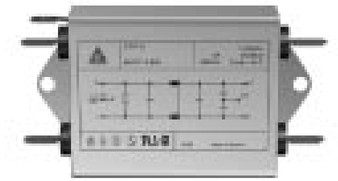
214

209

General technical data

Construction	All SIFI filters are incorporated in a shielded aluminum case, which is sealed with self-hardening, flame-retardant resin (UL 94 V-0)
Case styles and terminal styles	Case style A: Tab connectors on face ends, lateral mounting tabs. Particularly suitable for mounting on a shielding wall. Case style B: Tab connectors on face ends, mounting tabs on face ends. Case style K: IEC connector as per IEC 320 C 14 on line side, tab connectors on load side, mounting holes with metric thread. Case style L: Litz wires on face ends Case style P: Pins fitting PCB standard grid
Discharge resistors	The discharge resistors are designed such that one second after having disconnected the device from the power line, the voltage at the line connector should have dropped to 34 V.
Leakage current	Since the Y capacitors have voltage-independent dielectrics a leakage current of less than 0,5 mA per branch is safely kept at 50 Hz. Exceptions: B84115-E-*60 and -E-*110 with a leakage current <3,5 mA.

SIFI-A for normal attenuation
Rated voltage 250 Vac, 50/60 Hz
Rated current 1 A to 20 A



Construction

- Two-line filter
- Aluminum case

Features

- Compact design
- Low leakage current
- All relevant marks of confomity
- Cost-optimized construction

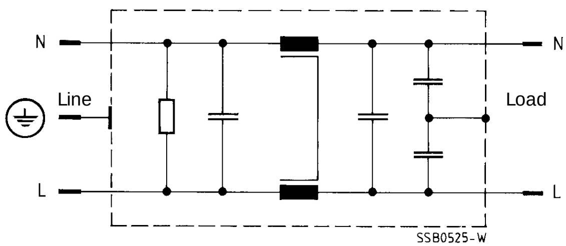
Applications

- Switch-mode power supplies in
  – industrial electronics
  – telecommunications
  – data systems
  – medical engineering

Terminals

Various terminal styles
depending on case styles A, B, K, L

Circuit diagram



Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 0,5 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

I_R A	C_R	L_R	Case style	Appr. weight g	Ordering code	Approvals					
						565-3					
1	2 × 0,1 µF (X2) + 2 × 4700 pF (Y2)	2 × 1,5 mH	A K	80 140	B84111-A-A10 B84111-A-K10	× ×	× ×	× ×	× ×	× ×	× ×
2	2 × 0,1 µF (X2) + 2 × 4700 pF (Y2)	2 × 1,5 mH	A	80	B84111-A-A20	×	×	×	×	×	×
3	2 × 0,1 µF (X2) + 2 × 4700 pF (Y2)	2 × 1,5 mH	A K L	80 140 80	B84111-A-A30 B84111-A-K30 B84111-A-L30	× × ×	× × ×	× × ×	× × ×	× × ×	× × ×
6	2 × 0,1 µF (X2) + 2 × 4700 pF (Y2)	2 × 1,8 mH	A B K L	110 110 140 110	B84111-A-A60 B84111-A-B60 B84111-A-K60 B84111-A-L60	× × × ×	× × × ×	× × × ×	× × × ×	× × × ×	× × × ×
10	2 × 0,1 µF (X2) + 2 × 4700 pF (Y2)	2 × 820 µH	A B L	120 120 120	B84111-A-A110 B84111-A-B110 B84111-A-L110	× × ×	× × ×	× × ×	× × ×	× × ×	× × ×
20	2 × 0,1 µF (X2) + 2 × 4700 pF (Y2)	2 × 470 µH	A B	210 210	B84111-A-A120 B84111-A-B120	× ×	× ×	× ×	× ×	× ×	× ×

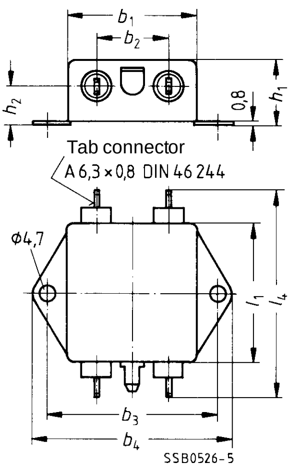
× = mark of conformity granted

Case styles and dimensions

Case style	Ordering code B84111-	Dimensions in mm											
		b_1	b_2	b_3	b_4	l_1	l_2	l_3	l_4	h_1	h_2	Litz mm^2	Style 1015
A	-A-A10	45	26,5	60,4	70	50	—	—	76,5	22,3	14	—	—
K	-A-K10	51	—	—	—	63,5	—	—	—	32	—	—	—
A	-A-A20	45	26,5	60,4	70	50	—	—	76,5	22,3	14	—	—
A	-A-A30	45	26,5	60,4	70	50	—	—	76,5	22,3	14	—	—
K	-A-K30	51	—	—	—	63,5	—	—	—	32	—	—	—
L	-A-L30	45	—	60,4	70	50	—	—	—	28,6	—	0,82	AWG18
A	-A-A60	45	26,5	60,4	70	50	—	—	76,5	28,6	20	—	—
B	-A-B60	45	26,5	—	—	50	60,4	70	76,5	28,6	20	—	—
K	-A-K60	51	—	—	—	63,5	—	—	—	32	—	—	—
L	-A-L60	45	—	60,4	70	50	—	—	—	28,6	—	0,82	AWG18
A	-A-A110	45	26,5	60,4	70	50	—	—	76,5	28,6	20	—	—
B	-A-B110	45	26,5	—	—	50	60,4	70	76,5	28,6	20	—	—
L	-A-L110	45	—	60,4	70	50	—	—	—	28,6	—	1,35	AWG16
A	-A-A120	63,5	31,5	74,7	84,5	50,8	—	—	77	38,1	28	—	—
B	-A-B120	see outline drawing											

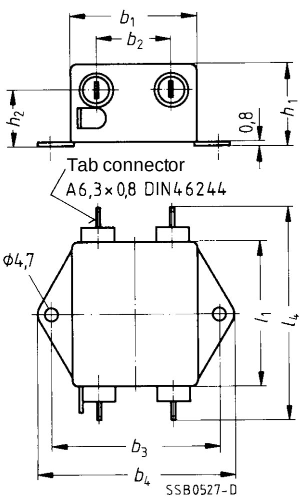
Case style A

B84111-A-A10
B84111-A-A20
B84111-A-A30



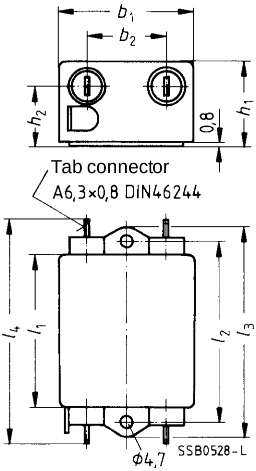
Case style A

B84111-A-A60
B84111-A-A110
B84111-A-A120



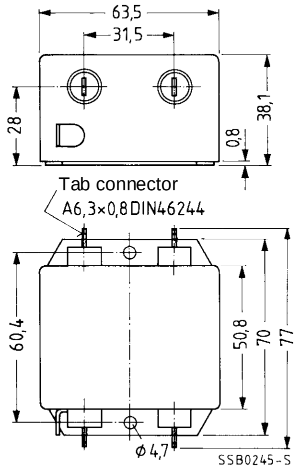
Case style B

B84111-A-B60
B84111-A-B110

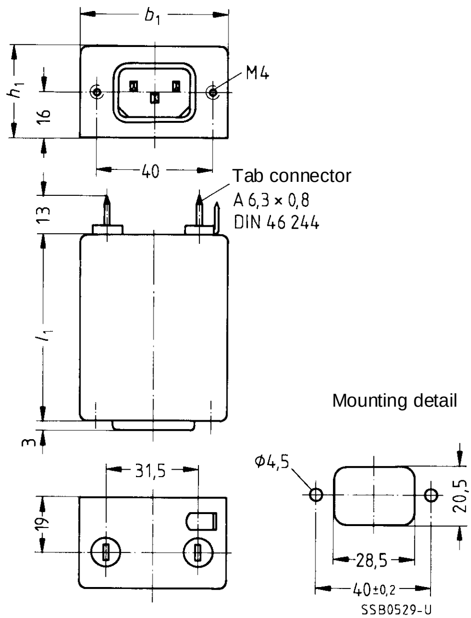


Case style B

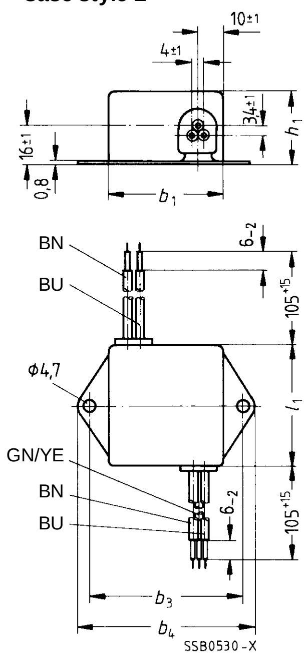
B84111-A-B120



Case style K



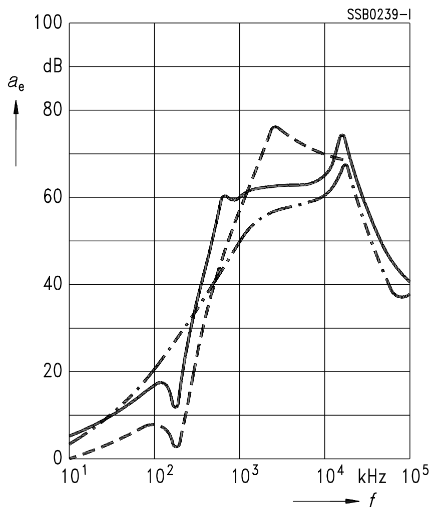
Case style L



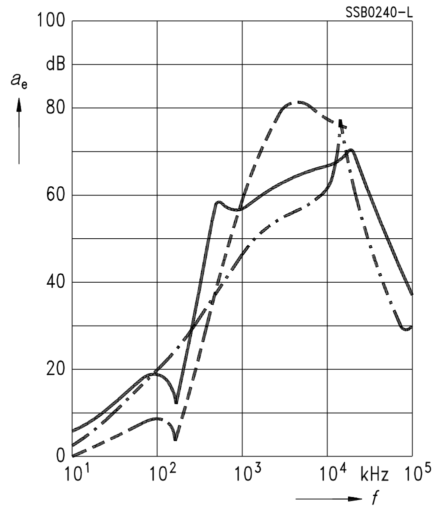
Insertion loss (typical values at Z = 50 Ω)

———————	unsymmetrical, adjacent branches terminated
– · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

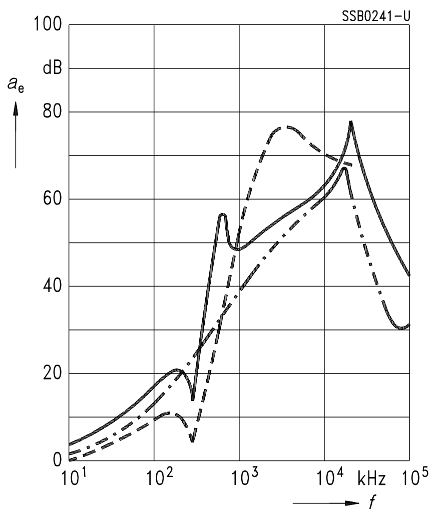
B84111-A-*10 ... -A-*30



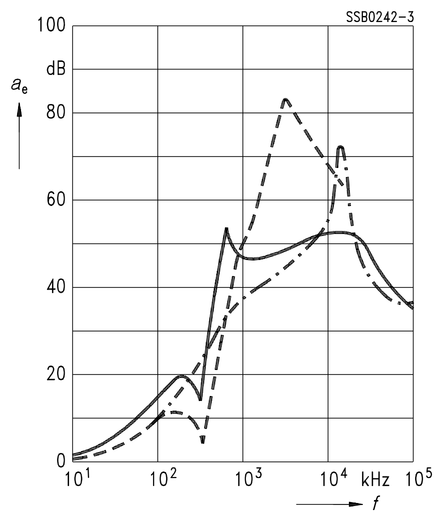
B84111-A-*60

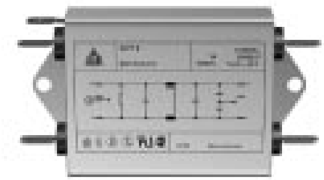


B84111-A-*110



B84111-A-*120





SIFI-B for enhanced attenuation
Rated voltage 250 Vac, 50/60 Hz
Rated current 1 A to 20 A

Construction

- Two-line filter
- Aluminum case

Features

- Compact design
- Low leakage current
- All relevant marks of confomity
- Cost-optimized construction

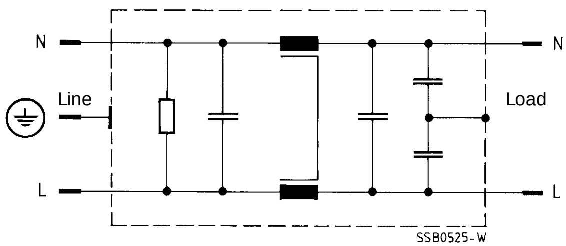
Applications

- Switch-mode power supplies in
  – industrial electronics
  – telecommunications
  – data systems
  – medical engineering

Terminals

Various terminal styles
depending on case styles A, B, K, L, P

Circuit diagram



Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 0,5 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

I_R A	C_R	L_R	Case style	Appr. weight g	Ordering code	Approvals 565-3					
1	2 × 0,15 µF (X2)	2 × 10 mH	A	110	B84112-B-A10	×	×	×	×	×	×
	+		B	110	B84112-B-B10	×	×	×	×	×	×
	2 × 4700 pF (Y2)		K	140	B84112-B-K10	×	×	×	×	×	×
			L	110	B84112-B-L10	×	×	×	×	×	×
2	2 × 0,15 µF (X2)	2 × 10 mH	A	110	B84112-B-A20	×	×	×	×	×	×
	+		B	110	B84112-B-B20	×	×	×	×	×	×
	2 × 4700 pF (Y2)		L	110	B84112-B-L20	×	×	×	×	×	×
3	2 × 0,22 µF (X2)	2 × 10 mH	A	140	B84112-B-A30	×	×	×	×	×	×
	+		B	140	B84112-B-B30	×	×	×	×	×	×
	2 × 4700 pF (Y2)		K	210	B84112-B-K30	×	×	×	×	×	×
			L	140	B84112-B-L30	×	×	×	×	×	×
			P	140	B84112-B-P30	×	×	×	–	×	×
6	2 × 0,33 µF (X2)	2 × 3,3 mH	A	150	B84112-B-A60	×	×	×	×	×	×
	+		B	150	B84112-B-B60	×	×	×	×	×	×
	2 × 4700 pF (Y2)		K	210	B84112-B-K60	×	×	×	×	×	×
			L	150	B84112-B-L60	×	×	×	×	×	×
10	2 × 0,47 µF (X2)	2 × 1,8 mH	A	200	B84112-B-A110	×	×	×	×	×	×
	+		B	200	B84112-B-B110	×	×	×	×	×	×
	2 × 4700 pF (Y2)		L	200	B84112-B-L110	×	×	×	×	×	×
20	2 × 0,68 µF (X2)	2 × 1,8 mH	A	700	B84112-B-A120	×	×	×	×	×	×
	+		B	700	B84112-B-B120	×	×	×	×	×	×
	2 × 4700 pF (Y2)										

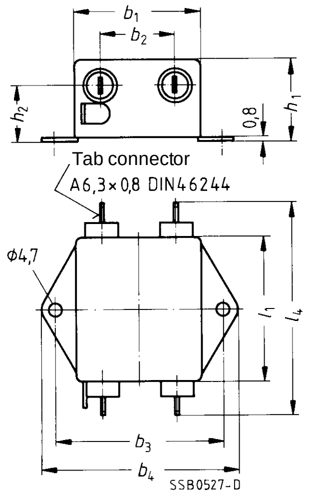
× = mark of conformity granted

Case styles and dimensions

Case style	Ordering code B84112-	Dimensions in mm b_1	b_2	b_3	b_4	l_1	l_2	l_3	l_4	h_1	h_2	Litz mm^2	Style 1015
A	-B-A10	45	26,5	60,4	70	50	—	—	76,5	28,6	20	—	—
B	-B-B10	45	26,5	—	—	50	60,4	70	76,5	28,6	20	—	—
K	-B-K10	51	—	—	—	63,5	—	—	—	32	—	—	—
L	-B-L10	45	—	—	—	50	60,4	70	—	28,6	—	0,82	AWG18
A	-B-A20	45	26,5	60,4	70	50	—	—	76,5	28,6	20	—	—
B	-B-B20	45	26,5	—	—	50	60,4	70	76,5	28,6	20	—	—
L	-B-L20	45	—	—	—	50	60,4	70	—	28,6	—	0,82	AWG18
A	-B-A30	50,8	31,5	60,4	70	63,5	—	—	89,5	28,6	20	—	—
B	-B-B30	50,8	31,5	—	—	63,5	74,7	84,5	89,5	28,6	20	—	—
K	-B-K30	50,8	—	—	—	79,5	—	—	—	32	—	—	—
L	-B-L30	50,8	—	—	—	63,5	74,7	84,5	—	28,6	—	0,82	AWG18
P	-B-P30	See outline drawing											
A	-B-A60	50,8	31,5	60,4	70	63,5	—	—	89,5	28,6	20	—	—
B	-B-B60	50,8	31,5	—	—	63,5	74,7	84,5	89,5	28,6	20	—	—
K	-B-K60	50,8	—	—	—	79,5	—	—	—	32	—	—	—
L	-B-L60	50,8	—	—	—	63,5	74,7	84,5	—	28,6	—	0,82	AWG18
A	-B-A110	50,8	31,5	60,4	70	63,5	—	—	89,5	38,1	28	—	—
B	-B-B110	50,8	31,5	—	—	63,5	74,7	84,5	89,5	38,1	28	—	—
L	-B-L110	50,8	—	—	—	63,5	74,7	84,5	—	38,1	—	1,35	AWG16
A	-B-A120	See outline drawing											
B	-B-B120												

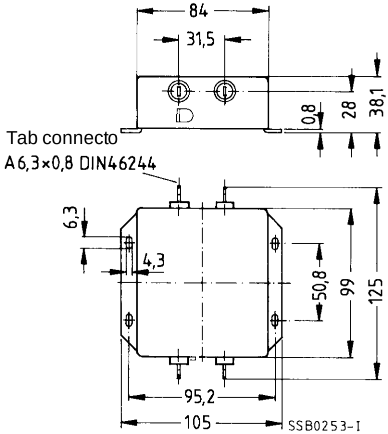
Case style A

B84112-B-A10 …
B84112-B-A110



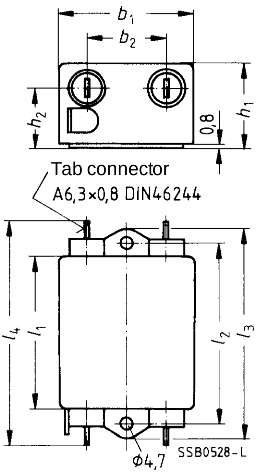
Case style A

B84112-B-A120



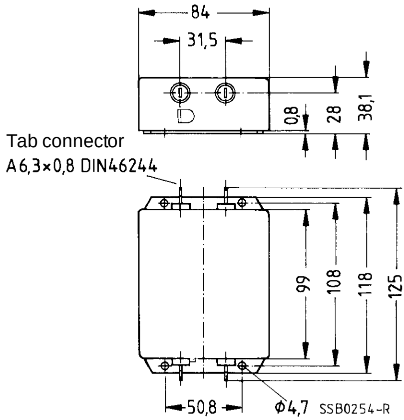
Case style B

B84112-B-B10 …
B84112-B-B110

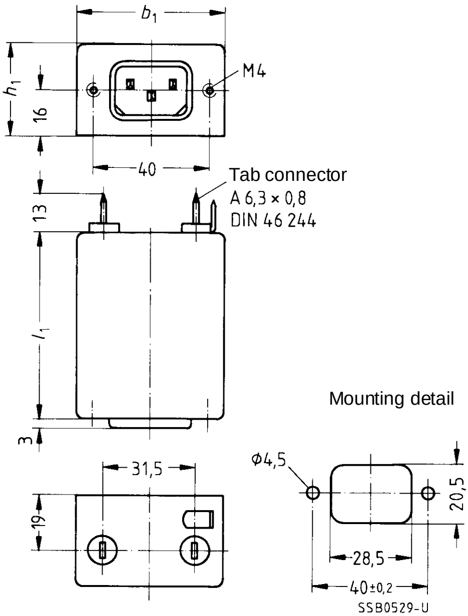


Case style B

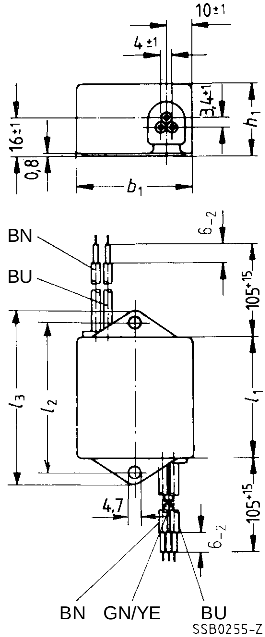
B84112-B-B120



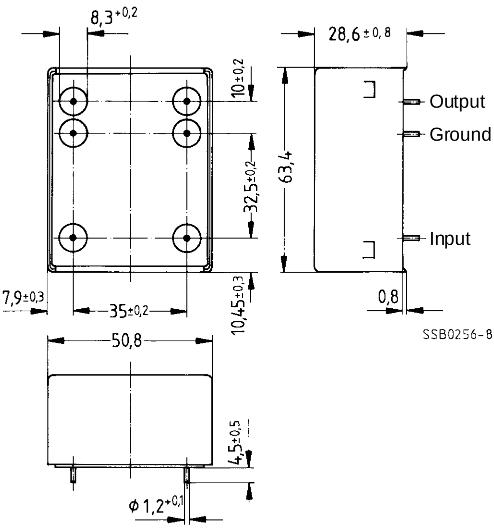
Case style K



Case style L



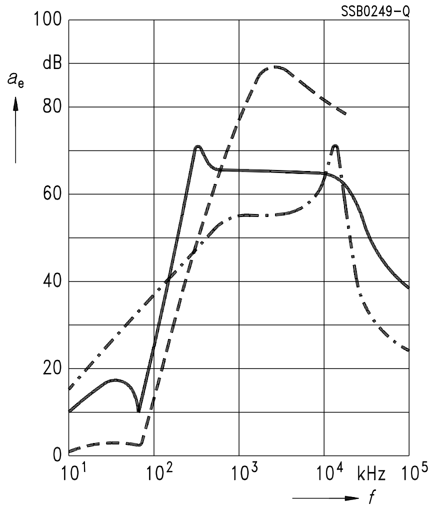
Case style P



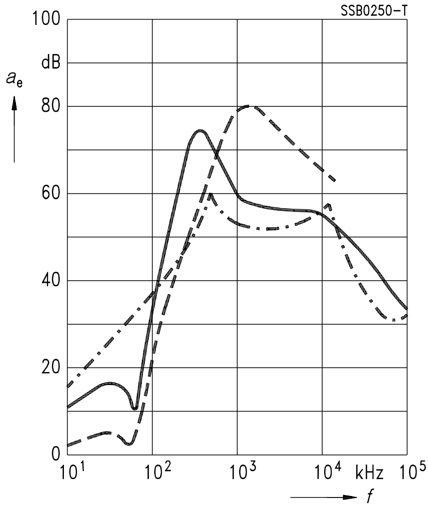
Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated
–·–·–·–·– asymmetrical, all branches in parallel (common mode)
– – – – – – – – symmetrical (differential mode)

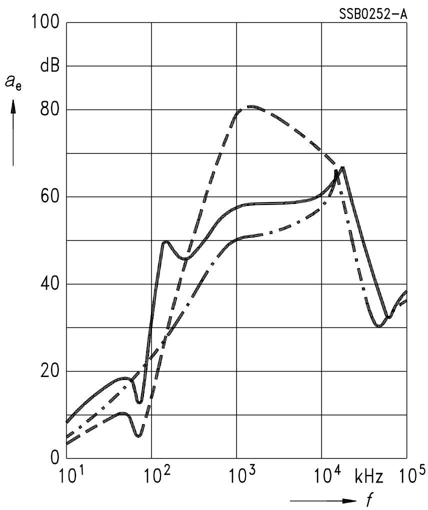
B84112-B-*10
B84112-B-*20



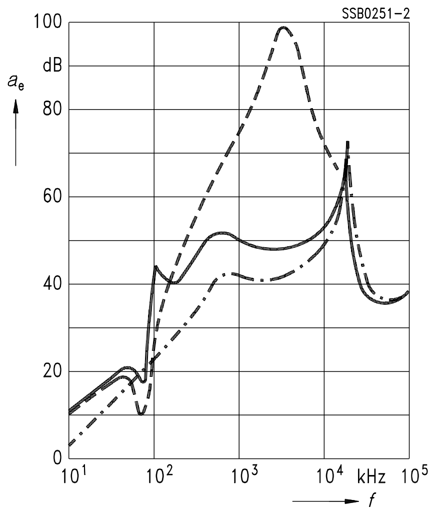
B84112-B-*30

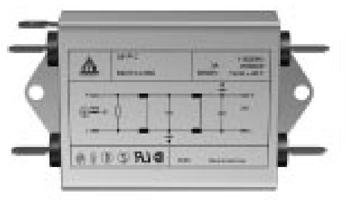


B84112-B-*60
B84112-B-*110



B84112-B-*120





SIFI-C for very high attenuation
Rated voltage 250 Vac, 50/60 Hz
Rated current 3 A to 10 A

Construction

- Two-line filter
- Aluminum case

Features

- Compact design
- Low leakage current
- All relevant marks of confomity
- Cost-optimized construction

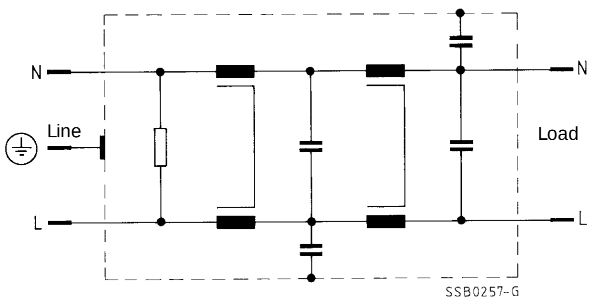
Applications

- Switch-mode power supplies in
  – industrial electronics
  – telecommunications
  – data systems
  – medical engineering

Terminals

Various terminal styles
depending on case styles A, B, K, L

Circuit diagram



Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 0,5 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

I_R A	C_R	L_R	Case style	Appr. weight g	Ordering code	Approvals 565-3					
3	2 × 0,47 µF (X2) + 2 × 4700 pF (Y2)	4 × 4,7 mH	A	210	B84113-C-A30	×	×	×	×	×	×
			B	210	B84113-C-B30	×	×	×	×	×	×
			K	270	B84113-C-K30	×	×	×	×	×	×
			L	210	B84113-C-L30	×	×	×	×	×	×
6	2 × 0,47 µF (X2) + 2 × 4700 pF (Y2)	4 × 4,7 mH	A	510	B84113-C-A60	×	×	×	×	×	×
			B	510	B84113-C-B60	×	×	×	×	×	×
			L	510	B84113-C-L60	×	×	×	×	×	×
10	2 × 0,47 µF (X2) + 2 × 4700 pF (Y2)	4 × 3,6 mH	A	690	B84113-C-A110	×	×	×	×	×	×
			B	690	B84113-C-B110	×	×	×	×	×	×
			L	690	B84113-C-L110	×	×	×	×	×	×

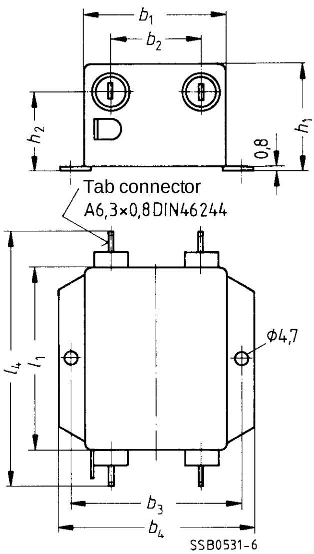
× = mark of conformity granted

Case styles and dimensions

Case style	Ordering code B84113-	Dimensions in mm b_1	b_2	b_3	b_4	l_1	l_2	l_3	l_4	h_1	h_2	Litz mm²	Style 1015
A	-C-A30	50,8	31,5	60,4	70	63,5	—	—	89,5	38,1	28	—	—
B	-C-B30	50,8	31,5	—	—	63,5	74,7	84,5	89,5	38,1	28	—	—
K	-C-K30	50,8	—	—	—	63,5	—	—	—	38	—	—	—
L	-C-L30	50,8	—	—	—	63,5	74,7	84,5	—	38,1	—	0,82	AWG18
A	-C-A60	See outline drawing											
B	-C-B60	See outline drawing											
L	-C-L60	50,8	—	—	—	133	142,9	153	—	44,5	—	0,82	AWG18
A	-C-A110	See outline drawing											
B	-C-B110	See outline drawing											
L	-C-L110	50,8	—	—	—	133	142,9	153	—	44,5	—	1,35	AWG16

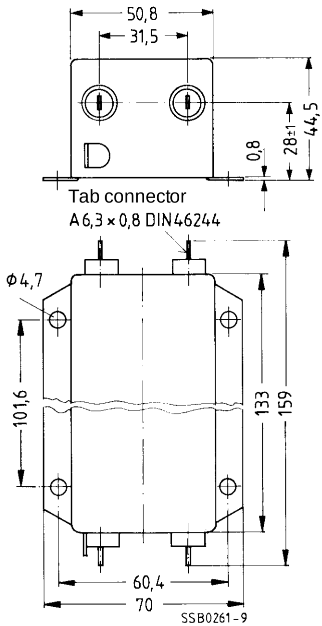
Case style A

B84113-C-A30



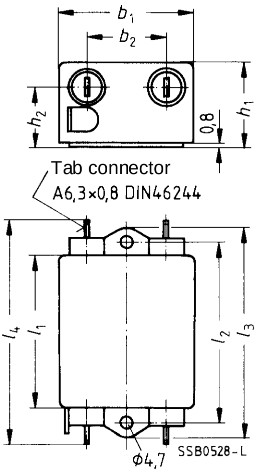
Case style A

B84113-C-A60
B84113-C-A110



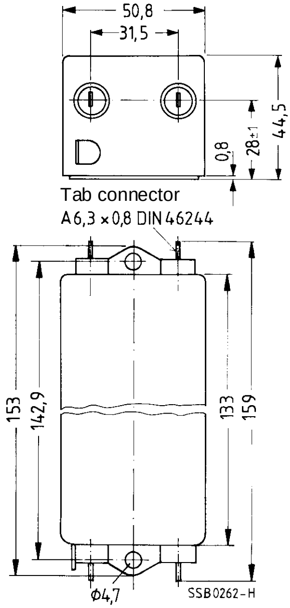
Case style B

B84113-C-B30

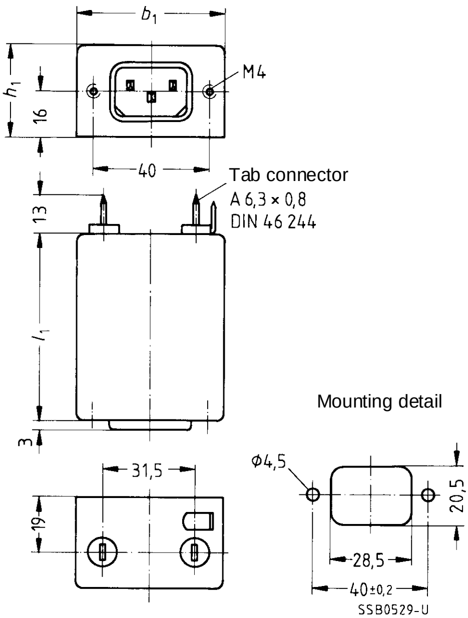


Case style B

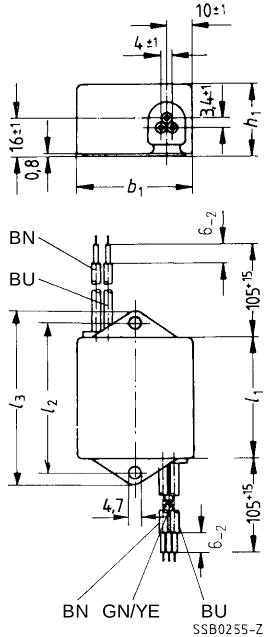
B84113-C-B60
B84113-C-B110



Case style K



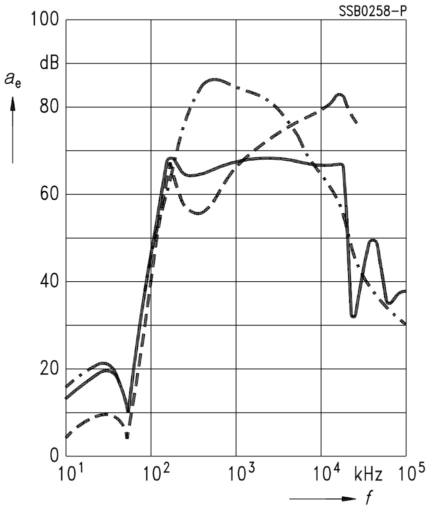
Case style L



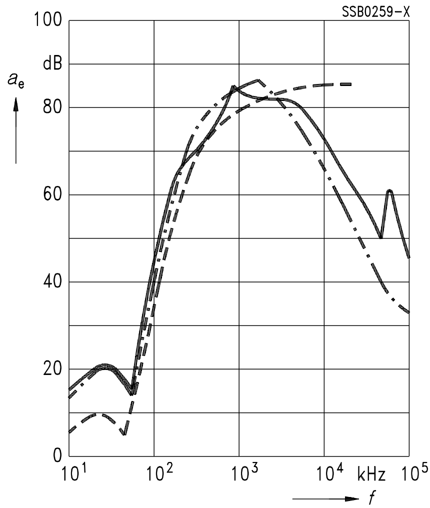
Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated
– · – · – · – · – asymmetrical, all branches in parallel (common mode)
– – – – – – – – symmetrical (differential mode)

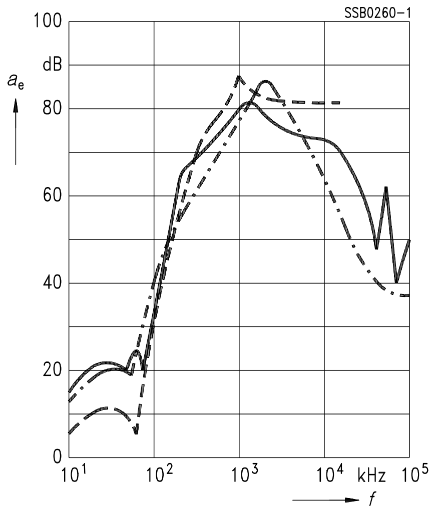
B84113-C-⁎30



B84113-C-⁎60



B84113-C-⁎110



SIFI-D for high attenuation
Rated voltage 250 Vac, 50/60 Hz
Rated current 1 A to 10 A

Construction

- Two-line filter
- Aluminum case

Features

- Compact design
- Low leakage current
- All relevant marks of confomity
- Cost-optimized construction

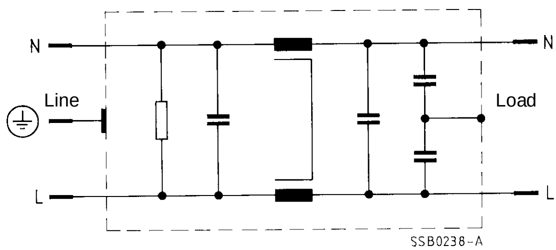
Applications

- Switch-mode power supplies in
  – industrial electronics
  – telecommunications
  – data systems
  – medical engineering

Terminals

Various terminal styles
depending on case styles A, B, K, L

Circuit diagram



Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 0,5 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

I_R A	C_R	L_R	Case style	Appr. weight g	Ordering code	Approvals 565-3					
1	2 × 0,47 µF (X2)	2 × 5,6 mH	A	150	B84114-D-A10	×	×	×	×	×	×
	+		B	150	B84114-D-B10	×	×	×	×	×	×
	2 × 4700 pF (Y2)		K	210	B84114-D-K10	×	×	×	×	×	×
			L	150	B84114-D-L10	×	×	×	×	×	×
2	2 × 0,47 µF (X2)	2 × 5,6 mH	A	150	B84114-D-A20	×	×	×	×	×	×
	+		B	150	B84114-D-B20	×	×	×	×	×	×
	2 × 4700 pF (Y2)		L	150	B84114-D-L20	×	×	×	×	×	×
3	2 × 0,47 µF (X2)	2 × 5,6 mH	A	150	B84114-D-A30	×	×	×	×	×	×
	+		B	150	B84114-D-B30	×	×	×	×	×	×
	2 × 4700 pF (Y2)		K	210	B84114-D-K30	×	×	×	×	×	×
			L	150	B84114-D-L30	×	×	×	×	×	×
6	2 × 0,47 µF (X2)	2 × 4,7 mH	A	230	B84114-D-A60	×	×	×	×	×	×
	+		B	230	B84114-D-B60	×	×	×	×	×	×
	2 × 4700 pF (Y2)		K	290	B84114-D-K60	×	×	×	×	×	×
			L	230	B84114-D-L60	×	×	×	×	×	×
10	2 × 0,68 µF (X2)	2 × 4,7 mH	A	420	B84114-D-A110	×	×	×	×	×	×
	+		B	420	B84114-D-B110	×	×	×	×	×	×
	2 × 4700 pF (Y2)		L	420	B84114-D-L110	×	×	×	×	×	×

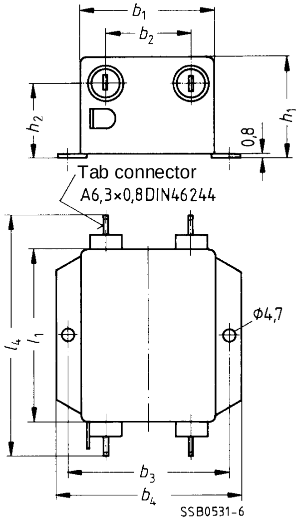
× = mark of conformity granted

Case styles and dimensions

Case style	Ordering code B84114-	Dimensions in mm b_1	b_2	b_3	b_4	l_1	l_2	l_3	l_4	h_1	h_2	Litz mm^2	Style 1015
A	-D-A10	50,8	31,5	60,4	70	63,5	—	—	89,5	28,6	20	—	—
B	-D-B10	50,8	31,5	—	—	63,5	74,7	84,5	89,5	28,6	20	—	—
K	-D-K10	50,8	—	—	—	79,5	—	—	—	32	—	—	—
L	-D-L10	50,8	—	—	—	63,5	74,7	84,5	—	28,6	—	0,82	AWG18
A	-D-A20	50,8	31,5	60,4	70	63,5	—	—	89,5	28,6	20	—	—
B	-D-B20	50,8	31,5	—	—	63,5	74,7	84,5	89,5	28,6	20	—	—
L	-D-L20	50,8	—	—	—	63,5	74,7	84,5	—	28,6	—	0,82	AWG18
A	-D-A30	50,8	31,5	60,4	70	63,5	—	—	89,5	28,6	20	—	—
B	-D-B30	50,8	31,5	—	—	63,5	74,7	84,5	89,5	28,6	20	—	—
K	-D-K30	50,8	—	—	—	79,5	—	—	—	32	—	—	—
L	-D-L30	50,8	—	—	—	63,5	74,7	84,5	—	28,6	—	0,82	AWG18
A	-D-A60	50,8	31,5	60,4	70	75,5	—	—	101,5	31,8	20	—	—
B	-D-B60	50,8	31,5	—	—	75,5	87,1	97	101,5	31,8	20	—	—
K	-D-K60	50,8	—	—	—	92,5	—	—	—	32	—	—	—
L	-D-L60	50,8	—	—	—	75,5	87,1	97	—	31,8	—	0,82	AWG18
A	-D-A110	See outline drawing											
B	-D-B110	See outline drawing											
L	-D-L110	50,8	—	—	—	92	103,1	113	—	44,5	—	1,35	AWG16

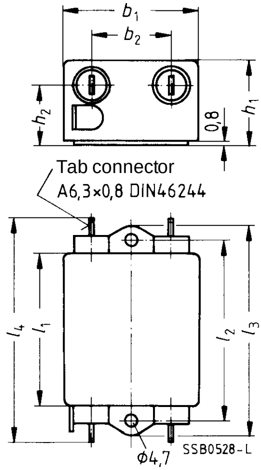
Case style A

B84114-D-A10 … B84114-D-A60

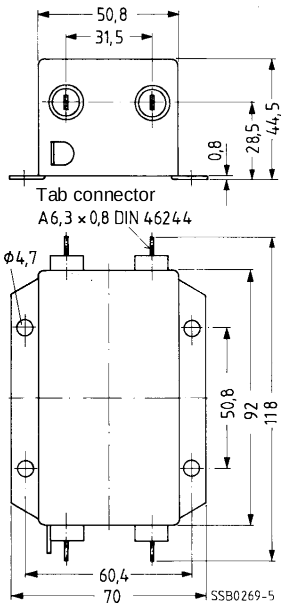


Case style B

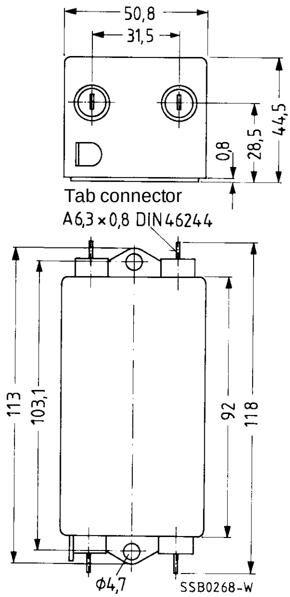
B84114-D-B10 … B84114-D-B60



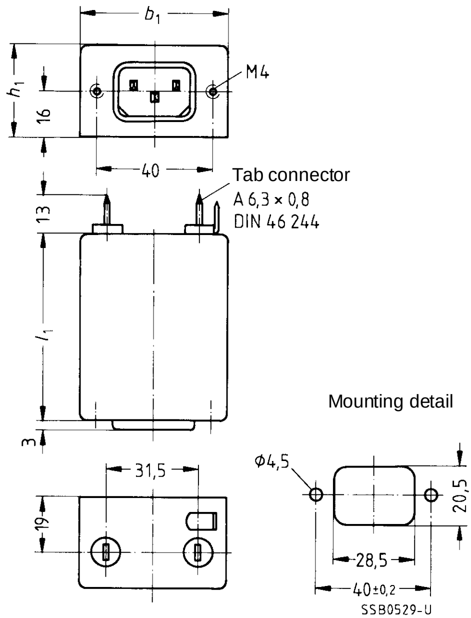
B84114-D-A110



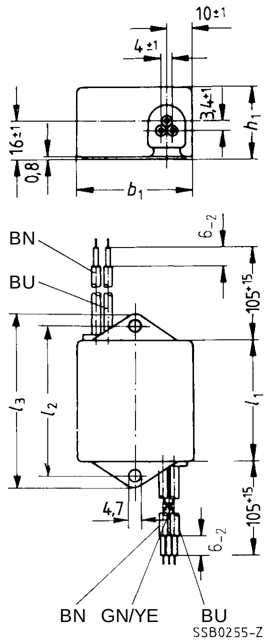
B84114-D-B110



Case style K



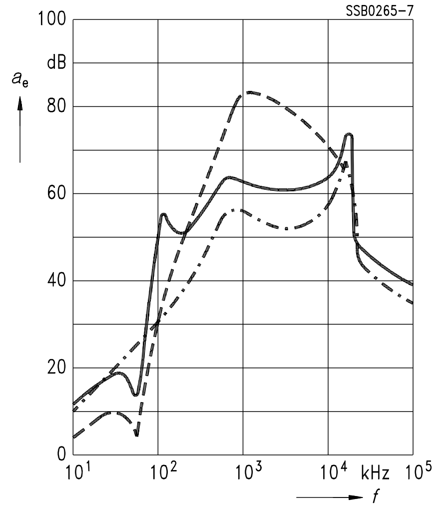
Case style L



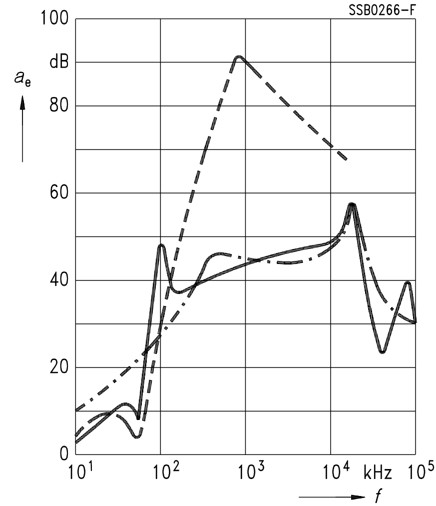
Insertion loss (typical values at Z = 50 Ω)

————————	unsymmetrical, adjacent branches terminated
– · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

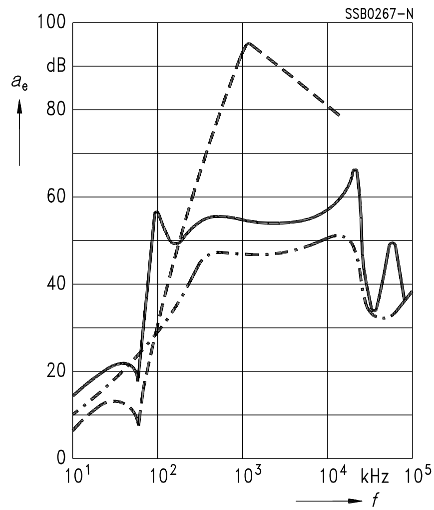
B84114-D-⁎10 ... B84114-D-⁎30

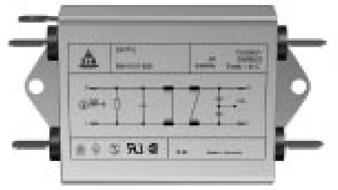


B84114-D-⁎60



B84114-D-⁎110





SIFI-E for very high attenuation
Rated voltage 250 Vac, 50/60 Hz
Rated current 3 A to 10 A

Construction

- Two-line filter
- Aluminum case

Features

- Compact design
- Very high insertion loss, even in the range below 100 kHz
- Low leakage current
- All relevant marks of confomity
- Cost-optimized construction

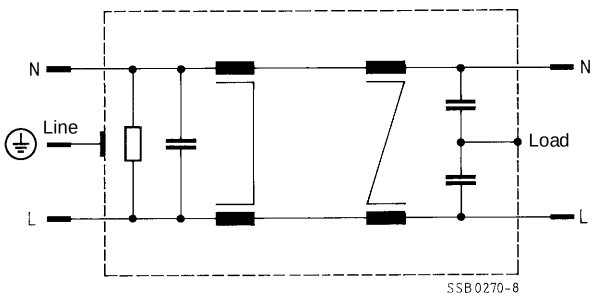
Applications

- Switch-mode power supplies in
  – industrial electronics
  – telecommunications
  – data systems
  – medical engineering

Terminals

Various terminal styles
depending on case styles A, B, K

Circuit diagram



Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 0,5 mA at 250 Vac, 50 Hz (for I_R = 3 A) < 3,5 mA at 250 Vac, 50 Hz (for I_R > 6 A)
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

I_R A	C_R	L_R	Cas style	Appr. weight g	Ordering code	Approvals 565-3				
3	0,47 µF (X2)	2 × 270 µH	A	210	B84115-E-A30	×	×	×	×	×
	+	+	B	210	B84115-E-B30	×	×	×	×	×
	2 × 4700 pF (Y2)	2 × 16 mH	K	270	B84115-E-K30	×	×	×	×	×
6	0,47 µF (X2)	2 × 100 µH	A	510	B84115-E-A60	×	×	×	×	×
	+	+	B	510	B84115-E-B60	×	×	×	×	×
	2 × 22 nF (Y2)	2 × 4,7 mH	K	510	B84115-E-K60	×	×	×	×	×
10	0,47 µF (X2)	2 × 47 µH	A	690	B84115-E-A110	×	×	×	×	×
	+	+	B	690	B84115-E-B110	×	×	×	×	×
	2 × 22 nF (Y2)	2 × 3,6 mH								

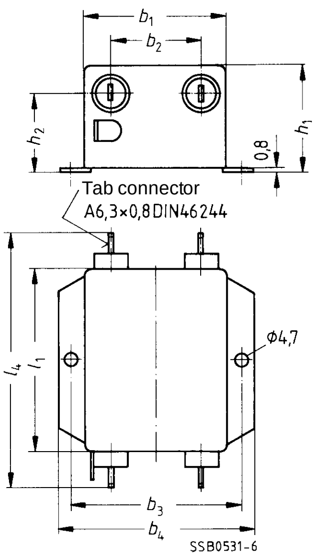
× = mark of conformity granted

Case styles and dimensions

Case style	Ordering code	Dimensions in mm									
		b_1	b_2	b_3	b_4	l_1	l_2	l_3	l_4	h_1	h_2
A	B84115-E-A30	50,8	31,5	60,4	70	63,5	—	—	89,5	38,1	28
B	B84115-E-B30	50,8	31,5	—	—	63,5	74,7	84,5	89,5	38,1	28
K	B84115-E-K30	50,8	—	—	—	79,5	—	—	—	38	—
A	B84115-E-A60	See outline drawing									
B	B84115-E-B60	See outline drawing									
K	B84115-E-K60	See outline drawing									
A	B84115-E-A110	See outline drawing									
B	B84115-E-B110	See outline drawing									

