

SIEMENS

**EMC
EMI Suppression**

**Components,
Filters**

Data Book 1983/84

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Placing orders should be based upon the packaging units (PU), indicated on the individual data sheets in addition to the ordering codes.

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General Information



General Information

Electromagnetic compatibility

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 radio interference suppression 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 radio interference suppression must be observed, but rather, it must be ensured that all equipment is able to operate simultaneously in the sense of electromagnetic compatibility (EMC). EMC is defined as the ability of electrical equipment to function satisfactorily in its electromagnetic environment and not influence other equipment in this environment to an impermissible extent.

The concept of EMC includes both electromagnetic emission (EME) and electromagnetic susceptibility (EMS) (Fig. 1).

An interference source may emit either conducted (conducted emission CE) or radiated (radiated emission RE) electromagnetic oscillations.

This also applies to the propagation paths and the electromagnetic susceptibility of victim equipment.

In order to elaborate economic solutions, it is necessary to take into consideration both possible factors, i.e. propagation and susceptibility, to an equal extent and not only one sub-area, e.g. conducted emission.

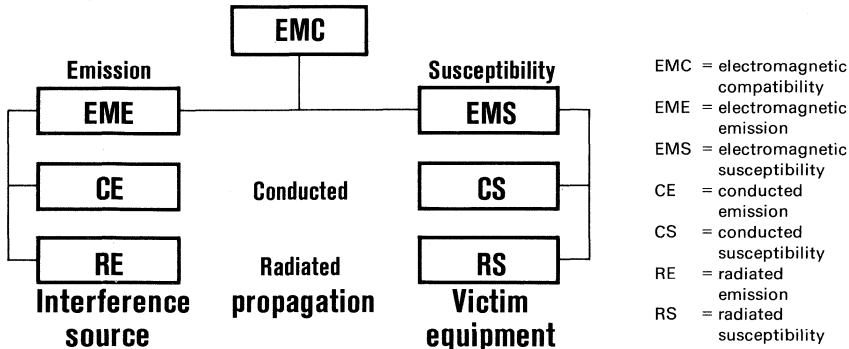


Fig. 1 EMC terms

EMI (electromagnetic interference) suppression components or EMI suppression filters are used to restrict conducted electromagnetic interference to the level values stipulated in an EMC plan or to reduce this interference below the limit values specified in the radio interference suppression regulations. These components or filters may be assigned either to the interference source or the victim equipment (Fig. 2).

A well-balanced range of Siemens EMI suppression devices is available both for power lines and for signal and control lines.

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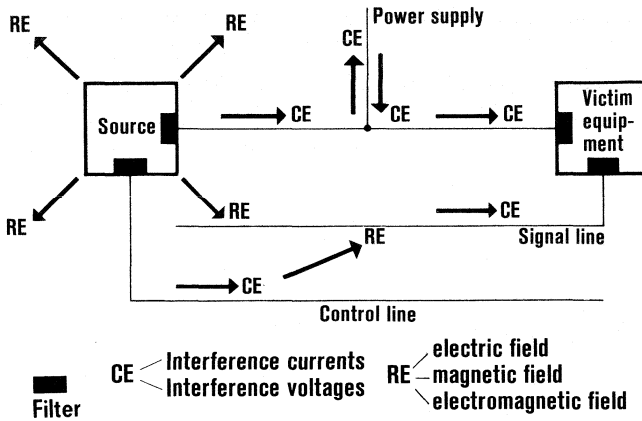


Fig. 2 Susceptibility model and filtering

Interference sources and victim equipment

We can differentiate two main groups of **interference sources** on the basis of the type of frequency spectrum emitted (Fig. 3).

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

Switchgear and electric motors in household appliances, for instance, distribute their interference energy over wide frequency bands and are classified amongst the interference sources with a continuous frequency spectrum.

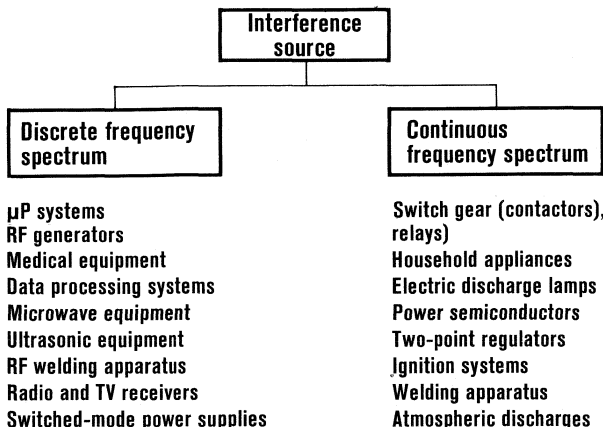


Fig. 3 Interference sources

General Information

Electrical devices and systems subject to such interference are defined as **victim equipment**.

In the same way as interference sources, victim equipment can also be categorized as regards the frequency characteristics. We can differentiate between narrowband and broadband susceptibility (Fig. 4).

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

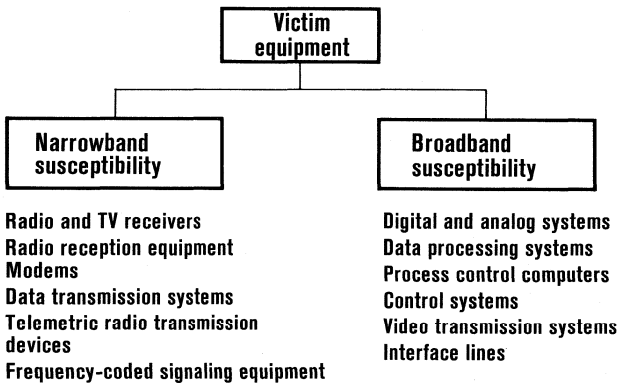


Fig. 4 Victim equipment

The propagation of electromagnetic interference and EMC measurement techniques

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

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

The effect of magnetic and electric interference fields on their immediate vicinity is assessed by measuring the magnetic and electric field components. In many cases, this method of propagation is also termed electric or magnetic coupling.

In the higher frequency range, characterized by device dimensions in the order of magnitude of the wavelength under consideration, the interference energy is predominantly radiated directly.

During actual measurement, this radiation can be measured by assessing the electric or magnetic components of the electromagnetic interference radiation density.

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

Sources, both with sinusoidal continuous interference and pulse generators with a wide variety of pulse forms are available as interference generators.

General Information

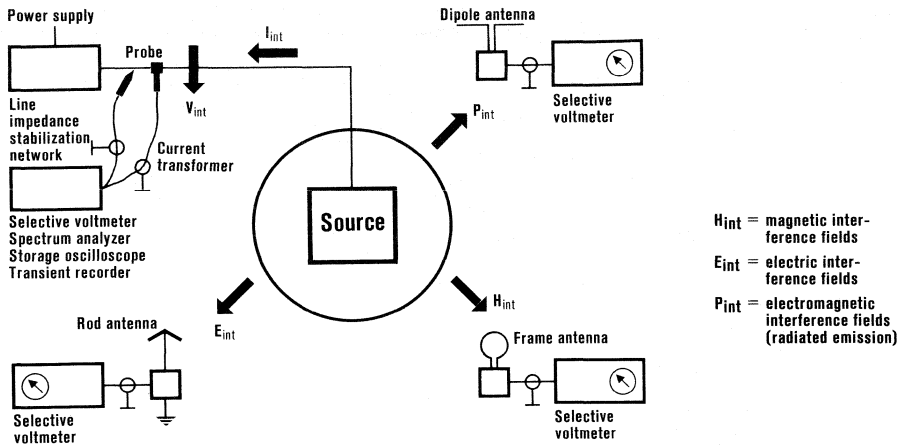


Fig. 5 Propagation of electromagnetic interference and EMC measurement techniques

EMC guidelines and specifications

Today, the entire field of electromagnetic compatibility has not yet been comprehensively covered by guidelines or specifications in the civilian sector.

RFI suppression specifications exist as regards the transmission of interference.

Admittedly, initial attempts have been made to regulate the susceptibility of victim equipment in the relevant committees of the German Electrotechnical Commission yet defined values and measuring procedures still need to be discussed between manufacturers and customers.

The field of electromagnetic compatibility in the military sector is largely covered by specifications.

The propagation of conducted interference

In order to permit the correct EMI suppression components and filters to be selected, it is necessary to know the propagation conditions of conducted interference.

Initially, an ungrounded interference source only emits interference which is propagated along the connected lines.

Like the line current, the interference current flows towards the victim equipment on one conductor and back to the interference source on the other conductor.

Both currents are in differential mode.

This interference is, therefore, designated either as differential mode interference or as symmetrical interference (Fig. 6).

General Information

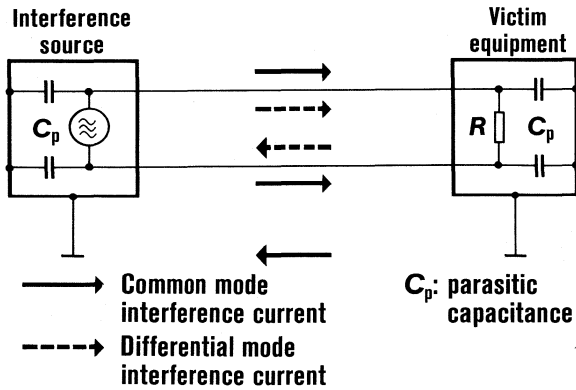


Fig. 6 Common mode and differential mode interference

Parasitic capacitances in the interference source and in the victim equipment or intended ground connections, however, also cause an interference current in the ground circuit. This interference current flows towards the victim equipment through both connecting lines and returns to the interference source through the ground lines.

The two currents on the connecting lines are in common mode. This interference is, therefore, designated as common mode or asymmetric interference.

In European parlance, the term "unsymmetric interference" is also used in addition to the two above-mentioned components. This component identifies the interference voltage between a line and reference ground or between the second line and reference ground.

The characteristic attenuation values are specified for the individual filter types in order to assist in the selection of suitable Siemens EMI suppression filters.

Filter circuits and line impedance

EMI suppression filters are virtually always designed as reflecting low-pass filters, i.e. they reach their highest attenuation when they are, on the one hand, mismatched to the impedance of the interference source or victim equipment and, on the other hand, mismatched to the impedance of the line. Fig. 7 shows possible filter circuits with various impedances of the line or interference source and victim equipment.

A knowledge of the internal impedances is also necessary in order to permit filter circuits to be designed optimally and permit economic solutions.

The internal impedances of the line networks under consideration are known on the basis of calculations and extensive measurements. The impedances of the interference sources or victim equipment are, in most cases, not known or not adequately known.

For this reason, measuring techniques are always required for selecting the suitable filter circuit.

In this respect, Messrs. Siemens offer all customers who do not, themselves, have an EMC test laboratory, their assistance in their applicational laboratory.

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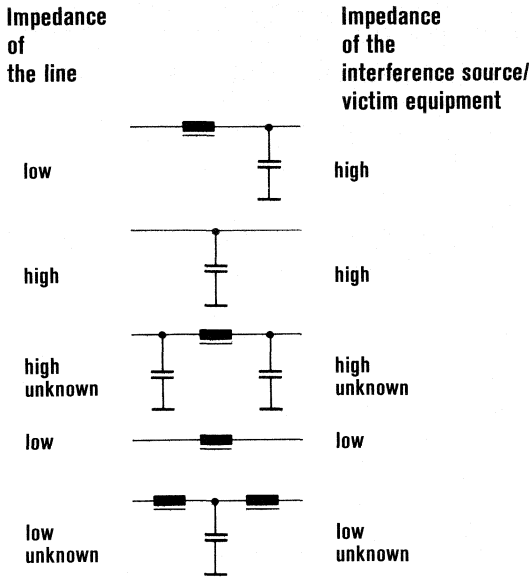


Fig. 7 Filter circuitry and impedance

Application laboratory

The central office for development and production of EMC and EMI suppression equipment such as capacitors, chokes, filters, and shielded enclosures has been established in Regensburg. An extensively equipped laboratory has been set up for applicational tests. It has the task of determining the most economically favorable EMI suppression circuit for equipment, systems, and machines, suitable for observing the legally required or recommended limit values.

Shielded enclosures with test set-ups and the appropriate measuring instruments are available for determining conducted interference emitted by the equipment under investigation via power lines, data lines, and connecting lines. Several test set-ups can be controlled centrally with the help of a computer-aided test method, developed specifically at Siemens. This permits interference voltage values to be recalled within a short period via corresponding commands, permits these values to be stored for repetition purposes and either displayed as curves on CRT display units or printed out. The most favorable component or the most favorable component configuration can be determined in a very short period by repeatedly comparing and analyzing the measured values of various EMI suppression circuits for most equipment. In general, the use of standard filters and components results in the most favorably priced solution.

Space should be provided for wiring the EMI suppression circuit even at the design stage of the equipment. Initial interference suppression tests on a prototype may be useful in this respect. In addition, they also supply important information, at the right time, on acceptable

General Information

line routes and shielding equipment from the point of view of EMI suppression. Should it prove necessary, design-specific modifications can still be implemented easily at this stage.

A specially developed, shielded hall, lined with absorbers, is available for investigating radiated interference. This hall is provided with a reflective floor and thus complies with the conditions required in accordance with VDE for test set-ups designed to route **both** the direct **and** the ground wave to the test antenna in the open air.

This hall is equipped with special interference measurement receivers, spectrum analyzers and various antennas for determining the interference field strength in the frequency range 10 kHz ... 1 GHz. A test set-up with absorbent current transformer calipers has been built up for determining the interference power in the frequency range 30 MHz...300 MHz.

Special facilities such as water inlets and outlets, extraction facilities for toxic gases, temperature regulation facilities, 3 x 200 A electric connection facilities and large doors permit even large-volume or high-power equipment and systems such as large data processing systems or motor vehicles to be tested at measuring distances up to and less than 10 m. Furthermore, the room shielding permits tests to be conducted free from environmental interference and interference from local, useful signals such as TV and radio or private and state radio services and, not least, testing can be carried out independently of weather conditions.

All tests and advice given are based upon the relevant national and international recommendations and specifications. Experience is exchanged with the German Central Telecommunications Office (FTZ) and the VDE Testing Institute in Offenbach at joint VDE meetings.

Naturally, all equipment and information which our various customers entrust to us is treated with the necessary discretion.

Systems and equipment in the frequency range 10 kHz to 1 GHz can be tested for RFI suppression and EMC in the Siemens applicational laboratory. The appropriate installations and measuring instruments are available for virtually any case of EMI suppression.

This means that the necessary interference suppression circuit and necessary interference suppression measures can be determined in the shortest possible time.

Selection criteria for EMI suppression devices

On the basis of current technologies, a frequency range of 10 kHz to 1000 MHz must be considered for guaranteeing electromagnetic compatibility in normal cases, providing audio-frequency line and network retroactive effects are not taken into consideration.

Consequently, EMI suppression equipment must have high frequency characteristics and generally exhibit an extremely broadband effect.

- As regards components, a specification of the impedance versus frequency serves to identify the high-frequency characteristics.
- As stated above, the insertion loss constitutes the selection criterion for EMI suppression filters.

The insertion loss is defined as the logarithmic ratio of the power emitted at the load impedance both with and without a filter (for further details please refer to the section entitled "EMI suppression filters" at the beginning of this chapter).

If the test sample is terminated on both sides with a real resistance of, for instance, 50 ohms this is referred to as a 50-ohm insertion loss.

General Information

Depending upon the particular application in question, the priorities for consideration of the three possible methods of attenuation or loss

- asymmetric (common-mode attenuation)
- symmetric (differential-mode attenuation)
- unsymmetric

must be specified.

The measuring procedure for 50-ohm insertion loss has been taken from the field of communications engineering and is also standardized in the relevant national and international specifications.

Admittedly, it permits a comparison of different filters yet provides little information about special applications.

The reason is that – as already stated in the previous section – neither the line impedance nor the impedance of the interference source or victim equipment respectively for the connected line system correspond to a real resistance of 50 ohms at frequencies less than 1 MHz.

Likewise, the attenuation of interference pulses can also not be easily determined on the basis of the insertion loss. In this case, it is necessary to observe the non-linear response of the EMI suppression chokes in the filters.

We will be able to specify filter-specific values if provided with information on the type of pulses on request.

Arrangement and installation of filters and filter components

If filter circuits are to be combined using individual components, the following should be considered:

- components should be arranged along the lines (see example in Fig. 8) to avoid capacitive and inductive coupling between components and between filter inputs and outputs.

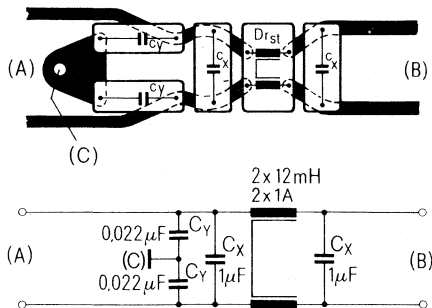


Fig. 8 Correct arrangement of filter components, e.g. on a PC board

- since attenuation of a filter circuit in the MHz range is primarily determined by the capacitors wired to ground, the connecting wires of the capacitors should be as inductance-free as possible, i.e. short.

General Information

- filter circuits which are to be installed in devices with limited available space must be shielded.

With ready-made filters, the following aspects are particularly important:

- to provide a proper electrically conductive connection between the filter case or filter ground, respectively, and metallic case of interference source or victim equipment, respectively.
- to provide sufficient high-frequency decoupling between the lines at the filter input (line causing the interference) and the filter output (filter line), if necessary by using shielding walls.

Safety regulations

When selecting EMI suppression devices – in particular for power line applications – the safety regulations for the respective device must be observed.

The following points necessitate special reference:

Capacitors connected between power lines and ground (Y capacitors) may cause – in the event of faults (interruption of the safety conductor or defective protective insulation) and if a person touches the device ground – a capacitive leakage current to flow between device ground, person, and ground. This current must be limited or dissipated in such a way that no dangerous voltages can occur on the accessible metal parts. VDE regulations 0875 contain a summary of the permissible leakage currents. However, the values specified in the individual specifications on specific equipment must be taken obligatory.

Capacitors for applications in which their failure, as a result of a short-circuit, would not cause a dangerous electric shock (X capacitors) are subdivided into two subclasses X1 and X2, corresponding to the peak voltages to which they are subjected in addition to the power line voltage. The selection criteria in this case are specified in VDE regulation 0565 section 1.

Quality information

The following is specified as regards identification of delivery quality:

- 1 technical data and typical values for insertion loss
- 2 sampling agreement, AQL values (acceptable quality level)

It is highly probable (probability generally $\geq 90\%$) that a batch with a percentage defect rate at a characteristic quantity equal to or less than the specified AQL value will be accepted during a corresponding sampling inspection in respect of this characteristic quantity.

- 3 Defects, defectives

A component is considered defective if it does not comply with the characteristics specified in the data sheet. The defectives are subdivided into "major defects and minor defects" and the defects into mechanical and electrical defects. Unless otherwise agreed upon, the AQL values summarized in section 4 apply to the various defectives. The identical sampling inspection plans DIN 40080 (or) MIL-STD 105 apply as a basis for inspection by attributes.

Only the number of defective units (each with one or more defective characteristic quantities) is evaluated in the particular defect class for each defective for which an AQL value is determined.

General Information

4 AQL table for EMI suppression components and filters

Defects and defectives	AQL values	
	Components	Filters
Defects as regards electrical characteristics		
Major defects		
Minor defects		
Sum of all defects	0.4	0.25
Defects as regards mechanical characteristics		
Major defects		
Minor defects		
Sum of all defects	0.65	0.4

5 Quality assurance

The quality of our products is assured on the basis of the following operational sequence:

- 5.1 Incoming inspection on the basis of the sampling inspection plan
- 5.2 Product quality inspection during the production process
- 5.3 Final production inspection
 - 5.3.1 Electrical characteristics 100%
 - 5.3.2 Mechanical characteristics on the basis of the sampling inspection plan
- 5.4 Quality assurance on the finished product
 - 5.4.1 Lot-by-lot random type sampling inspection
 - 5.4.2 Routine verification tests in accordance with VDE 0565, Sections 1–3.

These measures are designed to dispense with the need for costly incoming inspections on the premises of the user. However, if the user still wishes to conduct an incoming inspection, it is recommended that this inspection be based on the sampling inspection plan as specified in Section 6. The inspection method used must be agreed upon between the customer and the supplier. Furthermore, reference is made to the PPM concept within the framework of optimized quality. With this concept, the component manufacturer and the user assist each other mutually to improve their products.

The following information is required for assessing any complaints:

Test circuit, sample size, number of defective items found, sample of evidence, or package label.

General Information

6 Sampling inspection plan for normal inspection in accordance with DIN 40080 or ABC standard 105 D, inspection level II

Lot size	Sample size	AQL value											
		0,065	0,10	0,15	0,25	0,40	0,65	1,0	1,5	2,5	4,0	6,5	
		A R	A R	A R	A R	A R	A R	A R	A R	A R	A R	A R	
2 to 8	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	
9 to 15	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	0 1	
16 to 25	5	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	
26 to 50	8	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	
51 to 90	13	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	
91 to 150	20	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	
151 to 280	32	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	
281 to 500	50	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	
501 to 1200	80	↓	0 1	↑	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	
1201 to 3200	125	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	
3201 to 10000	200	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	
10001 to 35000	315	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	
35001–150000	500	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	
150001–500000	800	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	
500001 or more	1250	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	

A = acceptance number: the maximum number of defective sample units up to which the lot is accepted.
 R = rejection number: the minimum number of defective sample units which a sample must contain if the lot is to be rejected.

Additional condition

Since the informative value of the acceptance number 0 and rejection number 1 is low, the next highest size should be sampled.

General Information

Climatic categories

The permissible temperature and humidity stress is type-dependent and is identified as follows in accordance with DIN 40040:

1st code letter

Lower category temperature

- 55°C/-67°F	F
- 40°C/-40°F	G
- 25°C/-13°F	H
- 10°C/+14°F	J
- 0°C/+32°F	K
Individual regulation	Z ¹⁾

2nd code letter

Upper category temperature

+125°C/+257°F	K
+110°C/+230°F	L
+100°C/+212°F	M
+ 90°C/+194°F	N
+ 85°C/+185°F	P
+ 80°C/+176°F	Q
+ 75°C/+167°F	R
+ 70°C/+158°F	S
+ 65°C/+149°F	T
+ 60°C/+140°F	U
Individual regulation	Z ¹⁾

3rd code letter, humidity category

	G	F	D	C
relative humidity, annual average	≤65%	≤75%	≤80%	≤95%
30 days per year, continuously ²⁾	-	95%	100%	100%
60 days per year, continuously	85%	-	-	-
on the remaining days, occasionally ³⁾	75%	85%	90%	100%

¹⁾ If a temperature value not specified in the table is required, code letter Z must be specified.

²⁾ These days should reasonably be distributed throughout the entire year.

³⁾ Observing the annual average.

General Information

Test category in accordance with DIN 40045 or IEC-68

EMI suppression components and filters are assigned to specific test categories depending upon the climatic conditions on the basis of which they are tested. The test categories are based on three determining variables:

Example:

Test category:

55/085/56

Test A: low temperature
-55°C/-67°F
(in accordance with DIN IEC 68-2-1)

Test B: dry heat
+85°C/+185°F
(in accordance with DIN IEC 68-2-2)

Test C: Damp heat (long-term test)
56 days
(in accordance with DIN IEC 68-2-3)

EMI Suppression Capacitors



EMI Suppression Capacitors

Terms and definitions

The following terms and definitions are mainly drawn from the competent VDE specification VDE 0565-1/12.79 and are as far as possible adapted to the IEC publication 384, part 14 (1981): "Fixed Capacitors for Radio Interference Suppression".

EMI suppression capacitors

are capacitors to be used for the reduction of interference at radio frequencies caused by electrical appliances.

EMI suppression capacitors of class X (briefly X capacitors)

are capacitors suitable for use in situations where failure of the capacitors would not lead to danger of electric shock. Class X capacitors are divided into two subclasses according to the peak voltages to which they may be subjected in addition to the power line voltage applied.

Note

Such additional load may arise from:

- peak voltages superimposed on the power line voltage due to switchings. This is based on the assumption that peak voltages occurring in a normal household, are equal to or less than 1200 V.
- peak voltages, arising in the appliance to be suppressed during switching off of inductive load.

The magnitude of these peak voltages depends on kind and construction of the appliance to be suppressed.

The subclass of the X capacitors to be used is determined by the peak voltage, established by the equipment producer for the X capacitor of the equipment to be suppressed under the worst load and turn-off conditions.

Table 1

Subclass	Peak voltage in service V_p in kV	Application	Peak voltage applied during the endurance test V_p in kV
X1	> 1.2	High peak voltage application	4 for $C \leq 0.33 \mu\text{F}$ $4e^{(0.33 - C)}$ for $C > 0.33 \mu\text{F}$
X2	≤ 1.2	General purpose	1.4

EMI suppression capacitors of class Y (briefly Y capacitors)

are capacitors suitable for use in situations where failure of the capacitor could lead to danger of electric shock. Y capacitors are used for normal insulation requirements (in accordance with VDE 0550, part 1) of $V_{\text{rms}} = 250 \text{ V}$ at an increased electrical and mechanical safety margin and limited capacitance.

Note

The increased mechanical and electrical safety margins are intended to prevent electric short circuits; the limited capacitance is intended to decrease the ac current flowing through the capacitor or, at dc voltage, decrease the stored energy to a non-dangerous level.

EMI Suppression Capacitors

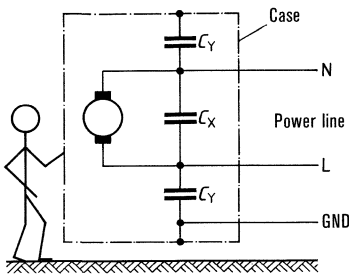
Y capacitors are placed across the insulation of electrical appliances, machines, and installations so as to maintain their safety to humans and animals.

Examples

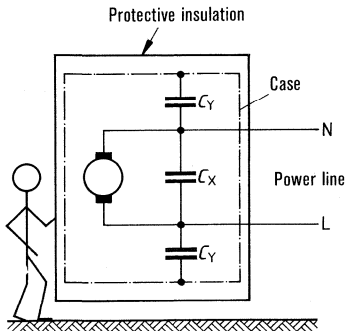
Figure 1a gives an example of an interference suppression of a motor of an electrical appliance, e.g. vacuum cleaner, hand-drilling machine, etc. to safety class I. The capacitor C_Y , provided to reduce the unsymmetrical interference voltage, is connected between the line and the metal case G of the appliance which is accessible to touch. The capacitor must therefore be a "Y" type.

An appliance according to safety class II, may not have a connection to the metal case G, as is shown in Fig. 1b. The live parts, which are not an integral part of the operating circuit, are non-accessible by virtue of double insulation.

In both cases a short circuit of the Y capacitor would endanger a person touching the appliance if at the same time the neutral conductor is interrupted (in safety class I) or the case insulation is damaged (in safety class II).



a) Example of an interference suppression by X and Y capacitors in an appliance according to safety class I e.g. in acc. with VDE 0730, part 1



b) Example of an interference suppression by X and Y capacitors in an appliance according to safety class II e.g. in acc. with VDE 0730, part 1

Fig. 1 Examples of an interference suppression by X and Y capacitors

EMI Suppression Capacitors

Terms and definitions

Two-terminal capacitors

are capacitors having two terminals.

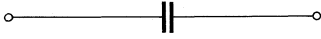


Fig. 2 Example of a two-terminal EMI suppression capacitor

Four-terminal capacitors (feed-through capacitors)

are capacitors in which the operating current flows through or across the electrodes. Either three (Figs. 3a and 3b) or four (Fig. 3c) external terminals are provided.

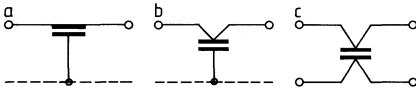


Fig. 3 Examples of four-terminal EMI suppression capacitors

Coaxial feed-through capacitors

are four-terminal capacitors with a central current carrying conductor (e.g. feed-through rod) surrounded by the capacitor element to form a coaxial construction (Figs. 3a and 4). Generally, one layer is connected to the capacitor case or a conductive part of it to produce an RF seal. The case (or its conductive part) permits RF-tight connection with a shielding wall.

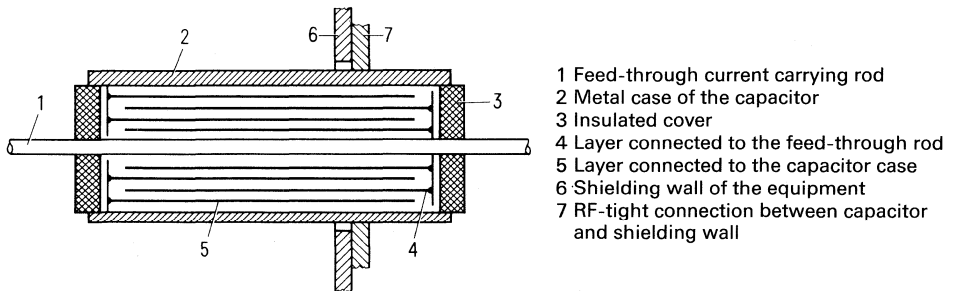


Fig. 4 Example of fitting a coaxial feed-through capacitor (wound capacitor)

EMI Suppression Capacitors

An RF-tight construction is generally based on strict maintenance of a continuous contact.

Non-coaxial feed-through capacitors

are four-terminal capacitors having one or several conductors carrying the operating current, which are of non-coaxial construction (Figs. 3b, 3c and 5).

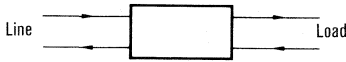


Fig. 5 Example of a non-coaxial feed-through capacitor

Wideband capacitors (non-coaxial)

have high attenuation characteristics over a wide frequency range contrary to two-terminal capacitors with an attenuation which is most effective at the resonant frequency. The leads to the source interference must be kept short in order to fully utilize the wideband characteristics of EMI suppression capacitors.

Test specification symbols

In principle all Siemens EMI suppression capacitors are designed in conformity with the appropriate VDE specifications. For each type the relevant VDE specifications are quoted. In addition, certain designs are tested by VDE or by similar foreign associations for compliance with their specifications. On passing the test, the design in question is allocated the appropriate test or quality symbol. e.g.



VDE
Germany



NEMKO
Norway



SEMKO
Sweden



DEMKO
Denmark



SEV
Switzerland

Rated voltage V_R

The rated voltage V_R is that voltage for which a capacitor is designed, according to which it is designated, which serves as reference value for other ratings, and which may be applied continuously to the terminations at any temperature between the lower and the upper category temperature.

Note

- 1 The rated voltage of EMI suppression capacitors should generally be the same value or higher than the rated voltage of the power line to which it will be applied. The possibility of the power lines temporarily exceeding their rated value by up to 10% should be allowed for.

EMI Suppression Capacitors

Terms and definitions

Line current rating

for four-terminal capacitors is the highest current which may flow through the current carrying conductor.

Generally, the magnitude of the current line rating is determined by the equipment to be suppressed. In special cases the current actually generated by the interference voltage must be taken into account.

Superimposed ac voltage up to 400 Hz

Capacitors with a rated dc voltage may have an ac voltage superimposed on the applied dc voltage. The sum of the dc voltage and the peak value of the superimposed ac voltage must not exceed the rated dc voltage. The superimposed ac voltage must in any case be kept below the rated ac voltage.

Non-sinusoidal RF voltage (continuous operation)

The specific rating of capacitors to which non-sinusoidal RF voltages are applied continuously must be ascertained separately for each application. Requests for information should preferably include a voltage oscillogram.

Peak voltage

A peak voltage is an intermittent, pulse-shaped voltage of the peak value V_p as may particularly be caused by the switching of inductances. Such peak voltages may, however, occur only during fractions of a second up to 5 times per hour.

(The limit of "5 times per hour" is meant to be for general guidance and is intended to convey clearly that those peak voltages should occur only occasionally).

Overvoltage

In addition to the line voltage, permitted in accordance with VDE specification 0565-1, overvoltages up to 1.1 times the rated voltage V_R are allowed for EMI suppression capacitors. Those overvoltages may occur as occasional line fluctuations up to 2 hours per day.

(The limit of "2 hours per day" is meant to be for general guidance and is intended to convey clearly that those overvoltages should occur only occasionally).

EMI Suppression Capacitors

Capacitance

The preferred capacitance tolerance is $\pm 20\%$.

The maximum permitted capacitance values for Y capacitors throughout the entire temperature range for all voltage values are contained in the equipment provisions of the VDE, which indicate safety limits for leakage current through the Y capacitor and the insulation and for the energy content of the capacitor. Where no limits are indicated for an appliance or machine, the specifications for the use of Y capacitors VDE 0875 "Specification for EMI suppression of appliances, machines and installations for rated frequencies between 0 and 10 kHz" apply.

The capacitance is measured at 1000 Hz and 20°C/68°F.

Insulation resistance

of a capacitor is the ratio of the applied dc voltage to the current flowing after a defined time.

The current flowing on applying a constant dc voltage is dependent on temperature, voltage and time and comprises charging, recharging and leakage current (definition in accordance with VDE 0560, part 1, § 11).

The insulation quality (in seconds) is the product of insulation resistance (in M Ω) and capacitance (in μ F).

Operating temperature range

is the range between the category temperatures at which the capacitor may be operated. The operating temperature range is limited by the category in accordance with DIN 40040.

Mechanical stress

Permitted vibration stress is referred to in the specification DIN 40046, sheet 8, June 1970, test F_C, partial test B 1 or IEC publication 68-2-6 at the following conditions:

Endurance duration:	6 hours	1.5 hours
Frequency range:	10 to 55 Hz	10 to 55 Hz
Displacement amplitude:	0.75 mm	0.35 mm
conforming to max.	10 g	5 g

The following details apply:

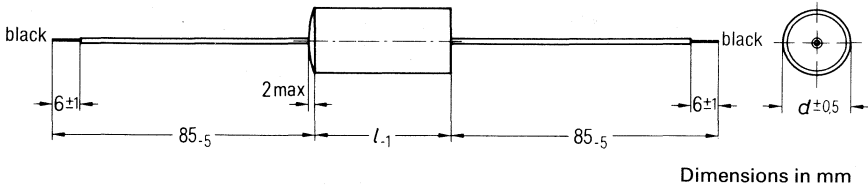
RFI suppression capacitors ¹⁾	max. 5 g
Coaxial feed-through capacitors up to 200 A	max. 10 g
Coaxial feed-through filters up to 40 A	max. 5 g
Coaxial feed-through capacitors > 200 A	} For these types particulars are given in the corresponding technical data sheets or are available upon request.
Coaxial feed-through filters > 40 A	

¹⁾ Including spark suppression combinations

X1 capacitors

Rated voltage 250 V dc/ac, 50 Hz

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. Leads 1 × 0.8 mm dia (YV). Other lead lengths or litz wires are available upon request.



Technical data

Test voltage	1650 V dc, 2 s (layer to layer)
Continuous voltage test (type test)	1000 hrs with 1.25 V _R = 315 V ac, in acc. with VDE 0565-1
Capacitance tolerance	±20 %
Insulation	≥6000 MΩ
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F, humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X1 capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols



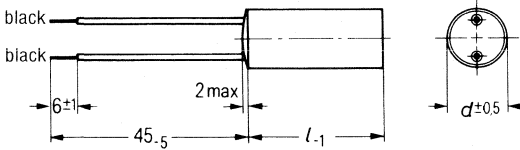
Types

Rated capacitance μF	Dimensions d × l mm	Approx. weight g	Ordering code PU: 200
0,01 (X1)	10 × 34	7	B81111-A-C37
0,025 (X1)	10 × 34	7	B81111-A-B38
0,05 (X1)	14 × 44	11	B81111-A-B39
0,07 (X1)	14 × 44	11	B81111-A-B40
0,1 (X1)	16 × 44	14	B81111-A-B41
0,2 (X1)	20 × 44	20	B81111-A-B42

X1 capacitors

Rated voltage 250 V dc/ac, 50 Hz

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. Leads 1 × 0.8 mm dia (YV). Other lead lengths or litz wires are available upon request.



Dimensions in mm

Technical data

Test voltage	1650 V dc, 2 s (layer to layer)
Continuous voltage test (type test)	1000 hrs with 1.25 V _R = 315 V ac in acc. with VDE 0565-1
Capacitance tolerance	±20 %
Insulation	≥6000 MΩ
DIN climatic category	HPF (- 25 + 85 °C/- 13 to + 185 °F, humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X1 capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols



Types

Rated capacitance μF	Rated voltage V dc/V ac 50 Hz	Dimensions d × l mm	Approx. weight g	Ordering code PU: 200
0,01 (X1)	250	8 × 34	6	B81121-A-B47
0,025 (X1)		10 × 34	7	B81121-A-B48
0,05 (X1)		12 × 44	9	B81121-A-B49
0,07 (X1)		14 × 39	11	B81121-A-B50
0,1 (X1)		14 × 39	11	B81121-A-B51
0,2 (X1)		20 × 39	20	B81121-A-B52

**X1 capacitors
hermetically sealed**

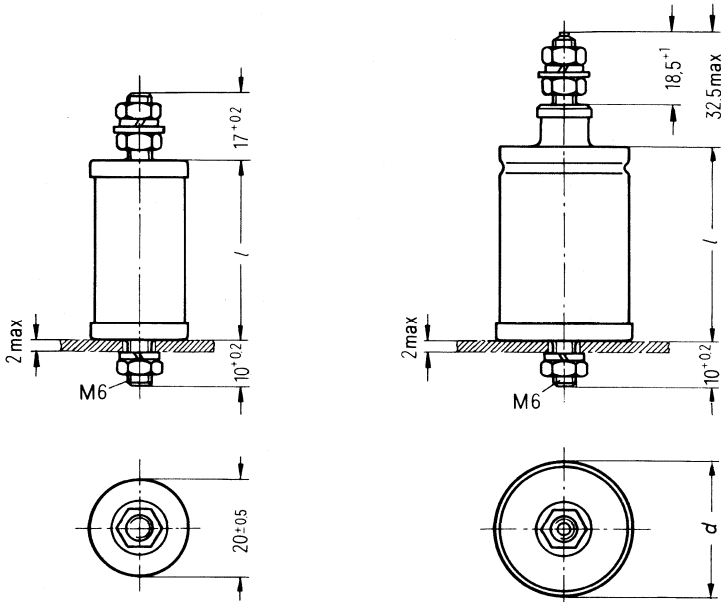
**Rated voltage up to 600 V dc
up to 380 V ac/60 to 400 Hz**

Capacitors comprising impregnated paper dielectric and metal foil electrodes.

The capacitors are enclosed in tubular metal or ceramic cases and are hermetically sealed. Axial connecting studs M6 at both face ends.

Ceramic case

Metal case



Mounting hole, 7 mm dia

Type B81551-A-B7

Type B81551-A-B14

Nuts and spring washers are loosely supplied.

Dimensions in mm

Application

Generally, the capacitors are intended to suppress interference from electrical equipment, such as machines, appliances, and on board ships. They feature specially high operational reliability and high test voltage. In order to obtain a broadband EMI suppression effect, the connection of the capacitor to the line to be wired must be as short as possible (low inductance).

Technical data

Capacitance tolerance	±20 %
Insulation	≧ 12000 MΩ for C ≤ 0.15 μF
DIN climatic category	GMC (-40 to +100°C / -40 to +212°F; humidity category C)
IEC climatic category (IEC 68)	40/100/56
Specifications	as X1 capacitors, these capacitors comply with VDE specification 0565-1

Types

Rated capacitance μF	Rated voltage V dc/V ac 60 Hz	Test voltage ¹⁾		Dimensions <i>d</i> × <i>l</i> mm	Approx. weight g	Ordering code PU: 50
		V ac 400 Hz	Sample test V dc; 2s			
0,035	(X1) 600/380	220	3600	2250	20,0 × 49	45 B81551-A-B7
0,15	(X1) 440/260	125	2700	2250	31,5 × 46,0	80 B81551-A-B14

¹⁾ Layer to layer, individual test at 20°C/68°F, type test at ϑ_{max}

X2 capacitors

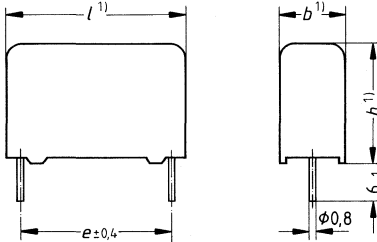
Rated voltage 250 V ac, 50 to 400 Hz

Self-healing flat capacitor winding comprising polypropylene dielectric, enclosed in rectangular plastic case with epoxy resin seal. (Plastic case and epoxy resin are flame-retardant.) The case is provided with spacers to improve solderability in the solder bath.

The capacitors have parallel leads in the lead spacing. Version B is particularly suitable for PCB mounting.

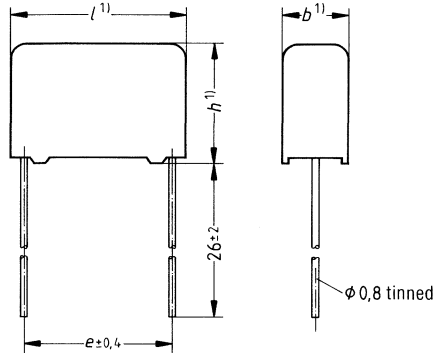
Version with litz wires upon request.

Version B



1) Max. dimension

Version C



Dimensions in mm

Technical data

Permissible dc voltage	630 V dc
Test voltage	1200 V dc, 2 s (layer to layer)
Permissible voltage peaks (max.)	1200 V
Voltage rate of rise (max.)	100 V/μs
Continuous voltage test (type test)	1000 hrs with $1.25 V_R = 315$ V ac, in acc. with VDE 0565-1
Capacitance tolerance	±10 %
Insulation	≥10,000 s for $C \geq 0.33 \mu\text{F}$ ≥30,000 MΩ for $C \leq 0.33 \mu\text{F}$
DIN climatic category	GPF (-40 to +85 °C / -40 to +185 °F; humidity category F)
IEC climatic category (IEC 68)	40/085/21
Specifications	as X2 capacitors, these capacitors comply with the specifications IEC 384-14 and VDE 0565-1

Test symbols

▼ to be preferred



Types

Rated capacitance μF	Dimensions $b \times h \times l$ mm	Lead spacing e mm	Approx. weight g	Ordering code ¹⁾
				PU: 200
0,022 (X2)	5,5×11 ×18	15	1,5	B81121-C-*121
0,033 (X2)	5,5×11 ×18	15	2,0	B81121-C-*122
0,047 (X2)	7 ×13 ×18	15	2,3	B81121-C-*123
0,068 (X2)	9 ×14,5×18	15	3,2	B81121-C-*124
0,1 (X2)	9 ×14,5×18	15	3,2	B81121-C-*125
0,15 (X2)	8,5×18,5×27	22,5	5,2	B81121-C-*126
0,22 (X2)	10,5×19 ×27	22,5	6,5	B81121-C-*127
0,33 (X2)	11 ×20,5×27	22,5	7,0	B81121-C-*128
0,47 (X2)	11,5×21 ×31,5	27,5	10	B81121-C-*129
0,68 (X2)	13,5×23 ×31,5	27,5	12	B81121-C-*130
1,0 (X2)	18 ×27,5×31,5	27,5	19	B81121-C-*132 ²⁾

¹⁾ When ordering, quote the code letter of the lead length required (see dimensional drawings).

B = short leads

C = long leads

²⁾ without SEMKO symbol

X2 capacitors

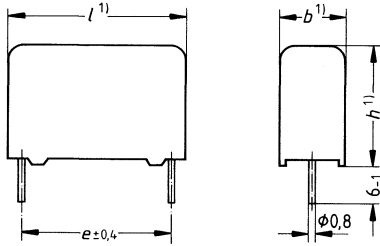
Rated voltage 300 V ac

Self-healing, flat capacitor winding comprising polyester dielectric, enclosed in rectangular plastic case with epoxy resin seal. (Plastic case and epoxy resin are flame-retardant). The case is provided with spacers to improve solderability in the solder bath.

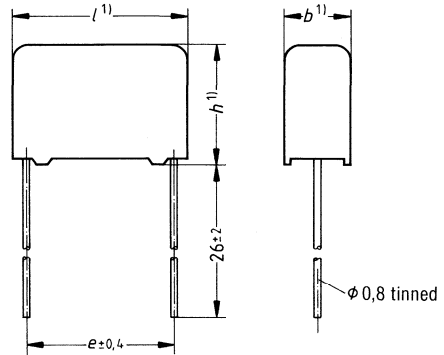
The capacitors have parallel leads in the lead spacing. Version B is particularly suitable for PCB mounting.

Version with litz wires upon request.

Version B



Version C



1) Max. dimension

Dimensions in mm

Technical data

Permissible dc voltage	800 V dc
Test voltage	1300 V dc, 2 s (layer to layer)
Permissible voltage peaks (max.)	1200 V
Voltage rate of rise (max.)	100 V/μs
Continuous voltage test (type test)	1000 hrs with $1.25 V_R = 315 \text{ V ac}$, in acc. with VDE 0565-1
Capacitance tolerance	±20 %
Insulation	$\geq 10.000 \text{ s}$ for $C \geq 0.33 \text{ μF}$ $\geq 30.000 \text{ M}\Omega$ for $C \leq 0.33 \text{ μF}$
DIN climatic category	GPF (-40 to +85 °C/-40 to +185 °F; humidity category F)
IEC climatic category (IEC 68)	40/085/21
Specifications	as X2 capacitors, these capacitors comply with the specifications IEC 384-14 and VDE 0565-1

Test symbols



▾ to be preferred

Types

Rated capacitance μF	Dimensions $b \times h \times l$ mm	Lead spacing e mm	Approx. weight g	Ordering code ¹⁾
				PU: 200
0,022 (X2)	5,5 × 11 × 18	15	1,5	B81121-C-*104
0,033 (X2)	7 × 13 × 18	15	2,0	B81121-C-*105
0,047 (X2)	9 × 14,5 × 18	15	2,2	B81121-C-*106
0,068 (X2)	9 × 14,5 × 18	15	2,2	B81121-C-*107
0,1 (X2)	7,3 × 16,5 × 27	22,5	4,4	B81121-C-*108
0,15 (X2)	8,5 × 18,5 × 27	22,5	5,2	B81121-C-*109
0,22 (X2)	10,5 × 19 × 27	22,5	7,5	B81121-C-*110
0,33 (X2)	11,5 × 21 × 31,5	27,5	10	B81121-C-*111
0,47 (X2)	13,5 × 23 × 31,5	27,5	14	B81121-C-*112
0,68 (X2)	15 × 24,5 × 31,5	27,5	16	B81121-C-*113
1,0 (X2)	18 × 27,5 × 31,5	27,5	20	B81121-C-*114 ²⁾

From Jan. 1984, the type B81121-C--108 will be replaced by the following types:

0,1 (X2)	9 × 17,5 × 18	15	5	B81121-C-D108 ³⁾
0,1 (X2)	9 × 17,5 × 18	15	5	B81121-C-E108 ⁴⁾

¹⁾ When ordering, quote the code letter of the lead length required (see dimensional drawings).

B = short leads

C = long leads

²⁾ without SEV and SEMKO symbols

³⁾ short leads, refer to B version

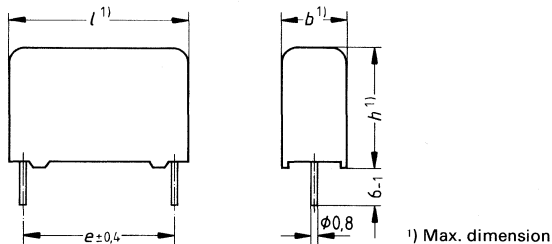
⁴⁾ long leads, refer to C version

X2 capacitors

Rated voltage 400 V ac, 50 to 1000 Hz

Self-healing capacitors with polypropylene film dielectric; enclosed in rectangular plastic case with epoxy resin seal (plastic case and epoxy resin are flame-retardant). The case is provided with spacers to improve solderability in the solder bath.

The capacitors have parallel leads in the lead spacing and are particularly suitable for PCB mounting.



Dimensions in mm

Technical data

Permissible dc voltage	1000 V dc
Test voltage	1800 V dc, 2 s (layer to layer)
also permitted	750 V ac, 50 Hz, 1 min
Permissible voltage peaks (max.)	1600 V
Voltage rate of rise (max.)	200 V/ μ s
Continuous voltage test (type test)	1000 hrs with 1.25 $V_R = 500$ V ac, in acc. with VDE 0565-1
Capacitance tolerance	± 10 %
Insulation	$\geq 30,000$ M Ω
DIN climatic category	GPF (-40 to +85°C/-40 to +185°F; humidity category F)
IEC climatic category (IEC 68)	40/085/21
Specifications	as X2 capacitors, these capacitors comply with the VDE specification 0565-1
Test symbol	\textcircled{S}

Types

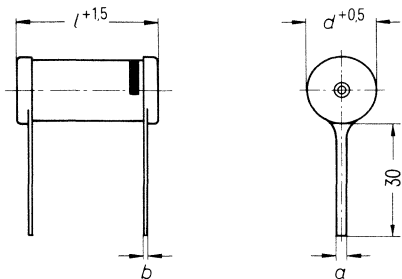
Rated capacitance μ F	Dimensions $b \times h \times l$ mm	Lead spacing e mm	Approx. weight g	PU	Ordering code
0,01 (X2)	7 × 13 × 18	15	2	300	B81121-C-B92
0,022 (X2)	9 × 14,5 × 18	15	2,2	300	B81121-C-B93
0,033 (X2)	7,3 × 16,5 × 27	22,5	4,4	200	B81121-C-B94
0,047 (X2)	8,5 × 18,5 × 27	22,5	5,2	200	B81121-C-B95
0,068 (X2)	10,5 × 19 × 27	22,5	7,5	200	B81121-C-B96
0,1 (X2)	11 × 20,5 × 27	22,5	8,5	100	B81121-C-B97
0,15 (X2)	11,5 × 21 × 31,5	27,5	10	100	B81121-C-B98
0,22 (X2)	15 × 24,5 × 31,5	27,5	15,4	100	B81121-C-B99
0,33 (X2)	18 × 27,5 × 31,5	27,5	20,8	100	B81121-C-B100

▼ to be preferred

**X2 capacitors
hermetically sealed**

**Rated voltage 300 V dc
250 V ac/60 to 400 Hz**

Capacitors comprising impregnated paper dielectric and metal foil electrodes, in ceramic protective tube, hermetically sealed with metal caps at both ends and covered with insulating caps.



Dimensions in mm

Technical data

Test voltage (sample test)	1650 V dc, 2 s (layer to layer)
Capacitance tolerance	±20 %
Insulation	≥ 12 000 MΩ
DIN climatic category	GMC (−40 to +100°C/−40 to +212°F; humidity category C)
IEC climatic category (IEC 68)	40/100/56
Specifications	as X2 capacitors, these capacitors comply with the VDE specification 0565-1.

Types

Rated capacitance μF	Rated voltage		Dimensions			Approx. weight g	Ordering code PU: 50
	V dc/V ac 60 Hz	V ac 400 Hz	$d \times l$ mm	a	b		
0,05 (X2)	300/250	110	15×25	2,5	0,4	14	B81151-A-C7
0,1 (X2)			19×30	2,5	0,4	19	B81151-A-C8

**X2 capacitors
hermetically sealed**

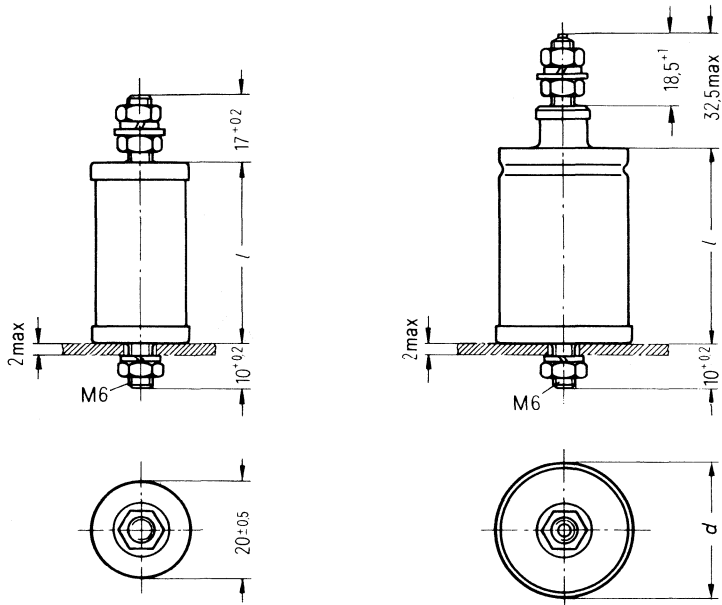
**Rated voltage up to 800 V dc
up to 440 V ac**

Self-healing capacitors comprising impregnated paper dielectric and a vacuum deposited metallizing as electrodes.

The capacitors are enclosed in tubular metal or ceramic cases and hermetically sealed. Axial connecting studs M6 at both face ends.

Ceramic case

Metal case



Mounting hole 7 mm dia

Type B81551-A-B9

Type B81551-A-B16

Nuts and spring washers are loosely supplied.

Dimensions in mm

Application

For general EMI suppression purposes in electrical equipment such as machines, appliances, and on board ships. The capacitors < 1 μF are designed for specially high operational reliability and high test voltage. The 1 μF version is intended for low voltage applications. To obtain a broadband EMI suppression effect, the connection of the capacitor to the line must be as short as possible (low inductance).

Technical data

Capacitance tolerance	$\pm 20\%$
Insulation	≥ 3000 s for $C \geq 0.6$ μF
DIN climatic category	GPC (-40 to +85°C/-40 to +185°F; humidity category C)
IEC climatic category (IEC 68)	40/085/56
Specifications	as X2 capacitors, these capacitors comply with the VDE specification 0565-1

Types

Rated capacitance μF	Rated voltage V dc/V ac 60 Hz	V ac 400 Hz	Test voltage ¹⁾		Dimensions d × l mm	Approx. weight g	Ordering code PU: 10
			Sample test V dc; 2s	Type test V dc; 1 min			
0,6 (MP ²⁾ (X2)	800/440	220	2500	2250	37 × 52	120	B81551-A-B16
1 (MP ²⁾ (X)	125/50	-	350	190	20 × 33	30	B81551-A-B9

¹⁾ Layer to layer, sample test at 20°C/68°F, type test at θ_{max} .

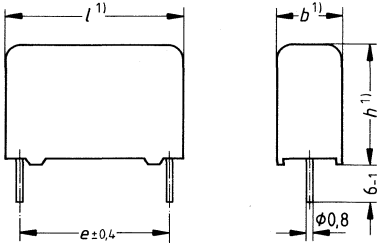
²⁾ MP stands for metalized paper.

Y capacitors

Rated voltage 250 V ac, 50 Hz

Self-healing capacitors with polypropylene film dielectric; enclosed in rectangular plastic case with epoxy resin seal. (Plastic case and epoxy resin are flame-retardant.) The case is provided with spacers to improve solderability in the solder bath.

The capacitors have short parallel leads in the lead spacing and are particularly suitable for PCB mounting.



1) Max. dimension

Dimensions in mm

Technical data

Test voltage	1500 V ac, 2 s (layer to layer)
Voltage rate of rise (max.)	200 V/μs
Continuous voltage test (type test)	1000 hrs with $1.7 V_R = 425 \text{ V ac}$
Capacitance tolerance	± 10 %
Insulation	≥ 30 000 MΩ
DIN climatic category	GPF (- 40 to + 85 °C / - 40 to + 185 °F; humidity category F)
IEC climatic category (IEC 68)	40/085/21
Specifications	as Y capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols



▼ to be preferred

Types

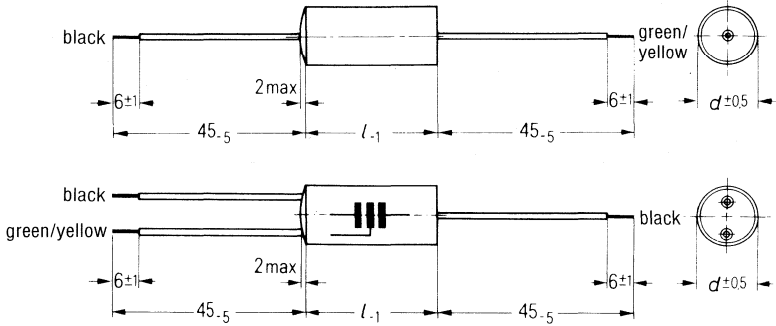
Rated capacitance	Dimensions $b \times h \times l$ mm	Lead spacing e mm	Approx. weight g	PU	Ordering code
2500 pF (Y)	7 × 13 × 18	15	2	500	B81121-C-B141
3300 pF (Y)	7 × 13 × 18	15	2	500	B81121-C-B142
4700 pF (Y)	9 × 14,5 × 18	15	2,2	500	B81121-C-B143
6800 pF (Y)	7,3 × 16,5 × 27	22,5	4,4	400	B81121-C-B144 ¹⁾
0,01 μF (Y)	7,3 × 16,5 × 27	22,5	4,4	400	B81121-C-B145 ¹⁾
0,015 μF (Y)	8,5 × 18,5 × 27	22,5	5,2	300	B81121-C-B146
0,022 μF (Y)	10,5 × 19 × 27	22,5	7,5	300	B81121-C-B147
0,027 μF (Y)	11 × 20,5 × 27	22,5	8,5	250	B81121-C-B148 ¹⁾
0,033 μF (Y)	11,5 × 21 × 32	27,5	10	200	B81121-C-B149 ¹⁾

¹⁾ without SEMKO symbol

Y capacitors

Rated voltage 250 V dc/ac, 50 Hz

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. Leads 1 × 0.8 mm dia (YV). Other lead lengths or litz wires are available upon request.