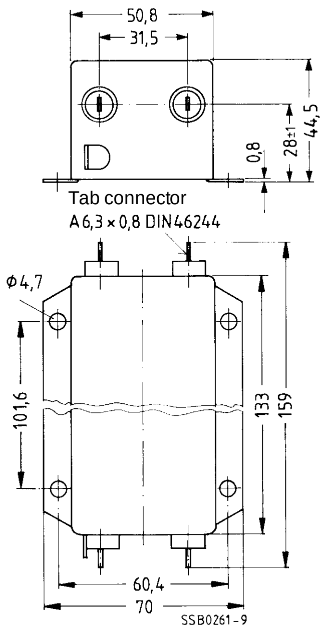
Case style A

B84115-E-A30



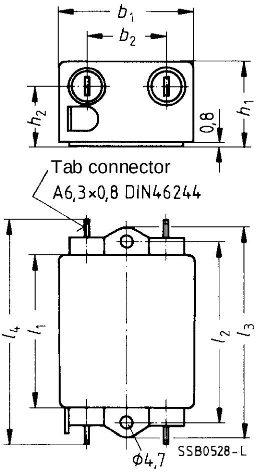
Case style A

B84115-E-A60
B84115-E-A110



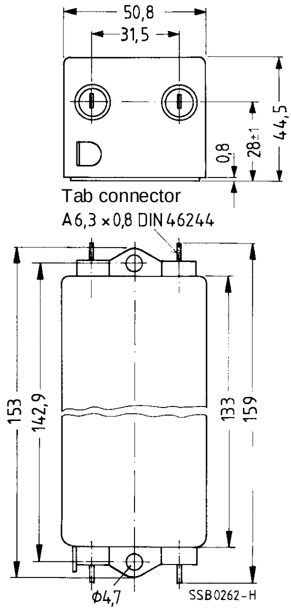
Case style B

B84115-E-B30



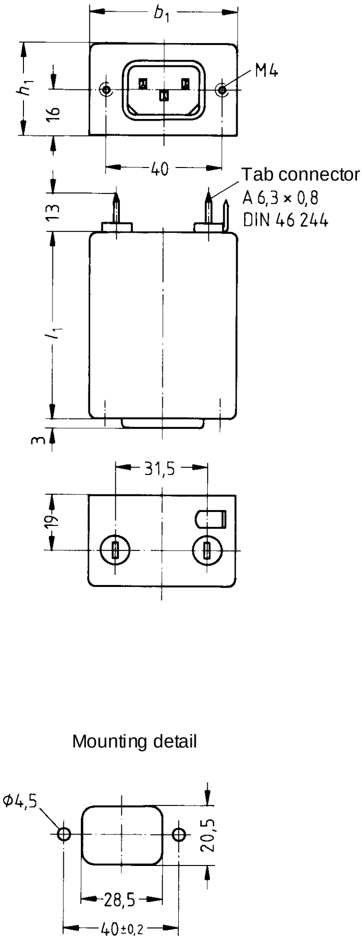
Case style B

B84115-E-B60
B84115-E-B110



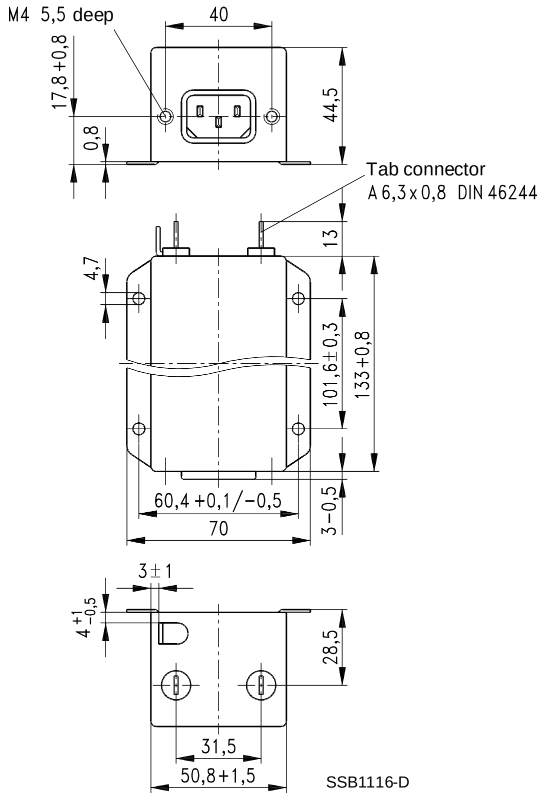
Case style K

B84115-E-K30



Case style K

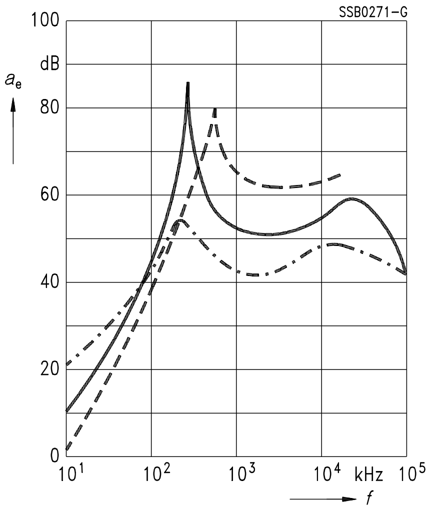
B84115-E-K60



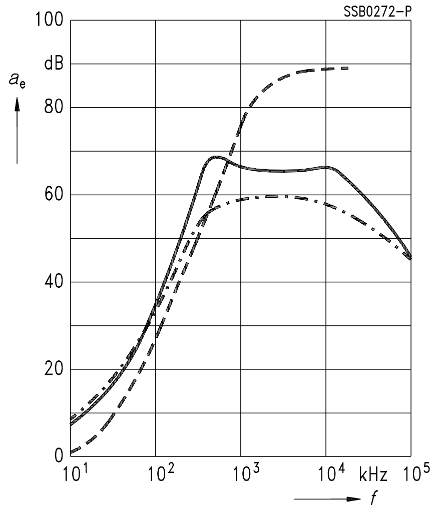
Insertion loss (typical values at Z = 50 Ω)

————————	unsymmetrical, adjacent branches terminated
– · – · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

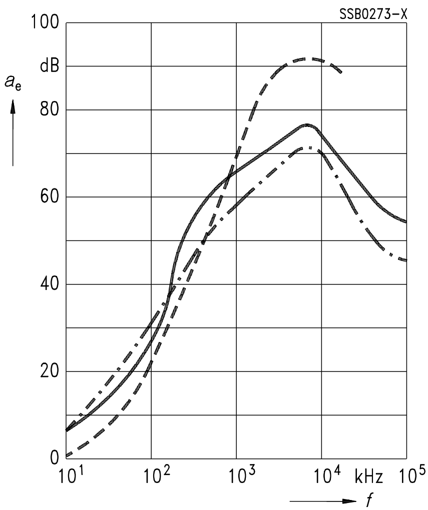
B84115-E-∗30

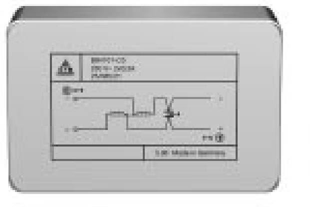


B84115-E-∗60



B84115-E-∗110





Power line filters for single-phase systems
Rated voltage 250 Vdc/250 Vac, 50/60 Hz
Rated current 0,5 to 6 A

Construction

- Cable clamps for strain relief on load side and line side
- Shock-hazard protection by metal cover
- Filter comprises I core double choke (as per VDE 0565-2) and broadband multiple-section capacitor (as per VDE 0565-1)

Features

- High insertion loss

Applications

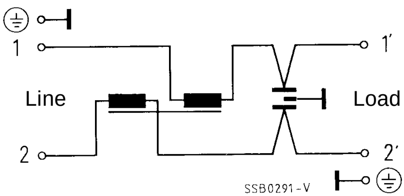
- Industrial equipment and small-size systems

Terminals

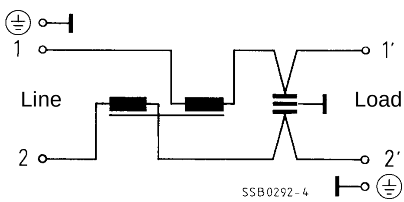
- Safe-to-touch terminal blocks

Circuit diagrams

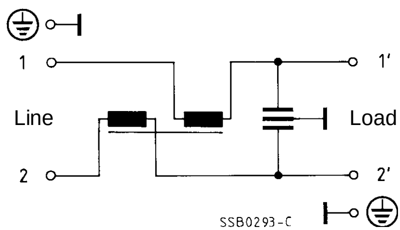
B84101-C10 … -C60



B84101-C140, -C150



B84101-C180



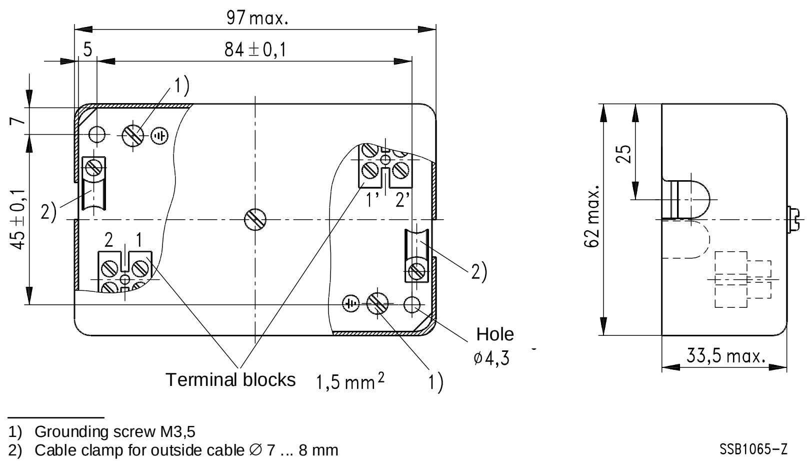
Technical data

Rated voltage V_R	250 Vdc/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1650 Vdc, 2 s, (line/line) 2700 Vdc, 2 s, (lines/case)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)
Weight	approx. 300 g

Characteristics and ordering codes

I_R A	C_R	L_R	I_{leak} mA	Ordering code
0,5 1 2	0,1 µF (X1) + 2 × 2500 pF (Y2)	2 × 15 mH 2 × 3,9 mH 2 × 1,2 mH	< 0,5 < 0,5 < 0,5	B84101-C10 B84101-C20 B84101-C30
4	0,1 µF (X1) + 2 × 5000 pF (Y2)	2 × 220 µH	< 0,5	B84101-C60
2 4 6	2 × 0,035 µF (Y2)	2 × 1,2 mH 2 × 220 µH 2 × 82 µH	< 3,5 < 3,5 < 3,5	B84101-C140 B84101-C150 B84101-C180

Outline drawing



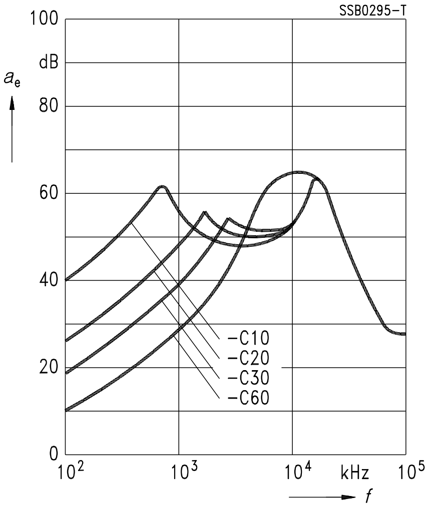
1) Grounding screw M3,5
2) Cable clamp for outside cable ∅ 7 ... 8 mm

Insertion loss (typical values at Z = 50 Ω)

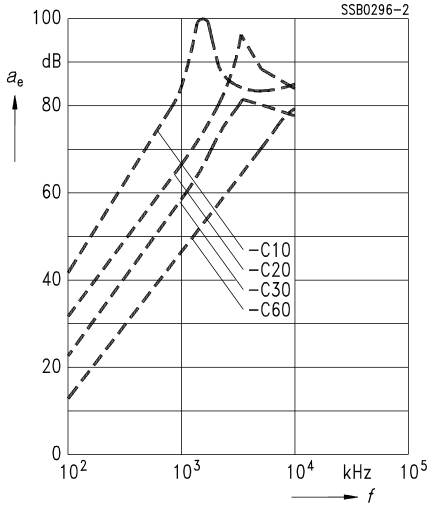
———————— unsymmetrical, adjacent branches terminated

– – – – – – – – symmetrical (differential mode)

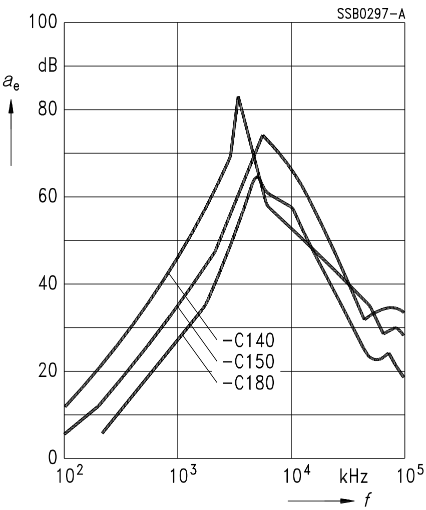
B84101-C10 … -C60



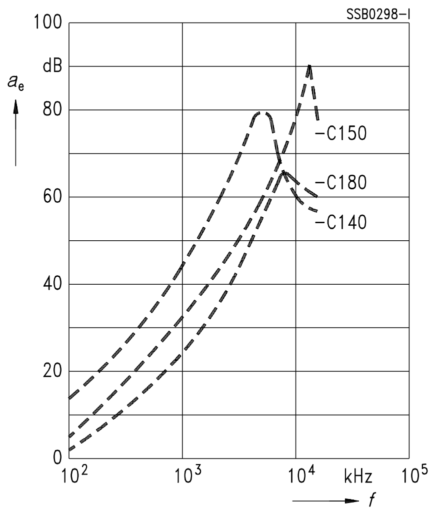
B84101-C10 … -C60



B84101-C140 … -C180



B84101-C140 … -C180



Power line filters for single-phase systems
Rated voltage 250 Vdc/250 Vac, 50/60 Hz
Rated current 0,5 to 4 A

Construction

- Plastic case
- Filter comprises I core double choke and broadband multiple-section capacitor

Features

- High insertion loss

Applications

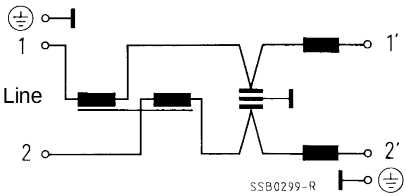
- Industrial equipment and small-size systems

Terminals

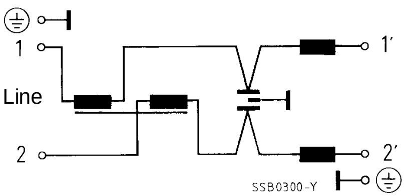
- Safe-to-touch terminal blocks

Circuit diagrams

B84102-C20 … -C50



B84102-C140, -C150



Technical data

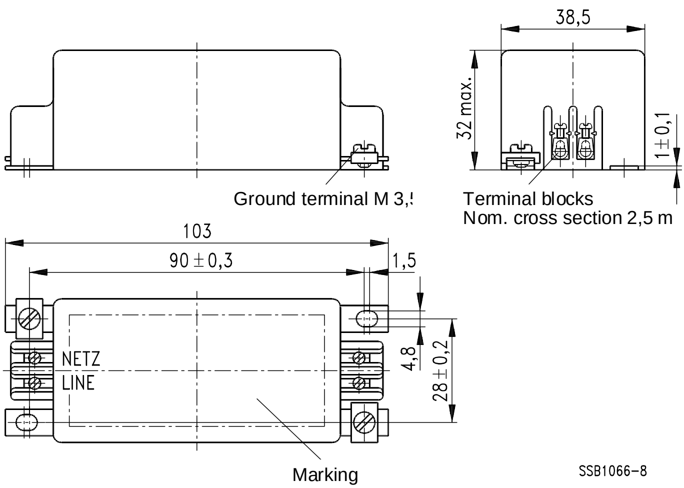
Rated voltage V_R	250 Vdc/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1650 Vdc, 2 s, (line/line) 2700 Vdc, 2 s, (lines/ground)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)
Weight	approx. 250 g

Characteristics and ordering codes

I_R A	C_R	L_R	I_{leak} mA	Ordering code	Approvals VDE 565-3
0,5	0,1 µF (X1)	2 × 13,5 mH, 2 × 14 µH	< 0,5	B84102-C20	×
1	+	2 × 3,1 mH, 2 × 8 µH	< 0,5	B84102-C30	×
2	2 × 2500 pF (Y2)	2 × 1,1 mH, 2 × 2 µH	< 0,5	B84102-C40	×
4		2 × 220 µH, 2 × 1 µH	< 0,5	B84102-C50	×
2	2 × 0,035 µF (Y2)	2 × 1,1 mH, 2 × 2 µH	< 3,5	B84102-C140	×
4		2 × 220 µH, 2 × 1 µH	< 3,5	B84102-C150	×

× = mark of conformity granted

Outline drawing

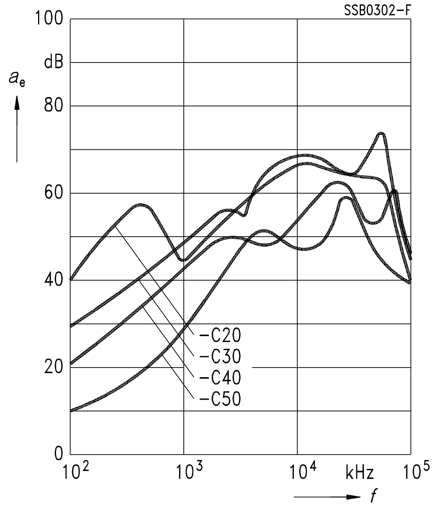


Insertion loss (typical values at Z = 50 Ω)

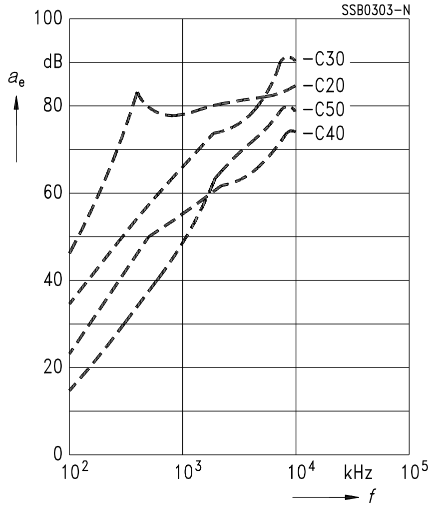
——————— unsymmetrical, adjacent branches terminated

– – – – – – – – symmetrical (differential mode)

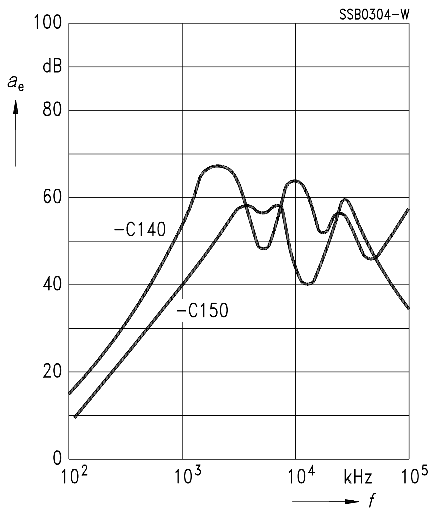
B84102-C20 … -C50



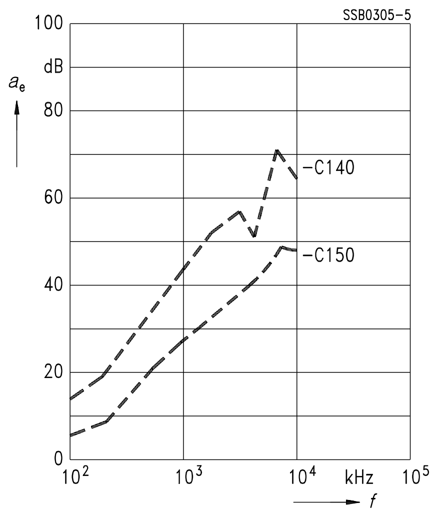
B84102-C20 … -C50

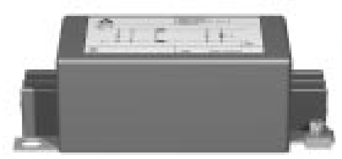


B84102-C140 … -C150



B84102-C140 … -C150





Power line filters for single-phase systems
Rated voltage 250 Vac, 50/60 Hz
Rated current 1 to 6 A

Construction

- Plastic case
- Filter comprises current-compensated choke

Features

- High insertion loss

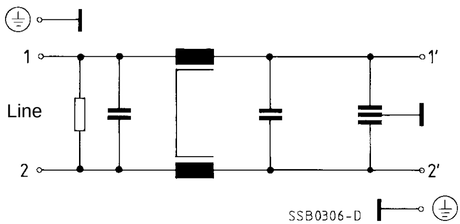
Applications

- Industrial equipment and small-size systems

Terminals

- Safe-to-touch terminal blocks

Circuit diagram



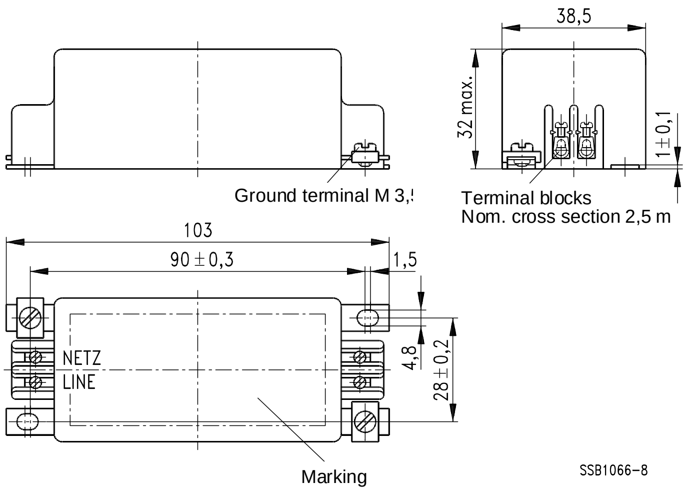
Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/ground)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days humidity test)
Weight	approx. 250 g

Characteristics and ordering codes

I_R A	C_R	L_R mH	I_{leak} mA	Ordering code
1	2 × 0,22 μF (X2) + 2 × 2500 pF (Y2)	2 × 18	< 0,5	B84102-K30
2	2 × 0,33 μF (X2) + 2 × 2500 pF (Y2)	2 × 10	< 0,5	B84102-K40
4	2 × 0,47 μF (X2) + 2 × 2500 pF (Y2)	2 × 4,7	< 0,5	B84102-K50
6	2 × 0,47 μF (X2) + 2 × 0,035 μF (Y2)	2 × 2,2	< 3,5	B84102-K160

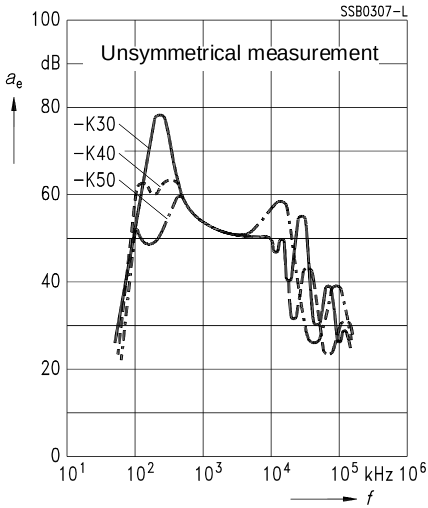
Outline drawings



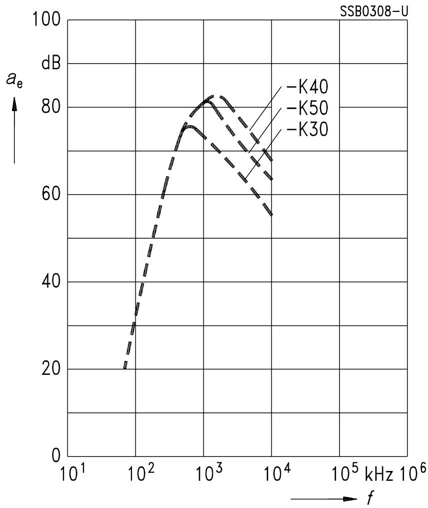
Insertion loss (typical values at Z = 50 Ω)

——————— unsymmetrical, adjacent branches terminated
– – – – – – – – – symmetrical (differential mode)

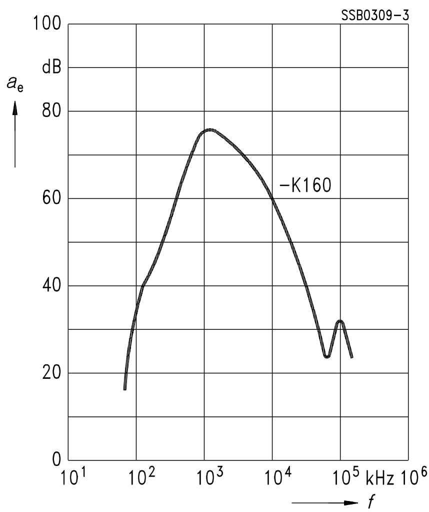
B84102-K30 … -K50



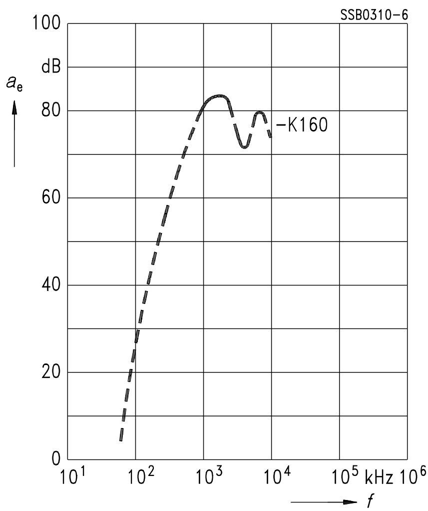
B84102-K30 … -K50



B84102-K160



B84102-K160



Power line filters for single-phase systems
Rated voltage 250 Vac, 50/60 Hz
Rated current 0,5 A to 6 A

Construction

- Two-line filter
- Plastic case

Features

- High insertion loss
- For PCB mounting
- Cost-effective solution

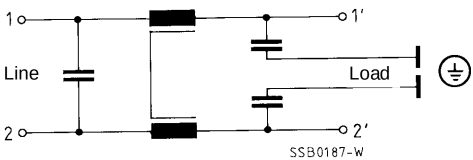
Applications

- Medium-performance switch-mode power supplies
- Data systems, gambling machines, small-size equipment

Terminals

- Pins fitting standard PCB grid

Circuit diagram



Technical data

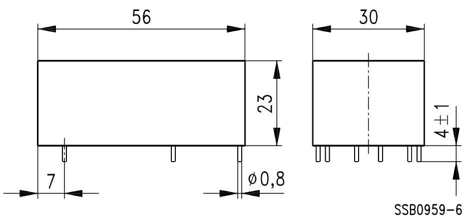
Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/ground)
Leakage current I_{leak}	< 0,5 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)
Weight	approx. 53 g

Characteristics and ordering codes

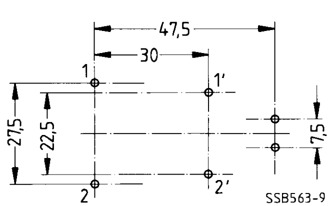
I_R	C_R	L_R	Ordering code	Approvals		
A				565-3		
0,5	0,25 µF (X2)	2 × 39 mH	B84110-A-A5	×	×	×
1	+	2 × 10 mH	B84110-A-A10	×	×	×
2	2 × 4700 pF (Y2)	2 × 5,6 mH	B84110-A-A20	×	×	×
4		2 × 2,7 mH	B84110-A-A40	×	×	×
6		2 × 1,9 mH	B84110-A-A60	–	–	–

× = mark of conformity granted

Outline drawing



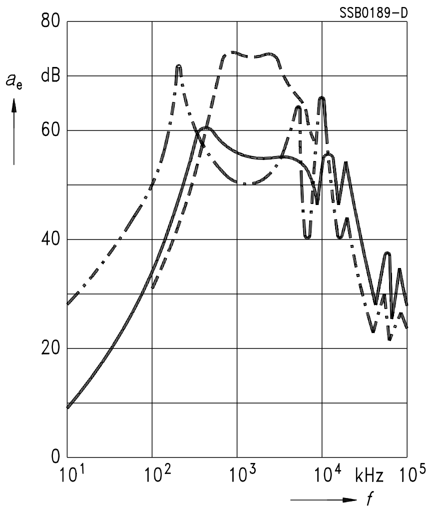
Mounting holes



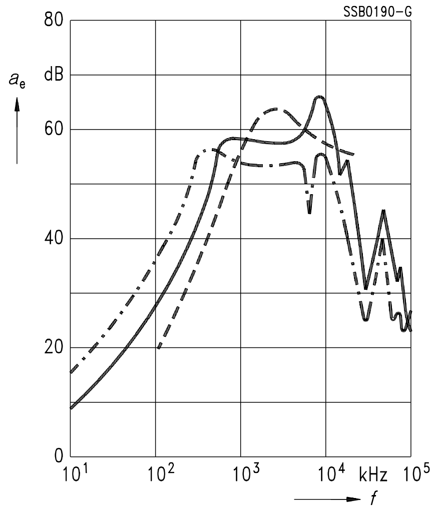
Insertion loss (typical values at $Z = 50\ \Omega$)

——————— unsymmetrical, adjacent branches terminated
– · – · – · – · – asymmetrical, all branches in parallel (common mode)
– – – – – – – – symmetrical (differential mode)

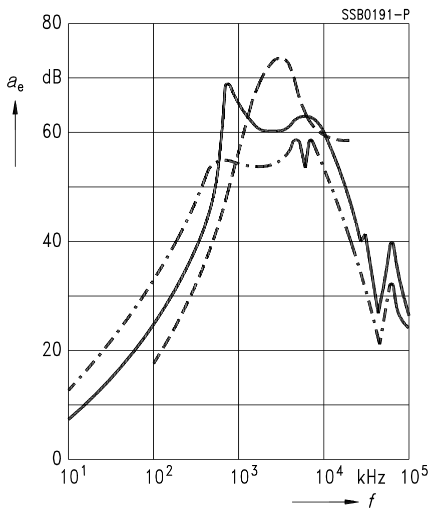
B84110-A-A5



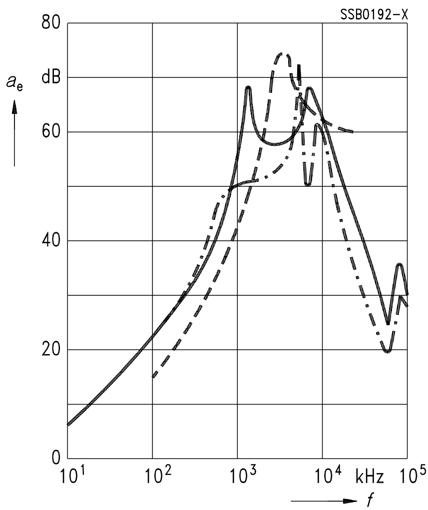
B84110-A-A10



B84110-A-A20



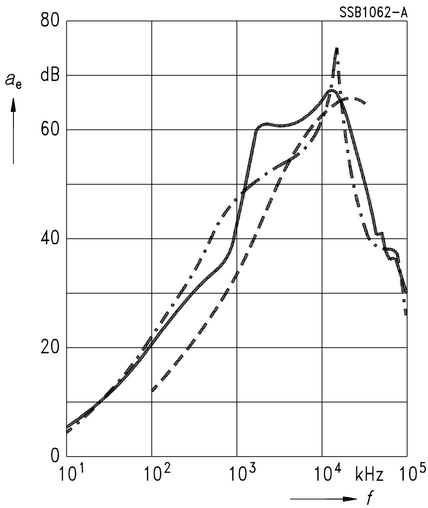
B84110-A-A40



Insertion loss (typical values at Z = 50 Ω)

————————	unsymmetrical, adjacent branches terminated
– · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

B84110-A-A60



Power line filter for single-phase systems
Rated voltage 250 Vac, 50/60 Hz
Rated current 1,4 A

Construction

- Two-line filter
- Plastic case

Features

- High insertion loss
- For PCB mounting
- Cost-effective solution

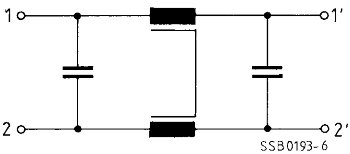
Applications

- Low-performance switch-mode power supplies
- TV sets
- Data systems, small-size equipment, industrial electronics

Terminals

- Pins fitting standard PCB grid

Circuit diagram



Technical data

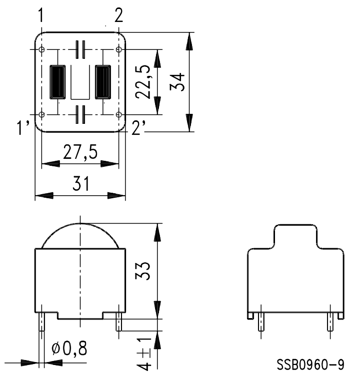
Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line)
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)
Weight	approx. 47 g

Characteristics and ordering codes

I_R A	C_R	L_R	Ordering code	Approvals VDE 565-3	S
1,4	2 × 0,15 µF (X2)	2 × 27 mH	B84110-B-A14	×	×

× = mark of conformity granted

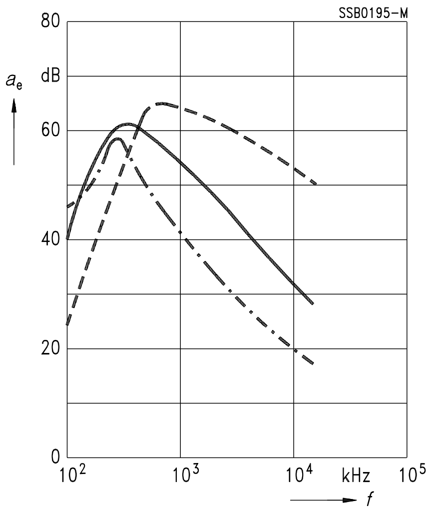
Outline drawing



Insertion loss (typical values at $Z = 50\ \Omega$)

————————	unsymmetrical, adjacent braches terminated
– · – · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

B84110-B-A14



Power line filters for single-phase systems
Rated voltage 250 Vac, 50/60 Hz
Rated current 1 to 6 A

Construction

- Filter with IEC connector, fuse holder and switch
- Appliance connector as per IEC 320
- Fuse holder 5 × 20 mm
- 2-pole disconnector

Features

- Enhanced symmetrical insertion loss
- For installation in instrument housings

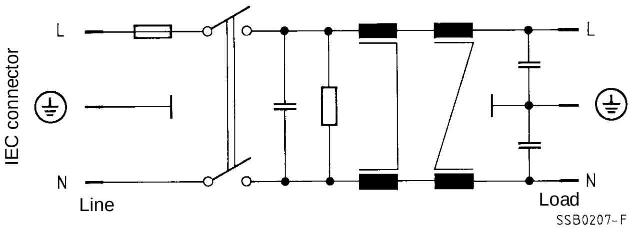
Applications

- Medium-performance switch-mode power supplies
- Industrial electronics
- Measuring instruments

Terminals

- Tab connector 6,3 mm at output

Circuit diagram



Technical data

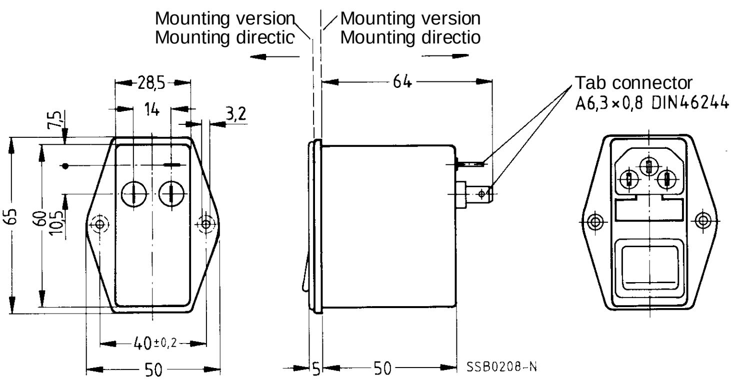
Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 1 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)
Weight	approx. 150 g

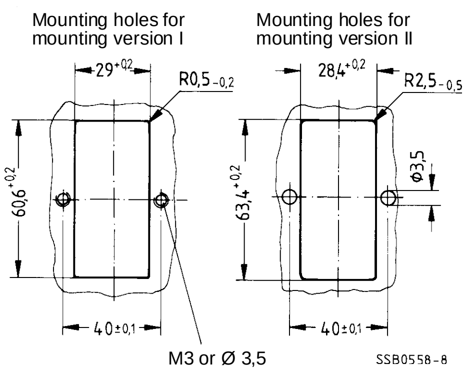
Characteristics and ordering codes

I_R A	C_R	L_R	Ordering code	Approvals 565-3		
1	0,33 µF (X2) + 2 × 10 nF (Y2)	2 × 9 mH + 2 × 270 µH	B84103-S1-A10	×	×	×
3	0,33 µF (X2) + 2 × 10 nF (Y2)	2 × 1,5 mH + 2 × 22 µH	B84103-S1-A30	×		×
6	0,33 µF (X2) + 2 × 10 nF (Y2)	2 × 0,47 mH + 2 × 8 µH	B84103-S1-A60	×		×

× = mark of conformity granted

Outline drawing

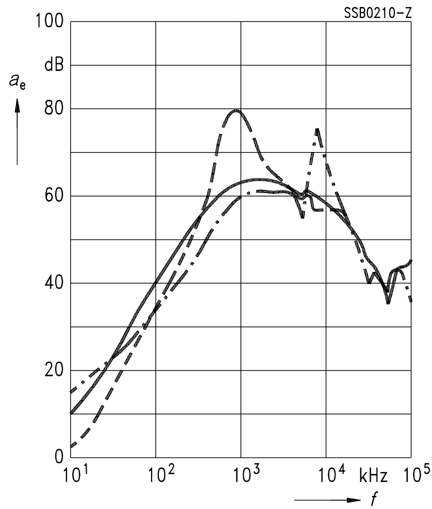




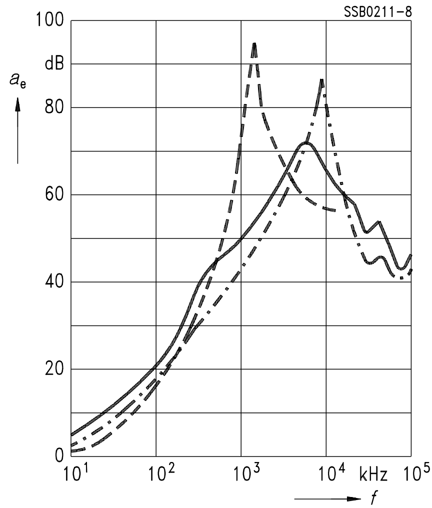
Insertion loss (typical values at Z = 50 Ω)

————————	unsymmetrical, adjacent branches terminated
– · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

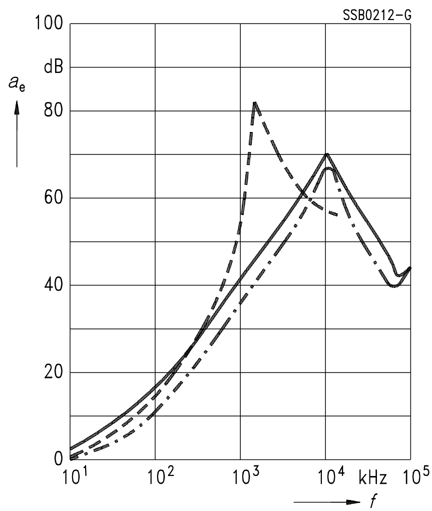
B84103-S1-A10



B84103-S1-A30



B84103-S1-A60



**Power line filters for single-phase systems
with additional LF suppression
Rated voltage 250 Vac, 50/60 Hz
Rated current 2 A to 36 A**

Construction

- Two-line filter
- Metal case
- Resin potting (UL 94 V-0)

Features

- Especially high symmetrical insertion loss from 20 kHz upwards
- Safe mounting by press-in nuts
- Space-saving construction

Applications

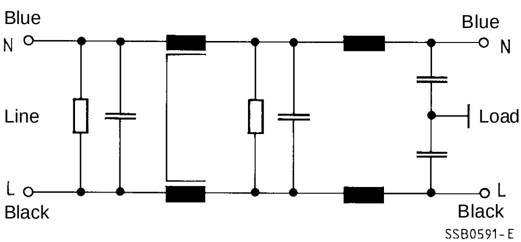
- Switch-mode power supplies for traction, safety systems, automation engineering
- Industrial electronics

Terminals

- Litz wires

Circuit diagram

Typical circuit



Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2830 Vdc, 2 s (lines/case)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

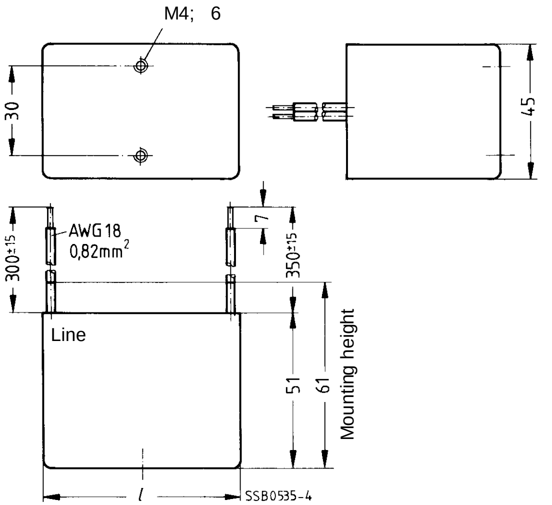
Characteristics and ordering codes

I_R A	R_{typ} mΩ	Approx. weight kg	I_{leak} mA	Ordering code	Approvals VDE 565-3	 UL
2	530	0,35	< 3,5	B84299-K61-C	×	
4	150	0,37	< 3,5	B84299-K62-C	×	
6	110	0,82	< 3,5	B84299-K63		×
10	50	1	< 3,5	B84299-K64-C		×
16	35	1,8	< 3,5	B84299-K65		
25	27	2,9	< 3,5	B84299-K66		
36	12	2,9	> 3,5	B84299-K67		

× = mark of conformity granted

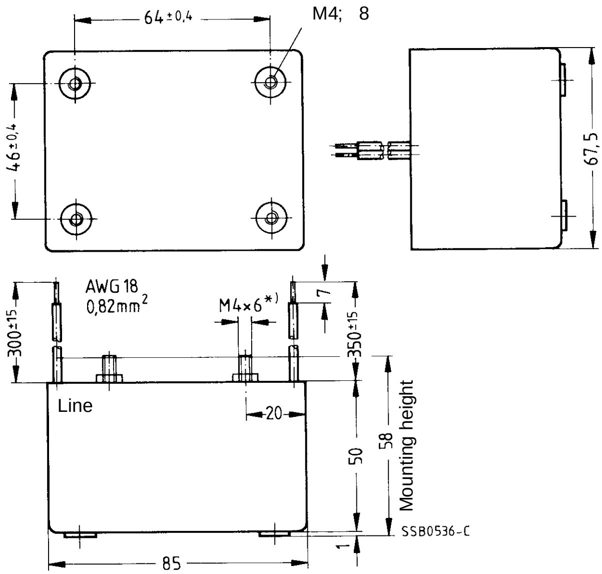
Outline drawings

B84299-K61-C, B84299-K62-C



Type	Length *l*
B84299-K61-C	65 mm
B84299-K62-C	75 mm

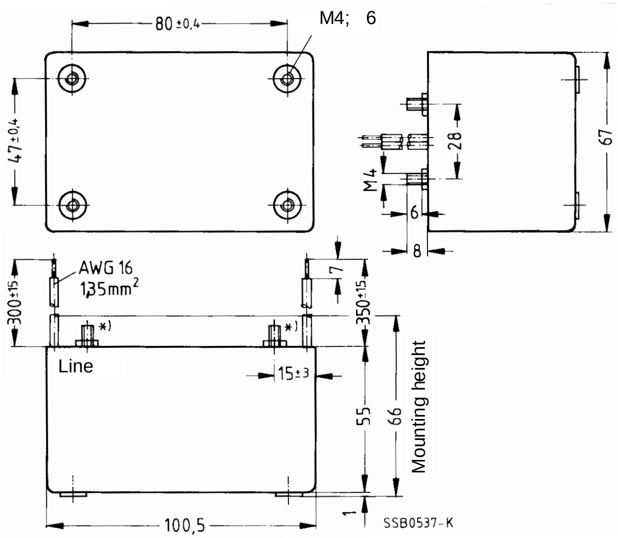
B84299-K63



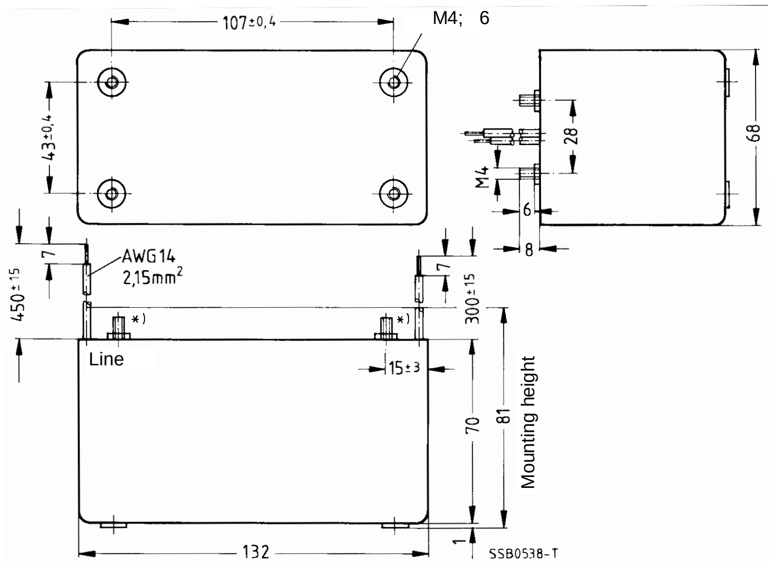
*) Ground terminal for shielding braid or fixing stud for cable clamp

Outline drawings

B84299-K64-C



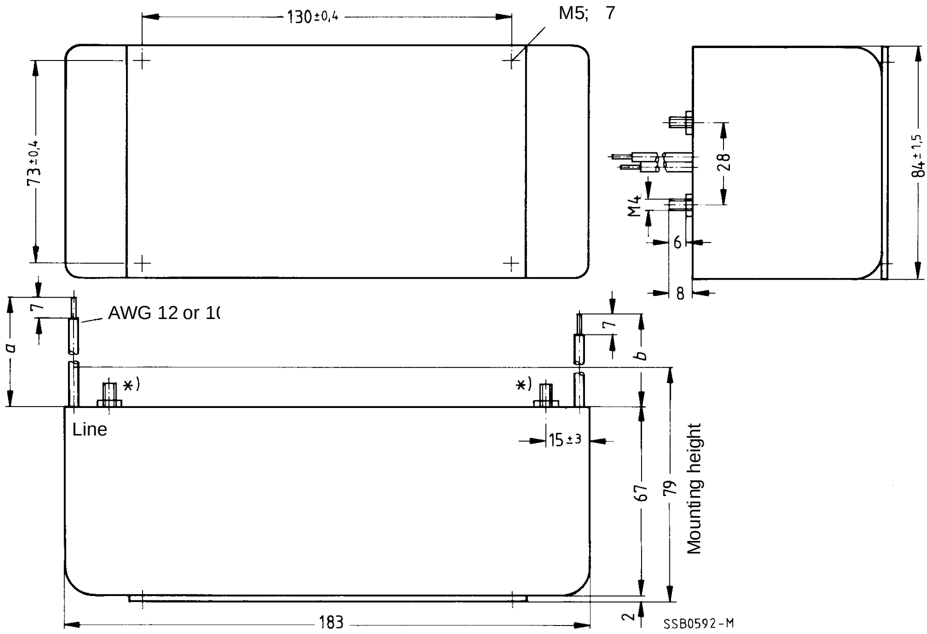
B84299-K65



*) Ground terminal for shielding braid or fixing stud for cable clamp

Outline drawing

B84299-K66, B84299-K67



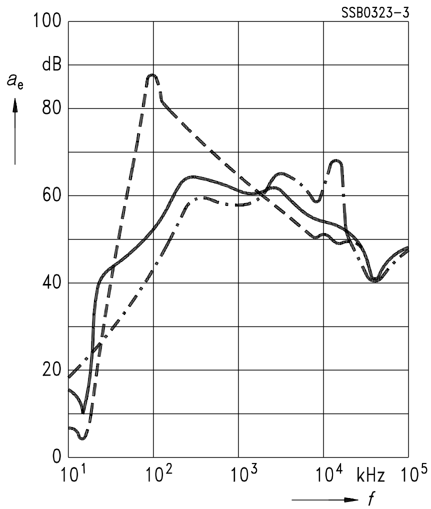
Type	Litz wire	Length *l* (mm)	
		a	*b*
B84299-K66	AWG 12; 3,44 mm^2	300 (line)	800
B84299-K67	AWG 10; 5,37 mm^2	240 (line)	800

*) Ground terminal for shielding braid or fixing stud for cable clamp

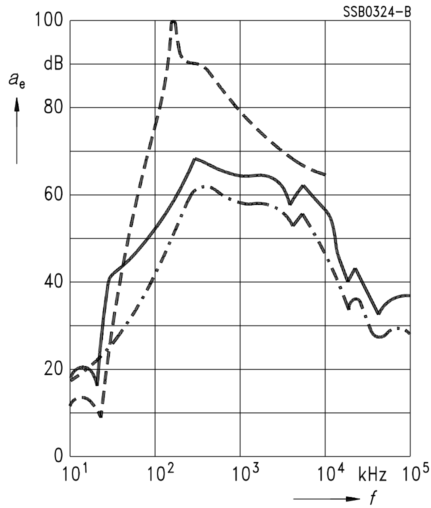
Insertion loss (typical values at Z = 50 Ω)

——————— unsymmetrical, adjacent branches terminated
– · – · – · – · – asymmetrical, all branches in parallel (common mode)
– – – – – – – – symmetrical (differential mode)

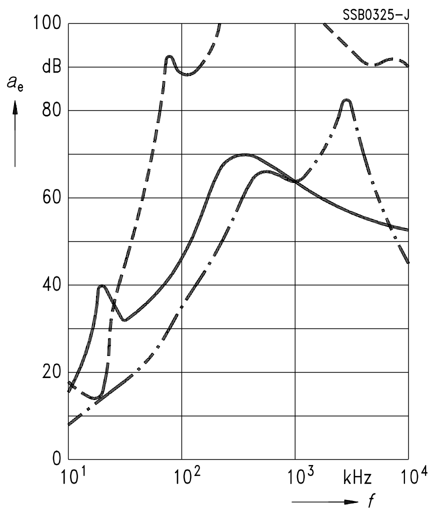
B84299-K61-C



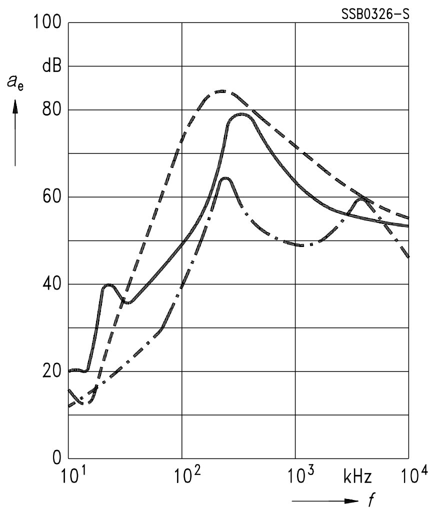
B84299-K62-C



B84299-K63



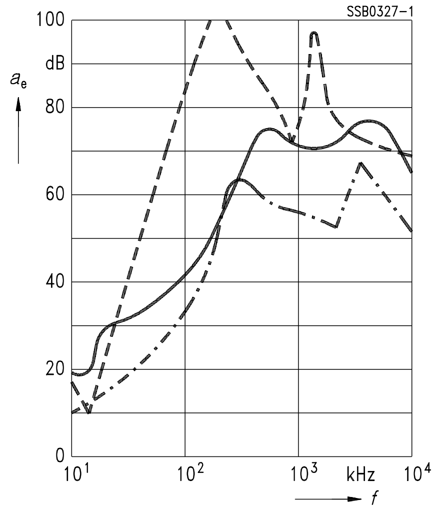
B84299-K64-C



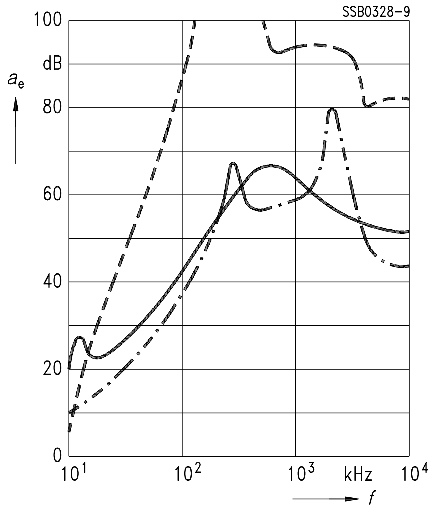
Insertion loss (typical values at Z = 50 Ω)

———— unsymmetrical, adjacent branches terminated
– · – · – · – asymmetrical, all branches in parallel (common mode)
– – – – – symmetrical (differential mode)

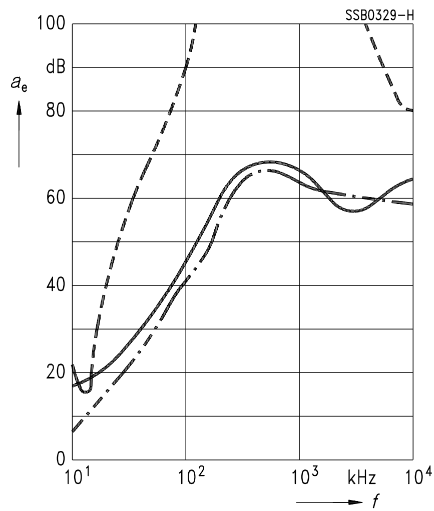
B84299-K65



B84299-K66



B84299-K67



Power line filters for single-phase systems
with additional VHF suppression
Rated voltage 250 Vac, 50/60 Hz
Rated current 10 to 25 A

Construction

- Two-line filter
- Metal case
- Screw-type cable gland for strain relief on line side, edge protector on load side
- Feed-through capacitors

Features

- High insertion loss up to the GHz range

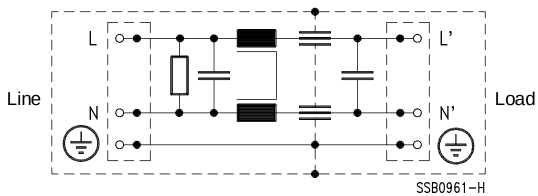
Applications

- Power supplies for medical equipment and industrial installations

Terminals

- Safe-to-touch terminal blocks

Circuit diagram



Typical circuit taking the example of B84299-K21-E

Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

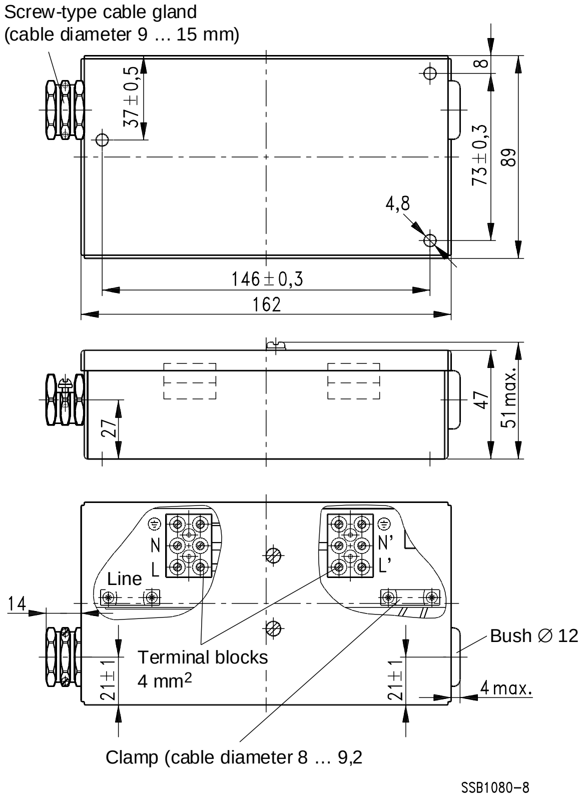
Characteristics and ordering codes

I_r A	Terminal cross sect. mm^2	Approx. weight kg	I_{leak} mA	Ordering code	Approvals SEV	 UR	 CSA
10	4	1	< 3,5	B84299-K21-E	×	×	×
25	4	1,8	< 3,5	B84299-K26			

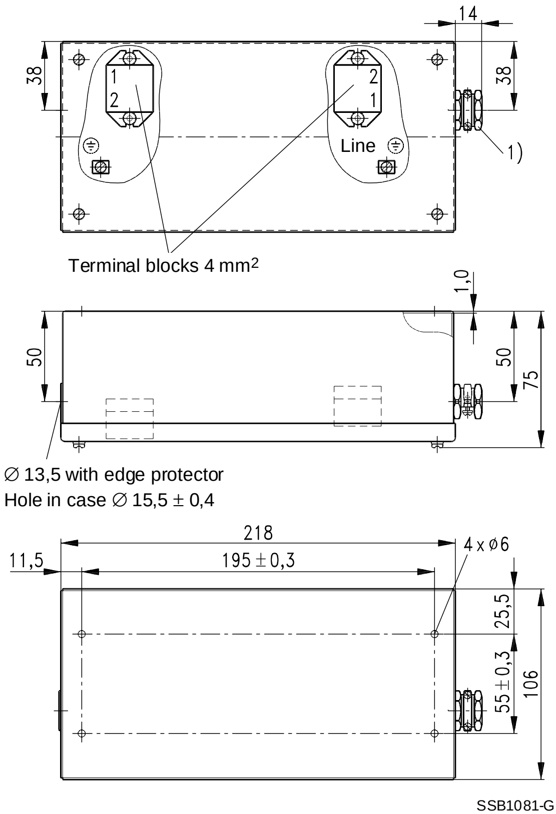
× = mark of conformity granted

Outline drawings

B84299-K21-E



B84299-K26

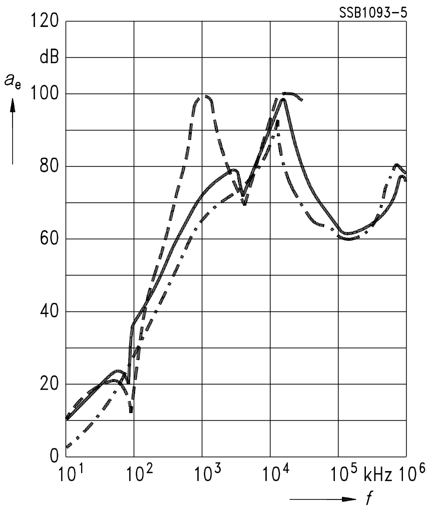


1) Screw-type cable gland PG9, for cable diameter 8 … 12,5 mm

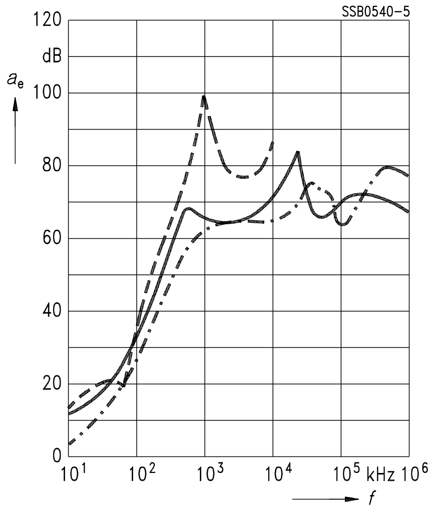
Insertion loss (typical values at Z = 50 Ω)

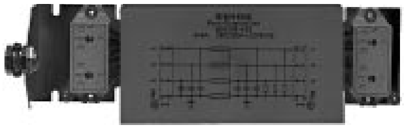
————————	unsymmetrical, adjacent branches terminated
– · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

B84299-K21-E



B84299-K26





Power line filters for three-phase systems
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 4 × 6 A to 4 × 50 A

Construction

- Four-line filter
- Plastic case or
  metal case

Features

- High insertion loss

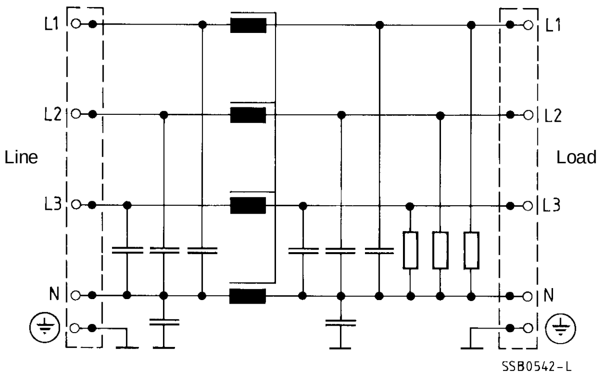
Applications

- Power supplies for
  - industrial installations,
  - knitting machines,
  - data systems,
  - medical equipment

Terminals

- Safe-to-touch terminal blocks

Circuit diagram



Technical data

Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 3,5 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

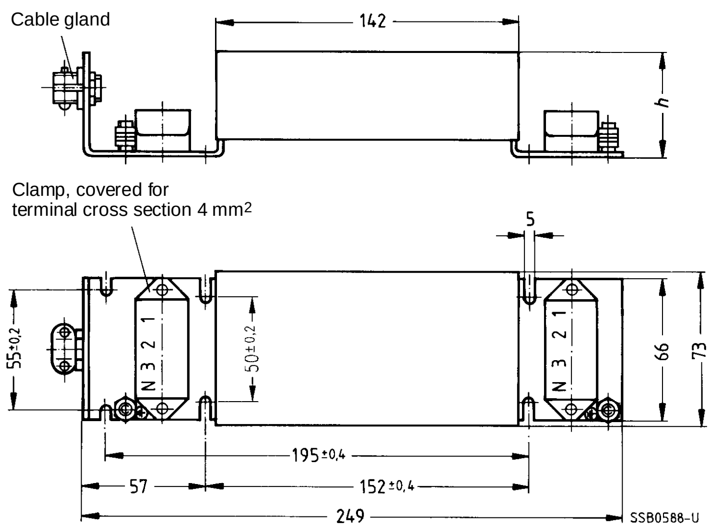
Characteristics and ordering codes

I_R A	Dim. h mm	Cable gland for cable diameter	Approx. weight kg	Ordering code	Approvals VDE 565-3	UL	CSA
4 × 6	50	8 … 12,5 mm	1,1	B84299-K53	×		
4 × 16	67	7 … 15,0 mm	1,6	B84299-K55	×		
4 × 25	67	9 … 15 mm	1,6	B84299-K56	×	×	×
4 × 50	—	—	6,3	B84299-K57-D			

× = mark of conformity granted

Outline drawing

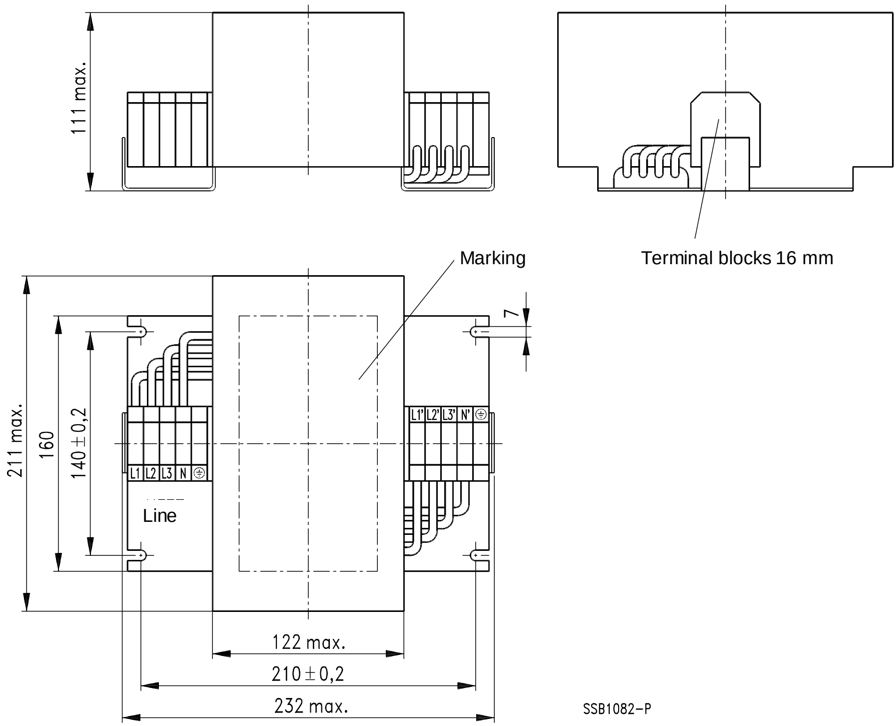
B84299-K53 … -K56
Plastic case



Outline drawing

B84299-K57-D

Metal case

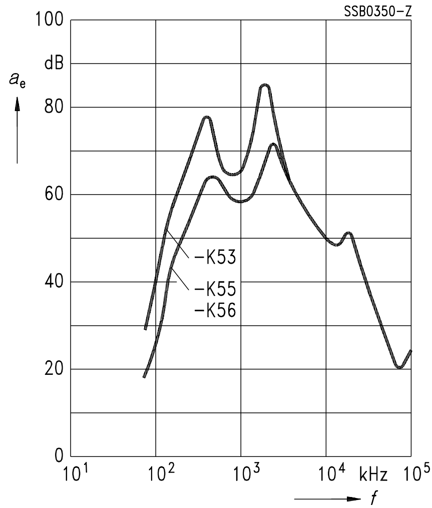


Insertion loss (typical values at Z = 50 Ω)

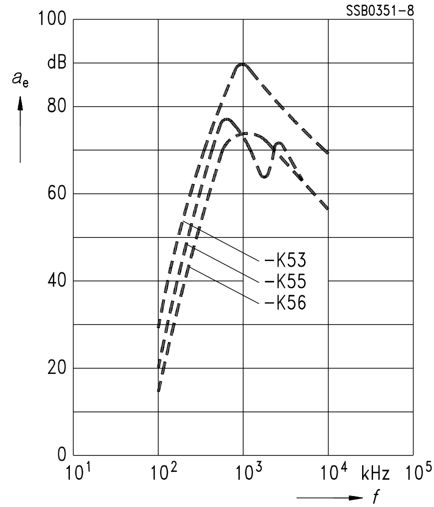
——————— unsymmetrical, adjacent branches terminated

– – – – – – – – symmetrical (differential mode)

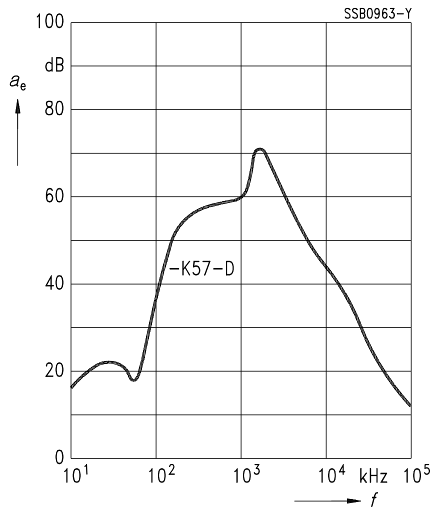
B84299-K53 … -K56



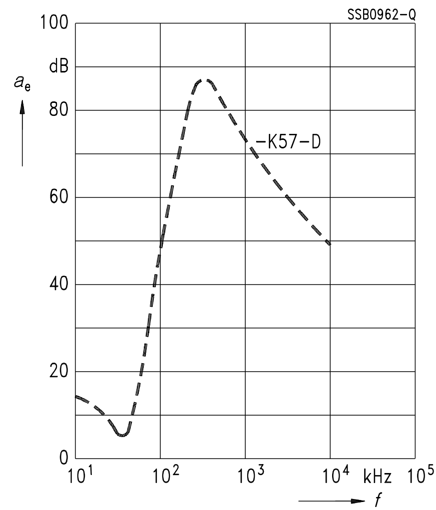
B84299-K53 … -K56



B84299-K57-D



B84299-K57-D



Power line filters for three-phase systems
with additional VHF suppression
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 4 × 6 A to 4 × 75 A

Construction

- Four-line filter
- Metal case
- Screw-type cable gland for strain relief on line side, edge protector on load side
- Feed-through capacitors

Features

- High insertion loss up to the GHz range

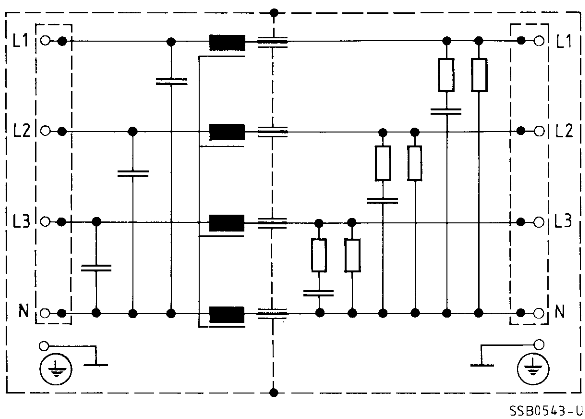
Applications

- Power supplies for industrial applications
- Medical engineering

Terminals

- Safe-to-touch terminal clamps incorporated in case

Circuit diagram



Typical circuit taking the example of B84299-K35

Technical data

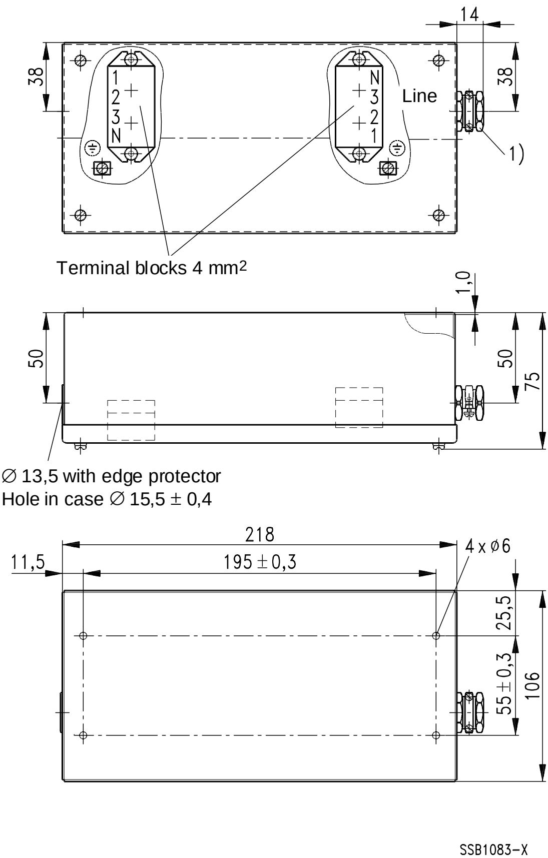
Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 40/085/21 (– 40 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

I_R A	I_{leak} mA	Terminal cross sect. mm^2	Approx. weight kg	Ordering code	Approvals
4 × 6	< 5	4	1,8	B84299-K33	×
4 × 16	< 5	4	2,1	B84299-K35	× (for 14 A)
4 × 25	< 5	4	3	B84299-K36	× (for 20 A)
4 × 50	< 5	16	7,5	B84299-K37	× (for 40 A)
4 × 75	< 10	25	11	B84299-K39	× (for 65 A)

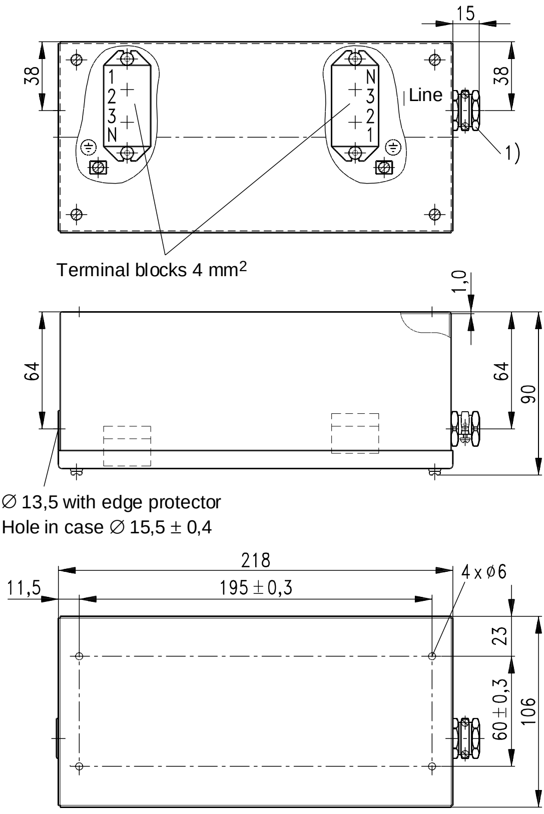
Outline drawings

B84299-K33



1) Screw-type cable gland PG 9, for cable diameter 8 … 12,5 mm

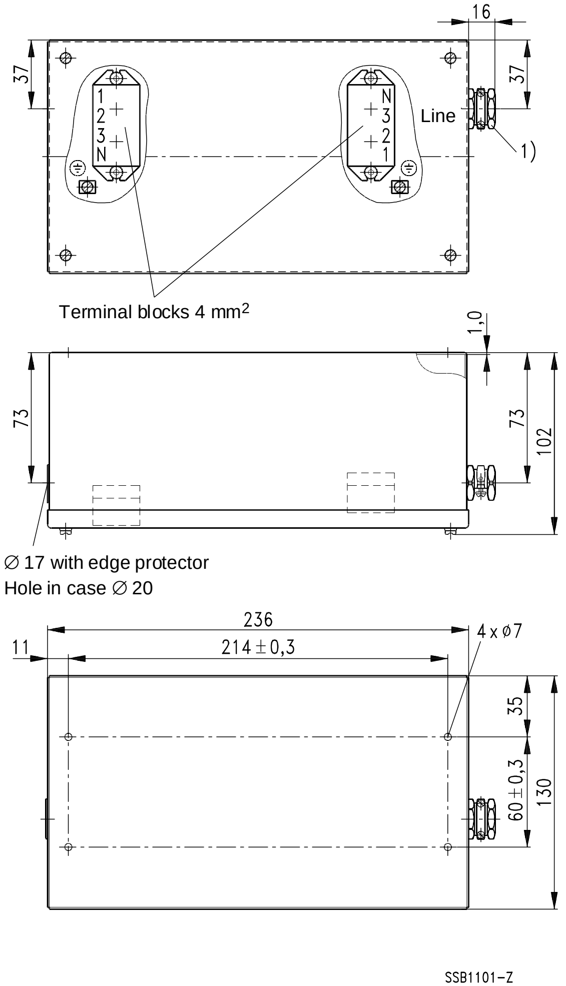
B84299-K35



…

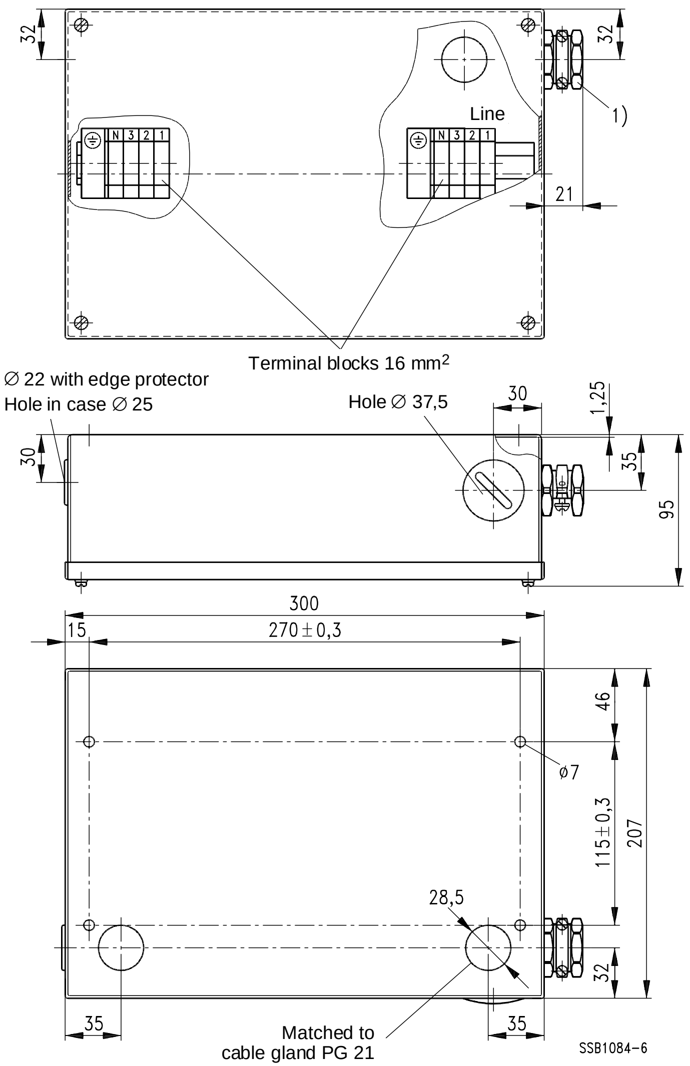
1) Screw-type cable gland PG 9, for cable diameter 8 bis 12,5 mm

B84299-K36



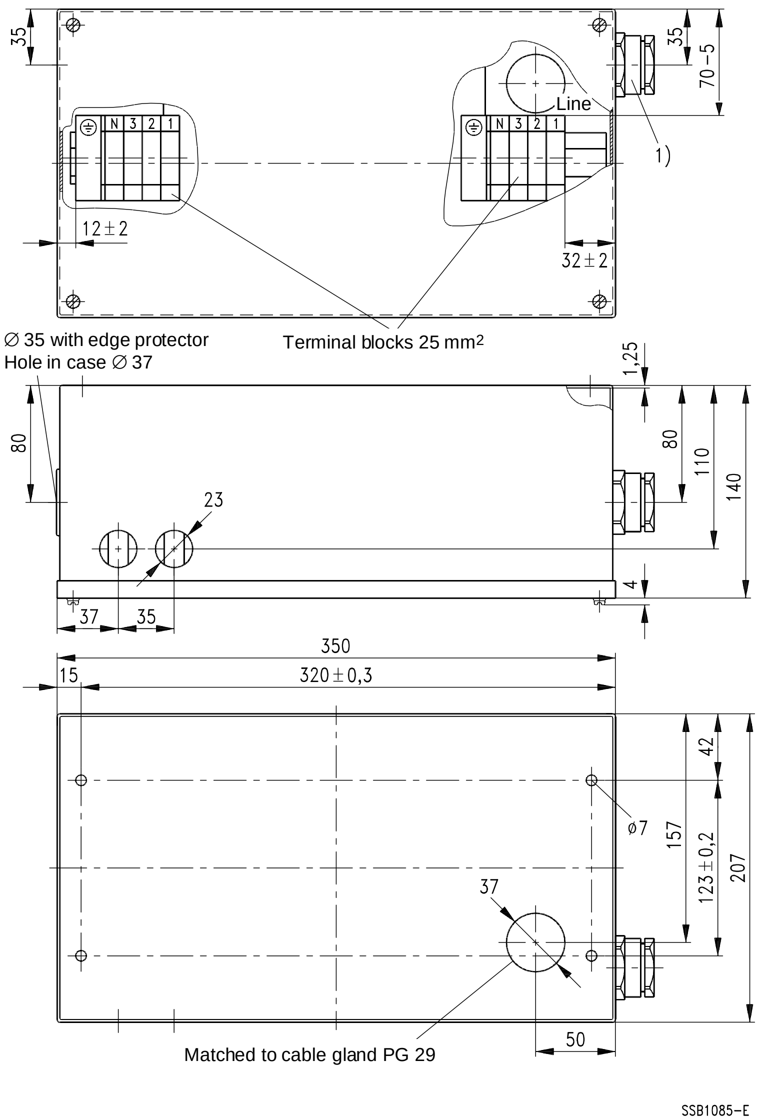
1) Screw-type cable gland PG 11, for cable diameter 9 … 15 mm

B84299-K37



1) Screw-type cable gland DIN 46 320 PG 21 included in delivery (loosely)
Hole in case ∅ 28,5 mm
Cable diameter 18 … 23 mm

B84299-K39



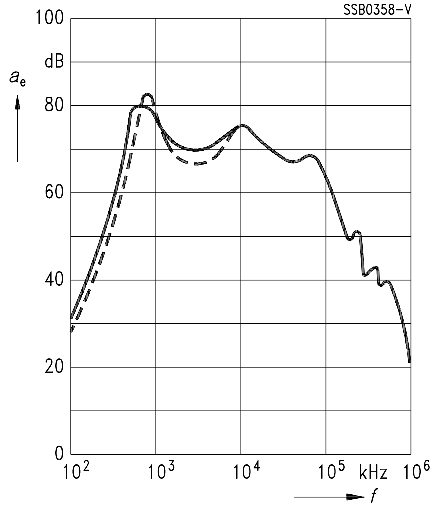
1) Screw-type cable gland DIN 46 320 PG 29 included in delivery (loosely)
Hole in case ∅ 37 mm

Insertion loss (typical values at Z = 50 Ω)

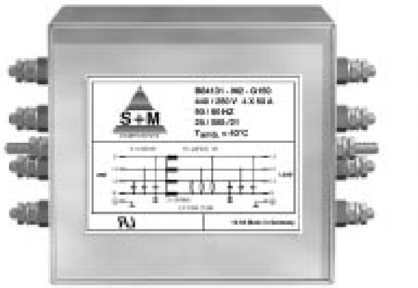
——————— unsymmetrical, adjacent branches terminated

– – – – – – – – symmetrical (differential mode)

Example of filter B84299-K35



Power line filters for three-phase systems
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 4 × 6 A to 4 × 125 A



Construction

- Four-line filter
- Metal case

Features

- High insertion loss
- Compact, cost-optimized design
- Easy to install

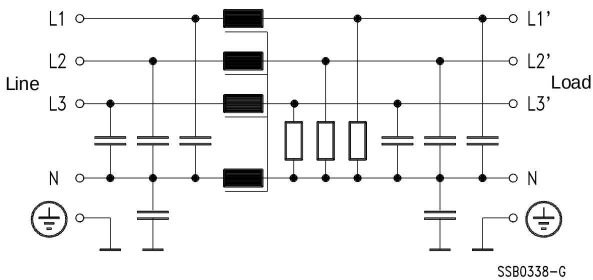
Applications

Power supplies for
- data systems, telecom systems
- medical equipment, industrial installations

Terminals

- Tab connectors 6,3 × 0,8 mm or
- Screw terminals

Circuit diagram



Technical data

Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	2121 Vdc, 2 s (line/line) 1770 Vdc, 2 s (line/line) for B84131-A6-A1 2700 Vdc, 2 s (lines/case)
Leakage current I_{leak}	< 3,5 mA at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

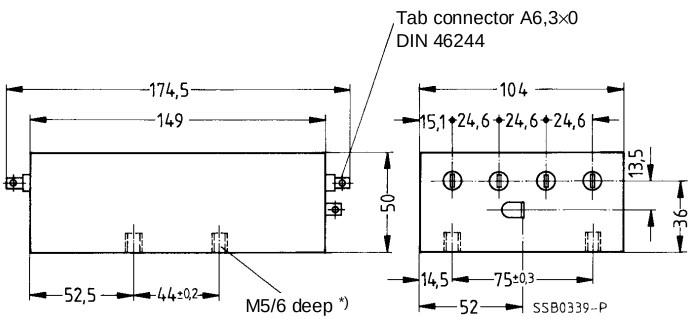
Characteristics and ordering codes

I_R A	Approx. weight kg	Ordering code	Approvals VDE 565-3	UL	CSA
4 × 6	0,8	B84131-A6-A1			
4 × 16	1,5	B84131-M3-A116	×	×	×
4 × 35	2,3	B84131-M1-G135	×	×	×
4 × 35	2,3	B84131-M1-H135	×	×	×
4 × 50	4,5	B84131-M2-G150		×	×
4 × 63	4,5	B84131-M2-G163		×	×
4 × 80	12,5	B84131-M4-G180			
4 × 125	12,5	B84131-M4-G225			

× = mark of conformity granted

Outline drawing

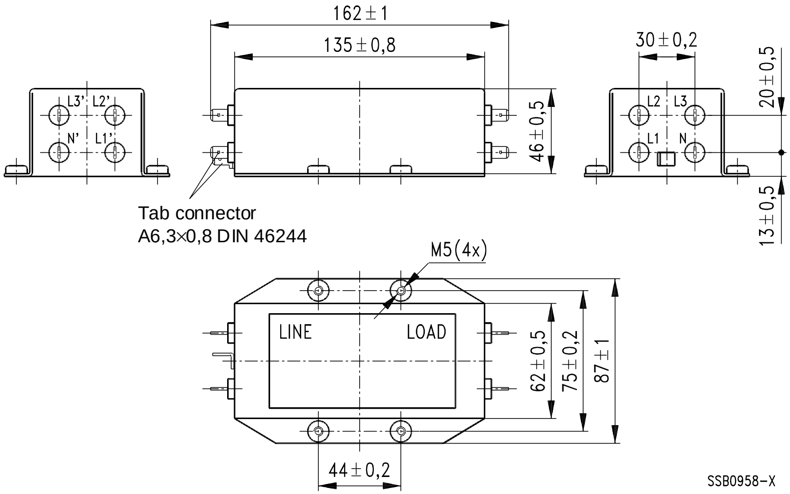
B84131-M3-A116



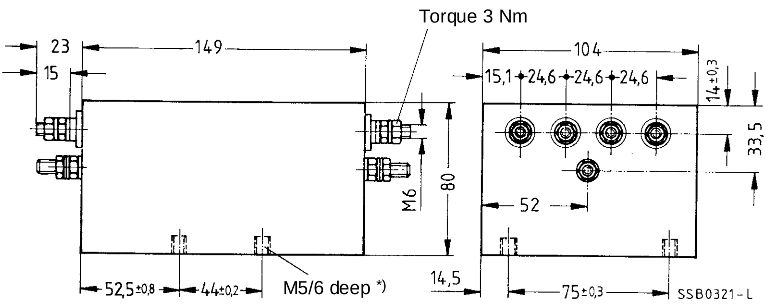
*) Also suitable for screws with 10-32 UNF thread

Outline drawings

B84131-A6-A1



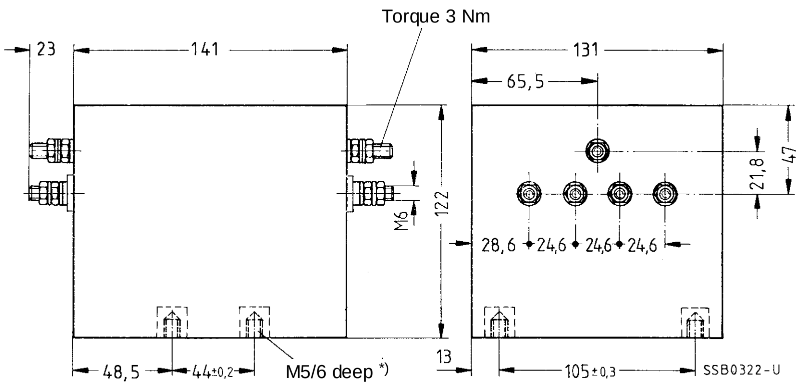
B84131-M1-G135, thread M6
B84131-M1-H135, thread 10-32 UNF



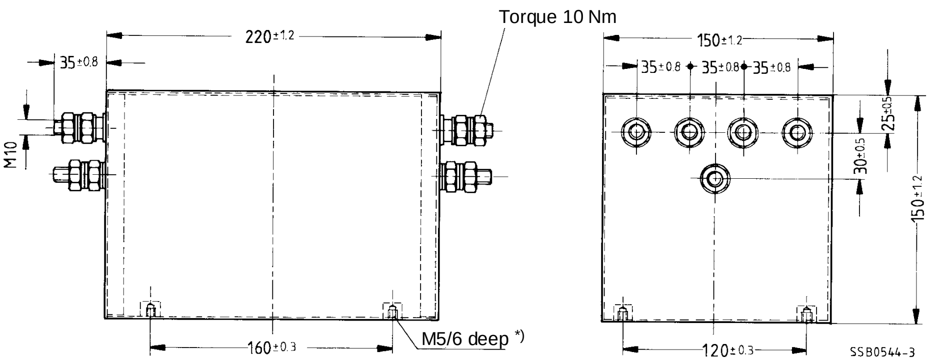
∗) Also suitable for screws with 10-32 UNF thread

Outline drawings

B84131-M2-G150, -G163, thread M6



B84131-M4-G180, -G225, thread M10

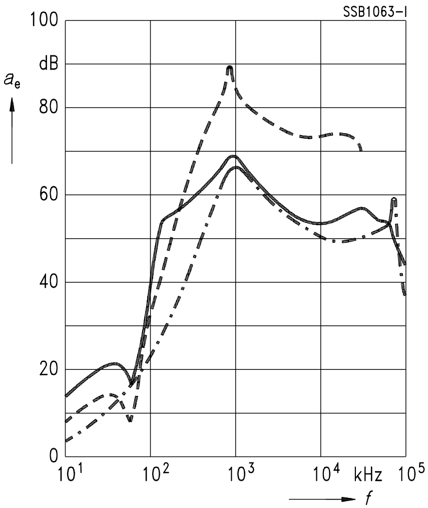


*) Also suitable for screws with 10-32 UNF thread

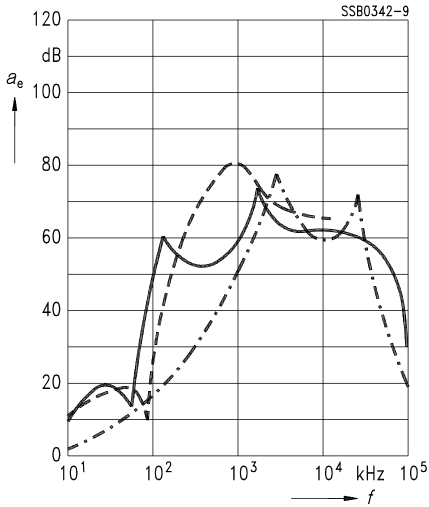
Insertion loss (typical values at Z = 50 Ω)

——————— unsymmetrical, adjacent branches terminated
– · – · – · – · – asymmetrical, all branches in parallel (common mode)
– – – – – – – – symmetrical (differential mode)

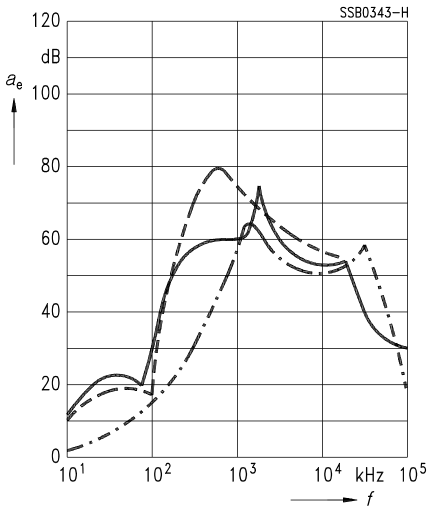
B84131-A6-A1



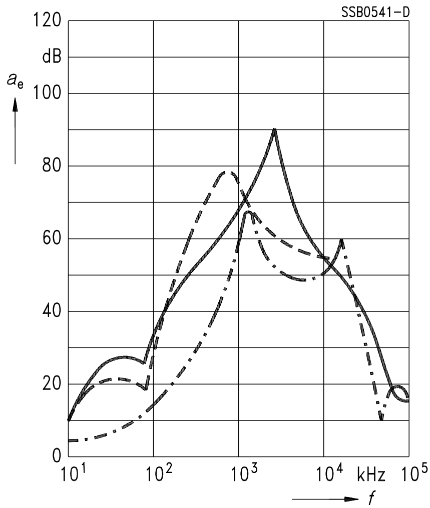
B84131-M3-A116



B84131-M1-G135
B84131-M1-H135



B84131-M2-G150



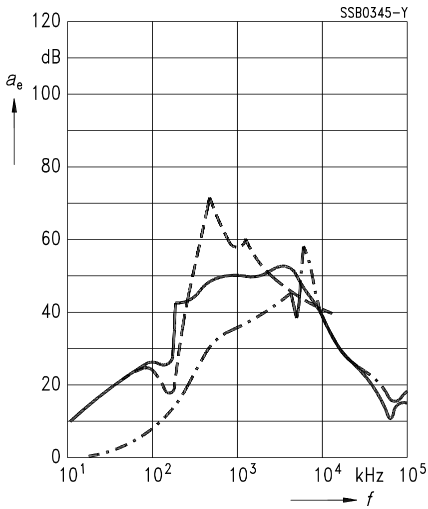
Insertion loss (typical values at Z = 50 Ω)

——————— unsymmetrical, adjacent branches terminated

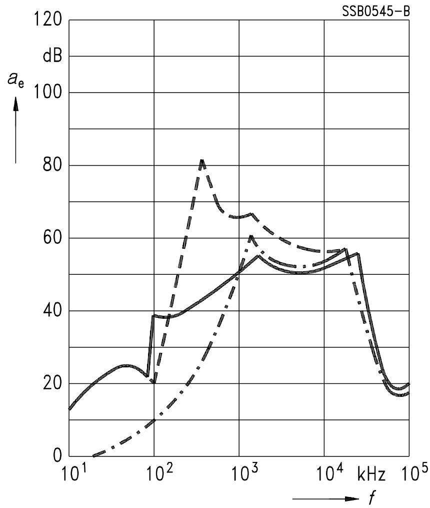
– · – · – · – · – asymmetrical, all branches in parallel (common mode)

– – – – – – – – symmetrical (differential mode)

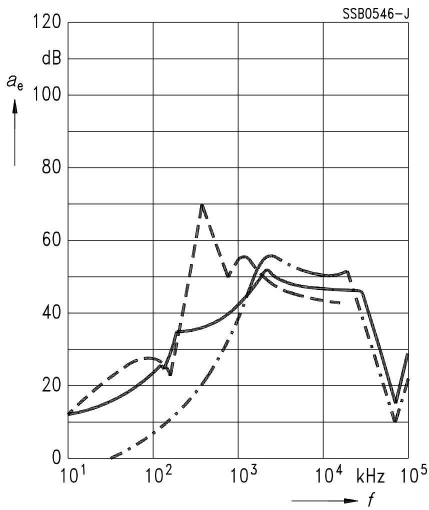
B84131-M2-G163

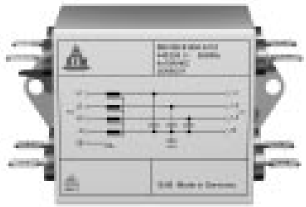


B84131-M4-G180



B84131-M4-G225





Power line filters for three-phase systems
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 4 × 10 A and 4 × 20 A

Construction

- Four-line filter
- Aluminum case

Features

- Medium insertion loss
- Small size (similar to SIFI)
- Easy to install

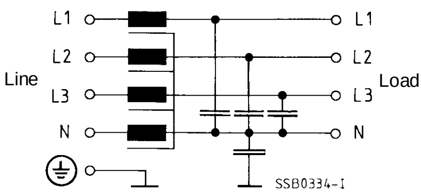
Applications

- Industrial electronics
- Medical engineering

Terminals

- Tab connectors 6,3 × 0,8 mm

Circuit diagram



Technical data

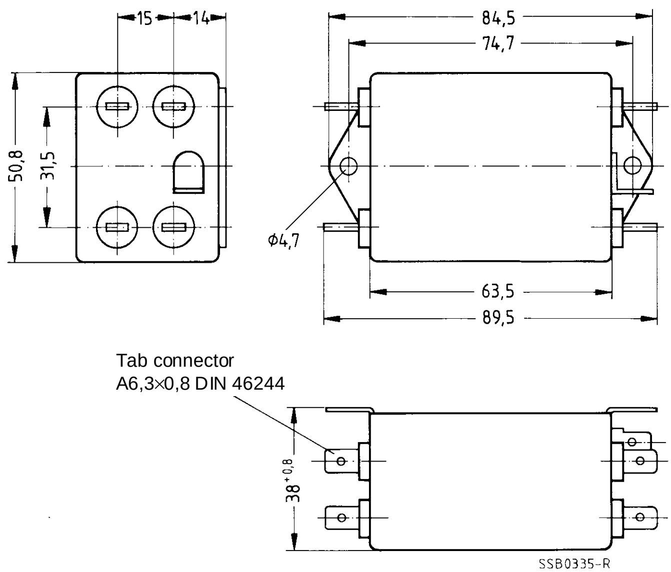
Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc , 2 s (line/line) 2700 Vdc , 2 s (lines/case)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)
Weight	approx. 220 g

Characteristics and ordering codes

I_R A	I_{leak} mA	Ordering code	Approvals 565-3
4 × 10 4 × 20	< 3,5 < 3,5	B84108-S1004-A110 B84108-S1004-A120	×

× = mark of conformity granted

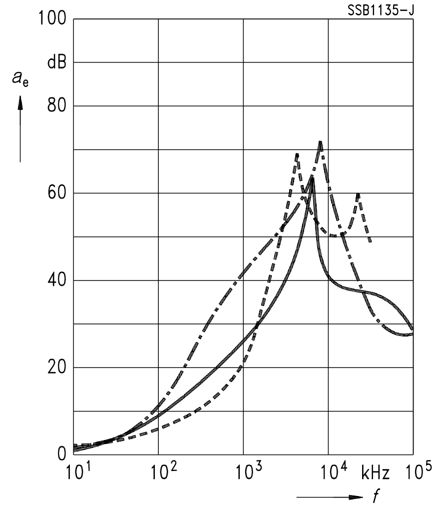
Outline drawing



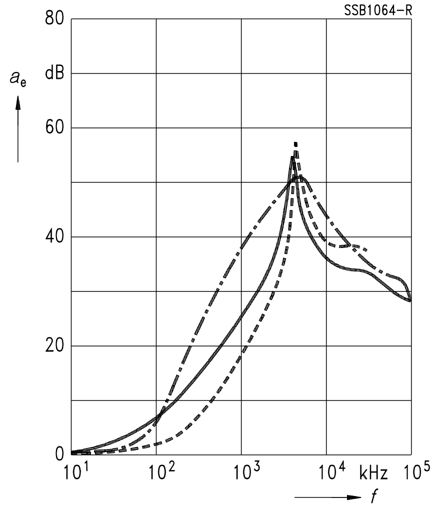
Insertion loss (typical values at Z = 50 Ω)

———————	unsymmetrical, adjacent branches terminated
– · – · – · – · –	asymmetrical, all branches in parallel (common mode)
– – – – – – – –	symmetrical (differential mode)

B84108-S1004-A110



B84108-S1004-A120



Power line filters for three-phase systems
with additional LF suppression
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 12 A

Construction

- Four-line filter
- Metal case

Features

- Compact design

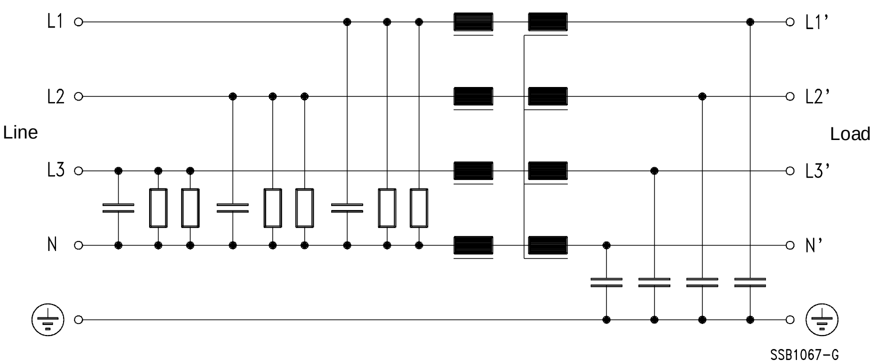
Applications

- Switch-mode power supplies for traction
- Industrial applications, computers

Terminals

- Tab connectors 6,3 × 0,8 mm

Circuit diagram



Technical data

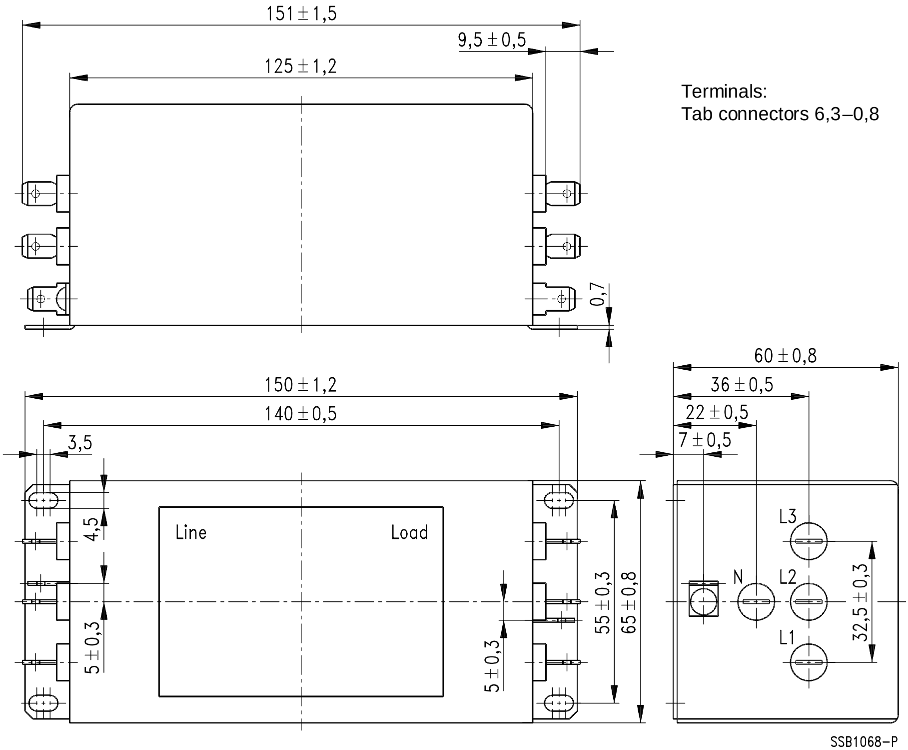
Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1414 Vdc , 2 s (line/line) 2700 Vdc , 2 s (lines/case)
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

I_R A	I_{leak} mA	Approx. weight	Ordering code	Approvals 565-3		
12	< 3,5	1,1 kg	B84134-F12-A1	×	×	×

× = mark of conformity granted

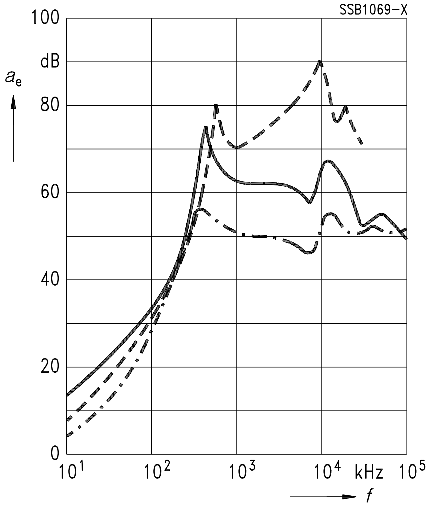
Outline drawing



Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated
– · – · – · – · – asymmetrical, all branches in parallel (common mode)
– – – – – – – – symmetrical (differential mode)

B84134-F12-A1



Power line filters for three-phase systems
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 25 and 50 A

Construction

- Four-line filter
- Metal case with terminal compartments
- Screw-type cable glands for strain relief on line and load side
- I core chokes
- One-stage or two-stage

Features

- Insertion loss ≥100 dB in the medium frequency range

Applications

- Power supplies for lifts and industrial installations
- Medical engineering

Terminals

- Screw terminals

Technical data

Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	L/L = line/line L/G = lines/case
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

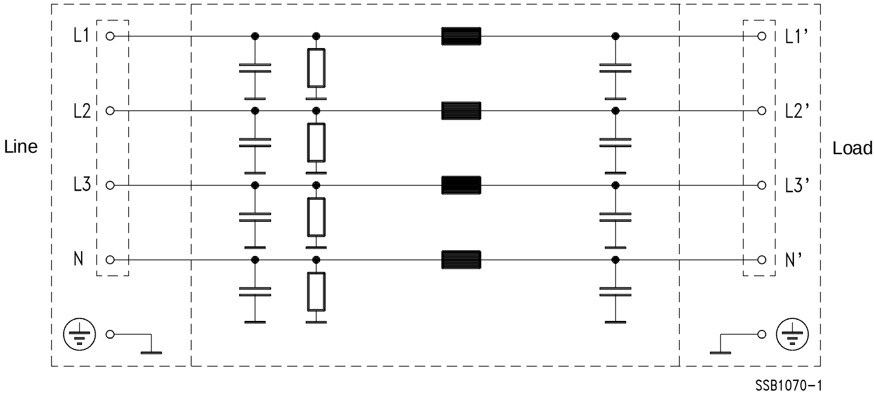
Characteristics and ordering codes

I_R A	V_P L/L	 L/G	I_{leak} A	Approx. weight kg	Ordering code	Approvals UR
25	1414 Vdc , 2 s	2500 Vdc , 2 s	< 0,18	12,5	B84134-A25-G1	×
50	1100 Vdc , 2 s	1100 Vdc , 2 s	< 1,7	30	B84134-B50-G1	

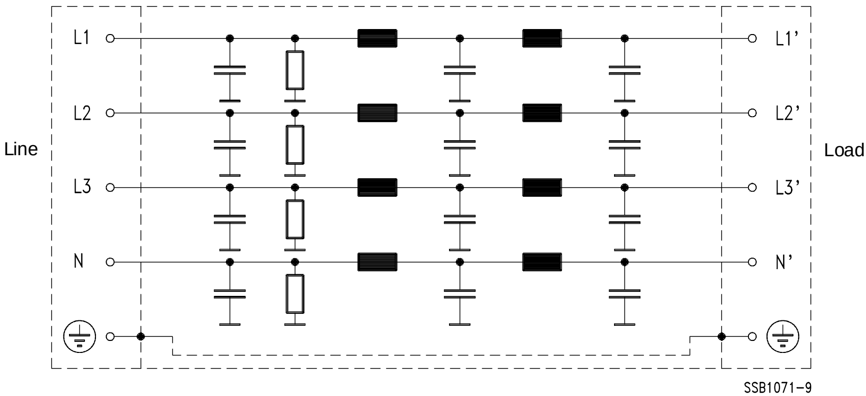
× = mark of conformity granted

Circuit diagrams

B84134-A25-G1

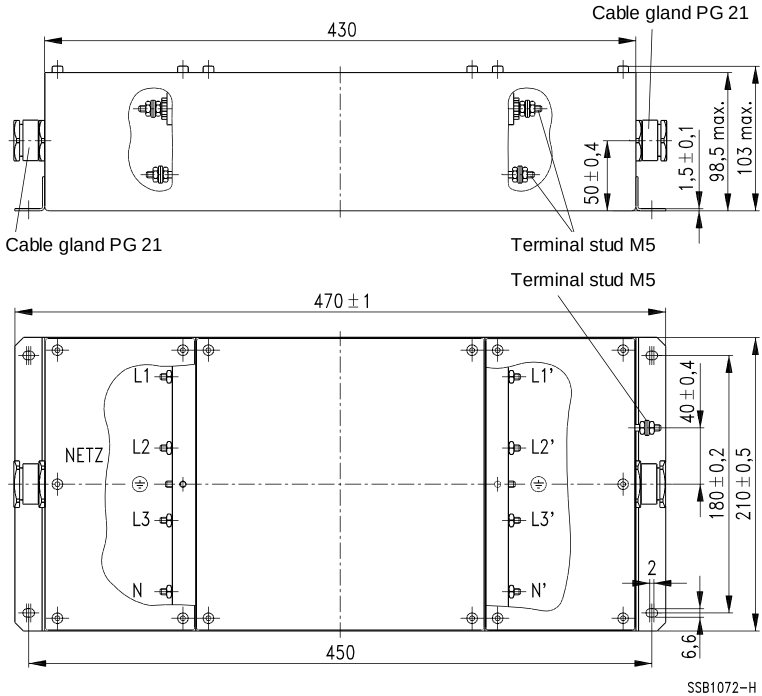


B84134-B50-G1

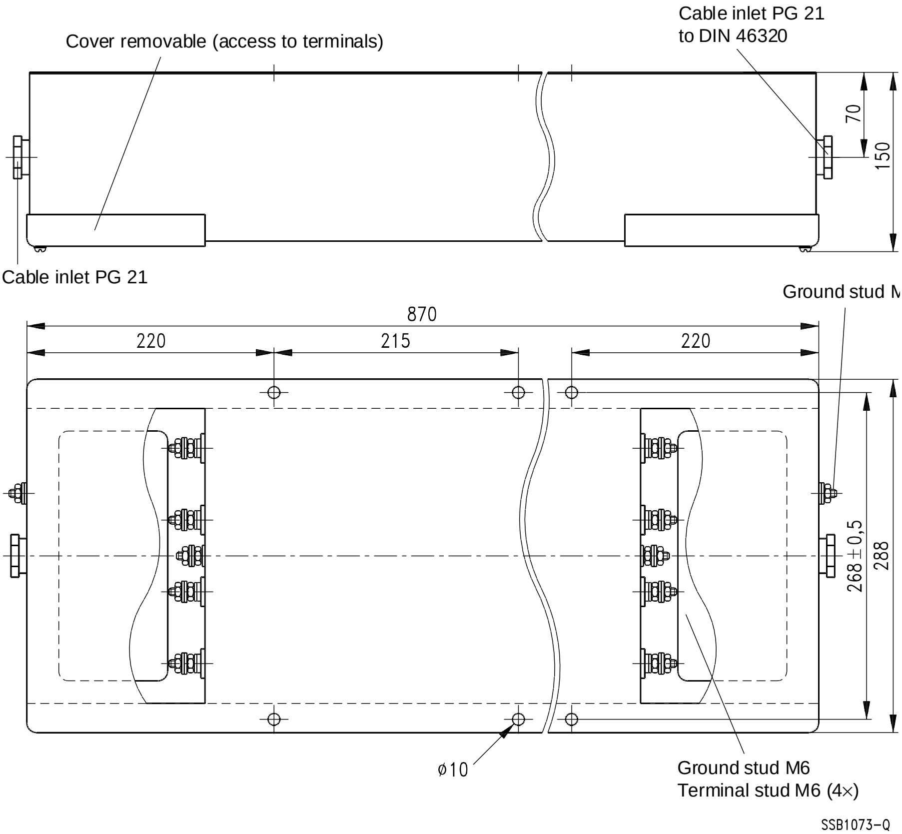


Outline drawings

B84134-A25-G1



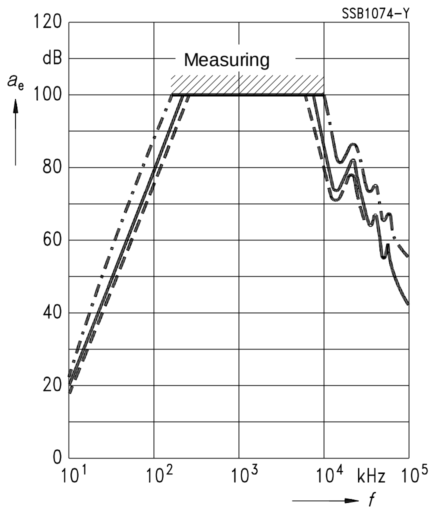
B84134-B50-G1



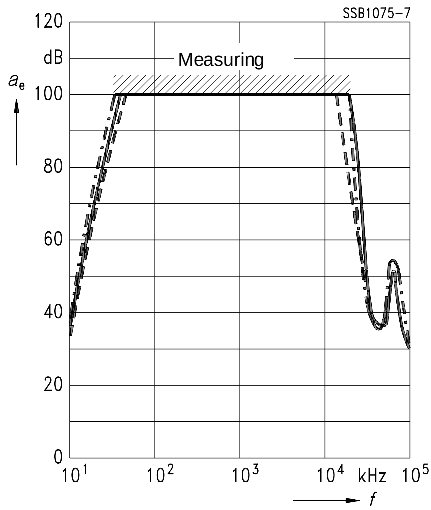
Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated
– · – · – · – · – asymmetrical, all branches in parallel (common mode)
– – – – – – – – symmetrical (differential mode)

B84134-A25-G1



B84134-B50-G1



General technical information

Frequency converters are being used more and more in the field of drive and power electronics.