Dimensions in mm

Technical data

Test voltage	2700 V dc, 2s (layer to layer)
Continuous voltage test (type test)	1000 hrs with $1.7 V_R = 425$ V ac
Capacitance tolerance	± 20%
Insulation	≥ 6000 MΩ
DIN climatic category	HPF (− 25 to +85 °C/− 13 to +185 °F, humidity category F)
IEC climatic category (IEC 68)	25/085/21

Specifications as Y capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols



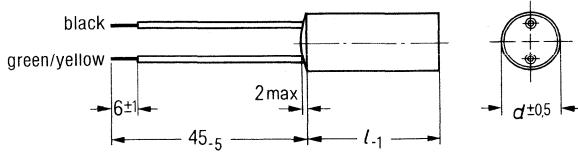
Types

Rated capacitance	Dimensions $d \times l$ mm	Approx. weight g	Ordering code PU: 200
5000 pF (Y)	10 × 34	7	B81111-A-B33
0,01 μF (Y)	12 × 34	8	B81111-A-B34
0,025 μF (Y)	12 × 44	9	B81111-A-B35
0,035 μF (Y)	14 × 44	11	B81111-A-B36
2 × 2500 pF (Y)	10 × 34	7	B81211-A-B32
2 × 5000 pF (Y)	12 × 34	8	B81211-A-B33
2 × 0,015 μF (Y)	14 × 44	11	B81211-A-B34
2 × 0,035 μF (Y)	20 × 44	20	B81211-A-B35

Y capacitors

Rated voltage 250 V dc/ac, 50 Hz

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. Leads 1×0.8 mm dia (YV). Other lead lengths or litz wires are available upon request.



Dimensions in mm

Technical data

Test voltage	2700 V dc, 2s (layer to layer)
Continuous voltage test (type test)	1000 hrs with $1.7 V_R = 425$ V ac
Capacitance tolerance	$\pm 20\%$
Insulation	≥ 6000 M Ω
DIN climatic category	HPF (-25 to +85 °C/-13 to +185 °F, humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as Y capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols



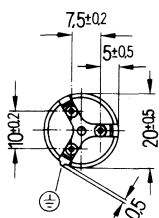
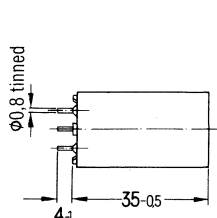
Types

Rated capacitance	Dimensions $d \times l$ mm	Approx. weight g	Ordering code PU: 200
5000 pF (Y)	10 × 34	7	B81121-A-B43
0,01 μ F (Y)	12 × 30	7	B81121-A-B44
0,025 μ F (Y)	12 × 44	9	B81121-A-B45
0,035 μ F (Y)	14 × 39	11	B81121-A-B46

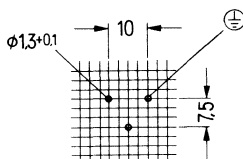
Y capacitors

Rated voltage 250 V dc/ac

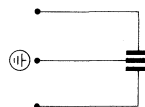
Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. As their leads are arranged in the lead spacing, they are particularly suitable for PCB mounting.



Mounting holes



Circuit diagram



Dimensions in mm

Technical data

Test voltage	2700 V dc, 2s (layer to layer)
Continuous voltage test (type test)	1000 hrs with $1.7 V_R = 425$ V ac
Capacitance tolerance	± 20%
Insulation	≥ 6000 MΩ
DIN climatic category	HPF (-25 to +85 °C / -13 to +185 °F, humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as Y capacitors, these capacitors comply with the VDE specification O565-1

Test symbol



Types

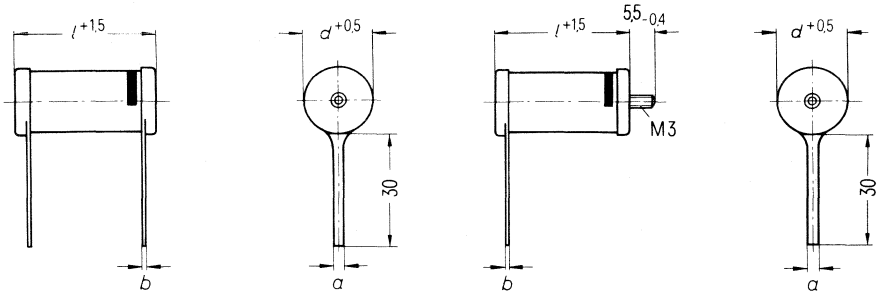
Rated capacitance	Dimensions $d \times l$ mm	Approx. weight g	Ordering code PU: 200
$2 \times 0,015 \mu\text{F}$ (Y)	20 × 35	17	B81221-A-B19

**Y capacitors
hermetically sealed**

Rated voltage 440 V dc/250 V ac

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in ceramic protective tube, hermetically sealed with metal caps at both ends and covered with insulating caps.

Type B 81551 is a low loss version which is particularly suitable for bypassing RF to ground.



Dimensions in mm

Type B 81151 Connecting tags at both sides

Type B 81551 Threaded stud connected to outer layer, tag at opposite side

Technical data


Test voltage (sample test)	layer to layer 3000 V dc, 2s
Capacitance tolerance	± 20%
Insulation	≥ 12,000 MΩ
DIN climatic category	GMC (-40 to +100°C/-40 to +212°F; humidity category C)
IEC climatic category (IEC 68)	40/100/56
Specifications	as Y capacitors, these capacitors comply with the VDE specification 0565-1

Y capacitors

Types

Rated capacitance	Rated voltage		Dimensions			Approx. weight g	Ordering code PU: 50
	V dc/V ac 60 Hz	V ac 400 Hz	$d \times l$ mm	a	b		
Type B81151							
1000 pF (Y)	440/250	110	8,5×18	2	0,3	4	B81151-A-C3
2500 pF (Y)			8,5×22	2	0,3	5	B81151-A-C1 ²⁾
5000 pF (Y)			10,5×25	2,5	0,3	9	B81151-A-C2
0,01 μF (Y)			13 ×25	2,5	0,4	12	B81151-A-C4
0,025 μF (Y)			19 ×25	2,5	0,4	17	B81151-A-C5
0,035 μF (Y)			19 ×30	2,5	0,4	19	B81151-A-C6
Type B81551						PU: 10	
500 pF (Y)	440/250	110	8,5×18	2	0,3	4	B81551-A-C1
2500 pF (Y)			10,5×22	2,5	0,3	8	B81551-A-C2
0,01 μF ¹⁾ (Y)			15 ×22	2,5	0,4	10	B81551-A-C3
0,025 μF (Y)			19 ×30	2,5	0,4	21	B81551-A-C4

1) A reduction in the upper category temperature to + 95 °C/203°F would permit a continuous operation at 125 V, 400 Hz.

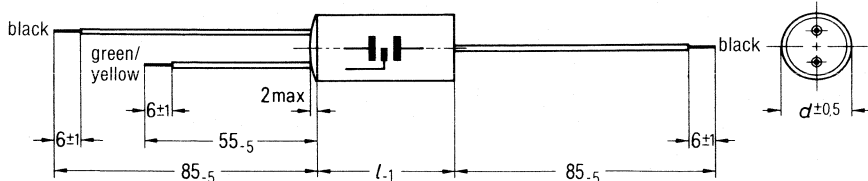
2) with  test symbol

565-1

X1Y capacitors

Rated voltage 250 V dc/ac, 50 Hz

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. Leads 1 × 0.8 mm dia (YV). Other lead lengths or litz wires are available upon request.



Dimensions in mm

Technical data

Test voltage	X1 capacitors: 1650 V dc, 2s (layer to layer) Y capacitors: 2700 V dc, 2s (layer to layer)
Continuous voltage test (type test)	X1 capacitors: 1000 hrs with 1.25 V _R = 315 V ac, in acc. with VDE 0565-1 Y capacitors: 1000 hrs with 1.7 V _R = 425 V ac
Capacitance tolerance	± 20% (applies to each X1 or Y capacitance)
Insulation	≥ 6000 MΩ
DIN climatic category	HPF (-25 to +85 °C/-13 to +185 °F, humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X1Y capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols



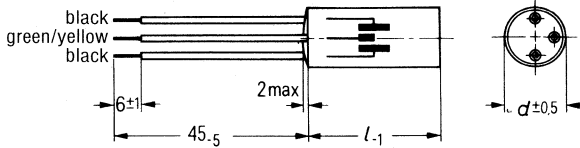
Types

Rated capacitance		Dimensions d × l mm	Approx. weight g	Ordering code PU: 200
0,025 μF +2 × 2500 pF	(X1) (Y)	12 × 44	9	B81311-A-B31
0,05 μF +2 × 2500 pF	(X1) (Y)	14 × 44	11	B81311-A-B32
0,07 μF +2 × 2500 pF	(X1) (Y)	14 × 44	11	B81311-A-B33
0,1 μF +2 × 2500 pF	(X1) (Y)	16 × 44	14	B81311-A-B34
0,2 μF +2 × 2500 pF	(X1) (Y)	20 × 44	20	B81311-A-B35

X1Y capacitors

Rated voltage 250 V dc/ac, 50 Hz

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. Leads 1 × 0.8 mm dia (YV). Other lead lengths or litz wires are available upon request.



Dimensions in mm

Technical data

Test voltage	X1 capacitors: 1650 V dc, 2s (layer to layer) Y capacitors: 2700 V dc, 2s (layer to layer)
Continuous voltage test	X1 capacitors: 1000 hrs with $1.25 V_R = 315 \text{ V ac}$ Y capacitors: 1000 hrs with $1.7 V_R = 425 \text{ V ac}$
Capacitance tolerance	± 20% (applies to each X1 or Y capacitance)
Insulation	≥ 6000 MΩ
DIN climatic category	HPF (-25 to +85 °C/-13 to +185 °F, humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X1Y capacitors, these capacitors comply with the VDE specification O565-1

Test symbols



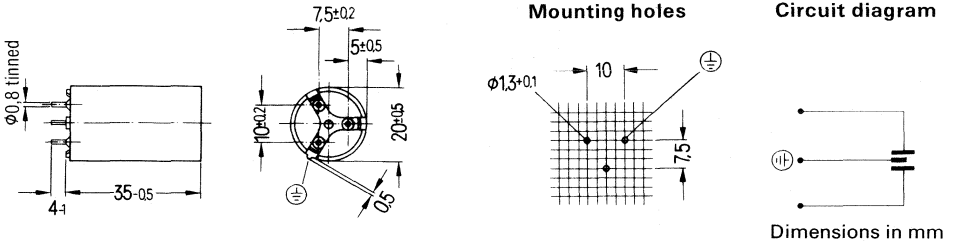
Types

Rated capacitance		Dimensions $d \times l$ mm	Approx. weight g	Ordering code PU: 200
0,025 μF +2 × 2500 pF	(X1) (Y)	12 × 30	8	B81321-A-B11
0,05 μF +2 × 2500 pF	(X1) (Y)	14 × 39	11	B81321-A-B12
0,07 μF +2 × 2500 pF	(X1) (Y)	14 × 39	11	B81321-A-B13
0,1 μF +2 × 2500 pF	(X1) (Y)	16 × 44	14	B81321-A-B14
0,2 μF +2 × 2500 pF	(X1) (Y)	20 × 39	20	B81321-A-B15

X1Y capacitors

Rated voltage 250 V dc/ac

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. As their leads are arranged in the lead spacing, they are particularly suitable for PCB mounting.



Technical data

Test voltage	X1 capacitors: 1650 V dc, 2s (layer to layer) Y capacitors: 2700 V dc, 2s (layer to layer)
Continuous voltage test	X1 capacitors: 1000 hrs with $1.25 V_R = 315$ V ac Y capacitors: 1000 hrs with $1.7 V_R = 425$ V ac
Capacitance tolerance	$\pm 20\%$ (applies to each X1 or Y capacitance)
Insulation	≥ 6000 M Ω
DIN climatic category	HPF (-25 to +85°C / -13 to +185°F, humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X1Y capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols	  
--------------	--

Types

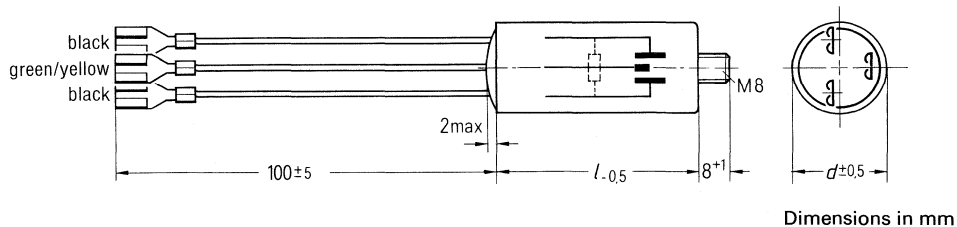
Rated capacitance		Dimensions $d \times l$ mm	Approx. weight g	Ordering code PU: 200
0,1 μ F (X1) + 2 \times 2500 pF	(Y)	20 \times 35	17	B81321-A-E14
0,2 μ F (X1) + 2 \times 2500 pF	(Y)	20 \times 35	17	B81321-A-E15

X1Y capacitors

Rated voltage 250 V dc/ac, 50 Hz

Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular aluminum can, with epoxy resin seal.

1 × 0.8 mm dia. leads (YV) with 3 fastened adapter plugs (6.3 × 1 DIN 46247, tinned brass).



Nuts and spring washers upon request

Technical data

Test voltage (sample test)	X1 capacitors: 1650 V dc, 2s (layer to layer) Y capacitors: 2700 V dc, 2s (layer to layer) 2500 V ac, 2s (layers to case)
Continuous voltage test (type test)	X1 capacitors: 1000 hrs with 1.25 V _n = 315 V ac } in acc. with Y capacitors: 1000 hrs with 1.7 V _R = 425 V ac } VDE 0565-1
Capacitance tolerance	± 20% (applies to each X1 or Y capacitance)
Insulation	≥ 6000 MΩ
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F; humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X1Y capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols



Types

Rated capacitance		Dimensions d × l mm	Approx. weight g	Ordering code PU: 200
0,1 μF + 2 × 2500 pF	(X1) (Y)	20 × 38	30	B81321-A-F5
0,3 μF + 2 × 2500 pF + 1 MΩ	(X1) (Y)	20 × 45		B81321-A-F7
0,25 μF + 2 × 27000 pF + 1 MΩ	(X1) (Y)	25 × 45		B81321-A-F17

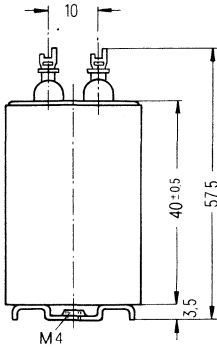
X1Y capacitors hermetically sealed

Rated voltage up to 450 V dc/250 V ac

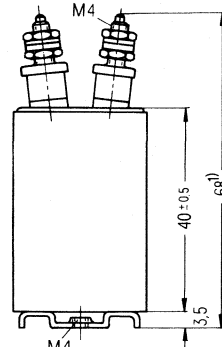
Capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in rectangular metal case, hermetically sealed.

The broadband EMI suppression effect – as shown in the graphs – is obtained by connecting the capacitor terminals directly to the lines to be suppressed.

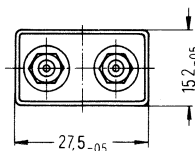
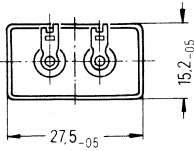
To ensure a good ground connection, two sharp notches are provided underneath the mounting bracket which would puncture a paint film.



B81361-C-B1
with glass feed-through
elements and solder tags



B81362-C-B1
with ceramic
feed-through
elements and
screw connections



1) Max. dimensions

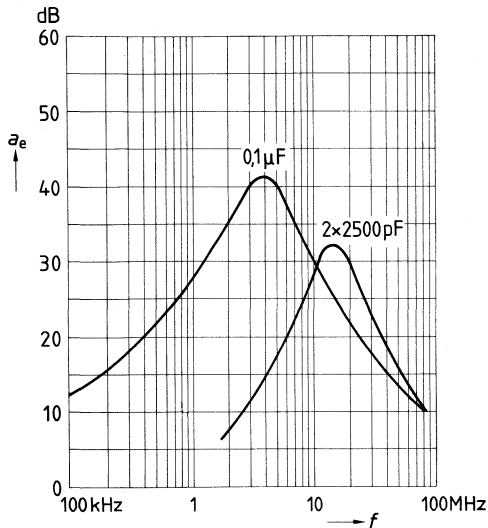
Dimensions in mm

Technical data

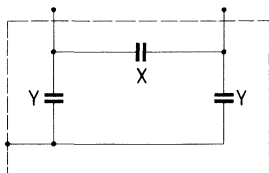
Test voltage (sample test)	layer to layer type B 81361-C-B1: 2000 V dc; 2s at 20°C/68°F for X1 capacitance 2700 V dc; 2s at 20°C/68°F for Y capacitances type B 81362-C-B1: 3000 V dc; 2s at 20°C/68°F for X1 capacitance 5000 V dc; 2s at 20°C/68°F for Y capacitances
Capacitance tolerance	± 10% for X1 capacitances ± 20% for Y capacitances
Insulation	≥ 12,000 MΩ
DIN climatic category	HQC (-25 to +80°C/-13 to +176°F; humidity category C)
IEC climatic category (IEC 68)	25/080/56
Specifications	as X1Y capacitors these capacitors comply with the VDE specification 0565-1.

X1Y capacitors

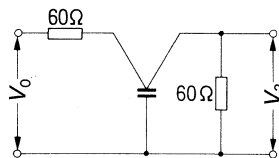
Insertion loss a_e versus frequency f (typical values)



Circuit diagram



Measuring arrangement



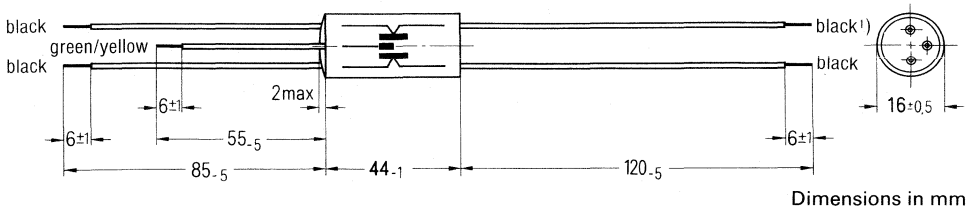
Types

Rated capacitance	Rated voltage		Dimensions $b \times l$ mm	Approx. weight g	Ordering code PU: 10
	Vdc/V ac 50 Hz	V ac 400 Hz			
0,1 μF (X1) +2 \times 2500 pF (Y)	440/250	125	27,5 \times 40	40	B81361-C-B1
0,1 μF (X1) +2 \times 2500 pF (Y)	450/250	125			B81362-C-B1

X1Y capacitors

Rated voltage 250 V dc/ac, 50 Hz
Rated current 4 A

Broadband EMI suppression capacitors comprising impregnated paper dielectric and metal foil electrodes, enclosed in tubular plastic can with epoxy resin seal. Leads 1 × 0.8 mm dia (YV). Other lead lengths or litz wires are available upon request.



Technical data

- Test voltage X1 capacitors: 1650 V dc, 2s (layer to layer)
Y capacitors: 2700 V dc, 2s (layer to layer)
- Continuous voltage test (type test) X1 capacitors: 1000 hrs with $1.25 V_R = 315 V ac$ } in acc. with
Y capacitors: 1000 hrs with $1.7 V_R = 425 V ac$ } VDE 0565-1
- Capacitance tolerance ± 20% (applies to each X1 or Y capacitance)
- Insulation $\geq 6000 M\Omega$
- DIN climatic category HPF (-25 to +85°C/-13 to +185°F; humidity category F)
- IEC climatic category (IEC 68) 25/085/21
- Specifications as X1Y capacitors, these capacitors comply with the VDE specification 0565-1

- Test symbols   
- 565-1

Types

Rated capacitance		Dimensions $d \times l$ mm	Approx. weight g	Ordering code PU: 100
0,025 μF + 2 × 2500 pF	(X1) (Y)	12 × 44	9	B81711-A-B21
0,05 μF + 2 × 2500 pF	(X1) (Y)	14 × 44	11	B81711-A-B22
0,07 μF + 2 × 2500 pF	(X1) (Y)	14 × 44	11	B81711-A-B23
0,1 μF + 2 × 2500 pF	(X1) (Y)	16 × 44	14	B81711-A-B24
0,2 μF + 2 × 2500 pF	(X1) (Y)	20 × 44	20	B81711-A-B25

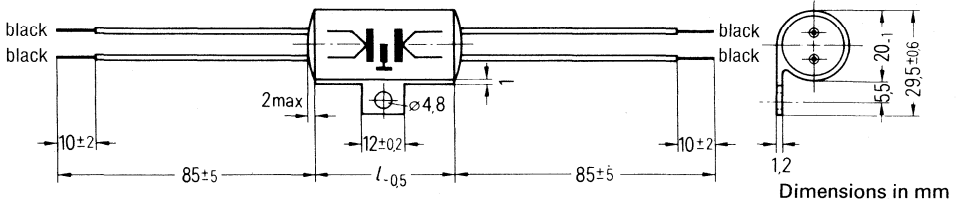
1) Unambiguous assignment by varicolored terminals upon request

X1Y capacitors

Rated voltage 250 V dc/ac, 50 Hz
Rated current 10 A

Capacitors comprising impregnated paper dielectric and metal foil electrodes; in metal tubes with mounting strips and epoxy resin seal.

Litz wire connections $1 \times 0.75 \text{ mm}^2$ (NYFAFw). Other litz wire lengths are also available upon request.



Technical data

Test voltage	X1 capacitors: 1650 V dc, 2s (layer to layer) Y capacitors: 2700 V dc, 2s (layer to layer)
Continuous voltage test (type test)	X1 capacitors: 1000 hrs with $1.25 V_R = 315 \text{ V ac}$ } in acc. with Y capacitors: 1000 hrs with $1.7 V_R = 425 \text{ V ac}$ } VDE 0565-1
Capacitance tolerance	$\pm 20\%$ (applies to each X1 or Y capacitance)
Insulation	$\geq 6000 \text{ M}\Omega$
DIN climatic category	HPF (-25 to $+85^\circ\text{C}$; -13 to $+185^\circ\text{F}$; humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X1Y capacitors, these capacitors comply with the VDE specification 0565-1

Test symbols  

Types

Rated capacitance	Dimensions $d \times l$ mm	Approx. weight g	Ordering code PU: 100
0,05 μF $+2 \times 2500 \text{ pF}$	20 \times 38	25	(X1) (Y) B81711-A-B31
0,07 μF $+2 \times 2500 \text{ pF}$			B81711-A-B32
0,1 μF $+2 \times 5000 \text{ pF}$	20 \times 45	29	(X1) (Y) B81711-A-B33
0,1 μF $+2 \times 2500 \text{ pF}$			B81711-A-B34
0,2 μF $+2 \times 2500 \text{ pF}$	20 \times 58	42	(X1) (Y) B81711-A-B36
0,2 μF $+2 \times 2500 \text{ pF}$	20 \times 61	42	(X1) (Y) B81712-A-B36 ¹⁾

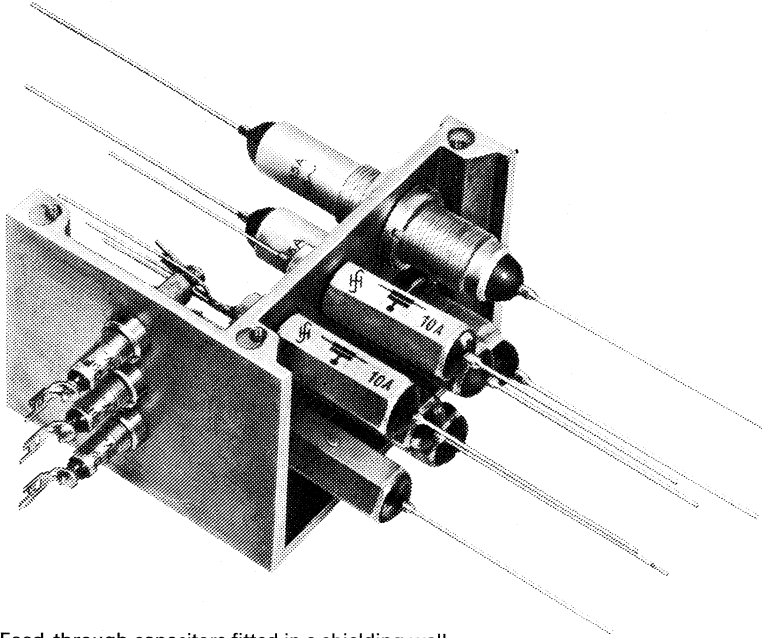
¹⁾ with  symbol

EMI Suppression Feed-Through Elements



EMI Suppression Feed-Through Elements

Feed-through capacitors Four-terminal capacitors



Feed-through capacitors fitted in a shielding wall

Capacitors in combination with shielding elements are effective from audio frequencies up to and above the SW and VHF band and are used to eliminate interference from electrical apparatus and appliances over a broad bandwidth. To fully utilize their RF characteristics the capacitors must be fitted in a shielding wall. The capacitor case must have RF tight contact with the shielding wall.

The mounting elements are so constructed as to guarantee the required complete and concentric joint between the capacitor and the shielding. For capacitors with threaded lugs this is achieved by means of the contact cone on the threaded lug care being taken to ensure that the mounting hole has sharp edges. The complete joint between feed-through capacitors with external $M6 \times 0.5$ thread and the shielding is similarly obtained via the contact cone of the nut, whilst the type with an external $M12 \times 0.75$ thread is provided with a sharp-edged mounting nut.

The types for 100 to 1600 Adc/1200 Aac current ratings must be screwed into a threaded socket thereby ensuring good contact via the threaded sides.

In these so-called feed-through capacitors the load current carrying conductor which is connected over a large surface area to one layer, is fed centrally through the capacitors. The other layer makes concentric contact with the capacitor case.

Due to their electrical equivalent circuit, feed-through capacitors can be considered as four-terminal networks. They are designed to be effective from audio frequency to far above 300 MHz. The low loss reliable contact winding with leads contacted at its ends is enclosed in a metal case with either a threaded socket or an external thread.

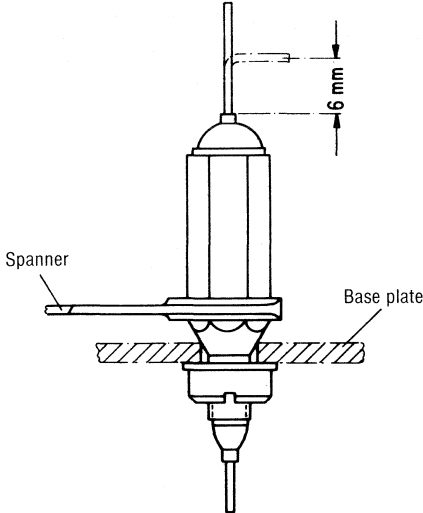
In order to guarantee the EMI suppression effect even at high frequencies, all coaxial feed-through capacitors are sample-tested for attenuation.

EMI Suppression Feed-Through Elements

Feed-through capacitors Four-terminal capacitors

Mounting instruction for feed-through capacitors up to 25 A

When fitting the capacitor in the metal shielding wall, the following points should be noted:



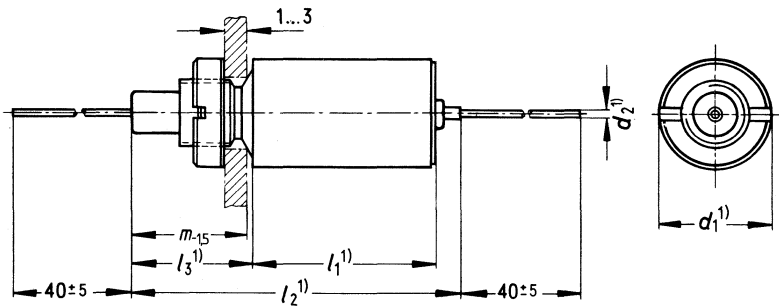
1. The capacitor must be fitted vertically into the hole in the base plate and mounted by tightening the nut with a slotted screw driver. When using a ring or open-end spanner as an auxiliary tool, the spanner should only be applied directly on the mounting plate thus only applying torque to the case in that position.
2. When bending the feed-through lead, the 6 mm distance between the bending point and the upper edge of the feed-through tube must be observed and the lead should be gripped between glass bead and bending tool by a suitable device.
3. Soldering at the feed-through lead requires a minimum space of 5 mm from the upper edge of the feed-through tube.

**Feed-through capacitors
Y capacitors
for central screw mounting**

**Rated voltage up to 440 V dc
up to 250 V ac
Rated current 16 and 25 A**

Coaxial feed-through capacitors of class Y in accordance with VDE 0565-1. In respect of surface leakage paths they meet VDE 0110, group C.

These capacitors also meet the stringent requirements in respect of test voltage for use in electrical machines in accordance with VDE 0530 and in switching appliances in accordance with VDE 0660.



1) Max. dimension

Dimensions in mm

Type	d_1	l_1	l_2	l_3	m	d_2	Thread	Mounting hole
			mm					
B85121-A-B1	16	24	42,5	16,5	16	1	M 10×0,75	10,5 ^{+0,3}
B85121-A-B2								
B85121-A-B3								
B85121-A-B4	20	26,5	46	18	17	2	M 12×0,75	12,5 ^{+0,5}
B85121-A-B5		38,5	58					
B85121-A-B6								

Technical data

Operating voltage	category voltage V_C = rated voltage V_R ; V_C is referred to the upper category temperature If the capacitors are not used as Y capacitors but for example for wiring anode voltage lines, the max. permissible operating voltage is: 350 V_{rms} 60 Hz/750 V dc or 250 V_{rms} 60 Hz/600 V dc for B85121-A-B6
Test voltage	Sample test 3750 V dc, 2 s at 20°C/68°F Type test 1500 V ac, 50 Hz, 1 min at 100°C/212°F (non-destructive) or 2500 V ac, 50 Hz, 1 min at 20°C/68°F (destructive)
Operating current	max. permissible operating current = rated current
Capacitance tolerance	± 20%
Insulation	≥ 12,000 MΩ
Inherent temperature rise	max. 15°C/59°F at rated current operation
DIN climatic category	GMC (-40 to +100°C/-40 to + 212°F; humidity category C)

Types

Rated current A	Rated voltage		Rated capacitance	Approx. weight g	Ordering code PU: 20
	V dc/V ac 60 Hz	V ac 400 Hz			
16	440/250	110	1250 pF (Y)	23	B85121-A-B1
			2500 pF (Y)		B85121-A-B2
			5000 pF (Y)		B85121-A-B3
25	350/125	60	0,01 μF (Y)	36	B85121-A-B4
			0,035 μF (Y)		B85121-A-B5
					0,05 μF ¹⁾

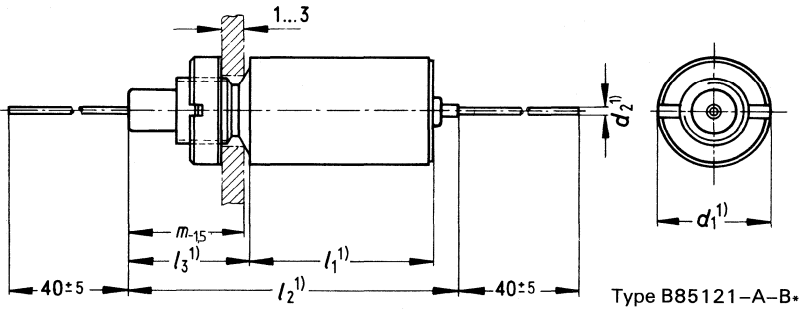
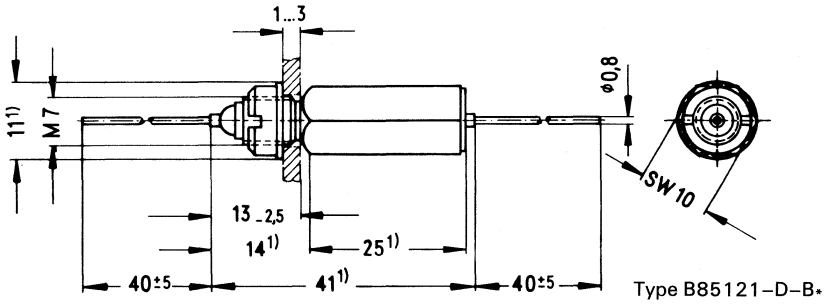
¹⁾ The capacitor design corresponds to that of a Y capacitor for 250 V ac.

**Feed-through capacitors
X capacitors
for central screw mounting**

**Rated voltage up to 350 V dc
up to 220 V ac
Rated current 10 to 25 A**

Coaxial feed-through capacitors of class X2 in acc. with VDE 0565-1 or class X in acc. with VDE 0560-7/1.67.

In respect of surface leakage paths they meet VDE 0110, group C.



1) Max. dimension

Dimensions in mm

Type	d_1	l_1	l_2	l_3	m	d_2	Thread	Mounting hole
			mm					
B85121-A-B 7	16	24	42,5	16,5	16	1	M 10×0,75	10,5 ^{+0,3}
B85121-A-B 8		34	52,5					
B85121-A-B 9		24	42,5					
B85121-A-B10		34	52,5					
B85121-A-B11								
B85121-A-B12								
B85121-A-B13	20	38,5	58	18	17	2	M 12×0,75	12,5 ^{+0,5}
B85121-A-B14								
B85121-A-B15	16	34	52,5	16,5	16	1	M 10×0,75	10,5 ^{+0,3}

Technical data

Operating voltage	category voltage V_C = rated voltage V_R ; V_C referred to the upper category temperature
Operating current	max. permissible operating current = rated current
Capacitance tolerance	±20 %
Insulation	for $C \leq 0.33 \mu\text{F}$: $\geq 12,000 \text{ M}\Omega$ for $C > 0.33 \mu\text{F}$: $\geq 4,000 \text{ s}$ type B85121-A-B15: $\geq 1,000 \text{ s}$
Inherent temperature rise	max. 15 °C/59 °F at rated current operation
DIN climatic category	GMC (-40 to +100 °C/-40 to +212 °F; humidity category C) type B85121-A-B15: GPC (-40 to +85 °C/-40 to +185 °F; humidity category C)
Specifications	types which are marked 'class X2' comply as X2 capacitors with VDE 0565-1; types which are without any marking comply as X capacitors with VDE 0560-7/11.67 (expiration 11.1983)

**Feed-through capacitors
X capacitors
for central screw mounting**

Types

Rated current A	Rated voltage		Rated capacitance	Test voltage V dc; 2 s	Approx. weight g	Ordering code
	V dc/V ac 60 Hz	V ac 400Hz				
10	350/250	110	5000 pF (X2)	1500	13	B85121-D-B 1 ¹⁾
			0,01 µF (X2)			B85121-D-B 2 ¹⁾
	160/110	60	0,025 µF (X)	750		B85121-D-B 3 ²⁾
	80/ 42	-	0,05 µF (X)	900		B85121-D-B 4
16	350/250	110	0,025 µF (X2)	1500	26	B85121-A-B 7
	160/110	60	0,05 µF (X)	750		B85121-A-B 8
	350/250	110	0,05 µF (X2)	1600	28	B85121-A-B 9
	80/ 42	-	0,1 µF (X)	375	26	B85121-A-B10
	160/110	60		750	28	B85121-A-B11
	80/ 42	-	0,25 µF (X)	375	30	B85121-A-B12
	160/ 75	40	1,0 µF (MP ⁴⁾ (X)	300		B85121-A-B15 ³⁾
25	160/110	60	0,25 µF (X)	750	50	B85121-A-B13
	80/ 42	-	0,5 µF (X)	375		B85121-A-B14

Ordering code	PU
B85121-D-B 1	150
B85121-D-B 2	200
B85121-D-B 3	150
B85121-D-B 4	200
B85121-A-B 7	100
B85121-A-B 8	100
B85121-A-B 9	100
B85121-A-B10	100
B85121-A-B11	100
B85121-A-B12	100
B85121-A-B15	100
B85121-A-B13	100
B85121-A-B14	100

1) Surface leakage paths in acc. with VDE 0110, group A
 2) Surface leakage paths in acc. with VDE 0560-1 § 25
 3) Dimensions in accordance with DIN 41172, sheet 2
 4) MP stands for metalized paper.

EMI Suppression Feed-Through Elements

B85111-A-B
B85112-A-B

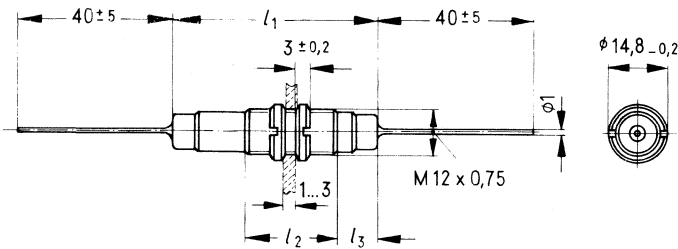
Feed-through capacitors
Y capacitors
with external thread M 12 x 0.75

Rated voltage 440 V dc
250 V ac
Rated current 16 A

Coaxial feed-through capacitors of class Y in accordance with VDE 0565-1. In respect of the surface leakage paths they meet VDE 0110, group C. The Y capacitor design

of type B85111 also complies with the Swedish specification SEN 432901; and that

of type B85112 with the specifications for EMI suppression capacitors of Denmark (DEMKO), Norway (NEMKO), Sweden (SEMKO) and Switzerland (SEV).



Dimensions in mm

Mounting hole $12.5^{+0.3}$ mm dia

Type	l_{1-3}	$l_{2-1,5}$	l_{3-1}
B85111-A-B1	54,5	23,5	11,4
B85111-A-B2	64	29	10,6
B85112-A-B1	72		14,6

**Feed-through capacitors
Y capacitors
with external thread M 12 x 0.75**

Technical data

Operating voltage	category voltage V_C = rated voltage V_R ; V_C referred to the upper category temperature
Operating current	When the capacitors are not used as Y capacitors but for example for wiring anode voltage lines, the max. permissible operating voltage is $350 V_{rms}$. 50 Hz/750 V dc. max. permissible operating current = rated current
Capacitance tolerance	$\pm 20 \%$
Insulation	$\geq 12,000 M\Omega$
Inherent temperature rise	max. $15^\circ C/59^\circ F$ at rated current operation
DIN climatic category	GMC (-40 to $+100^\circ C/-40$ to $+212^\circ F$; humidity category C) When the capacitors of type B85112 are used in accordance with the Norwegian specifications (NEMKO) the upper category temperature is $80^\circ C/176^\circ F$.

Types

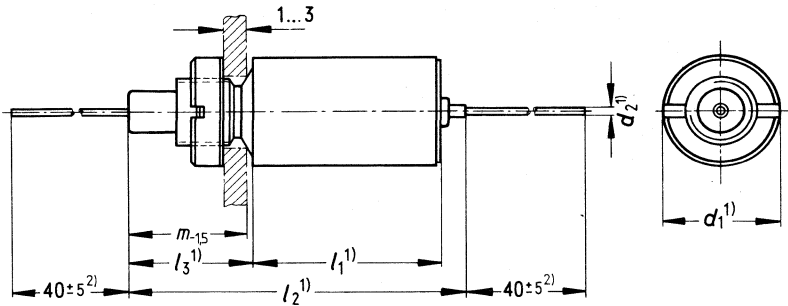
Rated current A	Rated voltage		Rated capacitance pF	Test voltage V dc, 2 s	Approx. weight g	PU	Ordering code
	V dc/V ac 60 Hz	V ac 400 Hz					
16	440/250	110	2500 (Y)	3750	25	125	B85111-A-B1
			5000 (Y)				30
			2500 (Y)	5000	100	B85112-A-B1	

**Feed-through capacitors
X and Y capacitors
for central screw mounting**

**Rated voltage up to 600 V dc
up to 440 V ac
Rated current 16 and 25 A**

Coaxial feed-through capacitors of class X1 in acc. with VDE 0565-1 or class X in acc. with VDE 0560-7/11.67. Type B85122-A-B2 complies with class Y in acc. with VDE 0565-1. Due to their construction and electrical design they are suitable for use in electrical machines and apparatus and on board ships. They are designed for particularly high operational reliability.

Types for particularly high operational reliability



1) Max. dimension

2) B85121-A-C37, length 65 ± 5 mm

Dimensions in mm

Type	d_1	l_1	l_2	l_3	m	d_2	Thread	Mounting hole
			mm					
B85122-A-B 2	16	24	42,5	16,5	16	1	M 10×0,75	$10,5^{+0,3}$
B85121-A-B24	20	38,5	58	18	17	2	M 12×0,75	$12,5^{+0,5}$
B85121-A-B35	16	34	52,5	16,5	16	1	M 10×0,75	$10,5^{+0,3}$
B85121-A-C37	20	32	61	19	18,5	2	M 12×0,75	$12,5^{+0,5}$
B85121-A-B38		38,5	58	18	17			
B85121-A-B39								

Feed-through capacitors X and Y capacitors for central screw mounting

Technical data

Operating voltage	category voltage V_c = rated voltage V_R ; V_c referred to the upper category temperature
Operating current	max. permissible operating current = rated current at 400 Hz only 75 % of the rated ac current
Capacitance tolerance	±20 %
Insulation	for $C \leq 0.33 \mu\text{F}$: $\geq 12,000 \text{ M}\Omega$ for $C > 0.33 \mu\text{F}$ in acc. with VDE 0560-14: $\geq 1,000 \text{ s}$
Inherent temperature rise	max. 15 °C/59 °F at rated current operation
DIN climatic category	GMC or GPC respectively (see table) GMC (-40 to +100 °C/-40 to +212 °F; humidity category C) GPC (-40 to +85 °C/-40 to +185 °F; humidity category C)
Specifications	types which are marked with a class designation comply with VDE 0565-1; types which are without any marking comply with VDE 0560-7/11.67 (expiration 11.83)

Types

Rated current A	Rated voltage		Rated capacitance	Test voltage V dc, 2 s	DIN climatic category	Approx. weight g	Ordering code PU: 50
	V dc/V ac 60 Hz	V ac 400 Hz					
16	600/250	220	2500 pF (Y)	3950	GMC	30	B85122-A-B 2 ¹⁾
	125/ 50	40	1 μF (MP ²⁾ (X)	300	GPC		B85121-A-B35
25	600/440	220	0,035 μF (X1)	3950	GMC	55	B85121-A-B39
	600/380	125	0,05 μF (X1)	3600			B85121-A-B24
	80/ 60	-	0,25 μF (X)	540	GPC	50	B85121-A-B38
	160/ 75	-	1 μF (MP ²⁾ (X)	450			55

¹⁾ If used as an X1 capacitor, a rated voltage of 440 V ac/50 Hz is permitted.

²⁾ MP stands for metalized plastic

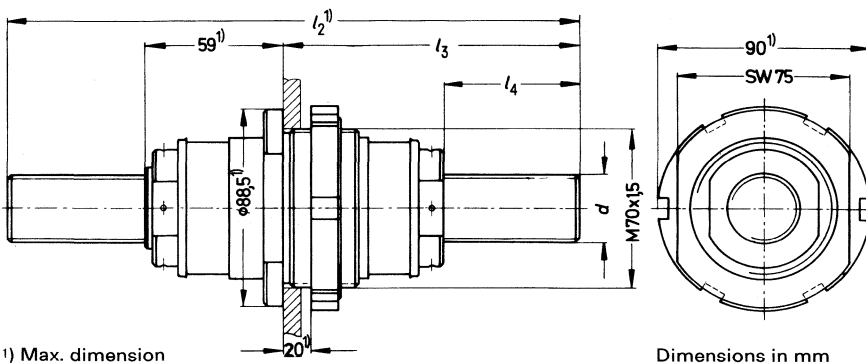
**Feed-through capacitors
X capacitors
for central screw mounting**

Rated voltage **600 V dc**
 440 V ac
Rated current **100 to 1600 A dc**
 100 to 1200 A ac

These coaxial feed-through capacitors are of class X1 or X2 in acc. with VDE 0565-1. Due to their construction and electrical design they are suitable for use in electrical machines and apparatus on land and on ships. They are designed for particularly high operational reliability and high test voltage. The 0.5 and 2 µF types (MP capacitors) are provided with windings of a high surface resistance resulting in a particularly steep attenuation rise in the VHF band.

The cable is connected to the feed-through conductor between two nuts fitted on each terminal of those types with current ratings of 100 to 600 A dc/500 A ac. When tightening, both the nuts must be braced so that no torque can be applied on the feed-throughs of the capacitor.

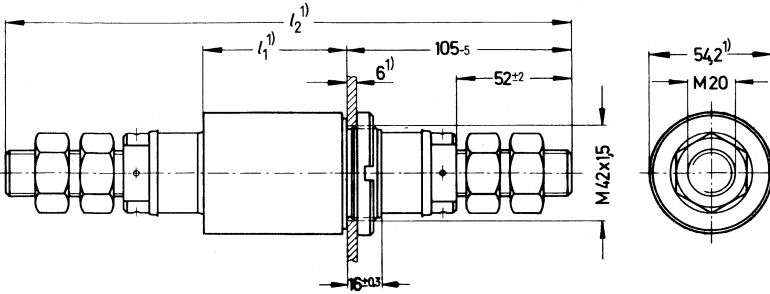
For those types with 1000 A dc/800 A ac and 1600 A dc/1200 A ac current ratings special connecting elements (C62104-A) should be used which must be ordered separately. These connecting elements prevent the application of the torque on the ceramic parts of the capacitor when screwing on the cable and provide for simultaneous connection of several cables. It is, therefore, recommended that these connecting elements should also be ordered for the 100 to 600 A dc/500 A ac types. Special mounting instructions upon request.



Type	l_2	l_{3-8}	$l_4^{\pm 1}$	d
B85111-A-B30	270	153	66	M 30×2
B85111-A-B33	310	173	86	M 36×3

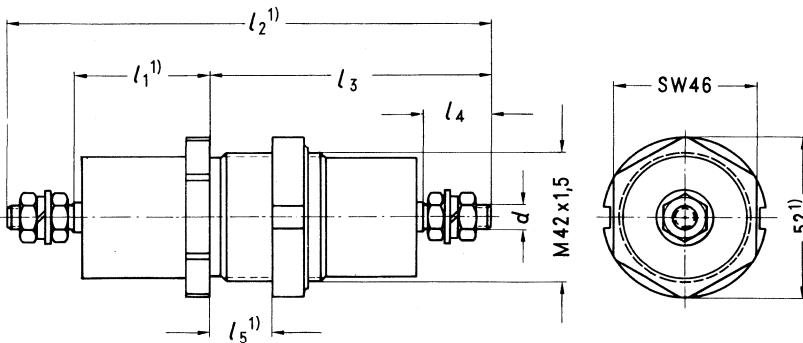
Rated dc current 1000/1600 A
Rated ac current 800/1200 A

Feed-through capacitors X capacitors for central screw mounting



Type	l_1	l_2
	mm	
B85121-A-B17	60,5	252
B85121-A-B29		
B85121-A-B18	86,5	278

Rated dc current 600 A
Rated ac current 500 A



Type	l_1	l_2	l_3	l_{4-5}	l_5	d
	mm					
B85111-A-B13	27	115	66 ₋₆	27	20	M 8
B85111-A-B14						
B85111-A-B15	40	169	92 ₋₈	45	14	M 12
B85111-A-B16						
B85111-A-B17	73	204	109 ₋₆	27	20	M 8
B85111-A-B18	80	260	144 ₋₈	45	20	M 12

Rated dc current 100/300 A
Rated ac current 100/200 A

1) Max. dimension

Dimensions in mm

Technical data

Operating voltage	category voltage $V_c = \text{rated voltage } V_R$; V_c referred to the upper category temperature
Test voltage	2500 V dc, 2 s at 20°C/68°F types B85111-A-B13, -A-B15, B85121-A-B17 3950 V dc, 2 s at 20°C/68°F
Operating current	max. permissible operating current = rated current; at 400 Hz only 75 % of the rated ac current
Capacitance tolerance	±20 %
Insulation	for $C \leq 0.035 \mu\text{F}$ ≥ 12,000 MΩ for $C \geq 0,5 \mu\text{F}$ in acc. with VDE 0560-14: ≥ 1,000 s
Inherent temperature rise	max. 15°C/59°F at rated current operation the connecting elements C62104-A2-A1 for 600 A feed-through capacitors may only be used with an additional mechanical support
DIN climatic category	GPC (-40 to +85°C/-40 to +185°F; humidity category C)

Types

Rated current A dc/A ac	Rated voltage		Rated capacitance μF	Approx. weight kg	Ordering code PU: 1
	V dc/V ac 60 Hz ¹⁾	V ac 400 Hz			
100/ 100	600/440	220	0,035 (X1)	0,4	B85111-A-B13
			0,5 (MP) (X2)	0,4	B85111-A-B14
			2 (MP) (X2)	0,9	B85111-A-B17
0,035 (X1)			0,6	B85111-A-B15	
0,5 (MP) (X2)			0,6	B85111-A-B16	
2 (MP) (X2)			1,2	B85111-A-B18	
300/ 200	600/440	220	0,035 (X1)	1,4	B85121-A-B17
			0,5 (MP) (X2)	1,4	B85121-A-B29
			2 (MP) (X2)	1,6	B85121-A-B18
0,5 (MP) (X2)			3,1	B85111-A-B30	
0,5 (MP) (X2)			4,1	B85111-A-B33	
1600/1200			600/440	220	0,5 (MP) (X2)
0,5 (MP) (X2)	4,1	B85111-A-B33			

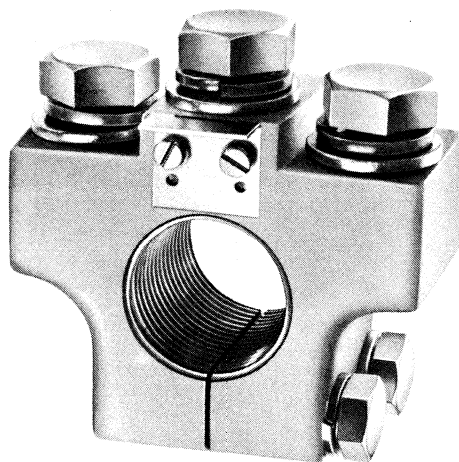
¹⁾ Referred to 85°C/185°F

Connecting elements for coaxial feed-through capacitors

When screwing the cables tightly on the bolts of coaxial feed-through capacitors for 100 to 1600 A dc/1200 A ac, there is danger that the feed-throughs of the capacitors can be damaged by the applied torque. In order to prevent this, it is recommended that the copper connecting elements listed below be used which, moreover, provide for the simultaneous connection of several cables for the types ≥ 600 A dc/500 A ac; and have a label marking the various lines.

So as not to exceed the mechanical stress for coaxial feed-through capacitors up to 1600 A dc/1200 A ac, the connecting element C62104-A2-A1 for 600 A feed-through capacitors should only be used with an additional mechanical support.

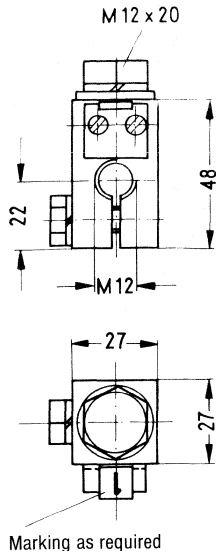
The connecting elements must be ordered piece by piece. Two connecting elements are required for each feed-through capacitor.

**Types**

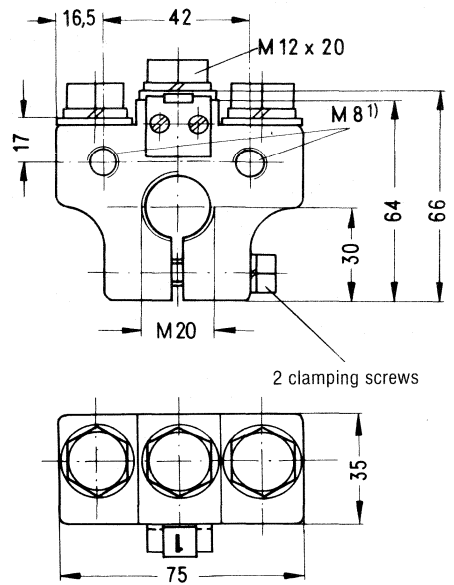
Suitable for feed-through capacitor	Rated current A dc/A ac 60 Hz	Approx. weight g	Ordering code PU: 2
B85111-A-B15 B85111-A-B16 B85111-A-B18	300/ 200	300	C62104-A1-A2
B85121-A-B17 B85121-A-B18 B85121-A-B29	600/ 500	900	C62104-A2-A1
B85111-A-B30	1000/ 800		C62104-A2-A2
B85111-A-B33	1600/1200	1800	C62104-A4-A1

Dimensions (in mm)

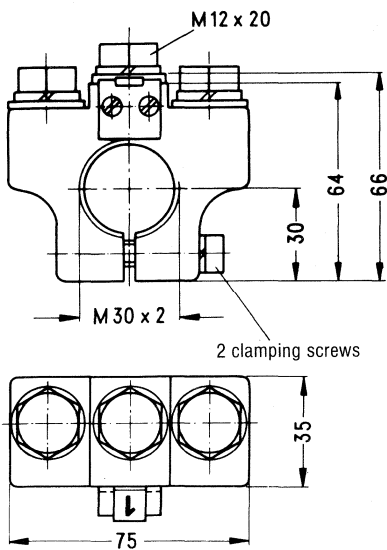
C62104-A1-A2



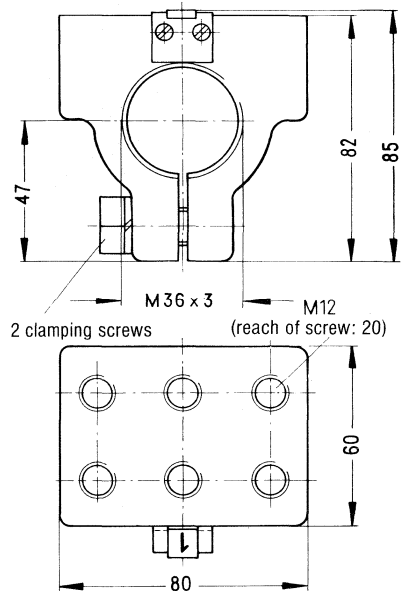
C62104-A2-A1



C62104-A2-A2



C62104-A4-A1



1) Useful reach of screw: 11 mm

EMI Suppression Feed-Through Elements

Feed-through filters

Four-terminal filters for power installations

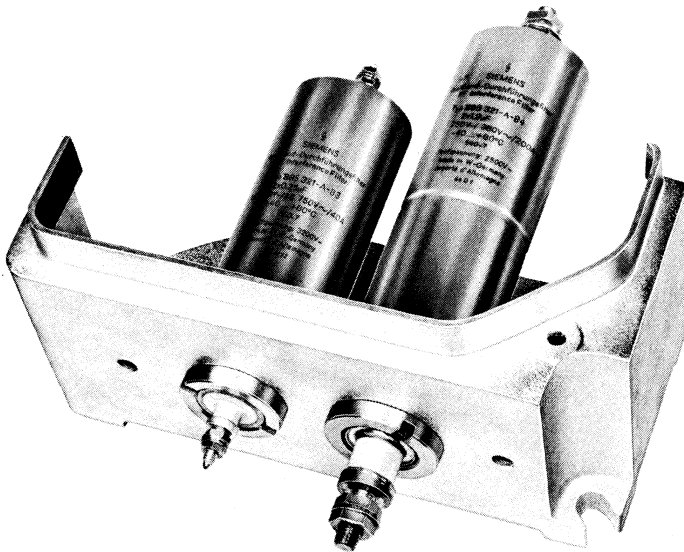
Feed-through filters are designed to eliminate interference from power installations over a broad bandwidth. Their construction and electrical characteristics make them highly suitable for use in electrical machines and apparatus and on board ships.

These π -derived filters consist of two equal capacitive shunt networks and one ferromagnetic series network. The concentric arrangement of the components results in high attenuation values to above 1 GHz. To fully utilize their RF characteristics these filters must be fitted in a shielding wall. The filter case must make RF tight contact with the shielding wall. For central screw mounting filters this can best be achieved by screwing the filters into a threaded hole or socket.

Good contact can be ensured for filters with threaded lug and additional contact cone provided that the cone is inserted in a sharp-edged mounting hole. Filters without shielding elements which are used to reduce interference only up to the VHF band can be assembled by angled mounting plates.

Filters with flange mounting have a special contact area in order to provide continuous contact.

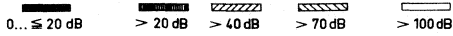
Filters with high capacitance values require special safety measures, e.g. neutral line connection (in accordance with VDE 0875 and VDE 0100).