The applications of such circuits in drive engineering are widely varied, e.g. for controlling the motion of conveyors or assembly lines, machine tool and production machinery applications, agitators, textile and printing machinery, pumps and fans, as well as in cranes and lifts.

However, the fast-switching power semiconductor components used in the converters generate RFI on the lines to the motors and on the mains lines.

S + M offers a wide variety of chokes and filters for suppressing such interference, for both the input and the output side of frequency converters.

Type	I_R	Description	Page
B82747, B82745	6 – 200 A	Three-line choke	191
B82765	6 – 100 A	Four-line choke	197
B84142-B	8 – 25 A	Two-line filter with very high attenuation	306
B84143-A	8 – 1600 A	Three-line filter with high attenuation	310
B84143-B	8 – 80 A	Three-line filter with very high attenuation	322
B84144	16 – 1600 A	Four-line filter with high attenuation	328
B84163	3 – 25 A	Three-line filter for frequency converter outputs	303

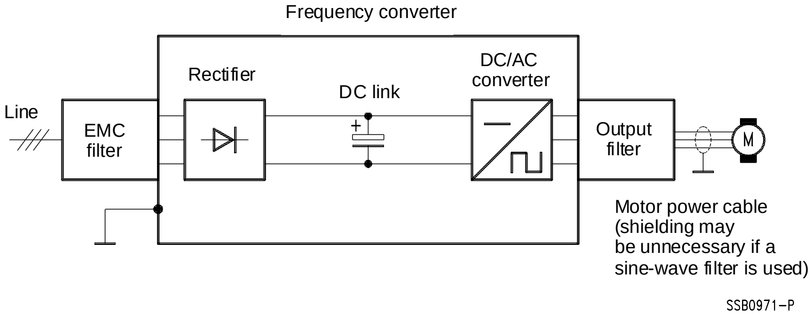
Technical advantages of our filters

- Low leakage current< 3,5 mA (filters up to 36 A)
  < 6,0 mA (filters above 50 A)
- Compact size (patent pending for our filter designs for currents above 250 A)
- Large standard product range of filters for 8 … 1600 A
- Optimized for full-load operation with long motor power cables

Filters by S + M Components have been developed and optimized under real-life operating conditions. High-quality components and materials ensure decades of reliable operation. These filters have large power reserves with respect to the attenuation and load current.

Examples of applications

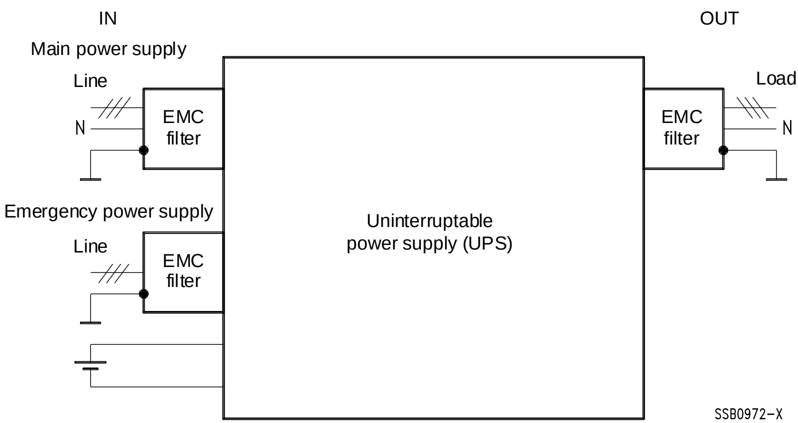
1. Block diagram of an electric drive with frequency converter and input and output filters



The same technology is used and similar interference suppression is achieved in the following applications:

Induction heating, medical and welding equipment and uninterruptable power supplies (UPS).

2. Block diagram, UPS



Installation

Apart from installing frequency converter filters, additional design rules should be observed. Very high interference levels are caused by the fast switching transients on the high voltages used in the dc link and the ground coupling capacitances. This interference is propagated as conducted interference on the lines and also as radiated interference. This means that even the functioning of equipment which is not connected to the same ac line circuits but which is in the vicinity may be impaired by radiated RF interference. Because of this, the following must be observed, for EMC reasons, in equipment with frequency converters:

- To eliminate emission, the filter should be bolted directly to the converter. Where this is not possible, shield the connecting cable.
- The contact surface on which the filter is mounted must be bright metal. Paint or other insulating coatings should be removed before mounting the filter.
- Filters and converters must have large ground-contact surfaces, preferrably mounted on a common, well-earthed metal plate or switchgear cabinet panel.
- Motor cables should be kept as short as possible; if possible, install the converter directly next to the motor. Special interference suppression measures are required in systems which are spread out over larger areas. Such measures must be specially adapted to the respective conditions.
- The motor cable must be shielded (except if suitable sine-wave filters are used).
- All cable shields should have large-cross-section connections to ground/earth at both ends.
- Never use a separate wire to earth shields! (No pigtail!)
- Do not install power supply and motor cables parallel and near to one another.

Obviously, the respective safety regulations must also be complied with, in addition to ensuring that the system is designed to achieve electromagnetic compatibility.

Selector guide for converter filters

According to our experience, the filters listed below have been tried and proven in frequency converter applications, both practically and by EMC measurements.

However, the following points must always be taken into consideration:

- Compliance with EMC regulations must be proven by application-related measurements.
- The current handling capability of the filter must be matched to the input rated current of the frequency converter (also refer to the specifications on filter overload characteristics in the data sheets).
- Ensure correct installation of the filters and take all additional measures that help to meet the EMC Directive requirements. In this context, refer back to the installation tips.

2-line filters (250 Vac) for frequency converters for electric drives

Motor power (230 V 1-ph. ac)	Recommended filters for suppression class B in accordance with EN 55011
550 W	B84142-B8-R
750 W	B84142-B8-R
1100 W	B84142-B12-R
1500 W	B84142-B16-R
2200 W	B84142-B25-R

3-line filters (440 Vac) for frequency converters for electric drives

Motor power (440 V 3-ph. ac)	Recommended filters for suppression in accordance with EN 55011	
	Class A	Class B
1,5 kW	B84143-A8-R	B84143-B8-R
2,2 kW	B84143-A8-R	B84143-B8-R
3,0 kW	B84143-A12-R	B84143-B12-R
4,0 kW	B84143-A12-R	B84143-B12-R
5,5 kW	B84143-A16-R	B84143-B16-R
7,5 kW	B84143-A25-R	B84143-B25-R
11 kW	B84143-A36-R	B84143-B36-R
15 kW	B84143-A36-R	B84143-B36-R
18,5 kW	B84143-A50-R	B84143-B50-R
22 kW	B84143-A50-R	B84143-B50-R
30 kW	B84143-A80-R	B84143-B80-R
37 kW	B84143-A80-R	B84143-B80-R
45 kW	B84143-A120-R	
55 kW	B84143-A120-R	

Motor power (440 V 3-ph. ac)	Recommended filters for suppression in accordance with EN 55011	
	Class A	**Class B**
75 kW	B84143-A150-R	
90 kW	B84143-A180-R	
110 kW	B84143-A250-S	
132 kW	B84143-A250-S	
160 kW	B84143-A500-S	
200 kW	B84143-A500-S	
250 kW	B84143-A500-S	
315 kW	B84143-A1000-S	
400 kW	B84143-A1000-S	
630 kW	B84143-A1000-S	
1100 kW	B84143-A1600-S	

Filters for converter outputs

Frequency converters for variable motor speeds generate a “synthetic line frequency”, which is varied by being derived from a square-wave current generated by fast-switching power semiconductor components. This, however, leads to high-frequency interference on the motor power cable. Furthermore, the clock frequency interference leads to acoustic vibration in the motor which causes loud whistling noises. This can be reduced or eliminated by connecting a sine-wave filter betwen the motor and the converter.

In the following example, we shall describe how to deduce the ratings required for a filter for a 4-kW frequency converter with a clock frequency of 9 kHz.

In our example the motor is connected to the converter by a cable of 50m length. It is used to drive a generator. Figure 1 shows a voltage with a rise rate d*v*/d*t* of approx. 5,5 kV/µs, as measured at the motor terminals in the described configuration. To eliminate this steep rise at the motor terminals, an output filter is needed.

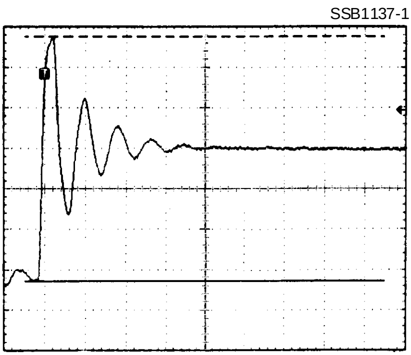


Fig. 1 Voltage rise at motor terminals (200 V/Div, 2 µs/Div)

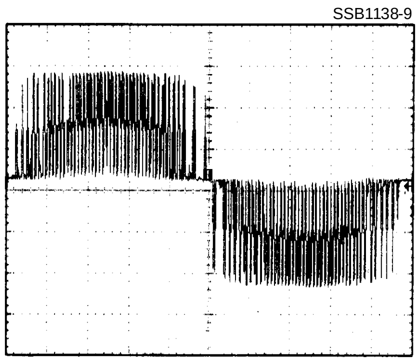


Fig. 2 Output voltage, without output filter (clock frequency 9 kHz, rated frequency 50 Hz)

It is also our aim to reduce the motor noise emissions, as the converter drive is to be used in a ventilation system. Figure 2 shows the output voltage waveform obtained when no output filter is connected. Here, the individual pulses of converter clock frequency, superimposed on the 50 Hz load output frequency, can be clearly seen.

The motor current shown in figure 3 has a sinusoidal waveform due to the high inductance of the motor windings. However, high current pulses are superimposed on the motor current.

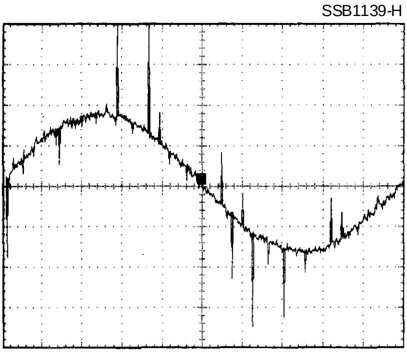


Fig. 3 Motor current without output filter (5 A/Div)

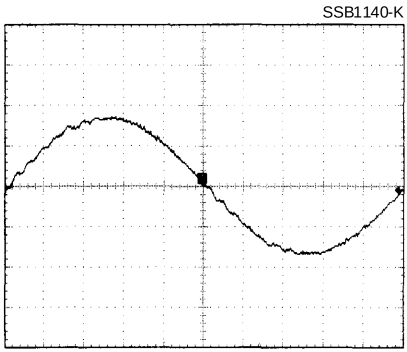


Fig. 4 Output voltage with sine-wave filter (clock frequency 9 kHz, rated frequency 50 Hz)

An important condition for the filter dimensions in this example was that the voltage drop across the filter should be as low as possible in order to avoid reducing the motor voltage unnecessarily. This means that the inductances used in the filter must be kept low and, to compensate, the capacitances used must be higher. On the other hand, this also means that the filter will have to dissipate more heat due to the flux-reversal losses in the choke core because of the higher ripple currents occurring. It is thus necessary to match the choke inductance and the capacitor capacitances very accurately. Figure 4 shows the output voltage achieved by the selected circuit solution. A very small ripple can be seen superimposed on the basic waveform. The motor is no longer subjected to steep voltage rises.

Upon examining the output current shown in figure 5, we can see that the current needle pulses have also been eliminated. The noise emitted by the motor is no longer any different than that occurring when the motor is powered by line ac.

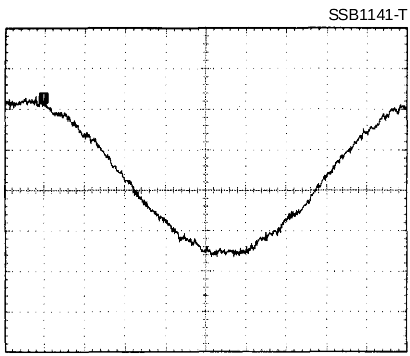


Fig. 5 Output current with sine-wave filter (5 A/Div)

As already explained, in the example described here, the filter was not required for EMC reasons. However, in the course of the development work, the output voltage was examined to check for high-frequency harmonics in the 150 kHz to 30 MHz range. The voltage between the probe and earth potential was measured. Figure 6 illustrates the results originally obtained. Figure 7 shows the same frequency range after a sine-wave filter was installed. The reduction of the voltages in the 150 kHz to 10 MHz frequency range is clearly noticeable.

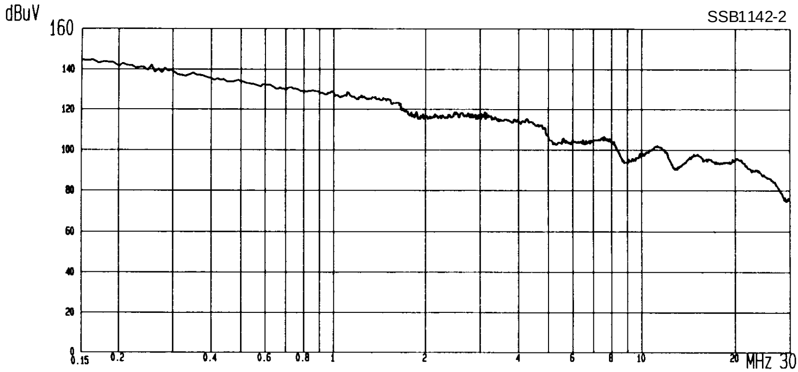


Fig. 6 Voltages of the harmonics between 150 Hz and 30 MHz (without output filter)

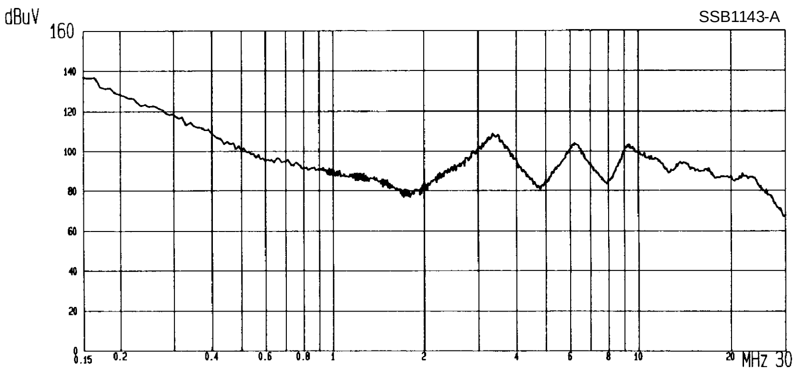


Fig. 7 Voltages of the harmonics between 150 Hz and 30 MHz (with output filter)

With this, the EMC problems of a frequency-converter drive have also been reduced. However, measurements will have to be carried out for each individual application to determine whether the limits of the corresponding regulations can be met without using a shielded cable.

Power line filters for single-phase systems
Rated voltage 250 Vac, 50/60 Hz
Rated current 8 A to 25 A

Construction

- Two-line filter
- Metal case

Features

- Very high insertion loss
- Low leakage current
- Easy to install
- Space-saving construction
- Construction complies with
  EN 133 200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and
  operation under full load

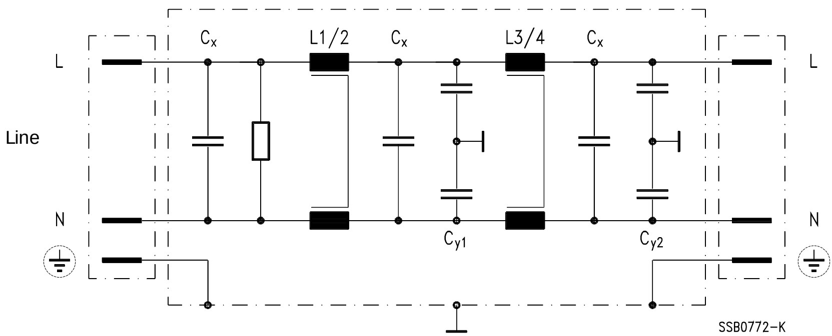
Applications

- Frequency converters for motor drives, e.g.
  – lifts
  – pumps
  – conveyor systems
  – air conditioning systems
- Power supplies

Terminals

- Safe-to-touch terminal blocks

Circuit diagram



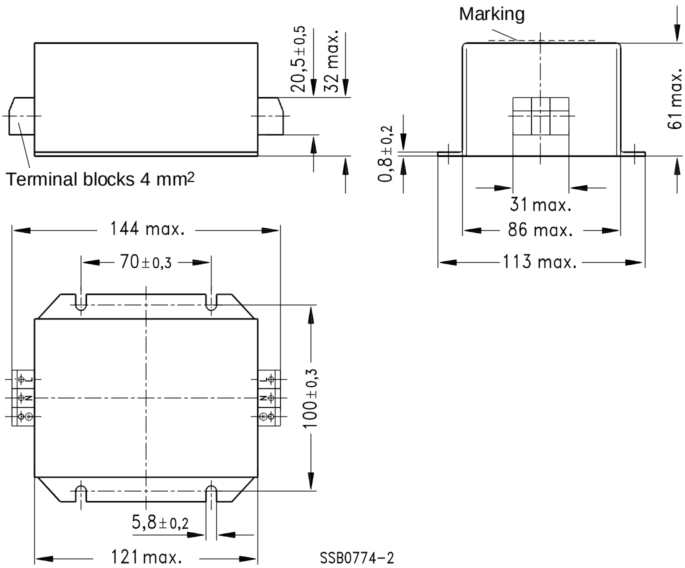
Technical data

Rated voltage V_R	250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	2121 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Overload capability	1,5 · I_R for 3 min per hour or 2,5 · I_R for 30 s per hour
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

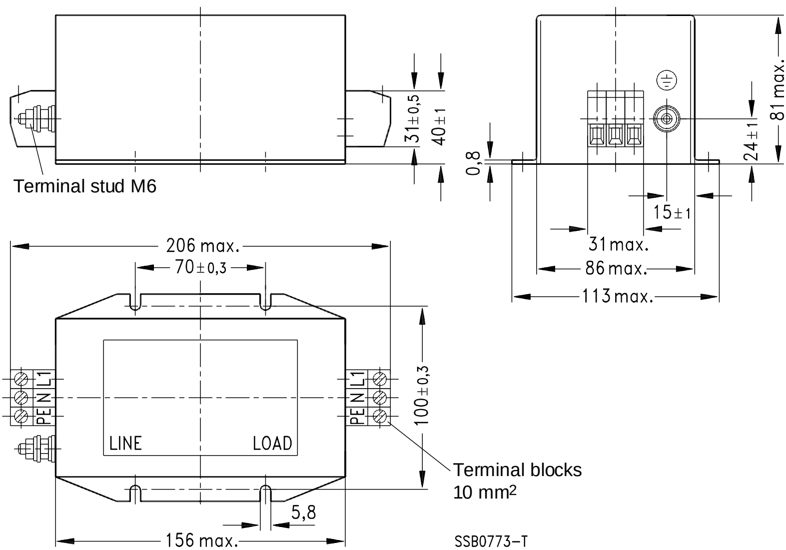
Characteristics and ordering codes

I_R A	Terminal cross section mm²	I_{leak} mA	R_{typ} mΩ	Approx. weight kg	Ordering code
8	4	< 3,5	42	1,35	B84142-B8-R
12	4	< 3,5	30	1,45	B84142-B12-R
16	4	< 3,5	21	1,45	B84142-B16-R
25	10	< 3,5	9	3,7	B84142-B25-R

Outline drawing B84142-B8-R … B84142-B16-R



Outline drawing B84142-B25-R



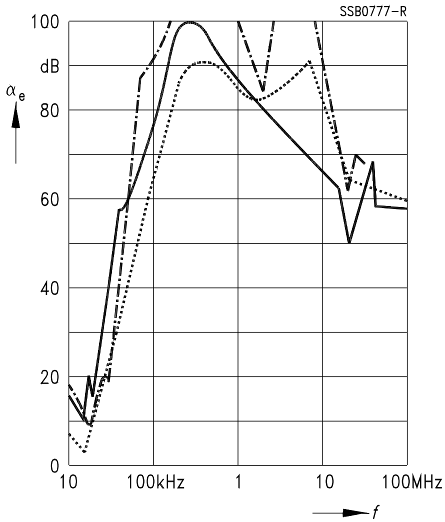
Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated

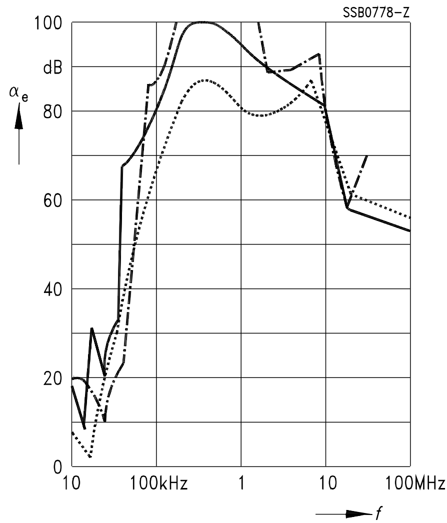
·································· asymmetrical, all branches in parallel (common mode)

—·—·—·—·— symmetrical (differential mode)

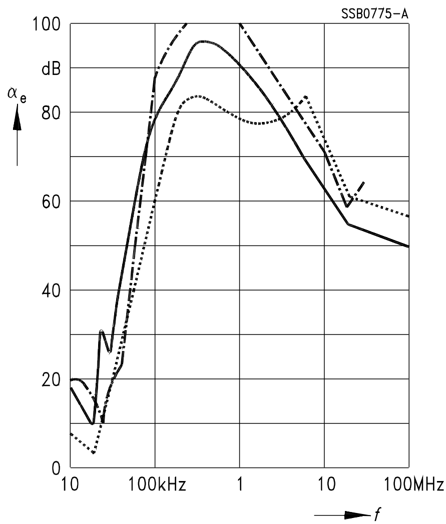
B84142-B8-R



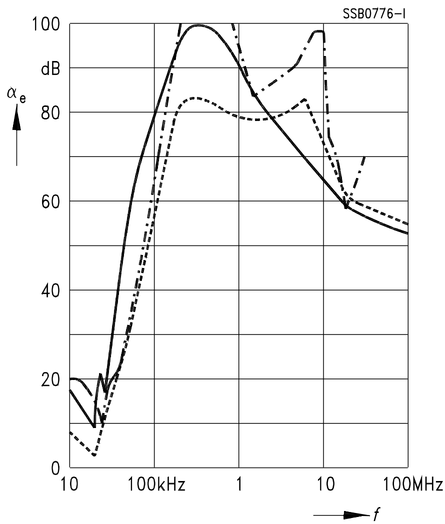
B84142-B12-R



B84142-B16-R



B84142-B25-R



Power line filters for three-phase systems
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 8 A to 1600 A

Construction

- Three-line filter
- Metal case

Features

- Very high insertion loss
- Low leakage current
- Easy to install
- Space-saving construction
- Construction complies with UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load

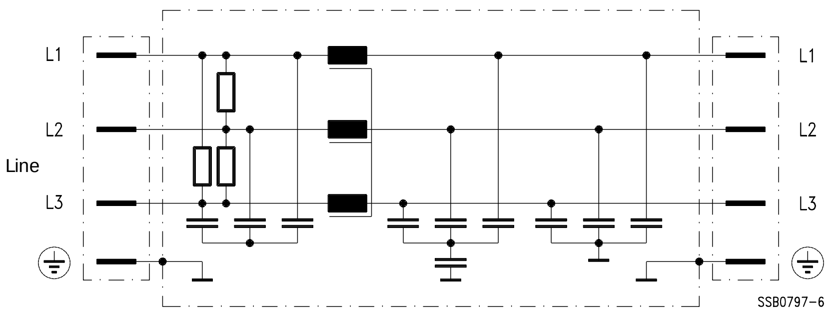
Applications

- Frequency converters for motor drives, e.g.
  – lifts
  – pumps
  – traction systems
  – conveyor systems
  – air conditioning systems
- Wind-driven power plants
- Power supplies

Terminals

- Safe-to-touch terminal blocks for filters up to 180 A
- Terminal lugs for filters 250 to 1600 A

Typical circuit diagram



Technical data

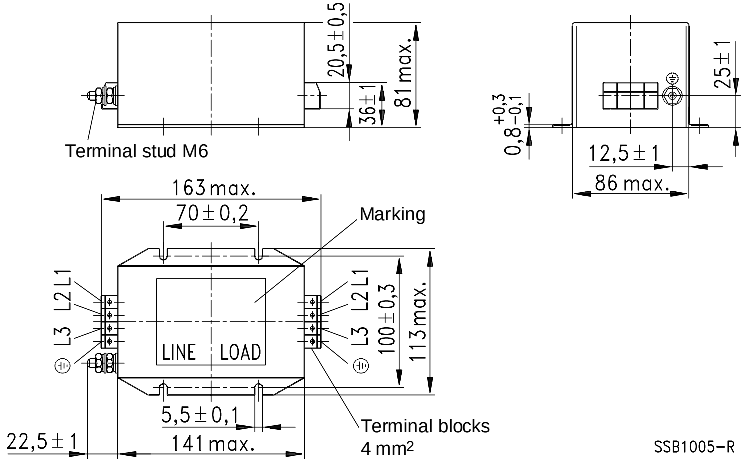
Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	2121 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case), for 8 … 180 A 2121 Vdc, 2 s (lines/case), for 250 … 1600 A
Overload capability	1,5 · I_R for 3 min per hour or 2,5 · I_R for 30 s per hour
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

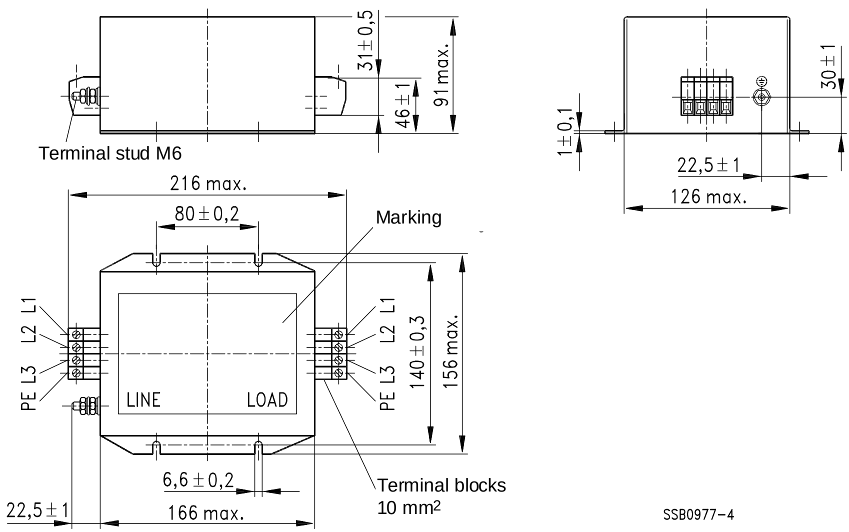
I_R A	Terminal cross section mm^2	I_{leak} mA	R_{typ} mΩ	Approx. weight kg	Ordering code
8	4	< 3,5	40	2,2	B84143-A8-R
12	4	< 3,5	20	2,2	B84143-A12-R
16	4	< 3,5	15	2,2	B84143-A16-R
25	10	< 3,5	8	3,7	B84143-A25-R
36	10	< 3,5	2,5	3,7	B84143-A36-R
50	10	< 6	2	4,0	B84143-A50-R
80	25	< 6	1	9,5	B84143-A80-R
120	50	< 6	0,75	10	B84143-A120-R
150	50	< 6	0,4	10	B84143-A150-R
180	95	< 6	0,4	13	B84143-A180-R
250	Terminal lugs	< 6	0,095	30	B84143-A250-S
500	Terminal lugs	< 6	0,060	49	B84143-A500-S
1000	Terminal lugs	< 6	0,030	90	B84143-A1000-S
1600	Terminal lugs	< 6	0,020	130	B84143-A1600-S

Outline drawings

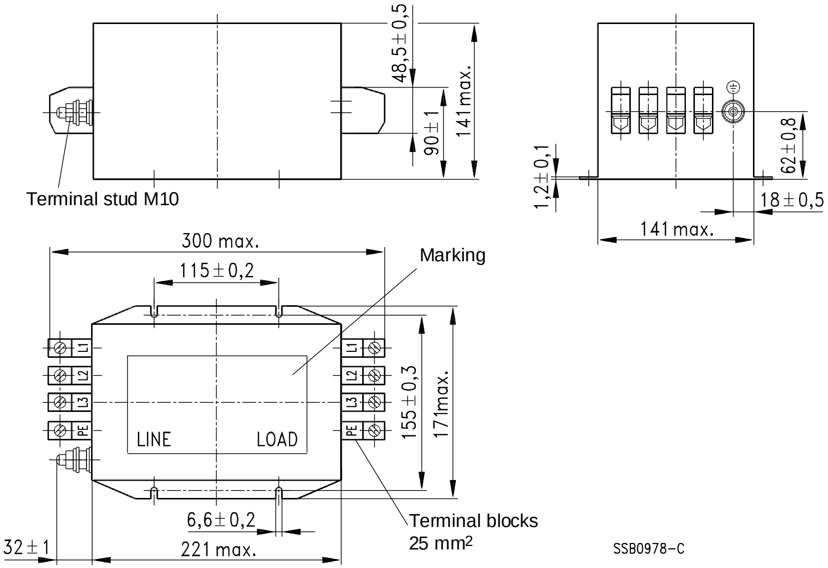
B84143-A8-R … B84143-A16-R



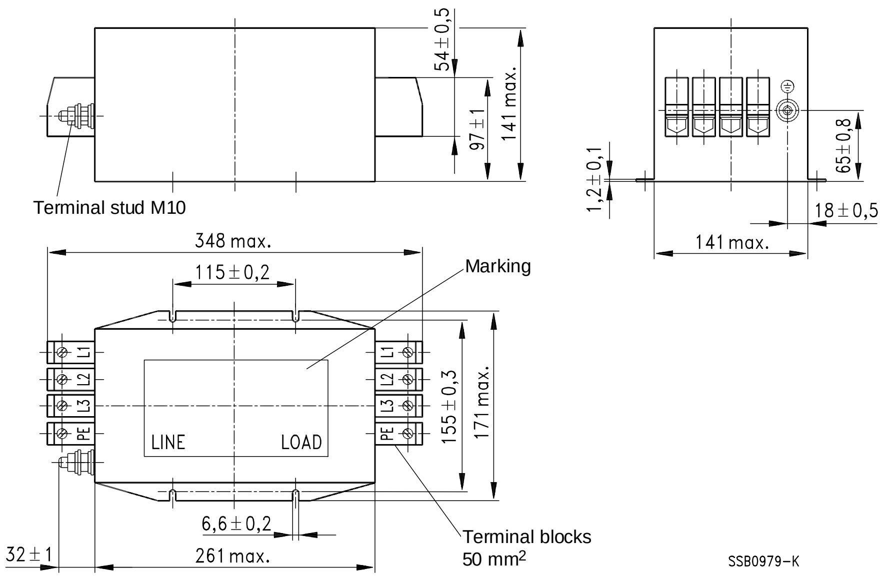
B84143-A25-R ... A50-R



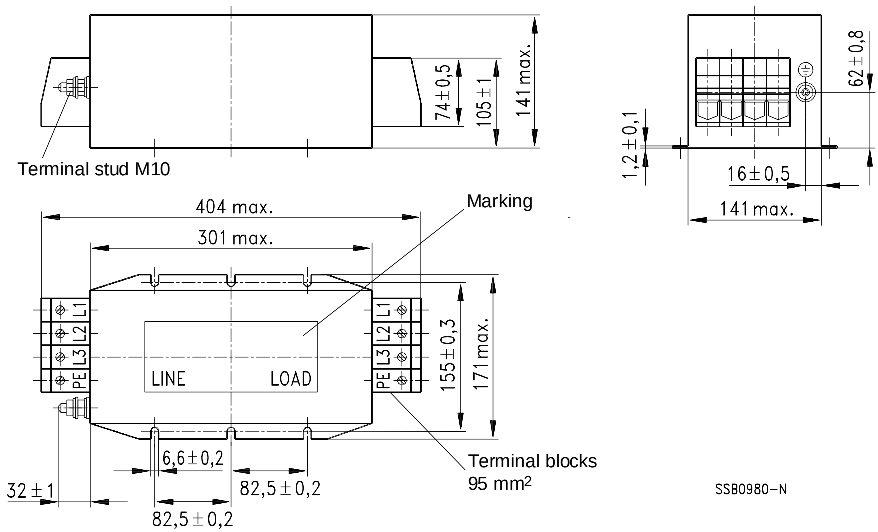
B84143-A80-R



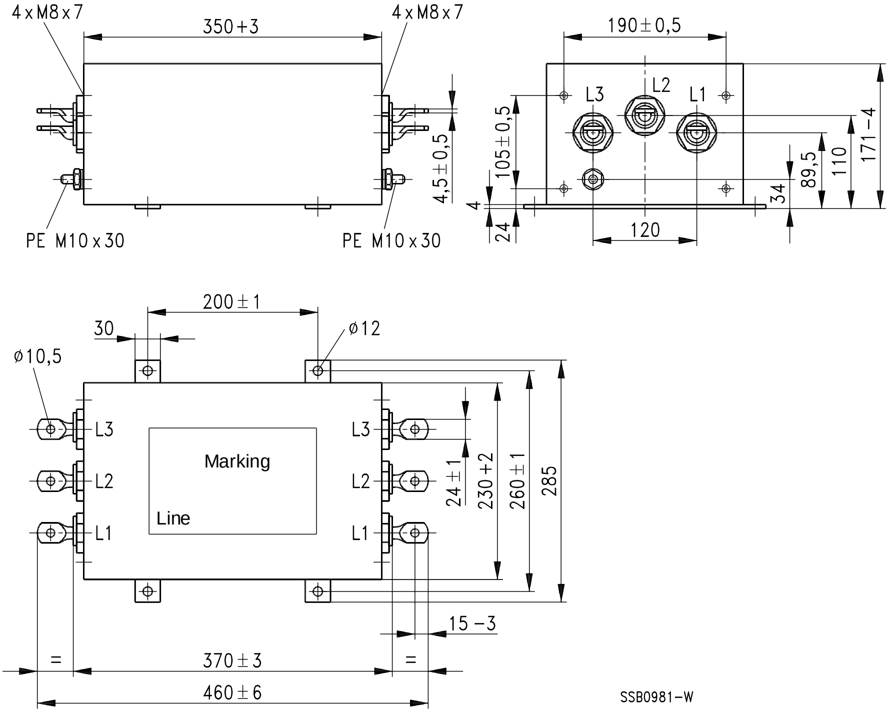
B84143-A120-R, B84143-A150-R



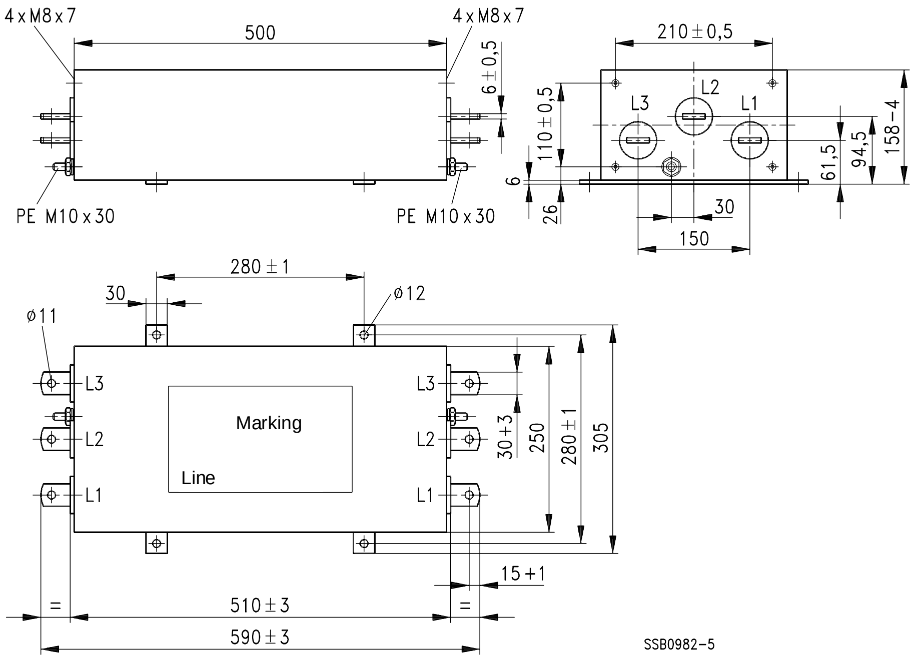
B84143-A180-R



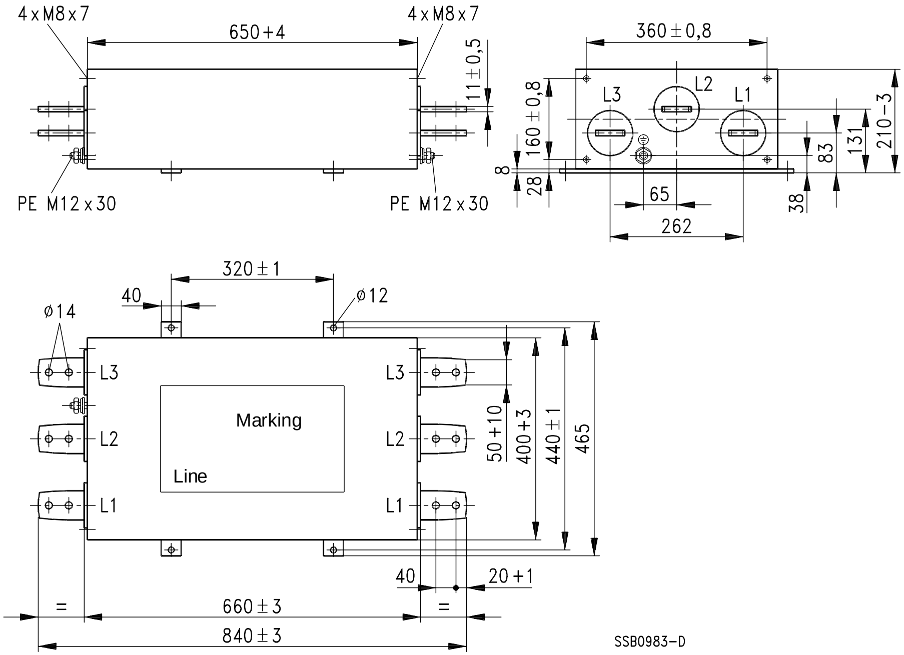
B84143-A250-S



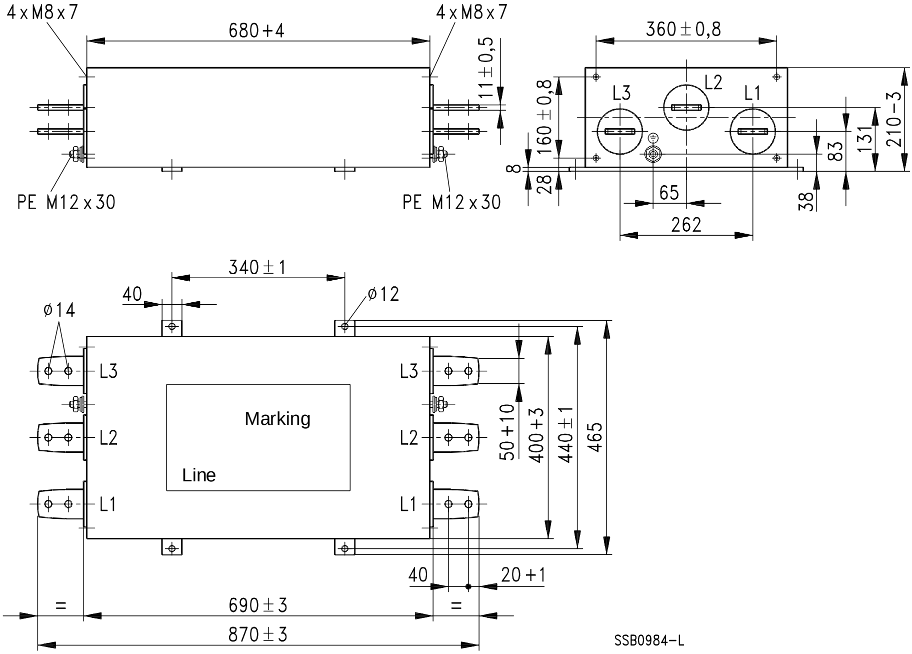
B84143-A500-S



B84143-A1000-S



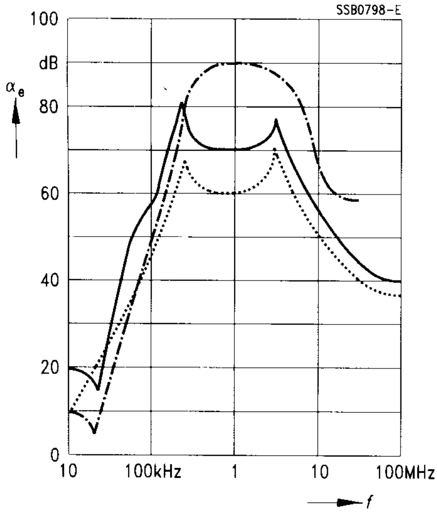
B84143-A1600-S



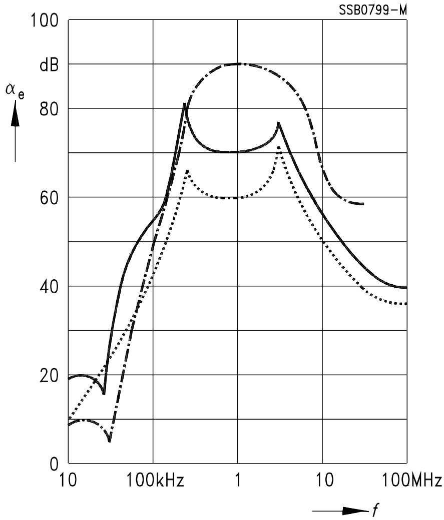
Insertion loss (typical values at Z = 50 Ω)

————————	unsymmetrical, adjacent branches terminated
······························	asymmetrical, all branches in parallel (common mode)
—·—·—·—·—	symmetrical (differential mode)

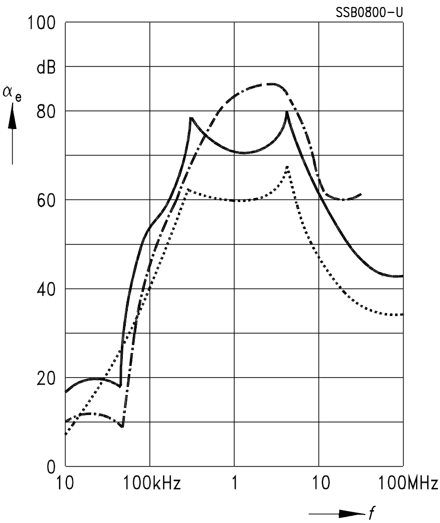
B84143-A8-R



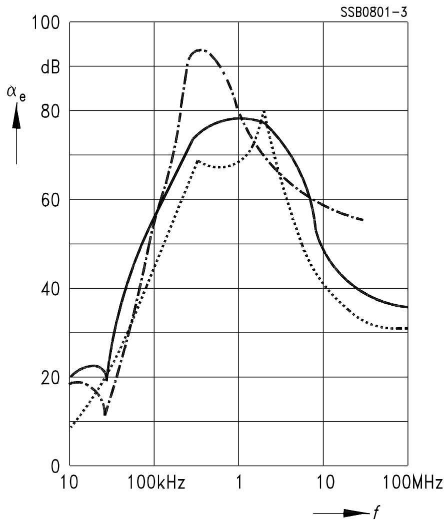
B84143-A12-R



B84143-A16-R



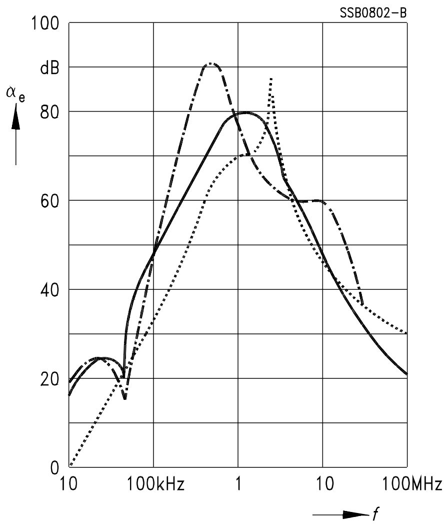
B84143-A25-R



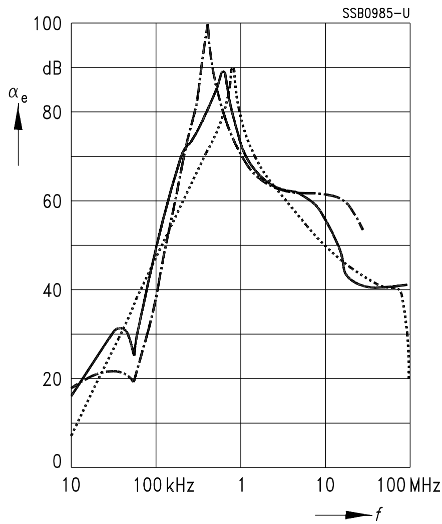
Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated
··························· asymmetrical, all branches in parallel (common mode)
—·—·—·—·— symmetrical (differential mode)

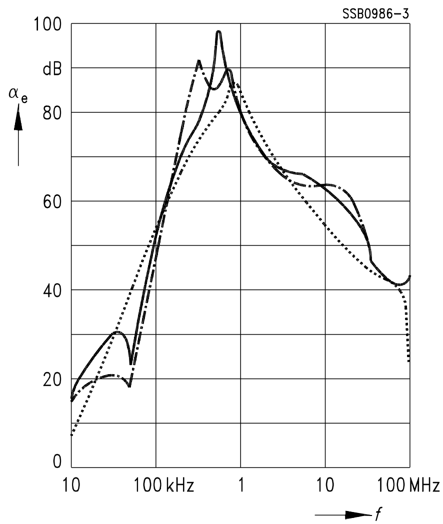
B84143-A36-R



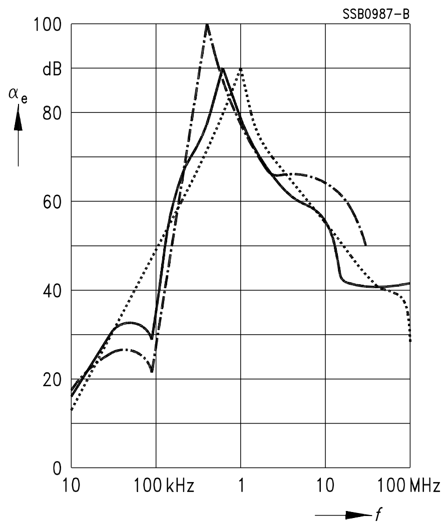
B84143-A50-R



B84143-A80-R



B84143-A120-R … B84143-A180-R



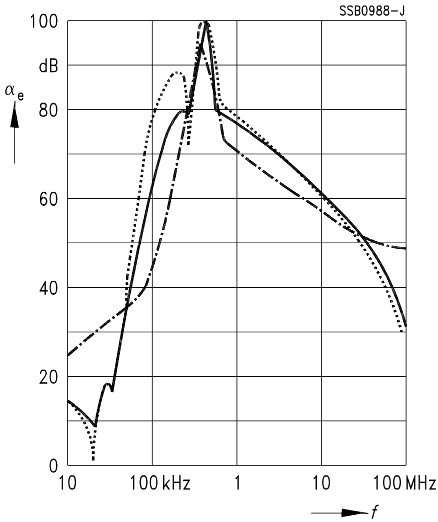
Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated

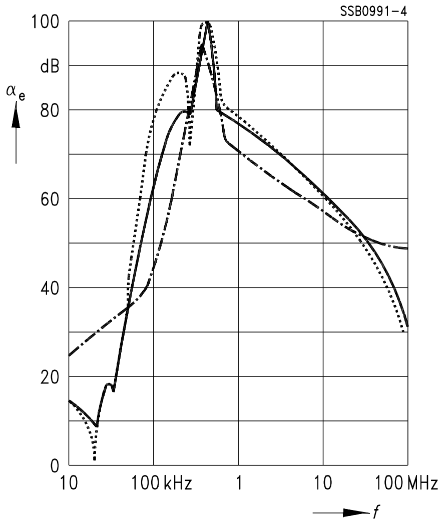
················ asymmetrical, all branches in parallel (common mode)

—·—·—·—·— symmetrical (differential mode)

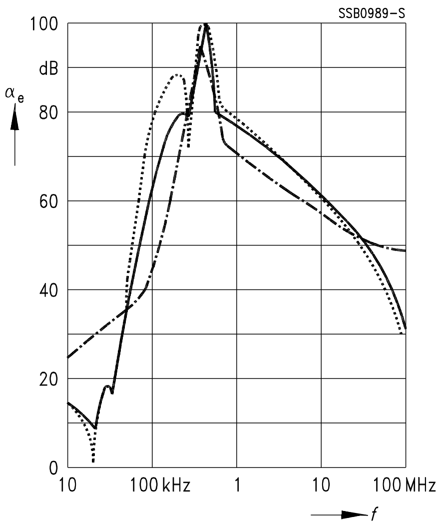
B84143-A250-S



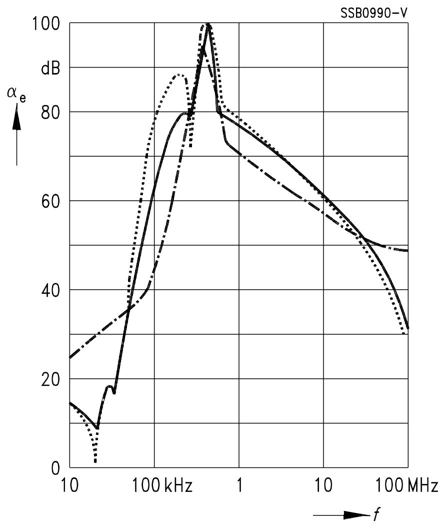
B84143-A500-S



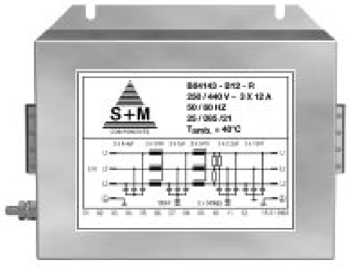
B84143-A1000-S



B84143-A1600-S



Power line filters for three-phase systems
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 8 A to 80 A



Construction

- Three-line filter
- Metal case

Features

- Very high insertion loss
- Low leakage current
- Easy to install
- Space-saving construction
- Construction complies with UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load

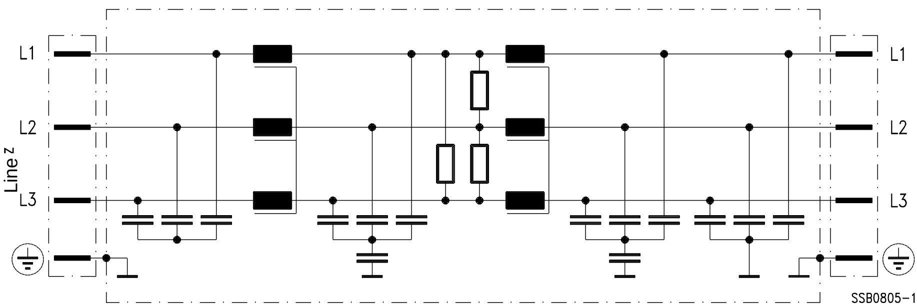
Applications

- Frequency converters for motor drives, e.g.
  – lifts
  – pumps
  – traction systems
  – conveyor systems
  – air conditioning systems
- Wind-driven power plants
- Power supplies

Terminals

- Safe-to-touch terminal blocks

Typical circuit diagram



Technical data

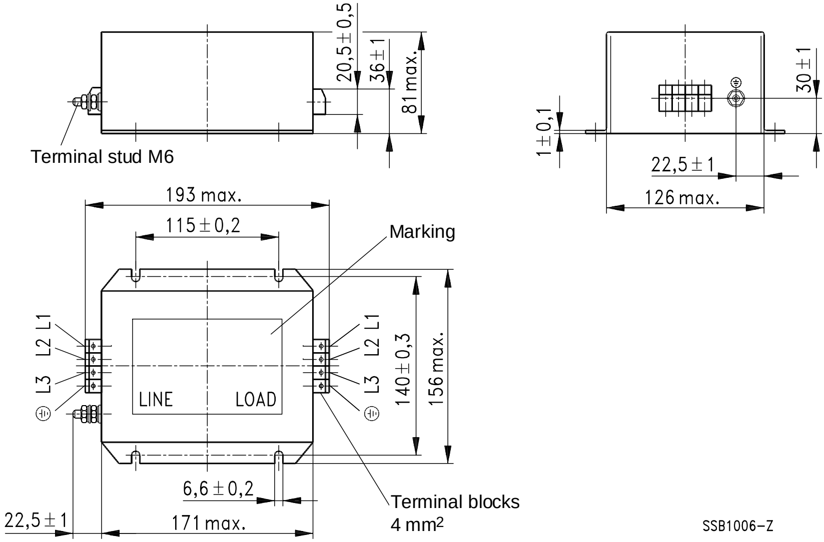
Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	2121 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Overload capability	1,5 · I_R for 3 min per hour or 2,5 · I_R for 30 s per hour
Leakage current I_{leak}	at 250 Vac, 50 Hz
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

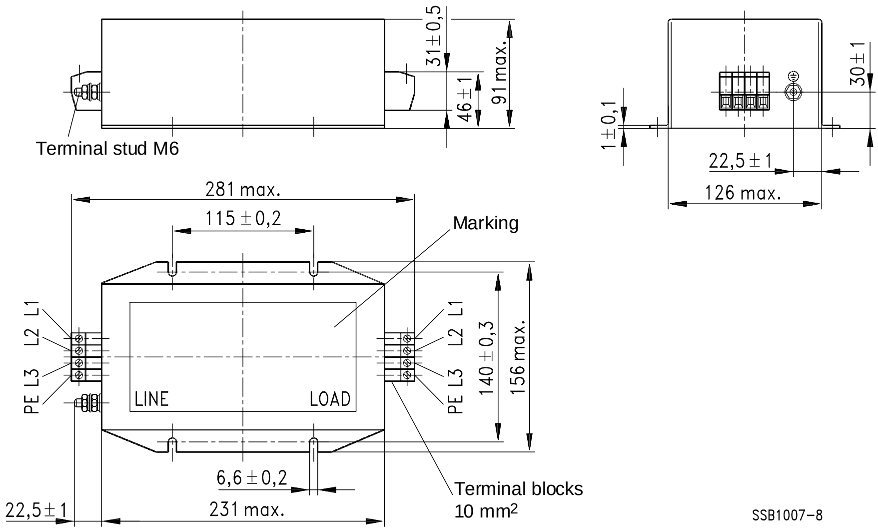
I_R A	Terminal cross section mm^2	I_{leak} mA	R_{typ} mΩ	Approx. weight kg	Ordering code
8	4	< 3,5	80	3,8	B84143-B8-R
12	4	< 3,5	40	3,8	B84143-B12-R
16	4	< 3,5	25	3,8	B84143-B16-R
25	10	< 3,5	10	5,7	B84143-B25-R
36	10	< 3,5	5	5,7	B84143-B36-R
50	10	< 6	3,5	5,7	B84143-B50-R
80	25	< 6	2	16	B84143-B80-R

Outline drawings

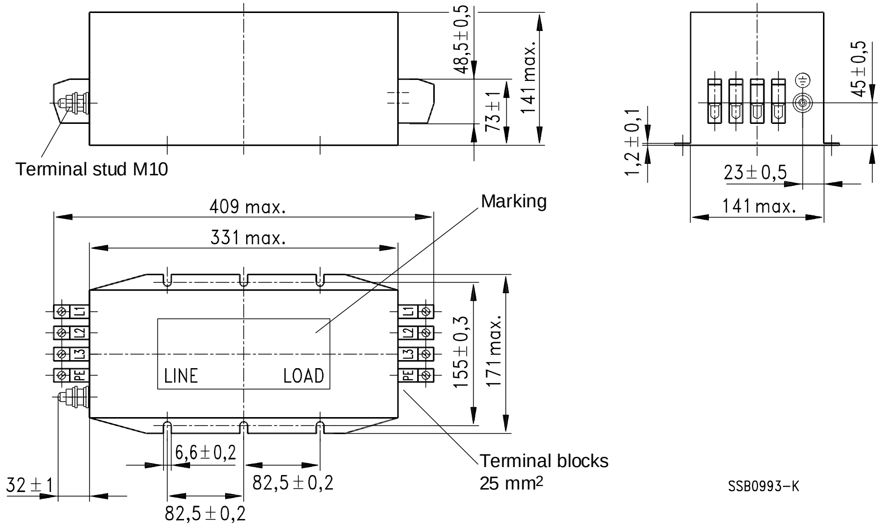
B84143-B8-R … B84143-B16-R



B84143-B25-R … B84143-B50-R



B84143-B80-R



48,5±0,5
73±1
141 max.
Terminal stud M10
45±0,5
1,2±0,1
23±0,5
141 max.
409 max.
331 max.
Marking
L1
L2
L3
PE
LINE
LOAD
155±0,3
171 max.
6,6±0,2
82,5±0,2
32±1
82,5±0,2
Terminal blocks
25 mm2
SSB0993-K

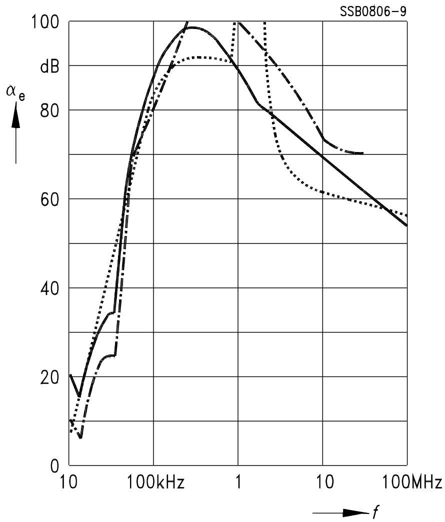
Insertion loss (typical values at Z = 50 Ω)

——————— unsymmetrical, adjacent branches terminated

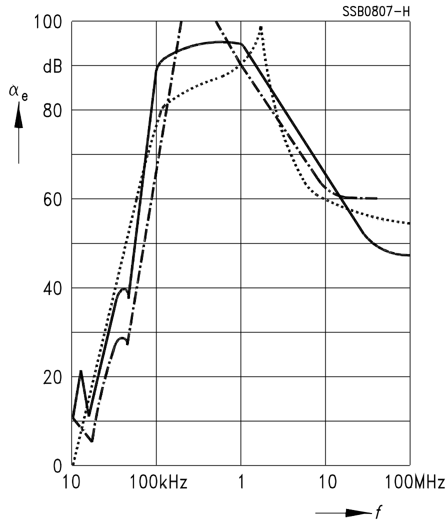
·················· asymmetrical, all branches in parallel (common mode)

—·—·—·— symmetrical (differential mode)

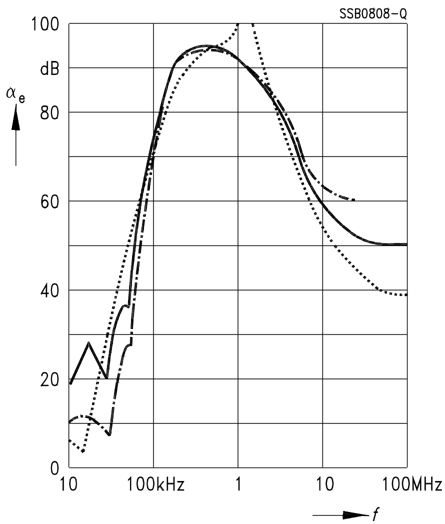
B84143-B8-R



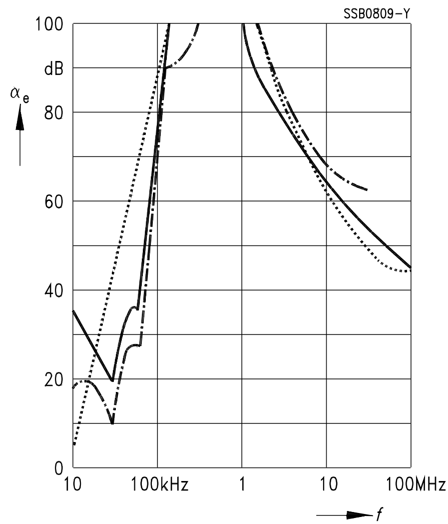
B84143-B12-R



B84143-B16-R



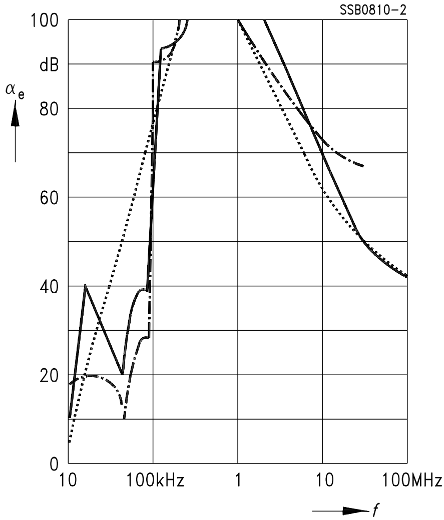
B84143-B25-R



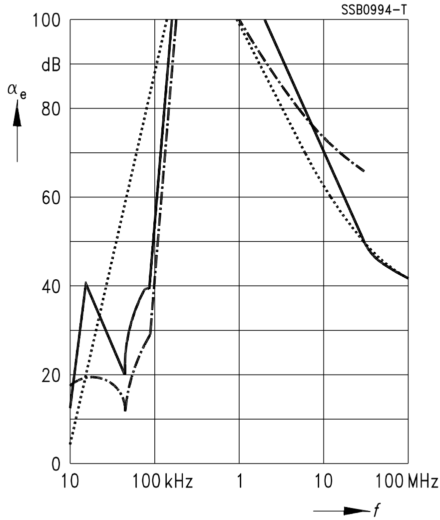
Insertion loss (typical values at Z = 50 Ω)

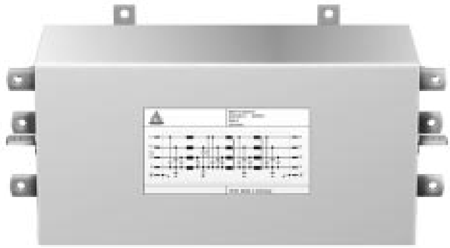
———————	unsymmetrical, adjacent branches terminated
···························	asymmetrical, all branches in parallel (common mode)
—·—·—·—·—	symmetrical (differential mode)

B84143-B36-R



B84143-B50-R
B84143-B80-R





Power line filters for three-phase systems
Rated voltage 440/250 Vac, 50/60 Hz
Rated current 16 A to 1600 A

Construction

- Four-line filter
- Metal case
- Threaded bushes at end faces for RF-tight installation

Features

- High insertion loss
- Low leakage current
- Easy-to-install
- Space-saving construction
- Construction complies with UL 1283, CSA 22.2 No.8 1986

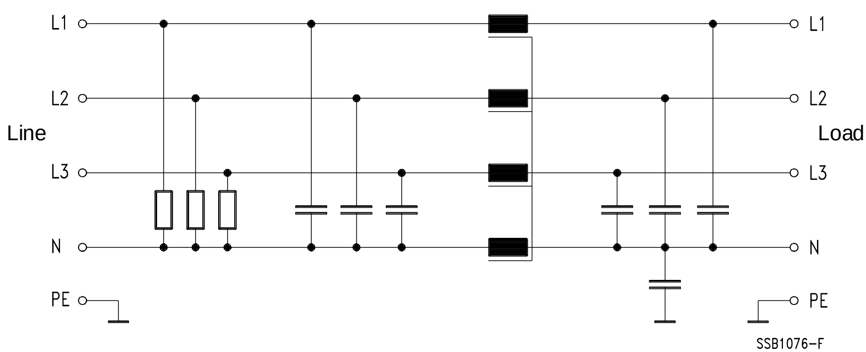
Applications

- General-purpose application in power electronics
- UPS
- Wind-driven power plants

Terminals

- Safe-to-touch terminal blocks for filters up to 180 A
- Terminal lugs for filters 250 to 1600 A

Typical circuit diagram



Technical data

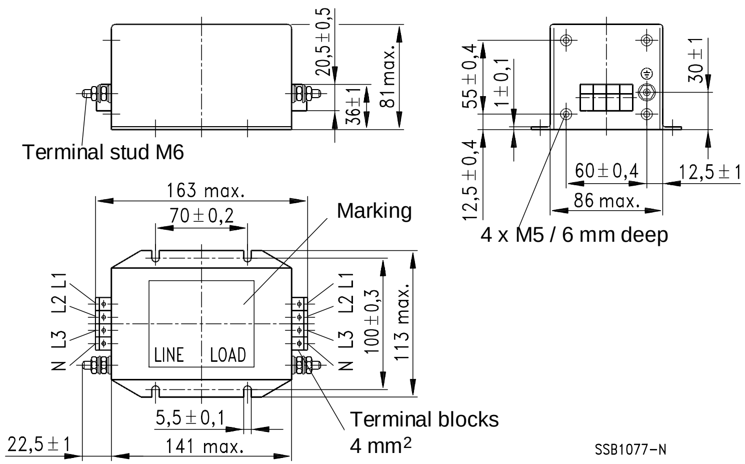
Rated voltage V_R	440/250 Vac, 50/60 Hz
Rated current I_R	Referred to 40 °C ambient temperature
Test voltage V_P	1770 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case), for 16 … 50 A 2550 Vdc, 2 s (lines/case), for 80 … 180 A 2121 Vdc, 2 s (lines/case), for 250 … 1600 A
Overload capability	1,5 · I_R for 3 min per hour or 2,5 · I_R für 30 s per hour
Climatic category	In accordance with IEC 68-1 25/085/21 (– 25 °C/+ 85 °C/21 days damp heat test)

Characteristics and ordering codes

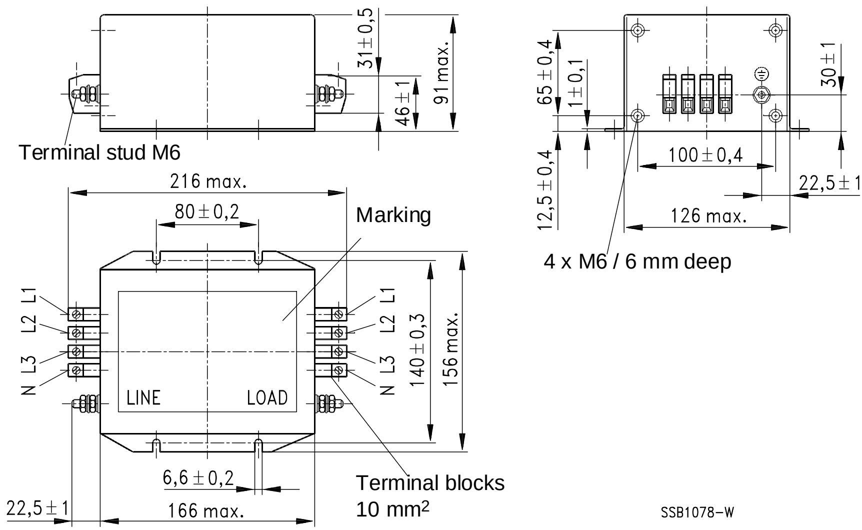
I_R A	Terminal cross sect. mm^2	I_{leak} mA	R_{typ} mΩ	P_V W	Approx. weight kg	Ordering code
16	4	< 3,5	10	8	2,2	B84144-A16-R
25	10	< 3,5	6	11	3,7	B84144-A25-R
36	10	< 3,5	3,5	14	3,7	B84144-A36-R
50	10	< 6	1,3	10	4,0	B84144-A50-R
80	25	< 6	0,7	13	9,5	B84144-A80-R
120	50	< 6	0,5	22	10	B84144-A120-R
150	50	< 6	0,35	24	10	B84144-A150-R
180	95	< 6	0,25	24	13	B84144-A180-R
250	Terminal lugs	< 6	0,095	18	21	B84144-G250-S
500		< 6	0,060	45	53	B84144-G500-S
1000		< 6	0,030	90	140	B84144-G1000-S
1600		< 6	0,020	150	185	B84144-G1600-S

Outline drawings

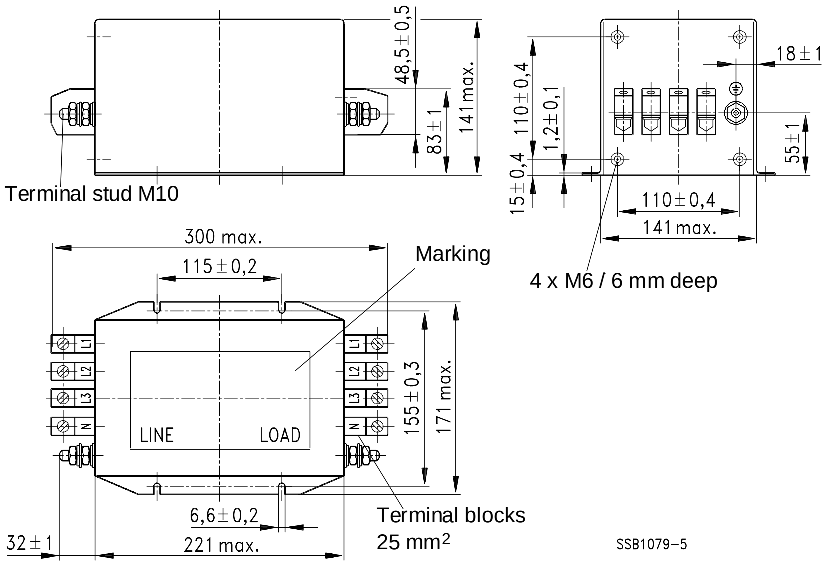
B84144-A16-R



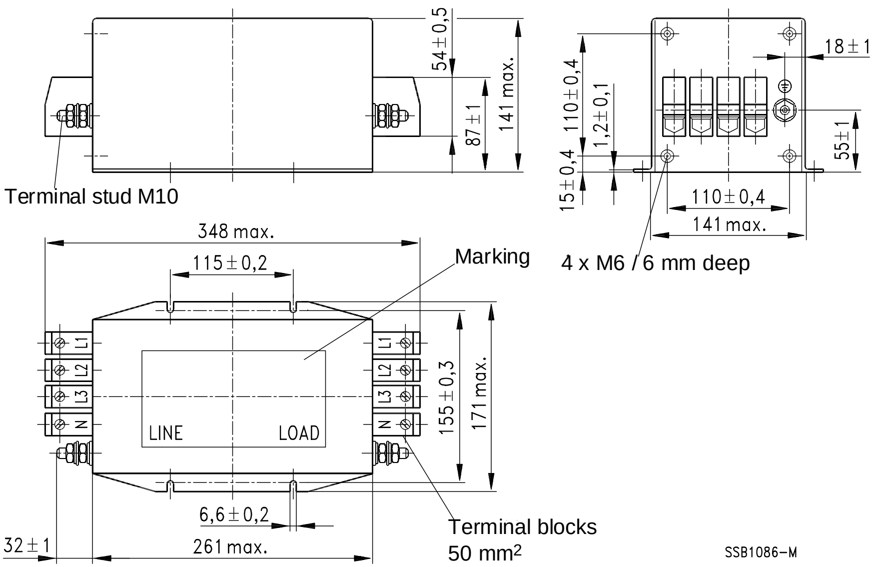
B84144-A25-R … B84144-A50-R



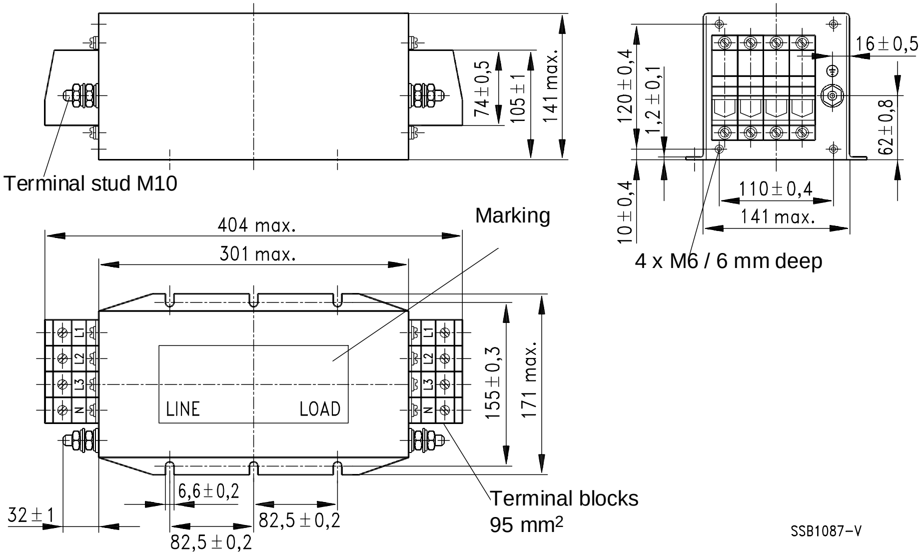
B84144-A80-R



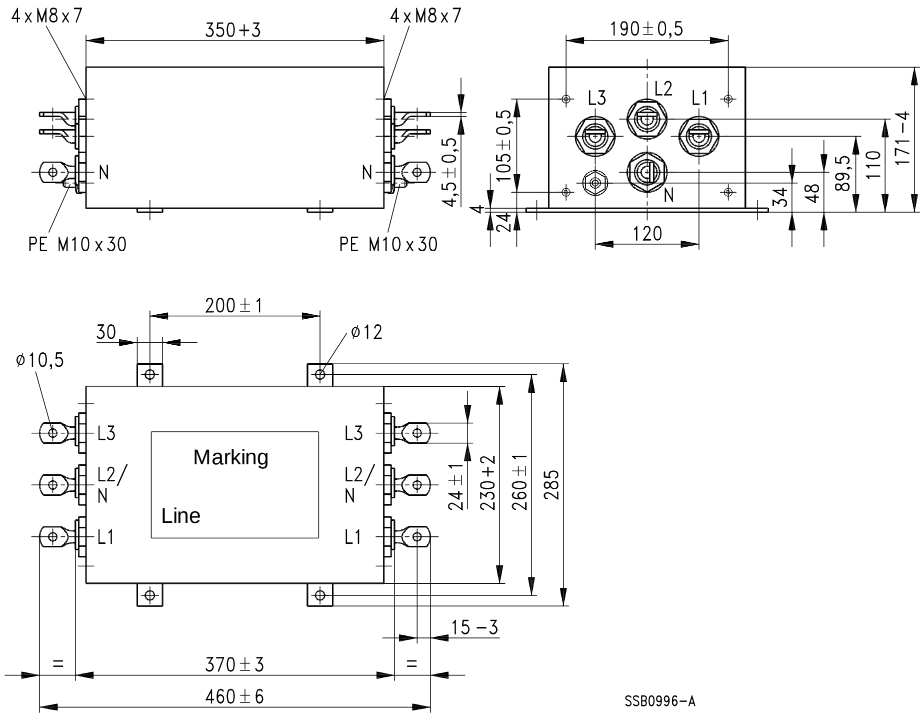
B84144-A120-R, B84144-A150-R



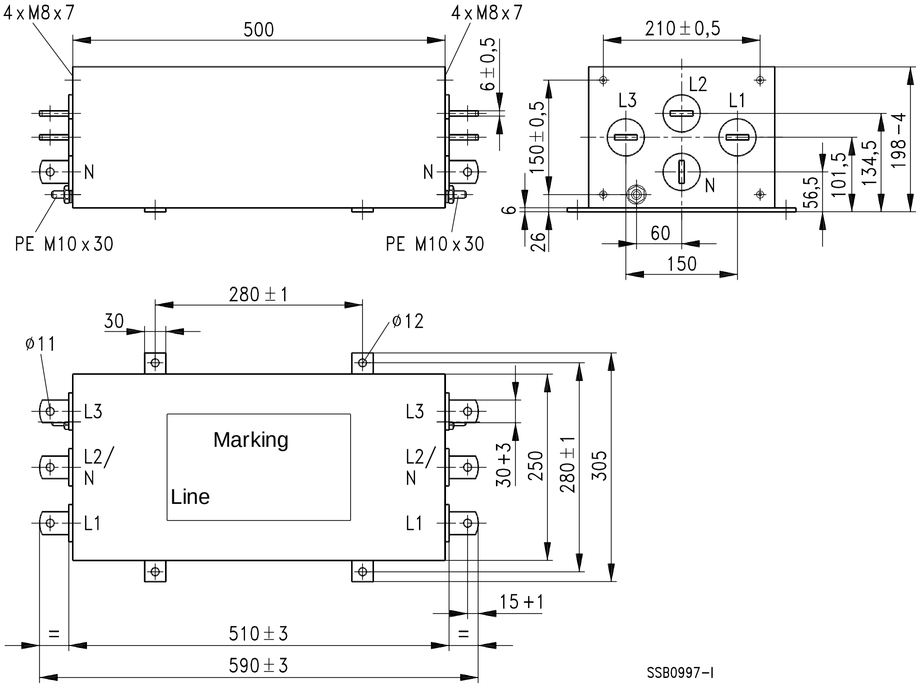
B84144-A180-R



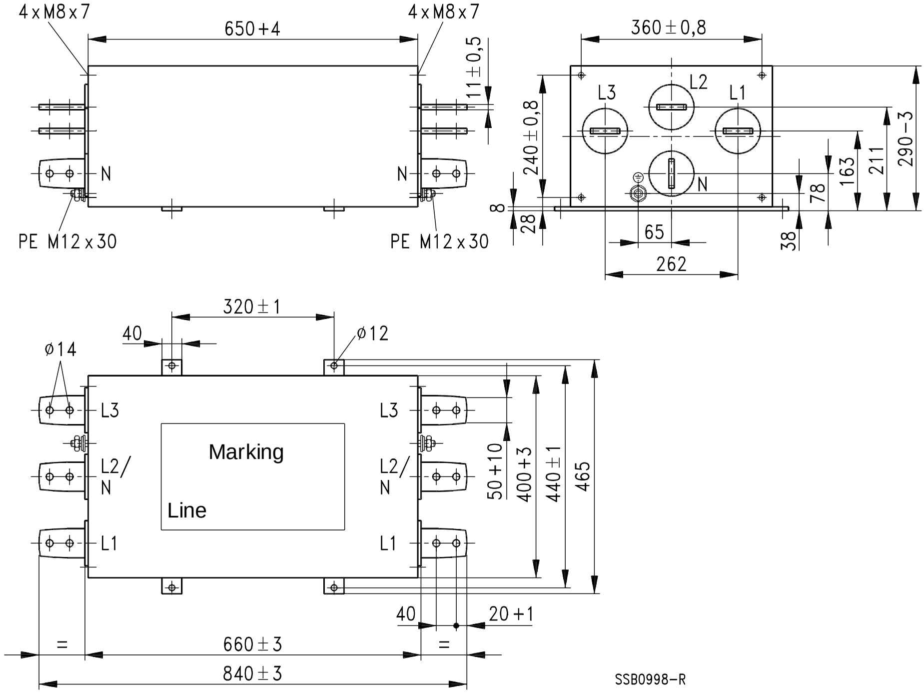
B84144-G250-S



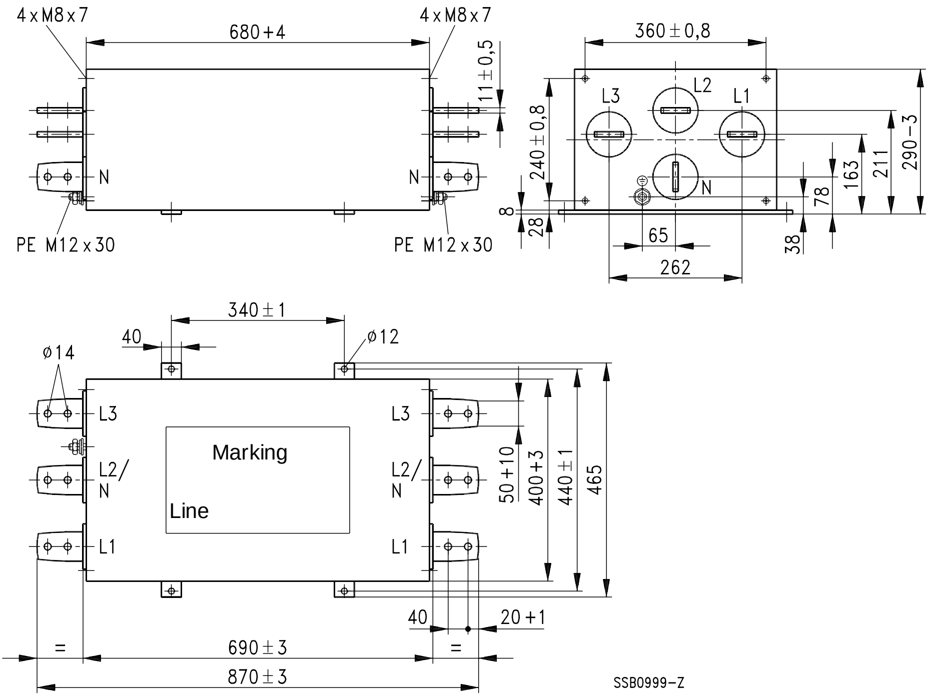
B84144-G500-S



B84144-G1000-S



B84144-G1600-S



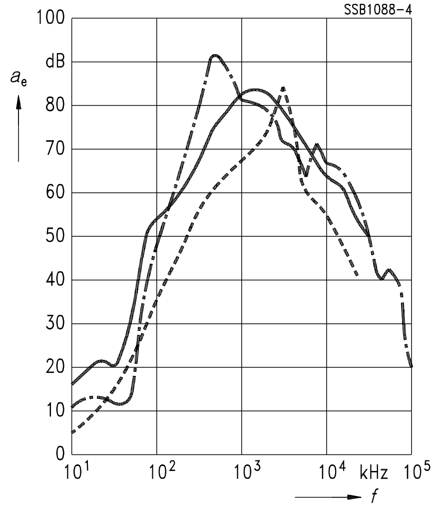
Insertion loss (typical values at Z = 50 Ω)

———————— unsymmetrical, adjacent branches terminated

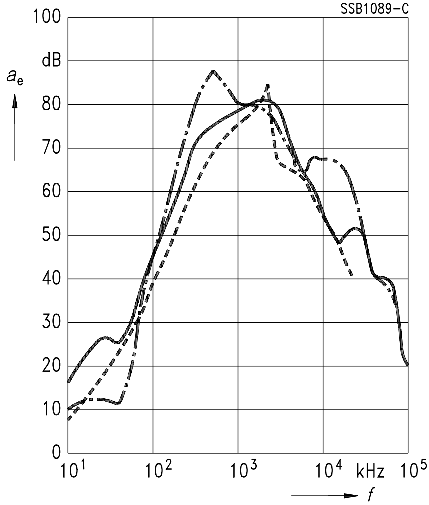
.... asymmetrical, all branches in parallel (common mode)

—·—·—·—·— symmetrical (differential mode)

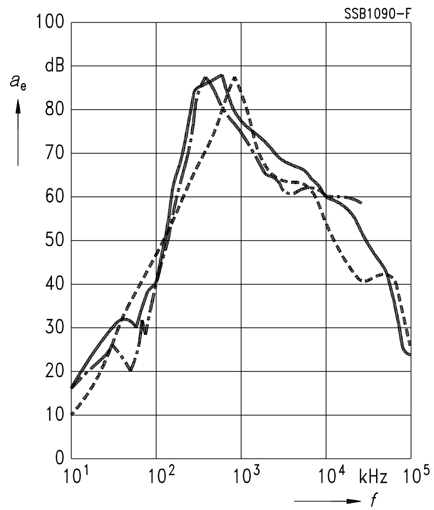
B84144-A16-R ... -A36-R



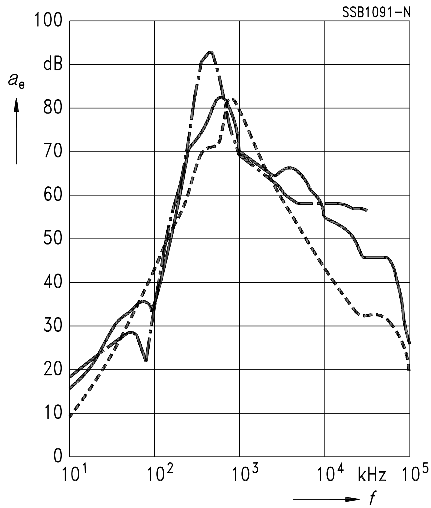
B84144-A50-R



B84144-A80-R



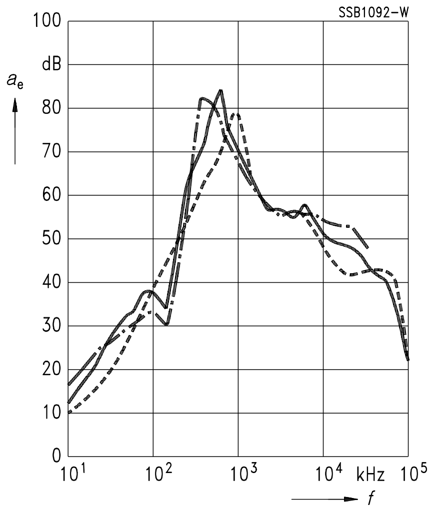
B84144-A120 ... -A150-R



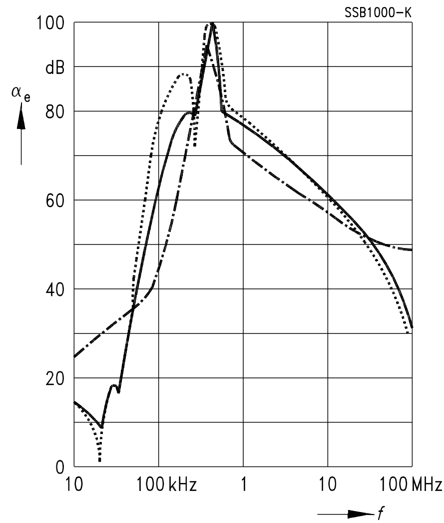
Insertion loss (typical values at Z = 50 Ω)

——————— unsymmetrical, adjacent branches terminated
.... asymmetrical, all branches in parallel (common mode)
—·—·—·—·— symmetrical (differential mode)

B84144-A180-R



B84144-G250-S ... -G1600-S



General technical information

Shielded rooms or enclosures are meant to protect against electromagnetic fields. Depending on the application, it may be necessary to shield the interior from the external electromagnetic environment or, conversely, to protect the environment from electromagnetic interference.

The first case may apply to research, development and testing sites, data processing equipment or medical equipment which can only operate safely and error-free if they are adequately protected from RF interference.

In the second case, e.g. where spark-erosion equipment is used or high-voltage tests and dielectric strength measurements are carried out, the emitted RF energy would not only interfere with radio and television reception but would even impair the functioning of electrical equipment in the vicinity.

Furthermore, such equipment often needs to be protected not only from sine-wave interference signals, but also from being disturbed by electrical impulses. This type of interference includes electromagnetic pulses (EMP), which is a term used to describe the effects of lightning (LEMP) on the one hand, and, on the other hand, nuclear electromagnetic pulses (NEMP) and the corresponding effects of transients induced on the lines.

To prevent the interference and overvoltages from entering or leaving the shielded rooms, filters must be fitted to all lines passing through the shield.

In this data book, we are presenting the following filters for these applications:

	Type	Page
Filters for communications lines	B84312	340
Filters for power lines	B84204 … B84226, B84299	349

If you would like to obtain more information on our range of filters for electrical installations and shielded rooms, we would be pleased to oblige; please contact:

Siemens Matsushita Components
EMV-Systemtechnik
Siemensstraße 103
D-89520 Heidenheim

Tel: 07231/326-120 … 125
Fax: 07231/326-381

Filters for communications lines

Filters for connecting communicaions lines into shielded rooms and enclosures are available for various applications. They are directly fitted into the shielded wall as individual filters. Where several filters are needed for one application, they are mounted in filter boxes or filter cabinets. The input and output capacitors are designed as coaxial feed-through components, so that blocking attenuation is achieved for frequencies up to 40 GHz.

The filters' insertion loss is chosen to comply with C.I.S.P.R. publication 17 , which specifies more severe conditions than the more frequently applied MIL-STD-220 A standard, which only requires a no-load measurement for frequencies in the range below 100 kHz. For all filters, the attenuations given are the full-load values for the entire specified frequency range.

Mechanical construction

The electrical components are installed in an RF-tight cases of tin-plated sheet steel. The covers are soldered RF-tight. 2-line and 20-line filters are available. These can either be mounted flat on the shielded wall or upright (i.e. perpendicular to the mounting surface).

Type	Mounting		Filter selection
B84312-C	Upright	The spacing-saving solution where several different filters have to be installed together.	B84312-C***-B (2-line) B84312-C***-H (20-line)
B84312-F	Flat	Advantageous due to the low profile where only one or just a few filters are required.	B84312-F***-B (2-line)

Filter applications

The standard filters listed below have been developed for the most common applications, however, customer-specific filters can be implemented to meet deviating requirements.

<table>
<tr><th>Type series</th><th>Passband</th><th>Application</th></tr>
<tr><td>B84312-+20- …</td><td>0 … 3,4 kHz
at 600 Ω impedance</td><td>Standard filters for telephone systems</td></tr>
<tr><td>B84312-+10- …</td><td>0 … 10 kHz
at 600 Ω impedance</td><td>Standard filters for telephone systems with extended pass bandwidth</td></tr>
<tr><td>B84312-+40- …</td><td>0 … 50 kHz
at 600 Ω impedance</td><td>Filters for telephone systems and modem cables and, due to the low capacitive loads, also suitable for control lines with critical signal rise times</td></tr>
<tr><td>B84312-+30- …</td><td></td><td>Universal filters for signal and control lines with up to 1 A</td></tr>
<tr><td>B84312-+50- …</td><td>0 … 120 kHz
at 150 Ω impedance</td><td rowspan="2">Suitable for data signals with balanced signal transmission mode (wire pairs) as used by modems or RS 485 or RS 422 interfaces with transmission rates up to 9,600 or 19,200 Baud</td></tr>
<tr><td>B84312-+60- …</td><td>0 … 300 kHz
at 150 Ω impedance</td></tr>
<tr><td>B84312-+90- …</td><td>0 … 3,4 kHz
at 600 Ω impedance</td><td>Filters for telephone systems
No-pass attenuation of 100 dB above 10 kHz for extreme requirements</td></tr>
<tr><td>B84312-+100- …</td><td></td><td>Filters for control lines with up to 1 A and stricter attenuation requirements</td></tr>
</table>

Other communications filters and accessories

We also supply the folllwing filter types:

- Filters for ISDN systems
- Filters with integrated overvoltage protection for 1 to 10 wire pairs

A variety of designs is available for installation in cases and cabinets, as well as matching flexible connector fittings and accessories.

Special designs

The modular construction of the 2-line filter types enables us to supply them, upon special request, with various connectors or circuits adapted for special applications.

Technical data

Rated voltage V_R	250 Vdc/100 Vac
Rated current I_R	Referred to 40 °C ambient temperature
Number of lines B84312-C***-B*** B84312-F***-B*** B84312-C***-H***	 2 2 20
Climatic category	In accordance with IEC 68-1 40/085/56 (– 40 °C/+ 85 °C; 56 days damp heat test test)
Weight	B84312-C***-B***: approx. 560 g B84312-F***-B***: approx. 560 g B84312-C***-H***: approx. 4,5 kg

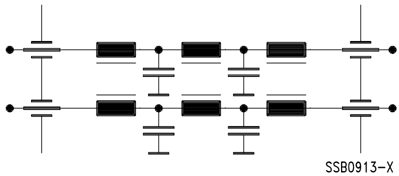
Characteristic data and ordering codes

Pass bandwidth kHz	Matched to Ω	I_R A	Circuit	V_P line/line 2s V	V_P line/case V	R_{DC} per line Ω	Ordering code [1)]
DC … 10	600	0,1	1	600	600	4	B84312-+10-+3
DC … 3,4	600	0,1	1	600	600	11	B84312-+20-+3
—	—	1	1	400	400	0,2	B84312-+30-+3
DC … 50	600	0,1	1	600	600	1,1	B84312-+40-+1
DC … 120	150	0,1	2	600	600	4,4	B84312-+50-+1
DC … 300	150	0,1	2	600	600	1,6	B84312-+60-+1
DC … 3,4	600	0,1	3	600	600	17	B84312-+90-+4
—	—	1	4	400	400	0,6	B84312-+100-+3

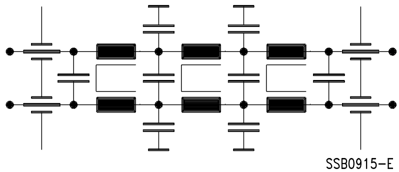
1) Replace the + in the 2nd block of the ordering code by the code letter for mounting mode:
C = upright mounting, F = flat mounting
Replace the + in the 3rd block of the ordering code by the code letter for the number of lines:
B = 2-line filter, H = 20-line filter.

Circuit diagrams

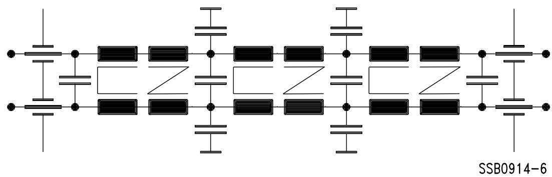
Circuit 1



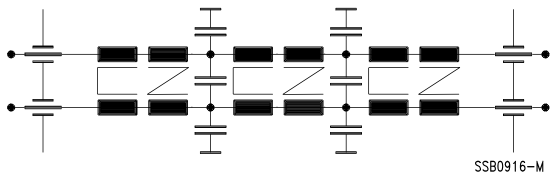
Circuit 2



Circuit 3



Circuit 4



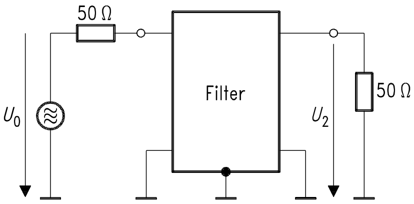
Notes on circuits 2, 3 and 4:

These filters use current-compensated chokes. Please ensure that both lines of a signal pair are passed through the same filter.

The 20-line designs B84312-C***-H*** each contain ten of these filter circuits.