Feed-through filters fitted in a shielding wall

Feed-through filters Four-terminal filters for power installations

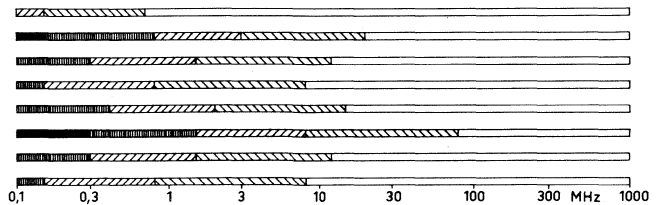
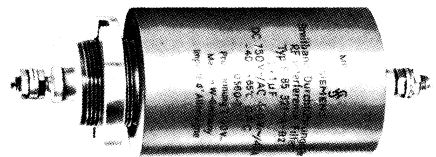
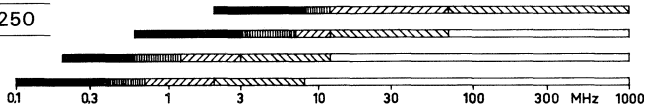
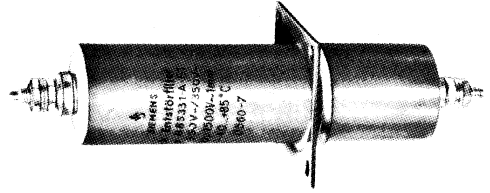
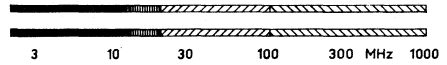
Frequency range and attenuation



Type	Rated current A	Rated voltage V dc/V ac
B85321-A-B9	16	250/250
B85321-A-B6	16	350/250 600/380

Type	Rated current A	Rated voltage V dc/V ac
B85331-A-B2	25	350/250
B85331-A-B3	25	440/440
B85332-A-B1	25	440/300
B85331-A-B1	25	350/250

Type	Rated current A	Rated voltage V dc/V ac
B85321-A-B8	6	440/250
B85321-A-B3	40	750/600
B85321-A-B2	40	750/440
B85321-A-B1	40	440/250
B85321-A-B11	100	750/440
B85321-A-B5	200	750/600
B85321-A-B4	200	750/440
B85321-A-B7	200	440/250

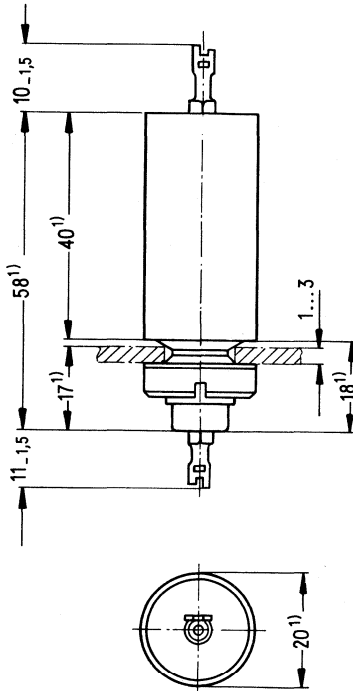


**Feed-through filters
for central screw mounting**

**Rated voltage up to 600 V dc
up to 380 V ac
Rated current 16 A**

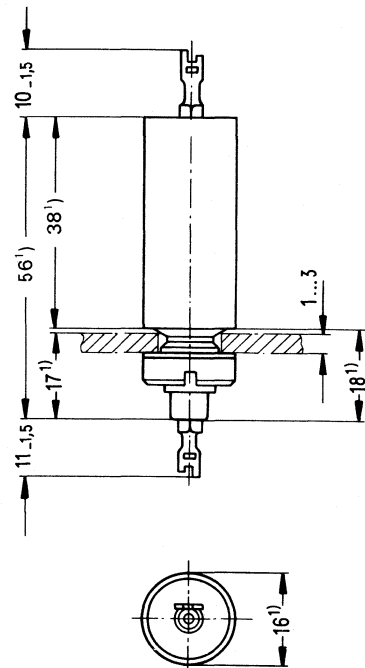
The capacitors enclosed in these coaxial feed-through filters comply with VDE 0565-1. They are designed as Y capacitors.

B85321-A-B6



Mounting hole $12.5^{+0.3}$ mm dia

B85321-A-B9



Mounting hole $10.5^{+0.3}$ mm dia

1) Max. dimension

Dimensions in mm

Technical data

Operating voltage

category voltage $V_c =$ rated voltage V_R ;
 V_c referred to the upper category temperature

Capacitance tolerance

$\pm 20 \%$

Inherent temperature rise

max. $15^\circ\text{C}/59^\circ\text{F}$ at rated current operation

DIN climatic category

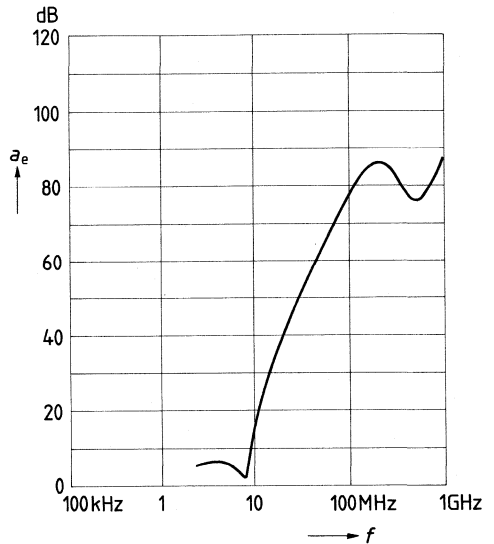
GPC (-40 to $+85^\circ\text{C}/-40$ to $+185^\circ\text{F}$; humidity category C)

Circuit diagram



Insertion loss a_e versus frequency f

(typical values; measured in 60Ω line, without load)



Types

Rated current A	Rated voltage		Rated capacitance pF	Test voltage V dc, 2 s	Approx. weight g	Ordering code PU: 100
	V dc/V ac 60 Hz	V ac 400 Hz				
16	250/250	110	2×2500 (Y)	2700	32	B85321-A-B9
	350/250	110	2×2500 (Y)	5000 ¹⁾	50	B85321-A-B6 ²⁾

¹⁾ or 2500 V ac, 1 min

²⁾ If used as an X1 capacitor, a rated voltage of 600 V dc/380 V ac is permitted

Feed-through filters with fixing flange

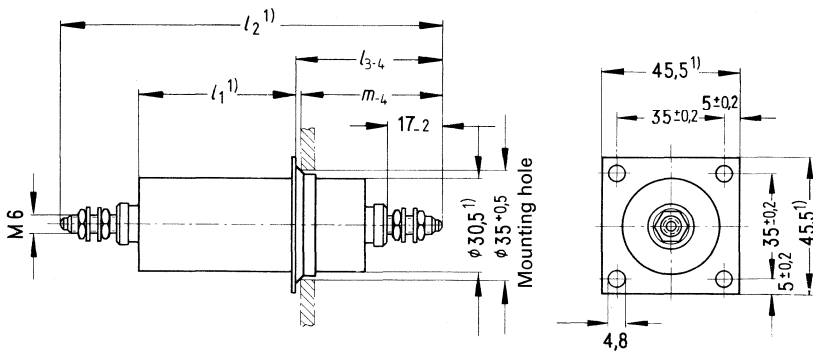
Rated voltage up to 440 V ac
Rated current 25 A

The capacitors enclosed in these coaxial feed-through filters comply with VDE 0565-1. In filters with test voltage values of 2500 V ac or 2700 V dc resp. they are designed as Y capacitors – independent of the capacitance rating.

The high capacitance values of types B85331-A-B1 and B85332-A-B1 require special safety measures, e.g. neutral line connection (in accordance with VDE 0875 and VDE 0100).

The filter must be fitted in a shielding wall in order to obtain continuous contact.

Each filter connection is provided with two nuts between which the cable must be connected to the feed-through conductor. When screwing on tightly the lock nut on the feed-through must be held in place to prevent the torque being applied to the ceramic parts of the filters.



1) Max. dimension

Dimensions in mm

Type	l_1	l_2	l_3	m
B85331-A-B1	68	152	61	60,5
B85332-A-B1				
B85331-A-B2	48,5	115	44	43,5
B85331-A-B3				

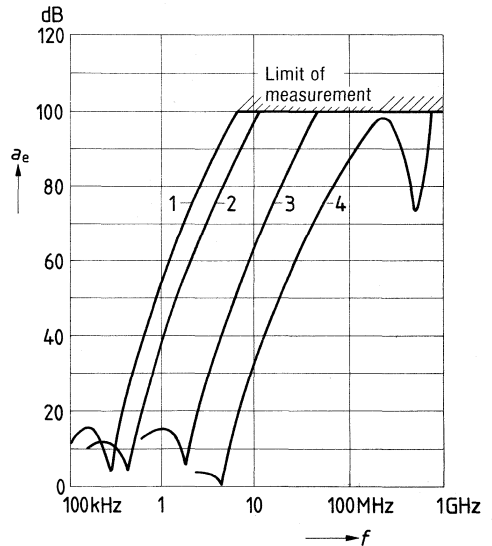
Technical data

Operating voltage	category voltage $V_c = \text{rated voltage } V_R$; V_c referred to the upper category temperature
Capacitance tolerance	$\pm 20 \%$ $\pm 10 \%$ for B85331-A-B1
Inherent temperature rise	max. $15^\circ\text{C}/59^\circ\text{F}$ at rated current operation
DIN climatic category	GPC (-40 to $+85^\circ\text{C}/-40$ to $+185^\circ\text{F}$; humidity category C)

Circuit diagram



Insertion loss a_e versus frequency f
(typical values; measured in 60Ω line without load)



- 1 = B85331-A-B1
- 2 = B85332-A-B1
- 3 = B85331-A-B3
- 4 = B85331-A-B2

Types

Rated current A	Rated voltage		Rated capacitance	Test voltage V	Approx. weight g	Ordering code PU: 20
	V dc/V ac 60 Hz	V ac 400 Hz				
25	350/250	110	2×2500 pF (Y)	2700 Vdc, 2 s	175	B85331-A-B2
	440/440	220	2×17500 pF (X2) ¹⁾	2700 Vdc, 2 s		B85331-A-B3
	440/300	110	$2 \times 0,05$ μF (X2)	2500 Vac, 1 min	245	B85332-A-B1
	350/250	110	$2 \times 0,1$ μF (X2)	1500 Vac, 1 min		B85331-A-B1

¹⁾ When used at 250 V ac, the filter complies with VDE 0565-1, class. Y

Broadband feed-through filters for central screw mounting

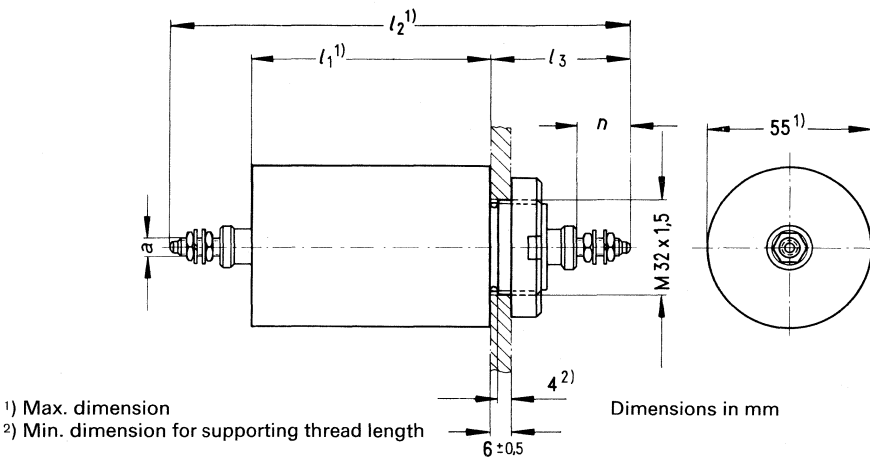
Rated voltage up to 750 V dc
up to 600 V ac
Rated current 6 to 200 A

The capacitors enclosed in these coaxial feed-through filters comply with VDE 0565-1. In filters with test voltage values ≥ 2500 V dc they are designed as Y capacitors – independent of the capacitance rating.

The high capacitance values require special safety measures, e.g. neutral line connection (in accordance with VDE 0875 and VDE 0100).

The filter must be screwed into a threaded hole or socket of at least 4 mm thread length in order to obtain continuous contact. Shielding walls of less than 5.5 mm thickness require a washer between filter base and shielding wall to make up the difference to 6 ± 0.5 mm (see dimensional drawing).

Each filter connection is provided with two nuts between which the cable must be connected to the feed-through conductor. When screwing on tightly the lock nut on the feed-through must be held in place to prevent the torque applied to the ceramic parts of the filter.



Type	l_1	l_2	l_3 mm	a	n
B85321-A-B 1	92	166	45 ₋₃	M 6	17 ₋₂
B85321-A-B 2					
B85321-A-B 3	136	210			
B85321-A-B 4	161	271	65 ₋₄	M 10	26 ₋₃
B85321-A-B 5					
B85321-A-B 7					
B85321-A-B 8	92	151	45 ₋₃	M 6	17 ₋₂
B85321-A-B11	94	200	62 ₋₄	M 8	24 ₋₄
B85321-A-B12	92	166	45 ₋₃	M 6	17 ₋₂

Technical data

Operating voltage

category voltage $V_c = \text{rated voltage } V_R$;
 V_c referred to the upper category temperature

Capacitance tolerance

$\pm 20\%$

Inherent temperature rise

max. $15^\circ\text{C}/59^\circ\text{F}$ at rated current operation

DIN climatic category

GPC (-40 to $+85^\circ\text{C}/-40$ to $+185^\circ\text{F}$; humidity category C)

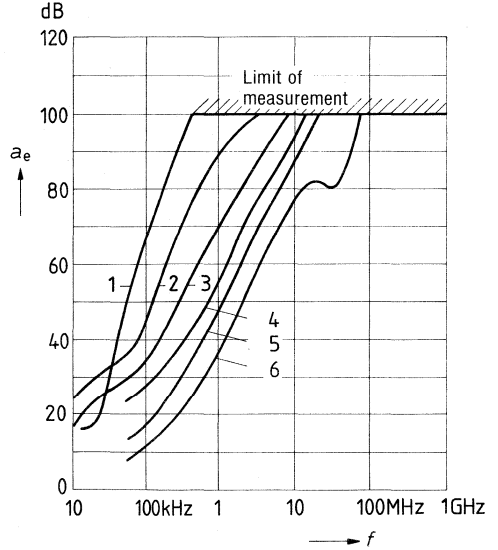
Circuit diagram



Insertion loss a_e versus frequency f

(typical values; measured in $60\ \Omega$ line, without load)

- 1 = B85321-A-B8
- 2 = B85321-A-B12
- 3 = B85321-A-B1
B85321-A-B7
- B85321-A-B2
- 4 = B85321-A-B11
B85321-A-B4
- 5 = B85321-A-B3
- 6 = B85321-A-B5



**Broadband feed-through filters
for central screw mounting**
Types

Rated current A/50 Hz (A/400 Hz)	Rated voltage Vdc/Vac 60 Hz	Rated voltage Vac 400 Hz	Dc resistance (typical values) Ω	Rated capacitance μF	Test voltage Vdc/Vac 50 Hz	Approx. weight g	Ordering code
6 (4,5)	440/250	60	71 m	2×2 (MP) (X2)	1400 Vdc, 2 s	600	B85321-A-B8
40 (30)	750/600 ¹⁾	300	76 μ	2×0,25 (X1)	5400 Vdc, 2 s 3200 Vdc, 1 min or 2000 Vac, 1 min	1000	B85321-A-B3
	750/440	220	60 μ	2×1 (MP) (X2)	2500 Vdc, 2 s or 1500 Vac, 1 min	600	B85321-A-B2
	440/250	60		2×2 (MP) (X2)	1400 Vdc, 2 s		B85321-A-B1
	440 Vdc ²⁾	250		2×4,7 (MKV) (X2)	1100 Vdc, 2 s		B85321-A-B12
100 (75)	750/440	220	40 μ	2×1 (MP) (X2)	2500 Vdc, 2 s	750	B85321-A-B11
200 (100)	750/600 ¹⁾	300	30 μ	2×0,15 (X1)	5400 Vdc, 2 s 3200 Vdc, 1 min or 2000 Vac, 1 min	1400	B85321-A-B5
	750/440	220		2×1,2 (MP) (X2)	2500 Vdc, 2 s or 1500 Vac, 1 min		B85321-A-B4
	440/250	60		2×2,2 (MP) (X2)	1400 Vdc, 2 s		B85321-A-B7

Ordering code	PU
B85321-A-B8	10
B85321-A-B3	5
B85321-A-B2	10
B85321-A-B1	10
B85321-A-B12	10
B85321-A-B11	5
B85321-A-B5	5
B85321-A-B4	5
B85321-A-B7	5

¹⁾ Peak voltage 2700 V up to 20 times per day (rise time 1 μs , decay time 50 μs)

²⁾ Operation at 250 V ac up to 400 Hz also permitted.

VHF feed-through filters for communications systems
for solder or screw connections

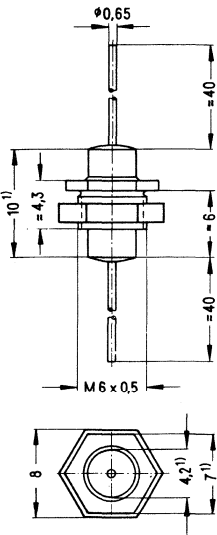
Rated voltage 350 V dc
Rated current 6 A

These π -derived filters consist of two capacitive shunt networks (feed-through capacitors of class 2 ceramic material) and an inductive series attenuation network (through conductor SIFERRIT tube core sleeve). The series network – also called waveguide – consists of a wire through which the load current flows and a ferrite core slipped over the wire. This series network is designed for high impedance values with predominant reactive losses at high frequencies. The attenuation characteristic permits wideband operation (see diagram). To fully utilize the effective suppression, the filters are fitted in a shielding wall separating the non-suppressed from the suppressed room. Assembly is by solder or screw connection (see dimensional drawing).

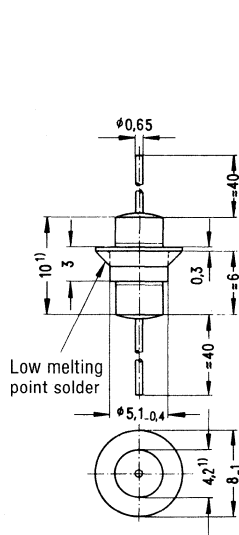
The type B85313-A-B4 is provided with a low melting point solder (melting point about 95°C/203°F); soldering temperature max. 160°C/230°F.

Application: These filters can be used in communications systems (e.g. in telecommunications apparatus and systems complying with VDE 0800 and 0804, in radio and similar sets complying with VDE 0860), also at 250 V ac, 50 Hz, but not in power circuits and where safety specifications for capacitors (VDE 0565-1) must be observed.

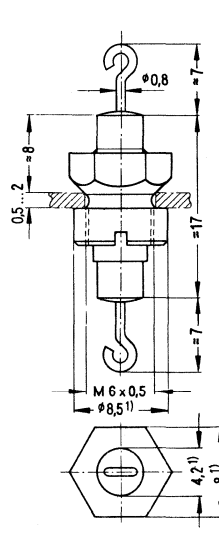
B85313-A-B7



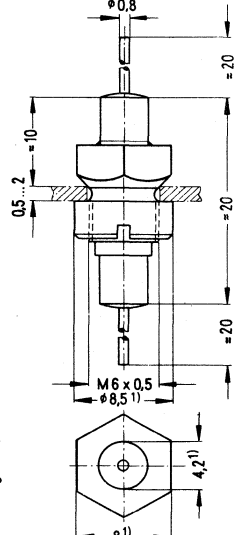
B85313-A-B4



B85313-A-B3



B85313-A-C1



1) Max. dimension

Dimensions in mm

Mounting holes for screw mounting $6.3^{+0.2}$ mm dia
Mounting holes for solder mounting $5.3^{+0.2}$ mm dia

VHF feed-through filters for communications systems for solder or screw connections

Technical data

Permissible surface temperature	85 °C/185 °F
Permissible rms reactive current	0.75 A
Test voltage	1050 V dc
DIN climatic category	GPG (- 40 to + 85 °C/- 40 to + 185 °F; humidity category G)

Circuit diagram



Types

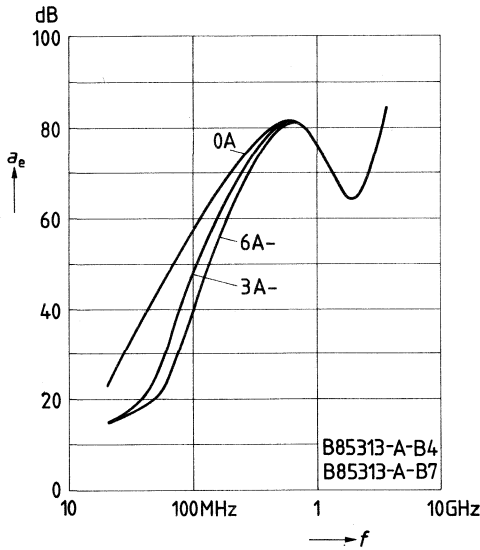
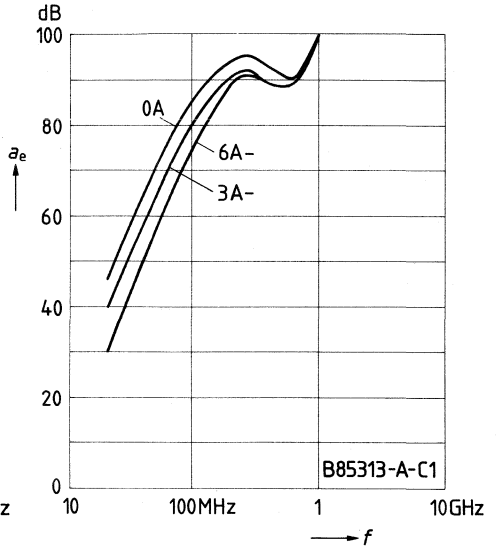
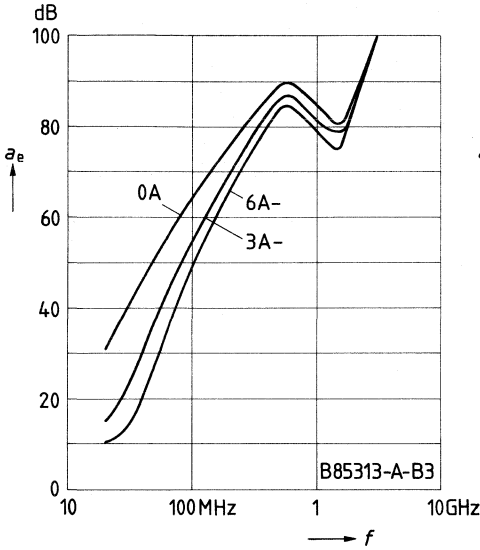
Rated current	Rated voltage	Rated capacitance		Perm. power loss mW ²)	Approx. weight	Version	Ordering code
		pF	tolerance				
A1)	V dc				g		PU: 200
6	350	2 × 800	+50 %	120	0,2	for screw connection, wire for solder connection (160 °C/230 °F), wire	B85313-A-B7
		2 × 800	-20 %	120	0,13		B85313-A-B4
		2 × 1600	+30 %	200	0,4	for screw connection, hook for screw connection, wire	B85313-A-B3
		2 × 3500	-20 %	270	0,6		B85313-A-C1

¹) At frequencies up to 20 kHz

²) At room temperatures up to 55 °C/131 °F and mounting in a metal plate. The feed-through element then heats by 30 °C/86 °F; when mounted in a copper-clad plate only half the indicated power loss is permitted.

Insertion loss a_e versus frequency f

(measured with different operating currents and 60Ω termination at both ends; typical values).



Spark Suppression Combinations



Spark Suppression Combinations

General

Particular measures are required to protect highly loaded contacts from quick contact-burning due to switch sparking. Switch sparking can badly grow especially when inductances such as relay coils and break contactor coils are incorporated in circuits. The spark suppression circuit is then intended to assist in reducing the energy stored in the inductance without stressing the contacts.

Moreover, the pulses generated by the switching process result in high frequency oscillations that may cause RF interference.

When opening an inductive circuit a self-inductance voltage arises due to the reduction of the magnetic energy ($LI^2/2$) stored in the coil. This self-inductance voltage causes a spark or an arc at the contact breaker point thus generating a transformation from magnetic energy to heat. The contact surfaces are strongly heated causing a flow of material that reduces the life of the contacts considerably. The magnitude of the self-inductance voltage V_L , also called maximum voltage, depends according to the equation $V_L = LdI/dt$ on the magnitude of the connected inductance and the switching speed. Thus, values can be attained that lead to damaging the insulation.

In any case these voltage peaks cause interference in pulse sensitive circuits; they may even destroy sensitive components such as semiconductors etc.

Spark suppression circuits

In order to avoid the affects occurring when inductances are switched off, so-called spark suppression circuits are used, e. g. for relay circuits; this is aimed at preventing the spark at the point of contact by leading off the magnetic energy stored in the coil.

Spark suppression can be obtained by connecting a resistor in parallel with the coil (**figure 1**). In case of dc operation a diode can be used instead of the resistor (**figure 2**).

The most usual spark suppression is achieved from a capacitor connected across the contact to be switched or across the relay winding (**figure 3**). When opening the switch the capacitor is charged, and discharged when closing it.

In order to eliminate too high currents that could weld the contacts, the discharge current is limited by a resistor connected in series to the capacitor (*RC* spark suppression combination).

The *RC* spark suppression combination is mainly connected in parallel to the contacts, in this way also resulting in best suppression effects.

Spark Suppression Combinations

Power rating and measurement

The capacitance and resistance ratings for spark suppression depend on the inductance and resistance values of the relay coil, the contact material, the switching current and the maximum voltage permitted. Typical values can be obtained from information material of producers of relays, e. g. Siemens Relay Data Book, Ordering No. A 23999-A311-A959--7604. The effect of spark suppression circuits can suitably be tested by an oscilloscope.

To design the voltage of the dielectric requires to know how the peak voltage runs (voltage diagram). The load of the resistance results from the spark suppression current, the effective value of which can be measured with a thermocouple.

The permissible values for peak voltage and rate of rise are given for all types. As a maximum limiting load they are not allowed to be exceeded.

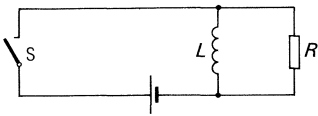


Figure 1
with resistor R in parallel to coil L

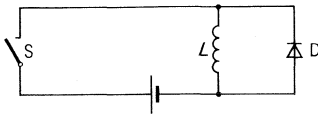


Figure 2
with diode D in parallel to coil L

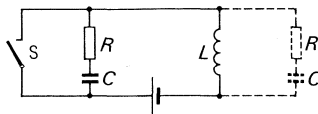


Figure 3
 RC combination in parallel to contact S
or in parallel to coil L

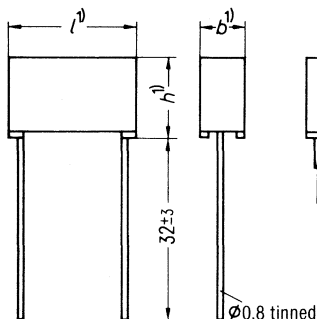
RC combinations

Rated voltage 250 V ac

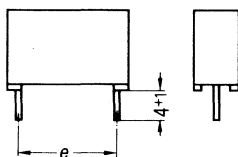
RC combination including a self-healing capacitor winding with polycarbonate dielectric and a series-connected fixed resistor, enclosed in rectangular plastic case with epoxy resin seal.

The components are provided with parallel leads in the lead spacing. Version C is particularly suitable for PC board mounting.

Version B



Version C



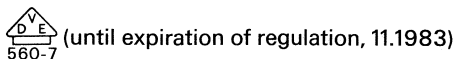
Dimensions in mm

¹) Max. dimension

Technical data

Test voltage	1200 V dc; 1 s, (layer to layer)
Permissible voltage peaks (max.)	1000 V (for ms)
Pulse repetition frequency	because of the arising inherent heating, the pulse repetition frequency must be limited such that the average power loss of 0.66 W or the maximum surface temperature of 85 °C/185 °F is not exceeded.
Capacitance tolerance	± 20%
Resistance tolerance	± 10%
Insulation resistance	≥ 30,000 MΩ
DIN climatic category	HPF (−25 to +85 °C/−13 to +185 °F; humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X capacitors the capacitors comply with the VDE specification 0560–7/11.67

Test symbol



Types

Rated value	Dimensions $b \times h \times l$ mm	Lead spacing e mm	Approx. weight g	Ordering code*) PU: 100
0,1 $\mu\text{F} + 22 \Omega$	8,5 \times 18,5 \times 27	22,5	8	B81921-C220-*11
0,1 $\mu\text{F} + 47 \Omega$				B81921-C470-*11
0,1 $\mu\text{F} + 100 \Omega$				B81921-C101-*11
0,1 $\mu\text{F} + 220 \Omega$				B81921-C221-*11
0,1 $\mu\text{F} + 470 \Omega$				B81921-C471-*11
0,18 $\mu\text{F} + 22 \Omega$	10,5 \times 19,0 \times 27	22,5	10	B81921-C220-*12
0,18 $\mu\text{F} + 47 \Omega$				B81921-C470-*12
0,18 $\mu\text{F} + 100 \Omega$				B81921-C101-*12
0,18 $\mu\text{F} + 220 \Omega$				B81921-C221-*12
0,18 $\mu\text{F} + 470 \Omega$				B81921-C471-*12
0,25 $\mu\text{F} + 22 \Omega$	11,0 \times 20,0 \times 32	27,5	12	B81921-C220-*14
0,25 $\mu\text{F} + 47 \Omega$				B81921-C470-*14
0,25 $\mu\text{F} + 100 \Omega$				B81921-C101-*14
0,25 $\mu\text{F} + 220 \Omega$				B81921-C221-*14
0,25 $\mu\text{F} + 470 \Omega$				B81921-C471-*14

*) When ordering, quote the code letter for the desired lead length (see dimensional drawings) for *:

- B = long leads;
- C = short leads.

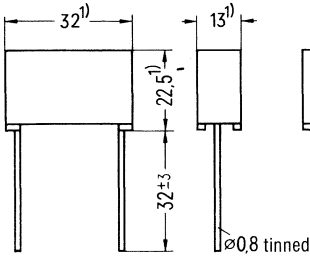
RC combinations

Rated voltage 380 V ac

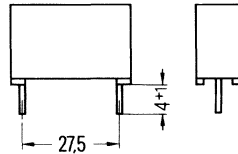
RC combination including a self-healing capacitor winding with polycarbonate dielectric and a series-connected fixed resistor, enclosed in rectangular plastic case with epoxy resin seal.

These components are provided with parallel leads in the lead spacing. Version G is particularly suitable for PC board mounting.

Version F



Version G



Dimensions in mm

¹⁾ Max. dimension

Technical data

Test voltage	1600 V dc; 1 s, (layer to layer)
Permissible voltage peaks (max.)	1200 V (for ms)
Pulse repetition frequency	because of the arising inherent heating the pulse repetition frequency must be limited such that the average power loss of 0.66 W or the maximum surface temperature of 85 °C/185 °F is not exceeded.
Capacitance tolerance	± 20%
Resistance tolerance	± 10%
Insulation resistance	> 30,000 MΩ
DIN climatic category	HPF (-25 to +85 °C/-13 to +185 °F; humidity category F)
IEC climatic category (IEC 68)	25/085/21
Specifications	as X capacitors the capacitors comply with the VDE specification 0560-7/11.67

Types

Rated value	Dimensions $b \times h \times l$ mm	Approx. weight g	Ordering code*) PU: 100
0,15 μF + 22Ω	13 × 22,5 × 32	15	B81921-C220-*18
0,15 μF + 47Ω			B81921-C470-*18
0,15 μF + 100Ω			B81921-C101-*18
0,15 μF + 220Ω			B81921-C221-*18
0,15 μF + 470Ω			B81921-C471-*18

) When ordering, quote the code letter for the desired lead length (see dimensional drawings) for:

- F = long leads
- G = short leads

RC combinations

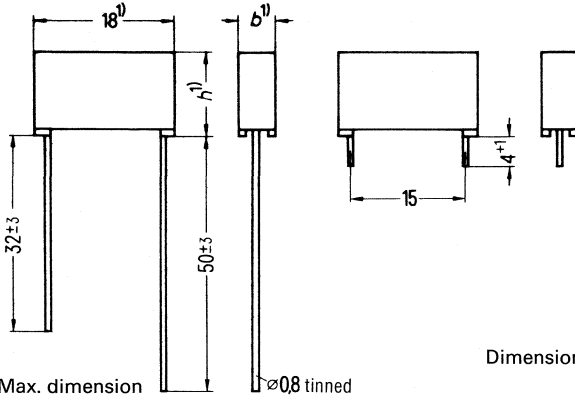
Rated voltage 250 V dc
100 V ac/50 Hz

RC combination consisting of a self-healing flat capacitor winding with polyester dielectric and vacuum deposited metal electrodes and a series-connected fixed resistor, enclosed in rectangular plastic case with epoxy resin seal.

The components are provided with parallel leads in the lead spacing. Version C is particularly suitable for PC board mounting.

Version B

Version C



Dimensions in mm

1) Max. dimension

∅0.8 tinned

Technical data

Peak voltage	325 V
Test voltage	350 V, 2s (layer to layer)
Capacitance tolerance	± 20%
Resistance tolerance	± 5%
Insulation resistance	≥ 30,000 MΩ
DIN climatic category	GPF (-40 to +85 °C/-40 to +185 °F; humidity category F)
IEC climatic category (IEC 68)	40/085/21
Specifications	DIN 44131

Types

Rated value	Dimensions $b \times h \times l$ mm	Approx. weight g	Ordering code*) PU: 200
0,047 μF + 470 Ω	5,5 × 11 × 18	2	B81923-C-*10
0,1 μF + 470 Ω			B81923-C-*7
0,22 μF + 100 Ω	7 × 13 × 18	3	B81923-C-*9
0,22 μF + 220 Ω			B81923-C-*8

*) When ordering, quote the code letter for the desired lead length (see dimensional drawings) for *:

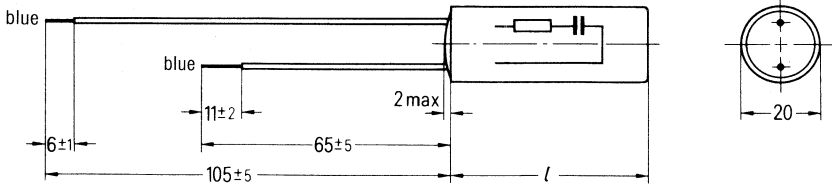
- B = long leads
- C = short leads

RC combinations

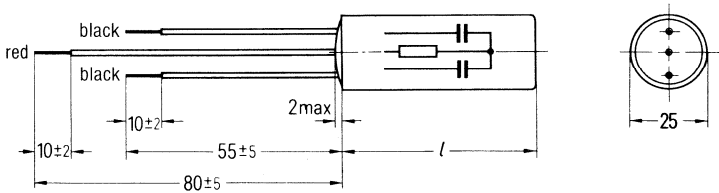
Rated voltage up to 500 V dc
up to 380 V ac

RC combination consisting of a capacitor winding with impregnated paper dielectric and metal foil electrodes and a series-connected fixed resistor, enclosed in a tubular aluminum case with epoxy resin seal.

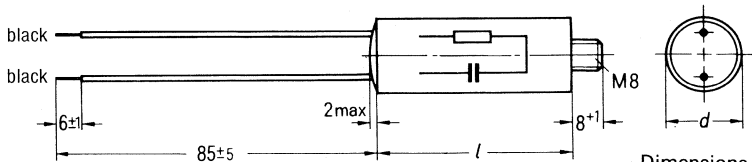
Leads 1 × 0.8 mm dia (YV) (configuration according to dimensional drawings).



Type B81921-A-B3
B81921-A-B21



Type B81921-A-B13



Type B81923-A-H5
B81923-A-B8

Dimensions in mm

Nuts are supplied loosely. Spring washers upon request.

Technical data

Peak voltage	1350 V
Test voltage	2500 V dc, 1 s (layer to layer) for $V_R = 380$ V ac 1600 V dc, 1 s (layer to layer) for $V_R = 250$ V ac 2500 V ac, 1 s (layer to case)
Capacitance tolerance	$\pm 20\%$
Resistance tolerance	$\pm 20\%$
Insulation resistance	≥ 6000 M Ω
Specifications	As X capacitors the capacitors comply with the VDE specifications 0560-7/11.67 and as X1 capacitors with VDE 0565-1

Test symbols

The types marked * have the VDE symbol

The types marked ** additionally have the SEV symbol



Types

Rated value	Rated voltage Vdc/Vac 50 Hz	DIN climatic category	Dimensions $d \times l$ mm	Approx. weight g	Ordering code
0,1 μ F (X) + 50 Ω	250/250	HPF -25 to + 85 °C/ -13 to + 185 °F Humidity category F	20 × 43	27	B81923-A-H5**
0,1 μ F (X) + 50 Ω	380/380	HSF -25 to + 70 °C/ -13 to + 158 °F Humidity category F	20 × 50	34	B81921-A-B3**
0,1 μ F (X) + 220 Ω		HSF -25 to + 70 °C/ -13 to + 158 °F Humidity category F	20 × 50		B81921-A-B21
2 × 0,1 μ F (X) + 50 Ω	500/380	HSF -25 to + 70 °C/ -13 to + 158 °F Humidity category F	25 × 50	48	B81921-A-B13*
0,2 μ F (X) + 50 Ω	250/250	HPF -25 to + 85 °C/ -13 to + 185 °F Humidity category F	25 × 50		B81923-A-B8**

Ordering code	PU
B81923-A-H5	200
B81921-A-B3	100
B81921-A-B21	100
B81921-A-B13	100
B81923-A-B8	200

EMI Suppression Chokes



EMI Suppression Chokes

RF chokes

General information

RF chokes are EMI suppression chokes of particularly small size. They are needed for audio and radio frequency decoupling of signal and control circuits, for filtering supply voltages, for the use in filters, and where electromagnetic compatibility (EMC) has to be ensured. Their field of application covers electronically controlled household appliances, devices of entertainment electronics, personal computers, board computers in vehicles, as well as professional equipment.

The RF chokes are suitable for automatic assembly.

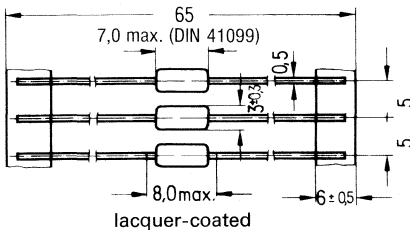
RF chokes

Rated current 0.08 to 1.1 A

MCC chokes

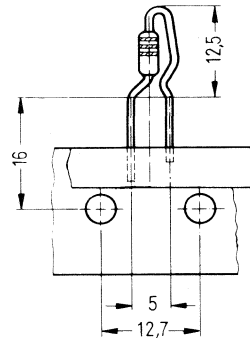
MCC (miniature cylindrical core) chokes are RF chokes comprising a copper-wire winding on special cylindrical ceramic (type B781+8-T3) or ferrite core. The plastic encapsulation is flame-retardant in accordance with UL94 V-0. Color coding is performed by rings in accordance with IEC publication 62*. Axial and radial (vertical) versions of the chokes are available on continuous tapes. The bent lead of the vertical version is insulated. The chokes are suitable for automatic assembly.

B78108-T taped



Dimensions in mm

B78148-T central-radially taped



Technical data

Rated inductance

0.1 ... 100 μ H
 measuring frequency 1 MHz for $L \leq 10 \mu$ H
 10 kHz for $L > 10 \mu$ H
 distance between measuring clamps 25.4 mm

Rated current

referred to 40°C/104°F ambient temperature

DC resistance

measured at 20°C/68°F
 distance between measuring clamps 25.4 mm

Quality

measured at quality test set-up HP 4342 A

Resonant frequency

absorption measurement in acc. with MIL-C 15305

DIN climatic category (DIN 40040)

FKF (-55 ... +125°C/-67 ... +257°F,
humidity category F)

IEC climatic category (IEC 68)

55/125/56

Resistance to soldering heat

Test Tb (DIN IEC 68-2-20) 260°C/500°F, 10 s

Tensile strength of the leads ≥ 20 N

RF choke assortment

The series of values between 1 and 100 μ H – covering 13 values of the E6 series – is also available in tape sections of 10 items, each, in an easy-to-use packing box.

Ordering code: B78108-X3

▾ to be preferred
 * basic unit: μ H

RF chokes

MCC chokes

Inductance L μH	Tolerance %	Quality at measuring frequency		Rated current $I_R^{2)}$ mA	DC resistance $R_{max}^{1)}$ Ω	Resonant frequency f_{min} MHz	Ordering code PU: 5000 ³⁾			
		Q_{min}	MHz							
0,10	±10 ≐K	40	25,2	1100	0,11	600	B781•8-T3101-x			
0,12		40	25,2	1000	0,12	570	B781•8-T3121-x			
0,15		38	25,2	1020	0,13	500	B781•8-T3151-x			
0,18		35	25,2	1000	0,14	460	B781•8-T3181-x			
0,22		35	25,2	990	0,16	420	B781•8-T3221-x			
0,27		35	25,2	910	0,17	380	B781•8-T3271-x			
0,33		35	25,2	830	0,20	330	B781•8-T3331-x			
0,39		±20 ≐M	35	25,2	790	0,22	300	B781•8-T3391-x		
0,47			35	25,2	750	0,25	280	B781•8-T3471-x		
0,56			35	25,2	700	0,28	260	B781•8-T3561-x		
0,68	35		25,2	530	0,48	240	B781•8-T3681-x			
0,82	35		25,2	500	0,55	230	B781•8-T3821-x			
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					570	0,30	150	B781•8-T1152-K		
1,8					540	0,30	130	B781•8-T1182-K		
2,2					520	0,35	120	B781•8-T1222-K		
2,7		480			0,40	110	B781•8-T1272-K			
3,3		45			7,96	420	0,50	110	B781•8-T1332-K	
3,9						400	0,55	100	B781•8-T1392-K	
4,7						380	0,65	90	B781•8-T1472-K	
5,6						260	1,30	75	B781•8-T1562-K	
6,8	50					7,96	250	1,45	70	B781•8-T1682-K
8,2			240	1,60			65	B781•8-T1822-K		
10			230	1,70			60	B781•8-T1103-x		
12			55	2,52			190	2,4	50	B781•8-T1123-x
15							185	2,7	45	B781•8-T1153-x
18							175	2,9	40	B781•8-T1183-x
22		170			3,2		30	B781•8-T1223-x		
27		160			3,6		27	B781•8-T1273-x		
33		60			2,52		150	4,1	24	B781•8-T1333-x
39							140	4,5	22	B781•8-T1393-x
47	100					8,5	20	B781•8-T1473-x		
56	100					8,8	18	B781•8-T1563-x		
68	95					10,0	15	B781•8-T1683-x		
82	90		11,5	14		B781•8-T1823-x				
100	85		12,5	11		B781•8-T1104-x				

* Here, the digit 0 or 4 is to be inserted (refer to table and type):

0 ≐ axial taping; 4 ≐ central-radial taping

x Here, the tolerance code letter is to be inserted: J ≐ ± 5 %; K ≐ ± 10 %; M ≐ ± 20 %

1) $R_{\vartheta_{amb}} = R_{max} \times (0.92 + 0.004 \vartheta_{amb}) = \text{max. dc resistance at } \vartheta_{amb}^{\circ}\text{C}$

2) $I_R = \text{max. dc current at } 40^{\circ}\text{C}$

$I_{\vartheta_{amb}} = \text{max. dc current at } \vartheta_{amb}^{\circ}\text{C} = 0.1175 I_R \sqrt{\frac{125 - \vartheta_{amb}}{1 + 0.00433 \vartheta_{amb}}}$ for $\vartheta_{amb} \geq 40^{\circ}\text{C}$

3) PU 2000 for B78148-T

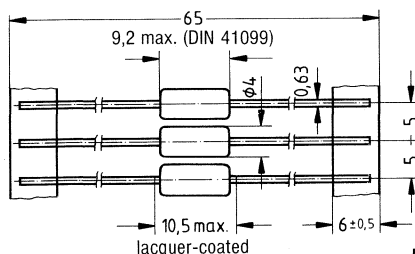
RF chokes

Rated current 0.05 to 1.2 A

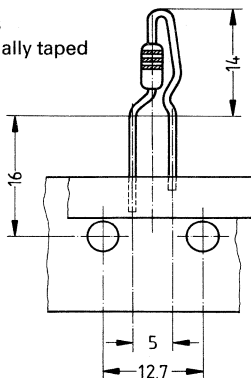
BC chokes

BC (bobbin core) chokes are RF chokes comprising a copper-wire winding on special ferrite drum core. The plastic encapsulation is flame-retardant in accordance with UL 94 V-0. Color coding is performed by rings in accordance with IEC publication 62*. Axial and radial (vertical) versions of the chokes are available on continuous tapes. The bent lead of the vertical version is insulated. The chokes are suitable for automatic assembly.

B78108-S taped



B78148-S central-radially taped



Dimensions in mm

Technical data

Rated inductance

1 ... 4700 μH

measuring frequency 1 MHz for $L \leq 10 \mu\text{H}$
10 kHz for $L > 10 \mu\text{H}$

distance between measuring clamps 25.4 mm

referred to 40°C/104°F ambient temperature

measured at 20°C/68°F

distance between measuring clamps 25.4 mm

measured at quality test set-up HP 4342 A

absorption measurement in acc. with MIL-C-15305

FKF (-55 ... +125°C/-67 ... +257°F,

humidity category F)

55/125/56

Rated current

DC resistance

Quality

Resonant frequency

DIN climatic category

(DIN 40040)

IEC climatic category (IEC 68)

Resistance to soldering heat

Test Tb (DIN IEC 68-2-20)

Tensile strength of the leads

260°C/500°F, 10 s

≥ 20 N

RF choke assortment

The series of values between 1 and 4700 μH – covering 23 values of the E6 series – is also available in tape sections of 10 items, each, in an easy-to-use packing box.

Ordering code: B78108-X1

▼ to be preferred
* basic unit: μH

RF chokes

BC chokes

Inductance L μH	Tolerance %	Quality at measuring frequency		Rated current $I_R^{2)}$ mA	DC resistance $R_{max}^{1)}$ Ω	Resonant frequency f_{min} MHz	Ordering code PU: 5000 ³⁾	
		Q_{min}	MHz					
1	±10 %	55	7,96	1200	0,16	205	B781•8-S1102-K	
1,2				1150	0,18	185	B781•8-S1122-K	
1,5				1100	0,20	165	B781•8-S1152-K	
1,8				1030	0,22	155	B781•8-S1182-K	
2,2				1000	0,25	140	B781•8-S1222-K	
2,7		≅ K		60	940	0,26	125	B781•8-S1272-K
3,3					900	0,29	115	B781•8-S1332-K
3,9					850	0,31	105	B781•8-S1392-K
4,7					820	0,34	95	B781•8-S1472-K
5,6					780	0,38	85	B781•8-S1562-K
6,8	65		670	0,51	75	B781•8-S1682-K		
8,2			690	0,48	50	B781•8-S1812-K		
10	±10 %	70	2,52	680	0,49	35	B781•8-S1103-x	
12				650	0,55	30	B781•8-S1123-x	
15	≅ K	60		610	0,60	20	B781•8-S1153-x	
18				580	0,67	17	B781•8-S1183-x	
22	±5 %	55		560	0,74	13	B781•8-S1223-x	
27				530	0,83	10	B781•8-S1273-x	
33	≅ J	50		500	0,92	9	B781•8-S1333-x	
39				470	1,02	8	B781•8-S1393-x	
47	±5 %	45		450	1,10	7,5	B781•8-S1473-J	
56		40		430	1,23	7,0	B781•8-S1563-J	
68		40	410	1,35	6,5	B781•8-S1683-J		
82		35	390	1,54	6,0	B781•8-S1823-J		
100		70	0,796	370	1,7	5,0	B781•8-S1104-J	
120				300	2,4	4,5	B781•8-S1124-J	
150				280	2,8	4,2	B781•8-S1154-J	
180				270	3,0	3,9	B781•8-S1184-J	
220				250	3,3	3,7	B781•8-S1224-J	
270				200	5,7	2,8	B781•8-S1274-J	
330	190			6,4	2,7	B781•8-S1334-J		
390	180			7,0	2,4	B781•8-S1394-J		
470	170			7,9	2,2	B781•8-S1474-J		
560	60			160	8,8	2,0	B781•8-S1564-J	
680	55	150	10,0	1,9	B781•8-S1684-J			
820	50	0,252	140	12,0	1,6	B781•8-S1824-J		
1000			130	14,0	1,6	B781•8-S1105-J		
1200			115	16,9	1,3	B781•8-S1125-J		
1500			100	21,6	1,25	B781•8-S1155-J		
1800			95	24,0	1,20	B781•8-S1185-J		
2200			40		80	34,7	1,10	B781•8-S1225-J
2700					75	40,0	1,00	B781•8-S1275-J
3300					62	59,5	0,90	B781•8-S1335-J
3900					59	66,0	0,80	B781•8-S1395-J
4700					55	74,0	0,70	B781•8-S1475-J

* Here, the digit 0 or 4 is to be inserted (refer to table and type):

0 ≅ axial taping; 4 ≅ central-radial taping

x Here the tolerance code letter is to be inserted J ≅ ± 5 %; K ≅ ± 10 %

1) $R_{max} = R_{20} = \text{max. dc resistance at } 20^\circ\text{C}$

$$R_{\vartheta_{amb}} = R_{20} \times (0.92 + 0.004 \vartheta_{amb}) = \text{max. dc resistance at } \vartheta_{amb}^\circ\text{C}$$

2) $I_R = \text{max. dc current at } 40^\circ\text{C}$

$$I_{\vartheta_{amb}} = \text{max. dc current at } \vartheta_{amb}^\circ\text{C} = 0.1175 I_R \sqrt{\frac{125 - \vartheta_{amb}}{1 + 0.00433 \vartheta_{amb}}} \cdot \text{for } \vartheta_{amb} \geq 40^\circ\text{C}$$

3) PU 2000 for B78148-S

EMI Suppression Chokes

VHF chokes

Types and application

VHF chokes are intended to reduce interference from every kind of small equipment and are specially suitable for blocking high frequency and for decoupling of communications, TV and radio equipment. They meet the requirements for a low dc resistance at small dimensions, low impedance at low frequencies, and high impedance in the RF and VHF range.

Chokes rated at different self-resonant frequencies should not be connected in series as harmful series resonance would otherwise develop in the range between the two self-resonant frequencies where one choke has an inductive impedance and the other a capacitive impedance.

The following versions are available:

- **VHF chokes with plastic core** with axial leads at both ends and encapsulation
The inductance of these chokes is unaffected by the operating current. They can thus be used in circuits, tuned to a stop frequency, and also where certain Q requirements have to be maintained.
- **VHF chokes with ferrite or carbonyl iron core**, with axial leads at both ends and insulating sleeve.
Contrary to chokes with plastic cores these chokes feature at the same dimensions a higher inductance and a substantially lower dc resistance and therefore a higher current carrying capability, as a result from the high effective permeability of the RF core material.
- **VHF chokes with six-aperture ferrite cores** with axial leads at both ends with or without insulating sleeve.
This type is preferred for wideband EMI suppression of electrical machines and installations in the short wave, RF and VHF range and for reduction of radiated interference from radio and TV sets. The magnetically closed core with a low external leakage field implies that the inductance of the choke largely depends on the current carrying capability. By suitable selection of the core material, maximum impedance is provided in the interesting frequency range between 50 and 200 MHz.

EMI Suppression Chokes

VHF chokes

Types and application

- **Damped VHF chokes (RL networks)** with special carbonyl iron core and axial leads at both ends and insulating sleeve.

For EMI suppression of electrical household appliances, electrical tools, and similar devices, chokes with inductances of some μH have to be applied to reduce RFI in the RF and VHF range.

Despite good interference suppression in the VHF range the chokes can cause significantly increased resonances of the interfering voltage at MW and SW frequencies. The increase in the interfering voltage is due to the effect of a resonant circuit set up by the inductance of the VHF choke and the stray capacitances of the interference source being effective to ground. These parasitic capacitances of the interference source are given by the design and construction of the interference source and cannot be influenced. The undesired increase in the interference voltage can be effectively avoided by using damped VHF chokes (*RL networks*) instead of the usual, low-loss VHF chokes. The damped VHF choke features such high losses over the frequency range in which the resonance may arise that an increased resonance doesn't occur.

When mounting VHF chokes, the following should be taken into consideration:

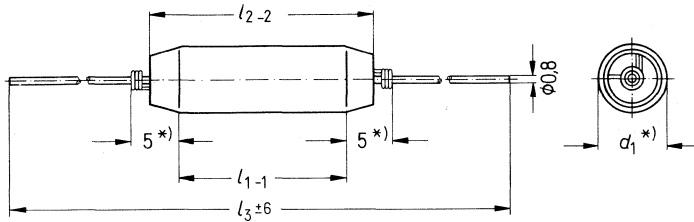
Pliers should be used to bend the leads **not closer than 5 mm** from the end of the choke core. In order to reliably avoid tearing of the winding wire, the soldered joint between winding and connecting lead should in no case lie in the bending range.

VHF chokes (ferrite or carbonyl iron core)

Rated voltage 500 V dc/ac
Rated current 0.1 to 10 A

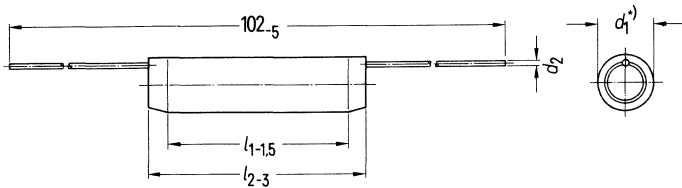
VHF choke with single layer-winding on cylindrical ferrite or carbonyl iron core with axial leads and insulating sleeve.

Type B82111-E-C with ferrite core
B82111-A-C with carbonyl iron core



l_1	l_3
10 to 15	83
20 to 25	93


Type B82111-B-C with ferrite core



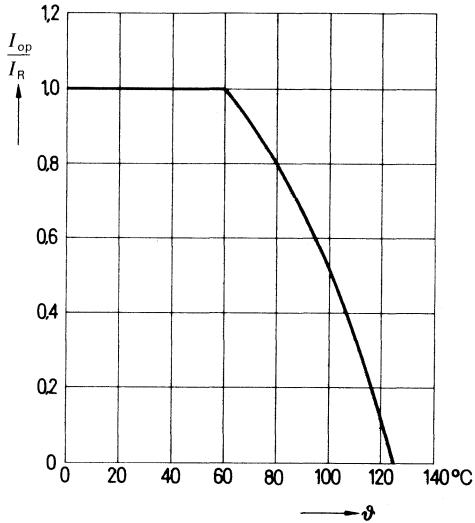
*) Max. dimension
Dimensions in mm

VHF chokes

Technical data

Test voltage	2500 V ac, 1 min (voltage strength of insulation)
Inductance tolerance	± 20 %
DIN climatic category	FKF (- 55 to + 125 °C / - 67 to + 257 °F, humidity category F)
IEC climatic category (IEC 68)	55/125/56
Marking	uncoded legend
Specifications	the EMI suppression chokes comply with the VDE specification O565-2
Test symbol	

Current carrying capability $\frac{I_{op}}{I_R}$
 versus ambient temperature ϑ



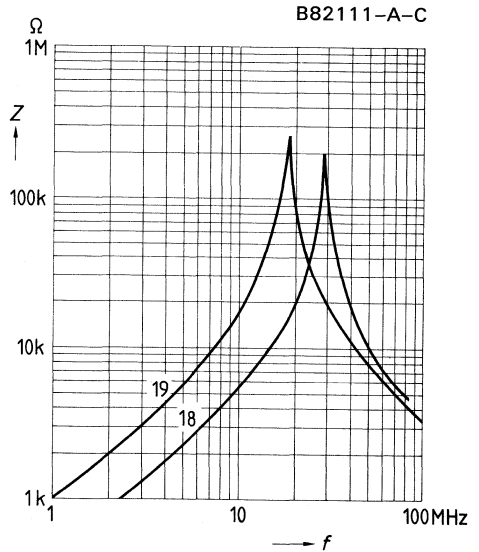
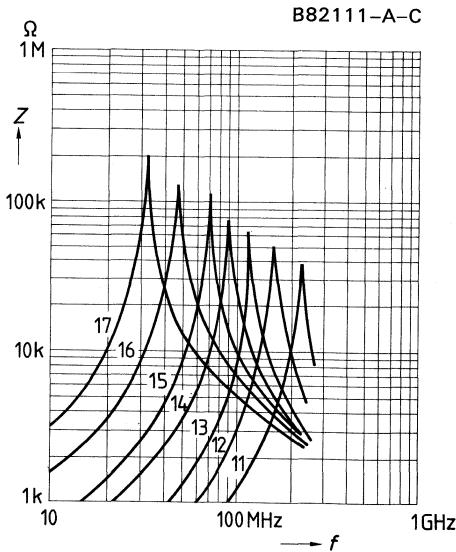
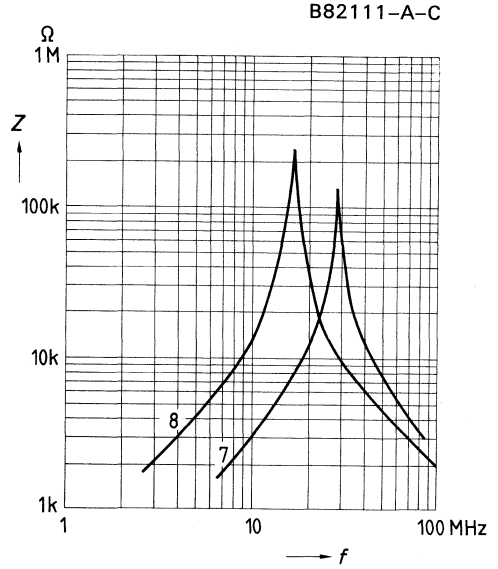
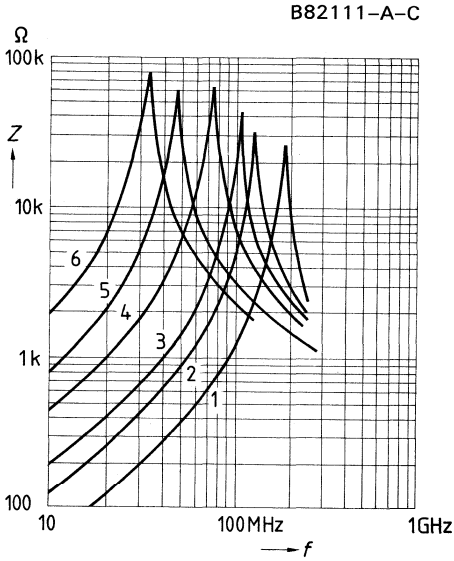
Types

Rated current	Rated inductance	Cold resistance at +20°C/68°F (typical value)	First resonant frequency (typical value)	Approx. weight	Dimensions				Ordering code B82111-
					l_1	l_2	d_1	d_2	
A	μH	mΩ	MHz	g	mm	mm	mm	mm	PU: 500
0,1	1 200	34000	16	2,2	20	24	6,0	0,8	-E-C29
0,15	100	19 000	18	1,0	10	13	4,0	0,8	-A-C8
	160	18 000	18	1,5	15	18	4,0	0,8	-A-C19
	350	19 000	10	2,3	20	24	6,0	0,8	-A-C29
	475	20 000	10	3,0	25	29	6,0	0,8	-A-C39
0,2	680	14 000	19	2,2	20	24	6,0	0,8	-E-C28
0,3	40	4 100	28	1	10	13	4,5	0,8	-A-C7
	70	4 500	27	1,5	15	18	4,5	0,8	-A-C18
	160	6 600	14	2,3	20	24	6,0	0,8	-A-C28
	230	7 200	14	3,0	25	29	6,0	0,8	-A-C38
0,4	470	6 500	25	2,3	20	24	6,0	0,8	-E-C27
	30	2 700	32	1,0	10	13	4,5	0,8	-A-C6
	50	3 000	31	1,5	15	18	4,5	0,8	-A-C17
	130	4 800	16	2,4	20	24	6,0	0,8	-A-C27
0,5	160	3 800	17	3,2	25	29	6,0	0,8	-A-C37
	220	2 600	32	2,3	20	24	6,5	0,8	-E-C26
0,7	14	760	46	1,0	10	13	4,5	0,8	-A-C5
	23	730	47	1,5	15	18	4,5	0,8	-A-C16
	55	1 300	24	2,6	20	24	6,5	0,8	-A-C26
	75	1 300	25	3,3	25	29	6,5	0,8	-A-C36
1	100	650	55	2,5	20	24	6,5	0,8	-E-C25
1,5	6	190	73	1,0	10	13	4,5	0,8	-A-C4
	10	230	70	1,5	15	18	4,5	0,8	-A-C15
	25	340	36	2,7	20	24	6,5	0,8	-A-C25
	30	350	38	3,6	25	29	6,5	0,8	-A-C35
	56	300	70	2,7	20	24	6,5	0,8	-E-C24
2	3	77	105	1,0	10	13	4,5	0,8	-A-C3
	6	120	92	1,5	15	18	5,0	0,8	-A-C14
	15	165	42	2,9	20	24	6,5	0,8	-A-C24
	17	63	100	3,0	18,3	24	7,0	0,45	-B-C14
	20	170	48	3,8	25	29	6,5	0,8	-A-C34
3	40	180	90	3,0	20	24	7,0	0,8	-E-C23
	2	45	125	1,0	10	13	5,0	0,8	-A-C2
	3	38	130	1,5	15	18	5,0	0,8	-A-C13
	8	25	145	3,0	18,3	24	7,0	0,63	-B-C13
	10	87	60	3,0	20	24	7,0	0,8	-A-C23
4	12	83	62	4,2	25	29	7,0	0,8	-A-C33
	13	24	170	3,5	24,5	29	6,5	0,67	-B-C19
	20	54	125	3,5	24,5	29	6,0	0,5	-B-C20
	22	70	110	3,3	20	24	7,0	0,8	-E-C22
	25	46	85	6,0	28,5	34	8,5	0,63	-B-C24
6	1	15	180	1,0	10	13	5,0	0,8	-A-C1
	2	20	175	1,5	15	18	5,5	0,8	-A-C12
	5	34	80	3,2	20	24	7,0	0,8	-A-C22
	6	17	170	3,0	18,3	24	7,5	0,75	-B-C12
	7	35	80	4,6	25	29	7,5	0,8	-A-C32
	11	20	150	6,0	24,5	29	6,5	0,71	-B-C18
	12	40	140	3,5	20	24	7,5	0,8	-E-C21
15	24	120	7,0	28,5	34	8,5	0,75	-B-C23	
9	1	11	225	1,5	15	18	5,5	0,8	-A-C11
	3	18	100	3,5	20	24	7,5	0,8	-A-C21
	4	14	205	4,0	18,3	24	7,5	0,8	-B-C11
	5	23	96	5,0	25	29	7,5	0,8	-A-C31
	6	10	200	5,0	24,5	29	7,0	0,95	-B-C17
	7	20	180	3,6	20	24	7,5	0,8	-E-C20
10	9	12	150	8,0	28,5	34	9,0	0,95	-B-C22
	3	6	220	5,0	24,5	29	7,5	1,2	-B-C16
10	5	5	175	10,0	28,5	34	9,5	1,3	-B-C21

VHF chokes

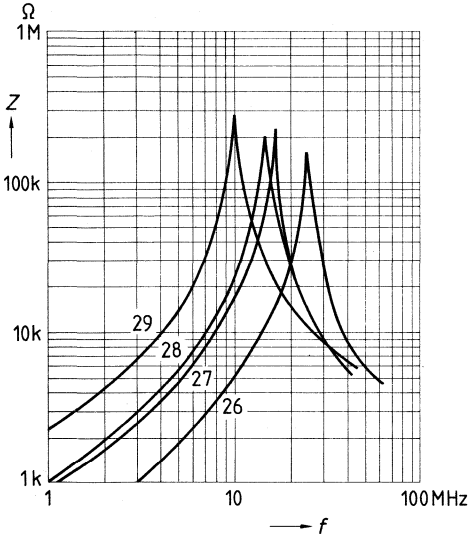
Impedance Z versus frequency f (typical values)

The following impedance characteristics have been measured in accordance with VDE 0565-2.

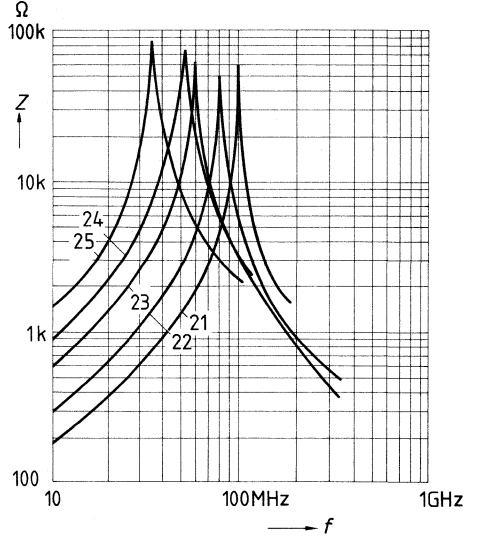


Impedance Z versus frequency f (typical values)

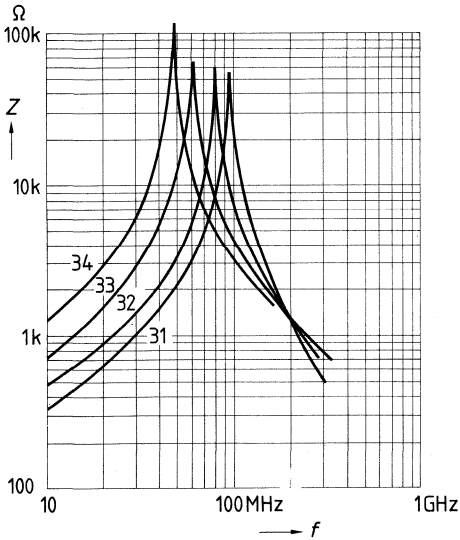
B82111-A-C



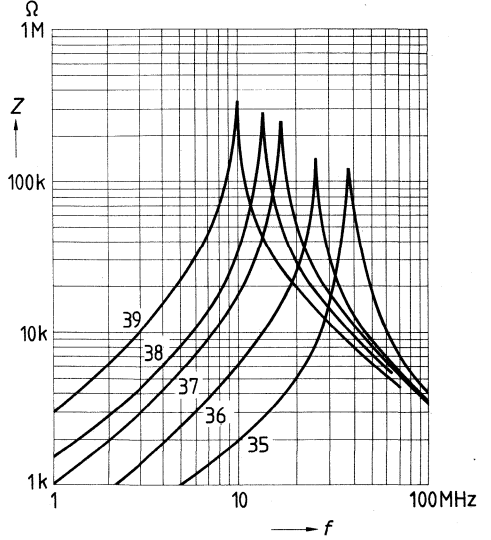
B82111-A-C



B82111-A-C

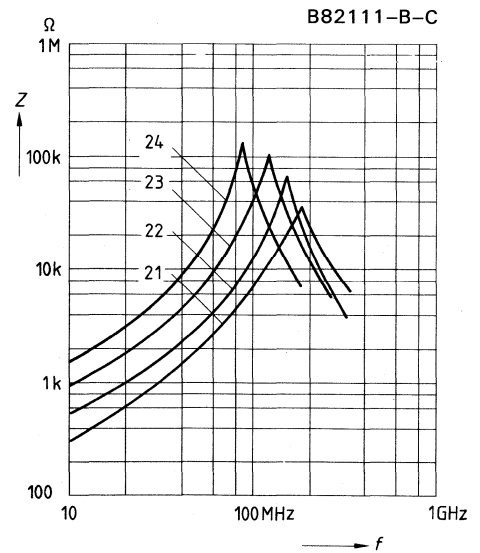
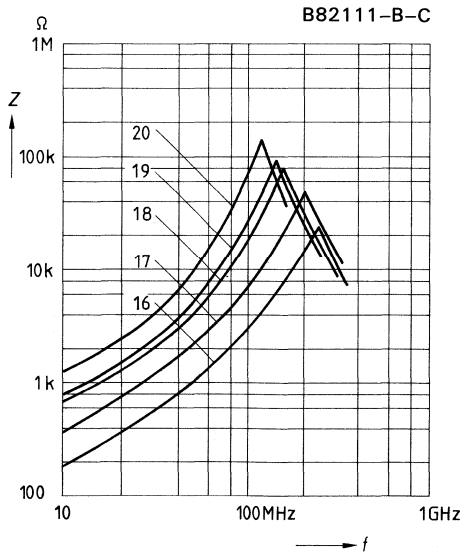
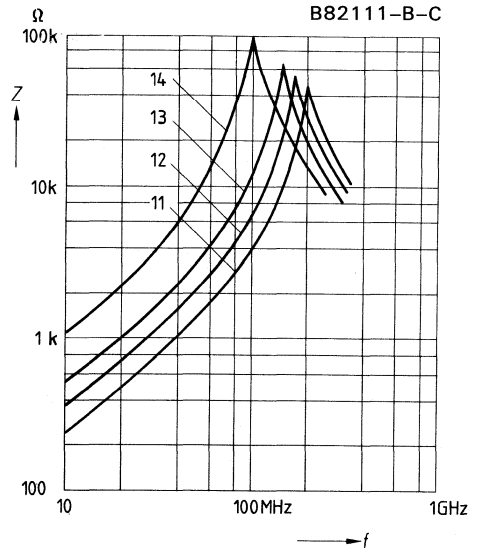
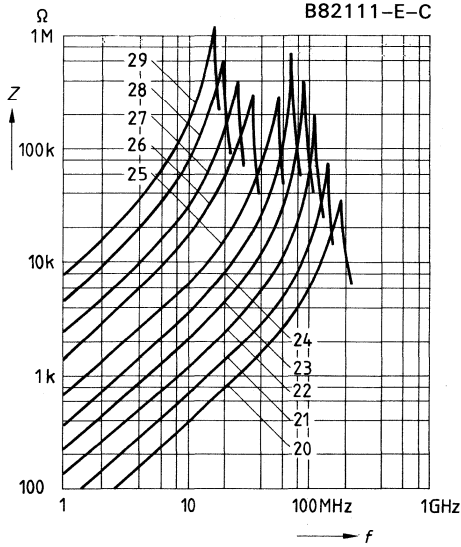


B82111-A-C



VHF chokes

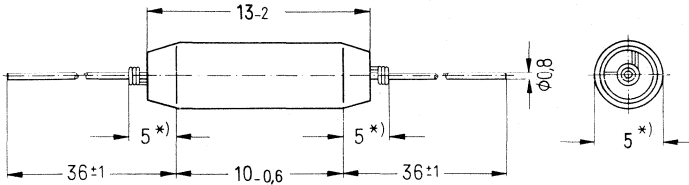
Impedance Z versus frequency f (typical values)



VHF chokes
with plastic core

Rated voltage 500 V dc/ac
Rated current 0.7 to 1.5 A

VHF chokes with single-layer winding on a plastic core, axial leads and insulating sleeve.



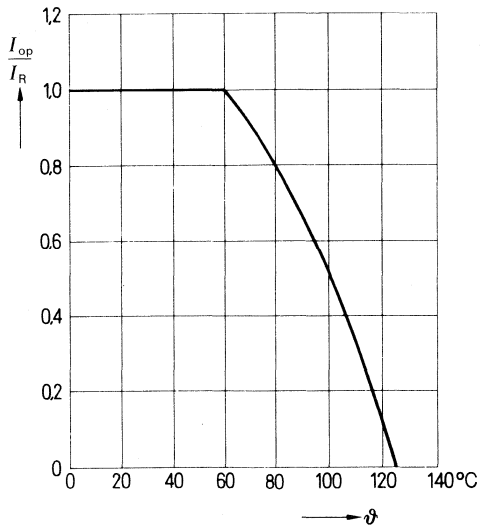
*) Max. dimension

Dimensions in mm

Technical data

Test voltage	2500 V ac, 1 min (voltage strength of insulation)
Inductance tolerance	± 20 %
DIN climatic category	FKF (-55 to +125 °C / -67 to +257 °F, humidity category F)
IEC climatic category (IEC 68)	55/125/56
Marking	uncoded legend
Specifications	the EMI suppression chokes comply with the VDE specification 0565-2

Current carrying capability $\frac{I_{op}}{I_R}$
versus ambient temperature ϑ

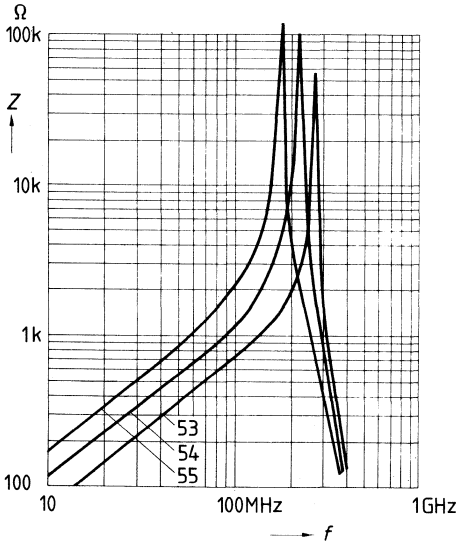


VHF chokes

Types

Rated current	Rated inductance	Cold resistance at +20°C/68°F (typical value)	First resonant frequency (typical value)	Ordering code
A	μH	mΩ	MHz	PU: 500
0,7	3	760	165	B82112-D-C55
1	2	400	210	B82112-D-C54
1,5	1	180	245	B82112-D-C53

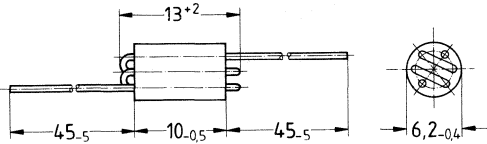
Impedance Z versus frequency f (typical values)



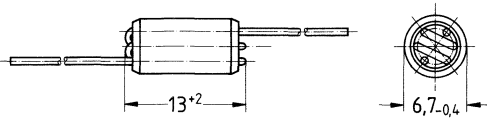
**VHF chokes
with tubular six-aperture ferrite cores**

**Rated voltage 250 V dc/ac¹⁾
Rated current max. 1 A**

VHF chokes of a ferrite core with 6 axial holes to take up the winding, with and without insulating sleeve. By suitable selection of core material, maximum impedance is provided in the interesting frequency range between 50 and 200 MHz.



Type B82114-R-A*



Type B82114-R-C*

Wire gauge 0.5 mm (tinned)

Dimensions in mm

Application for broadband interference suppression in electrical apparatus and appliances in the RF and VHF range, and to reduce the radiated interference from radio and TV receivers.

Technical data

Test voltage	2500 V ac, 1 min (only for insulated types)
Rated current	max. 1 A
Approx weight	1.3 g
Specifications	The EMI suppression chokes comply with the VDE specifications 0550-1 and VDE 0565-2.

Test symbol 

applied for 

Version	without insulating sleeve	with insulating sleeve
DIN climatic category (DIN 40040)	FZF - 55 to +120 °C / - 67 to +248 °F	HQF - 25 to +80°C / - 13 to +176 °F Humidity category F

¹⁾ only for types with insulated sleeves.

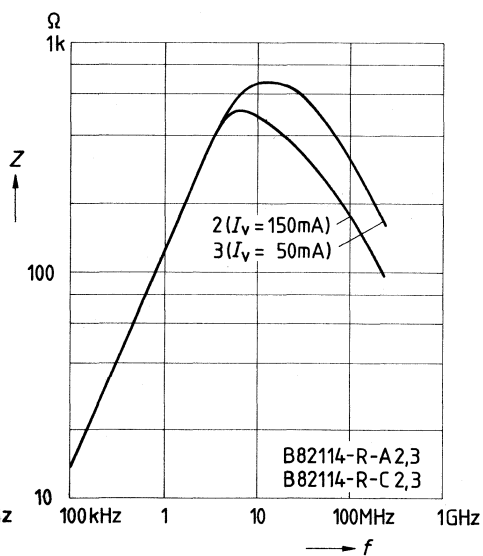
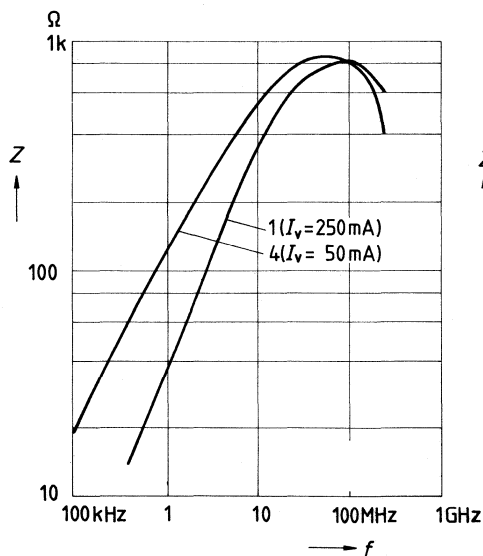
▼ to be preferred

VHF chokes

Types

Resonant frequency f_R MHz	Impedance Z at f_R Ω	Color code	No. of turns	Ordering code	
				PU: 500 uninsulated	PU: 500 insulated
5	500	white	2,5	B82114-R-A2	B82114-R-C2
15	700	red		B82114-R-A3	B82114-R-C3
60	900	brown		B82114-R-A4	B82114-R-C4
100	800	green		B82114-R-A1	B82114-R-C1

Impedance Z versus frequency f
 I_V : dc premagnetizing current

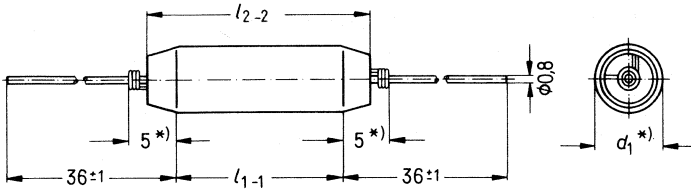


▼ to be preferred.

Damped VHF chokes (RL networks)

Rated voltage 500 V dc/ac
 Rated current 1.5 to 6 A

VHF chokes with single-layer winding on a cylindrical carbonyl iron core, axial leads and insulating sleeve.



*) Max. dimension

Dimensions in mm

Technical data

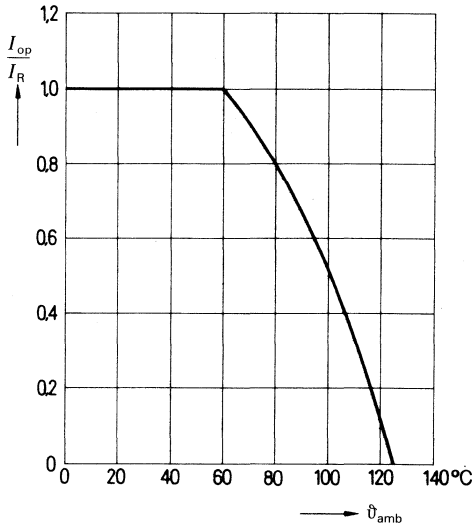
Test voltage	2500 V ac, 1 min (voltage strength of insulation)
Inductance tolerance	± 25 %
DIN climatic category	FKF (-55 to +125°C/-67°C to +257°F, humidity category F)
IEC climatic category (IEC 68)	55/125/56
Marking	uncoded legend
Specifications	the EMI suppression chokes comply with the VDE specification 0565-2

Test symbol



Damped VHF chokes (RL networks)

Current carrying capability $\frac{I_{op}}{I_R}$ versus ambient temperature ϑ



Types

Rated current	Rated inductance	DC resistance (typical value) at +20°C/68°F	Dimensions			Approx. weight	Ordering code
			l_1	l_2	d_1		
A	μH	$\text{m}\Omega$	mm			g	PU: 500
1,5	10	260	15	18	4,5	1,3	B82121-A-C15
1,5	25	345	20	24	6,5	2,7	B82121-A-C25
2	15	175	20	24	6,5	2,8	B82121-A-C24
3	12	90	25	29	7,0	4,3	B82121-A-C33
4	7	40	25	29	7,5	5	B82121-A-C32
6	5	25	25	29	7,5	5	B82121-A-C31

EMI Suppression Chokes

I-core chokes

General technical information

I-core chokes are used to attenuate symmetrical as well as unsymmetrical interference voltages. Their inductance is highly independent of the operating premagnetizing current. The low inherent capacitance of the windings is obtained by dividing the tubular wire winding into sections or by a single-layer, wound on edge.

I-core chokes generally utilize laminated transformer grade iron cores with windings applied on plastic coil formers.

The number of turns determines whether the chokes are designed as single or double units. Terminations may be flying leads or by connecting terminals. Simple means of fixing are provided. For use in printed circuit boards, sealed versions with connecting pins in the lead spacing are available.

Technical data

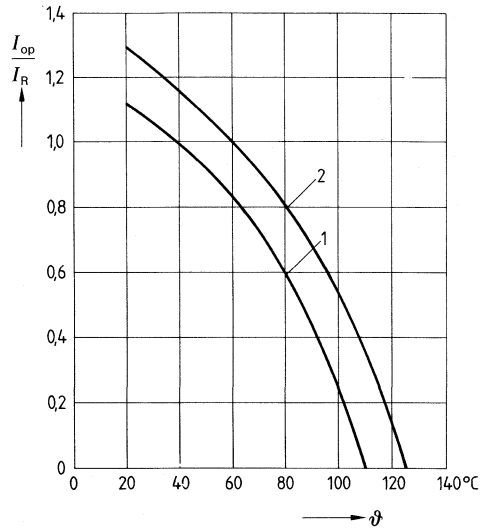
Specifications	The chokes comply with the VDE specifications O550-6 and VDE O565-2
DIN climatic category	
Open chokes	G L F - 40 to + 110°C/humidity category F - 40 to + 230°F Exceptions: B82503-U-A (GKC) B82523-T-A (GKC)
Sealed chokes	G K C - 40 to + 125°C/humidity category C - 40 to + 257°F
Rated inductance	measured in acc. with VDE O565-2 at 160 kHz for $L \leq 1$ mH at 16 kHz for $L > 1$ mH
Inductance tolerance	± 20 %
DC resistance	typical values, measured in accordance with VDE O565-2 at 20°C/68°F
Rated voltage	the quoted rated voltage is the insulating voltage applicable under operating conditions between windings or between one winding and accessible metal parts (VDE O565-2)
Test voltage ¹⁾	2800 V ac, 2s, (winding to core, for multiple chokes also winding to winding) 2800 V ac, 2s, (winding to case) Exception: B82500..., see data sheet
Rated current	depending on the type 0.1 A dc or ac up to 700 A dc/ 550 A ac referred to 50 Hz and 40 or 60°C/104 or 140°F room temperature. Operating current at 400 Hz: see individual data sheets

¹⁾ Repetition test in accordance with VDE O550, part 1, § 28, para. 2.2

EMI Suppression Chokes

I core chokes

Permissible operating current I_{op}
versus ambient temperature ϑ



Curve 1:

Choke, open version (rated current referred to $\vartheta_{amb} = 40^\circ\text{C}/104^\circ\text{F}$)

Curve 2:

Choke, sealed version (rated current referred to $\vartheta_{amb} = 60^\circ\text{C}/140^\circ\text{F}$)

EMI Suppression Chokes

I core chokes

Technical data

Thermal characteristics

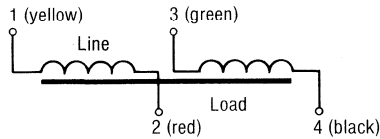
(measurement of the heating in accordance with VDE 0550; part 1, § 13)

Version	Open chokes	Sealed chokes
Room temperature	40°C/104°F	60°C/140°F
Excess temperature of the winding (at rated current)	<60°C/140°F	<55°C/131°F
Maximum permissible temperature of the winding	100°C/212°F	115°C/239°F

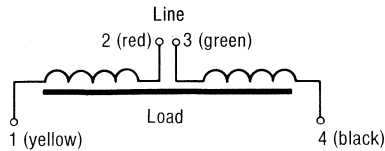
Designation of terminals and choke circuits



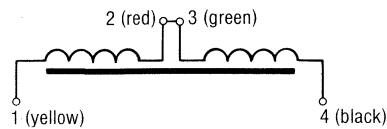
Single choke



Double choke
effective for unsymmetrical
interference voltage
1 and 3 to be connected to line,
2 and 4 to load.



Double choke
effective for symmetrical
interference voltage,
2 and 3 to be connected to line,
1 and 4 to load.



Double choke
(used as single choke)
2 and 3 must be connected close
together. About 3 times the
inductance of each winding
obtains between 1 and 4.

The color code given in brackets refers to chokes with insulated leads.

EMI Suppression Chokes

I core chokes

Summary of types Single chokes

Rated current	Rated voltage 250V \approx	Rated voltage 500 V~/600 V- sealed	Rated voltage 380 V~/450 V-	Rated voltage 500 V~/500 V-	Rated voltage 750 V~/900 V-				
						B82500-	B82501-	B82502-	B82503-
50 Hz									
0,1	-B-A1 8,2/65	-W-A1 68/90							
0,2	-B-A2 3,9/20	-W-A2 18/25	-D-A2 69/34						
0,5	-B-A5 0,82/2/5	-W-A5 2,7/4	-D-A5 14/5,7	-U-A5 47/10					
1	-B-A8 0,33/0,7	-W-A8 3,3/1,9	-D-A8 3,8/1,6	-U-A8 15/2,7					
2	-B-A10 0,12/0,2	-W-A10 0,18/0,3	-D-A10 0,68/0,55	-U-A10 3,3/0,7					
4				-W-A2 2,0/0,33					
6			-D-A13 0,07/0,07	-W-A3 5,0/0,35					
10				-W-A4 1,2/0,054					
16				-W-A5 1,5/0,045					
25				-W-A6 1,4/0,03					
35				-W-A7 0,55/0,016					
40				-W-A7 0,056/0,006					
60				-W-A8 0,08/0,0035					
75									
125 A~									
250 A~									
200 A~									
270 A~									
230 A~									
350 A~									
275 A~									
700 A~									
550 A~									

The table contains e. g.:

B82502-D-A10 _____ Type

0,75/0,5 _____

_____ Direct current resistance in Ω

_____ Rated inductance in mH

V - = V dc, V~ = V ac

EMI Suppression Chokes

I core chokes

Summary of types Double chokes

Rated current A \approx	Rated voltage		Rated current 500 V~/500 V-	B82525-	B82526-	B82527-
	500 V~/600 V-/ 380 V~/440V-	380 V~/440V-				
50 Hz	B82522-	B82522-	B82524-	B82525-	B82526-	B82527-
0.1	sealed -V-C1 68/50 -V-C2 33/25	-C-A1 64/50 -C-A2 23/16				
0.2	-V-C3					
0.3	12/12					
0.5	-V-C5 5,6/4,5 -V-C8	-C-A5 4,7/3,2 -C-A8				
1	1,2/1 -V-C10	1,25/0,8 -C-A10	-V-A2 3/0,68 -V-A3			
2	0,33/0,3	0,32/0,3	0,45/0,175 -V-A4 -V-A5	1,8/0,24 -V-A2 -V-A3		
4			0,22/0,1 -T-A13 0,082/0,05 -T-A14	1,8/0,24 -V-A3 -V-A4 -V-A5		
6			0,045/0,012 -V-A6 -V-A7	1,8/0,24 -V-A3 -V-A4 -V-A5		
10			0,022/0,0045 -V-A6 -V-A7	1,8/0,24 -V-A3 -V-A4 -V-A5		
16			0,015/0,003 -V-A7	1,8/0,24 -V-A3 -V-A4 -V-A5		
25			0,0025/0,0018 -V-A8	1,8/0,24 -V-A3 -V-A4 -V-A5		
35			0,0028/0,0018 -V-A8	1,8/0,24 -V-A3 -V-A4 -V-A5		
40			0,028/0,001 -V-A8	1,8/0,24 -V-A3 -V-A4 -V-A5		
60				1,8/0,24 -V-A3 -V-A4 -V-A5		
75				1,8/0,24 -V-A3 -V-A4 -V-A5		

The table contains e. g.:

B82522-C-A1 _____ Type

64/50

_____ Direct current resistance in Ω

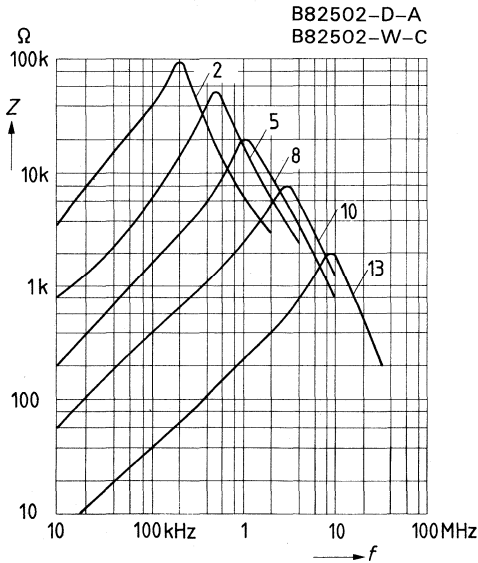
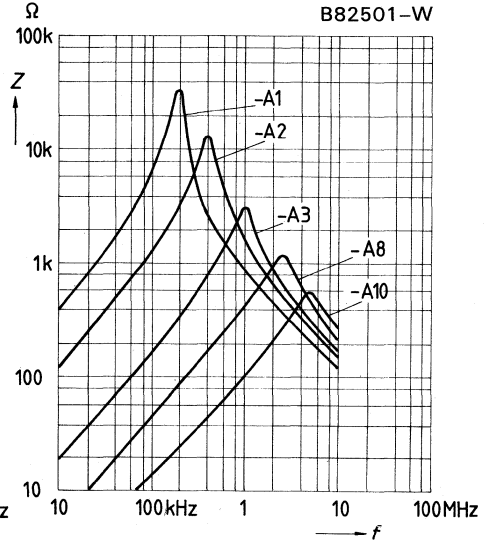
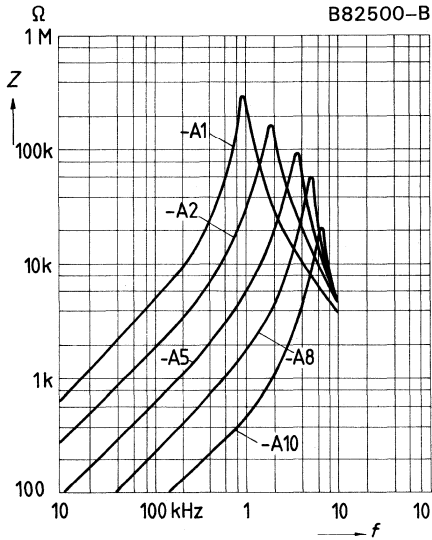
_____ Rated inductance in mH

V- = V dc, V~/ = V ac

EMI Suppression Chokes

I core chokes

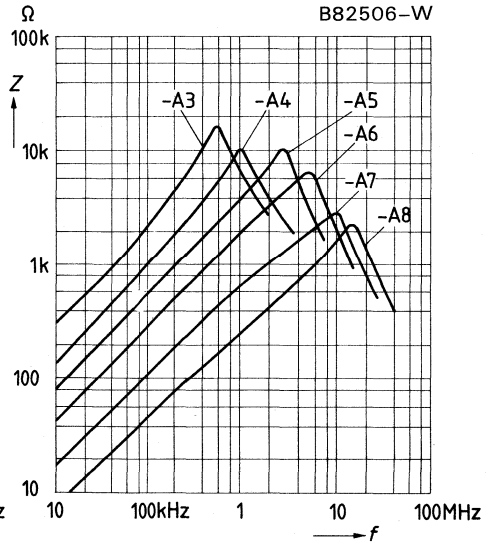
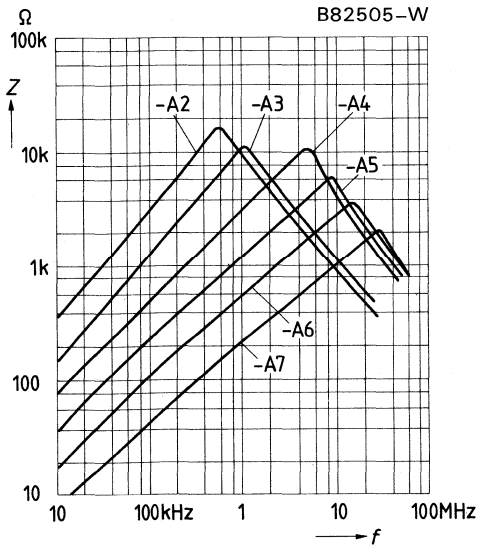
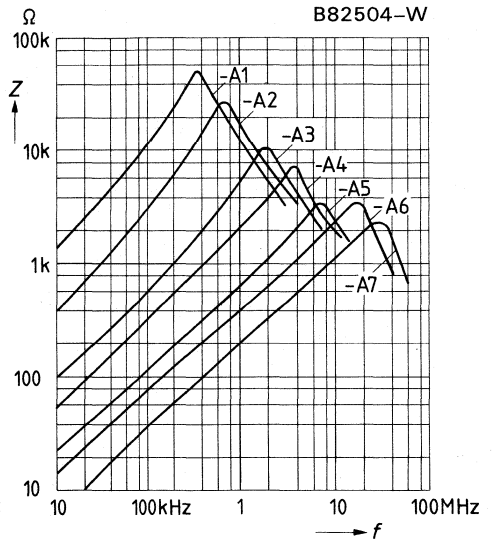
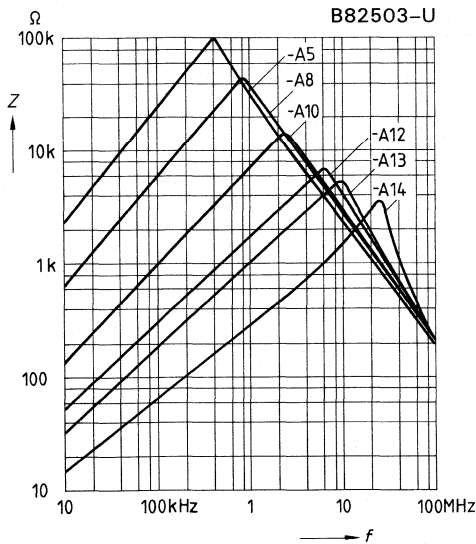
Impedance Z versus frequency f (typical values)



EMI Suppression Chokes

I core chokes

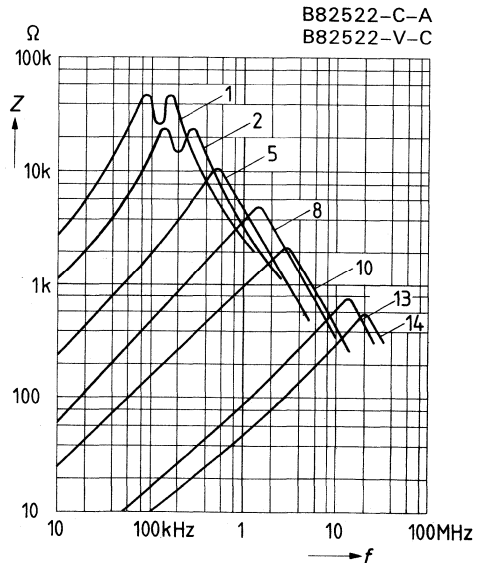
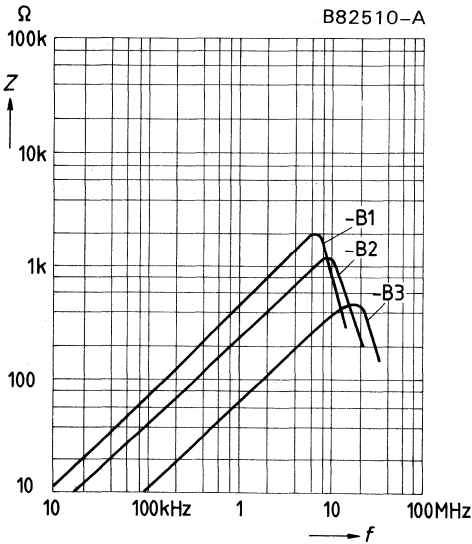
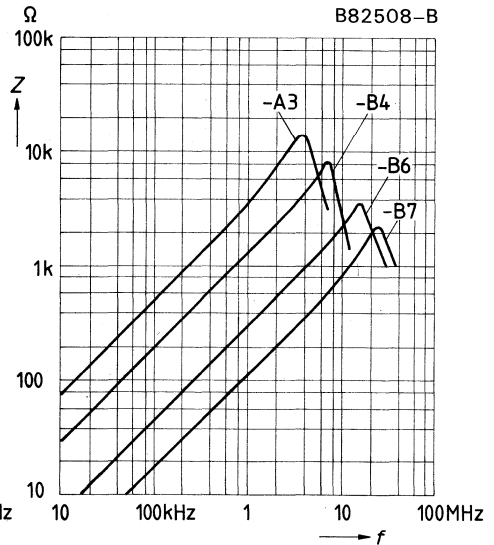
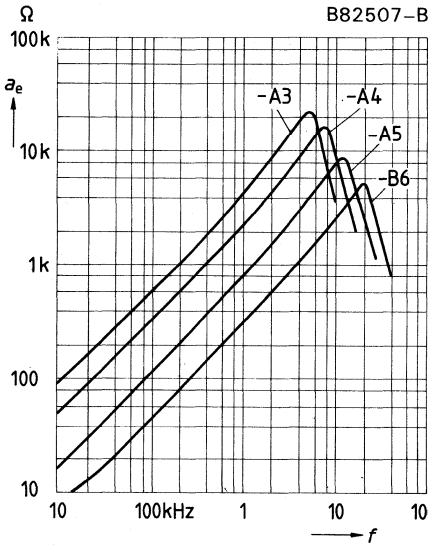
Impedance Z versus frequency f (typical values)



EMI Suppression Chokes

I core chokes

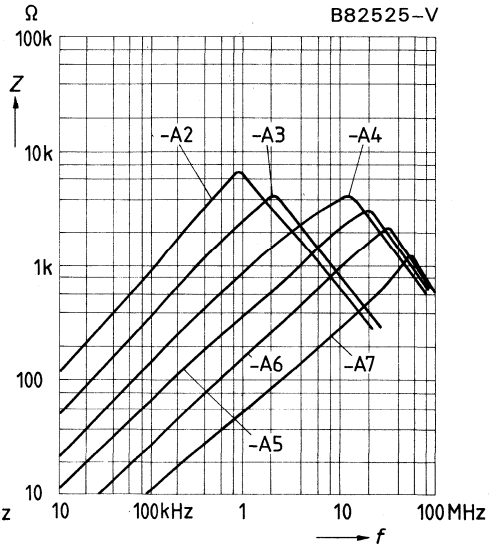
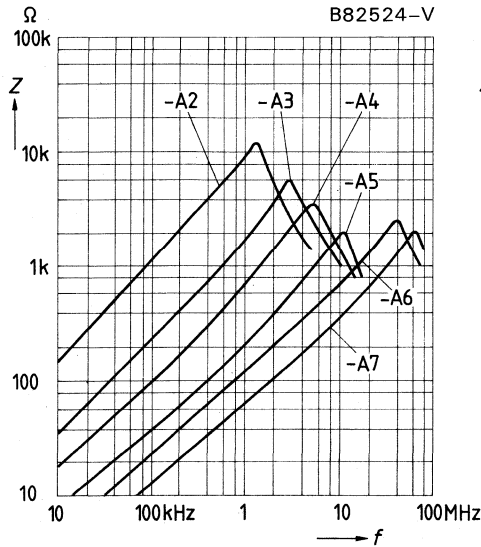
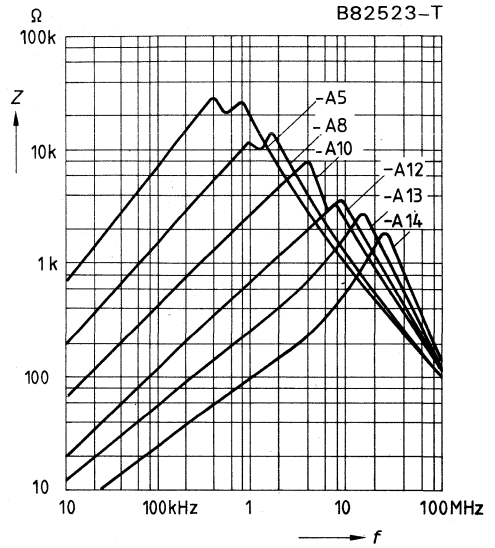
Impedance Z versus frequency f (typical values)



EMI Suppression Chokes

I core chokes

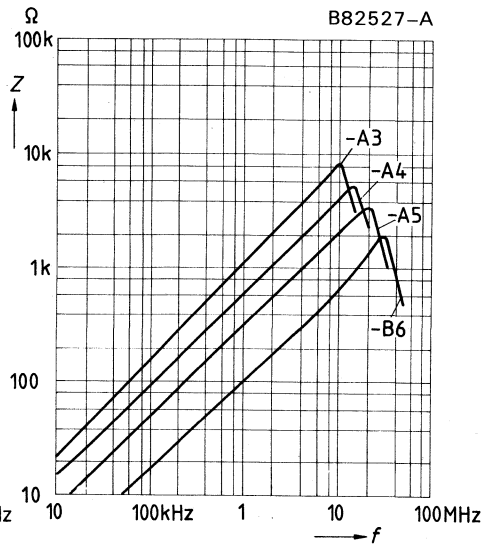
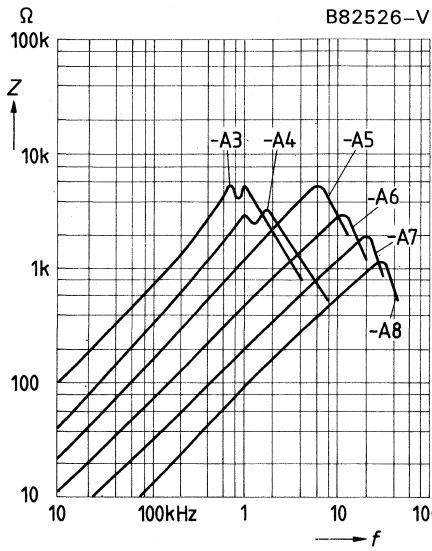
Impedance Z versus frequency f (typical values)



EMI Suppression Chokes

I core chokes

Impedance Z versus frequency f (typical values)

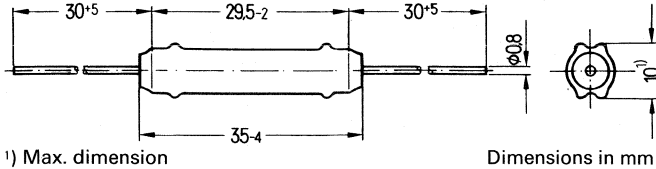


I core single chokes



Rated voltage 250 V ac
Rated current 0.1 to 2 A

Tubular choke body of ferrite material with winding and shrunk sleeve encapsulation. The particularly low-capacity choke design guarantees excellent RF characteristics.

Axial leads



Technical data

Permissible voltage	250 V dc
Rated current	referred to 50 Hz and +40°C/104°F room temperature
Dielectric strength of insulation	test voltage 1500 V ac, 1 min.
Approx. weight	7 g
Test symbol	 (for B82500-B-A5/8/10)
applied for	

For further details refer to "Technical data on I core chokes".

Types

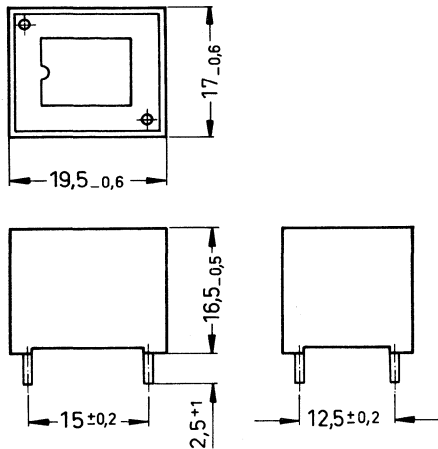
Rated current	Rated inductance	DC resistance (typical value)	Ordering code
A		Ω	PU: 100
0,1	8,2 mH	65	B82500-B-A1
0,2	3,9 mH	20	B82500-B-A2
0,5	820 μH	2,5	B82500-B-A5
1,0	330 μH	0,7	B82500-B-A8
2,0	120 μH	0,2	B82500-B-A10

▼ to be preferred

I core single chokes

Rated voltage 500 V ac
Rated current 0.1 to 2 A

Choke body with low capacity winding; enclosed in rectangular plastic case with epoxy resin seal. Terminal pins in the lead spacing; suitable for use in PC boards.



Dimensions in mm

Terminal pins 0.8 mm dia

Technical data

Permissible voltage 600 V dc
 Rated current referred to 50 Hz and +60°C/140°F room temperature
 Approx. weight 15 g
 Specifications (additional) Insulation group C in accordance with VDE 0110.
 For further details refer to "Technical data on I core chokes".

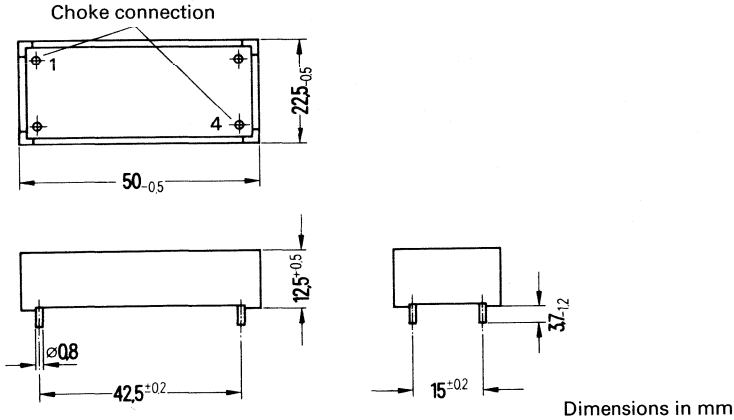
Types

Rated current	Rated inductance	DC resistance (typical value) Ω	Ordering code
A			PU: 50
0,1	68 mH	90	B82501-W-A1
0,2	18 mH	25	B82501-W-A2
0,5	2,7 mH	4	B82501-W-A5
1,0	560 μH	0,9	B82501-W-A8
2,0	180 μH	0,3	B82501-W-A10

I core single choke

Rated voltage 500 V ac
 Rated current 0.2 to 2 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.
 Terminal pins in the lead spacing.



Technical data

Permissible voltage 600 V dc
 Rated current referred to 50 Hz and +60°C/140°F room temperature
 Permissible operating current at 400 Hz $0.75 \times I_R$
 Approx. weight 40 g
 Specifications (additional) Insulation group C in accordance with VDE 0110.
 For further details refer to "Technical data on I core chokes".

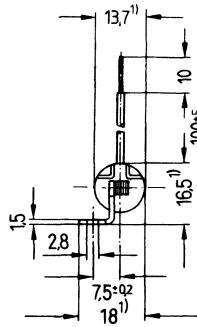
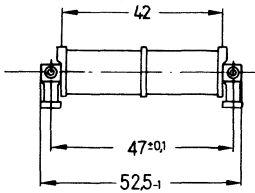
Types

Rated current	Rated inductance	DC resistance (typical value)	Ordering code
A		Ω	PU: 50
0,2	82 mH	45	B82502-W-C2
0,5	15 mH	8,5	B82502-W-C5
▼1	3,3 mH	1,9	B82502-W-C8
2	680 μ H	0,55	B82502-W-C10

▼ to be preferred

I core single chokes

Rated voltage 380 V ac
 Rated current 0.2 to 6 A



¹) Max. dimension

Dimensions in mm

Technical data

Permissible voltage 450 V dc
 Rated current referred to 50 Hz and +40°C/104°F room temperature
 Approx. weight 25 to 35 g
 Specifications (additional) Resistance to tracking: Group KA 1 in accordance with DIN 53480
 Insulation group B in accordance with VDE 0110.

Test symbol

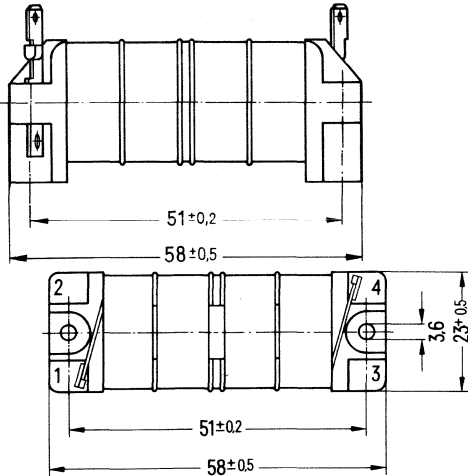


For further details refer to "Technical data on I core chokes".

Types

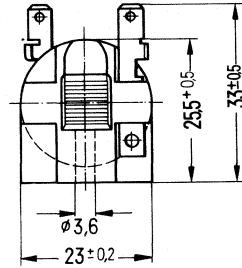
Rated current	Rated inductance	DC resistance (typical value) Ω	Ordering code
A			PU: 50
0,2	69 mH	34	B82502-D-A2
0,5	14 mH	5,7	B82502-D-A5
1	3,8 mH	1,6	B82502-D-A8
2	750 μH	0,5	B82502-D-A10
6	70 μH	0,07	B82502-D-A13

I core single chokes



Flat plug A 4.8 × 0.8 DIN 46244, tinned

Rated voltage 380 V ac
Rated current 0.5 to 10 A



Dimensions in mm

Technical data

- Permissible voltage 450 V dc
- Rated current referred to 50 Hz and +40°C/104°F room temperature
- Permissible operating current at 400 Hz $0.75 \times I_R$
- Storage temperature down to $-55^\circ\text{C}/-67^\circ\text{F}$
- Approx. weight 70 to 90 g
- Specifications (additional) Resistance to tracking: Group KA 1 in accordance with DIN 53480
Insulation group B in accordance with VDE 0110.

Test symbol  550-1/6

applied for  565-2

For further details refer to "Technical data on I core chokes".

Types

Rated current	Rated inductance	DC resistance (typical value)	Ordering code
A		Ω	PU: 50
0,5	47 mH	10	B82503-U-A 5
1	15 mH	2,7	B82503-U-A 8
2	3,3 mH	0,7	B82503-U-A 10
4	680 μH	0,2	B82503-U-A 12
6	330 μH	0,1	B82503-U-A 13
10	100 μH	0,03	B82503-U-A 14

▼ to be preferred

I core single chokes

Rated voltage 500 V ac
 Rated current 1 to 25 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.

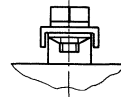
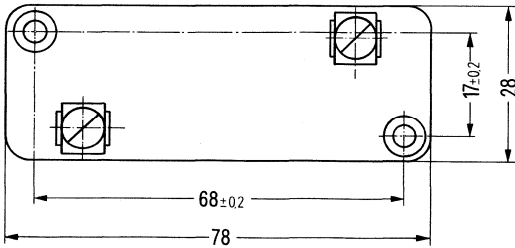


Figure 1
 Type with clamps

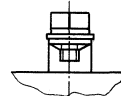
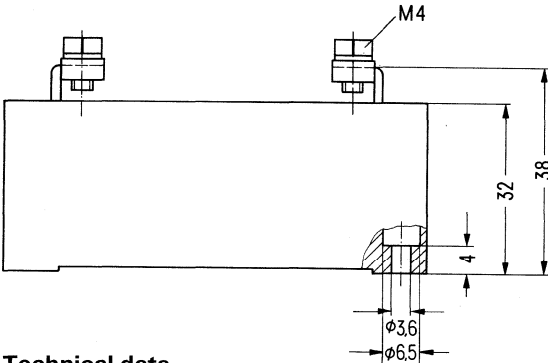


Figure 2
 Type with spring washers

Dimensions in mm

Technical data

Permissible voltage 600 V dc
 Rated current referred to 50 Hz and +60°C/140°F room temperature
 Permissible operating current at 400 Hz $0.6 \times I_R$
 Storage temperature down to -55°C/-67°F
 Specifications (additional) Resistance to tracking: Group KA 1 in accordance with DIN 53480
 Insulation group B in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

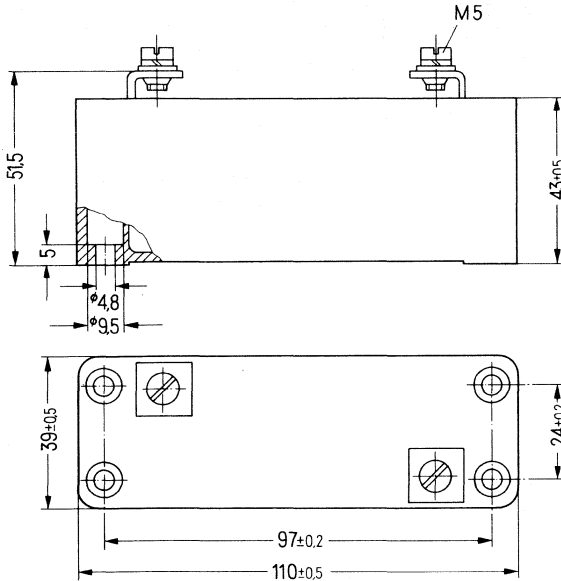
Types

Rated current A	Rated inductance	DC resistance (typical value) Ω	Approx. weight g	Ordering code PU: 10	Figure
1	27 mH	5,25	170	B82504-W-A1	1
2	7,5 mH	1,3	170	B82504-W-A2	
4	2,0 mH	0,33	180	B82504-W-A3	
6	600 μH	0,15	180	B82504-W-A4	
10	200 μH	0,054	180	B82504-W-A5	
16	140 μH	0,024	200	B82504-W-A6	2
25	65 μH	0,009	230	B82504-W-A7	

I core single chokes

Rated voltage 500 V ac
 Rated current 4 to 40 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.



Dimensions in mm

Technical data

- Permissible voltage 600 V dc
- Rated current referred to 50 Hz and +60°C/140°F room temperature
- Permissible operating current at 400 Hz $0.6 \times I_R$
- Approx. weight 600 g
- Specifications (additional) Resistance to tracking: Group KA 1 in accordance with DIN 53480
 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

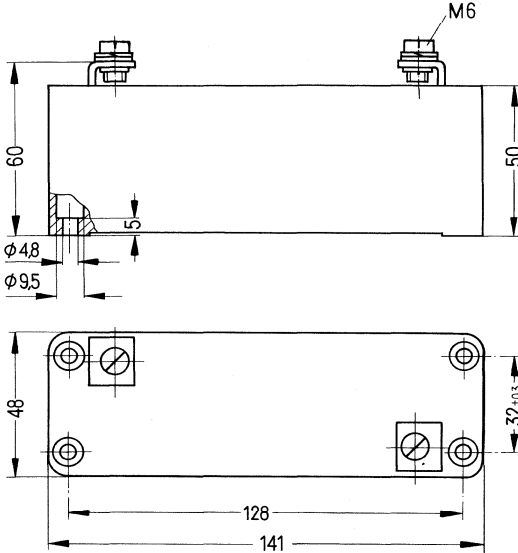
Types

Rated current	Rated inductance	DC resistance (typical value) mΩ	Ordering code
A			PU: 10
4	5,6 mH	480	B82505-W-A2
6	2,2 mH	220	B82505-W-A3
10	1,2 mH	75	B82505-W-A4
16	330 μH	35	B82505-W-A5
25	150 μH	15	B82505-W-A6
40	56 μH	6	B82505-W-A7

I core single chokes

Rated voltage 500 V ac
 Rated current 6 to 60 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.



Dimensions in mm

Technical data

- Permissible voltage 600 V dc
- Rated current referred to 50 Hz and +60°C/140°F room temperature
- Permissible operating current at 400 Hz $0.45 \times I_R$
- Specifications (additional) Resistance to tracking: Group KA 1 in accordance with DIN 53480
 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

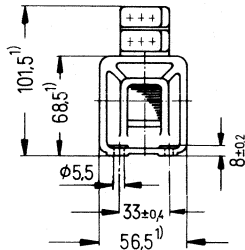
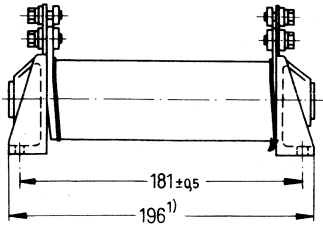
Types

Rated current	Rated inductance	DC resistance (typical value)	Approx. weight	Ordering code
A		mΩ	g	PU: 10
6	5,0 mH	350	880	B82506-W-A3
10	2,5 mH	125	1030	B82506-W-A4
16	1,5 mH	45	1220	B82506-W-A5
25	500 μH	20	1220	B82506-W-A6
40	200 μH	8	1250	B82506-W-A7
60	80 μH	3,5	1250	B82506-W-A8

I core single chokes

Rated voltage 500 V ac
 Rated current 25 to 75 A

Chokes with flat copper band, wound on edge.