Insertion loss a_e in the attenuation band (typical curves)

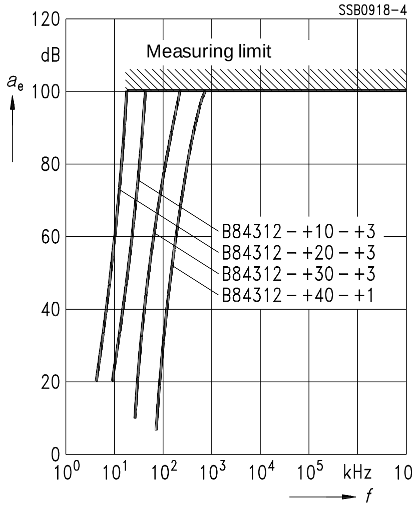
Measuring circuit



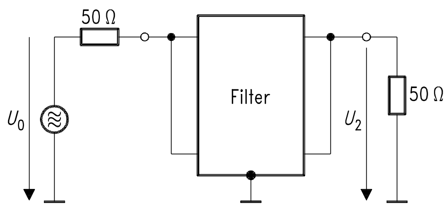
$$a_e = 20 \lg \frac{U_0}{2 \cdot U_2} \text{ [dB]}$$

SSB0917-V

U = V = Voltage



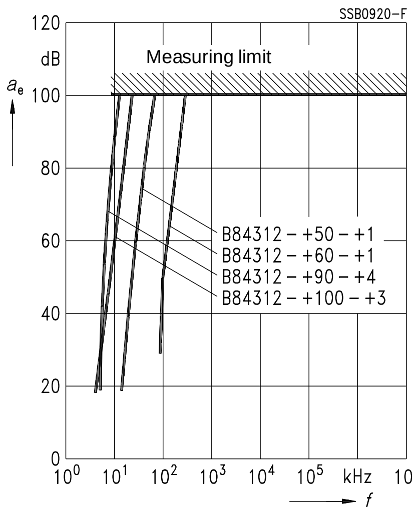
Measuring circuit



$$a_e = 20 \lg \frac{U_0}{2 \cdot U_2} \text{ [dB]}$$

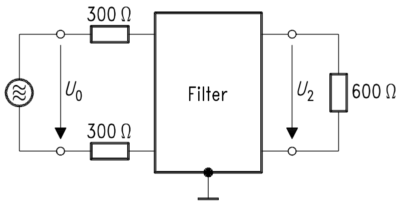
SSB0919-C

U = V = Voltage



Insertion loss a_e in the attenuation band (typical curves)

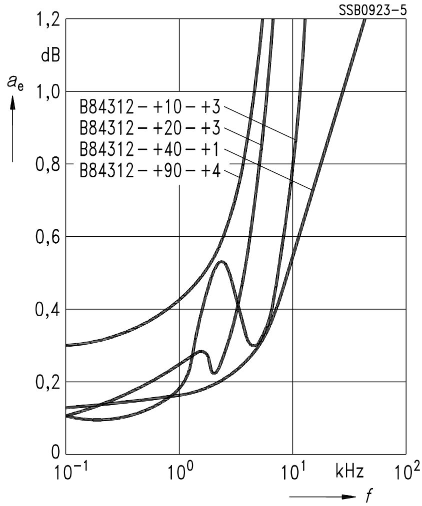
Measuring circuit



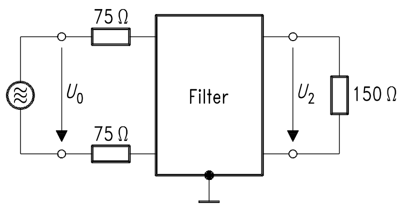
$a_e = 20 \lg \frac{U_0}{2 \cdot U_2}$ [dB]

SSB0921-N

U = V = Voltage



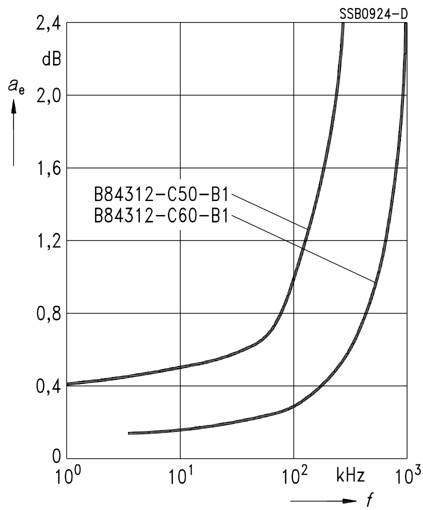
Measuring circuit



$a_e = 20 \lg \frac{U_0}{2 \cdot U_2}$ [dB]

SSB0922-W

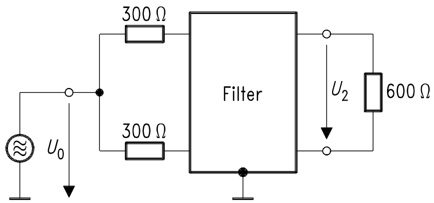
U = V = Voltage



Common-mode attenuation in the passband

for types B84312-+10-+3
B84312-+20-+3
B84312-+40-+1
B84312-+90-+4

Measuring circuit



$$\text{CMR} = 20 \lg \frac{U_0}{U_2} \; [\text{dB}]$$

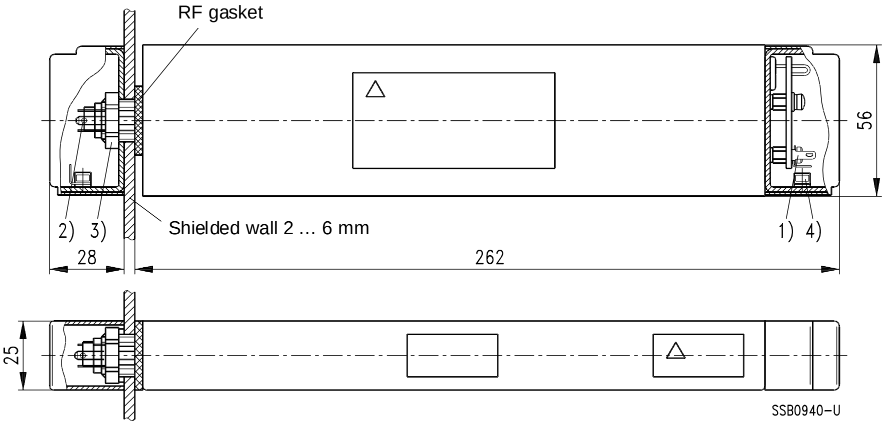
SSB0925-L

U = *V* = Voltage

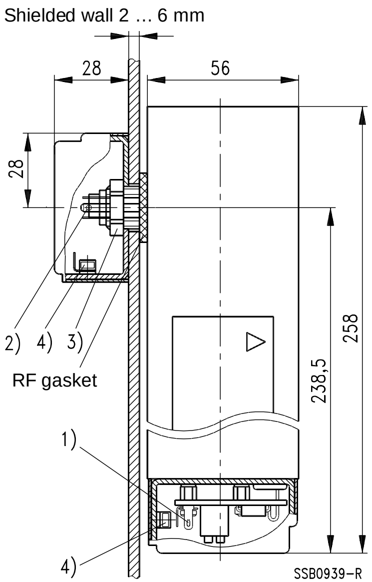
CMR >40 dB in the passband

Outline drawings

B84312-C***-B*

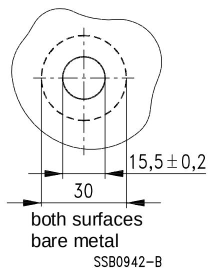


B84312-F***-B*

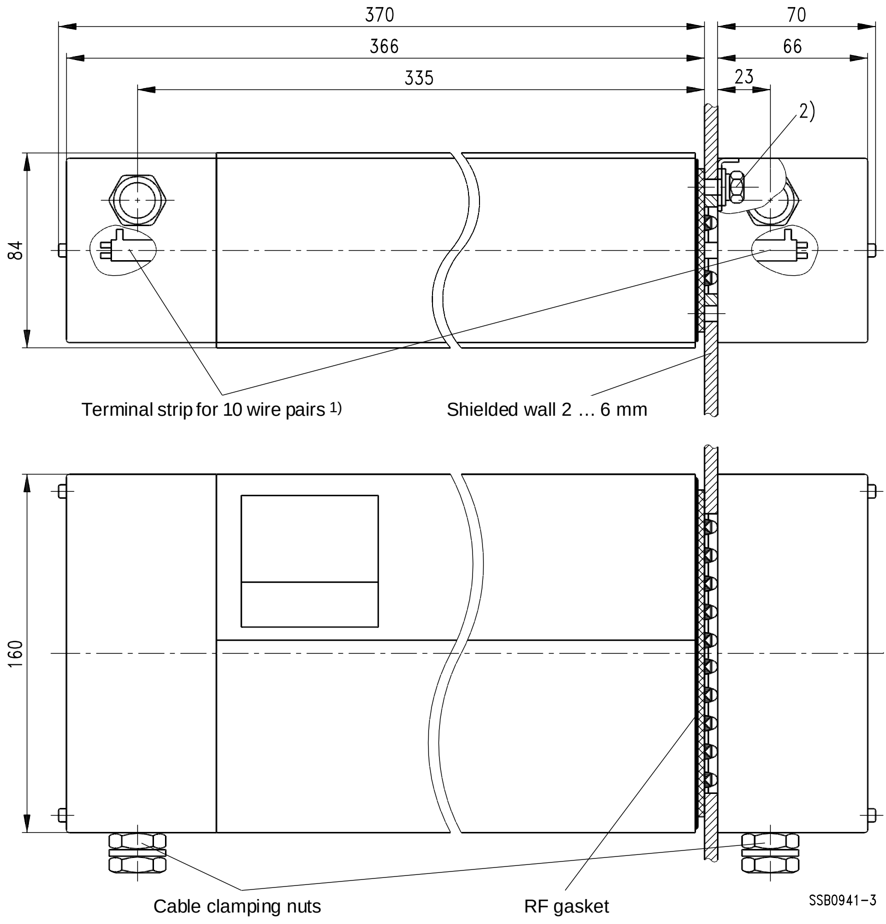


1) Cable input terminals:
   2 × male tab connectors DIN 46244-A2,8-0,5
   for female connectors 2,8-0,5 (incl. in package)
2) Cable output terminals:
   2 × male tab connectors DIN 46244-2,8-0,5
   for female connectors 2,8-0,5 (incl. in package)
3) Fixing nut PG 9
   Tightening torque rating 22 ± 2 Nm
4) Cable clamp on both sides for cables with
   d = 4,5 … 6 mm and soldering lug for shield

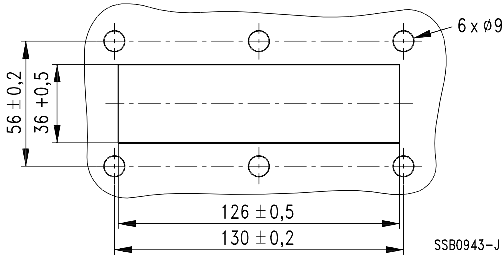
Mounting holes



B84312-C*-H***



Shielded wall cut-out



1) Suitable for solid conductors of diameter 0,4 … 0,6 (0,8) mm, insulated by PE or PVC (maximum external cable diameter 1,2 mm)
2) Tightening torque rating 10 + 1 Nm

General technical information

Filters for power lines can be supplied for single-phase and three-phase power supplies with rated frequencies of 50 Hz and 60 Hz.

The filter version will determine the upper frequency limit with respect to the attenuation requirements:
 1 GHz = version C
40 GHz = version G

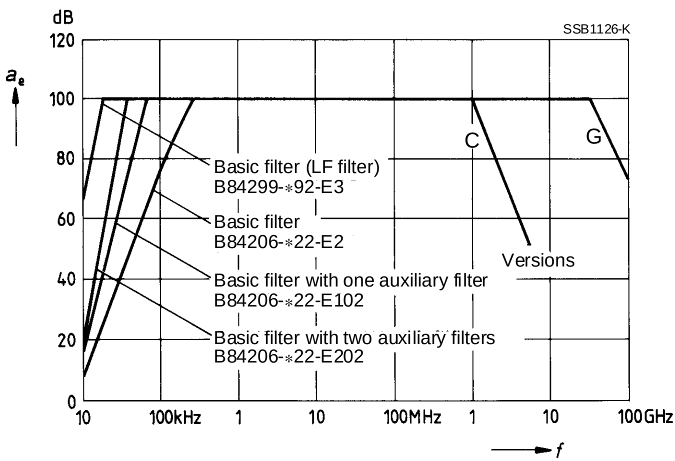
- Version C filters are primarily meant for suppressing interference generated by electrical installations. They can also be used for shielded rooms and enclosures when equipped with additional fittings.
- Version G filters are suitable for shielded rooms and enclosures.

For low-frequency applications, the followings models are available:

- Basic filters B84204 … B84226
  Standard filters generally having attenuations > 100 dB at frequencies starting from the MF range.
- Basic filters B84204 … B84226 with one or two auxiliary filters
  The frequency range in which an attenuation of > 100 dB is achieved can be lowered to the LF range by connecting one or two auxiliary filters.
- LF filters B84299 (Low frequency)
  Filters which already achieve attenuation values of > 100 dB in the LF range. Combinations with auxiliary filters do not lead to improvements, the use of such is thus not planned.

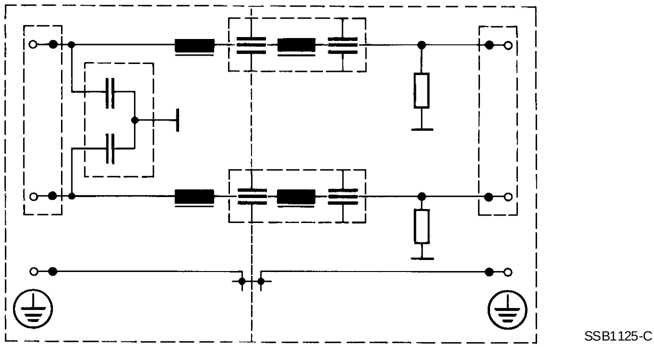
Insertion loss

Insertion loss that can be achieved, using a 25-A 3-phase power line filter as an example:

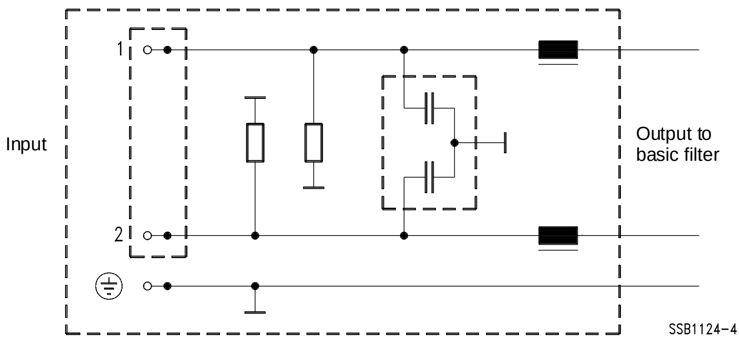


Circuit diagrams, showing two-line filters as examples

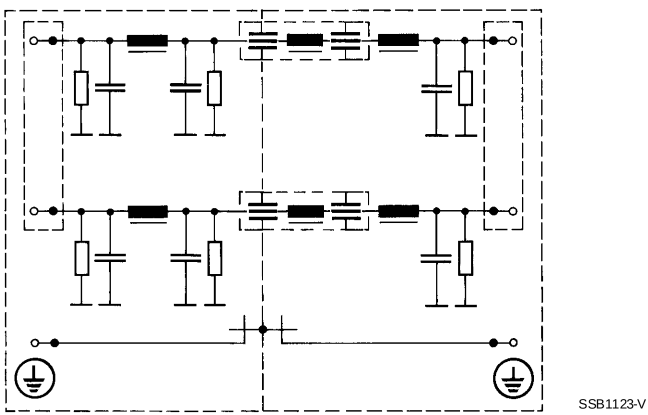
Basic filters
B84204 … B84226



Auxiliary filters



LF filters B84299



General technical data

Basic filters B84204 … B84226 with auxiliary filters

Rated voltage V_R	440 Vac, 50/60 Hz (line/line) 250 Vac, 50/60 Hz (line/case)
Rated current I_R	5 … 200 A Referred to + 40 °C ambient temperature and 60 Hz
Test voltage V_P	1100 Vdc, 2 s (line/line) 1100 Vdc, 2 s (line/case)
Voltage drop/line	Measured at rated current and 50 Hz For 60 Hz , multiply values in table by 1,2
Permissible ambient temperature	– 40 °C … + 40 °C

LF filter B84299

Rated voltage V_R	440 Vdc/440Vac, 50/60 Hz (line/line) 250 Vac, 50/60 Hz (line/case)
Rated current I_R	6 … 100A Referred to + 40 °C ambient temperature
Test voltage V_P	1100 Vdc, 2 s (line/line) 1100 Vdc, 2 s (line/case)
Leakage current / line	Measured at 50 Hz
Voltage drop / line	Measured at rated current and 50 Hz For 60 Hz , multiply values in table by 1,2
Permissible ambient temperature	– 25 °C … + 40 °C

Safety note!

The filters have protective earth and cable conductor connectors. Protective measures in accordance with VDE 0100 and national regulations are necessary due to the large capacitances connected between each conductor and case ground. It is also possible to connect protective earth conductors to the filter cases.

Where local regulations permit connection to neutral potential and earthing of the neutral line, the neutral line must be connected to the unassigned conductor which is connected to the case. In other cases, select filters that also have line interference suppression circuits for the neutral conductor (e.g. four-line filters).

Selector guide

I_R A	Lines	α_e (dB) at f (kHz)				Ordering code[1)]		
		14	50	100	1000	Basic filter	Basic filter + 1 auxiliary filter	Basic filter + 2 auxiliary filters
25	2	19	56	76	>100	B84204-+22-B2		
25	4	19	56	76	>100	B84206-+22-E2		
25	2	32	88	100	>100		B84204-+22-B201	
25	4	32	88	100	>100		B84206-+22-E201	
25	2	45	>100	>100	>100			B84204-+22-B202
25	4	45	>100	>100	>100			B84206-+22-E202
25	2	96	>100	>100	>100	B84299-+86-B3		
25	4	96	>100	>100	>100	B84299-+92-E3		
40	2	–	–	68	>100	B84204-+23-B2		
40	4	–	–	68	>100	B84206-+23-E2		
40	2	9	73	85	>100		B84204-+23-B102	
40	4	9	73	85	>100		B84206-+23-E102	
40	2	14	94	>100	>100			B84204-+23-B202
40	4	14	94	>100	>100			B84206-+23-E202
40	2	96	>100	>100	>100	B84299-+89-B3		
40	4	96	>100	>100	>100	B84299-+94-E3		
60	4	–	–	70	>100	B84224-+24-E2		
60	4	14	69	80	>100		B84224-+24-E102	
60	4	18	90	100	>100			B84224-+24-E202
60	2	96	>100	>100	>100	B84299-+90-B3		
60	4	96	>100	>100	>100	B84299-+87-E3		

Selector guide

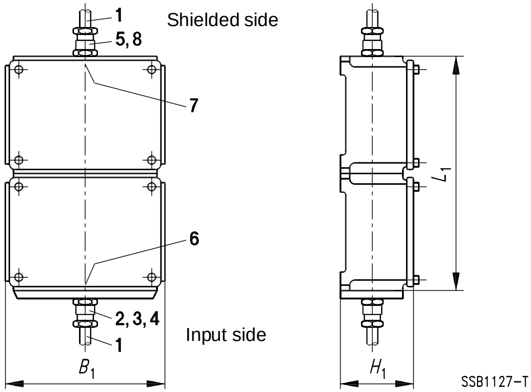
I_R A	Lines	α_e (dB) at f (kHz)				Ordering code[1)]		
		14	50	100	1000	Basic filter	Basic filter + 1 auxiliary filter	Basic filter + 2 auxiliary filters
100	4	–	–	58	>100	B84226-+25-E2		
100	4	–	40	65	>100		B84226-+25-E102	
100	4	14	60	80	>100			B84226-+25-E202
100	4	68	>100	>100	>100	B84299-+97-E3		
200	4	–	–	58	>100	B84209-C26-E2		
200	4	–	40	65	>100		B84209-C26-E102	
200	4	14	60	80	>100			B84209-C26-E202

1) Replace the + in the ordering code by the code letter for the required version:
C = Filter up to 1 GHz:
Filter for EMI suppression in electrical installations
With additional fitting also suitable for connection to shielded enclosures and rooms (see outline drawings)

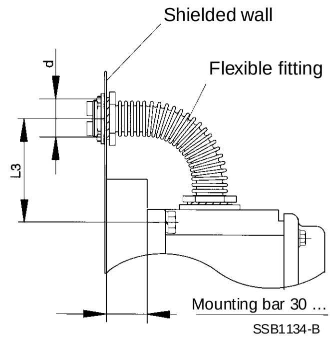
2) G = Filter up to 40 GHz:
For shielded enclosures and rooms

Basic filters B84204 to B84226

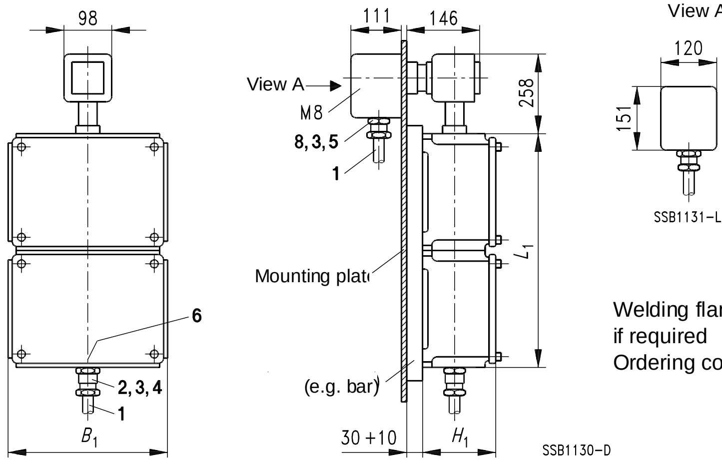
Version C (up to 1 GHz)



Flexible fittings for connection to shielded rooms[1)]



Version G (up to 40 GHz)



Welding flange, to be ordered if required
Ordering code: B83208-A-Z804

1) Fittings with 25 mm nominal width:
ordering code B84298-A42-L16 (L3 = 103 mm, d = 37 mm)

Fittings with 40 mm nominal width:
ordering code B84298-A44-L22 (L3 = 168 mm, d = 54 mm)

Basic filters B84204 to B84226

Types

I_R	Lines	Voltage drop per line at I_R		Dimensions (mm)			Approx. weight	Ordering code[1]
A		Vdc	Vac, 50 Hz	L_1	B_1	H_1	kg	
25	2	<0,5	4,2	500	248	157	30	B84204-+22-B2
25	4	<0,5	4,2	500	315	157	38	B84206-+22-E2
40	2	<0,5	2,4	500	248	157	31	B84204-+23-B2
40	4	<0,5	2,4	500	315	157	39	B84206-+23-E2
60	4	<0,5	3,6	752	315	157	52	B84224-+24-E2
100	4	<0,5	2,6	887	315	177	82	B84226-+25-E2
200	4	<0,5	5,2	1014	315	177	96	B84209-C26-E2

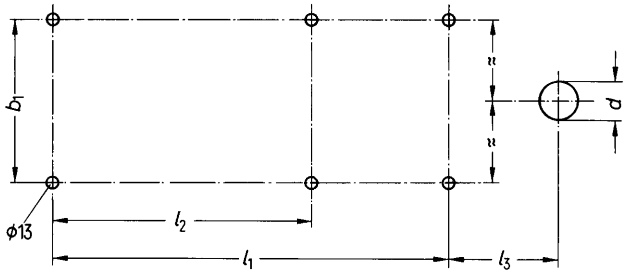
Connecting data

Filter type		1	2	3	4	5	6	7	8
I_R A	Lines	Recomm. cable cross section	Thread for conduit bush	Possible inside diameter for rubber sleeve	Clear-ance hole for bush		Max. available cross section of the clamps or thread of the screw		Thread for conduit bush
25	2	4 mm²	PG 21	14 ... 20	21		10 mm²	10 mm²	PG 29/21[2]
25	4	4 mm²	PG 29	23 ... 29	30		10 mm²	10 mm²	PG 29
40	2	6 mm²	PG 21	14 ... 20	21		10 mm²	10 mm²	PG 29/21[2]
40	4	6 mm²	PG 29	23 ... 29	30		10 mm²	10 mm²	PG 29
60	4	10 ... 16 mm²	PG 29	23 ... 29	30		35 mm²	M8	PG 29
100	4	35 mm²	PG 36	31 ... 37	38		M8	M8	PG 42/36[3]
200	4	95/50 mm²	PG 42/36[3]	39 ... 41	43		M10	M10	PG 42

1) Replace the + in the ordering code by the code letter for the required version:
C = Filter up to 1 GHz, G = Filter up to 40 GHz
2) PG 29/21 indicates: reducing adapter to PG 21 screwed into PG 29 threaded hole in case
3) PG 42/36 bedeutet: reducing adapter to PG 36 screwed into PG 42 threaded hole in case

Basic filters B84204 to B84226

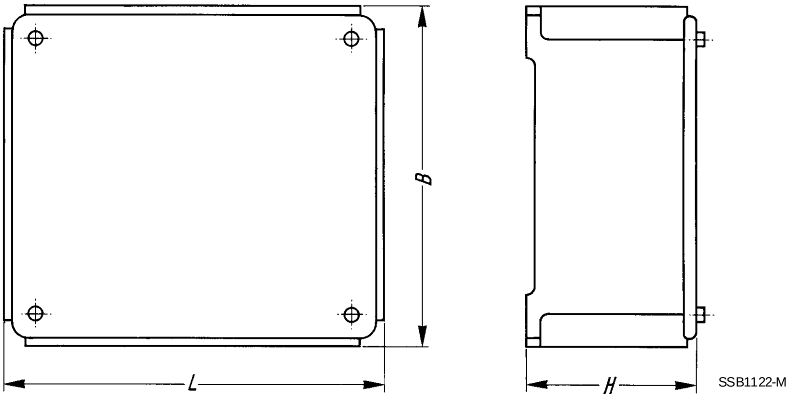
Fixing dimensions



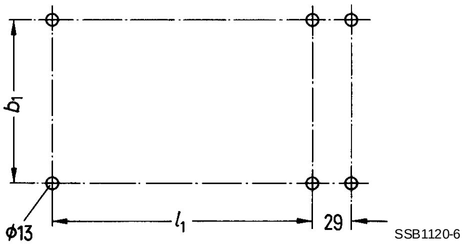
Ordering code for filter	Fixing dimensions (mm)			Dimensions for connector fitting (mm)			
				Version C with corrugated tube 1)		Version G	
	b_1	l_1	l_2	l_3	∅d	l_3	∅d
B84204-+22-B2	223	475	–	103	37	220	71
B84204-+23-B2	223	475	–	103	37	220	71
B84206-+22-E2	290	475	–	103	37	220	71
B84206-+23-E2	290	475	–	103	37	220	71
B84209-C26-E2	290	989	610	168	54	–	–
B84224-+24-E2	290	727	475	103	37	220	71
B84226-+25-E2	290	862	610	168	54	220	71

1) Ordering code for fitting for version C:
l_3 = 103 mm: B84298-A42-L16 (nom. width 25)
l_3 = 168 mm: B84298-A44-L22 (nom. width 40)
} not included in delivery (for outline drawing see page 354)

Auxiliary filters



Fixing dimensions



Dimension 29 indicates the hole spacing between basic filter and auxiliary filter.

Types

I_R	Lines	Voltage drop per line at I_R		Fixing dimensions (mm)		Dimensions (mm)			Approx. weight
A		Vdc	Vac, 50 Hz	b_1	l_1	L	B	H	kg
25	2	<0,5	4,2	223	223	248	248	157	15
25	4	<0,5	4,2	290	223	248	315	157	21
40	2	<0,5	2,4	223	223	248	248	157	17
40	4	<0,5	2,4	290	223	248	315	157	22
60	4	<0,5	3,6	290	475	500	315	157	36
100	4	<0,5	2,6	290	610	635	315	177	65
200	4	<0,5	5,2	290	610	635	315	177	71

LF filters B84299

Selector guide

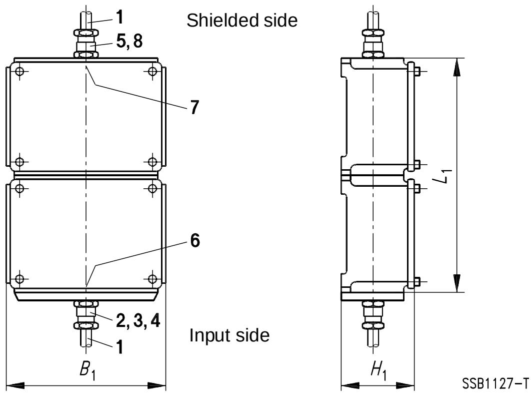
I_R A	Lines	Figure	R_{typ}/ line mΩ	Ohmic voltage drop/ line V	Voltage drop/ line V	Leakage current/ line A	Ordering code[1)]
25	2	1	20	0,5	6	5,3	B84299-+86-B3
25	4	2	20	0,5	6	5,2	B84299-+92-E3
40	2	1	20	0,8	9,6	5,2	B84299-+89-B3
40	4	2	5	0,2	6,6	7,1	B84299-+94-E3
60	2	1	5	0,3	9,2	7,1	B84299-+90-B3
60	4	2	5	0,3	9,2	7,1	B84299-+87-E3
100	4	2	3	0,3	9	7,1	B84299-+97-E3

1) Replace the + in the ordering code by the code letter for the required version:
C = Filter up to 1 GHz:
Filter for EMI suppression in electrical installations
With additional fitting also suitable for shielded enclosures and rooms (see outline drawings)

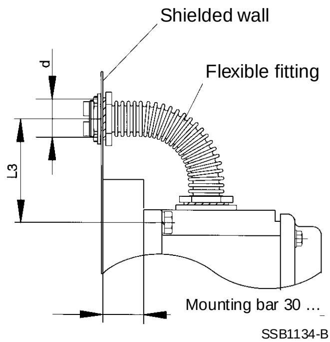
G = Filter up to 40 GHz:
For shielded enclosures and rooms

LF filters B84299

Version C (up to 1 GHz) - Figure 1



Flexible fittings for connection to shielded rooms[1)]



Types

I_R A	Lines	Dimensions (mm) L_1	B_1	H_1	Approx. weight kg	Ordering code
25	2	879	315	177	35	B84299-C86-B3
40	2	879	315	177	35	B84299-C89-B3
60	2	879	315	177	40	B84299-C90-B3

Connecting data

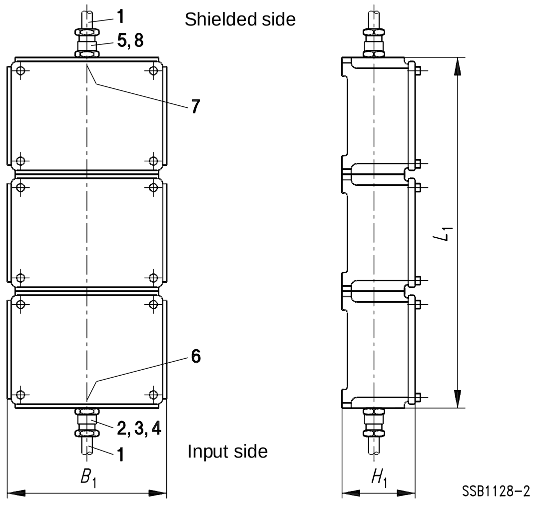
I_R A	Lines	1 Recomm. cable cross section	2 Thread for conduit bush	3 Possible inside dia. for rubber sleeve	4 Clear-ance hole for bush	5	6 Max. available cross section for the clamps	7	8 Thread for conduit bush
25	2	4 mm^2	PG 29	20 ... 27	32		10 mm^2		PG 29
40	2	4 mm^2	PG 29	20 ... 27	32		10 mm^2		PG 29
60	2	10...16 mm^2	PG 29	20 ... 27	32		35 mm^2		PG 29

1) Fittings with 25 mm nominal width: ordering code B84298-A42-L16 (L3 = 103 mm, d = 37 mm)
Fittings with 40 mm nominal width:ordering code B84298-A44-L22 (L3 = 168 mm, d = 54 mm)

2) PG 29/21 indicates: cable screwed into PG 29 in case, reducing adapter to PG 21 screwed into PG 29.

LF filters B84299

Version C (up to 1 GHz) - Figure 2



Types

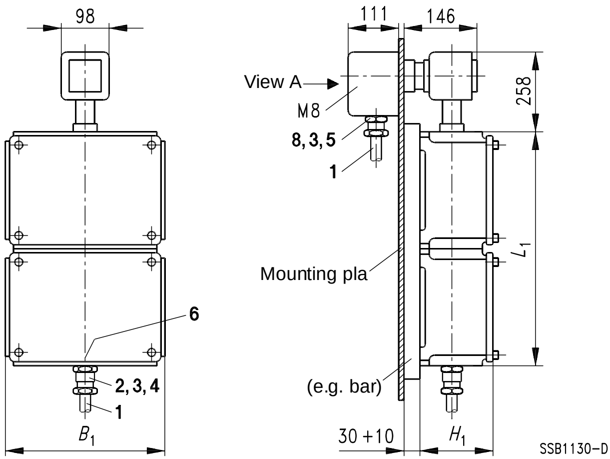
I_R A	Lines	Dimensions (mm) L_1	B_1	H_1	Approx. weight kg	Ordering code
25	4	1508	315	177	55	B84299-C92-E3
40	4	1508	315	202	69	B84299-C94-E3
60	4	1508	315	202	70	B84299-C87-E3
100	4	1508	315	177	70	B84299-C97-E3

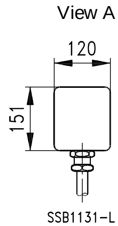
Connecting data

I_R A	Lines	1 Recomm. cable cross section	2 Thread for conduit bush	3 Possible inside dia. for rubber sleeve	4 Clear-ance hole for bush	5	6 Max. available cross section for the clamps	7	8 Thread for conduit bush
25	4	4 mm²	PG 29	20 ... 27	32		10 mm²		PG 29
40	4	6 mm²	PG 29	20 ... 27	32		10 mm²		PG 29
60	4	10...16 mm²	PG 29	20 ... 27	32		35 mm²		PG 29
100	4	95/50 mm²	PG 42	39 ... 41	43		70 mm²		PG 42

LF filters B84299

Version G (up to 40 GHz) - Figure 1





Welding flange to be ordered if required.
Ordering code: B83208-A-Z804

Types

I_R A	Lines	Dimensions (mm) L_1	B_1	H_1	Approx. weight kg	Ordering code
25	2	879	315	177	39	B84299-G86-B3
40	2	879	315	177	73	B84299-G89-B3
60	2	879	315	177	44	B84299-G90-B3

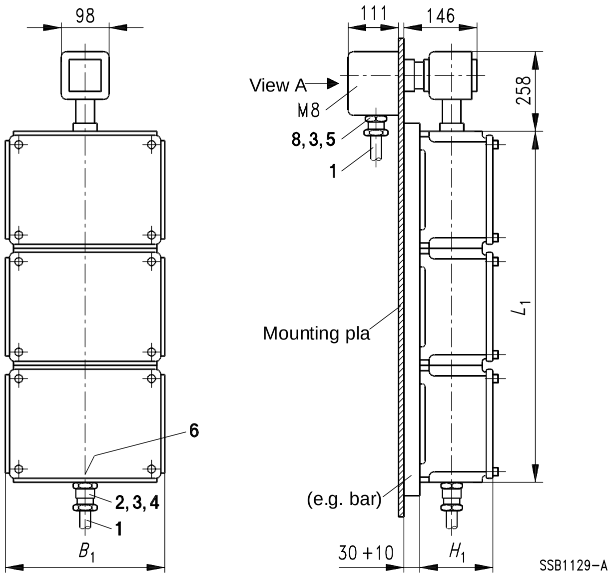
Connecting data

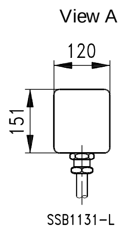
I_R	Lines	1	2	3	4	5	6	7	8
A		Recomm. cable cross section	Thread for conduit bush	Possible inside dia. for rubber sleeve	Clearance hole for bush		Max. available cross section for the clamps		Thread for conduit bush
25	2	6 mm²	PG 29	20 ... 27	32	24	10 mm²		PG 29/21 1)
40	2	4 mm²	PG 29	20 ... 27	32	24	10 mm²		PG 29/21 1)
60	2	10...16 mm²	PG 29	20 ... 27	32		35 mm²		PG 29

1) PG 29/21 indicates: cable screwed into PG 29 in case, reducing adapter to PG 21 screwed into PG 29.

LF filters B84299

Version G (up to 40 GHz) - Figure 2





Welding flange to be ordered in required.
Ordering code: B83208-A-Z804

Types

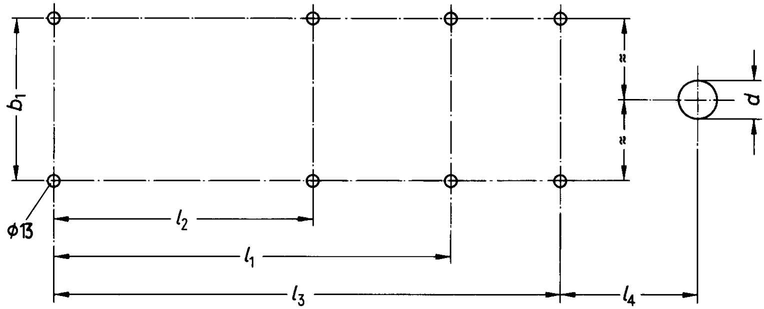
I_R A	Lines	Dimensions (mm) L_1	B_1	H_1	Approx. weight kg	Ordering code
25	4	1508	315	177	59	B84299-G92-E3
40	4	1508	315	202	73	B84299-G94-E3
60	4	1508	315	202	74	B84299-G87-E3
100	4	1508	315	177	74	B84299-G97-E3

Connecting data

I_R	Lines	1	2	3	4	5	6	7	8
A		Recomm. cable cross section	Thread for conduit bush	Possible inside dia. for rubber sleeve	Clear-ance hole for bush		Max. available cross section for the clamps		Thread for conduit bush
25	4	4 mm^2	PG 29	20 ... 27	32		10 mm^2		PG 29
40	4	6 mm^2	PG 29	20 ... 27	32		35 mm^2		PG 29
60	4	10 ... 16 mm^2	PG 29	20 ... 27	32		35 mm^2		PG 29
100	4	50 mm^2	PG 42	39 ... 41	43	38	70 mm^2		PG 36

LF filters B84299

Fixing dimensions



Ordering code for filter	Dimensions for fixing (mm)				Dimensions for connector fitting (mm)			
					Version C with corrugated tube[1]		Version G	
	b_1	l_1	l_2	l_3	l_4	∅d	l_4	∅d
B84299-+86-B3	290	854	475	–	103	37	220	71
B84299-+87-E3	290	979	475	1483	103	37	220	71
B84299-+89-B3	290	854	475	–	103	37	220	71
B84299-+90-B3	290	854	475	–	103	37	220	71
B84299-+92-E3	290	979	475	1483	103	37	220	71
B84299-+94-E3	290	979	475	1483	103	37	220	71
B84229-+97-E3	290	979	475	1483	168	54	220	71

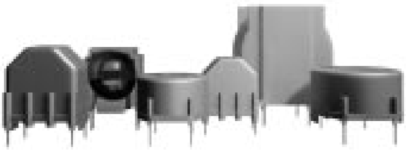
1) Ordering code for fitting, version C:
l_4 = 103 mm: B84298-A42-L16 (nom. width 25)
l_4 = 168 mm: B84298-A44-L22 (nom. width 40)
} not included in delivery (outline drawing see page 359)

Siemens Matsushita Components

A whole lot of ring core chokes

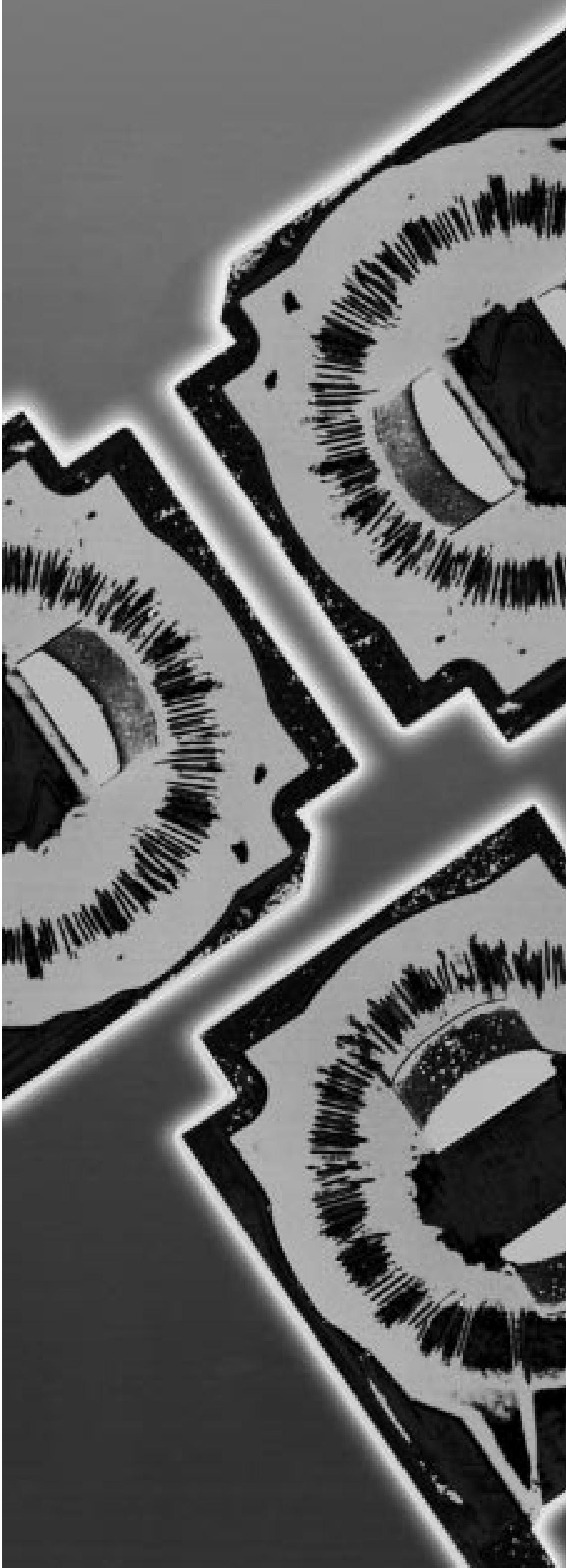
Chokes to your choice

You urgently need particular ring core chokes? That's no problem, we have 200,000 pieces in stock and deliver reliably through SCS. Our automated production guarantees



the best of reliability too. It turns out chokes in different versions: flat and upright, with current rated from 0.4 to 16 A. UL and VDE approved, and complying with the latest EMC standards of course.

SCS – dependable, fast and competent



Feed-Through Capacitors
Feed-Through Filters

Selector guide feed-through capacitors

I_R A	V_R	Features Fields of application	Type	Page
10 ... 25	up to 600 Vdc up to 440 Vac, 50/60 Hz	Axial leads Central screw fixing	B85121 B85122	371
50 ... 1000	up to 750 Vdc up to 440 Vac, 50/60 Hz	Screw terminals Central screw fixing Broadband interference suppression up to the GHz range	B85111 B85121	374

Selector guide feed-through filters

I_R A	V_R	Features Fields of application	Type	Page
6	350 Vdc	Screw fixing or soldering Cost-effective solution	B85313	378
16	up to 350 Vdc 250 Vac, 50/60 Hz	Central screw fixing Solder lugs	B85321	382
25	up to 440 Vdc 440 Vac, 50/60 Hz	Screw terminals Flange fixing	B85331 B85332	385
40 ... 200	up to 750 Vdc 440 Vac, 50/60 Hz	Central screw fixing Broadband attenuation	B85321	388

General

1 Feed-through capacitors

((Foto als Film))

Fig. 1 Feed-through capacitors fitted into a shielding wall

Where broadband interference from low frequencies right up to and above the SW and VHF bands has to be effectively suppressed in electrical systems and equipment, shielding is used in combination with feed-through capacitors. To fully utilize their RF characteristics, the capacitors must be fitted directly into the shielding walls, taking care that an RF-tight contact is made between the capacitor case and shielding.

In all feed-through capacitors the load-current-carrying conductor, which is connected over a large surface area to one electrode, passes through the center of the capacitor. The other electrode makes concentric contact with the capacitor case.

Corresponding to their electrical equivalent circuit, feed-through capacitors can be considered as being four-terminal networks. They are designed to be effective from low frequency to far above 300 MHz. The low-loss winding with high-stability contact to the leads at its face ends is enclosed in a metal case with either a threaded stud at one end or an external thread.

Safety note!

If high-capacitance feed-through capacitors are used, protective measures (e.g. protective earthing) in accordance with equipment/system regulations (product standards) are required!

2 Feed-through filters

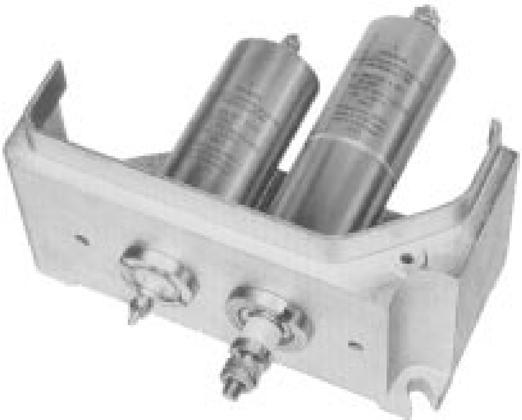


Fig. 2 Feed-through filters fitted into a shielding wall

Feed-through filters are designed to eliminate interference from power systems over a broad bandwidth. Construction and electrical characteristics of these filters make them highly suitable for use in electrical machinery and equipment ashore and on board ships.

These filters have π filter circuits consisting of two equal shunt capacitors and one ferromagnetic inductor connected in series. Due to the concentric arrangement of the components, high attenuation values are obtained for frequencies up to and exceeding 1 GHz.

To fully utilize their RF characteristics, the filters must be fitted into the shielding walls.The filter case must make RF-tight contact with the shielding.

Safety note!

If filters with high capacitances are used, protective measures (e.g. protective earthing) in accordance with equipment/system regulations (product standards) are required!

3 Mounting instructions

To fully utilize their RF characteristics, feed-through components must be fitted directly into the shielding wall. The component case must make perfect and unbroken (RF-tight!) contact with the shielding. This can be best achieved by screwing them into a threaded hole or bushing, so that good electrical contact is made by the flanks of the thread.

With feed-through components having M6 ... M12 threaded studs, contact is made via the conical contact surface adjoining the threaded stud by inserting the component into a sharp-edged mounting hole. If these filters are to be used without additional shielding solely for interference suppression up to the VHF range, it is sufficient to mount them on angle brackets.

3.1 Feed-through components with screw terminals

The connecting line must be attached by fixing it between two countered nuts in order to avoid exposing the component to torque loads (use two spanners).

For 600 A and 1000 A types (with M20 and M30 terminal threads respectively), a special connecting element which enables several lines to be connected simultaneously and also prevents the torque being transmitted to the ceramic parts is available.

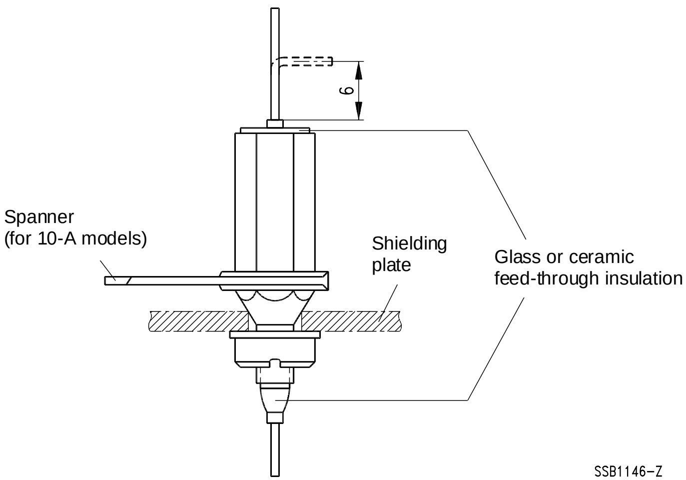
	Type 600 A (M20)	Type 1000 A (M30)
Ordering code (2 units needed each time)	C62104-A2-A3	C62104-A2-A4

NOTE

Due to the danger of exposing the ceramic parts to mechanical loads caused by shock and vibration, it is not permissible to use rigid copper bars as connecting elements.

3.2 Feed-through components for up to 25 A, with leads

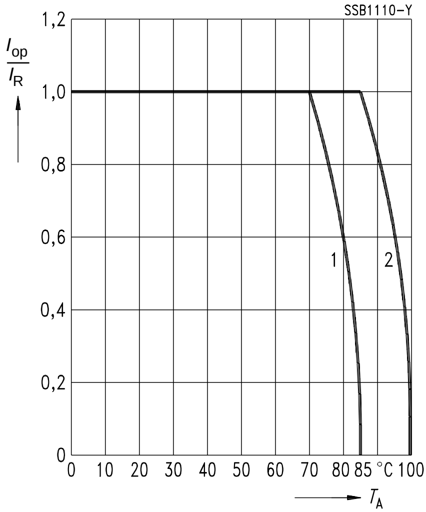
When fitting components into the metal shielding plate proceed as follows:



Example:Type B85121-D

1. Fit the component into the hole of the shielding plate at right angles to the surface and fix it by tightening the slotted nut with a suitable screw driver. When using an open-end spanner to hold components with hexagonal casings (10A), keep the spanner as near to the mounting plate as possible, so that the torque is applied to the case only at that end.
2. When bending the feed-through lead, keep a 6 mm distance between the bending point and the end of the feed-through tube and hold the lead between glass tube and bending tool with a suitable clamping tool.
3. When soldering the feed-through lead keep a minimum distance of 5 mm from the end of the feed-through tube.

General technical data[1)]

Rated curr	.ture
	Climatic category 40/100/56: referred to 85 °C ambient temperature
Self-heating	max. 15 °C at operation with rated current
Operating current I_{op}	max. permissible operating current = rated current
Operating current 400 Hz	at 400 Hz only 75 % of rated ac current
Current derating I_{op}/I_R versus ambient temperature T_A Curve 1 Climatic category 40/085/56 Curve 2 Climatic category 40/100/56	

1) For types ≥ 10 A.
For type B85313 (6 A) see data sheet

Rated current up to 25 A
Rated voltage up to 600 Vdc/440 Vac (50/60 Hz)

Construction

- FK technology
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metal foils
- MP technology (self-healing)
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metallized paper
- Metal case
- Glass or ceramic feed-throughs
- Hermetically soldered

Features

- For central screw fixing
- High contact reliability

Applications

- Broadband interference suppression
  for ac/dc supply and control lines
  up to 25 A

Terminals

- Axial leads, tinned

Marking

Manufacturer, ordering code,
rated capacitance, EMI suppression class,
rated voltage, rated current,
climatic category, date of manufacture (MM.YY)

Standards

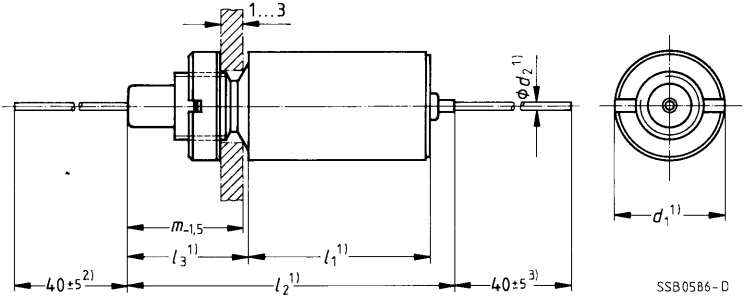
Capacitors marked with EMI suppression class
comply with VDE 0565-1

Safety information

If high-capacitance feed-through capacitors are used,
protective measures (e.g. protective earthing) in accordance
with equipment/system regulations are required.

Outline drawings

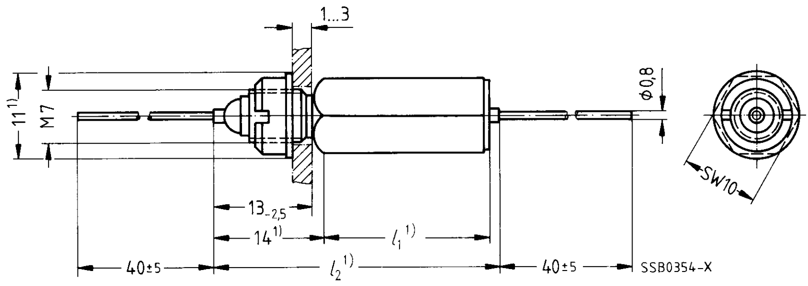
B85121-A, B85122-A



Slotted nut and spring washer included in deleivery

Type	Dimensions (mm)						Thread	Mounting hole	
	d_1	l_1	l_2	l_3	m	d_2			
B85122-A-B2 B85121-A-B1, -B3, -B7	16	24	42,5	16,5	16	1	M10 × 0,75	10,5 +0,3	Creep-age dis-tance/clear-ance ≥ 4 mm
B85121-A-B9, -B15	16	34	52,5	16,5	16	1	M10 × 0,75	10,5 +0,3	
B85121-A-B4	20	26,5	46	18	17	2	M12 × 0,75	12,5 +0,5	
B85121-A-B5, -B6 B85121-A-B24, -B39	20	38,5	58	18	17	2	M12 × 0,75	12,5 +0,5	
B85121-A-C37	20	32	52	19	18,5	2	M12 × 0,75	12,5 +0,5	

B85121-D



Mounting hoϕ $7{,}5^{+0,3}$

Type	l_1 (mm)	l_2 (mm)	Accessories	
B85121-D-B1... -B4	25	41	Slotted nut and spring washer included in delivery	Creep. dist./clearance ≥ 2 mm
B85121-D-B5, -B6	30	46		

1) max.
2) B85121-A-C37: length 45 ± 5
3) B85121-A-C37: length 65 ± 5

Technical data

Test voltage V_P	Terminal/case (layer/layer)
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$	$C_N \leq 0{,}33$ µF: ≥ 12000 MΩ; $C_N > 0{,}33$ µF: ≥ 4000 s
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 FK technology: 40/100/56 (–40 °C/+100 °C/56 days damp heat test) MP technology: 40/085/56 (–40 °C/+85 °C/56 days damp heat test)

Characteristics and ordering codes

I_R A	V_R Vdc/Vac 50/60 Hz	Vac 400 Hz	V_P Vdc, 2 s	C_R	Class[2]	Technology	Approx. weight g	Ordering code
10	350/250[1]	115	1500	5000 pF		FK	13	B85121-D-B1
10	350/250[1]	115	1500	0,01 µF		FK	13	B85121-D-B2
10	160/110	60	750	0,025 µF		FK	13	B85121-D-B3
10	80/42	–	900	0,05 µF		FK	13	B85121-D-B4
10	250/100	60	400	0,1 µF		MP	15	B85121-D-B5
10	250/42	–	1075	0,05 µF		FK	15	B85121-D-B6
16	440/250[3]	115	3750	1250 pF	Y	FK	23	B85121-A-B1
16	600/250[3]	220	3950	2500 pF	Y	FK	30	B85122-A-B2
16	440/250[3]	115	3750	5000 pF	Y	FK	23	B85121-A-B3
16	350/250	115	1500	0,025 µF	X2	FK	26	B85121-A-B7
16	350/250	115	1600	0,05 µF	X2	FK	28	B85121-A-B9
16	160/75	40	300	1,0 µF		MP	30	B85121-A-B15
25	440/250[3]	115	3750	0,01 µF	Y	FK	36	B85121-A-B4
25	440/250[3]	115	3750	0,035 µF	Y	FK	51	B85121-A-B5
25	440/250[3]	115	3750	0,05 µF	Y	FK	51	B85121-A-B6
25	600/440	220	3950	0,035 µF	X1	FK	55	B85121-A-B39
25	600/380	125	3600	0,05 µF	X1	FK	55	B85121-A-B24
25	160/75	–	450	1 µF		MP	55	B85121-A-C37

1) Not for power line operation!
2) In accordance with VDE 0565-1
3) If the capacitors are not used as Y capacitors, but e.g. for connection to anode voltage lines, the max. permissible operating voltage is 350 Vrms, 60 Hz/750 Vdc

Rated current up to 1000 A
Rated voltage up to 750 Vdc/440 Vac (50/60 Hz)

Construction

- MP technology (self-healing)
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metallized paper
- FK technology
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metal foils
- MKV technology (dry, self-healing)
  Dielectric: polypropylene
  Electrodes: metallized paper
- Metal case
- Ceramic feed-throughs
- Hermetically soldered

Features

- For central screw fixing
- High current handling capability
- High operational reliability

Applications

Broadband interference suppression for ac/dc supply lines, e.g. in

- shielded rooms
- telephone exchanges
- electrical machines and systems, power supplies
- ship building, traction

Terminals

- Threaded studs, screw connection
- Special elements for connecting several cables available
  for 600 and 1000 A types.