Dimensions in mm

¹) Max. dimension

Technical data

- Permissible voltage 600 V dc
- Rated current referred to 50 Hz and +40°C/104°F room temperature
- Permissible operating current at 400 Hz $0.4 \times I_R$
- Approx. weight 2.5 kg
- Specifications (additional) Resistance to tracking: Group KA 3 c in accordance with DIN 53480
 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

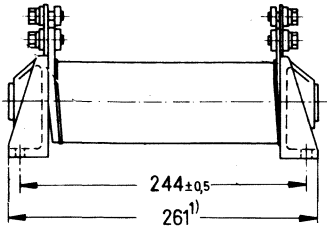
Types

Rated current	Rated inductance	DC resistance (typical value) mΩ	Ordering code
A			PU: 2
25	1,4 mH	30	B82507-B-A3
35	550 μH	16	B82507-B-A4
60	200 μH	7	B82507-B-A5
75	80 μH	2	B82507-B-B6

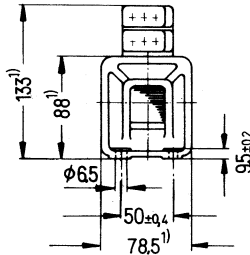
I core single chokes

Rated voltage 500 V ac
 Rated current 60 to 270 A

Chokes with flat copper band, wound on edge.



¹) Max. dimension



Dimensions in mm

Technical data

- Permissible voltage 600 V dc
- Rated current referred to 50 Hz and +40°C/104°F room temperature
- Permissible operating current at 400 Hz $0.3 \times I_R$
- Approx. weight 6.8 kg
- Specifications (additional) Resistance to tracking: Group KA 3 c in accordance with DIN 53480
 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

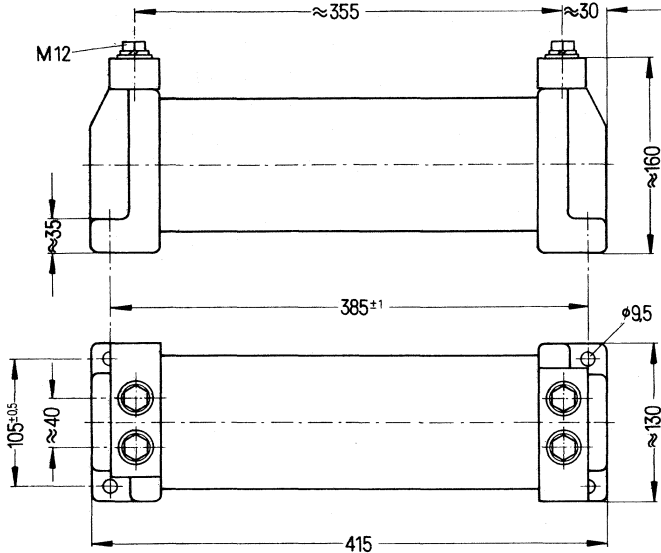
Types

Rated current	Rated inductance	DC resistance (typical value)	Ordering code
A	μH	mΩ	PU: 2
60	870	10	B82508-B-A3
75	300	4	B82508-B-B4
160 A dc/125 A ac	80	1	B82508-B-B6
270 A dc/230 A ac	30	0,4	B82508-B-B7

I core single chokes

Rated voltage 750 V ac
 Rated current 200 to 700 A

Chokes comprising specially formed insulated cable windings (copper litz wire, rectangularly shaped).



Dimensions in mm

Technical data

Permissible voltage 900 V dc
 Rated current referred to 50 Hz and +40°C/104°F room temperature
 Specifications (additional) Resistance to tracking: Group KA 3 c in accordance with DIN 53480
 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

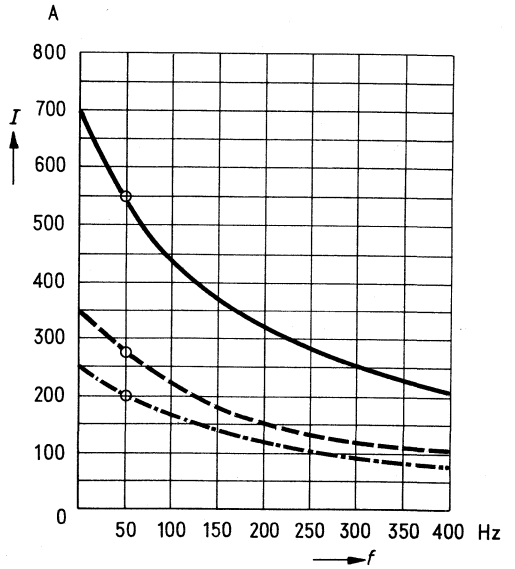
Types

Rated current	Rated inductance μH	DC resistance (typical value) mΩ	Approx. weight kg	Ordering code PU: 1
250 A dc 200 A ac	120	1	18,5	B82510-A-B1
350 A dc 275 A ac	70	0,5	19	B82510-A-B2
700 A dc 550 A ac	16	0,15	20	B82510-A-B3

I core single chokes

Permissible operating current I_{op}
versus frequency f

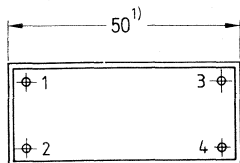
- B82510-A-B1
- - - B82510-A-B2
- B82510-A-B3



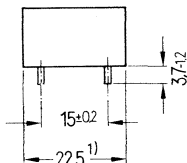
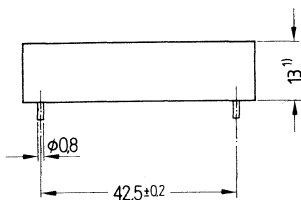
I core double chokes

Rated voltage 500 V ac
Rated current 0.1 to 2 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.
 Terminal pins in the lead spacing.



Winding 1: pins 1 and 2
 Winding 2: pins 3 and 4



Dimensions in mm

¹⁾ Max. dimension

Technical data

Permissible voltage 600 V dc
 Rated current referred to 50 Hz and +60°C/140°F room temperature
 Permissible operating current at 400 Hz $0.75 \times I_R$
 Approx. weight 40 g
 Specifications (additional) Insulation group C in accordance with VDE 0110.
 For further details refer to "Technical data on I core chokes".

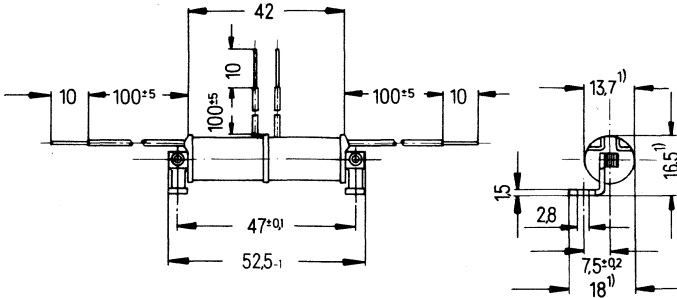
Types

Rated current per winding A	Rated inductance per winding	DC resistance per winding (typical value) Ω	Ordering code PU: 10
0,1	68 mH	50	B82522-V-C1
0,2	33 mH	25	B82522-V-C2
0,3	12 mH	12	B82522-V-C3
0,5	5,6 mH	4,5	B82522-V-C5
▼1	1,2 mH	1	B82522-V-C8
2	330 μ H	0,3	B82522-V-C10

▼ to be preferred

I core double chokes

Rated voltage 380 V ac
 Rated current 0.1 to 10 A



Dimensions in mm

1) Max. dimension

Technical data

Permissible voltage 440 V dc
 Rated current referred to 50 Hz and +40°C/104°F room temperature
 Approx. weight 25 to 35 g
 Specifications (additional) Resistance to tracking: Group KA1 in accordance with DIN 53480
 Insulation group B in accordance with VDE 0110.

Test symbol



For further details refer to "Technical data on I core chokes".

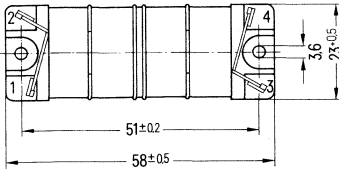
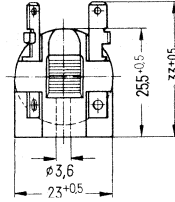
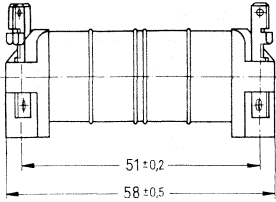
Types

Rated current per winding A	Rated inductance per winding	DC resistance per winding (typical value) Ω	Ordering code
▼ 0,1	64 mH	50	B82522-C-A1
▼ 0,2	23 mH	16	B82522-C-A2
▼ 0,5	4,7 mH	3,2	B82522-C-A5
▼ 1	1,25 mH	0,8	B82522-C-A8
2	320 μH	0,3	B82522-C-A10
6	30 μH	0,03	B82522-C-A13
10	12 μH	0,012	B82522-C-A14

▼ to be preferred

I core double chokes

Rated voltage 380 V ac
 Rated current 0.5 to 10 A



Dimensions in mm

Flat plug A 4,8 × 0,8 DIN 46244 tinned

Technical data

- Permissible voltage 450 V dc
- Rated current referred to 50 Hz and +40°C/104°F room temperature
- Permissible operating current at 400 Hz $0.75 \times I_R$
- Storage temperature down to -55°C/-67°F
- Approx. weight 70 to 90 g
- Specifications (additional) Resistance to tracking: Group KA1 in acc. with DIN 53480
 Insulation group B in accordance with VDE 0110.

Test symbol



applied for



For further details refer to "Technical data on I core chokes".

Types

Rated current per winding A	Rated inductance per winding	DC resistance per winding (typical value) Ω	Ordering code
0,5	15 mH	5	B82523-T-A5
▼ 1	3,9 mH	1,4	B82523-T-A8
▼ 2	1,2 mH	0,4	B82523-T-A10
▼ 4	220 μH	0,1	B82523-T-A12
▼ 6	82 μH	0,05	B82523-T-A13
▼ 10	33 μH	0,02	B82523-T-A14

▼ to be preferred

I core double chokes

Rated voltage 500 V ac
 Rated current 2 to 25 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.

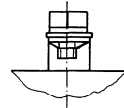
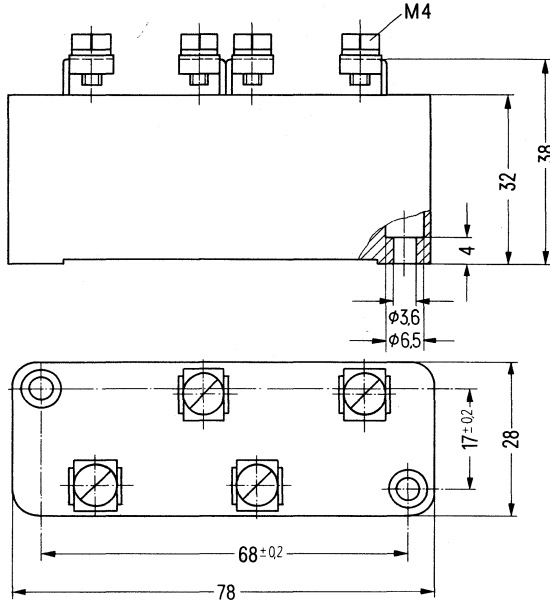


Figure 1
 Type with spring washers

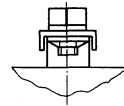


Figure 2
 Type with clamps
 Dimensions in mm

Technical data

Permissible voltage 500 V dc
 Permissible operating current at 400 Hz $0.6 \times I_R$
 Storage temperature down to $-55^\circ\text{C}/-67^\circ\text{F}$
 Approx. weight 140 g
 Specifications (additional) Resistance to tracking: Group KA1 in accordance with DIN 53480
 Insulation group B in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

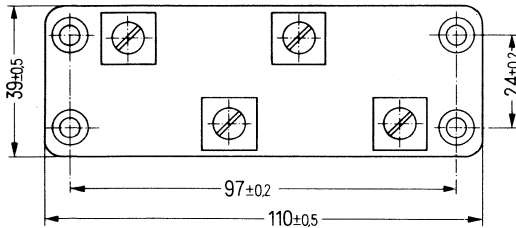
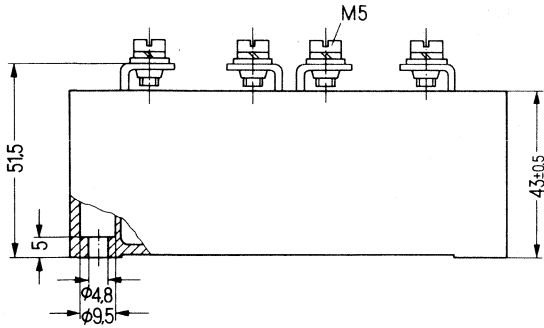
Types

Rated current per winding A	Rated inductance per winding	DC resistance per winding (typical value) mΩ	Ordering code PU: 10	Fig.
2	3 mH	680	B82524-V-A2	2
4	450 μH	175	B82524-V-A3	
6	200 μH	80	B82524-V-A4	
10	65 μH	28	B82524-V-A5	
16	45 μH	12	B82524-V-A6	1
25	20 μH	4,5	B82524-V-A7	

I core double chokes

Rated voltage 500 V ac
Rated current 4 to 40 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.



Dimensions in mm

Technical data

Permissible voltage	500 V dc
Rated current	referred to 50 Hz and + 60°C/140°F room temperature
Permissible operating current at 400 Hz	$0.6 \times I_R$
Approx. weight	600 g
Specifications (additional)	Resistance to tracking: Group KA1 in accordance with DIN 53480 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

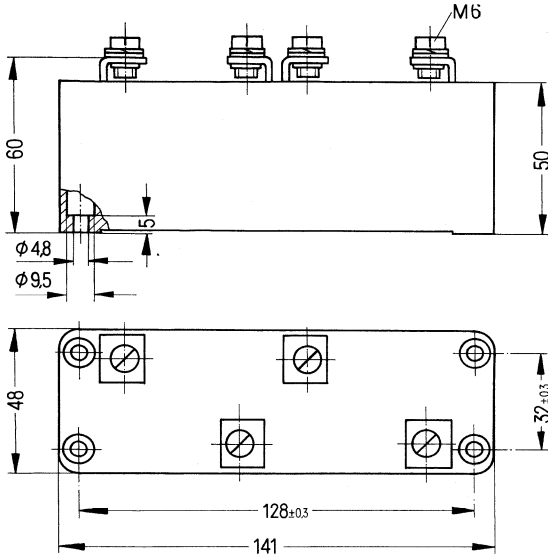
Types

Rated current per winding A	Rated inductance per winding	DC resistance per winding (typical value) mΩ	Ordering code PU: 10
4	1,8 mH	240	B82525-V-A2
6	560 μH	110	B82525-V-A3
10	220 μH	35	B82525-V-A4
16	100 μH	17	B82525-V-A5
25	39 μH	7	B82525-V-A6
40	15 μH	3	B82525-V-A7

I core double chokes

Rated voltage 500 V ac
 Rated current 6 to 60 A

Chokes, enclosed in rectangular plastic case, epoxy resin sealed.



Dimensions in mm

Technical data

Permissible voltage 500 V dc
 Rated current referred to 50 Hz and 60°C/140°F room temperature
 Permissible operating current at 400 Hz $0.45 \times I_R$
 Approx. weight 1.1 kg
 Specifications (additional) Resistance to tracking: Group KA1 in accordance with DIN 53480
 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

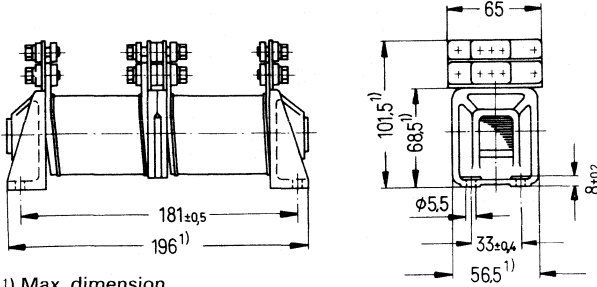
Types

Rated current per winding A	Rated inductance per winding	DC resistance per winding (typical value) mΩ	Ordering code
			PU: 10
6	1,7 mH	175	B82526-V-A3
10	650 μH	63	B82526-V-A4
16	320 μH	25	B82526-V-A5
25	150 μH	10	B82526-V-A6
40	60 μH	4	B82526-V-A7
60	25 μH	1,8	B82526-V-A8

I core double chokes

Rated voltage 500 V ac
Rated current 25 to 75 A

Chokes with flat copper band, wound on edge.



¹) Max. dimension

Technical data

Permissible voltage	500 V dc
Rated current	referred to 50 Hz and +40°C/104°F room temperature
Permissible operating current at 400 Hz	$0.4 \times I_R$
Approx. weight	2.5 kg
Specifications (additional)	Resistance to tracking: Group KA3c in accordance with DIN 53480 Insulation group C in accordance with VDE 0110.

For further details refer to "Technical data on I core chokes".

Types

Rated current per winding A	Rated inductance per winding μ H	DC resistance per winding (typical value) m Ω	Ordering code PU: 2
25	300	14	B82527-A-A3
35	180	8	B82527-A-A4
60	85	3	B82527-A-A5
75	28	1	B82527-A-B6

Ring core chokes

General technical information

Neutral conductor chokes

The reduction of radio interference from electrical appliances, especially those which are grounded by connection of a neutral conductor, by capacitors alone is frequently insufficient. Suppression chokes must therefore be inserted into the power line to provide additional voltage attenuation.

For appliances consuming high power these chokes become large and heavy. In hand-operated devices, e.g. electric tools up to about 1 kW, the chokes would become too unwieldy to be located in the equipment.

This problem can be solved by replacing both operating current chokes by one choke only which is placed in the (non-fused) neutral, provided the safety regulations applicable to the equipment are not infringed. In accordance with VDE 0565-2 the winding of the neutral conductor choke must have at least the same cross section as the neutral itself, moreover, with up to 4 times the rated current, the voltage drop must not exceed 4 V. To safeguard against incorrect applications and to avoid confusion, four different wire sections and therefore only four different current ratings are recognized.

Rated current A	Copper wire cross section mm ²
16	1,0
20	1,5
27	2,5
36	4,0

During normal operation only the leakage current flows through the neutral conductor choke (≤ 3.5 mA) and, because of the resultant low premagnetization, closed cores (ferrite ring cores) of high permeability can be used which makes for especially small sizes. At operating currents of >3.5 mA saturation already starts.

VDE specification 0875 draws attention to the following point: A choke in the neutral conductor of an equipment which may accidentally be connected to ground during operation becomes ineffective in these circumstances by being short-circuited.

An example is a drilling machine working on a grounded object.

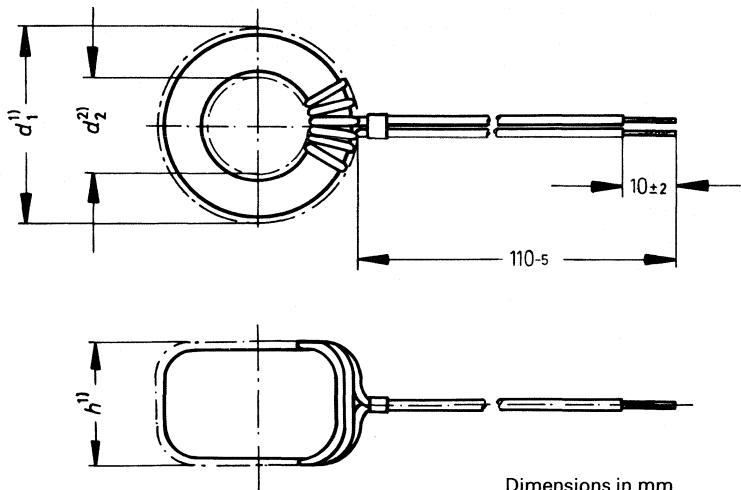
Ring core chokes with powder core

Ring core single chokes with powder core are used to attenuate the symmetrically propagating interference voltages and interference currents (differential mode) (for example in switched-mode power supplies and semiconductor correcting elements). In comparison with I core chokes, the dependence of the inductance on the operating current premagnetization is likewise low whereas the leakage field is substantially smaller due to the closed core shape.

Neutral conductor chokes

Cross section of the conductor up to 4 mm²

Ferrite ring core chokes with an insulated copper wire winding, without encapsulation



- 1) Max. dimension
- 2) Min. dimension

Type	d_1	d_2	h
B82302-A-A2	43	12	20
B82302-A-A3	41	12	18
B82302-A-A4	43	12	20
B82302-A-A5	21	5	18

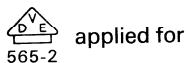
Suggested fixing: The choke should be put between two bakelized paper washers (diameter d_1), held together by threaded studs and nuts.

Technical data

Upper category temperature +100°C/212°F

Specifications The chokes comply with the VDE specification 0565-2

Test symbol



Types

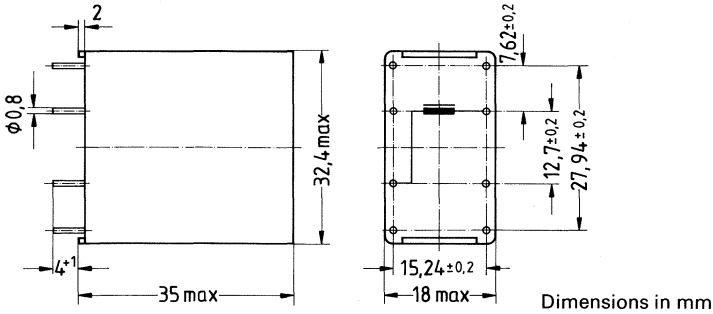
Rated current A	Rated inductance mH	Cross section of the conductor mm ²	Material	Approx. weight g	Ordering code PU: 20
16	1,2	1	CuL	20	B82302-A-A5
20	4,3	1,5	Litz wire ³⁾	60	B82302-A-A3
27	1,6	2,5	Litz wire ³⁾	65	B82302-A-A2
36	1,6	4	CuL	70	B82302-A-A4

³⁾ Change to CuL reserved

Ring core single chokes with powder core

Rated voltage 250 ac
Rated current 0.2 to 2 A

Ring core single chokes with powder core, sealed in a plastic can; can and sealing are flame-retardant in accordance with UL 94 V-0. The chokes are provided with parallel terminal pins in the lead spacing and are particularly suitable for PC board mounting.



Technical data

Permissible voltage	250 V dc
Inductance tolerance	± 30%
Rated current	referred to 50 Hz and +40°C/104°F room temperature
DC resistance	typical values, measured at +20°C/68°F
Approx. weight	45 g
DIN climatic category	GKC (-40 to +125°C/-40 to +257°F, humidity category C)
Specifications	The chokes are designed in accordance with VDE 0565, part 2.

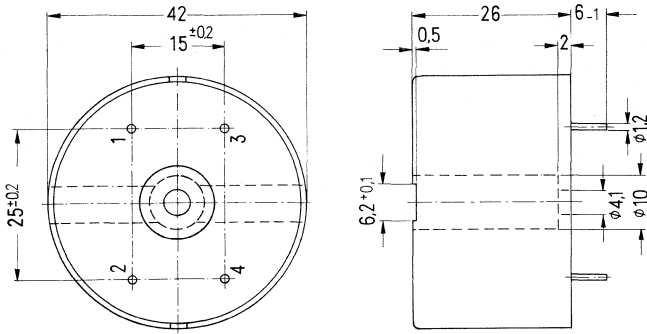
Types

Rated current	Rated inductance	DC resistance (typical value)	Ordering code
A	mH	mΩ	PU: 50
0,2	25	25	B82602-G-C2
0,5	8	5	B82602-G-C5
1	3,3	1,2	B82602-G-C8
2	1,2	0,27	B82602-G-C10

Ring core single chokes with powder core

Rated voltage 250 V ac
 Rated current 0.2 to 4 A

Ring core single chokes with powder core, sealed in a plastic can; can and sealing are flame-retardant in accordance with UL 94 V-0. The chokes are provided with parallel terminal pins in the lead spacing and are particularly suitable for PC board mounting.



Winding: pins 1 and 4
 not connected: pins 2 and 3

Dimensions in mm

Technical data

Inductance tolerance $\pm 30\%$
 Rated current referred to 50 Hz and +40°C/104°F test room temperature
 DC resistance typical values, measured at +20°C/68°F
 Approx. weight 100 g
 DIN climatic category GKC (-40 to +125°C/-40 to +257°F, humidity category C)
 Specifications The chokes are designed in accordance with VDE 0565, part 2.

Types

Rated current	Rated inductance	DC resistance (typical value)	Ordering code
A	mH	Ω	PU: 100
0,2	50	39	B82603-G-C2
0,5	20	6,2	B82603-G-C5
1	6	1,6	B82603-G-C8
2	2,5	500m	B82603-G-C10
4	1,2	160m	B82603-G-C12

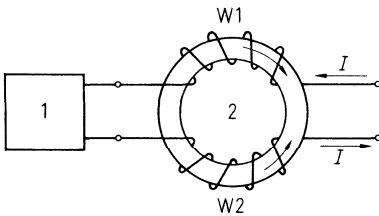
EMI Suppression Chokes

Current-compensated ring core chokes

General technical information

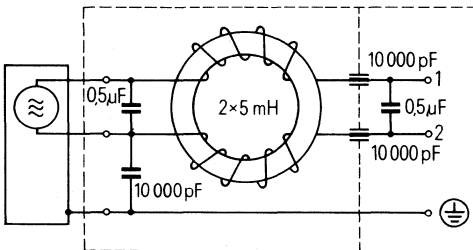
In order to eliminate interference from interference sources, in particular from grounded motors and appliances the interference range of which covers the LW-MW-SW range, so-called current-compensated ring core chokes have been developed. A special winding arrangement on high permeability ring cores prevents the core from being premagnetized by the operating current. The full inductance in connection with capacitances connected to ground is being effective in order to reduce the unbalanced interference voltage.

Because of its construction the suppression effect of the current-compensated choke on symmetrical interference is relatively low. An additional combination with symmetrically connected capacitors of about 0.1 to 1 μF is therefore recommended.



1 interference source (user),
2 choke with windings W1 and W2,
/ operating current (50 Hz)

Basic design of a current-compensated choke



Circuit design of an EMI suppression filter with a current-compensated choke

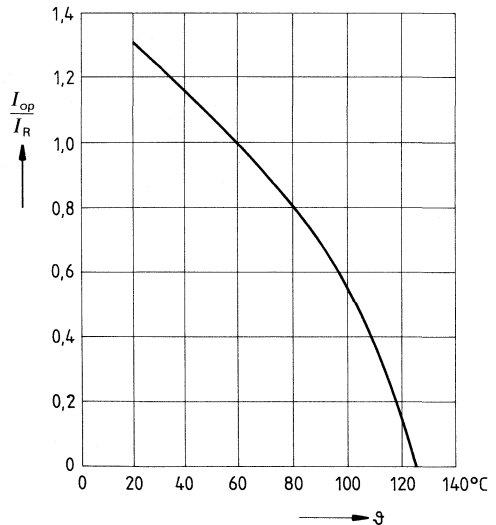
EMI Suppression Chokes

Current-compensated ring core chokes

Technical data

Specifications	The chokes are designed in accordance with VDE 0550-1 and VDE 0565-2
DIN climatic category	GKC (-40 to +125°C/-40 to +257°F, humidity category C)
Rated inductance	measured in accordance with VDE 0565-2 at 20°C/68°F and 160 kHz for ≤ 1 mH and 16 kHz for > 1 mH
Inductance tolerance	$\pm 30\%$
Inductance drop (at current-compensated connection)	$< 10\%$ at initial dc loading with I_R
DC resistance	Typical values, measured in accordance with VDE 0565-2
Test voltage	in accordance with VDE 0565-2
Thermal characteristics	Measurement of the heating in accordance with VDE 0565-2
Room temperature	60°C/140°F
Excess temperature of the windings	$< 55^\circ\text{C}/131^\circ\text{F}$
Max. permissible temperature of the windings	115°C/239°F

Permissible operating current I_{op} versus ambient temperature ϑ

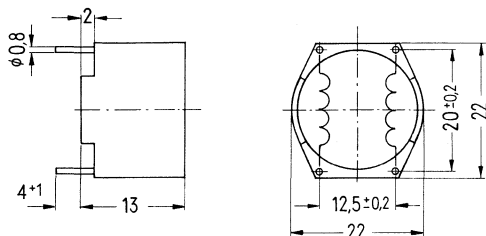


Current-compensated ring core double chokes

Rated voltage 250 V ac
Rated current 0.3 to 2 A

Ring core chokes with ferrite core, sealed in a plastic can.
 Can and sealing are flame-retardant in accordance with UL 94 V-0.

The chokes are provided with terminal pins in the lead spacing and are particularly suitable for PC board mounting.



Dimensions in mm

Technical data

Test voltage	1500 V ac, 2 s (winding to winding)
Rated current	referred to 50 Hz and +60°C/140°F room temperature
Approx. weight	10 g

Test symbol



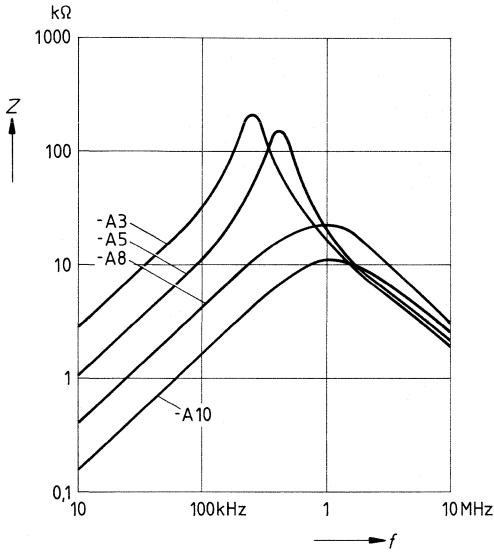
For further details refer to "Technical data on current-compensated ring core chokes".

Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Ordering code PU: 500
▼ 0,3	47	2100	B82722-G2-A3
0,35	27	1700	B82722-G2-C31
▼ 0,5	18	1500	B82722-G2-A5
▼ 1	5,6	700	B82722-G2-A8
▼ 2	2,2	180	B82722-G2-A10

▼ to be preferred

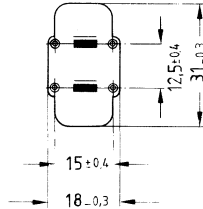
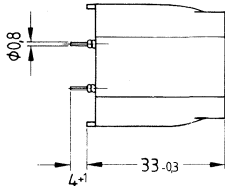
Impedance Z versus frequency f
(measured with windings connected in parallel)



Current-compensated ring core double chokes

Rated voltage 250 V ac
 Rated current 0,5 to 4 A

Chokes sealed in plastic can with terminal pins in the lead spacing. Can and sealing are flame-retardant in accordance with UL 94 V-0.




Dimensions in mm

Technical data

Test voltage 1500 V ac, 2 s, (winding to winding)
 Rated current referred to 50 Hz and +60°C/140°F room temperature
 Approx. weight 25 g

Test symbol



*-marked types additionally have the test symbol  (Guide FOKY 2)

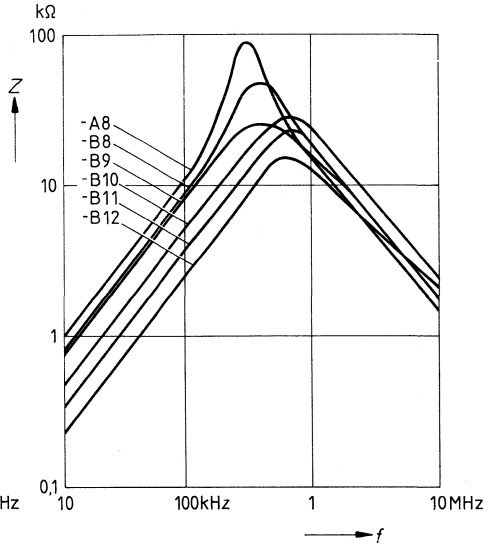
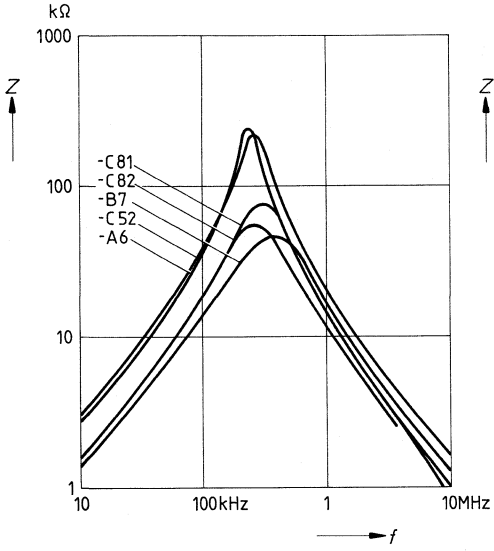
For further details refer to "Technical data on current-compensated ring core chokes".

Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Ordering code PU: 250
0,5	27	1800	B82723-G2-B5*
▼0,5	39	2000	B82723-G2-A5*
0,65	39	1400	B82723-G2-A6*
0,8	22	1100	B82723-G2-B7
▼1	12	700	B82723-G2-B8*
▼1	18	600	B82723-G2-A8*
▼1,4	27	500	B82723-G2-C82
▼1,6	10	400	B82723-G2-B9*
▼2	6,8	200	B82723-G2-B10*
2,5	5,6	160	B82723-G2-B11
▼4	3,3	90	B82723-G2-B12*

▼ to be preferred

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

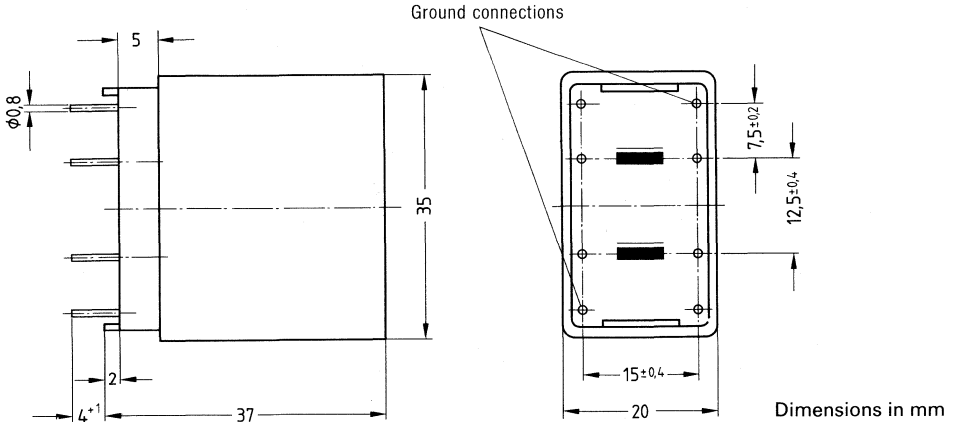


**Current-compensated ring core double chokes
incl. shielding**

**Rated voltage 250 V ac
Rated current 0.5 to 4 A**

Chokes sealed in a plastic can with terminal pins in the lead spacing. Can and sealing are flame-retardant in accordance with UL 94 V-0. A metal can, which can be grounded, is used for shielding.

Interference from the short-range magnetic field throughout the frequency range between 20 kHz and 300 kHz has been lowered by 30 dB.



Technical data

Test voltage 1500 Vac, 2 s, (winding to winding)
 2500 Vac, 2 s, (winding to case)
 Rated current referred to 50 Hz and +40°C/104°F room temperature
 Approx. weight 50 g
 For further details refer to "Technical data on current-compensated ring core chokes".

Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Ordering code
▼ 0,5	39	2000	B82723-G4-A5
0,5	27	1800	B82723-G4-B5
1	12	850	B82723-G4-B8
▼ 1,6	10	450	B82723-G4-B9
▼ 2	6,8	200	B82723-G4-B10
▼ 4	3,3	90	B82723-G4-B12

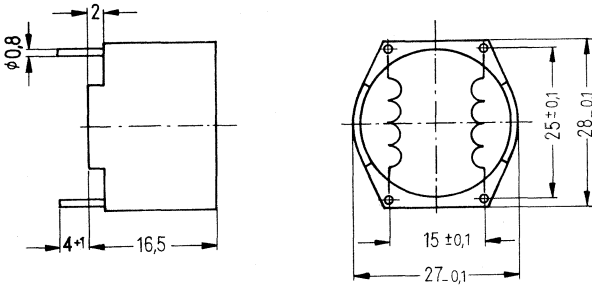
▼ to be preferred

Current-compensated ring core double chokes

Rated voltage 250 V ac
Rated current 0.5 to 4 A

Ring core chokes with ferrite core, sealed in a plastic can. Can and sealing are flame-retardant in accordance with UL 94 V-0.

The chokes are provided with terminal pins in the lead spacing and are particularly suitable for PC board mounting.



Dimensions in mm

Technical data

Test voltage 1500 V ac, 2 s, (winding to winding)
 Rated current referred to 50 Hz and +60°C/140°F room temperature
 Approx. weight 15 g



Test symbol

For further details refer to "Technical data on current-compensated ring core chokes".

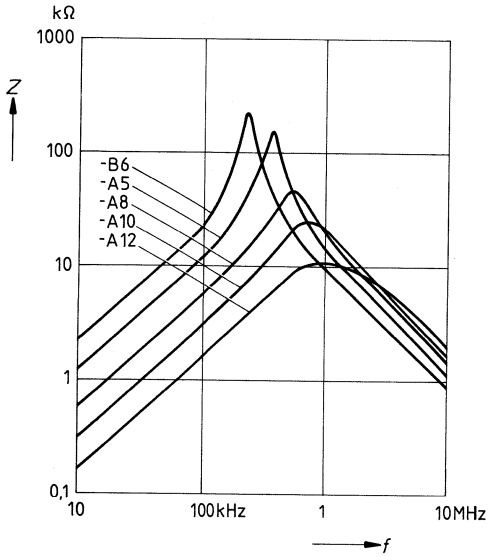
Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Ordering code PU: 100
0,5	22	1600	B82723-G5-A5
0,6	39	1100	B82723-G5-B6
1	10	600	B82723-G5-A8
2	5,6	160	B82723-G5-A10
4	2,7	60	B82723-G5-A12

▼ to be preferred

Current-compensated ring core double chokes

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

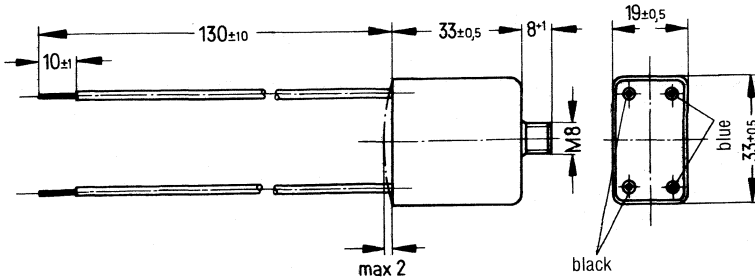


**Current-compensated ring core double chokes
incl. shielding**

**Rated voltage 250 V ac
Rated current 1 to 6 A**

Chokes, enclosed in aluminum case, epoxy resin sealed. A threaded stud at the bottom of the case is provided for mounting.

Single-ended fine litz-wire lines.



Dimensions in mm

Technical data

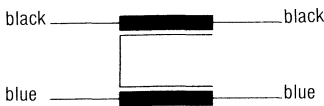
Test voltage 1500 V ac, 2 s, (winding to winding)
2500 V ac, 2 s, (winding to case)

Rated current referred to 50 Hz and +60°C/140°F room temperature

Approx. weight 50 g

For further details refer to "Technical data on current-compensated ring core chokes".

Circuit



Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Connections cross section/ material	Ordering code PU: 50
1	12	700	0,75 mm ² /NYFAFw	B82723-E1-A8
1,6	10	450		B82723-E1-A9
▼ 2	6,8	200		B82723-E1-A10
4	3,3	90		B82723-E1-A12
6	1,5	40		B82723-E1-A13

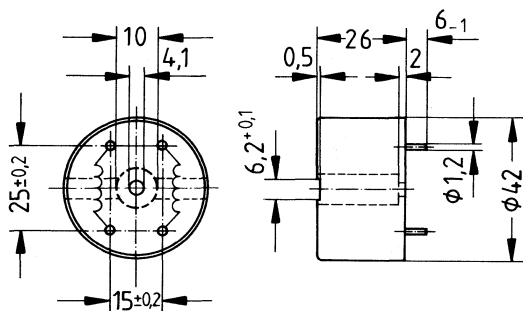
▼ to be preferred

Current-compensated ring core double chokes

Rated voltage 250 V ac
Rated current 1 to 10 A

Ring core chokes with ferrite core, sealed in a plastic can. Can and sealing are flame-retardant in accordance with UL 94 V-0.

The chokes are provided with terminal pins, arranged in the lead spacing. They are particularly suitable for PC board mounting.



Dimensions in mm

Technical data

Test voltage 1500 V ac, 2 s, (winding to winding)
Rated current referred to 50 Hz and +60°C/140°F room temperature
Approx. weight 80 g

Test symbol  (Guide FOKY 2)

For further details refer to "Technical data on current-compensated ring core chokes".

Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Ordering code PU: 250
1	33	1000	B82724-G2-A8
1,6	27	560	B82724-G2-A9
2	15	400	B82724-G2-A10
4	6,8	120	B82724-G2-A12
6	3,9	55	B82724-G2-A13
10	1,8	25	B82724-G2-A14

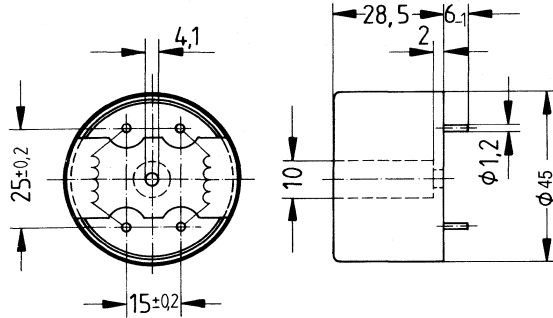
▼ to be preferred

Current-compensated ring core double chokes
incl. shielding

Rated voltage 250 V ac
Rated current 1 to 10 A

Ring core chokes with ferrite core, sealed in plastic can. An aluminum can is used for shielding.

The chokes are provided with terminal pins in the lead spacing and are particularly suitable for PC board mounting.



Dimensions in mm

Technical data

Test voltage 1500 V ac, 2 s, (winding to winding)
2500 V ac, 2 s, (winding to case)
Rated current referred to 50 Hz and +60°C/140°F room temperature
Approx. weight 100 g
For further details refer to "Technical data on current-compensated ring core chokes".

Types

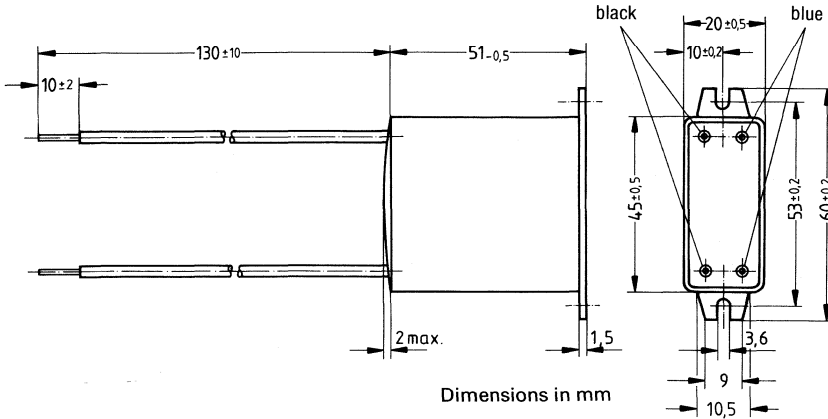
Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Ordering code PU: 200
1	33	1000	B82724-G4-A8
1,6	27	560	B82724-G4-A9
2	15	400	B82724-G4-A10
4	6,8	120	B82724-G4-A12
6	3,9	55	B82724-G4-A13
10	1,8	25	B82724-G4-A14

**Current-compensated ring core double chokes
incl. shielding**

**Rated voltage 250 V ac
Rated current 2 to 10 A**

Chokes, enclosed in aluminum case, epoxy resin sealed. A strip at the bottom of the case is provided for mounting.

Single-ended fine litz-wire lines.



Technical data

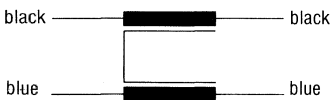
Test voltage 1500 V ac, 2 s, (winding to winding)
2500 V ac, 2 s, (winding to case)

Rated current referred to 50 Hz and +60°C/140°F room temperature

Approx. weight 100 g

For further details refer to "Technical data on current-compensated ring core chokes".

Circuit

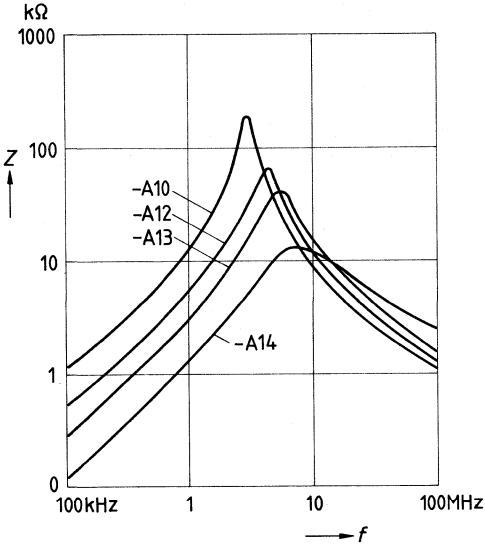


Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Connections cross section/ material	Ordering code
2	15	400	0,75 mm ² /NYFAFw	B82724-C1-A10
4	6,8	120		B82724-C1-A12
6	3,9	55		B82724-C1-A13
10	1,8	25	1,5 mm ² /NYAF	B82724-C1-A14

▼ to be preferred

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

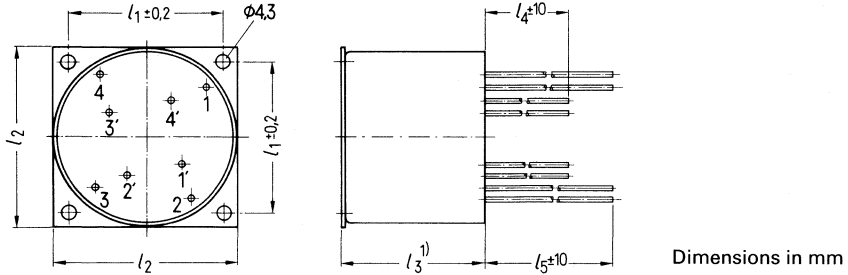


Current-compensated ring core quadruple chokes

Rated voltage 380 V dc/ac
 Rated current 6 to 75 A

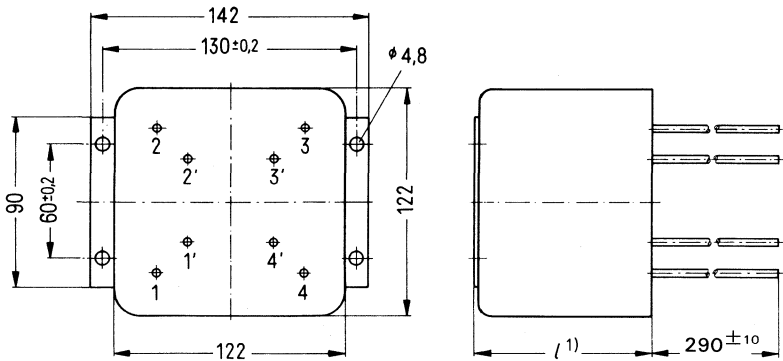
Chokes, enclosed in aluminum case, epoxy resin sealed. A base plate is provided for mounting.

Single-ended tinned leads or litz wires.



Dimensions in mm

Type	l_1	l_2	l_3	l_4	l_5
B82765-C3-A3	50	60	42	110	160
B82765-C1-A5	60	75	47	160	160
B82765-C2-A6	60	75	58	110	360



Type	l
B82765-C5-A7	70
B82765-C4-A9	92

¹⁾ Max. dimension

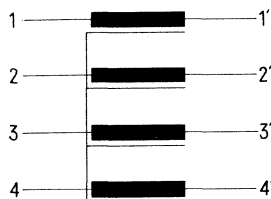
▼ to be preferred

Technical data

Rated current referred to 50 Hz and +60°C/140°F room temperature
 Drop in inductance < 20% at a direct current load with I_R
 (at the worst current-compensated connection)
 Test voltage 2.5 kV ac, 2s (winding to winding)
 2.5 kV ac, 2s (winding to case)

For further details refer to "Technical data on current-compensated ring core chokes".

Circuit



Types

Rated current per winding A	Rated inductance per winding mH	DC resistance per winding (typical value) mΩ	Connections diameter/ cross section/ material	Approx. weight g	Ordering code
6	3	45	1 mm dia. CuL	250	B82765-C3-A3
16	1,8	20	2×1,18 dia. CuL	450	B82765-C1-A5
25	1,3	14	4 mm ² litz wire	750	B82765-C2-A6
50	1,3	6	11,5 mm ² litz wire	1700	B82765-C5-A7
75	0,7	2,5	16 mm ² litz wire	3900	B82765-C4-A9

Ordering code	PU
B82765-C3-A3	10
B82765-C1-A5	10
B82765-C2-A6	10
B82765-C5-A7	1
B82765-C4-A9	1

**Chokes and Filters
for Data and Signal Lines**



Chokes and Filters for Data and Signal Lines

General technical information

State-of-the-art data and signal transmission methods – particularly in terminal systems – allow symmetrical data processing on simple unshielded multi-wire lines at a speed of up to several 100 Kbits/second.

In order to keep this technology alive even under the regulations of RFI suppression as well as from the EMC point of view, highly symmetric suppression chokes and filters have been developed.

Current-compensated ring core chokes are available for unsymmetric EMI suppression of data and communication lines. Low leakage inductance and thus high natural symmetry ensure a good balancing effect of the data lines. Double or quadruple chokes are available for selection; the quadruple chokes may also be used as triple chokes (current compensation taken for granted).

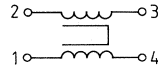
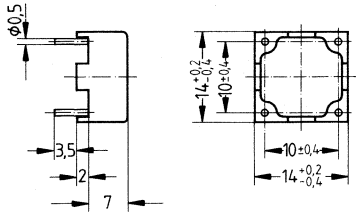
Chokes

Rated voltage 80 V dc/42 V ac
 Rated current 0.1 A

Ring core chokes with a ferrite core and highly symmetrical double or quadruple windings, enclosed in flame-retardant plastic case, sealed. The chokes are provided with terminal pins in the lead spacing and are particularly suitable for PC board mounting.

Version B82791-A5-A5

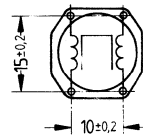
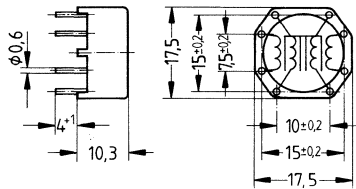
Marking of terminals



Double choke

Version B82791-G11-A12

B82791-G12-A13



Quadruple choke

Double choke

Dimensions in mm

Technical data

DIN climatic category	GKC (-40 to +125°C/-40 to +257°F, humidity category C)
Rated inductance	measured in acc. with VDE 0565-2
Inductance tolerance	± 30%
DC resistance	typical values measured in acc. with VDE 0565-2
Thermal characteristics	measurement of the heating in acc. with VDE 0565-2, excess temperature of the windings < 55°C

Types

Rated inductance	Test voltage	DC resistance per winding	Weight	Ordering code
mH	1 min.	mΩ	g	PU: 500
▼ 2 x 38	300 V ac	3000	4	B82791-A5 -A5
2 x 5	1200 V ac	900	4	B82791-G12-A13
▼ 4 x 6	300 V ac	1200	5	B82791-G11-A12

▼ to be preferred

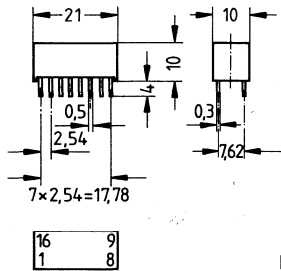
Filter

With the aid of this filter the asymmetrical interference levels can be lowered to the required level directly at the interface. The high balancing effect of the circuit simultaneously guarantees unhindered data flow and prevents character alterations due to unsymmetrical electromagnetic stray fields. The attenuation in the forward range is negligible. Line shielding is not required.

The filter is designed for wiring four lines (two transmitting and receiving lines, each) for the use on flat assemblies (max. 10 mm overall height).

EMC filter in 16 pin DIP case

Outline drawing



Dimensions in mm

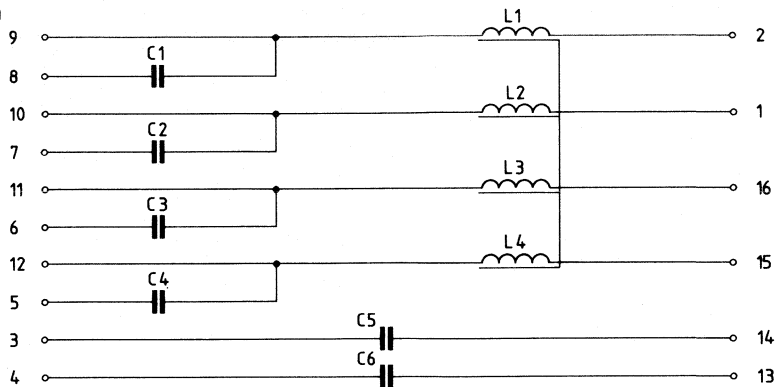
Technical data

Rated voltage	50 V dc
Rated current	0.1 A per line
Test voltage between the terminals 3/14, 4/13 and 8/9 etc.	300 V ac/750 V dc, 1 min (VDE 0804 c)
DC resistance	2.5 Ω per line (typical value)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F), humidity category F
Weight	2.5 g
Capacitance between the terminals	
C 1 to C 4	10 nF
C 5/C 6	1.5 nF
Ordering code	B84551-A11-K90

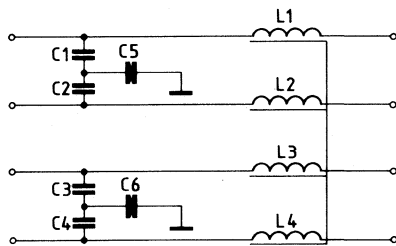
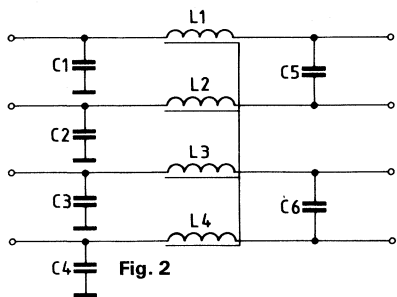
▼ to be preferred

Circuit diagram

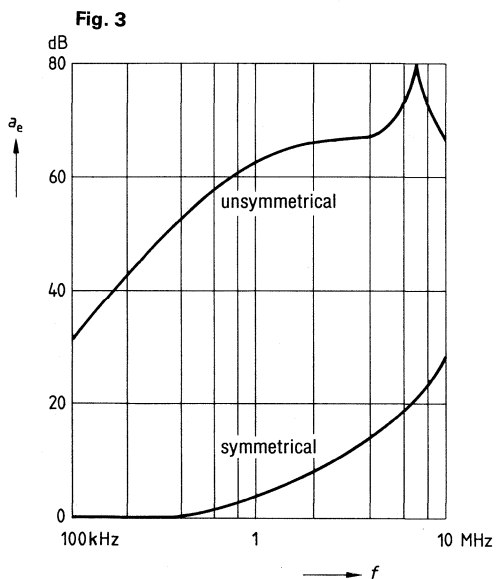
Fig. 1



Design example



Insertion loss a_e versus frequency f
 (typical values at $Z = 60 \Omega$)
 for design example according to figure 2

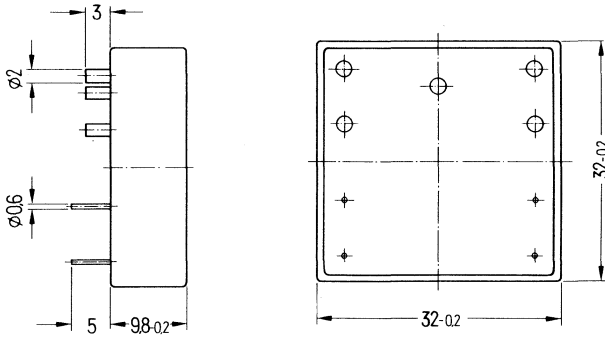


Measuring set-up in accordance with VDE 0565 part 3 (tentative standard) (without current load, however)

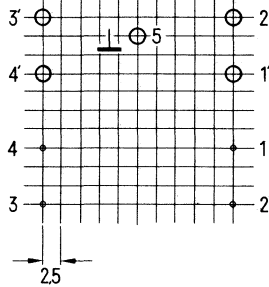
Filter

Rated voltage 80 V dc/42 V ac
 Rated current 4 x 0.1 A

EMC filter in plastic package for PC board mounting



Dimensions in mm

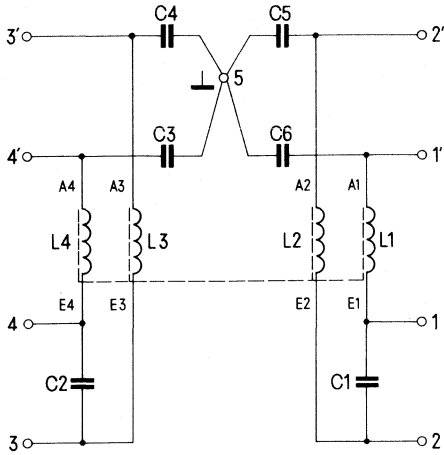


Not for new design!