Marking

Manufacturer, ordering code, rated capacitance, EMI suppression class, rated voltage, rated current, climatic category, date of manufacture (MM.YY)

Standards

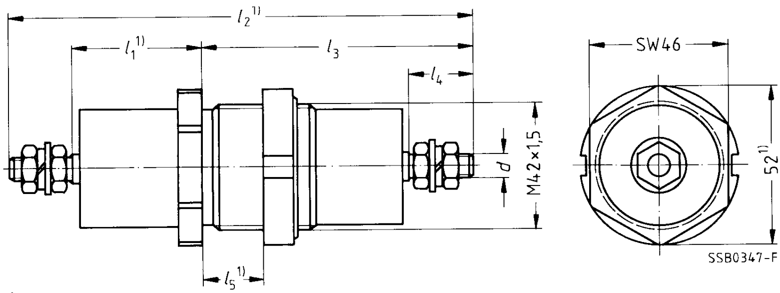
The capacitors comply with VDE 0565-1

Safety information

If high-capacitance feed-through capacitors are used, protective measures (e.g. protective earthing) in accordance with equipment/system regulations are required.

Outline drawings

B85111-A-B13 ... B16

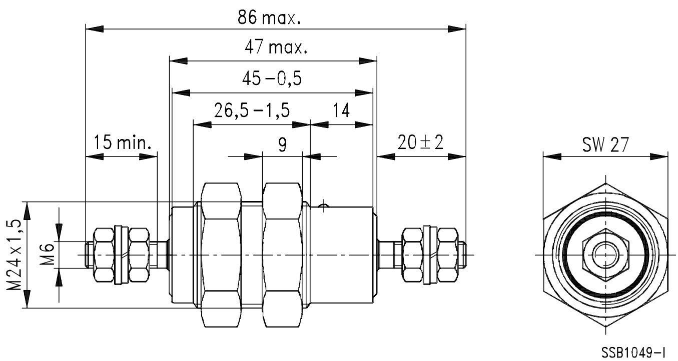


1) max.

Nuts, washers and spring rings included in delivery.
Types B85111-A-B15, -B16:
Instead of washer and spring ring, 2 locking washers each (DIN 93) included in delivery.

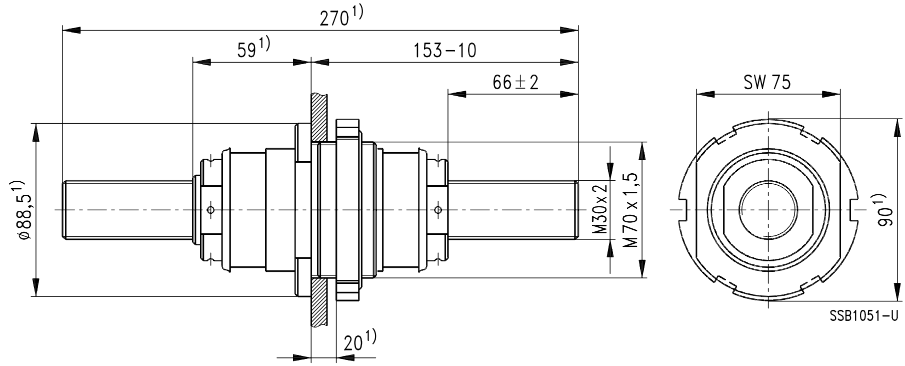
Type	Dimensions (mm)					Thread	Creepage dis-tance/clearance
	l_1	l_2	l_3	l_4 -5	l_5	d	
B85111-A-B13, -B14	27	115	66 –6	27	20	M 8	≥ 6 mm
B85111-A-B15, -B16	40	169	92 –8	45	14	M 12	≥ 6 mm

B85111-A-B20



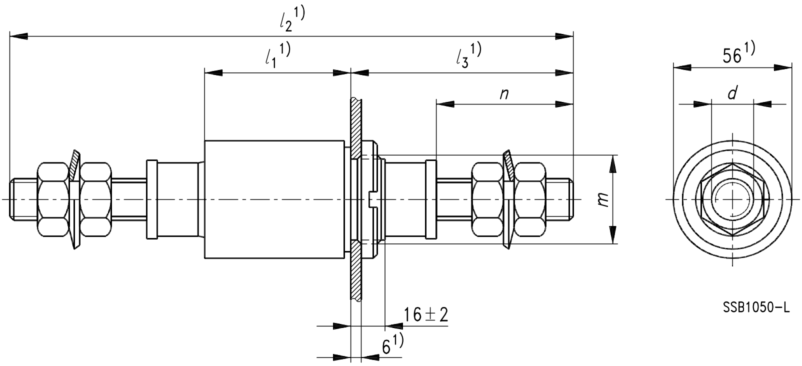
Creepage distance and clearance ≥ 4 mm
Nuts, washers and spring rings included in delivery.

B85111-A-B30[2]



Creepage distance and clearance ≥16 mm

B85121-A-B29, -B45, -C18



Nuts and washers included in delivery.
Type B85121-B45:
Instead of the tightening washer, 1 washer and 1 spring ring each included in delivery.

Type	Dimensions (mm)						Creepage distance/clearance
	l_1	l_2	l_3	*n* (min)	*m*	*d*	
B85121-A-B29[2]	60,5	252	105	50	M 42 × 1,5	M 20	≥ 16 mm
B85121-A-C18[2]	86,5	244	90	35	M 42 × 1,5	M 20	≥ 16 mm
B85121-A-B45	64	220	90	35	M 32 × 1,5	M 12	≥ 17 mm

1) max.
2) Special element for connecting several cables see page 368.

Technical data

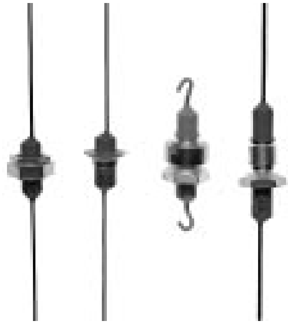
Test voltage V_P	Terminal/case (layer/layer)
Insulation resistance R_{is} or time constant $\tau = C_N \cdot R_{is}$	$C_R \leq 0{,}33$ µF: ≥ 12000 MΩ $C_R > 0{,}33$ µF: ≥ 4000 s
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 40/085/56 (–40 °C/+85 °C/56 days damp heat test)

Characteristics and ordering codes

I_R Adc/Aac	V_R Vdc/Vac 50/60 Hz	Vac 400 Hz	V_P Vdc, 2 s	C_R µF	Class[1]	Tech-nology	Approx. weight kg	Ordering code
50/50	440/250[2]	115	2700	0,05	Y	FK	0,12	B85111-A-B20
100/100	600/440	220	3950	0,035	X1	FK	0,4	B85111-A-B13
100/100	600/440	220	2500	0,5	X2	MP	0,4	B85111-A-B14
300/200	600/440	220	3950	0,035	X1	FK	0,6	B85111-A-B15
300/200	600/440	220	2500	0,5	X2	MP	0,6	B85111-A-B16
300/200	750/250	220	2500	1,0	X2	MKV	0,8	B85121-A-B45
600/500	600/440	220	2500	0,5	X2	MP	1,4	B85121-A-B29
600/500	600/440	220	2500	2,0	X2	MP	1,6	B85121-A-C18
1000/800[3]	600/440	220	2500	0,5	X2	MP	3,1	B85111-A-B30

1) In accordance with VDE 0565-1
2) If the capacitor is not used as Y capacitor, the max. permissible operating voltage is 350 V_{rms}/60 Hz/750 Vdc
3) >1000 A on request

Rated voltage 350 Vdc
Rated current 6 A



Construction

- Filter in π configuration consisting of
  2 feed-through capacitors and 1 series inductor
- Capacitors: class-2 ceramic material
  Lead-through wire enclosed by
  ferrite tube core
- For screw fixing or soldering

Features

- Broadband attenuation
- For shielded walls
- Cost-effective solution

Applications

- Telecom equipment and systems
- Measuring and control equipment and systems

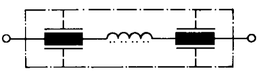
Terminals

- Axial leads
- Hooks

Safety information

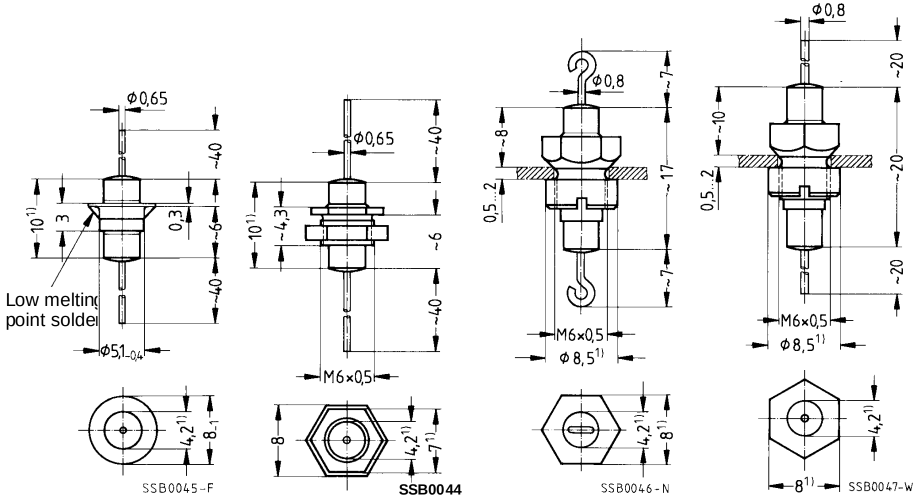
In telecom and broadcasting systems, these filters can also be used at 250 Vac, 50 Hz, but not in power systems or where shock hazard protection has to be ensured for capacitors (VDE 0565-1).

Circuit diagram



Outline drawings

B85313-A-B4	B85313-A-B7	B85313-A-B3	B85313-A-C1
(for soldering)	(for screw fixing)		



1) max.

Mounting information

Types for screw fixing	Mounting hole ∅ 6,3 + 0,2 Locking nuts are loosely included in delivery, torque: 80 Ncm max.
Types for soldering	Mounting hole ∅ 5,3 + 0,2 Melting point of solder: approx. 95 °C, soldering temperature max. 160 °C

Technical data

Rated voltage V_R	350 Vdc
Test voltage V_P	1050 Vdc
Rated current I_R	at frequencies up to 20 kHz, max. permissible operating current = rated current
Perm. rms reactive current	0,75 A
Perm. surface temperature	85 °C
Climatic category	In accordance with IEC 68-1 40/085/21 (–40 °C/+85 °C/21 days damp heat test)

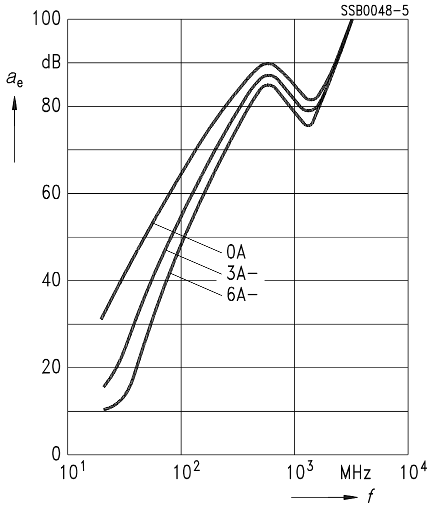
Characteristics and ordering codes

I_R A	C_R pF	Toler- ance %	P_V mW[1)]	Version	Approx. weight g	Ordering code
6	2 × 800	+50/–20	120	screw-in, leaded	0,2	B85313-A-B7
6	2 × 800	+50/–20	120	solderable, leaded	0,13	B85313-A-B4
6	2 × 1600	+30/–20	200	screw-in, hooks	0,4	B85313-A-B3
6	2 × 3500	+30/–20	270	screw-in, leaded	0,6	B85313-A-C1

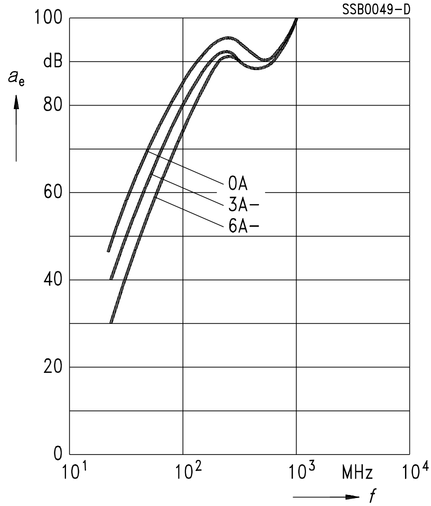
1) At room temperatures up to 55 °C and installation in a metal plate. The feed-through element then heats up by 30 °C. If installed in a copper-clad plate only half of the stated power loss ins permissible.

Insertion loss a_e versus frequency *f*
measured at different operating currents and 50 Ω termination at both ends
(typical values)

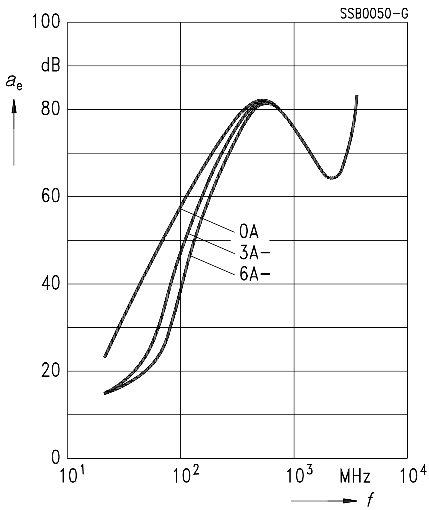
B85313-A-B3



B85313-A-C1



B85313-A-B4
B85313-A-B7



Rated voltage up to 350 Vdc/250 Vac (50/60 Hz)
Rated current 16 A

Construction

- FK technology
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metal foils
- Metal case
- Ceramic feed-throughs
- Hermetically soldered

Features

- For central screw fixing
- High contact reliability
- Rated as Y capacitors

Application

Universal broadband interference suppression
for ac/dc supply and control lines up to 16 A

Terminals

- Solder lugs

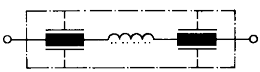
Marking

Manufacturer, ordering code, EMI suppression class,
rated capacitance, rated voltage, rated current,
climatic category, date of manufacture (MM.YY), circuit diagram

Standards

The incorporated capacitors comply with VDE 0565-1

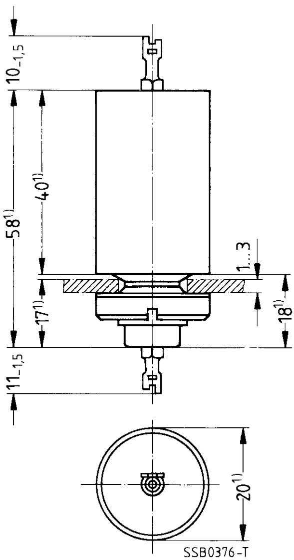
Circuit diagram



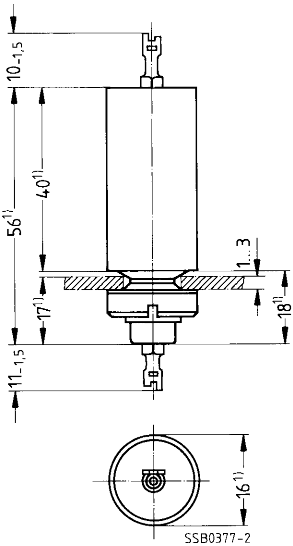
SSB0038-X

Outline drawings

B85321-A-B6



B85321-A-B9



1) max.

Slotted nut and spring washer included in delivery.

Type	Mounting hole	Creepage distance/ clearance
B85321-A-B6	∅ 12,5 +0,3	≥ 5 mm
B85321-A-B9	∅ 10,5 +0,3	≥ 3 mm

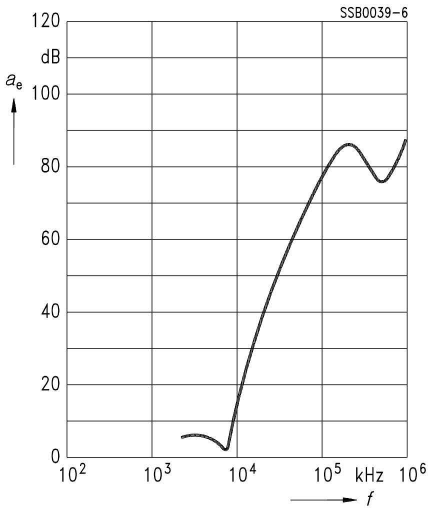
Technical data

Test voltage V_P	Terminal/case (layer/layer)
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 40/085/56 (–40 °C/+85 °C/56 days damp heat test)

Characteristics and ordering codes

I_R A	V_R Vdc/Vac 50/60 Hz	 Vac 400 Hz	V_P Vdc, 2 s	C_R pF	Class[1]	Approx. weight g	Ordering code
16	250/250	115	2700	2×2500	Y	32	B85321-A-B9
16	350/250[2]	115	5000	2×2500	Y	50	B85321-A-B6

Insertion loss a_e
(typical values at Z = 50 Ω)



1) In accordance with VDE 0565-1
2) If used as X1 capacitor, the permissible operating voltage is 600Vdc/400 Vac.

Rated voltage up to 440 Vdc/440 Vac (50/60 Hz)
Rated current 25 A

Construction

- FK technology
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metal foils
- Metal case
- Ceramic feed-throughs
- Hermetically soldered

Features

- For flange fixing
- High contact reliability

Application

Broadband interference suppression for
ac/dc supply lines up to 25 A, e.g. in

- shielded rooms
- telephone exchanges
- electrical machines and systems
- power supplies

Terminals

- Threaded stud M6

Marking

Manufacturer, ordering code, EMI suppression class ,
rated capacitance, rated voltage, rated current, test voltage,
climatic category, date of manufacture (MM.YY), circuit diagram

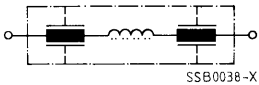
Standards

The incorporated capacitors comply with VDE 0565-1

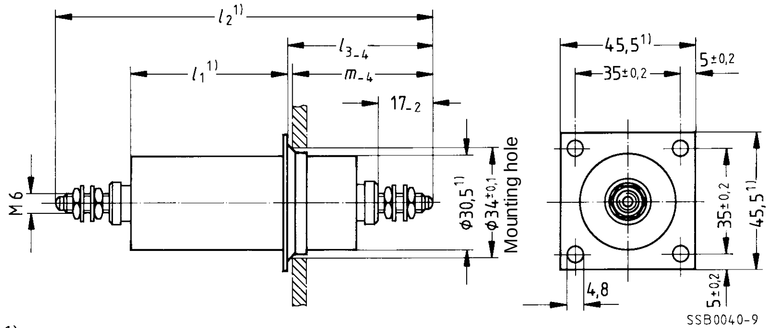
Safety information

If the high-capacitance types B85331-A-B1 or B85332-A-B1
are used, protective measures (e.g. protective earthing) in
accordance with equipment/system regulations are required.

Circuit diagram



Outline drawing



1) max.

Type	Dimensions (mm)				Creepage distance and clearance
	l_1	l_2	l_3	m	
B85331-A-B1 B85332-A-B1	68	152	61	60,5	≥ 6 mm
B85331-A-B2 B85331-A-B3	48,5	115	44	43,5	≥ 6 mm

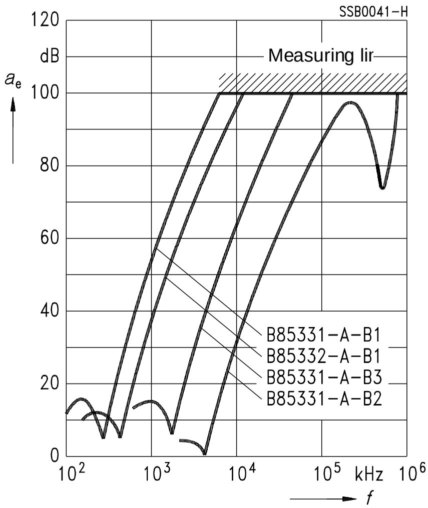
Technical data

Test voltage V_P	Terminal/case (layer/layer)
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 40/085/56 (–40 °C/+85 °C/56 days damp heat test)

Characteristics and ordering codes

I_R A	V_R Vdc/Vac 50/60 Hz	 Vac 400 Hz	V_P	C_R	Class[1]	Approx. weight g	Ordering code
25	350/250	115	2700 Vdc, 2 s	2 x 2500 pF	Y	175	B85331-A-B2
25	440/440	220	2700 Vdc, 2 s	2 x 17500 pF	X1[2]	175	B85331-A-B3
25	350/250	115	1500 Vac, 1 min	2 x 0,1 µF	X1	245	B85331-A-B1
25	440/300	115	2500 Vac, 1 min	2 x 0,05 µF	X1	245	B85332-A-B1

Insertion loss a_e
(typical values at Z = 50 Ω)



1) In accordance with VDE 0565-1
2) When operated at 250 Vac, the filter complies with VDE 0565-1, class Y

Broadband feed-through filters
Rated voltage up to 750 Vdc/440 Vac

Construction

- MP technology (self-healing)
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metallized paper
- MKV technology (dry, self-healing)
  Dielectric: polypropylene
  Electrodes: metallized paper
- Metal case
- Ceramic feed-throughs

Features

- For central screw fixing
- High contact reliability

Applications

Broadband interference suppression for
ac/dc supply lines, e.g. in

- shielded rooms
- telephone exchanges
- electrical machines and systems
- power supplies
- ship building

Terminals

- Threaded studs M6 ... M10

Marking

Manufacturer, ordering code, EMI suppression class,
rated capacitance, rated voltage, rated current,
climatic category, circuit diagram, date of manufacture (MM.YY)

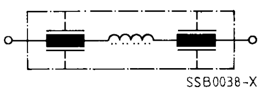
Standards

The incorporated capacitors comply with VDE 0565-1

Safety information

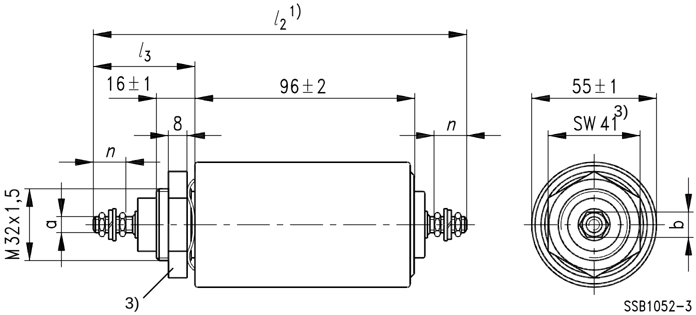
Due to the high capacitance ratings of these filters protective measures
(e.g. protective earthing) in accordance with equipment/system regulations are required.

Circuit diagram



Outline drawings

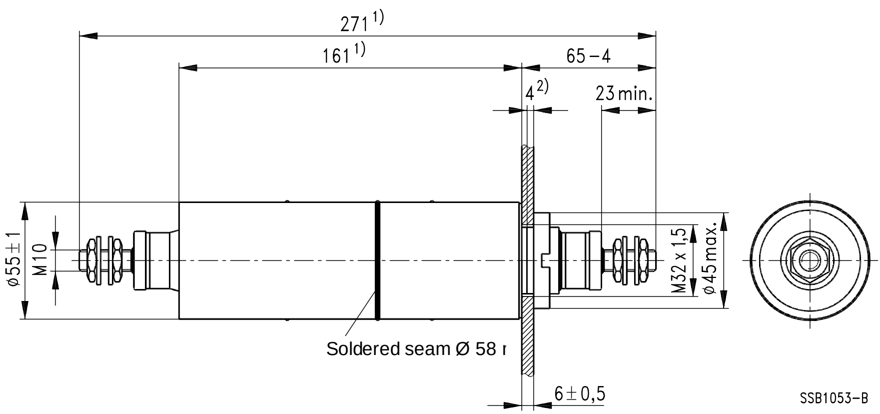
B85321-A-J



Nuts, washers and spring rings included in delivery.
3) Type B85321-A-J11:
Instead of hex nut M32 and spring washer, round slotted nut with locking screws.

Type	Dimensions (mm)					Creepage distance/clearance
	l_2	l_3	*a*	*b*	*n*	
B85321-A-J1, -J2, -J12	166	45 –3	M 6	SW10	15 min	≥ 10 mm
B85321-A-J11	200	62 –3	M 8	SW13	24 min	

B85321-A-C5, -B4, -B7



Nuts and washers included in delivery.

1) max.
2) Minimum dimension for supporting thread length

Technical data

Test voltage V_P	Terminal/case (layer/layer)
DC resistance R_{typ}	Typical values measured at 20 °C ambient temperature
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 40/085/56 (–40 °C/+85 °C/56 days damp heat test)

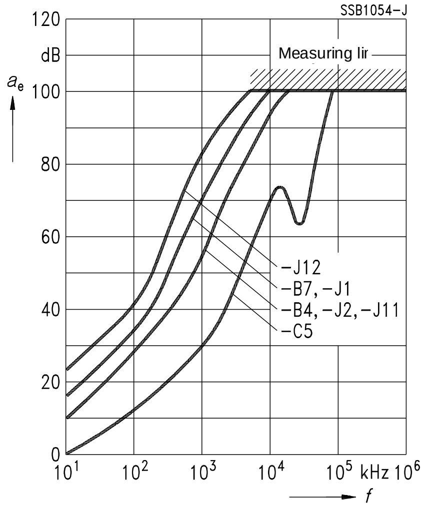
Characteristics and ordering codes

I_R A/50 Hz (A/400 Hz)	V_R Vdc/Vac 50/60 Hz	 Vac 400 Hz	V_P Vdc, 2 s	R_{typ} μΩ	C_R μF	Class[2]	Approx. weight g	Ordering code
40 (30)	350/250[1]	250[1]	1100	270	2 × 4,7 (MKV)	–	700	B85321-A-J12
40 (30)	440/250	250	1500	270	2 × 2 (MKV)	X2	700	B85321-A-J1
40 (30)	600/250	250	2121	270	2 × 1 (MKV)	X2	700	B85321-A-J2
100 (75)	600/250	250	2121	240	2 × 1 (MKV)	X2	700	B85321-A-J11
200 (160)	440/250	60	1400	30	2 × 2,2 (MP)	X2	1400	B85321-A-B7
200 (160)	750/440	220	2500	30	2 × 1,2 (MP)	X2	1400	B85321-A-B4
200 (160)	750/440	440	5400	30	2 × 0,15 (MKV)	X1	1400	B85321-A-C5

1) Not for power line operation!
2) In accordance with VDE 0565-1

Insertion loss a_e
(typical values at Z = 50 Ω)

B85321-A

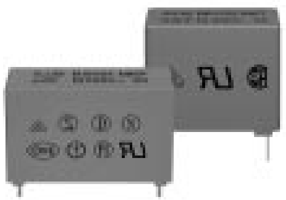


Siemens Matsushita Components

EMI suppression capacitors

Play it safe

Whether video recorder, television, refrigerator or toaster – our EMI suppression capacitors do a grand job in every possible kind of entertainment and consumer electronics appliance. They've also proven their worth in switch-mode power supplies for PCs. No wonder, because the advantages of film technology are there to be seen: low cost, no risk of failure through damp, and optimum self-



healing capability. The result – less destruction of equipment and ensuing fires. Plus the line is safeguarded against surges. In this way our capacitors satisfy the user's need for safety, and the new EMC standards too of course.

SCS – dependable, fast and competent

EMI Suppression Capacitors

Selector guide

Class	V_R	Features	Type	Page
Plastic case, radial leads				
X1	440 Vac, 50/60 Hz	Lead spacing ≥ 15 mm Suitable for three-phase applications	B81141	398
X2	250 Vac, 50 ... 400 Hz	Lead spacing ≥ 15 mm Standard version	B81121	400
	275 Vac, 50/60 Hz	Lead spacing 10 mm	B81132 **NEW**	402
	275 Vac, 50/60 Hz	Lead spacing ≥ 15 mm Small size	B81133	404
	300 Vac, 50/60 Hz	SAFE-X capacitor (excellent safety in terms of active flammability)	B81131	406
	440 Vac, 50 ... 1000 Hz	Lead spacing ≥ 15 mm	B81121	408
Y1	250 Vac, 50 ... 400 Hz	Lead spacing ≥ 15 mm	B81123 **NEW**	410
Y2	250 Vac, 50/60 Hz	Lead spacing 10 mm	B81122	412
	250 Vac, 50 ... 1000 Hz	Lead spacing ≥ 15 mm	B81121	414
Axial leads				
X2	275 Vac, 50/60 Hz	Cylindrical winding	B81191	416
Metal or ceramic case				
X1[1)]	up to 380 Vac, 50/60 Hz	Metal / ceramic case Screw terminals	B81551	418
X2[1)]	up to 440 Vac, 50/60 Hz	Metal / ceramic case Screw terminals	B81551	420
Y[1)]	up to 280 Vac, 50/60 Hz	Ceramic tube with flat leads or flat lead + screw terminal	B81151 B81551	422

1) In accordance with VDE 0565-1

1 General information / standards

EMI suppression capacitors are used to reduce electromagnetic interference. They are designed to be connected directly to line and are therefore exposed to overvoltages and transients which could damage the capacitors. For this reason, the following safety standards have been introduced for EMI suppression capacitors:

Region	Standard	Marks of conformity
Europa	VDE 0565, Teil 1 SEV 1055 IEC 384-14	
USA	UL 1414 UL 1283	
Canada	CSA 22.2, No. 0;1 CSA 22.2, No. 0;8	

Within the framework of harmonization of European standards, 1995 all European safety standards were replaced by a single standard for EMI suppression capacitors which applies throughout Europe: the European standard EN 132400. EN 132400 is identical in content to IEC 384-14 (2nd edition) and CECC 32 400.

The future introduction of a single mark of conformity valid for the whole of Europe is still being discussed. Until such a mark of conformity is introduced, the following marks are to be used: national mark of conformity (e.g. or VDE) appended by "IEC 384-14, 2nd edition". The UL and CSA standards are to remain unchanged.

2 X capacitors

These are capacitors suitable for use in situations where failure of the capacitors would not lead to danger of electric shock. In accordance with EN 132400, X capacitors are divided into three sub-classes according to the peak impulse voltage to which they are exposed in operation, in addition to the rated voltage. This kind of impulse can be caused by lightning in overhead cables, switching surges in neighbouring equipment or in the device in which the capacitor is being used to suppress interferences.

Sub-class	Peak pulse voltage V_P in operation	Application	Peak values of surge voltage V_P (before endurance test)
X1	2,5 kV < $V_P \leq$ 4,0 kV	Use for high peak voltages	For $C \leq$ 1,0 µF: V_P = 4,0 kV For $C >$ 1,0 µF: $V_P = \frac{4,0}{\sqrt{C_N}}$ kV[1])
X2	$V_P \leq$ 2,5 kV	General-purpose	For $C \leq$ 1,0 µF: V_P = 2,5 kV For $C >$ 1,0 µF: $V_P = \frac{2,5}{\sqrt{C_N}}$ kV[1])
X3	$V_P \leq$ 1,2 kV	General-purpose	No test

Note:Sub-class X3 corresponds to sub-class X2 as described in IEC 384-14 (1st edition).

1) Insert value of C_R in µF.

3 Y capacitors

These capacitors are intended for use where the failure of the capacitor could result in a dangerous electrical shock. In accordance with EN 132400, Y capacitors are divided into the following sub-classes:

Sub-class	Type of bridged insulation	Rated ac voltage	Peak values of surge voltage V_P (before endurance test)
Y1	Double or reinforced insulation	$V_R \leq 250$ V	8,0 kV
Y2	Basic or supplementary insulation	150 V $\leq V_R \leq$ 250 V	5,0 kV
Y3	Basic or supplementary insulation	150 V $\leq V_R \leq$ 250 V	No test
Y4	Basic or supplementary insulation	$V_R <$ 150 V	2,5 kV

Note: Sub-class Y3 corresponds to class Y as described in IEC 384-14 (1st edition).

Y capacitors are capacitors with increased electrical and mechanical reliability. The increased electrical and mechanical reliability are intended to eliminate the possibility of short circuits in the capacitor.

Y capacitors are used in connection with additional protective measures in electrical equipment and machines to bridge operational insulation which provides safety in order to avert danger to humans and animals. They cause a considerable portion of the leakage current occurring in a piece of equipment. The safety regulations for the individual device families, e.g. VDE 0805 for EDP equipment, VDE 0750 for medical equipment or VDE 0700 for household appliances, require limitation of the leakage current for safety reasons and thus indirectly limit the maximum capacitance of Y capacitors.

4 Definitions and explanations

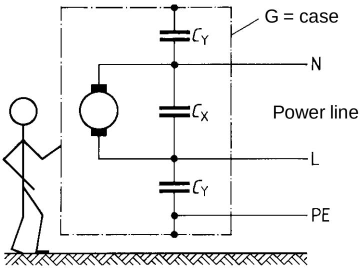


Fig. 1 Example of EMI suppression using X and Y capacitors

Depending on the way they are connected, X and Y capacitors are effective against different kinds of electromagnetic interference. X capacitors which are connected between the line phases are effective against symmetrical (differential-mode) interference. Y capacitors which are connected between a phase and neutral (zero potential) are effective against asymmetrical (common-mode) interference.

Rated voltage

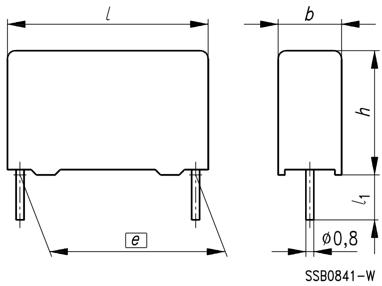
The rated voltage is the root-mean-square value of the operating ac voltage, at the rated frequency, which may be applied to the capacitor within the entire temperature range between the upper and lower category temperatures.

Non-sinusoidal ac voltages (continuous operating voltages)

For non-sinusoidal ac voltages in continuous operation, the specific load on the capacitors has to be determined for each individual application. If you require this information, please contact us, if possible enclosing a voltage oscillogram.

Active flammability

EN 132400 specifies that EMI suppression capacitors have to be tested for active flammability. This test is to ensure that the capacitors and the surrounding gauze do not ignite at a defined electrical overload.



Lead length l_1 mm	6 –1	26 ±2

X1 capacitors
Rated voltage 440 Vac, 50/60 Hz

Construction

- Dielectric: polyester (MKT)
- Internal series connection
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Terminals

- Parallel wire leads, tinned
- Two standard lead lengths available:
  6 mm and 26 mm
  Other lead lengths available upon request

Marking

Manufacturer, lot number, date of manufacture (year/week), rated capacitance (coded), capacitance tolerance (code letter), rated ac voltage, type number, interference suppression sub-class (X1), style (MKT), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
S	EN 132 400 / IEC 384-14, 2nd edition

Technical data

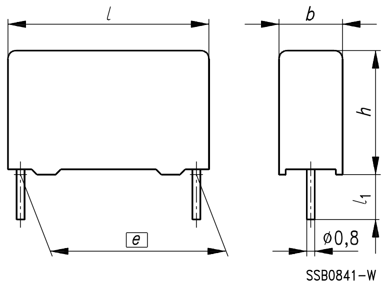
Permissibe continuous ac voltage	440 V (50/60 Hz)	
Permissible continuous dc voltage	1000 V	
DC test voltage	2400 V, 2 s (layer/layer)	
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$ at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	$C_R \leq 0{,}33\ \mu F$ 30 000 MΩ	$C_R > 0{,}33\ \mu F$ 10 000 s
Capacitance tolerance	± 20 % ≙ M (closer tolerances upon request)	
Climatic category	In accordance with IEC 68-1 40/085/21 (–40 °C/+85 °C/21 days damp heat test)	

Ordering codes and packing units

Lead spacing e ±0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1]	Packing units (pcs) Ammo pack	Reel	Untaped Lead length 6 mm	26 mm
15	10 nF	5,0 × 10,5 × 18,0	B81141-C1103-M***	1180	1300	1000	1000
	22 nF	7,0 × 12,5 × 18,0	B81141-C1223-M***	840	900	1000	1000
	33 nF	8,5 × 14,5 × 18,0	B81141-C1333-M***	690	700	500	500
	47 nF	9,0 × 17,5 × 18,0	B81141-C1473-M***	660	700	500	500
22,5	68 nF	8,5 × 16,5 × 26,5	B81141-C1683-M***	480	500	510	500
	0,10 µF	10,5 × 16,5 × 26,5	B81141-C1104-M***	400	400	540	500
	0,15 µF	11,0 × 20,5 × 26,5	B81141-C1154-M***	380	350	510	400
27,5	0,22 µF	12,5 × 21,5 × 31,5	B81141-C1224-M***	–	300	280	250
	0,33 µF	14,0 × 24,5 × 31,5	B81141-C1334-M***	–	–	260	250
	0,47 µF	18,0 × 27,5 × 31,5	B81141-C1474-M***[2]	–	–	200	200
32,5	0,68 µF	17,0 × 28,0 × 36,5	B81141-C1684-M***[2]	–	–	160	140

1) Replace the *** by the code number for the required lead length or packing.
000 = lead length 6 mm (untaped)
026 = lead length 26 mm (untaped)
289 = taped, Ammo pack
189 = taped, reel)
2) Approval pending

X2 capacitors, standard version
Rated voltage 250 Vac, 50 to 400 Hz



Lead length l_1 mm	6 –1	26 ± 2

Construction

- Dielectric: polypropylene (MKP)
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Terminals

- Parallel wire leads, tinned
- Two standard lead lengths available:
  6 mm and 26 mm
  Other lead lengths available upon request

Marking

Manufacturer, lot number, date of manufacture (year/week),
rated capacitance (coded), capacitance tolerance (code letter),
rated ac voltage, type number, interference suppression sub-class (X2),
style (MKP), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
UR S	UL 1283 EN 132400 / IEC 384-14, 2nd edition

Technical data

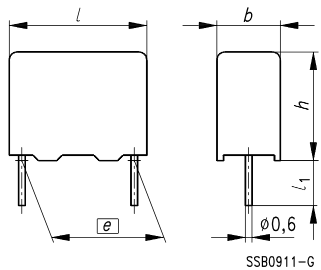
Permissible continuous ac voltage	250 V (50 to 400 Hz)
Permissible continuous dc voltage	630 V
DC test voltage	1400 V, 2 s (layer/layer)
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$ at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	$C_R \leq 0{,}33\ \mu F$: 30 000 MΩ $C_R > 0{,}33\ \mu F$: 10 000 s
Capacitance tolerance	± 10 % (closer tolerances upon request)
Climatic category	In accordance with IEC 68-1 40/085/21 (–40 °C/+85 °C/21 days damp heat test)

Ordering codes and packing units

Lead spacing e ± 0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1)]	Packing units (pcs) Ammo pack	Reel	Untaped Lead length 6 mm	26 mm
15	22 nF	5,0 × 10,5 × 18,0	B81121-C-∗121	1180	1300	1000	1000
	33 nF	5,0 × 10,5 × 18,0	B81121-C-∗122	1180	1300	1000	1000
	47 nF	7,0 × 12,5 × 18,0	B81121-C-∗123	840	900	1000	1000
	68 nF	8,5 × 14,5 × 18,0	B81121-C-∗124	690	700	500	500
	0,10 µF	8,5 × 14,5 × 18,0	B81121-C-∗125	690	700	500	500
22,5	0,15 µF	8,5 × 16,5 × 26,5	B81121-C-∗126	500	500	510	500
	0,22 µF	10,5 × 16,5 × 26,5	B81121-C-∗127	400	400	540	500
	0,33 µF	10,5 × 20,5 × 26,5	B81121-C-∗128	400	400	540	400
27,5	0,47 µF	11,0 × 21,0 × 31,5	B81121-C-∗129	–	350	320	250
	0,68 µF	13,5 × 23,0 × 31,5	B81121-C-∗130	–	250	260	250
	1,0 µF	18,0 × 27,5 × 31,5	B81121-C-∗132	–	–	200	200

1) Replace the ∗ by the code letter for the required lead length or packing
B = lead length 6 mm (untaped)
C = lead length 26 mm (untaped)
P = taped, Ammo pack
H = taped, reel

X2 capacitors with 10 mm lead spacing
Rated voltage 275 Vac, 50/60 Hz



Lead length l_1 mm	6 –1

Construction

- Dielectric: polyester (MKT)
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant
- Impregnated

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Terminals

- Parallel wire leads, tinned
- Standard lead length: 6 mm
  Other lead lengths available upon request

Marking

Manufacturer, date of manufacture (year/week),
rated capacitance (coded), capacitance tolerance (code letter),
rated ac voltage, type number, interference suppression sub-class (X2),
style (MKT), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
(S)	EN 132 400 / IEC 384-14, 2nd edition (pending)
UL	UL 1414 (pending for V_R = 250 Vac)
CSA	CSA C22.2 No. 0; 1 (pending for V_R = 250 Vac)

Technical data

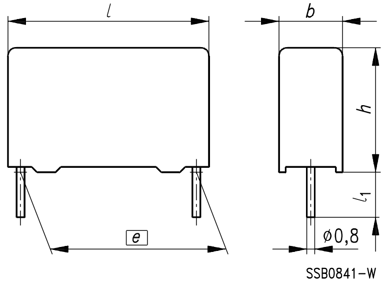
Permissible continuous ac voltage	275 V (50/60 Hz)
Permissible continuous dc voltage	630 V
DC test voltage	1100 V, 2 s (layer/layer)
Insulation resistance R_{is} at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered value)	30 000 MΩ
Capacitance tolerance	± 20 % ≙ M (closer tolerances upon request)
Climatic category	In accordance with IEC 68-1 40/100/56 (–40 °C/+100 °C/56 days damp heat test)

Ordering codes and packing units

Lead spacing $\boxed{e}$ ± 0,4 mm	C_R	Maximum dimensions $b \times h \times l$ mm	Ordering code[1)]	Packing units (pcs) Ammo pack	Reel	Untaped
10	22 nF	5,0 × 11,0 × 13,0	B81132-C1223-M***	800	1300	1000
	33 nF	6,0 × 12,0 × 13,0	B81132-C1333-M***	600	1100	1000
	47 nF	6,0 × 12,0 × 13,0	B81132-C1473-M***	600	1100	1000

1) Replace the *** by the code number for the required lead length or packing.
000 = lead length 6 mm (untaped)
289 = taped, Ammo pack
189 = taped, reel

X2 capacitors with small dimensions
Rated voltage 275 Vac, 50/60 Hz



Lead length l_1 mm	6 –1	26 ± 2

Construction

- Dielectric: polyester (MKT)
- Internal series connection
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Terminals

- Parallel wire leads, tinned
- Two standard lead lengths available:
  6 mm und 26 mm
  Other lead lengths available upon request

Marking

Manufacturer, lot number, date of manufacture (year/week), rated capacitance (coded), capacitance tolerance (code letter), rated ac voltage, type number, interference suppression sub-class (X2), style (MKT), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
UL	UL 1283 (250 Vac) UL 1414 (250 Vac)
CSA	CSA C22.2 No. 0; 8 (250 Vac) CSA C22.2 No. 0; 1 (250 Vac)
S	EN 132400 / IEC 384-14, 2nd edition

Technical data

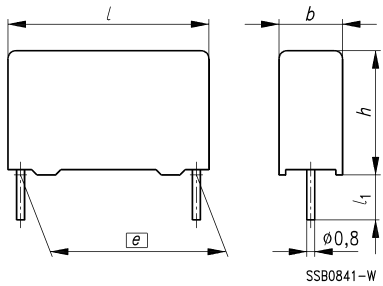
Permissible continuous dc voltage	275 V (50/60 Hz)
Permissible continuous ac voltage	630 V
DC test voltage	1700 V, 2 s (layer/layer)
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$ at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	$C_R \leq 0{,}33\ \mu F$: 30 000 MΩ; $C_R > 0{,}33\ \mu F$: 10 000 s
Capacitance tolerance	± 20 % ≙ M (closer tolerances upon request)
Climatic category	In accordance with IEC 68-1 40/100/21 (–40 °C/+100 °C/21 days damp heat test)

Ordering codes and packing units

Lead spacing e ±0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1)]	Packing units (pcs) Ammo pack	Reel	Untaped Lead length 6 mm	26 mm
15	22 nF	5,0 × 10,5 × 18,0	B81133-C1223-M***	1180	1300	1000	1000
	33 nF	5,0 × 10,5 × 18,0	B81133-C1333-M***	1180	1300	1000	1000
	47 nF	6,0 × 11,0 × 18,0	B81133-C1473-M***	1000	1100	1000	1000
	68 nF	7,0 × 12,5 × 18,0	B81133-C1683-M***	840	900	1000	1000
	0,10 µF	8,5 × 14,5 × 18,0	B81133-D1104-M***	690	700	500	500
	0,15 µF	8,5 × 14,5 × 18,0	B81133-D1154-M***	690	700	500	500
22,5	0,10 µF	6,0 × 15,0 × 26,5	B81133-C1104-M***	690	700	720	500
	0,15 µF	7,0 × 16,0 × 26,5	B81133-C1154-M***	590	600	630	500
	0,22 µF	8,5 × 16,5 × 26,5	B81133-C1224-M***	500	500	510	500
	0,33 µF	10,5 × 16,5 × 26,5	B81133-D1334-M***	400	400	540	500
	0,47 µF	11,0 × 20,5 × 26,5	B81133-D1474-M***	380	350	510	400
27,5	0,33 µF	11,0 × 21,0 × 31,5	B81133-C1334-M***	–	350	320	250
	0,47 µF	11,0 × 21,0 × 31,5	B81133-C1474-M***	–	350	320	250
	0,68 µF	12,5 × 21,5 × 31,5	B81133-C1684-M***	–	300	280	250
	1,0 µF	14,0 × 24,5 × 31,5	B81133-C1105-M***	–	–	260	250
	1,5 µF	18,0 × 27,5 × 31,5	B81133-C1155-M***	–	–	200	200[2)]
32,5	2,2 µF	20,0 × 31,0 × 36,5	B81133-C1225-M***	–	–	125	125[2)]

) Replace the *** by the code number for the required lead length or packing.
000 = lead length 6 mm (untaped)
026 = lead length 26 mm (untaped)
289 = taped, Ammo pack
189 = taped, reel
2) Approval to EN 132 400 / IEC 384-14, 2nd edition

X2 capacitors SAFE-X
Rated voltage 300 Vac, 50/60 Hz



Lead length l_1 mm	6 –1	26 ± 2

Construction

- Dielectric: polyester (MKT)
- Internal series connection and structured metallization
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant

Features

- The capacitors are considerably better than required by IEC 384-14, 2nd edition
- Best possible safety in terms of active flammability
- Self-healing properties
- Substitute for the MP version

Terminals

- Parallel wire leads, tinned
- Two standard lead lengths available:
  6 mm and 26 mm
  Other lead lengths available upon request

Marking

Manufacturer, lot number, date of manufacture (year/week), rated capacitance (coded), capacitance tolerance (code letter), rated ac voltage, type number, interference suppression sub-class (X2), style (MKT), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
UL	UL 1414 (125 Vac)
CSA	CSA C22.2 No. 0; 8 (250 Vac)
S	EN 132400 / IEC 384-14, 2nd edition

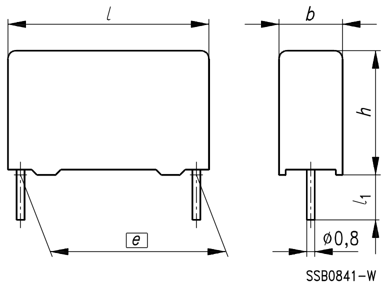
Technical data

Permissible continuous ac voltage	300 V (50/60 Hz)
Permissible continuous dc voltage	800 V
DC test voltage	2100 V, 2 s (layer/layer)
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$ at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	$C_R \leq 0{,}33\ \mu F$: 30 000 MΩ; $C_R > 0{,}33\ \mu F$: 10 000 s
Capacitance tolerance	± 20 % ≙ M (closer tolerances upon request)
Climatic category	In accordance with IEC 68-1 40/100/21 (–40 °C/+100 °C/21 days damp heat test)

Ordering codes and packing units

Lead spacing e ±0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1)]	Packing units (pcs) Ammo pack	Reel	Untaped Lead length 6 mm	26 mm
15,0	10 nF	5,0 × 10,5 × 18,0	B81131-C1103-M***	1180	1300	1000	1000
	22 nF	6,0 × 11,0 × 18,0	B81131-C1223-M***	1000	1100	1000	1000
	33 nF	7,0 × 12,5 × 18,0	B81131-C1333-M***	840	900	1000	1000
	47 nF	8,5 × 14,5 × 18,0	B81131-C1473-M***	690	700	500	500
	68 nF	9,0 × 17,5 × 18,0	B81131-C1683-M***	660	700	500	500
	0,10 µF	9,0 × 17,5 × 18,0	B81131-D1104-M***	660	700	500	500
22,5	0,10 µF	7,0 × 16,0 × 26,5	B81131-C1104-M***	590	600	630	500
	0,15 µF	8,5 × 16,5 × 26,5	B81131-C1154-M***	500	500	510	500
	0,22 µF	10,5 × 16,5 × 26,5	B81131-C1224-M***	400	400	540	500
	0,33 µF	11,0 × 20,5 × 26,5	B81131-D1334-M***	380	350	510	400
27,5	0,33 µF	11,0 × 21,0 × 31,5	B81131-C1334-M***	–	350	320	250
	0,47µF	13,5 × 23,0 × 31,5	B81131-C1474-M***	–	250	260	250
	0,68 µF	15,0 × 24,5 × 31,5	B81131-C1684-M***	–	–	240	200
	1,0 µF	19,0 × 30,0 × 31,5	B81131-C1105-M***	–	–	180	180
32,5	1,5 µF	20,0 × 31,0 × 36,5	B81131-C1155-M***	–	–	125	125

1) Replace the *** by the code number for the required lead length or packing.
000 = lead length 6 mm (untaped)
026 = lead length 26 mm (untaped)
289 = taped, Ammo pack
189 = taped, reel



SX2 capacitors
Rated voltage 440 Vac, 50 to 1000 Hz

Construction

- Dielectric: polypropylene (MKP)
- Internal series connection
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Lead length l_1 mm	6 –1	26 ± 2

Terminals

- Parallel wire leads, tinned
- Two standard lead lengths available: 6 mm and 26 mm
  Other lead lengths available upon request

Marking

Manufacturer, lot number, date of manufacture (year/week), rated capacitance (coded), capacitance tolerance (code letter), rated ac voltage, type number, interference suppression sub-class (X2), style (MKP), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
UR	UL 1283 (400 Vac)
S	EN 132400 / IEC 384-14, 2nd edition

Technical data

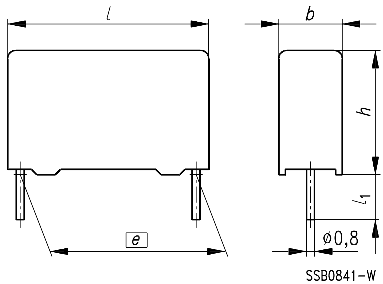
Permissible continuous ac voltage	450 V (50 to 1000 Hz)	
Permissible continuous dc voltage	1000 V	
DC test voltage	2400 V, 2 s (layer/layer)	
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$ at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	$C_R \leq 0{,}33$ µF 30 000 MΩ	$C_R > 0{,}33$ µF 10 000 s
Capacitance tolerance	± 10 % ≙ M	
Climatic category	In accordance with IEC 68-1 40/085/21 (–40 °C/+085 °C/21 days damp heat test)	

Ordering codes and packing units

Lead spacing e ±0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1]	Packing units (pcs) Ammo pack	Reel	Untaped Lead length 6 mm	26 mm
15	10 nF	6,0 × 11,0 × 18,0	B81121-C-∗92	1000	1100	1000	1000
	22 nF	8,5 × 14,5 × 18,0	B81121-C-∗93	690	700	500	500
22,5	33 nF	7,0 × 16,0 × 26,5	B81121-C-∗94	590	600	630	500
	47 nF	8,5 × 16,5 × 26,5	B81121-C-∗95	500	500	510	500
	68 nF	10,5 × 16,5 × 26,5	B81121-C-∗96	400	400	540	540
	0,10 µF	10,5 × 20,5 × 26,5	B81131-C-∗97	400	400	540	400
27,5	0,15 µF	11,0 × 21,0 × 31,5	B81121-C-∗98	–	350	320	250
	0,22 µF	14,0 × 24,5 × 31,5	B81121-C-∗99	–	–	260	250
	0,33 µF	18,0 × 27,5 × 31,5	B81121-C-∗100	–	–	200	200

1) Replace the * by the code letter for the required lead length or packing.
B = lead length 6 mm (untaped)
C = lead length 26 mm (untaped)
P = taped, Ammo pack
H = taped, reel

Y1 capacitors
Rated voltage 250 Vac, 50 to 400 Hz



Lead length l_1 mm	6 –1	26 ± 2

Construction

- Dielectric: polypropylene (MKP)
- Internal series connection
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant
- Impregnated

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Terminals

- Parallel wire leads, tinned
- Two standard lead lengths available:
  6 mm and 26 mm
  Other lead lengths available upon request

Marking

Manufacturer, lot number, date of manufacture (year/week),
rated capacitance (coded), capacitance tolerance (code letter),
rated ac voltage, type number, interference suppression sub-class (Y1),
style (MKP), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
	UL 1414 double protection (pending for V_R = 125 Vac)
	EN 132400 / IEC 384-14, Ausgabe 2 (pending for V_R = 250 Vac)

Technical data

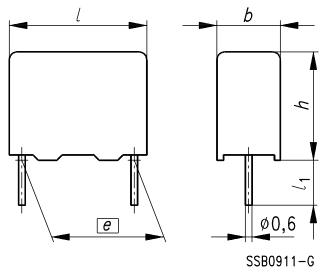
Permissible continuous ac voltage	750 V (50/60 Hz)
Permissible continuous dc voltage	3000 V
DC test voltage	4000 V, 2 s (layer/layer)
Insulation resistance R_{is} at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered value)	30 000 MΩ
Capacitance tolerance	± 20 % (closer tolerance upon request)
Climatic category	In accordance with IEC 68-1 40/085/21 (–40 °C/+85 °C/21 days damp heat test)

Ordering codes and packing units

Lead spacing e ±0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1)]	Packing units (pcs) Ammo pack	Reel	Untaped Lead length 6 mm	26 mm
15	1,0 nF	5,0 × 10,5 × 18,0	B81123-C1102-M***	1180	1300	1000	1000
	1,5 nF	6,0 × 11,0 × 18,0	B81123-C1152-M***	1000	1100	1000	1000
	2,2 nF	7,0 × 12,5 × 18,0	B81123-C1222-M***	840	900	1000	1000
	3,3 nF	8,5 × 14,5 × 18,0	B81123-C1332-M***	690	700	500	500
	4,7 nF	9,0 × 17,5 × 18,0	B81123-C1472-M***	660	700	500	500
22,5	5,6 nF	7,0 × 16,0 × 26,5	B81123-C1562-M***	590	600	630	500
	6,8 nF	8,5 × 16,5 × 26,5	B81123-C1682-M***	480	500	510	500
	10 nF	10,5 × 20,5 × 26,5	B81123-C1103-M***	400	400	510	400

1) Replace the *** by the code number for the required lead length or packing.
000 = lead length 6 mm (untaped)
026 = lead length 26 mm (untaped)
289 = taped, Ammo pack
189 = taped, reel

Y2 capacitors with 10 mm lead spacing
Rated voltage 250 Vac, 50/60 Hz



Lead length l_1 mm	6 –1

Construction

- Dielectric: polyester (MKT)
- Impregnated
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Terminals

- Parallel wire leads, tinned
- Standard lead length 6 mm
  Other lead lengths available upon request

Marking

Manufacturer, date of manufacture (year/week),
rated capacitance (coded), capacitance tolerance (code letter),
rated ac voltage, type number, interference suppression sub-class (Y2),
style (MKT), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
	EN 132 400 / IEC 384-14, 2nd edition UL 1414 CSA C22.2 No. 0; 1

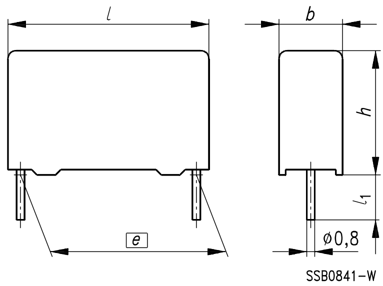
Technical data

Permissible continuous ac voltage	275 V (50/60 Hz)
Permissible continuous dc voltage	1200 V
DC test voltage	2500 V, 2 s (layer/layer)
Insulation resistance R_{is} at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	30 000 MΩ
Capacitance tolerance	± 20 % ≙ M (closer tolerances upon request)
Climatic category	In accordance with IEC 68-1 40/100/21 (–40 °C/+100 °C/21 days damp heat test)

Ordering codes and packing units

Lead spacing e ± 0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1)]	Packing units (pcs)		
				Ammo pack	Reel	Untaped
10	1,0 nF	4,0 × 9,0 × 13,0	B81122-C1102-M***	1000	1700	1000
	1,5 nF	4,0 × 9,0 × 13,0	B81122-C1152-M***	1000	1700	1000
	2,2 nF	5,0 × 11,0 × 13,0	B81122-C1222-M***	800	1300	1000
	3,3 nF	5,0 × 11,0 × 13,0	B81122-C1332-M***	800	1300	1000
	4,7 nF	6,0 × 12,0 × 13,0	B81122-C1472-M***	600	1100	1000
	5,6 nF	6,0 × 12,0 × 13,0	B81122-C1562-M***	600	1100	1000
	6,8 nF	6,0 × 12,0 × 13,0	B81122-C1682-M***	600	1100	1000

1) Replace the *** by the code number for the required lead length or packing.
000 = lead length 6 mm (untaped)
289 = taped, Ammo pack
189 = taped, reel



Lead length l_1 mm	6 –1	26 ± 2

Y2 capacitors
Rated voltage 250 Vac, 50 to 1000 Hz

Construction

- Dielectric: polypropylene (MKP)
- Internal series connection
- Plastic case (UL 94 V-0)
- Epoxy resin sealing, flame-retardant

Features

- The capacitors meet the requirements of IEC 384-14, 2nd edition
- Self-healing properties

Terminals

- Parallel wire leads, tinned
- Two standard lead lengths available:
  6 mm und 26 mm
  Other lead lengths available upon request

Marking

Manufacturer, lot number, date of manufacture (year/week),
rated capacitance (coded), capacitance tolerance (code letter),
rated ac voltage, type number, interference suppression sub-class (Y2),
style (MKP), climatic category, awarded marks of conformity

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping see page 439.