Technical data

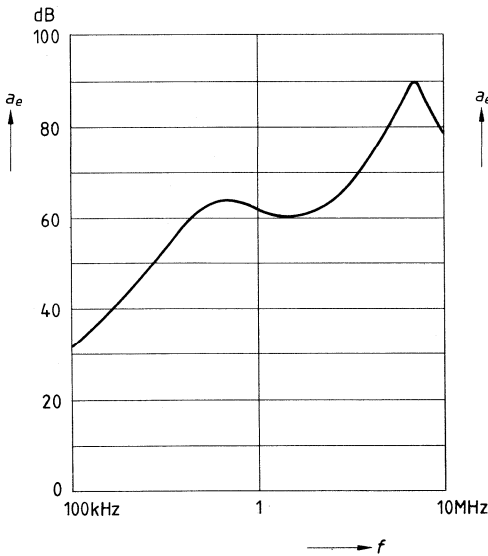
Number of lines	4 (2 transmitting and receiving lines, each)
Rated voltage	80 V dc/42 V ac (line to ground)
Test voltage	300 V ac, 1 min. (transmitting to receiving lines) 500 V ac, 1 min. (line to ground; VDE 0804 § 18 c)
Rated current	4 x 0.1 A
DC resistance (per line)	approx. 1.2 Ω
Approx. weight	14 g
Ordering code	B84551-A10-A3

Circuit diagram

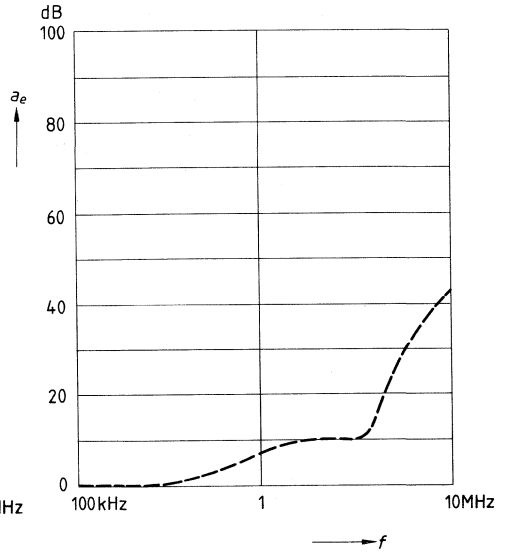


Not for new design!

Insertion loss a_e versus frequency f (typical values at $Z = 60 \Omega$)



Unsymmetrical measurement
(all branches in parallel)



Symmetrical measurement

Line Filters for Single-Phase Systems



Line Filters for Single-Phase Systems

General technical information

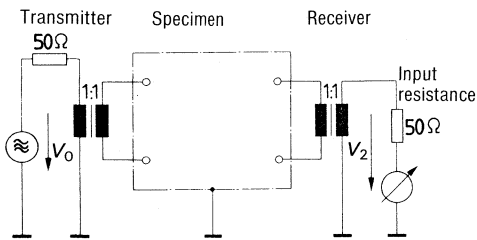
To suppress interference from single-phase electrical apparatus and machines up to a current consumption of 20 A, small suppression filters have proven useful. Suppression chokes and suppression capacitors combined to RF-tested low volume units provide simple mounting conditions for the users.

The choice of the type to meet the different requirements depends on the following aspects:

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

In the field of interference suppression the suppression effect of the filters used largely depends on the RF characteristics of the interference source and the victim equipment. Appropriate to the design, the interference voltage arises as so-called symmetric part between the lines or as unsymmetric or asymmetric part between the lines and ground (case). The voltage division depends on the internal impedance of the interference source. When filters are used to protect against pulses from the power-supply system the RF impedance of the connected networks is of influence. Statements on the attenuation of EMI suppression filters taking all possible applications into consideration, would therefore require many diagrams. It is, however, international use to only indicate one insertion loss, measured in a system of a defined characteristic impedance. In Germany a characteristic impedance of $Z = 60 \Omega$ is preferably used. This results in the following arrangement for measuring the insertion loss:

a) symmetrical measurement (differential mode)

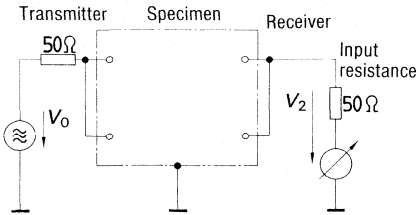


see C.I.S.P.R. 17 (1981) fig. B 5

$$\text{Insertion loss } a_e = 20 \times \log \frac{V_0}{2 \times V_2} \text{ [dB]}$$

Line Filters for Single-Phase Systems

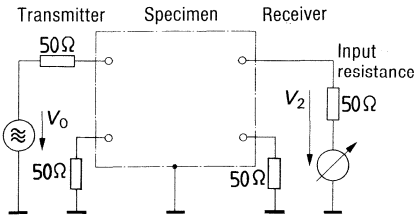
b) asymmetrical measurement (common mode)
paralleled branches



see C.I.S.P.R. 17 (1981) fig. B 6

The asymmetrical measurement with paralleled branches is widely used in the United States. For some diagrams in this data book it is indicated in addition to the measurements according to a) and c).

c) unsymmetrical measurement,
adjacent branch terminated



see C.I.S.P.R. 17 (1981) fig. 7

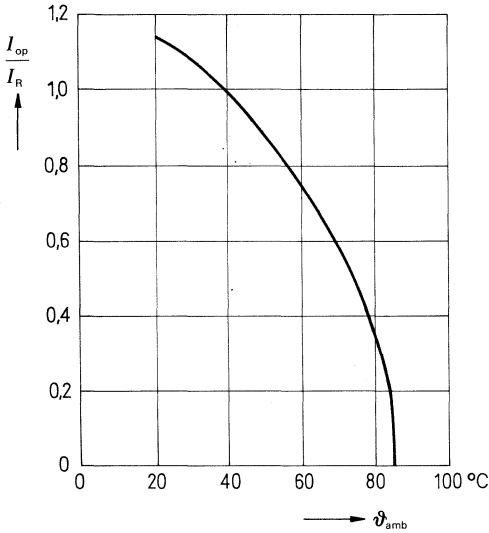
The termination of the adjacent branch by a defined resistance value has not been standardized up to now. As far as the present data book contains attenuation characteristics determined by other measuring arrangements, the deviations are marked at the relevant diagrams.

Line Filters for Single-Phase Systems

General technical information

The filters are determined for continuous operation at rated voltage and rated frequency. Their design allows operation at full rated current and ambient temperatures up to 40°C/104°F. For other ambient temperatures the permitted operating current is given in the following graph.

**Permissible operating current I_{op}
versus ambient temperature ϑ_{amb}**

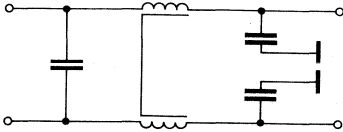


Filters for printed circuits

Rated voltage 250 V ac
Rated current up to 4 A

Application: switched-mode power supplies of medium performance; prefiltering in data processing systems

Circuit diagram

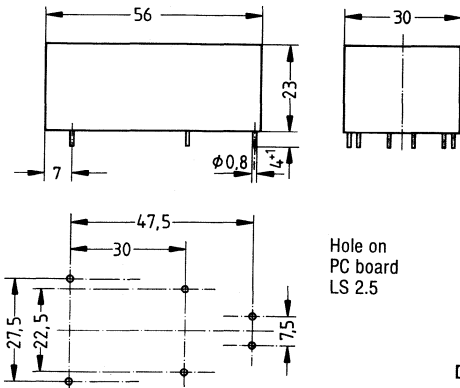


Technical data

Rated voltage	115/250 V ac, 50/60 Hz
Rated current	referred to +40°C/+104°F ambient temperature +60°C/+140°F for B84110-A-A5
Test voltage	1100 V dc, 2 s, (line to line) 2700 V dc, 2 s, (line to ground)
Leakage current	< 0,5 mA
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F, humidity category F)
Test symbols	VDE 0565-3, SEV applied for

Rated current A	Leakage current mA	Approx. weight g	Ordering code PU: 75
0,5			B84110-A-A5
1			B84110-A-A10
2	< 0,5	53	B84110-A-A20
4			B84110-A-A40

Outline drawing



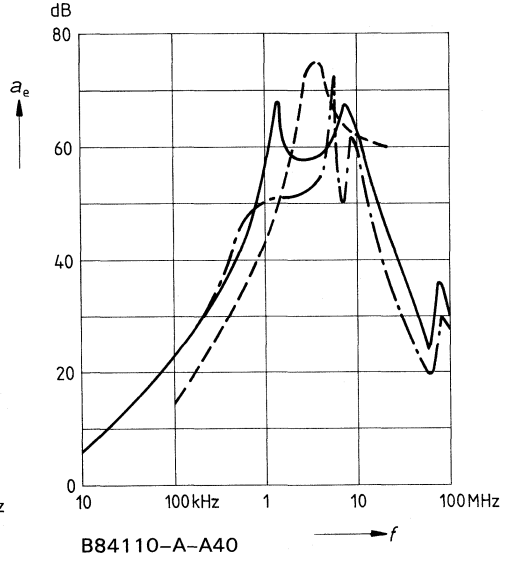
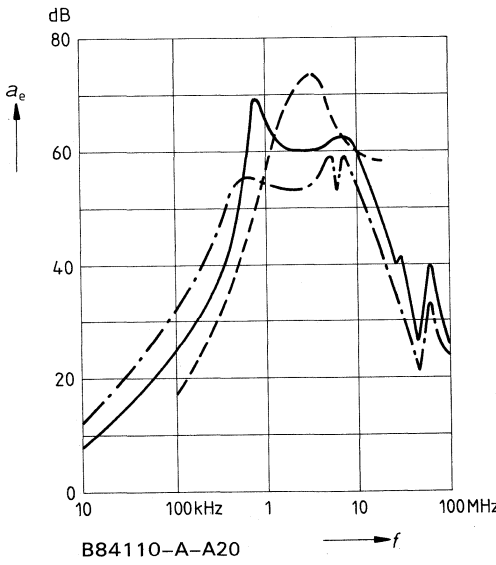
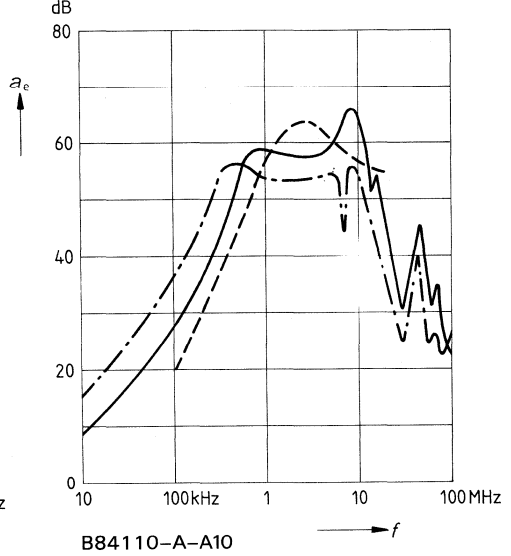
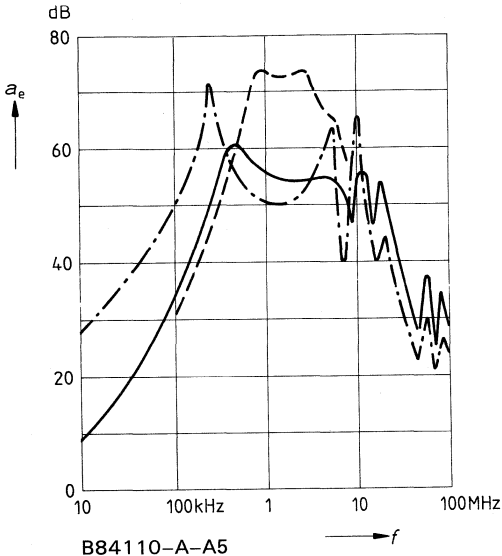
Dimensions in mm

▼ to be preferred

Filters for printed circuits

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

- unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement (differential mode)

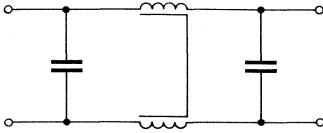


Filter for printed circuits

Rated voltage 250 V ac
Rated current 1.4 A

Application: TV, switched-mode power supplies up to 100W, prefiltering in office machines

Circuit diagram



Technical data

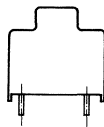
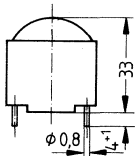
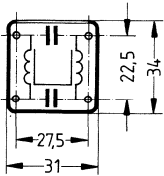
Rated voltage 250 V ac, 50/60 Hz
 Rated current referred to +40°C/104°F ambient temperature
 Test voltage 1100 V dc, 2 s
 DIN climatic category HPF (-25 to +85°C/-13 to +185°F, humidity category F)

Test symbols
 applied for



SEMKO

Rated current A	Approx. weight g	Ordering code PU: 125
1,4	47	B84110-B-A14



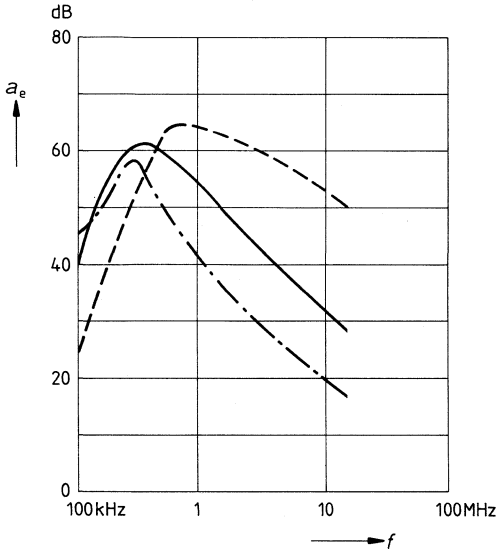
Dimensions in mm

▼ to be preferred

Filter for printed circuits

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

- unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement (differential mode)



Tubular filters

Rated voltage 250 V ac
Rated current up to 15 A

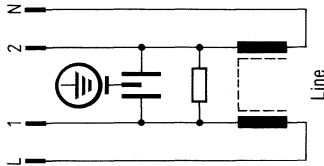
Filter with a current-compensated choke, enclosed in tubular metal can, epoxy resin sealed. A threaded stud at the bottom of the can is used for mounting and simultaneously for grounding. The filter is connected via 4 flat plugs A 6.3 × 0.8 DIN 46244.

One hex nut BM 8 DIN 439 and one locking washer – for example A 8.2 DIN 6797 – are required for mounting.

The application of current-compensated chokes and capacitors with high symmetric capacitance values results in a very high attenuation.

The filters are particularly suitable for use in household appliances and office machines.

Circuit diagram

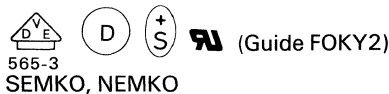


Technical data

Rated current	referred to 50 Hz and 40°C/104°F ambient temperature
Rated voltage	250 V ac, 50 Hz
Test voltage	X1 capacitors: 1650 V dc, 2 s (layer to layer) Y capacitors: 2700 V dc, 2 s (layer to case)
DC resistance	measured at 20°C/68°F
Capacitance tolerance	± 20%
Inductance tolerance	± 30%
Inductance drop ¹⁾	< 10% at dc load according to I_R
Excess temperature	45°C/113°F (at rated current)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F, humidity category F)
IEC climatic category	25/085/21
Specifications	the filters comply with the VDE specification 0565-3

Test symbols

applied for



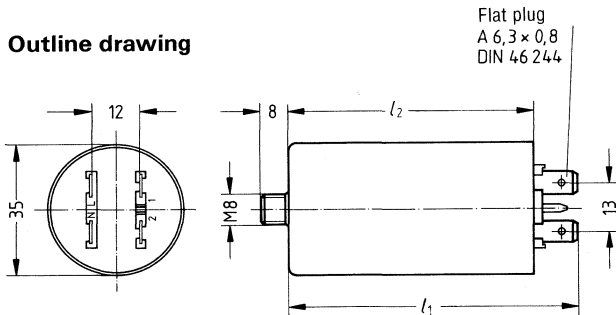
¹⁾ Current-compensated circuit

▼ to be preferred

Tubular filters

Rated current A	Rated capacitance	Rated inductance mH	DC resistance*) mΩ	Dimensions		Approx. weight g	Ordering code PU: 35
				l_1 mm	$d \times l_2$ mm		
4	0,22 μF (X1)	2 × 3,9	2 × 80	64,5	35 × 54	105	B84150-A-A40
6	+ 2 × 2500 pF (Y)	2 × 2,2	2 × 54				B84150-A-A60
10	0,33 μF (X1) + 2 × 2500 pF (Y)	2 × 1,8	2 × 16	78	35 × 67	135	B84150-A-110
15	0,47 μF (X1) + 2 × 5000 pF (Y)	2 × 1,0	2 × 8	88	35 × 77	155	B84150-A-A115
	0,47 μF (X1) + 2 × 0,01 μF (Y)						B84150-B-A115
	0,47 μF (X1) + 2 × 0,022 μF (Y)						B84150-C-A115
	0,47 μF (X1) + 2 × 0,03 μF (Y)						B84150-D-A115

Outline drawing

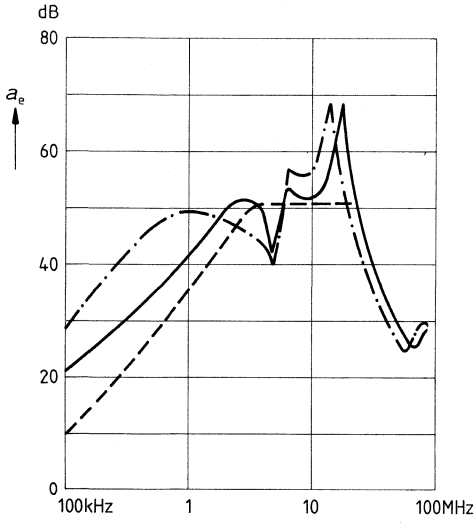


Dimensions in mm

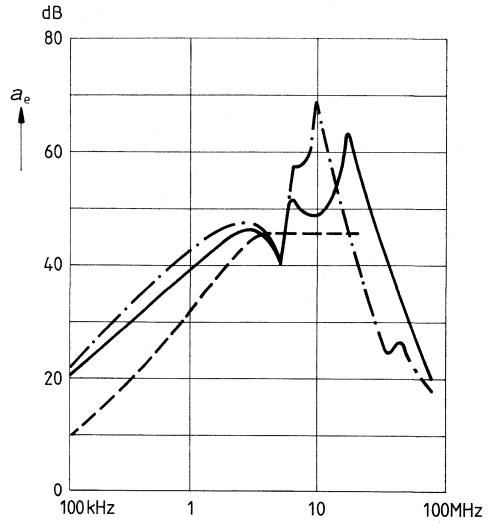
*) Typical values

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

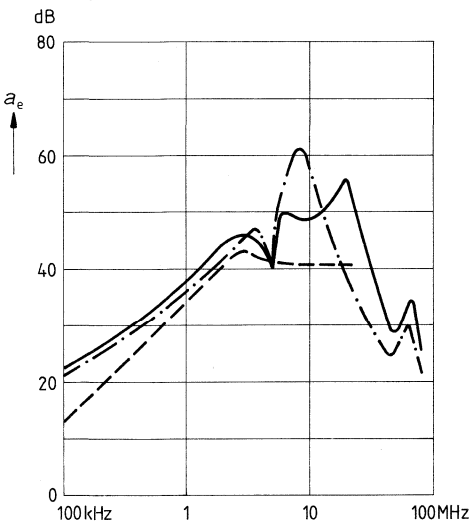
- unsymmetrical measurement, adjacent branch terminated
- - - - - asymmetrical measurement, both branches in parallel (common mode)
- · - · - symmetrical measurement (differential mode)



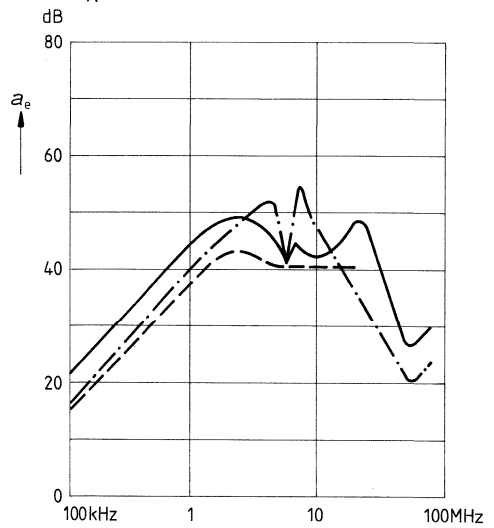
Type B84150-A-A40



Type B84150-A-A60



Type B84150-A-A110

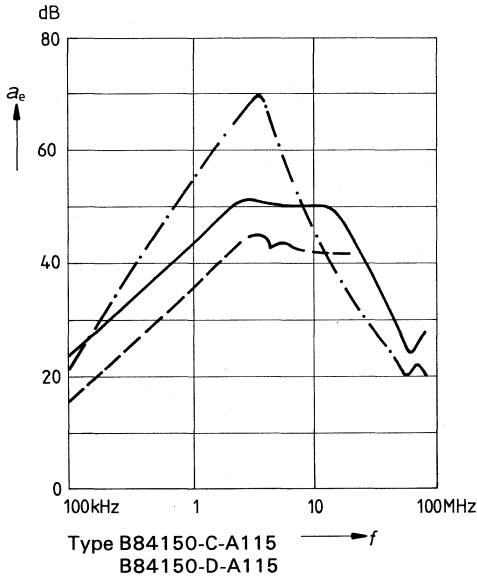


Type B84150-A-A115
B84150-B-A115

Tubular filters

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

- unsymmetrical measurement, adjacent branch terminated
- - - - - asymmetrical measurement, both branches in parallel (common mode)
- · - · - symmetrical measurement (differential mode)



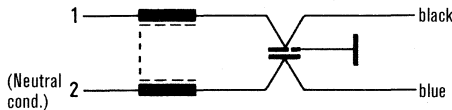
Tubular filter with plug terminal

Rated voltage 250 V ac
Rated current 3 A

Filter with a current compensated choke, enclosed in metal tube with mounting strip. Connection to the line is provided via plug terminals, to the user via leads, and ground connection at the metal tube. In order to avoid leakage currents, the filter has only one unsymmetric capacitance that is connected across neutral conductor (Mp) and safety conductor (chassis).

When the EMI suppression filter is used in fluorescent lamps with an incorporated series-connected choke, where RF interference arises, because of gas discharges of the fluorescent light tubes, the interference level can be decreased to 10 dB below K grade suppression according to VDE 0875. These requirements are established for installations, hospitals, laboratories etc.

Circuit diagram



Technical data

Rated current	referred to 50 Hz and 40°C/104°F ambient temperature
Rated voltage	250 V ac; 50 Hz
DC resistance	measured at 20°C/68°F
Capacitance tolerance	± 20%
Rated inductance	measured in accordance with VDE 0565-2 at 20°C/68°F
Inductance tolerance	± 30%
Inductance drop ¹⁾	< 10% at dc load according to I_R
Excess temperature	45°C/113°F (at rated current)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F; humidity category F)
Permissible switching surges	2000 V
Rated capacitance	0.2 µF (X1) + 0.035 µF (X1)
Rated inductance	2 × 3.9 mH
Specifications	the filter is designed in accordance with VDE 0565-3

Test symbols
 applied for

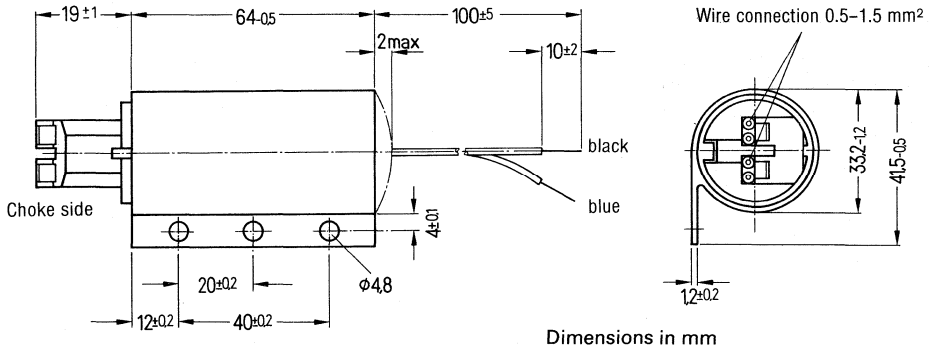


Ordering code

B84151-B-A30

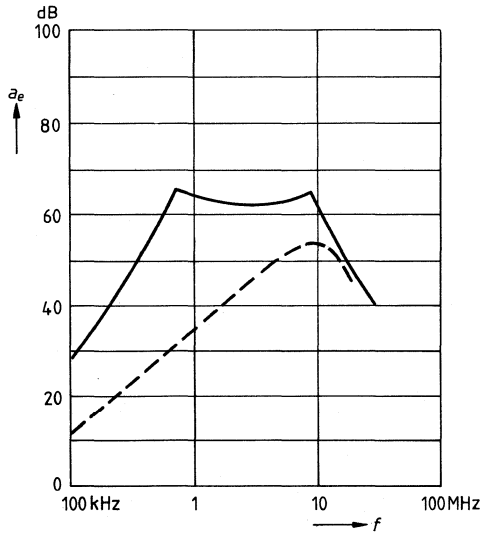
¹⁾ Typical value per branch

Tubular filter B84151-B-A30 with plug terminal



Insertion loss a_e versus frequency f
(typical values at $Z = 60 \Omega$)

———— asymmetrical measurement
(with lines connected in parallel)
- - - - - symmetrical measurement

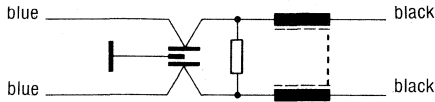


Tubular filter in flat-oval metal tube with litz wire connections

Rated voltage 250 V ac
Rated current 4 A

Filter with a current-compensated choke; enclosed in flat-oval metal tube with mounting strip; connection on both sides via litz wires, ground connection at the metal tube.

Circuit diagram



Technical data

Rated current	referred to 50 Hz and 40°C/104°F ambient temperature
Rated voltage	250 V ac, 50 Hz
DC resistance	measured at 20°C/68°F
Capacitance tolerance	± 20%
Rated inductance	measured in accordance with VDE 0565-2 at 20°C/68°F
Inductance tolerance	± 30%
Inductance drop ¹⁾	< 10% at dc load according to I_R
Excess temperature	45°C/113°F (at rated current)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F; humidity category F)
Rated capacitance	0.12 µF (X1) + 2 × 2,500 pF (Y)
Rated inductance	2 × 1 mH
Discharge resistance	1 MΩ
Specifications	the filter is designed in accordance with VDE 0565-3.

Test symbols



applied for

VDE, SEMKO

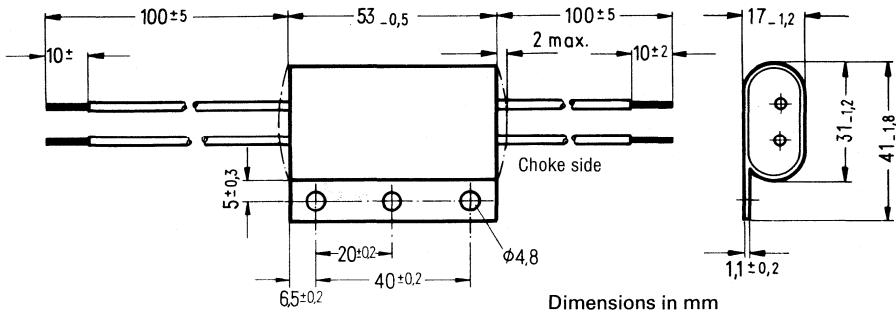
Ordering code

B84151-A-A40

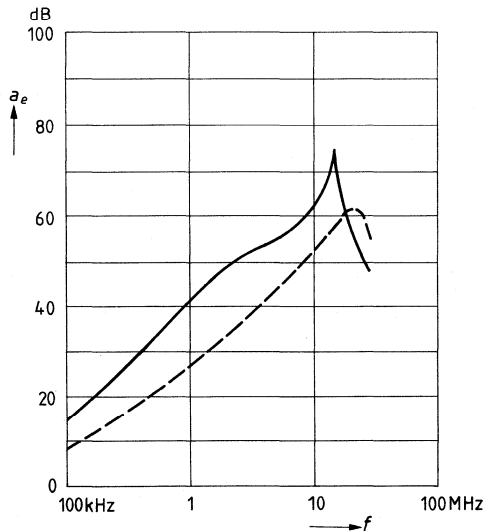
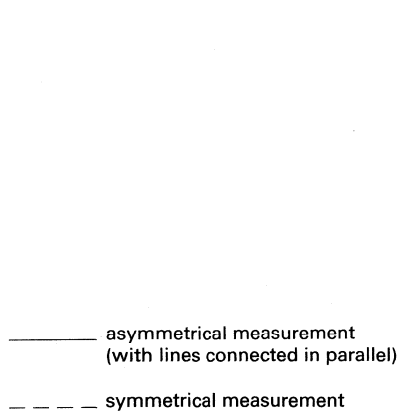
▼ to be preferred

¹⁾ Typical value per branch

Tubular filter B84151-A-A40 in flat-oval metal tube with litz wire connections



Insertion loss a_e versus frequency f
(typical values at $Z = 50 \Omega$)

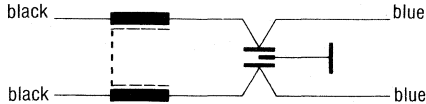


Tubular filter in flat-oval metal tube with litz wire connections

Rated voltage 250 V ac
Rated current 2.5 A

Filter with a current-compensated choke; enclosed in flat-oval metal tube with mounting strip; connection on both sides via litz wires, ground connection at the metal tube.

Circuit diagram



Technical data

Rated current	referred to 50 Hz and 40°C/104°F ambient temperature
Rated voltage	250 V ac, 50 Hz
DC resistance	measured at 20°C/68°F
Capacitance tolerance	± 20%
Rated inductance	measured in accordance with VDE 0565-2 at 20°C/68°F
Inductance tolerance	± 30%
Inductance drop ¹⁾	< 10% at dc load according to I_R
Excess temperature	45°C/113°F (at rated current)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F; humidity category F)
Rated capacitance	0.12 µF (X1) + 2 × 2,500 pF (Y)
Rated inductance	2 × 3.9 mH
Discharge resistance	1 MΩ
Specifications	the filter is designed in accordance with VDE 0565-2.

Test symbols



applied for

VDE, SEMKO

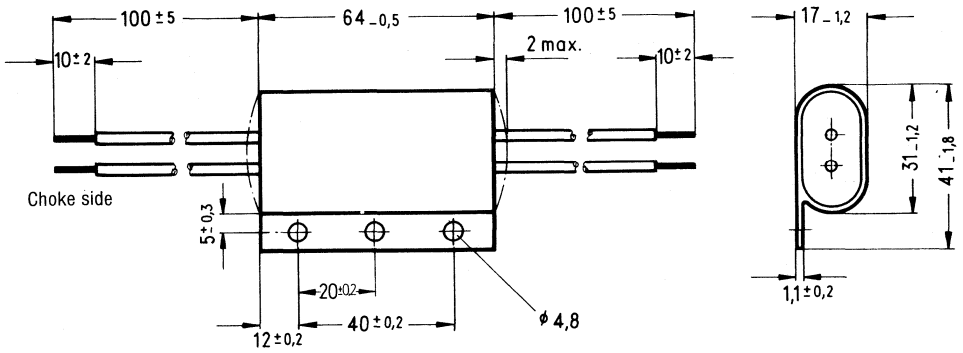
Ordering code

B84151-A-A25

▼ to be preferred

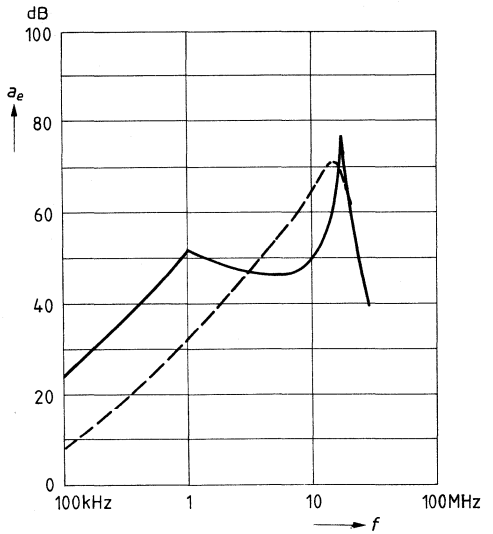
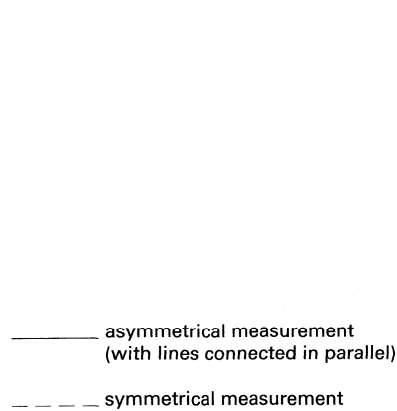
¹⁾ Typical value per branch

Tubular filter B84151-A-A25 in flat-oval metal tube with litz wire connections



Dimensions in mm

**Insertion loss a_e versus frequency f
(typical values at $Z = 50 \Omega$)**

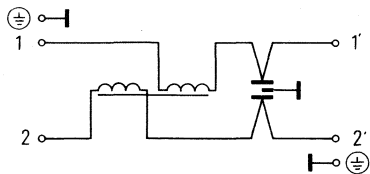


Filters with connecting terminals

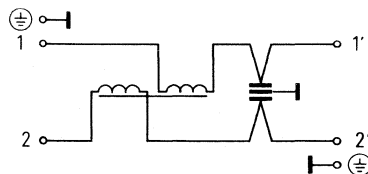
Rated voltage 250 V dc/ac
Rated current up to 6 A

These EMI suppression filters contain an I-core double choke and a wideband multiple-section capacitor. These components are assembled on a base plate fitted with connecting terminals; the base plate is closed by a metal cover ensuring the necessary mechanical and electrical protection. They are connected into the line, and cable clamps are fitted on both, line and equipment sides which ensure stress relief on the connecting leads.

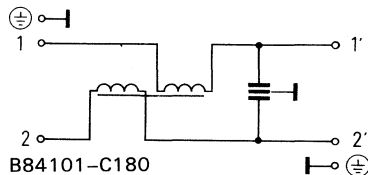
Circuit diagrams



B84101-C10 to -C60



B84101-C140, -C150



B84101-C180

Technical data

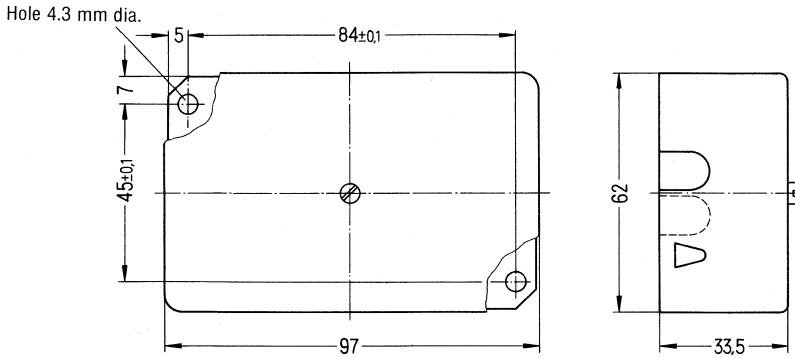
Rated voltage	250 V dc 250 V ac, 50/60 Hz
Rated current	referred to +40°C/104°F ambient temperature
Test voltage	1650 V dc, 2 s (line to line) 2700 V dc, 2 s (line to ground)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F; humidity category F)
Approx. weight	300 g
Specifications	The capacitors used are designed in accordance with VDE 0565-1, the chokes in accordance with VDE 0565-2.

Types

Rated current A	Rated inductance	Rated capacitance	Leakage current	Ordering code
				PU: 20
0,5	2 × 15 mH	0,1 μF (X1) + 2 × 2500 pF (Y)	<0,5 mA	B84101-C10
1	2 × 3,9 mH			B84101-C20
2	2 × 1,2 mH			B84101-C30
4	2 × 220 μH	0,1 μF (X1) + 2 × 5000 pF (Y)		B84101-C60
2	2 × 1,2 mH			B84101-C140
4	2 × 220 μH	2 × 0,035 μF (Y)	<3,5 mA	B84101-C150
6	2 × 82 μH			B84101-C180

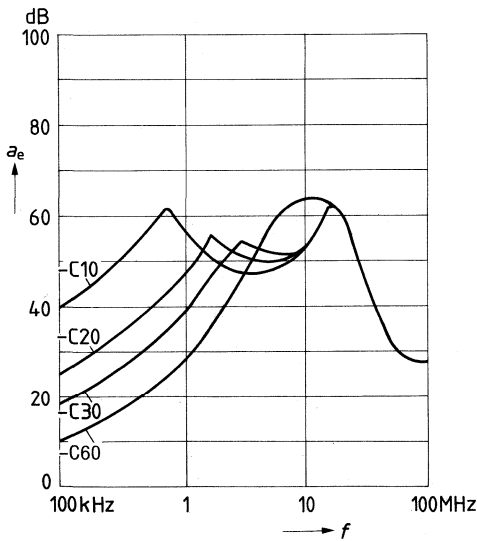
▼ to be preferred

Filters with connecting terminals

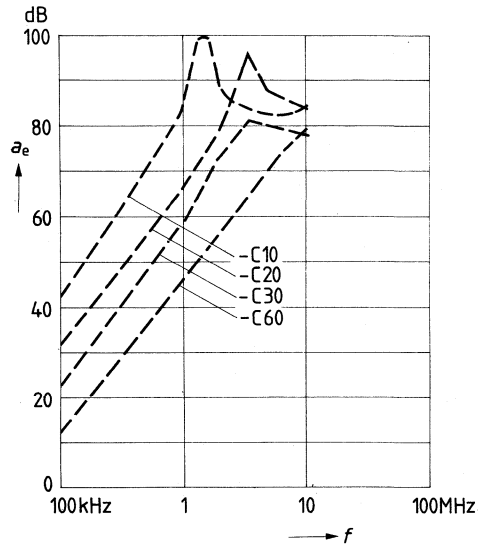


Dimensions in mm

Insertion loss a_e versus frequency f (typical values)

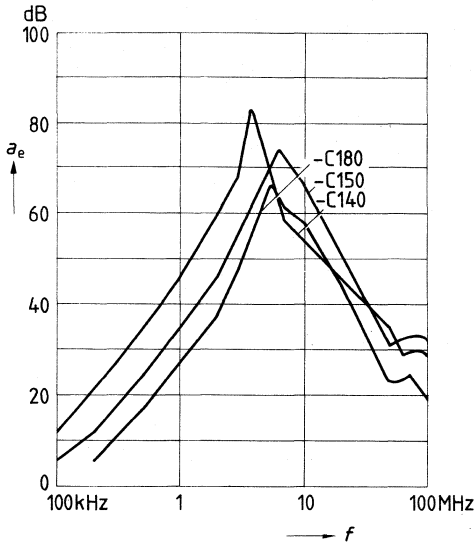


Unsymmetrical measurement

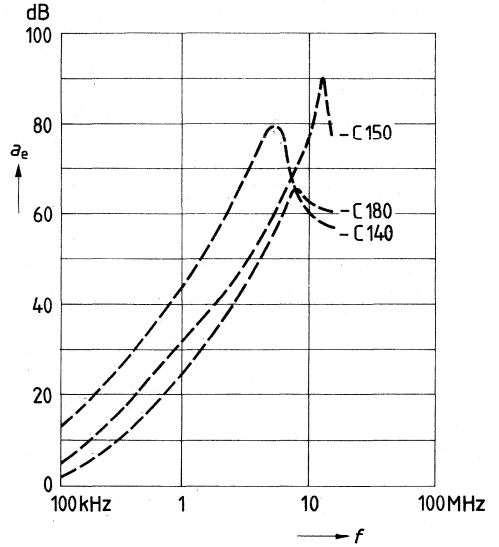


Symmetrical measurement

Insertion loss a_e versus frequency f (typical values)



Unsymmetrical measurement



Symmetrical measurement

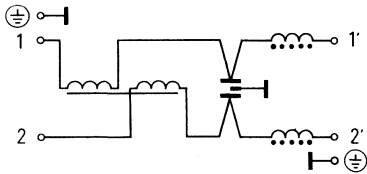
Filters with connecting terminals

Rated voltage 250 V dc/ac
Rated current up to 6 A

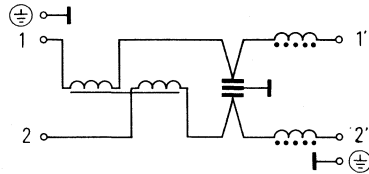
These EMI suppression filters, type B84102-C**, contain I core double chokes and type B84102-K*** current-compensated ring core chokes. The components are epoxy resin sealed in a plastic can. Terminals on the input and output side via clamps with wire protection. The metallic mounting strips are simultaneously used for RF contacting of the filter with the filter case.

Construction with I core chokes B84102-C

Circuit diagrams



B84102-C20 to -C50



B84102-C140, -C150

Technical data

Rated voltage 250 V dc/ac, 50/60 Hz
Rated current referred to 40°C/104°F ambient temperature
Test voltage 1650 V dc, 2s, (line to line)
 2700 V dc, 2s, (line to ground)
DIN climatic category HPF (-25 to +85°C/-13 to +185°F, humidity category F)
Approx. weight 250 g

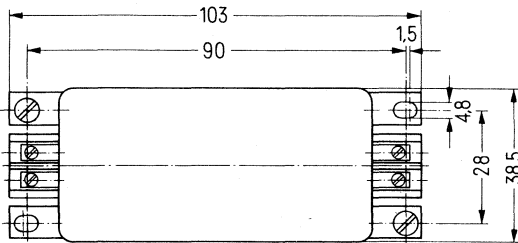
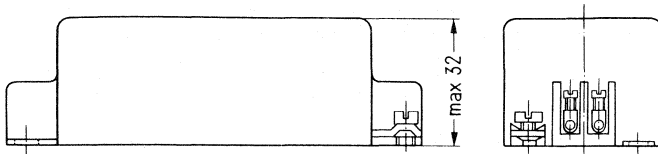
Test symbol



Types

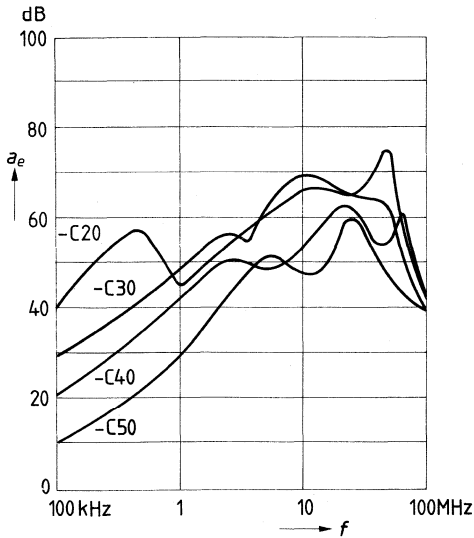
Rated current A	Rated inductance	Rated capacitance	Leakage current	Ordering code PU: 20
▼ 0,5	2 × 13,5 mH, 2 × 14 μH	0,1 μF (X1) + 2 × 2500 pF (Y)	< 0,5 mA	B84102-C20
▼ 1	2 × 3,1 mH, 2 × 10 μH			B84102-C30
▼ 2	2 × 1,1 mH, 2 × 2 μH			B84102-C40
▼ 4	2 × 220 μH, 2 × 1 μH			B84102-C50
2	2 × 1,1 mH, 2 × 2 μH	2 × 0,035 μF (Y)	< 3,5 mA	B84102-C140
4	2 × 220 μH, 2 × 1 μH			B84102-C150

▼ to be preferred

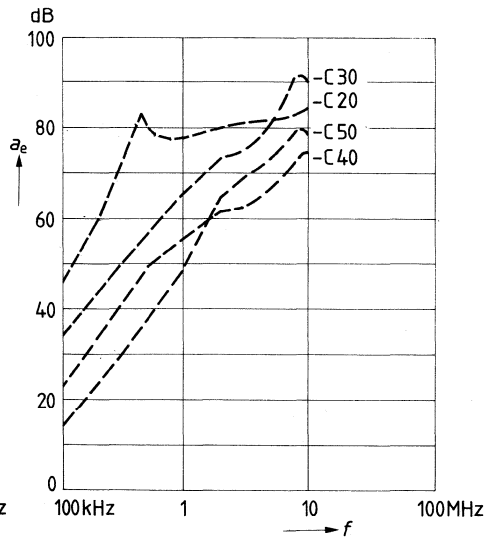


Dimensions in mm

Insertion loss a_e versus frequency f (typical values)



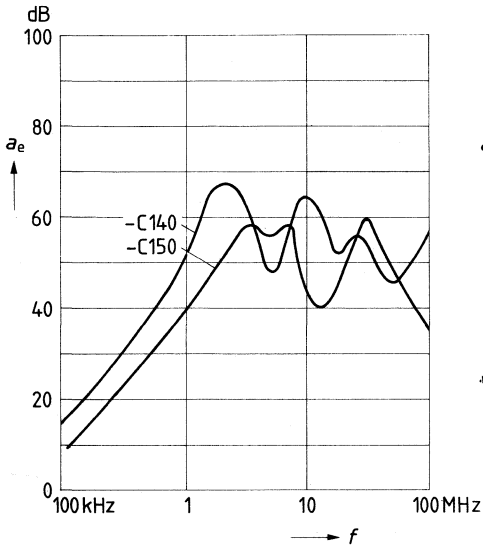
Unsymmetrical measurement



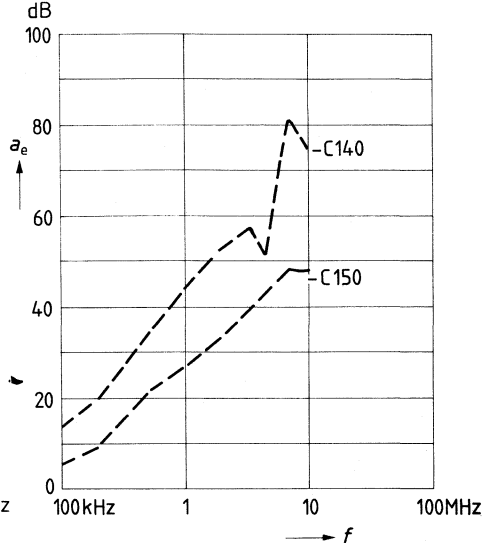
Symmetrical measurement

Filters with connecting terminals

Insertion loss a_e versus frequency f (typical values)



Unsymmetrical measurement

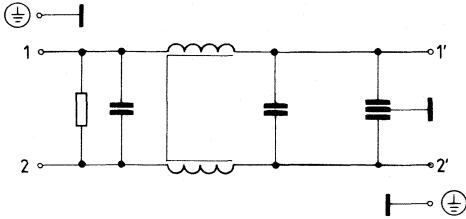


Symmetrical measurement

Filters with connecting terminals

Construction with current-compensated chokes B84102-K

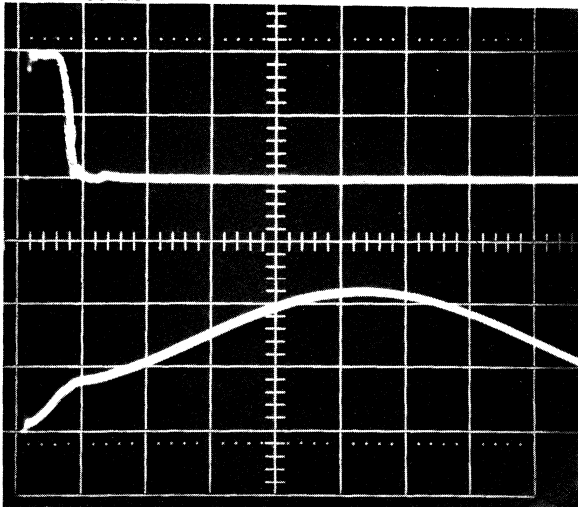
Circuit diagram



Technical data

Rated voltage	250 V ac, 50/60 Hz
Rated current	referred to 40°C/104°F ambient temperature
Test voltage	1200 V dc, 2 s, (line to line) 2700 V dc, 2 s, (line to ground)
DIN climatic category	HPF (- 25 to + 85 °C/- 13 to + 185 °F, humidity category F)
Approx. weight	250 g
Specifications	the filters comply with the VDE specification O565-3

Damping of short-term pulses



Input voltage
Amplitude = 1000 V

Residual voltage at the
filter output
Amplitude = 11 V

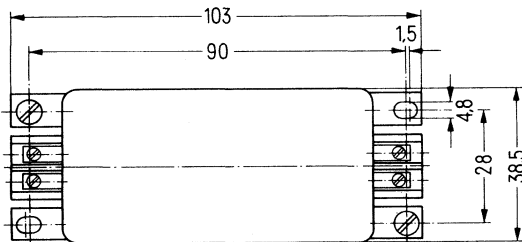
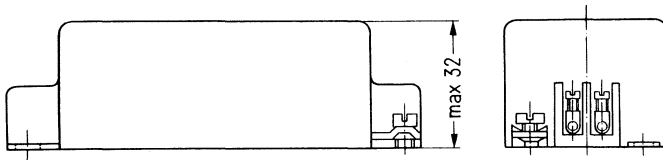
Time scale: 2 μs/cm

▼ to be preferred

Filters with connecting terminals

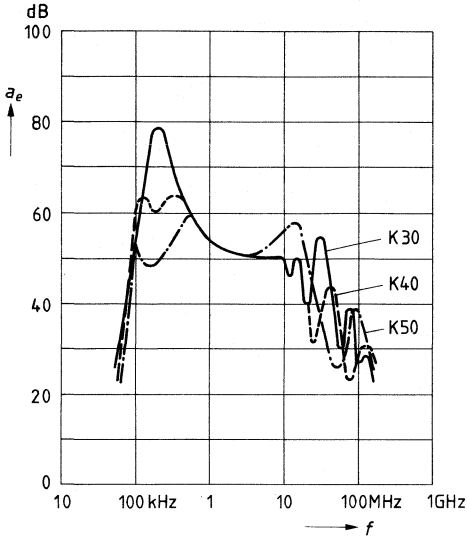
Types

Rated current A	Rated inductance mH	Rated capacitance	Ordering code PU: 20
1	2 × 18	2 × 0,22 μF (X2) + 2 × 2500 pF (Y)	B84102-K30
2	2 × 10	2 × 0,33 μF (X2) + 2 × 2500 pF (Y)	B84102-K40
4	2 × 4,7	2 × 0,47 μF (X2) + 2 × 2500 pF (Y)	B84102-K50
6	2 × 2,2	2 × 0,47 μF (X2) + 2 × 0,035 μF (Y)	B84102-K160

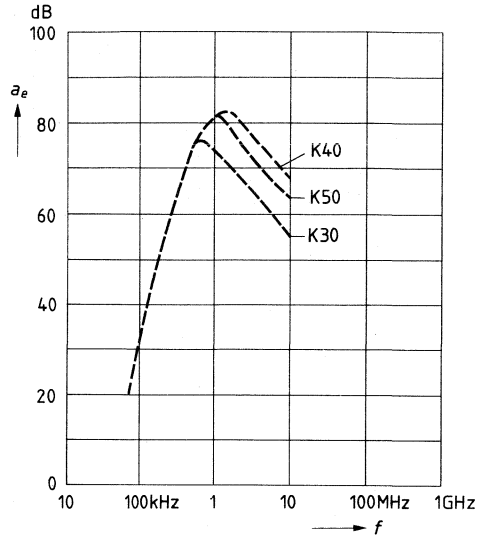


Dimensions in mm

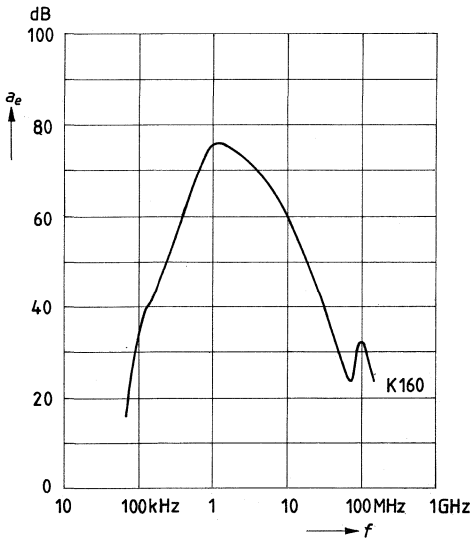
Insertion loss a_e versus frequency f (typical values)



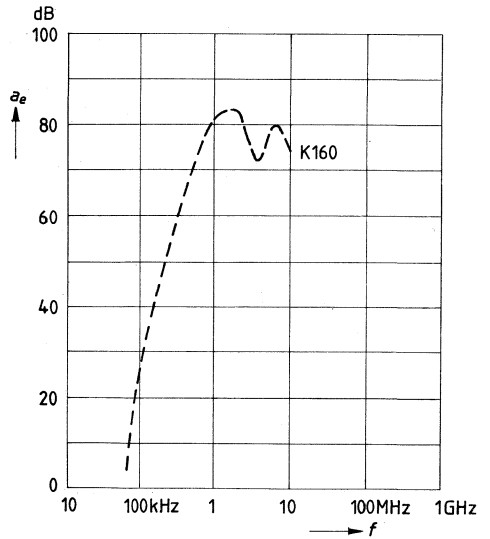
Unsymmetrical measurement



Symmetrical measurement



Unsymmetrical measurement



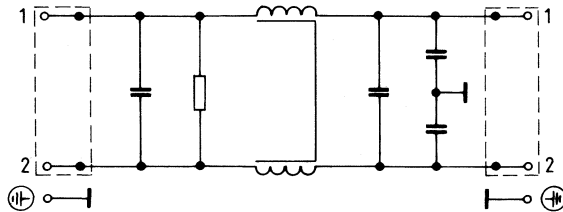
Symmetrical measurement

Filters with connecting terminals

Rated voltage 250 V ac, 50/60 Hz
Rated current up to 25 A

Two-wire EMI suppression filters in plastic case. Favorable volume/attenuation relationship due to compact construction and the use of current-compensated chokes.

Circuit diagram



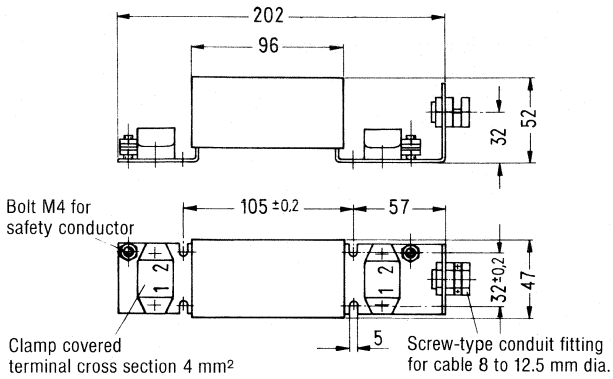
Technical data

Rated current	referred to the upper ambient temperature
Permissible ambient temperature	- 25 to +40°C/- 13 to +104°F
Number of suppressed lines	2
Test voltage	1100 V dc, 2 s, (phase/neutral conductor) 2700 V dc, 2 s, (phase connected to neutral conductor/GND)
Leakage current	<3.5 mA
Specifications:	design in acc. with VDE 0565-3

Types

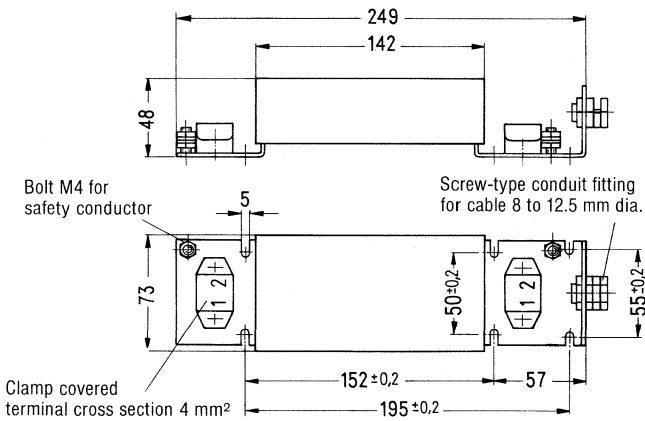
Rated current A	Voltage drop ¹⁾ / phase V	Reactive current ¹⁾ /phase A	Approx. weight kg	PU	Ordering code
10	<0,25	0,075	0,6	10	B84299-K44
25	<0,25	0,15	1,1	5	B84299-K46

¹⁾ measured at 50 Hz



Type B84299-K44

Rated current 10 A



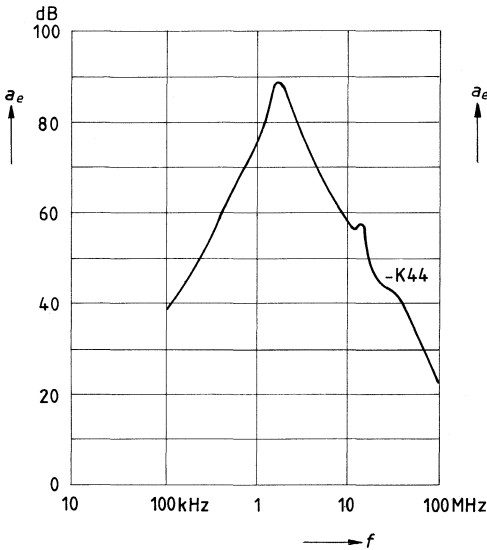
Type B84299-K46

Rated current 25 A

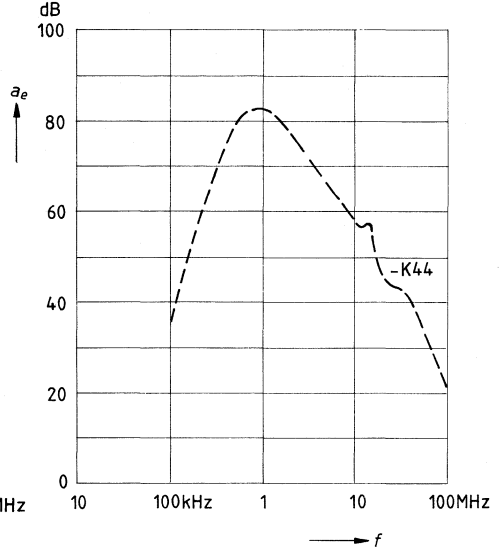
Dimensions in mm

Filters with connecting terminals

Insertion loss a_e versus frequency f (typical values at $Z = 50 \Omega$)



Unsymmetrical measurement



Symmetrical measurement

(Characteristic frequency run with filter B84299-K44 taken as an example)

Standard SIFI filter series

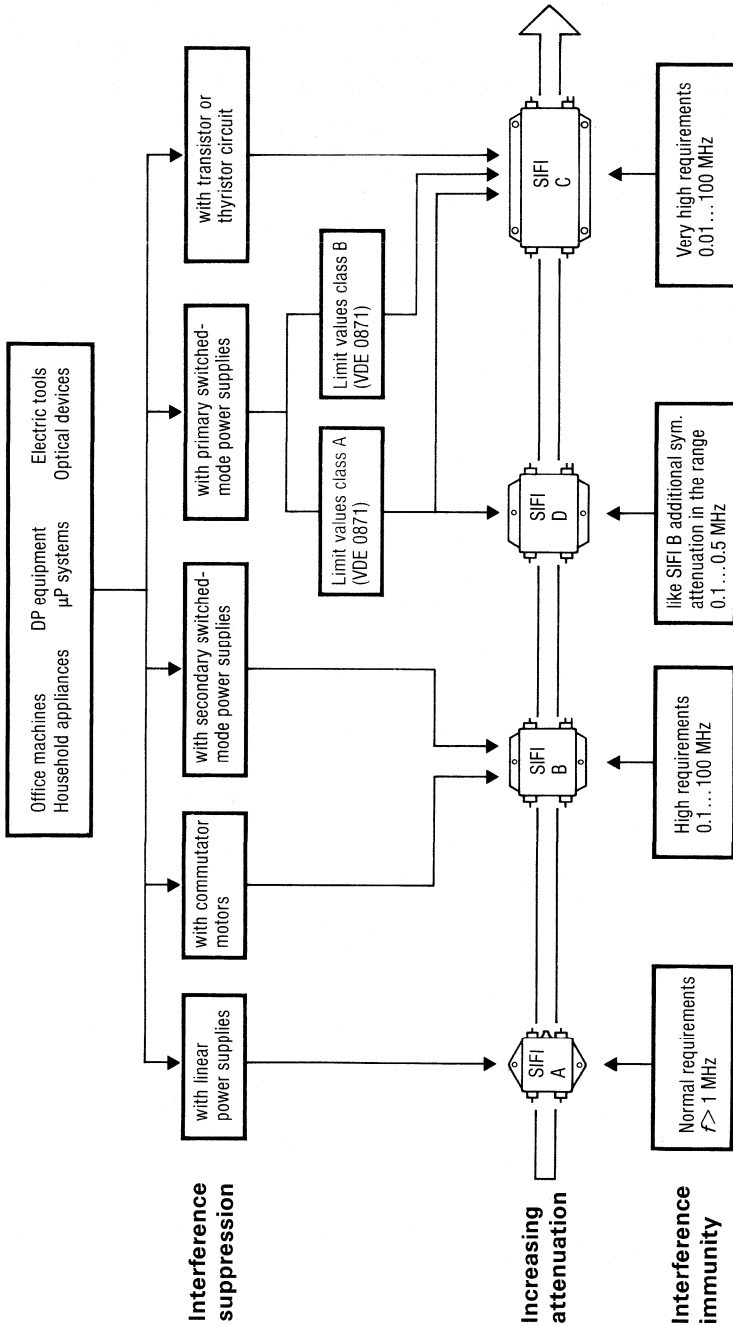
Application	<p>Four filter series for the solution of EMC problems and for EMI suppression are offered with the new standard filters SIFI B84111–A to B84114–D. An economic design can thus be realized dependent on the attenuation effect required.</p> <p>Filters with one choke SIFI A B84111–A→* 10 to →*120 normal attenuation, for rated currents up to 20 A SIFI B B84112–B→* 10 to →*120 enhanced attenuation, for rated currents up to 20 A SIFI D B84114–D→* 10 to →*110 high attenuation compared to SIFI B, for rated currents up to 10 A</p> <p>Filter with two chokes SIFI C B84113–C→* 30 to →*110 very high attenuation, for rated currents up to 10 A</p>
Construction	<p>The components are enclosed in a shielding aluminum case provided with mounting strips and sealed in a self-hardening epoxy resin.</p>
Terminals	<p>Version A and B: flat plugs on both sides 6.3 mm × 0.8 mm (DIN 46 244), inserted in insulating lead-throughs. Version K: Thermosetting plug on the line side in accordance with IEC 320/C 14; flat plug on the plug side 6.3 mm × 0.8 mm, DIN 46 244. Every case is provided with a flat plug 6.3 mm × 0.8 mm, DIN 46 244 as safety connector.</p>
Design and symbols	<p>The filters are designed such that they meet the requirements in accordance with VDE 0565-3, UL, CSA, SEV, SEMKO, NEMKO, and DEMKO. The corresponding test symbols for the filter series are applied for.</p>
Rated current	<p>The rated current intensity applies to 115 V ac, 50/60 Hz as well as to 250 V ac, 50/60 Hz, i.e. a current reduction in case of application at 250 V ac is not necessary. As the VDE specification 0565-3 is limited to filters up to a rated current of 16 A, the VDE test symbol for both the 20 A filters applies up to 16 A.</p>
Discharge resistors	<p>The discharge resistors are designed in accordance with VDE 0730, i.e. one second after disconnection between device and line, the voltage at the line plug must have dropped to 34 V. The requirements of this VDE specification are the same as those of the corresponding IEC specifications (IEC 355 for household appliances, IEC 380 for office machines, and IEC 435 for data processing systems.)</p>

Standard SIFI filter series

- Leakage current** As voltage-independent dielectrics are used for the Y capacitors, a leakage current of less than 0.5 mA per branch is ensured at 250 V, 50 Hz.
- Attenuation** The ability of attenuating unsymmetric interference as well as symmetric interference voltage parts is an important factor for a powerful EMI suppression. Particularly the filter series B, C, and D ensure a high, symmetric suppression effect already from 150 kHz on due to a suitable selection of the components.

Other technical data

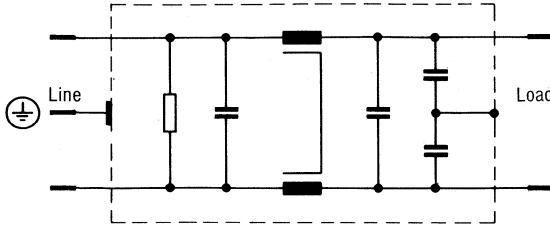
- Rated voltage** 115/250 V ac, 50/60 Hz
- Rated current** referred to 40°C ambient temperature
- Test voltage** 1414 V dc; 2 s; line to line
2700 V dc; 2 s; line to ground
- DIN climatic category** HPF (-25 to +85°C/-13 to +185°F, humidity category F)
Inherent heating of the choke at rated current < 45°C/113°F



Standard SIFI filter series
SIFI A, normal attenuation

Rated voltage 250 V ac
Rated current up to 20 A

Circuit diagram



Technical data

Rated voltage V_R 115/250 V ac, 50/60 Hz
 Rated current referred to 40°C/104°F ambient temperature
 Test voltage 1414 V dc; 2 s; line to line
 2700 V dc; 2 s; line to ground
 Leakage current < 0.5 mA at 250 V ac/50 Hz
 DIN climatic category HPF (-25 to +85°C/-13 to +185°F, humidity category F)

Test symbols



applied for

CSA, SEMKO, NEMKO

Discharge resistors

in accordance with VDE 0730, IEC 355, IEC 380, and IEC 435

Rated current A	Version A ¹⁾		Version B		Version K	
	Ordering code PU: 20	Approx. weight g	Ordering code PU: 20	Approx. weight g	Ordering code PU: 20	Approx. weight g
1	▼B84111-A-A10	80	-	-	▼B84111-A-K10	140
2	▼B84111-A-A20	80	-	-	-	-
3	▼B84111-A-A30	80	-	-	▼B84111-A-K30	140
6	B84111-A-A60	110	▼B84111-A-B60	110	▼B84111-A-K60	140
10	B84111-A-A110	120	▼B84111-A-B110	120	-	-
20 ²⁾	B84111-A-A120	210	▼B84111-A-B120	210	-	-

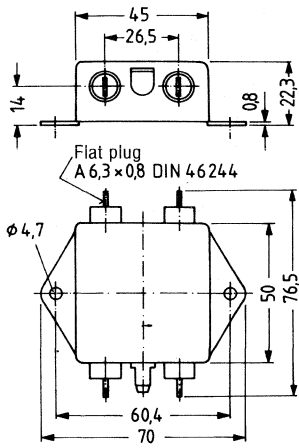
¹⁾ Version A is particularly suited for mounting at a shielded wall.

²⁾ VDE test symbol only for a rated current up to 16 A, as the VDE specification VDE 0565-3 is restricted to filters with a rated current of max. 16 A.

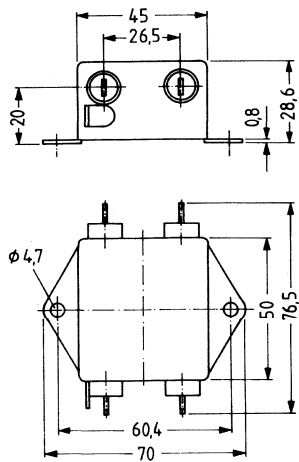
▼ to be preferred

Version A

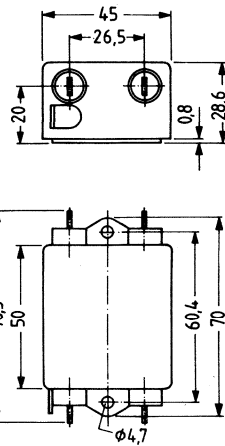
Version B



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



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

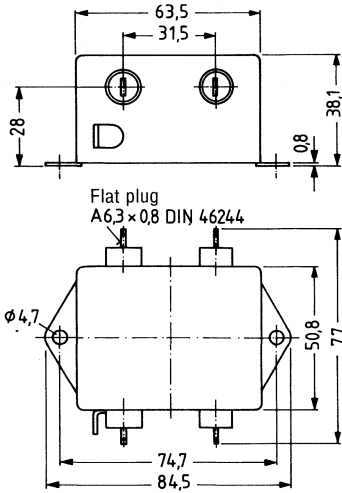


- B84111-A-B60
- B84111-A-B110

Dimensions in mm

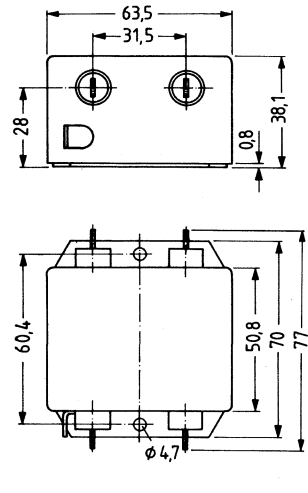
Standard SIFI filter series

Version A



B84111-A-A120

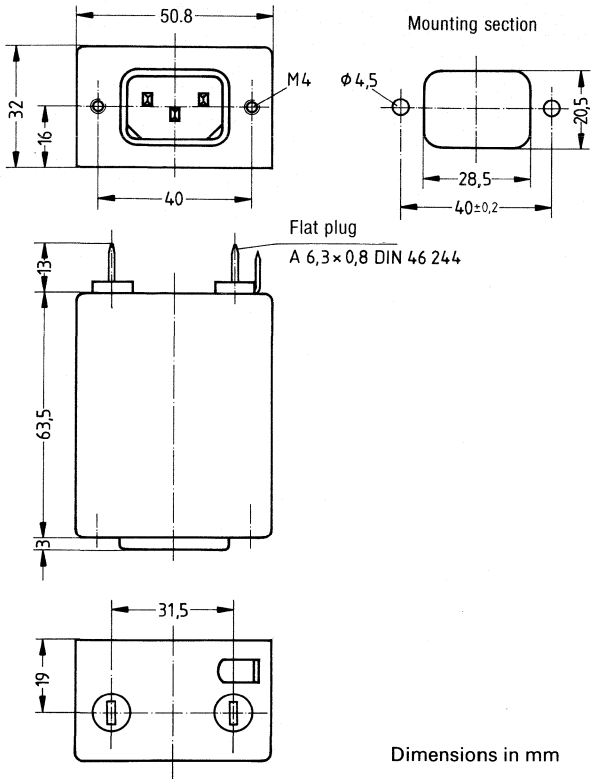
Version B



B84111-A-B120

Dimensions in mm

Version K



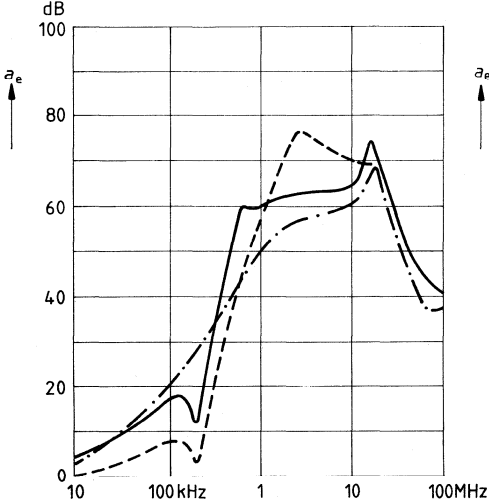
Dimensions in mm

- B84111-A-K10
- B84111-A-K30
- B84111-A-K60

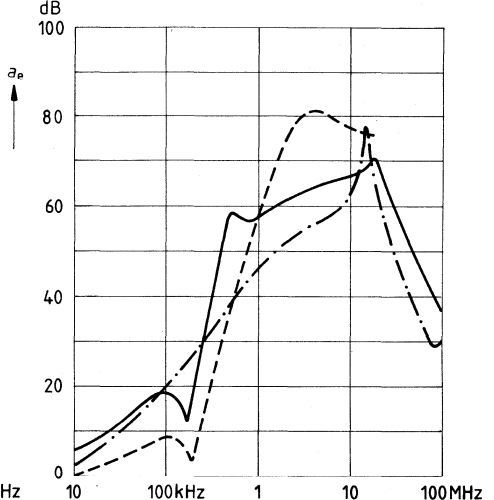
Standard SIFI filter series

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

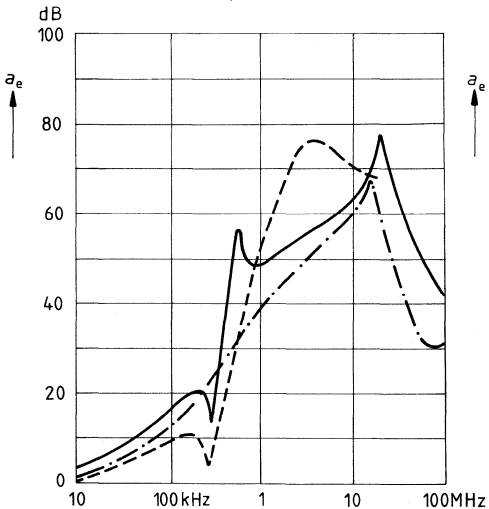
- unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement (differential mode)



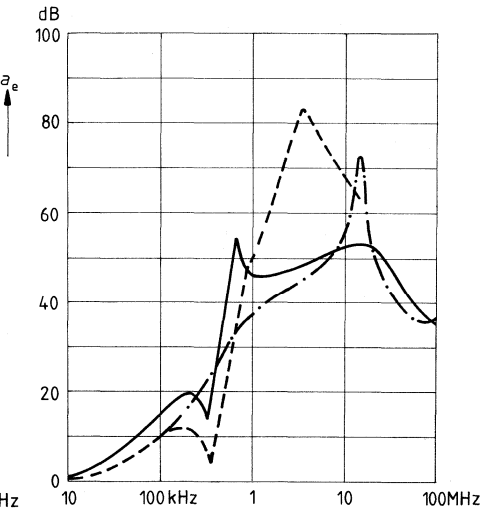
B84111-A-A10/-K10
B84111-A-A20
B84111-A-A30/-K30



B84111-A-A60/-B60/-K60



B84111-A-A110/-B110

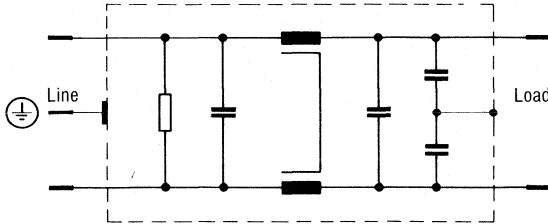


B84111-A-A120/-B120

Standard SIFI filter series
SIFI B, enhanced attenuation

Rated voltage 250 V ac
Rated current up to 20 A

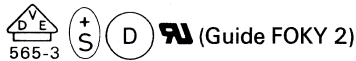
Circuit diagram



Technical data

Rated voltage V_R	115/250 V ac, 50/60 Hz
Rated current	referred to 40°C/104°F ambient temperature
Test voltage	1414 V dc; 2 s; line to line 2700 V dc; 2 s; line to ground
Leakage current	< 0.5 mA at 250 V ac/50 Hz
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F, humidity category F)

Test symbols



applied for	CSA, SEMKO, NEMKO
Discharge resistors	in accordance with VDE 0730, IEC 355, IEC 380, and IEC 435

Rated current A	Version A ¹⁾		▼ Version B ²⁾		▼ Version K ²⁾	
	Ordering code PU: 20	Approx. weight g	Ordering code PU: 20	Approx. weight g	Ordering code PU: 20	Approx. weight g
1	B84112-B-A10	110	B84112-B-B10	110	B84112-B-K10	140
2	B84112-B-A20	110	B84112-B-B20	110	-	-
3	B84112-B-A30	140	B84112-B-B30	140	B84112-B-K30	210
6	B84112-B-A60	150	B84112-B-B60	150	B84112-B-K60	210
10	B84112-B-A110	200	B84112-B-B110	200	-	-
20 ³⁾	B84112-B-A120 ⁴⁾	340	B84112-B-B120 ⁴⁾	340	-	-

¹⁾ Version A is particularly suited for mounting at a shielded wall.

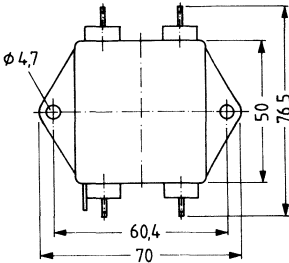
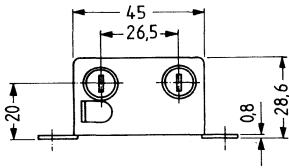
²⁾ ▼ to be preferred

³⁾ VDE test symbol only for a rated current up to 16 A, as the VDE specification VDE 0565-3 is restricted to filters with a rated current of max. 16 A.

⁴⁾ PU: 10

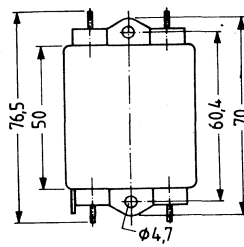
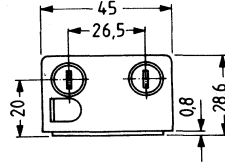
Standard SIFI filter series

Version A

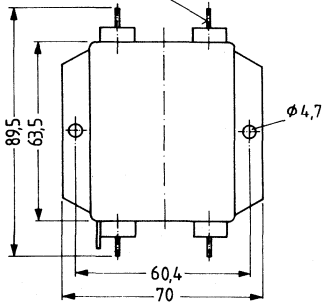
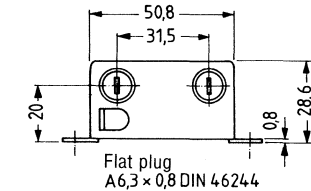


B84112-B-A10
B84112-B-A20

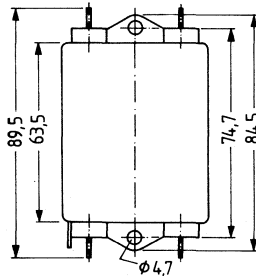
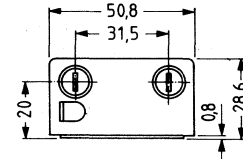
Version B



B84112-B-B10
B84112-B-B20



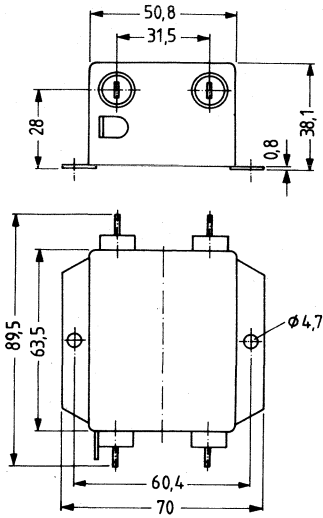
B84112-B-A30
B84112-B-A60



B84112-B-B30
B84112-B-B60

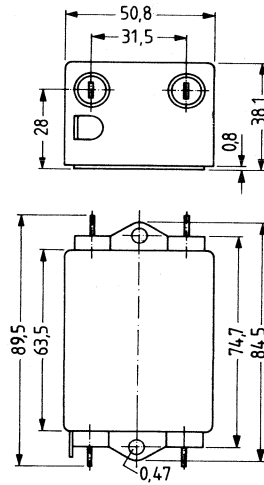
Dimensions in mm

Version A

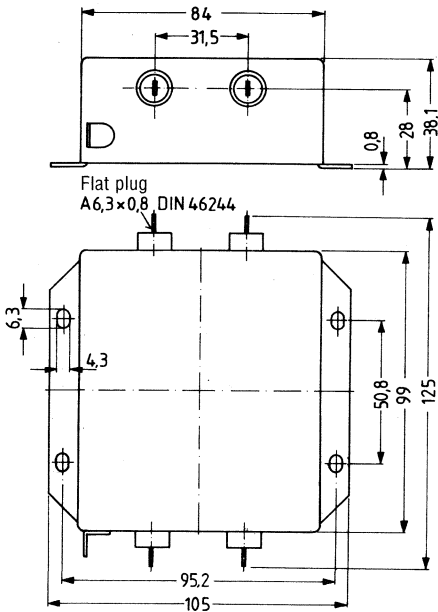


B 84 112-B-A110

Version B

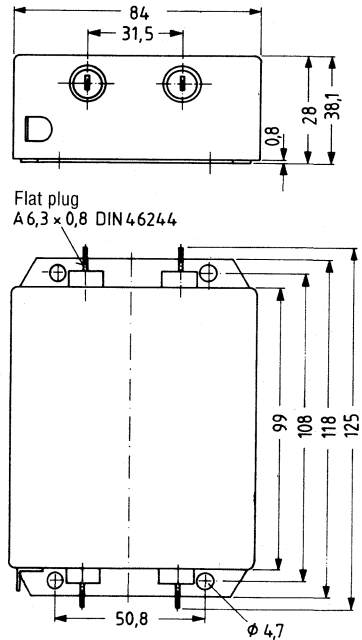


B 84 112-B-B110



B 84 112-B-A120

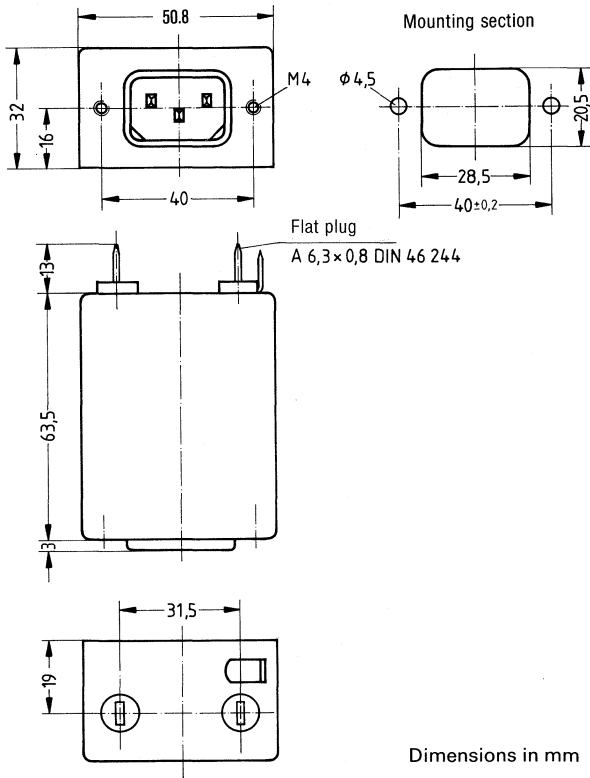
Dimensions in mm



B 84 112-B-B120

Standard SIFI filter series

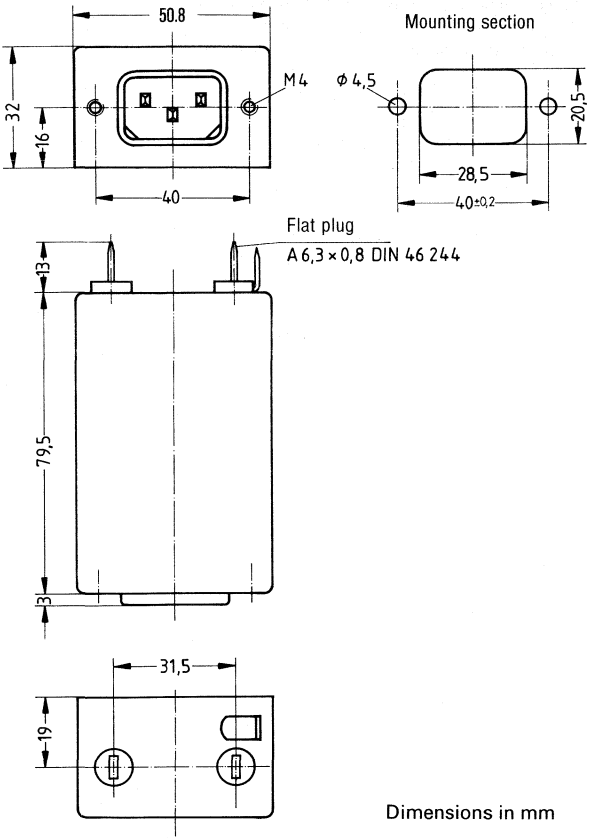
Version K



Dimensions in mm

B84112-B-K10

Version K



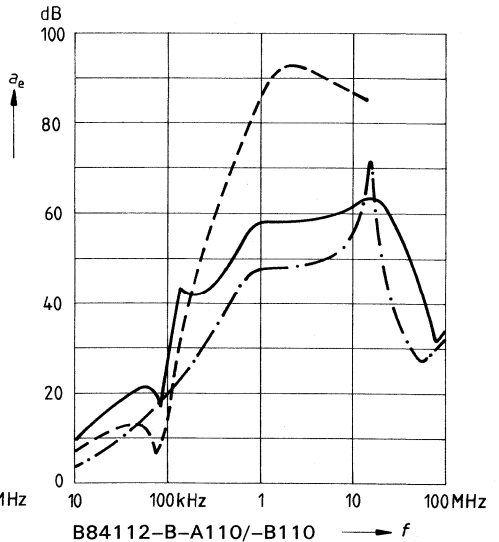
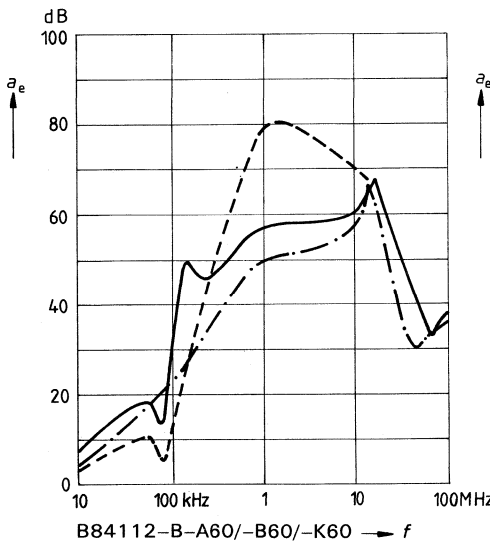
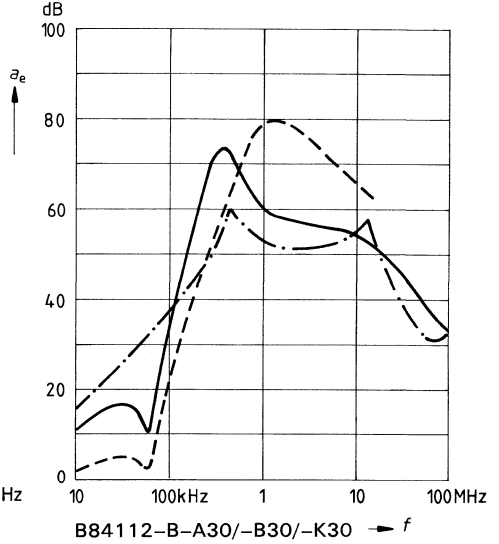
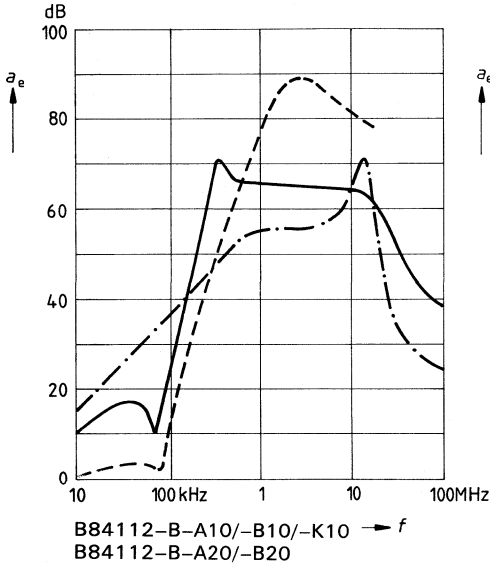
Dimensions in mm

B84112-B-K30
B84112-B-K60

Standard SIFI filter series

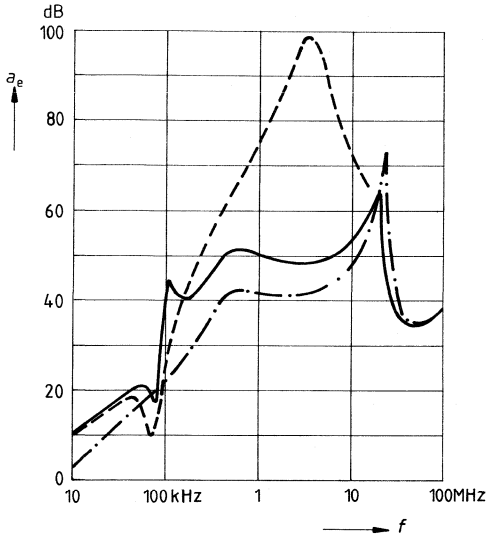
Insertion loss (typical values at $Z = 50\Omega$)

- unsymmetrical measurement, adjacent branch terminated
- - - - - asymmetrical measurement, both branches in parallel (common mode)
- · - · - symmetrical measurement (differential mode)



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

- unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement (differential mode)

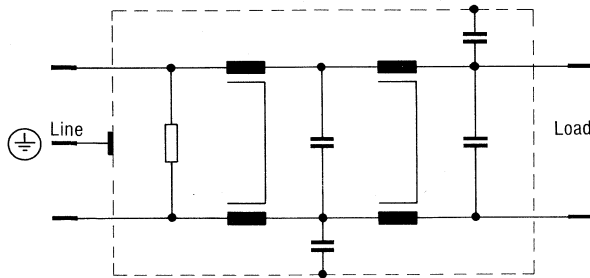


B84112-B-A120/-B120





Standard SIFI filter series
SIFI C, very high attenuation

Rated voltage 250 V ac
Rated current up to 10 A

Circuit diagram



Technical data

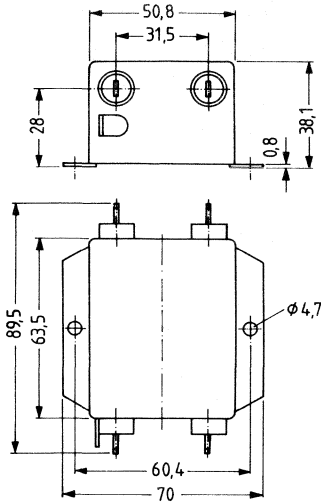
Rated voltage V_R	115/250 V ac, 50/60 Hz
Rated current	referred to 40 °C/104 °F ambient temperature
Test voltage	1414 V dc; 2 s; line to line 2700 V dc; 2 s; line to ground
Leakage current	< 0.5 mA at 250 V ac/50 Hz
DIN climatic category	HPF (-25 to +85 °C/-13 to +185 °F, humidity category F)
Test symbols	    (Guide FOKY 2)
applied for	CSA, SEMKO, NEMKO
Discharge resistors	in accordance with VDE 0730, IEC 355, IEC 380, and IEC 435

Rated current	Version A ¹⁾		Version B ²⁾		Version K ²⁾	
	Ordering code	Approx. weight g	Ordering code	Approx. weight g	Ordering code	Approx. weight g
A	PU: 20		PU: 20		PU: 20	
3	B84113-C-A30	210	B84113-C-B30	210	B84113-C-K30	270
6	B84113-C-A60	510	B84113-C-B60	510	-	-
10	B84113-C-A110	690	B84113-C-B110	690	-	-

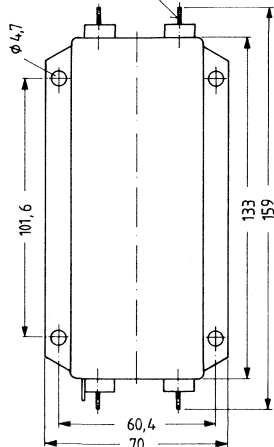
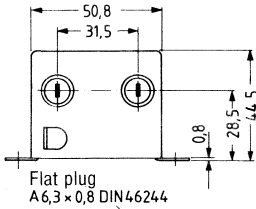
¹⁾ Version A is particularly suited for mounting at a shielded wall.

²⁾ ▽ to be preferred

Version A

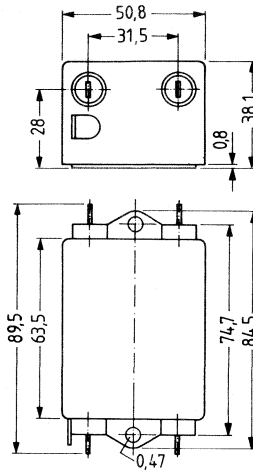


B84113-C-A30

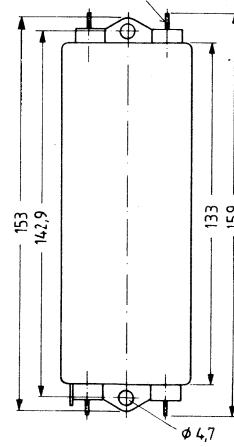
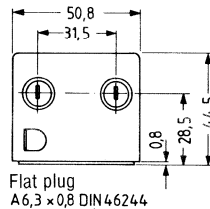


B84113-C-A60
B84113-C-A110

Version B



B84113-C-B30

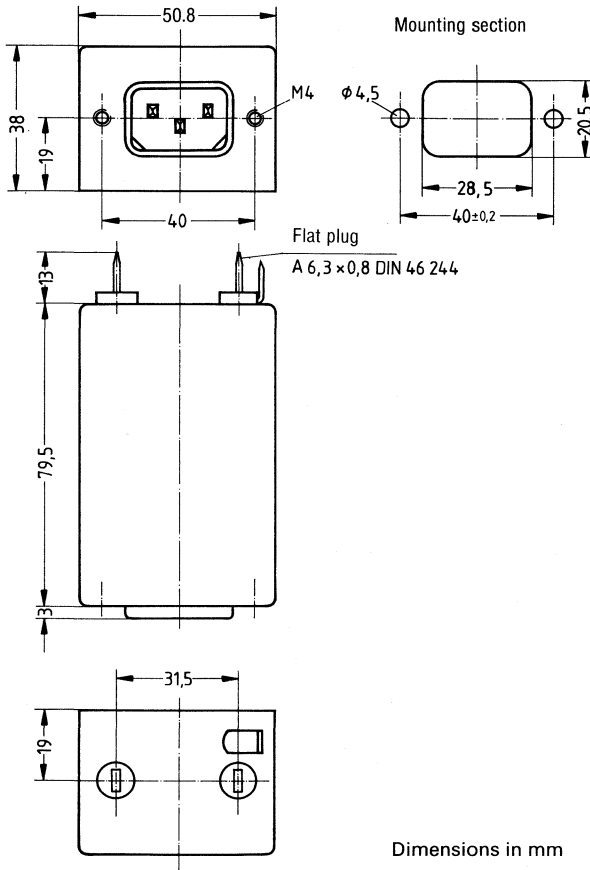


B84113-C-B60
B84113-C-B110

Dimensions in mm

Standard SIFI filter series

Version K

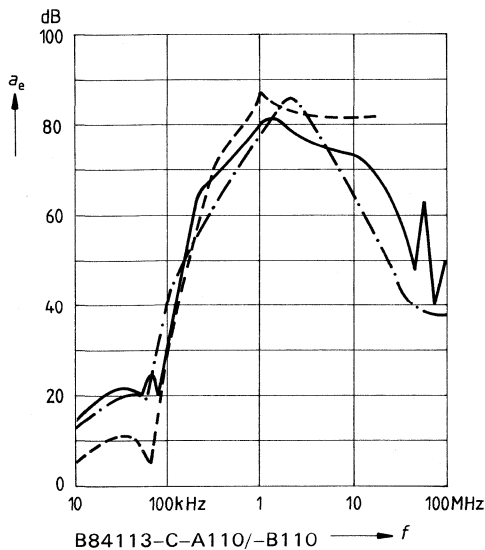
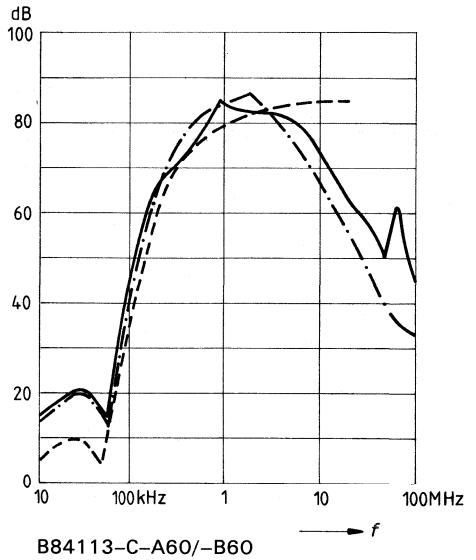
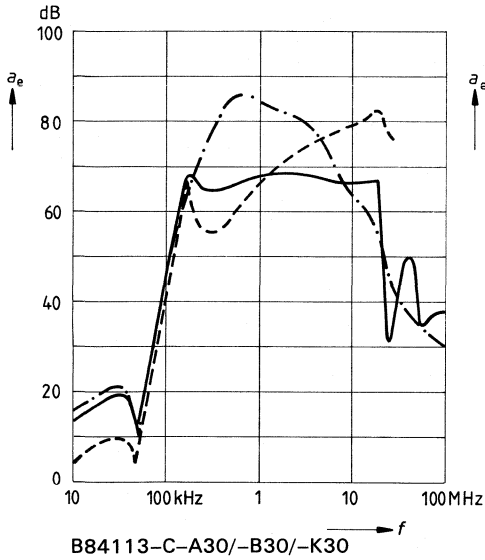


Dimensions in mm

B84113-C-K30

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

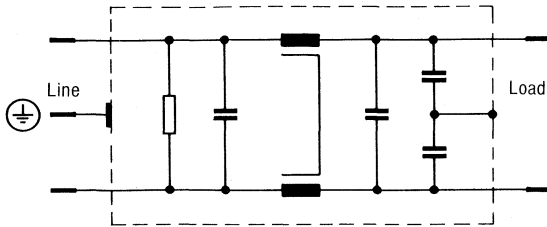
- unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement (differential mode)



Standard SIFI filter series
SIFI D, high attenuation

Rated voltage 250 V ac
Rated current up to 10 A

Circuit diagram



Technical data

Rated voltage V_R 115/250 V ac, 50/60 Hz
 Rated current referred to 40°C/104°F ambient temperature
 Test voltage 1414 V dc, 2 s, line to line
 2700 V dc, 2 s, line to ground
 Leakage current <0.5 mA at 250 V ac/50 Hz
 DIN climatic category HPF (-25 to +85°C/-13 to +185°F, humidity category F)

Test symbols



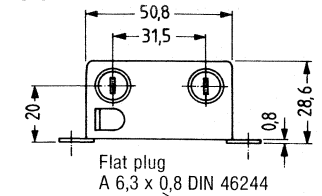
applied for CSA, SEMKO, NEMKO
 Discharge resistors in accordance with VDE 0730, IEC 355, IEC 380 and IEC 435

Rated current	Version A ¹⁾		Version B ²⁾		Version K ²⁾	
	Ordering code	Approx. weight g	Ordering code	Approx. weight g	Ordering code	Approx. weight g
A	PU: 20		PU: 20		PU: 20	
1	B84114-D-A10	150	B84114-D-B10	150	B84114-D-K10	210
2	B84114-D-A20	150	B84114-D-B20	150	-	-
3	B84114-D-A30	150	B84114-D-B30	150	B84114-D-K30	210
6	B84114-D-A60	230	B84114-D-B60	230	B84114-D-K60	290
10	B84114-D-A110	420	B84114-D-B110	420	-	-

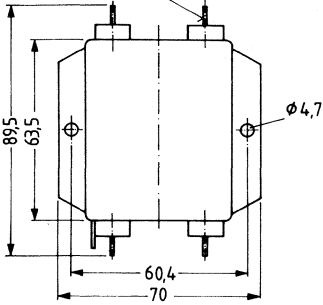
¹⁾ Version A is particularly suited for mounting at a shielded wall.

²⁾ ▽ to be preferred

Version A

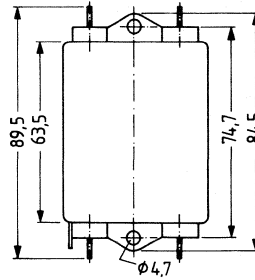
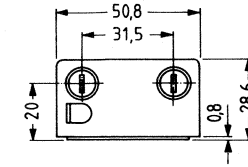


Flat plug
A 6,3 x 0,8 DIN 46244

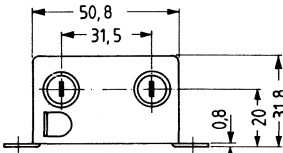


B84114-D-A10
B84114-D-A20
B84114-D-A30

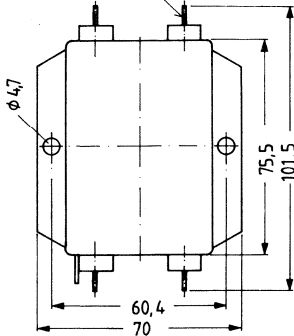
Version B



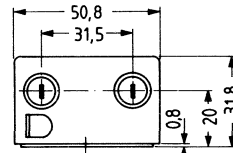
B84114-D-B10
B84114-D-B20
B84114-D-B30



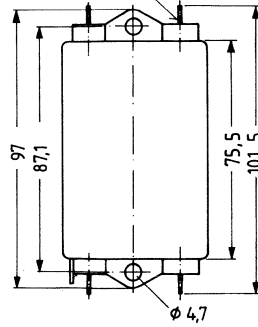
Flat plug
A 6,3 x 0,8 DIN 46244



B84114-D-A60



Flat plug
A 6,3 x 0,8 DIN 46244

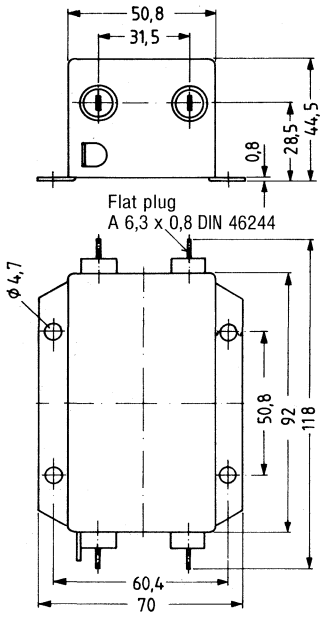


B84114-D-B60

Dimensions in mm

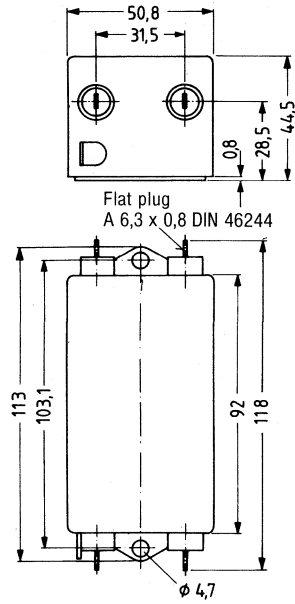
Standard SIFI filter series

Version A



B84114-D-A110

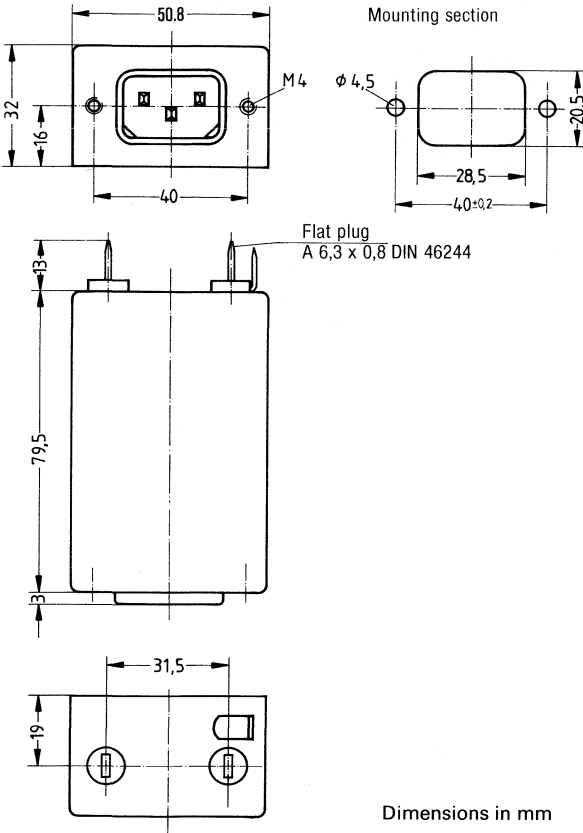
Version B



B84114-D-B110

Dimensions in mm

Version K

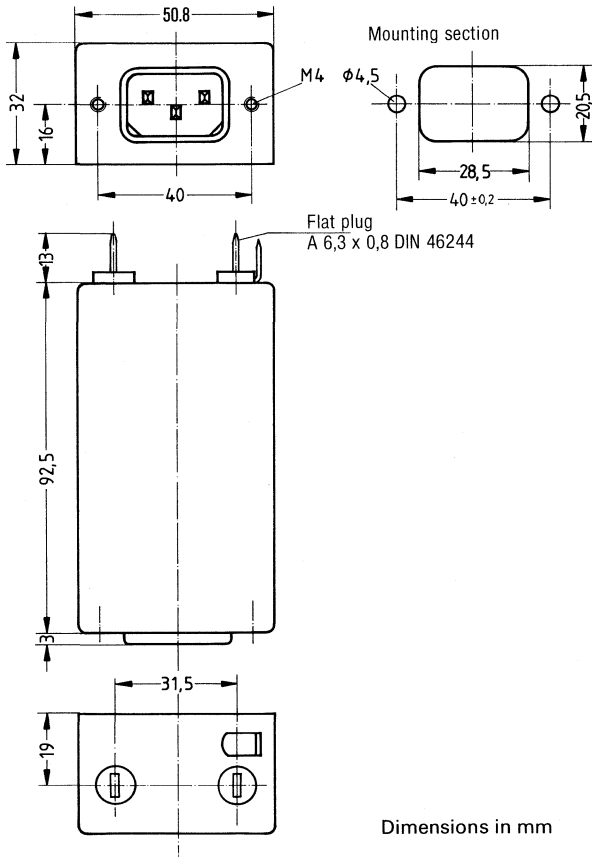


Dimensions in mm

B84114-D-K10
B84114-D-K30

Standard SIFI filter series

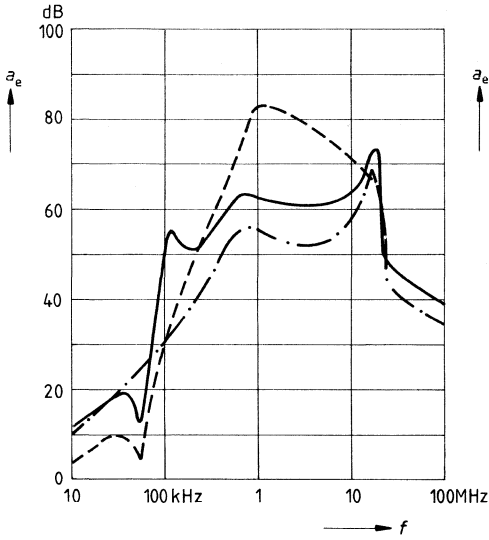
Version K



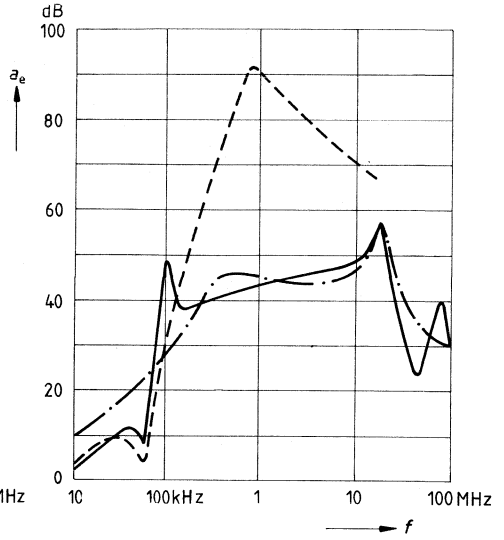
B84114-D-K60

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

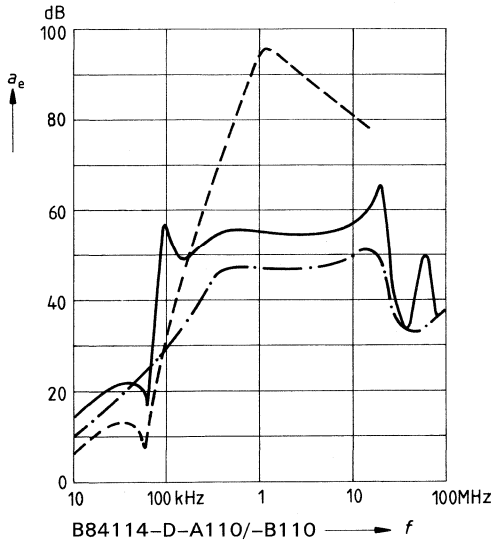
- asymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · - symmetrical measurement (differential mode)



B84114-D-A10/-B10/-K10
 B84114-D-A20/-B20
 B84114-D-A30/-B30/-K30



B84114-D-A60/-B60/-K60



B84114-D-A110/-B110

Filters with IEC plug

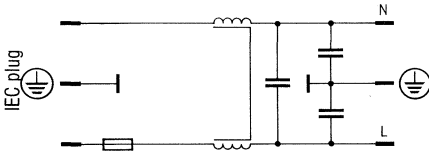
Rated voltage 250 V ac
Rated current up to 6 A

Series of filters having an integrated plug in accordance with IEC 320 with and without fuses are available for use in desk calculators, office machines, medical equipment, and other electronic devices.

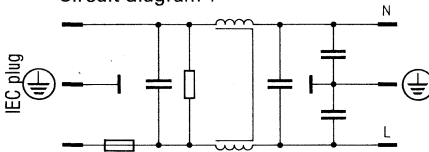
Relating to electromagnetic compatibility, the filters can be mounted at the best suitable position directly at the interface of line and device.

The application of these filters results in reducing the interference level generated in the devices as well as in an efficient protection against interference from the power line.