Approvals

Marks of conformity	Standards
UL CSA S	UL 1414 (125 Vac) CSA C22.2 No. 0; 8 (250 Vac) EN 132400 / IEC 384-14, 2nd edition

Technical data

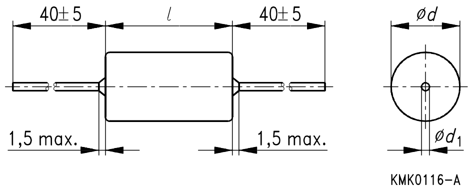
Permissible continuous ac voltage	500 V (50 to 1000 Hz)
Permissible continuous dc voltage	2000 V
DC test voltage	2700 V, 2 s (layer/layer)
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$ at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	$C_R \leq 0{,}33\ \mu F$: 30 000 MΩ; $C_R > 0{,}33\ \mu F$: 10 000 s
Capacitance tolerance	± 10 % (closer tolerances upon request)
Climatic category	In accordance with IEC 68-1 40/085/21 (–40 °C/+085 °C/21 days damp heat test)

Ordering codes and packing units

Lead spacing e ±0,4 mm	C_R	Maximum dimensions $b \times h \times l$ (mm)	Ordering code[1)]	Packing units (pcs) Ammo pack	Reel	Untaped Lead length 6 mm	26 mm
15	2,2 nF	6,0 × 11,0 × 18,0	B81121-C-*141	1000	1100	1000	1000
	3,3 nF	7,0 × 12,5 × 18,0	B81121-C-*142	840	900	1000	1000
	4,7 nF	8,5 × 14,5 × 18,0	B81121-C-*143	690	700	500	500
22,5	6,8 nF	6,0 × 15,0 × 26,5	B81121-C-*144	690	700	720	500
	10 nF	7,0 × 16,0 × 26,5	B81121-C-*145	590	600	630	500
	15 nF	8,5 × 16,5 × 26,5	B81121-C-*146	500	500	510	500
	22 nF	10,5 × 18,5 × 26,5	B81121-C-*147	400	400	540	500
	27 nF	10,5 × 20,5 × 26,5	B81121-C-*148	400	400	540	400
27,5	33 nF	11,0 × 21,0 × 31,5	B81121-C-*149	–	350	320	250

1) Replace the * by the code letter for the required lead length or packing.
B = lead length 6 mm (untaped)
C = lead length 26 mm (untaped)
P = taped, Ammo pack
H = taped, reel

X2 capacitors, axial leads
Rated voltage 275 Vac, 50/60 Hz



Dimensions in mm

$\varnothing d$ (max)	$\varnothing d_1$
≤ 7,0	0,6
> 7,0	0,8

When bending the leads take care to leave a clearance of 1 mm to the capacitor body.

Construction

- Dielectric: polyester (MKT)
- Internal series connection
- Cylindrical winding
- Insulating sleeve
- Face ends sealed with epoxy resin

Features

- The capacitors meet the requirements of IEC 384-14,2nd edition
- Self-healing properties

Terminals

- Central axial wire leads, tinned

Marking

Manufacturer, style (MKT),
interference suppression subclass (X2),
rated capacitance,
capacitance tolerance (code letter),
rated ac voltage

Delivery mode

Bulk (untaped)

Approvals

Marks of conformity	Standards
Ⓢ	EN 132 400 / IEC 384-14, 2nd edition (pending)

Technical data

Permissible continuous ac voltage	275 V (50/60 Hz)
Permissible continuous dc voltage	600 V
DC test voltage	1400 V, 2 s (layer/layer)
Insulation resistance R_{is} or time constant $\tau = C_R \cdot R_{is}$ at 20 °C, rel. humidity ≤ 65 % (minimum as-delivered values)	$C_R \leq 0{,}33\ \mu F$: 30 000 MΩ $C_R > 0{,}33\ \mu F$: 10 000 s
Capacitance tolerance	± 20 % ≙ M
Climatic category	In accordance with IEC 68-1 40/100/21 (–40 °C/+100 °C/21 days damp heat test)

Ordering codes and packing units

C_R	Max. dimensions $d \times l$ mm	Ordering code	Packing unit (pcs) Untaped
10 nF	7,0 × 19,0	B81191-C1103-M	500
15 nF	7,0 × 19,0	B81191-C1153-M	500
22 nF	7,0 × 19,0	B81191-C1223-M	500
33 nF	8,0 × 19,0	B81191-C1333-M	500
47 nF	8,0 × 19,0	B81191-C1473-M	500
68 nF	9,0 × 19,0	B81191-C1683-M	500
0,10 µF	11,0 × 19,0	B81191-C1104-M	500
0,15 µF	9,0 × 26,5	B81191-C1154-M	250
0,22 µF	11,0 × 26,5	B81191-C1224-M	250
0,33 µF	13,0 × 26,5	B81191-C1334-M	250
0,47 µF	15,0 × 26,5	B81191-C1474-M	250
0,68 µF	16,0 × 31,5	B81191-C1684-M	200
1,0 µF	19,0 × 31,5	B81191-C1105-M	200

X capacitors, metal or ceramic case
Rated voltage up to 600 Vdc/380 Vac (50/60 Hz)

Construction

- FK technology
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metal foils
- Metal or ceramic case
- Hermetically soldered

Features

- High operational reliability
- High test voltage
- High contact reliability

Terminals

- Threaded stud M 6

Marking

Manufacturer, ordering code,
rated capacitance, interference suppression sub-class,
rated voltage, climatic category,
date of manufacture

Standards

The capacitors comply with VDE 0565-1

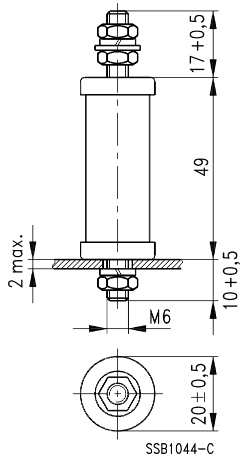
Mounting information

To obtain effective broadband interference suppression, the connection between capacitor and protected line must be as short as possible (low inductance).

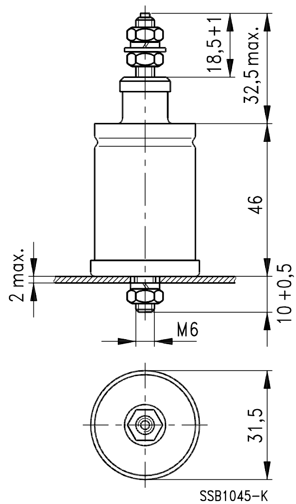
The flexible connecting line must be attached by fixing it between two countered nuts to avoid exposing the ceramic parts to torque load.

Outline drawings

B81551-A-B7
Ceramic case



B81551-A-B14
Metal case



Mounting hole ∅ 7mm
Torque 2,5 Nm max.
Nuts, washers and spring rings included in delivery.

Technical data

Test voltage U_P	Terminal/terminal (layer/layer
Insulation resistance R_{is}	≥ 12000 MΩ
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 40/100/56 (–40 °C/+100 °C/56 damp heat test)

Characteristics and ordering codes

Class[1]	C_R	V_R		V_P	Dimens.	Approx.	PU	Ordering code
		Vdc/Vac	Vac		$d \times l$	weight		
	µF	50/60 Hz	400 Hz	Vdc, 2 s	mm	g	pcs.	
X1	0,035	600/380	220	3600	20,0 × 49	45	100	B81551-A-B7
X1	0,15	440/260	125	2700	31,5 × 46	80	56	B81551-A-B14

1) In accordance with VDE 0565-1

X capacitors, metal or ceramic case
Rated voltage up to 800 Vdc/440 Vac (50/60 Hz)

Construction

- MP technology
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metallized paper
  Metal case, hermetically soldered
- MKT technology
  Electrodes/dielectric: metallized polyester
  Dry, resin-protected
  Ceramic case

Features

- Self-healing properties
- High operational reliability

Terminals

- Threaded stud M 6

Marking

Manufacturer, ordering code,
rated capacitance, interference suppression sub-class,
rated voltage, climatic category
date of manufacture

Standards

The capacitors comply with VDE 0565-1

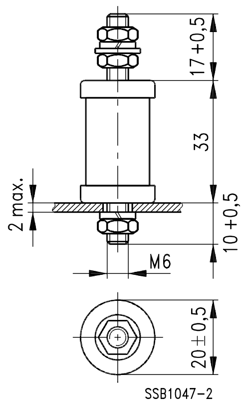
Mounting information

To obtain effective broadband interference suppression, the connection between capacitor and protected line must be as short as possible (low inductance).

The flexible connecting line must be attached by fixing it between two countered nuts to avoid exposing the ceramic parts to torque load.

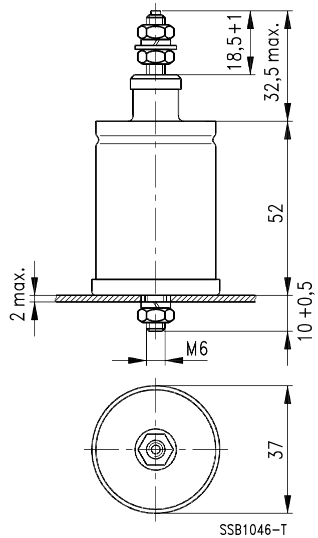
Outline drawings

B81551-A-C9
Ceramic case



Mounting hole ∅ 7mm
Torque 2,5 Nm max.
Nuts, washers and spring rings included in delivery.

B81551-A-B16
Metal case



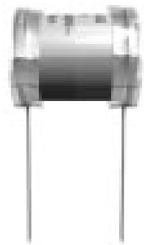
Technical data

Test voltage V_P	Terminal/terminal (ayer/layer
Insulation resistance R_{is}	≥ 5000 MΩ
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 40/085/56 (–40 °C/+85 °C/56 days damp heat test)

Characteristics and ordering codes

Class[1]	C_R µF	V_R Vdc/Vac 50/60 Hz	 Vac 400 Hz	V_P Vdc, 2 s	Dimens. $d \times l$ mm	Approx. weight g	PU pcs.	Ordering code
X2	0,6 (MP)	800/440	220	2500	37 × 52	120	36	B81551-A-B16
X2	1,0 (MKT)	125/50	–	350	20 × 33	30	100	B81551-A-C9

1) In accordance with VDE 0565-1



Y capacitors, ceramic case
Rated voltage up to 440 Vdc/280 Vac (50/60 Hz)

Construction

- FK technology
  Dielectric: oil-impregnated paper (free of PCB)
  Electrodes: metal foils
- Protective ceramic tube
- Hermetically sealed by metal caps
  soldered to face ends

Features

- B81551 is a low-loss version, which is
  particularly suitable for bypassing RFI
  to ground

Terminals

- B81151:
  Flat leads and insulating caps on both sides
- B81551:
  Threaded stud on outer foil side,
  flat lead and insulating cap on opposite side

Marking

Manufacturer, ordering code,
rated capacitance, interference suppression sub-class,
rated voltage, climatic category,
date of manufacture

Standards

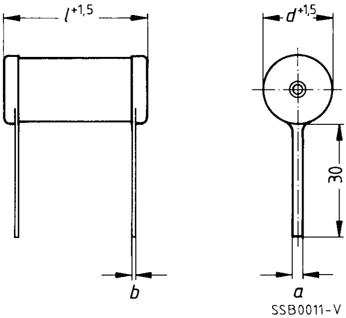
The capacitors comply with VDE 0565-1

Mounting information

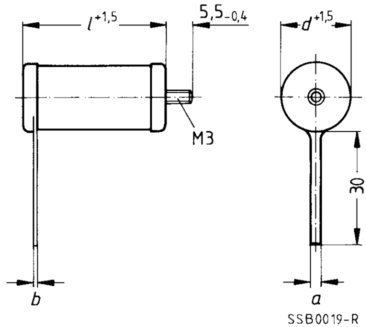
To obtain effective broadband interference suppression, the connection between capacitor and protected line must be as short as possible (low inductance).

Outline drawings

B81151



B81551



Technical data

Test voltage V_P	3000 Vdc, 2 s terminal/terminal (layer/layer)
Insulation resistance R_{is}	≥ 12000 MΩ
Capacitance tolerance	± 20 %
Climatic category	In accordance with IEC 68-1 40/100/56 (–40 °C/+100 °C/56 days damp heat test)

Characteristics and ordering codes

C_R	Class[1)]	V_R		Dimensions			Approx.	PU	Ordering code
		Vdc/Vac	Vac	$d \times l$	a	b	weight		
µF		50/60 Hz	400 Hz	mm	mm	mm	g	pcs.	
0,01	Y	440/250	115	15 × 22	2,5	0,4	10	10	B81551-A-C3
0,025	Y	440/280	115	19 × 30	2,5	0,4	21	10	B81551-A-D4
0,025	Y	440/280	115	19 × 25	2,5	0,4	17	10	B81151-A-D5

1) In accordance with VDE 0565-1

S+M COMPONENTS **Siemens Matsushita Components**

New lab assortments in film capacitors

Five at a stroke

To save you the trouble of inquiring for individual ratings to put into your design, there are now five practical sets of film capacitors:

- ▶ Lead spacing 5: 525 types, 50 to 400 V, 1 nF to 3.3 µF
- ▶ SilverCaps: the lowest-cost models, low in volume, 63 to 400 V, 1 nF to 10 µF
- ▶ MKPs in wound technology: for RF applications, 250 to 2000 V, 1.5 nF to 0.68 µF
- ▶ MKPs in stacked-film technology: 300 types, 160 to 1000 V, 1.5 nF to 1 µF
- ▶ Interference suppression: 150 types with a wide choice of ratings for different applications – X2 with small dimensions, Safe-X for maximum security against active flammability (X2) and Y for suppressing common-mode interference (Y2)

SCS – dependable, fast and competent

General

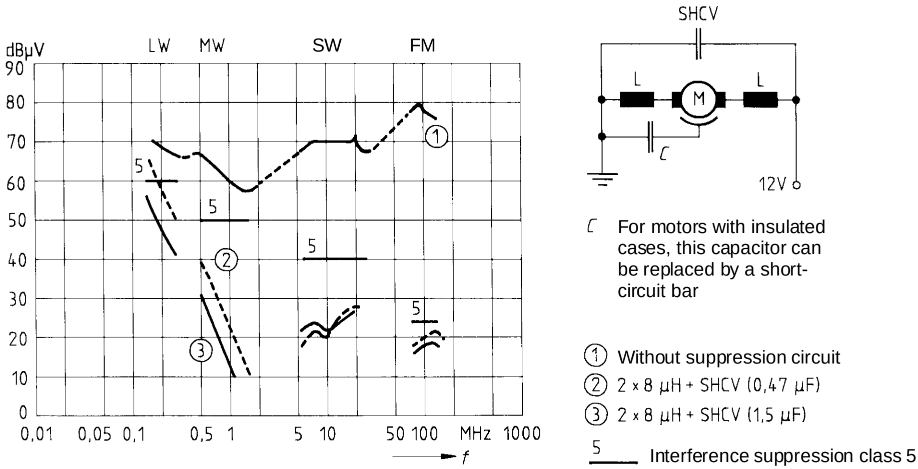
SIOV varistors (**SI**emens Matsushita Metal **O**xide **V**aristors) are voltage-dependent ceramic resistors whose resistance decreases by several powers of ten with rising voltages. When connected in parallel to the load to be protected, they will lead to a low-resistance shunt connection whenever overvoltages occur, thus preventing the voltage from rising further.

With SIOV varistors, the requirements for transient immunity to surges (IEC 801-5) and bursts (IEC 801-4) can be met efficiently and economically.

In addition, SIOV varistors are suitable for circuits to meet interference emission limit regulations in applications where it is necessary to absorb high-energy pulses generated by inductive loads being switched off.

S + M Components has developed high-capacitive varistors, SHCV (**S**iemens Matsushita **H**igh **C**apacitive **V**aristors) for suppressing interference caused by servo-motors. When used, for example, in a circuit as shown below, these meet even the most stringent interference suppression requirements.

The example shows the interference suppression of a small motor, under no-load conditions, using chokes and SHCV (measured in accordance with VDE 0879, part 3):



VAR0146-B

The following pages present our SHCV product line.

Our overall product range includes leaded models, SMDs, block varistors and arrester blocks.

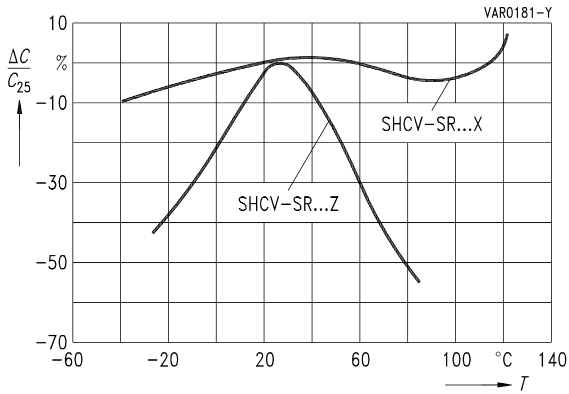
If you would like to obtain more detailed information, please ask for our short form catalog (ordering code B462-P6211-X-X-7400).

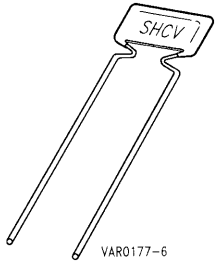
General technical data

Climatic category X Z	40/85/56 (– 40 °C/+ 85 °C; 56 days damp heat test) 25/85/56 (– 25 °C/+ 85 °C; 56 days damp heat test)	in accordance with IEC 68-1
Operating temperature X (full load) Z	– 40 … + 85 °C – 25 … + 85 °C	in accordance with CECC 42 000
Storage temperature X Z	– 40 … + 125 °C – 25 … + 85 °C	
Electric strength	> 1,0 kV	in accordance with CECC 42 000
Insulation resistance	> 1 GΩ	in accordance with CECC 42 000
Response time	< 25 ns	
Weight	approx. 1 g	

X = ceramic material X7R; Z = ceramic material Z5U

Typical capacitance change
as per EIA RS 198 B (…X), IEC 384-9 (…Z)





Construction

- Combination of a multilayer ceramic capacitor and a multilayer varistor
- Coating: epoxy resin, flame-retardant as per UL 94 V-0

Features

- High capacitance
- Overvoltage protection and RFI suppression provided by a single component
- Load-dump withstand capability
- Jump-start strength

Applications

- Interference suppression in automotive low-power motors, e.g. windshield wipers, power windows, memory seats, central locking systems etc.

Terminals

- Tinned copper wire, 5 mm lead spacing

Type designation

Example:

SHCV–SR 1 K 20 M 474 X

- SHCV: S+M High Capacitive Varistor
- SR: Design
- 1: Area of varistor element
  1 ≙ 1812, 2 ≙ 2220 ($l \times b$ in $^{1}/_{100}$ inch)
- K: Tolerance of varistor voltage
  K = ±10 %; S**B = special tol. + 23/– 0 %
- 20: Max. ac operating voltage
- M: Cap. tolerance (M = ± 20 %)
- 474: Capacitance (coded)
- X: Ceramic material of capacitor
  X = X7R; Z = Z5U

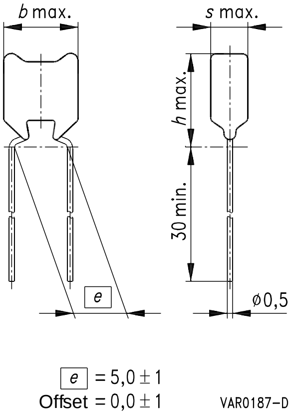
Maximum ratings (T_A = 85 °C)

Type	Ordering code	Operating voltage		Load dump	Surge current	Energy absorp-tion	Power dissipa-tion
		V_{RMS}	V_{DC}	W_{LD} (10×)	i_{max} 8/20 µs	W_{max} (2 ms)	P_{max}
SHCV-		V	V	J	A	J	W
-SR1S14BM474X	Q69587-E3140-S200	14	16	6	500	1,7	0,015
-SR2S14BM474X	Q69547-E3140-S200	14	16	12	1000	3,6	0,03
-SR1S14BM105Z	Q69588-G3140-S200	14	16	6	500	1,7	0,015
-SR1S14BM155Z	Q69588-H3140-S200	14	16	6	500	1,7	0,015
-SR2S14BM105Z	Q69548-G3140-S200	14	16	12	1000	3,6	0,03
-SR2S14BM155Z	Q69548-H3140-S200	14	16	12	1000	3,6	0,03
-SR1K20M474X	Q69587-E3200-K	20	26	6	500	2,5	0,015
-SR2K20M474X	Q69547-E3200-K	20	26	12	1000	5,5	0,03
-SR1K20M105Z	Q69588-G3200-K	20	26	6	500	2,5	0,015
-SR1K20M155Z	Q69588-H3200-K	20	26	6	500	2,5	0,015
-SR2K20M105Z	Q69548-G3200-K	20	26	12	1000	5,5	0,03
-SR2K20M155Z	Q69548-H3200-K	20	26	12	1000	5,5	0,03

Characteristics (T_A = 25 °C)

Type	Jump start	Varistor voltage	Tolerance	Max. clamping voltage		Capaci-tance
	V_{JUMP} (5 min.)	V_V (1 mA)	ΔV_V (1 mA)	v	i	$C \pm 20$ % (1 kHz)
SHCV-	V	V	%	V	A	µF
-SR1S14BM474X	24,5	22	+ 23 / – 0	40	5	0,47
-SR2S14BM474X	24,5	22	+ 23 / – 0	40	10	0,47
-SR1S14BM105Z	24,5	22	+ 23 / – 0	40	5	1,0
-SR1S14BM155Z	24,5	22	+ 23 / – 0	40	5	1,5
-SR2S14BM105Z	24,5	22	+ 23 / – 0	40	10	1,0
-SR2S14BM155Z	24,5	22	+ 23 / – 0	40	10	1,5
-SR1K20M474X	26	33	± 10	58	5	0,47
-SR2K20M474X	26	33	± 10	58	10	0,47
-SR1K20M105Z	26	33	± 10	58	5	1,0
-SR1K20M155Z	26	33	± 10	58	5	1,5
-SR2K20M105Z	26	33	± 10	58	10	1,0
-SR2K20M155Z	26	33	± 10	58	10	1,5

Outline drawing



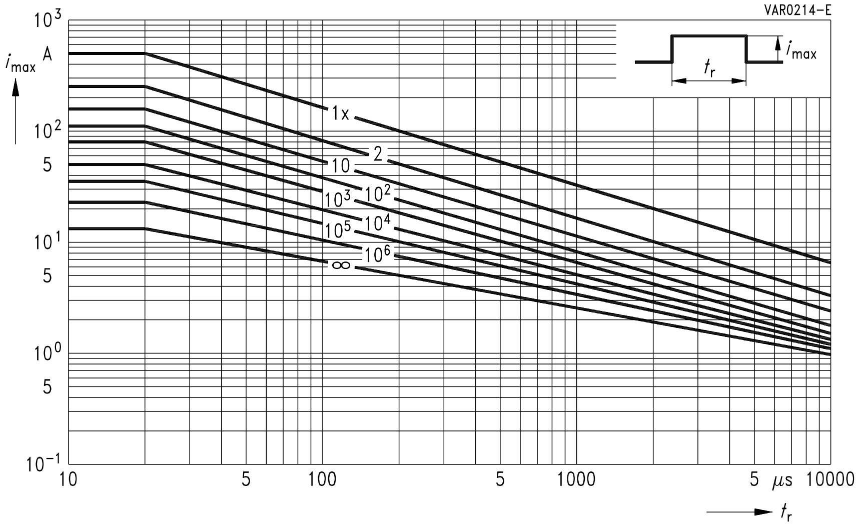
SHCV-	Size	$b_{max.}$ mm	$s_{max.}$ mm	$h_{max.}$ mm
-SR1 … 474X	1812	7,3	3,6	7,8
-SR1 … 105Z		7,3	4,0	7,8
-SR1 … 155Z		7,3	4,1	7,8
-SR2 … 474X	2220	7,8	3,6	9,0
-SR2 … 105Z		7,8	4,0	9,0
-SR2 … 155Z		7,8	4,1	9,0

Notes

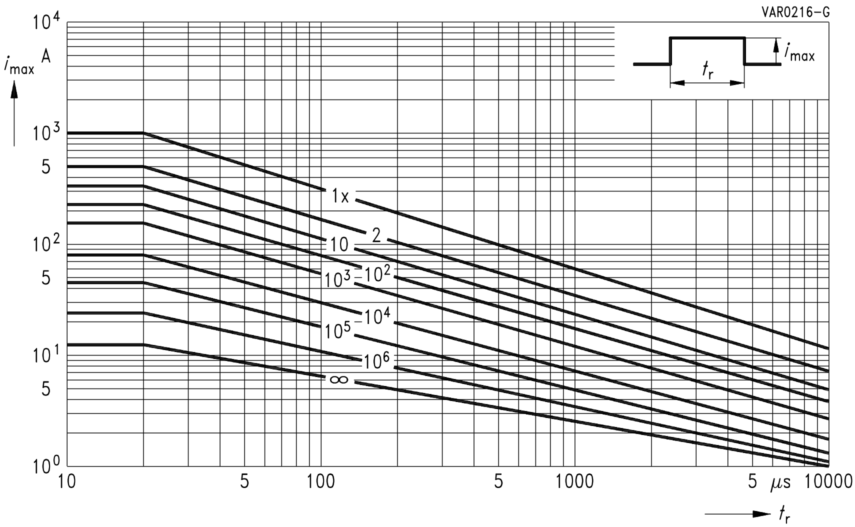
- If the maximum loads specified for load dump and jump start are fully utilized, subsequent polarity reversal of the SHCV varistors is inadmissible.
- If the loads remain under the maximum ratings, polarity reversal may be admissible. Contact S+M Components for consultancy on this kind of problem.
- Load dump or jump start can decrease the varistor voltage in load direction by max. 15%.
- Load Dump: min. time of energy input 30 ms, interval 60 s.

Derating curves (maximum surge current)
$i_{max} = f\,(t_r$, pulse train)

SHCV-SR1…X, …Z



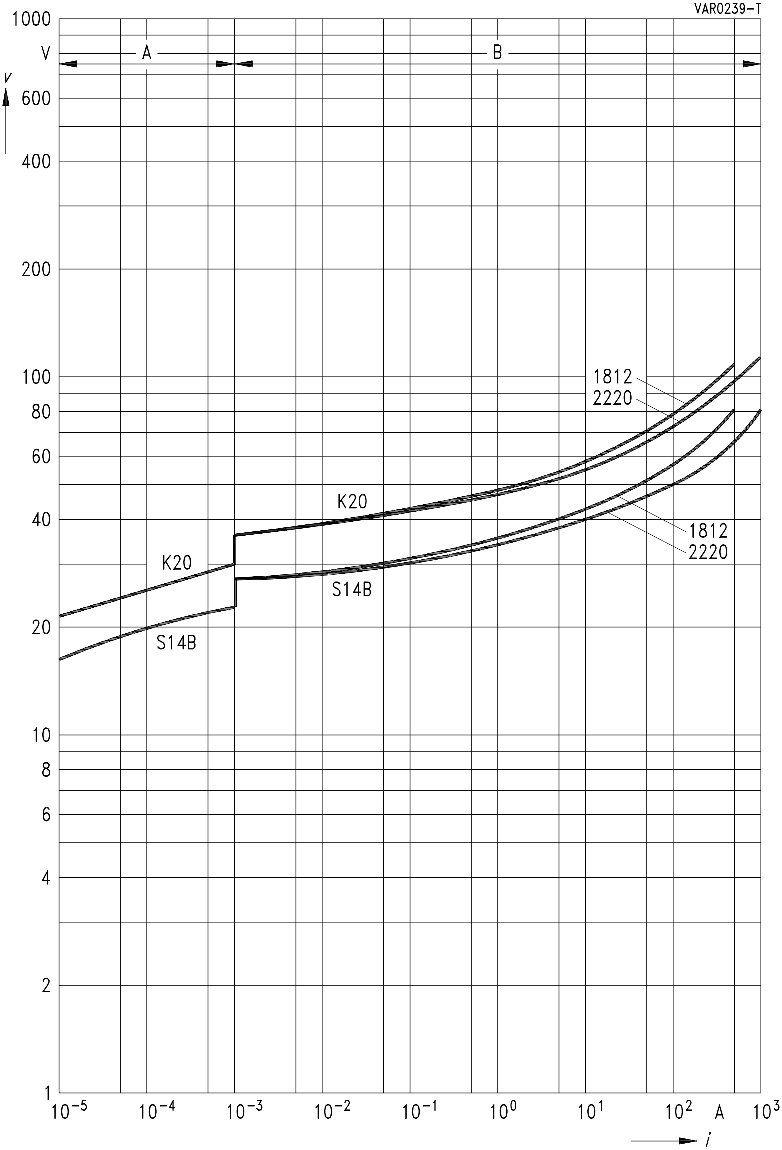
SHCV-SR2…X, …Z



V/*I* characteristics

v = *f* (*i*)

A = Leakage current for worst-case
B = Protection level varistor tolerances

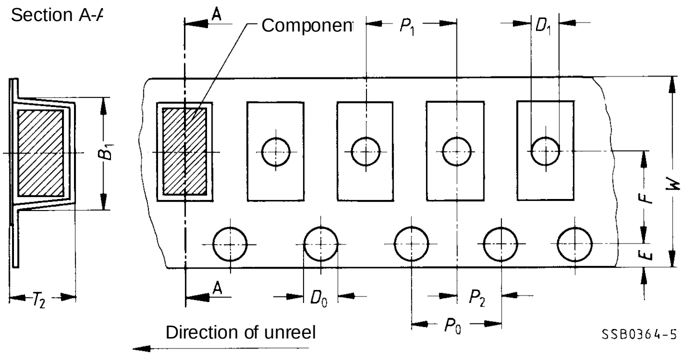


Taping and Packing

1 SMDs

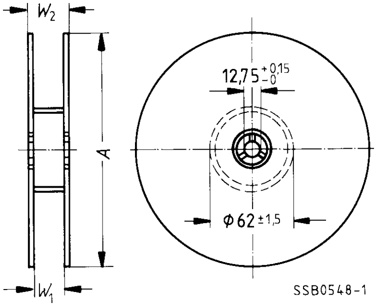
All SIMID RF chokes as well as the data line chokes B82790-+∗∗∗∗-N2 are supplied in blister tapes. Tape packaging is in accordance with IEC 286-3 or EIA 481 (for B82494 and B82498).

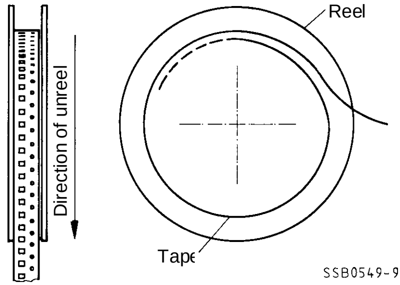
1.1 Taping



Dim. mm	Types B82412	B82422	B82432	B82442	B82494	B82498	B82790
W	8 ± 0,3	8 ± 0,3	12 ± 0,3	12 ± 0,3	8 ± 0,3	8 ± 0,3	16 ± 0,3
D_0	1,5 ± 0,1	1,5 ± 0,1	1,5 ± 0,1	1,5 ± 0,1	1,5 ± 0,1	1,5 + 0,1/–0	1,5 ± 0,1
D_1	1,0 ± 0,2	1,0 ± 0,2	1,5 ± 0,2	1,6 ± 0,1	1,0 ± 0,2	1,1 ± 0,2	1,6 ± 0,1
P_0	4 ± 0,1	4 ± 0,1	4 ± 0,1	4 ± 0,1	4 ± 0,1	4 ± 0,1	4 ± 0,1
P_1	4 ± 0,1	4 ± 0,1	8 ± 0,1	8 ± 0,1	4 ± 0,1	4 ± 0,1	8 ± 0,1
P_2	2 ± 0,05	2 ± 0,05	2 ± 0,05	2 ± 0,05	2 ± 0,05	2 ± 0,05	2 ± 0,1
E	1,75 ± 0,1	1,75 ± 0,1	1,75 ± 0,1	1,75 ± 0,1	1,75 ± 0,1	1,75 ± 0,1	1,75 ± 0,1
F	3,5 ± 0,05	3,5 ± 0,05	5,5 ± 0,05	5,5 ± 0,1	3,5 ± 0,05	3,5 ± 0,05	7,5 ± 0,1
B_1	≤ 4,2	≤ 4,2	≤ 5,9	≤ 7,2	≤ 2,9		≤ 10,5
T_2	≤ 2,0	≤ 2,6	≤ 4,1	≤ 6,0	≤ 1,85		≤ 6,0

1.2 Packing





Type	Reel dimensions (mm)		
	A	W_1	W_2
B82412	180 +0/–2 330 +0/–2	8,4 +1,5/–0 12,4 +1,5/–0	14,4 max. 18,4 max.
B82422	180 +0/–2 330 +0/–2	8,4 +1,5/–0 12,4 +1,5/–0	14,4 max. 18,4 max.
B82432	330 +0/–2	12,4 +1,5/–0	18,4 max.
B82442	330 +0/–2	12,4 +1,5/–0	18,4 max.
B82494	180 +0/–4	8,4 +1,5/–0	14,4 max.
B82498	180 +0/–4	8,4 +1,5/–0	14,4 max.
B82790	330 +0/–2	16,4 +2/–0	20,4 max.

1.3 Packing units

Type	180-mm ∅ reel PU: pcs/reel	330-mm ∅ reel PU: pcs/reel
B82412	2500	10000
B82422	2000	8000
B82432	–	2500
B82442	–	1500
B82494	2000	–
B82498	3000	–
B82790	–	1500

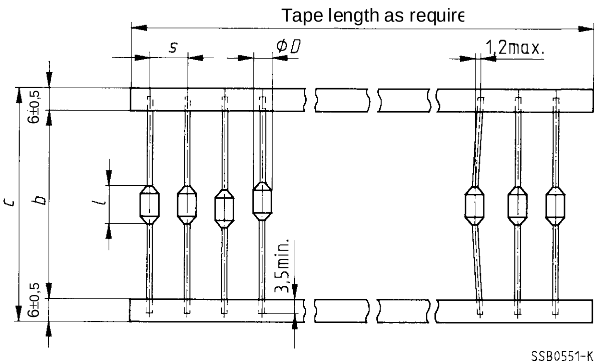
2 Leaded RF chokes

RF chokes are available with axial and radial leads. The table below provides a survey.

Type		Axial	Radial
B781*8-T	MCC	x	x
B82141	SBC	x	x
B781*8-S	BC	x	x
B82143	HBC	x	x
B82144	LBC	x	
B82145	HLBC	x	

2.1 Taping of axial-lead chokes

Tape packaging in accordance with IEC 286-1
Other modes of taping upon request.

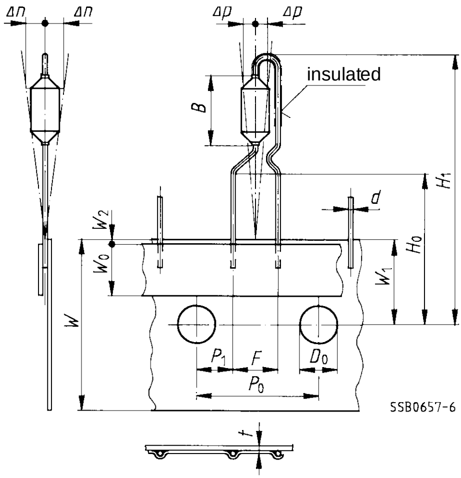


Dimensions (mm)	Types					
	B78108-T	B82141	B78108-S	B82143	B82144	B82145
b	53	53	53	53	53	53
c	65 ±1	65 ±1	65 ±1	65 ±1	65 ±1	65 ±1
∅ *D*	3 ±0,3	3 max	4 max	4 max	5,2 max	6,5 max.
l[1)]	7,0 max.	6,8 max.	9,2 max.	9,2 max.	12 max.	12 max.
s	5 ±0,25	5 ±0,25	5 ±0,25	5 ±0,25	10 ±0,25	10 ±0,25

1) In accordance with DIN 41099

2.2 Taping of radial-lead chokes

Tape packaging in accordance with IEC 286-2

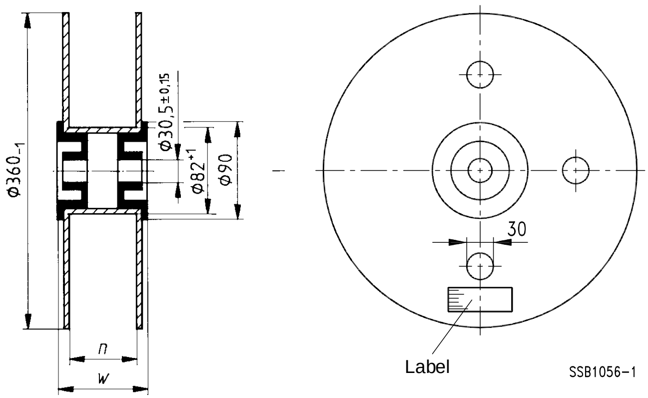


Dimensions	Types				Tolerance
mm	B78148-T	B82141-B	B78148-S	B82143	mm
B 1)	7	6,8	9,2	9,2	max.
$\varnothing d_1$	0,55	0,55	0,7	0,7	max.
F	5	5	5	5	+0,6/-0,1
H_1	29	29	30,5	30,5	max.
H_0	16	16	16	16	± 0,5
P_1	3,8	3,8	3,8	3,8	± 0,7
P_0	12,7				± 0,3
D_0	4,0				± 0,2
W	18,0				+ 1/–0,5
W_0	6,0				min.
W_1	9,0				+ 0,75/–0,5
W_2	0,5				max.
Δh	2				max.
Δp	1,3				max.
t	0,7				± 0,2

1) In accordance with DIN 41099

2.3 Packing

Taped RF chokes are supplied on reels.
Other modes of packing (e.g. Ammo pack) upon request.



Reel dimensions (mm)

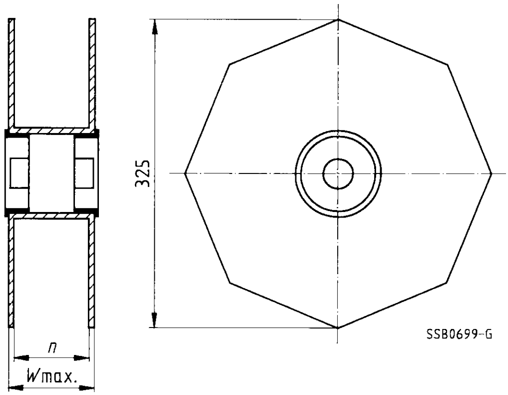
Type		Axial-lead RF chokes		Radial-lead RF chokes	
		n	*W* max.	*n*	*W* max.
B781*8-T	MCC	72 +1	84	42 +1	54
B82141	SBC	72 +1	84	42 +1	54
B781*8-S	BC	72 +1	84	42 +1	54
B82143	HBC	72 +1	84	42 +1	54
B82144	LBC	72 +1	84		
B82145	HLBC	72 +1	84		

2.4 Packing units

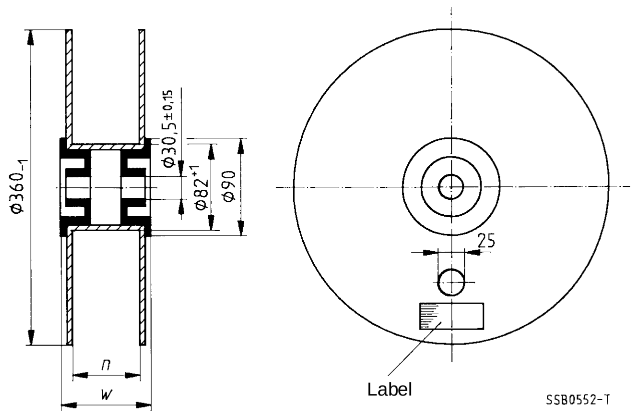
Type		Axial-lead RF chokes pcs/reel	Axial-lead RF chokes pcs/reel
B781*8-T	MCC	5000	2000
B82141	SBC	5000	2000
B781*8-S	BC	5000	2000
B82143	HBC	5000	2000
B82144	LBC	1500	
B82145	HLBC	1250	

3 VHF chokes

Reel packing of B82111-E (for taping see data sheet, page 120)



Reel packing of B82131 ... B82134 (for taping see data sheet, page 117)



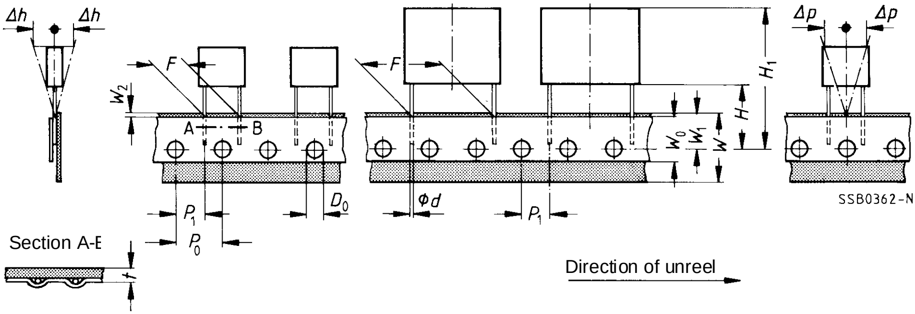
Type	Reel dimensions (mm)		Packing unit pcs/reel
	n +1	*W* max.	
B82111-E	97	109	1000
B82131, B82132	95	107	2000
B82133, B82134	95	107	1000

4 Radial-lead EMI suppression capacitors in plastic cases

Types B81121 ... B81141 wirh lead spacings 15 to 27,5 mm are available on tape. Tape packaging is in accordance with IEC 286-2.
For packing units see data sheets.

4.1 Taping

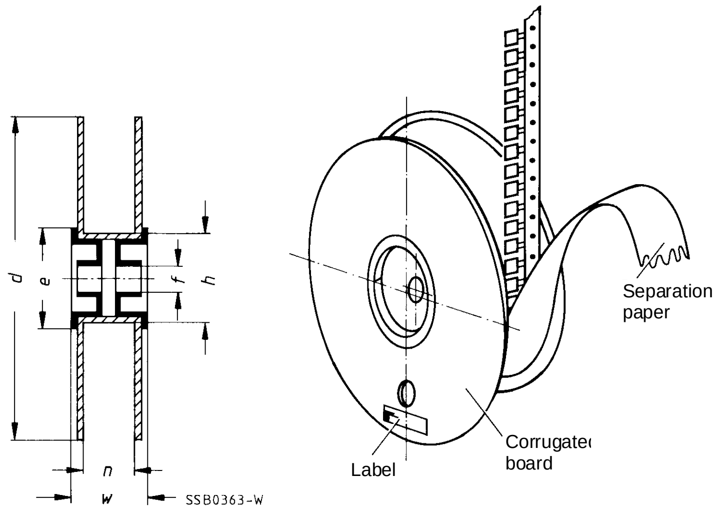
Lead spacings 10 and 15 mm Lead spacings 22,5 and 27,5 mm



Dimensions	Lead spacing				Tolerance
mm	10 mm	15 mm	22,5 mm	27,5 mm	mm
$\varnothing d$	0,6	0,8	0,8	0,8	+10 %/–0,05
F	10,0	15,0	22,5	27,5	+0,6/-0,1
P_1	7,7	5,2	7,8	5,3	± 0,7
H_1	32,2	36,5	39,5	40,5	max.
H	18,5				± 0,5
P_0	12,7				± 0,2± ± 1 per 20 × P
D_0	4,0				± 0,2
W	18,0				± 0,5
W_0	12,0				± 0,5
W_1	9,0				± 0,5
W_2	0,5				+ 2,5
t	0,7				± 0,2
Δh	0				± 2,0
Δp	0				± 1,3

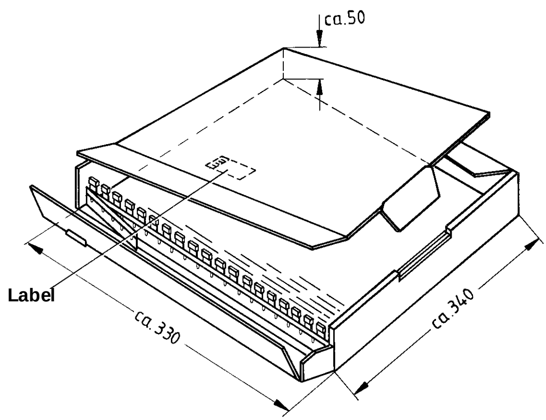
4.1 Packing

Reel packing



Dimensions (mm)	*n*	*w*	*d*	*e*	*f*	*h*
Lead spacing ≥ 10	54 +1	70 max.	∅ 500 –1	∅ 130	∅ 30,5 ±0,2	∅ 126 +1

Ammo pack



Symbol	Term
Cp	Parasitic capacitance
CR	Rated capacitance
CX	Capacitance of an X capacitor
CY	Capacitance of an Y capacitor
f	Frequency
fL	Measuring frequency for inductance
fQ	Measuring frequency for quality factor
fres	Resonance frequency
Ileak	Leakage current
Iop	Operating current
IR	Rated current
L	Inductance
LR	Rated inductance
LS	Stray inductance (leakage inductance)
L0	Inductance at I = 0
DL/L0	Inductance decrease
PV	Power dissipation
Qmin	Quality factor
Ris	Insulation resistance
Rmin	DC resistance, minimum value
Rtyp	DC resistance, typical value
TA	Ambient temperature
TR	Rated temperature
VP	Test voltage
VR	Rated voltage
Z	Impedance
|Z|	Impedance, absolute value
ae	Insertion loss
t	Time constant
$\boxed{e}$	Lead spacing (in mm)
fit	Failure rate (failures in time)
PU	Packing unit

Decimal points are indicated by commas.