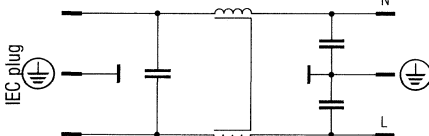
Circuit diagrams



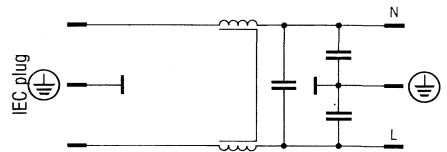
Circuit diagram 1



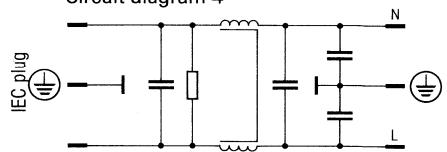
Circuit diagram 2



Circuit diagram 3





Circuit diagram 4



Circuit diagram 5

Technical data

Rated voltage	115/250 V ac, 50/60 Hz
Rated current	referred to 40°C/104°F ambient temperature
Test voltage	1414 V dc, 2 s (line to line) 2700 V dc, 2 s (line to ground)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F humidity category F)
Test symbols	  (Guide FOKY 2) 565-3
applied for	CŞA, SEV, SEMKO, DEMKO, NEMKO
Discharge resistor	in acc. with VDE 0730, IEC 355, IEC 380 and IEC 435

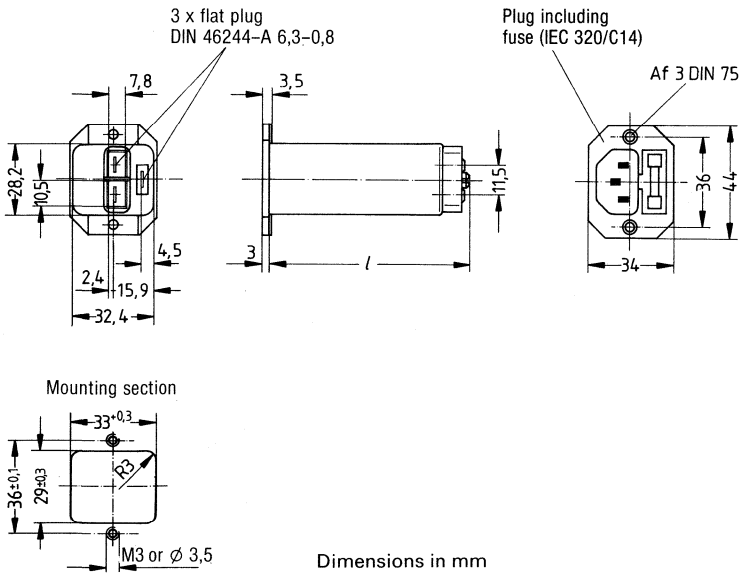
▼to be preferred

Filters with IEC plug and fuses

Rated current A	Leakage current*) mA	Circuit diagram	Dimension <i>l</i>	Approx. weight g	Ordering code PU: 30
1 2 4 6	<0,34	1	63,5	60	B84103-B2-A10 B84103-B2-A20 B84103-B2-A40 B84103-B2-A60
1 2 4 6	<0,5	2	79	80	B84103-C3-A10 B84103-C3-A20 B84103-C3-A40 B84103-C3-A60

*) at 250 V ac, 50 Hz

Outline drawing

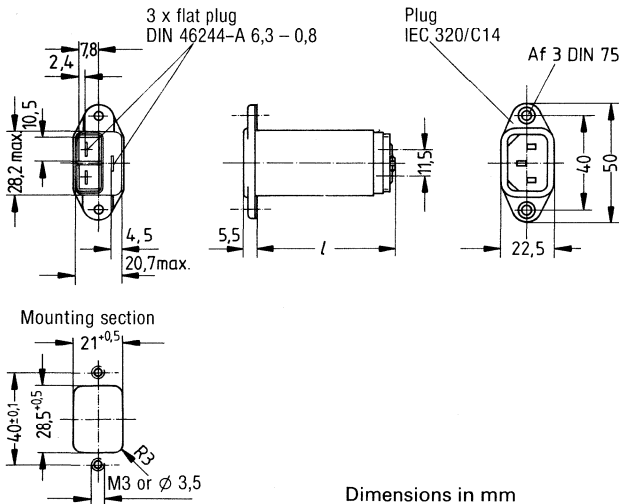


Filters with IEC plug

Rated current A	Leakage current*) mA	Circuit diagram	Dimension <i>l</i>	Approx. weight g	Ordering code PU: 40
1 2 4 6	<0,34	3	51	50	B84104-A1-A10 B84104-A1-A20 B84104-A1-A40 B84104-A1-A60
1 2 4 6	<0,34	4	61	60	B84104-B2-A10 B84104-B2-A20 B84104-B2-A40 B84104-B2-A60
1 2 4 6	<0,5	5	76	80	B84104-C3-A10 B84104-C3-A20 B84104-C3-A40 B84104-C3-A60

*) at 250 V ac, 50 Hz

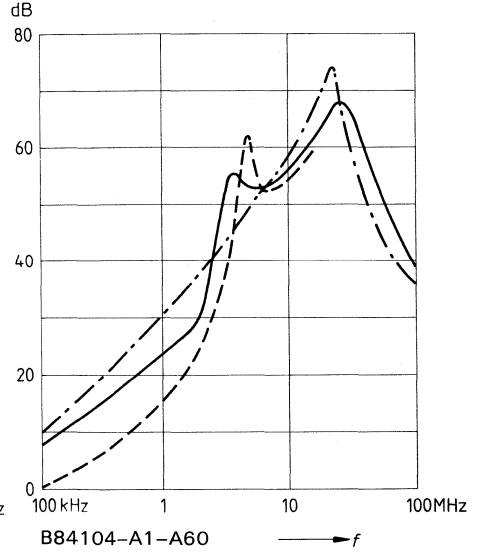
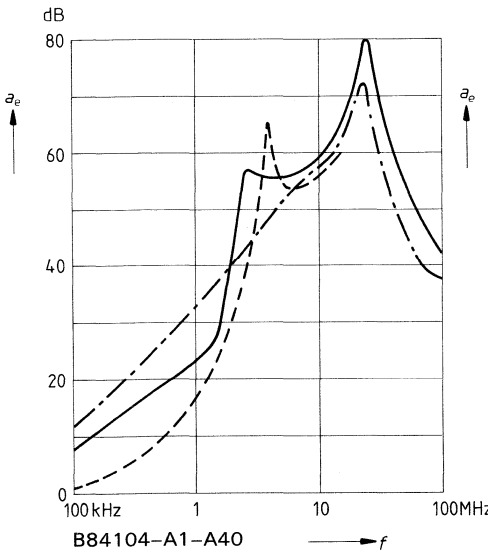
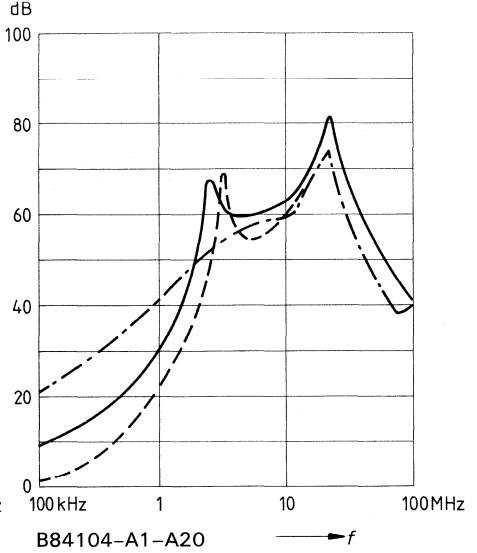
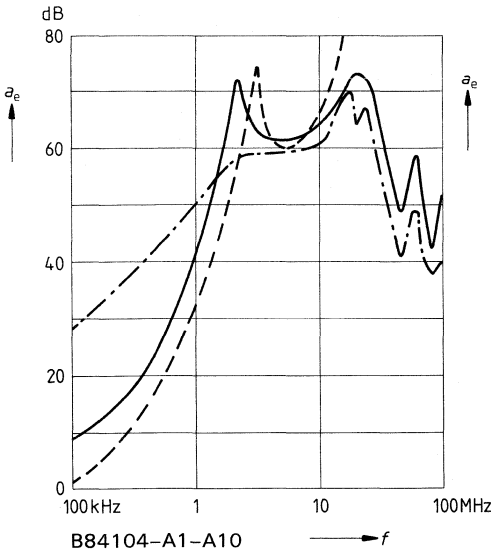
Outline drawing



▼ to be preferred

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

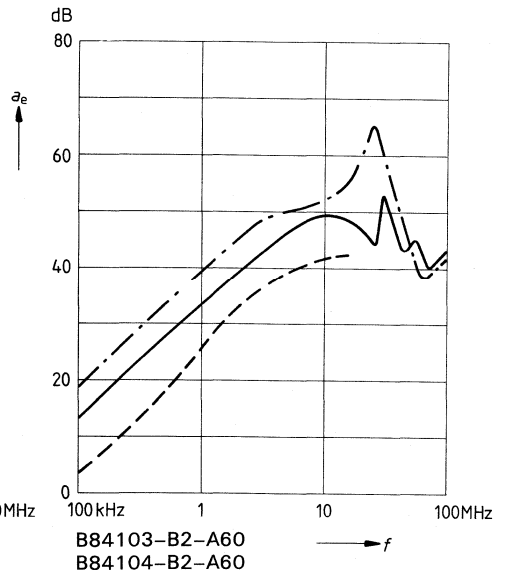
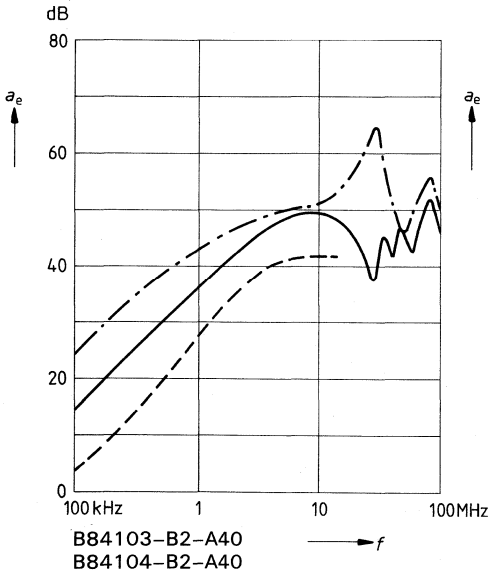
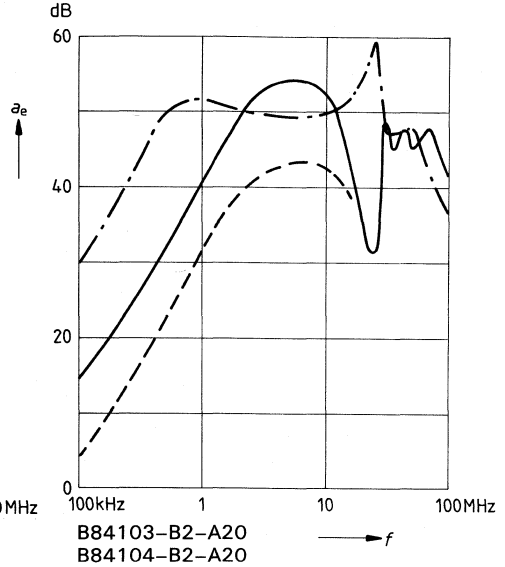
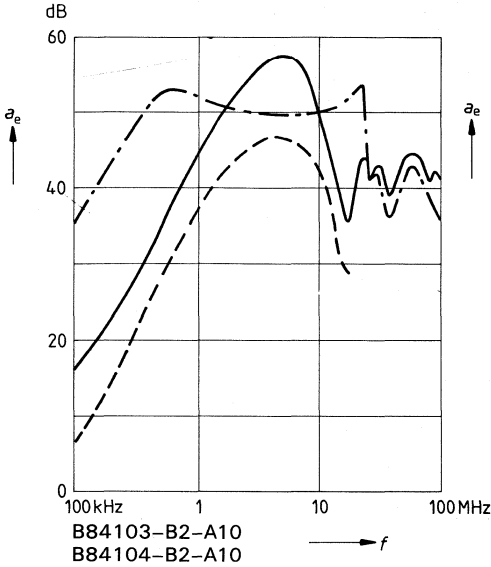
- Unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement, (differential mode)



Filters with IEC plug

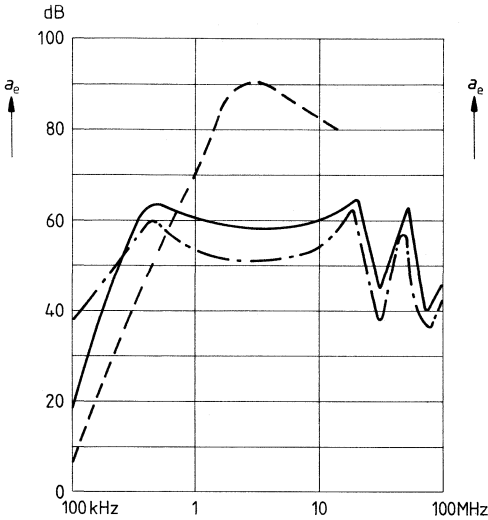
Insertion loss (typical values at $Z = 50 \Omega$)

- unsymmetrical measurement, adjacent branch terminated
- - - - - asymmetrical measurement, both branches in parallel (common mode)
- · - · - symmetrical measurement (differential mode)

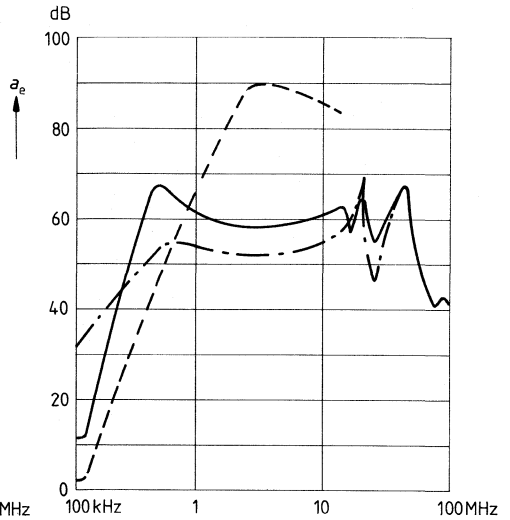


Insertion loss (typical values at $Z = 50 \Omega$)

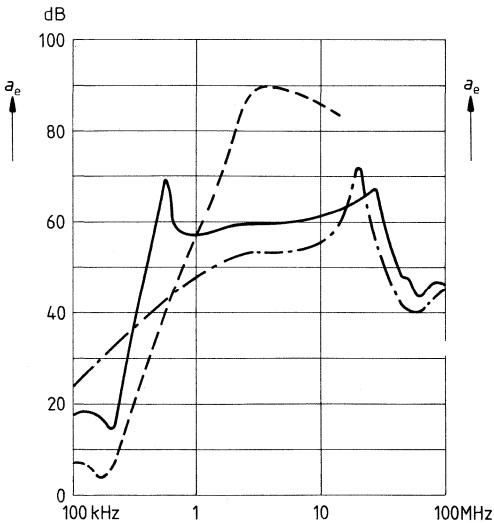
- unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement (differential mode)



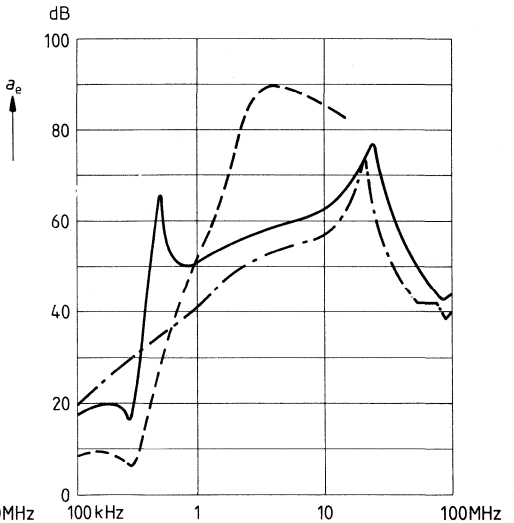
B84103-C3-A10
B84104-C3-A10



B84103-C3-A20
B84104-C3-A20



B84103-C3-A40
B84104-C3-A40



B84103-C3-A60
B84104-C3-A60

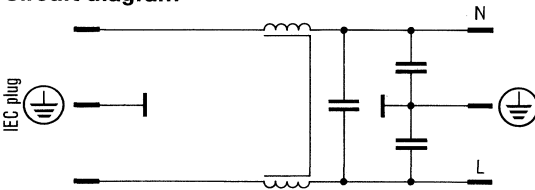
Filters with IEC plug for medical equipment

Rated voltage 250 Vdc/ac
Rated current 6 A



Filters to suppress EMI from stationary and mobile equipment. Due to the low leakage current, these filters are particularly suitable for use in medical equipment.

In addition to a reduced interference voltage, generated in the device to be suppressed, an effective protection against individual pulses from the power supply system can be obtained with these filters.

Circuit diagram



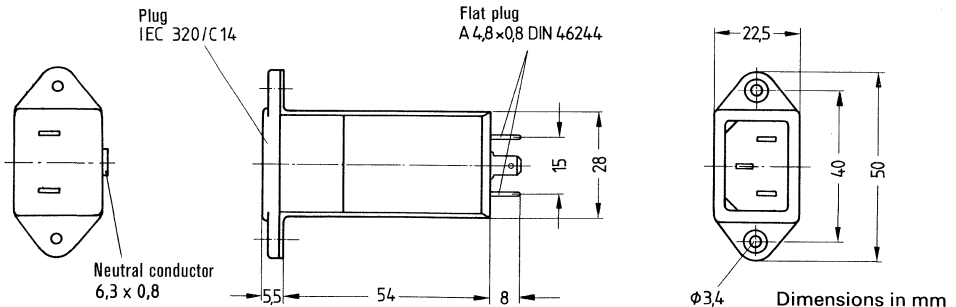
Technical data

Rated voltage	250 Vdc 250 Vac, 50/60 Hz
Rated current	6 A (referred to +40°C/+104°F ambient temperature)
Rated inductance	2 × 1,2 mH
Rated capacitance	0,068 µF (X1) symmetrical 2 × 330 pF (Y) unsymmetrical
Voltage drop	<0,6 V
Leakage current	approx. 0,1 mA
Test voltage	1075 Vdc, 2 s (phase to neutral) 2200 Vdc, 2 s (phase to case)
DIN climatic category	HSF (-25 to +70°C/-13 to +158°F, humidity category F)
Approx. weight	60 g
Test symbols	 (Guide FOKY 2) 

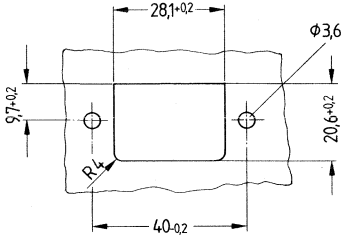
Ordering code

B84104-K162

Outline drawing

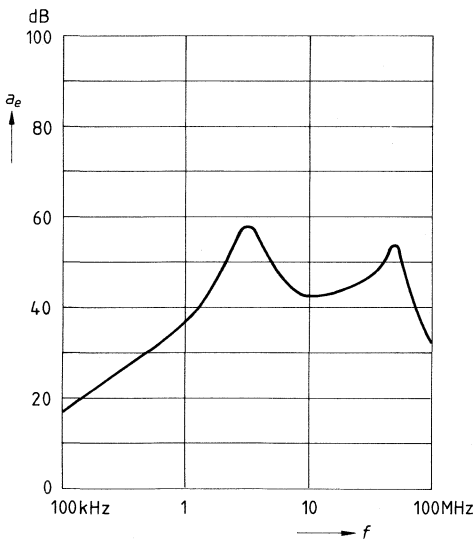


Mounting section with fixing holes

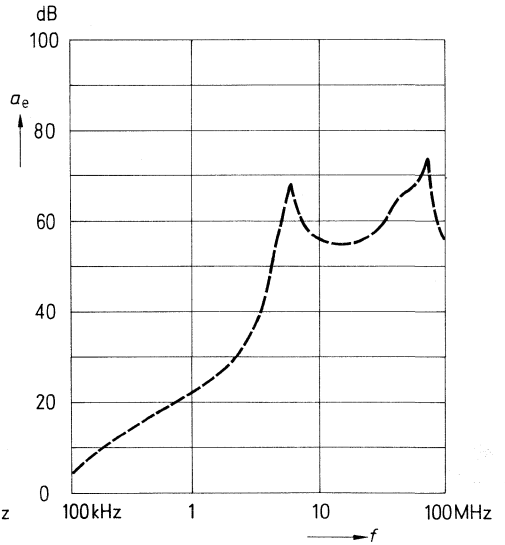


Dimensions in mm

Insertion loss a_e versus frequency f (typical values)



unsymmetrical measurement



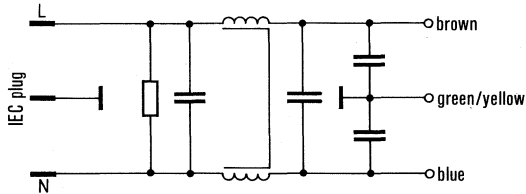
symmetrical measurement

Filters with IEC plug


Rated voltage 250 Vdc/ac

Filters with IEC plug for high attenuation requirements, particularly throughout the AF range.

Circuit diagram




Technical data

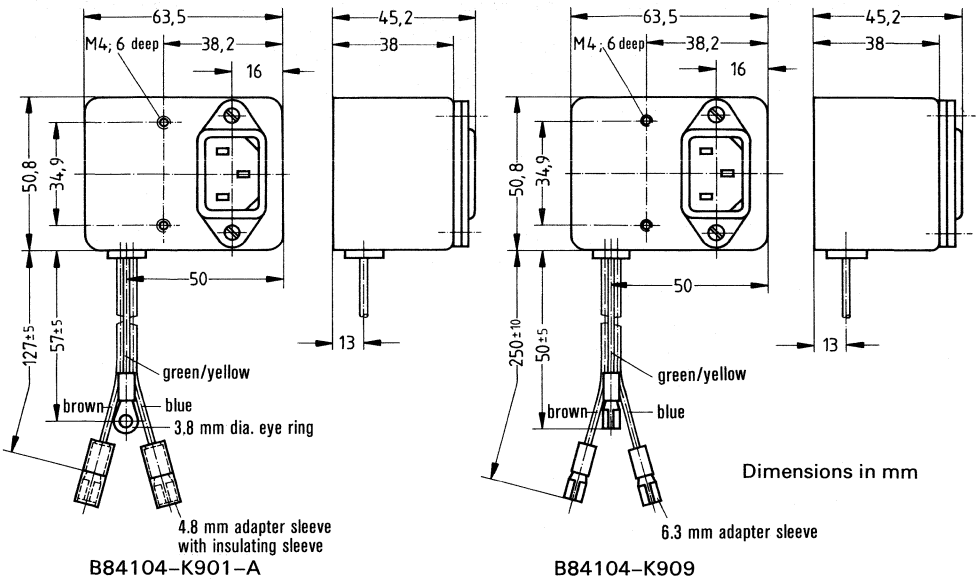
Rated voltage	115/250 Vdc 115/250 Vac, 50/60 Hz
Rated current	referred to +40°C/+104°F ambient temperature
Test voltage	1414 Vdc, 2 s (line to line) 2700 Vdc, 2 s (line to ground)
DIN climatic category	HPF (-25 to +85°C/-13 to +185°F, humidity category F)
Test symbol	VDE 0565-3, UL 478,  intended
Discharge resistor	in acc. with VDE 0730, IEC 355, IEC 380, and IEC 435

Rated current A	Leakage current ¹⁾ mA	Approx. weight g	Ordering code PU: 50
2	<0,5	200	B84104-K901-A ²⁾
6			B84104-K909

¹⁾ at 250 Vac, 50 Hz

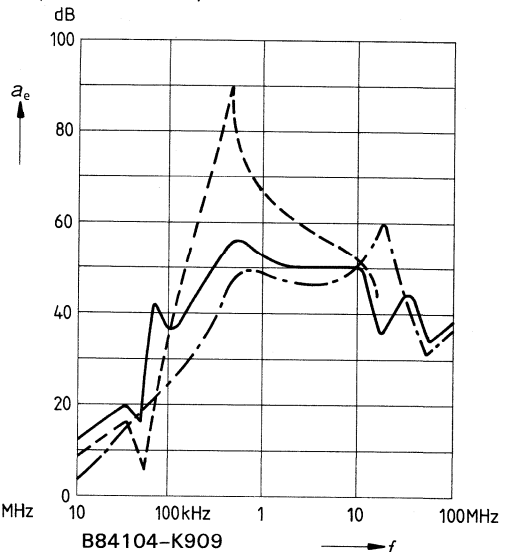
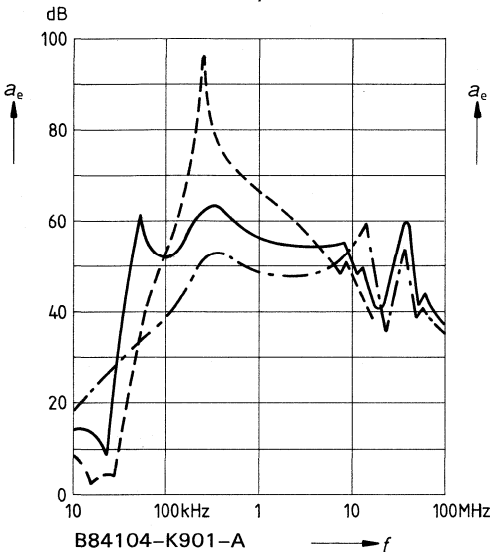
²⁾ with test symbol  (Guide FOKY 2)

Outline drawings



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

- unsymmetrical measurement, adjacent branch terminated
- - - asymmetrical measurement, both branches in parallel (common mode)
- · - · symmetrical measurement (differential mode)

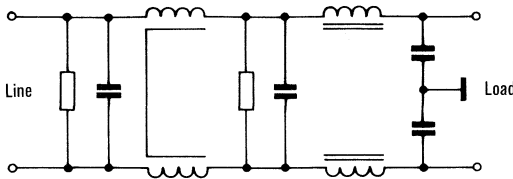


Filters incl. additional AF suppression
Two-wire filters

Rated voltage 250 V ac, 50/60 Hz
Rated current 2 A to 36 A

Two-wire filters for EMI suppression of switched-mode power supplies. The operating frequency of SMPS usually exceeds 20 kHz; from this frequency on, the filters become effective. The filters are incorporated in fully closed metal cases (aluminum or steel) and sealed with flame-retardant epoxy resin (UL 94 VO).

Typical circuit



Technical data

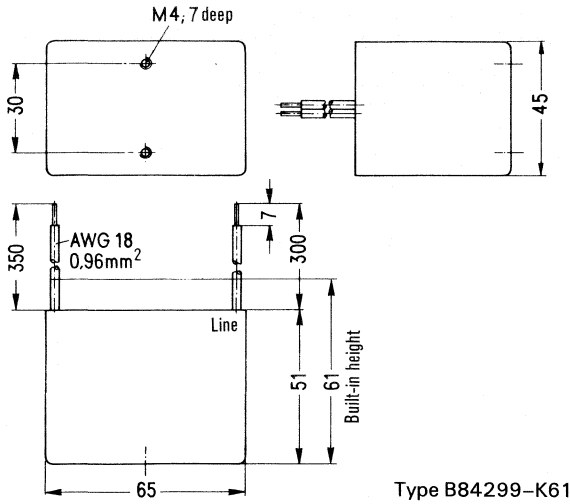
- Rated current referred to the upper ambient temperature¹⁾
- Test voltage 1200 V dc, 2 s, (line to line)
2700 V dc, 2 s, (line to case)
- Leakage current measured at 50 Hz sine
- Reactive current measured at 50 Hz sine
- Voltage drop measured at rated current and 50 Hz sine
- Ambient temperature - 25 to +40°C/- 13 to +104°F
- Dimensioning: at present still in accordance with VDE 0550-1/6 (chokes)
VDE 0560-7 (capacitors)

Redimensioning to VDE 0565-3 in preparation.

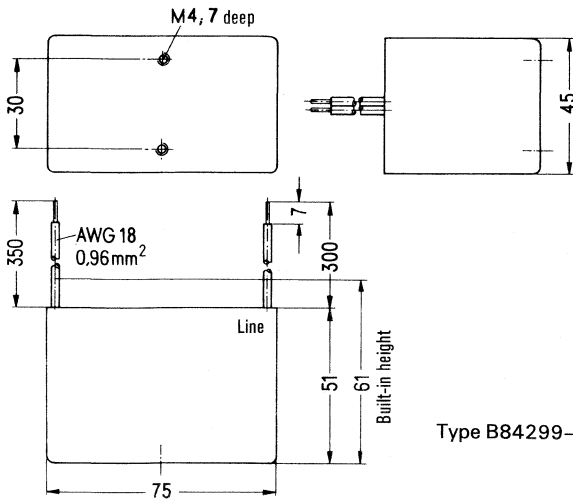
Rated current A	Reactive current A	DC resistance per line mΩ	Voltage drop per line V	Leakage current mA	Approx. weight kg	Ordering code PU: 1
2	0,15	530	1,6	<3,5	0,35	B84299–K61
4	0,15	150	1,8	<3,5	0,37	B84299–K62
6	0,3	110	2,1	<3,5	0,82	B84299–K63
10	0,3	50	1,3	<3,5	1	B84299–K64
16	0,47	35	0,85	<3,5	1,8	B84299–K65
25	0,47	27	2,3	<3,5	2,9	B84299–K66
36	1,4	12	1,3	>3,5 ²⁾	2,9	B84299–K67

¹⁾ The input current characteristic of an SMPS more or less deviates from sine; a current derating can therefore become necessary at choosing the filter.

²⁾ additional protective measures are required.



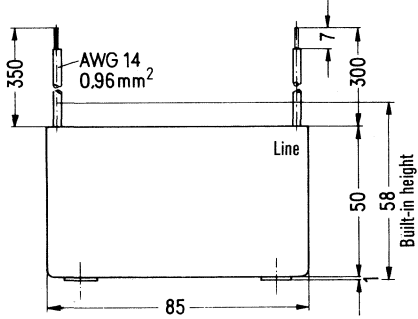
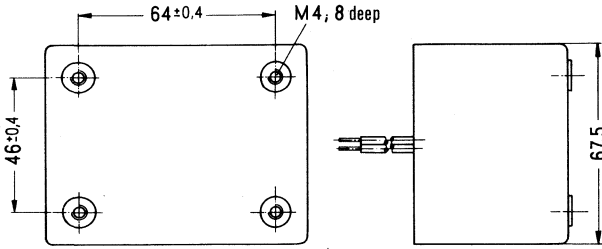
Type B84299-K61



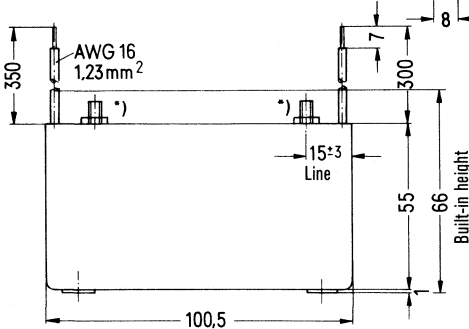
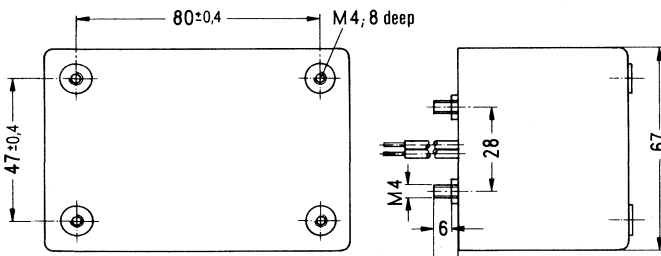
Type B84299-K62

Dimensions in mm

Filters incl. additional AF suppression
Two-wire filters



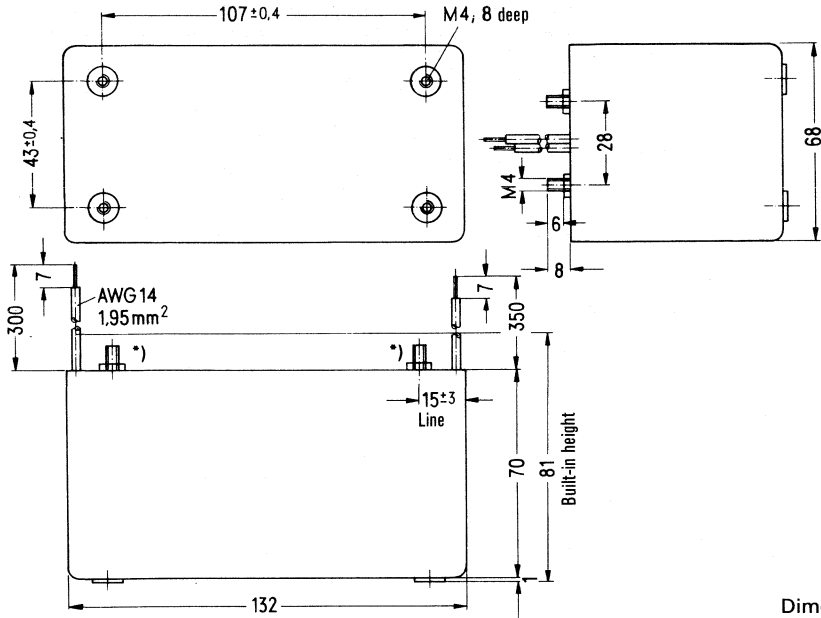
Type B84299-K63



Type B84299-K64

Dimensions in mm

*) Ground connection for screen mesh or fixing bolt for line clamp

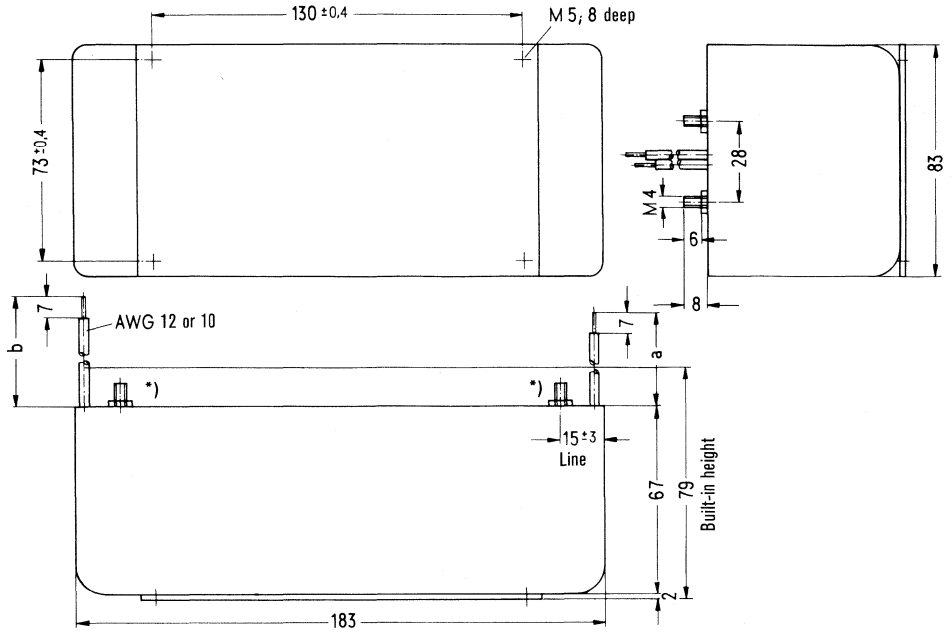


Dimensions in mm

Type B84299-K65

*) Ground connection for screen mesh or fixing bolt for line clamp

Filters incl. additional AF suppression
Two-wire filters

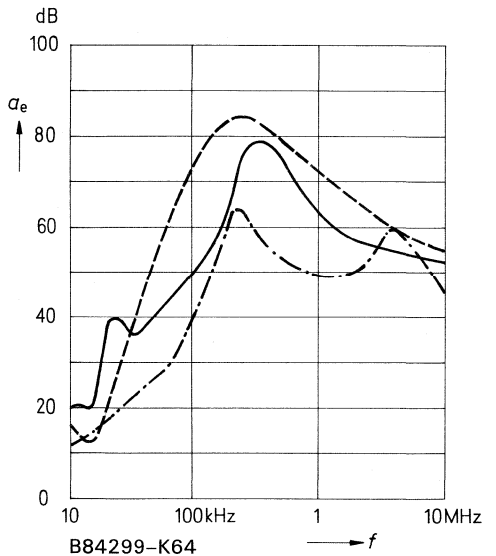
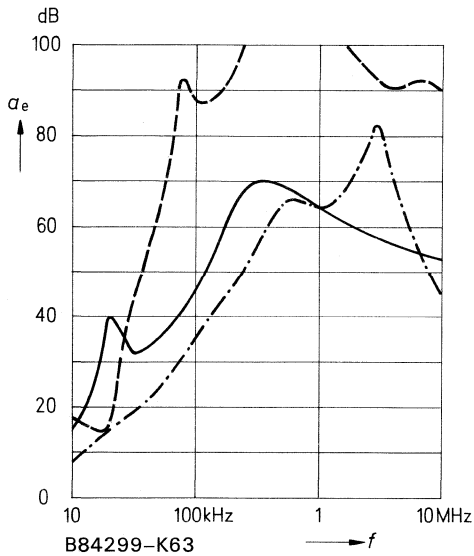
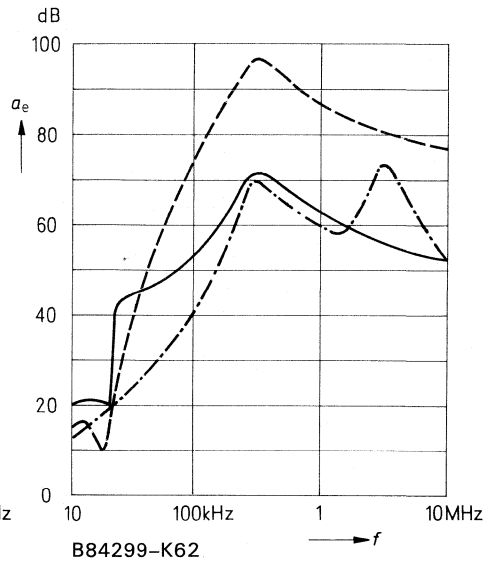
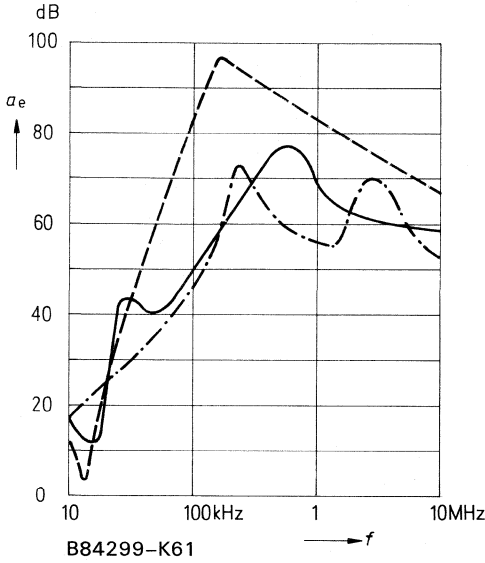


- Type B84299-K66 (connecting litz wire AWG 12; 3.05 mm², length a = 300 mm (line), b = 800 mm)
- B84299-K67 (connecting litz wire AWG 10; 5.76 mm², length a = 200 mm (line), b = 800 mm)

*) Ground connection for screen mesh or fixing bolt for line clamp

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

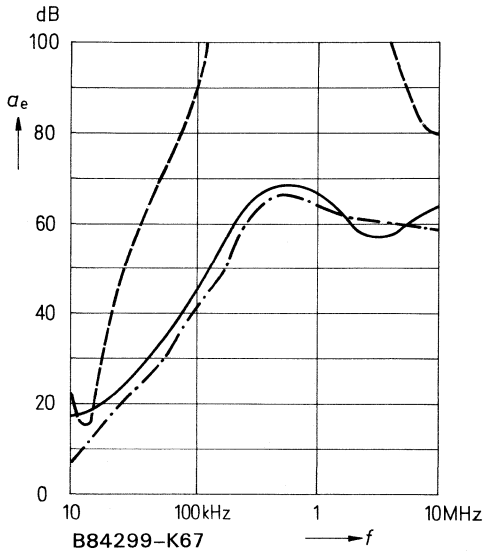
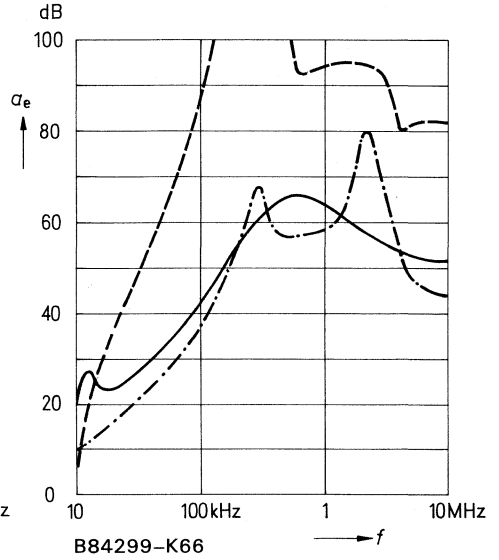
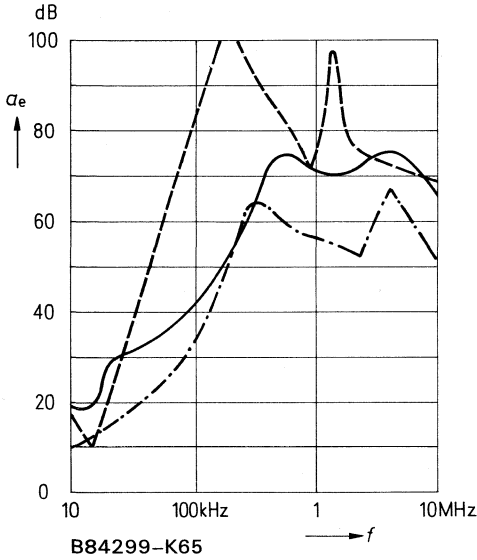
- unsymmetrical measurement, adjacent branch terminated
- - - - - asymmetrical measurement, both branches in parallel (common mode)
- · - · - symmetrical measurement (differential mode)



Filters incl. additional AF suppression
Two-wire filters

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

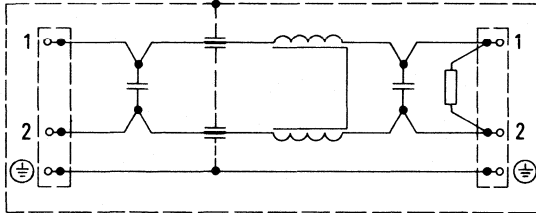
- unsymmetrical measurement, adjacent branch terminated
- - - - - asymmetrical measurement, both branches in parallel (common mode)
- · - · - symmetrical measurement (differential mode)



Filters incl. additional VHF suppression

Two-wire EMI suppression filters in metal case; additional interference suppression throughout the VHF range is obtained by applying feed-through capacitors.

Circuit diagram



(Typical circuit of a filter B84299–K21, for example)

Technical data

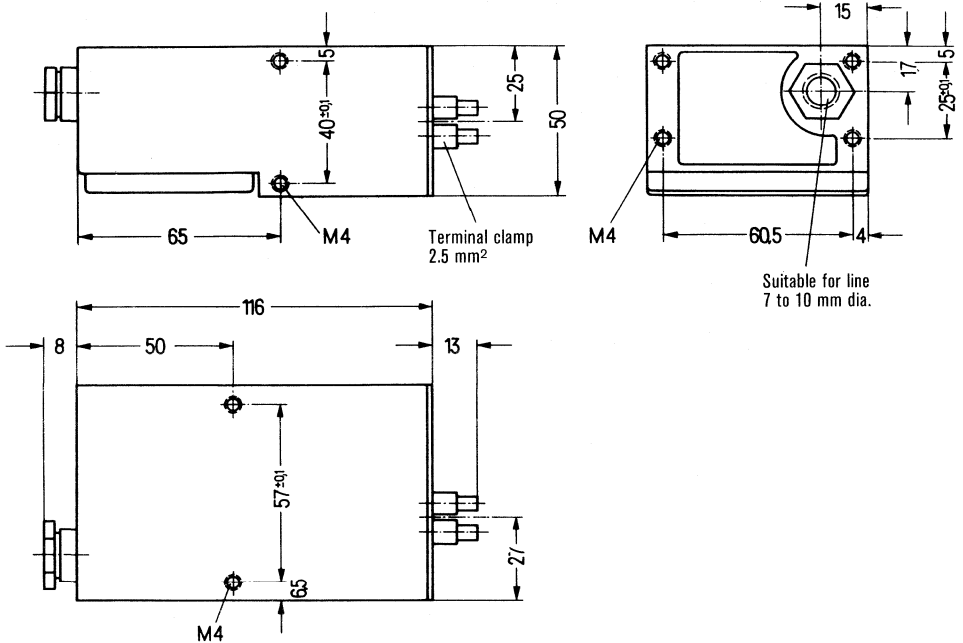
Rated current	referred to +60°C/140°F ambient temperature
Permissible ambient temperature	–40 to +60°C/–40 to +140°F
Number of suppressed lines	2
Test voltage	1000 V dc, 2 s (line to line) 2500 V dc, 2 s (line to ground)

Types

Rated current A	Voltage drop/ conductor V	Reactive current A	Leakage current mA	Approx. weight kg	Ordering code PU: 1
3	<0,3	0,05	<0,75	0,6	B84299–K27
10		0,15		1	B84299–K21
25		0,2	<3,5	1,8	B84299–K26

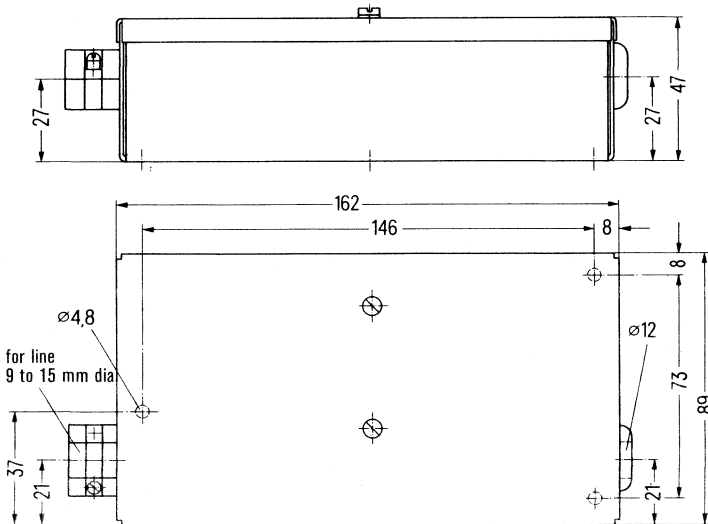
▼ to be preferred

Filters incl. additional VHF suppression



Type B84299-K27

Rated current 3 A



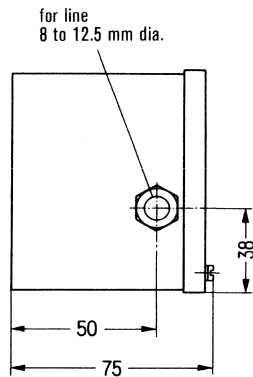
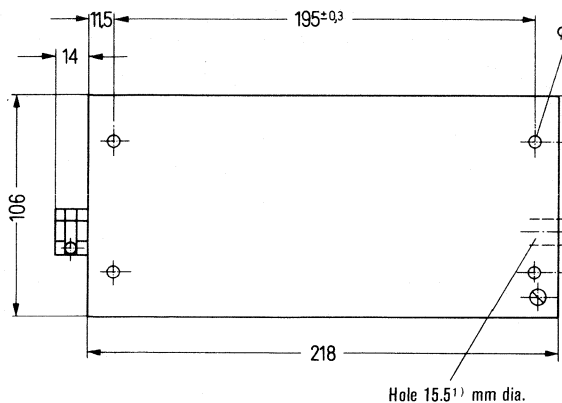
Type B84299-K21

Rated current 10 A

Dimensions in mm

Two-wire filters

Rated voltage 250 Vdc/ac 50/60 Hz



Type B84229–K26

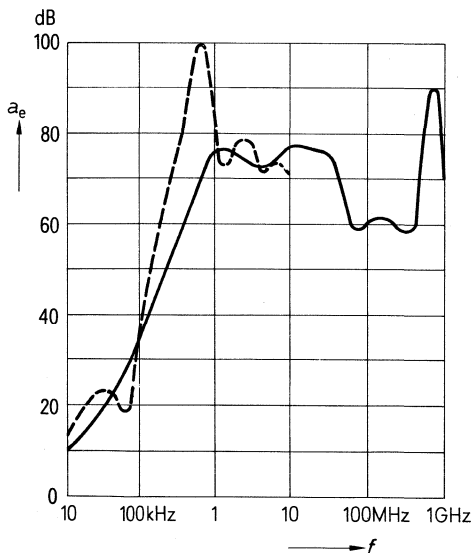
Rated current 25 A

¹⁾ with edge protection 13.5 mm dia

Dimensions in mm

Insertion loss a_e versus frequency f (typical values)

———— unsymmetrical measurement
 - - - - symmetrical measurement



(Frequency characteristic, e.g. of a filter B84299–K21)

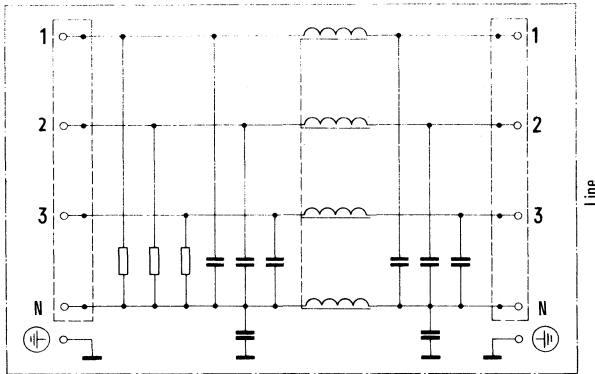
Power Line Filters for Three Phase Systems



Filters with connecting terminals

Rated voltage 220/380 V ac, 50/60 Hz
 Rated current 6 to 50 A

Circuit diagram



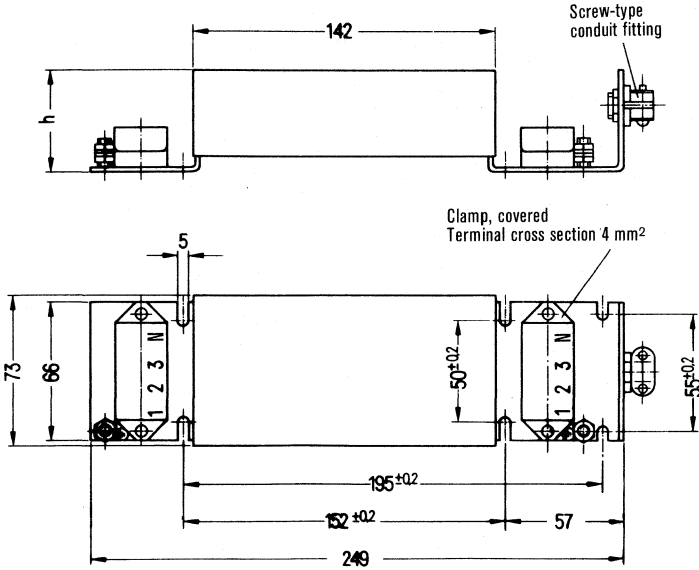
Technical data

Rated current referred to the upper ambient temperature
 Permissible ambient temperature -25 ... +40°C / -13 ... +104°F (for the filters B84299-K53 and -K55 an upper ambient temperature of +60°C / +140°F is permitted)
 Number of lines 4
 Test voltage 1000 V dc, 2 s (phase to phase, phase to neutral)
 2500 V dc, 2 s (phase connected to neutral conductor/ground)
 Leakage current <3,5 mA

Types

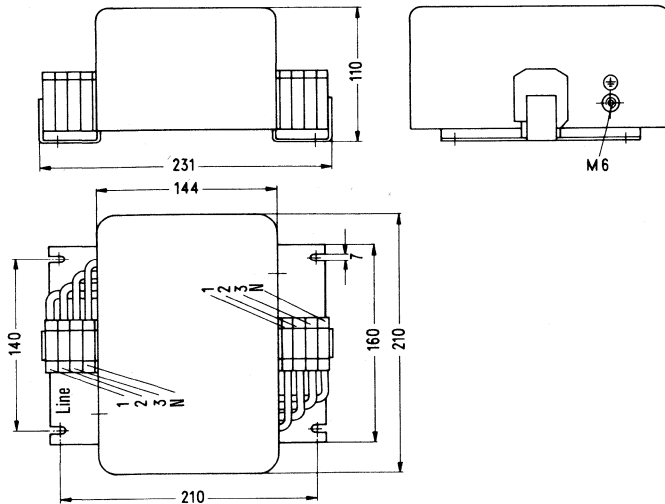
Rated current A	Voltage drop ¹⁾ /phase V	Reactive current ¹⁾ /phase A	h mm	Screw-type conduit fitting for cable dia. mm	Approx. weight kg	Ordering code PU: 1
▼ 6	<0,4	0,07	48	8...12,5	1,1	B84299-K53
▼ 16	<0,3	0,15	65	8...12,5	1,6	B84299-K55
▼ 25	<0,3	0,15	65	9...15	1,6	B84299-K56
50	<0,6	0,5	-	-	6,3	B84299-K57

▼ to be preferred
¹⁾ measured at 50 Hz



Types B84299-K53, -K55, -K56 in plastic package

Rated current up to 25 A



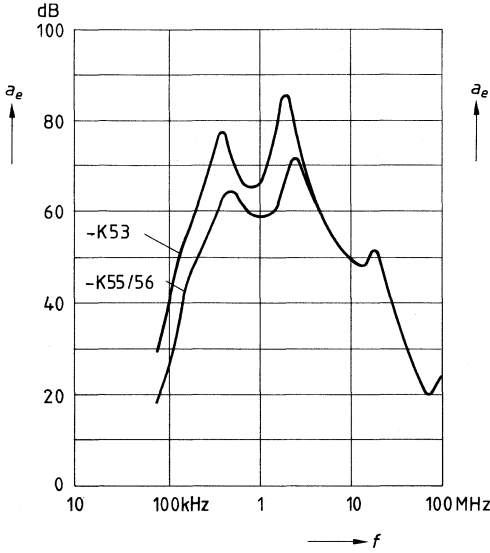
Type B84299-K57 in metal case

Dimensions in mm

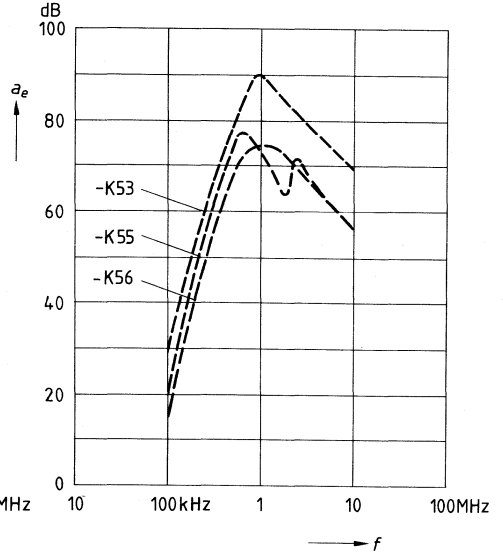
Rated current 50 A

Filters with connecting terminals

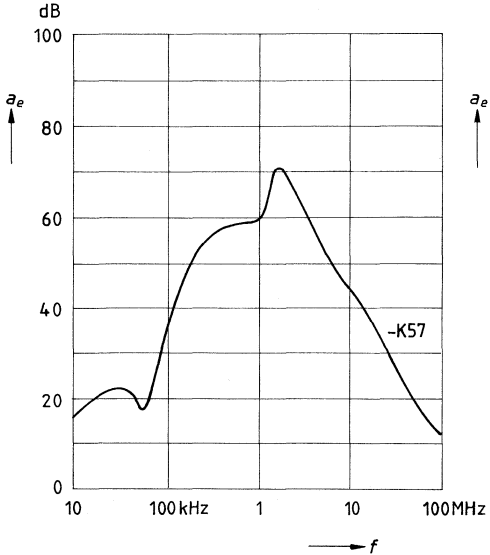
Insertion loss a_e versus frequency f (typical values)



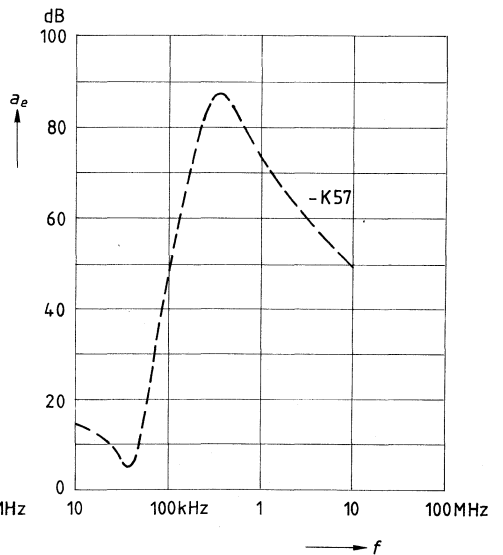
Unsymmetrical measurement



Symmetrical measurement



Unsymmetrical measurement



Symmetrical measurement

Power Line Filters for Three Phase Systems ▼ B84299–K33...K39

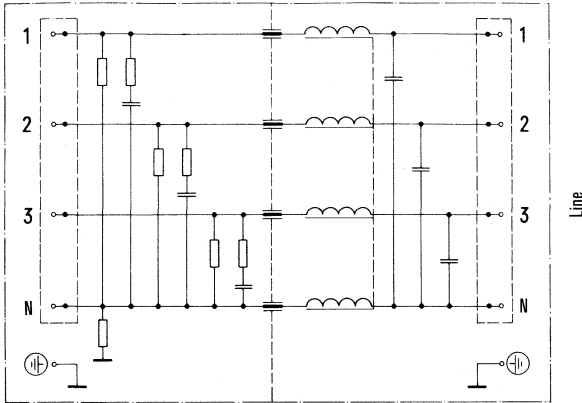
Filters incl. additional VHF suppression

Rated voltage 220/380 V ac, 50/60 Hz
Rated current 6 to 75 A

EMI suppression filters for three-phase systems in metal cases; additional interference suppression throughout the VHF range is obtained by applying feed-through capacitors.

Circuit diagram

(Typical circuit, e.g. of a filter B84299–K35)



Technical data

Rated current

referred to +60°C/140°F ambient temperature
for the types B84299–K33, –K35 and –K36
referred to +40°C/104°F ambient temperature
for the types B84299–K37 and –K39

Permissible
ambient temperature

–40 to +60°C/–40 to +140°F or
–40 to +40°C/–40 to +104°F (see rated current)

Test voltage

1000 V dc, 2 s (phase to phase, phase to neutral)
2500 V dc, 2 s (phase connected to neutral conductor/
ground)

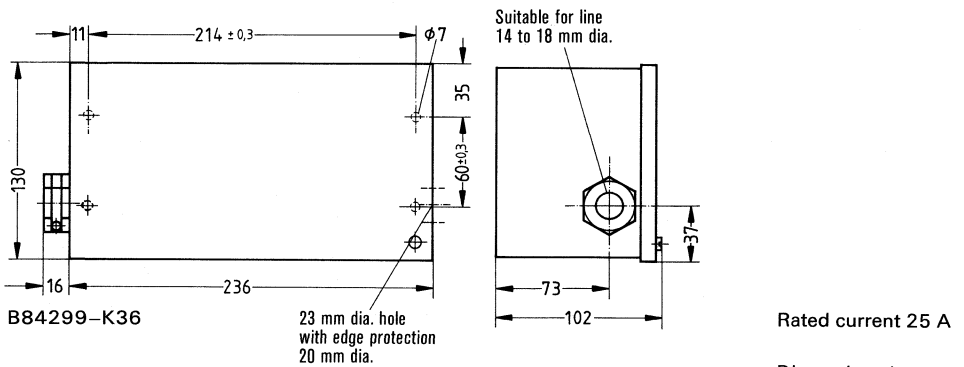
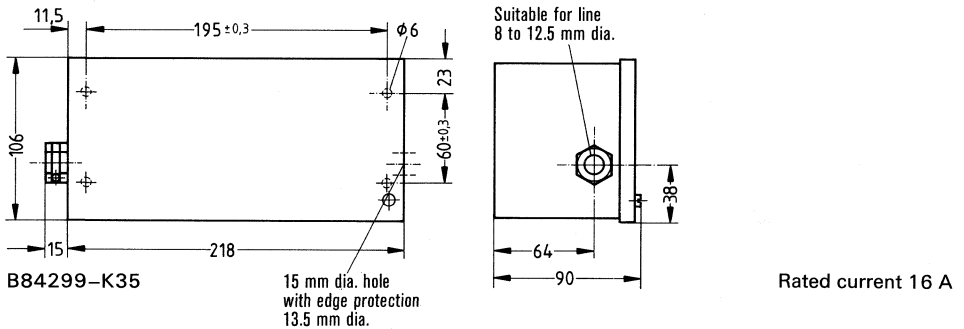
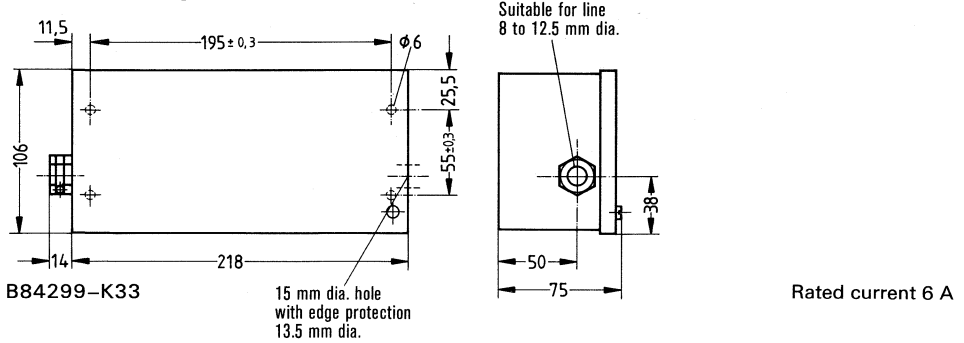
Types

Rated current	Voltage drop/phase	Reactive current/ phase	Approx. weight	Ordering code
A	V	A	kg	PU: 1
6	<0,3	0,15	1,8	B84299–K33
16	<0,4	0,15	2,1	B84299–K35
25	<0,4	0,37	3	B84299–K36
50	<0,6	0,37	7,5	B84299–K37
75	<0,6	0,37	11	B84299–K39

▼ to be preferred

Filters incl. additional VHF suppression

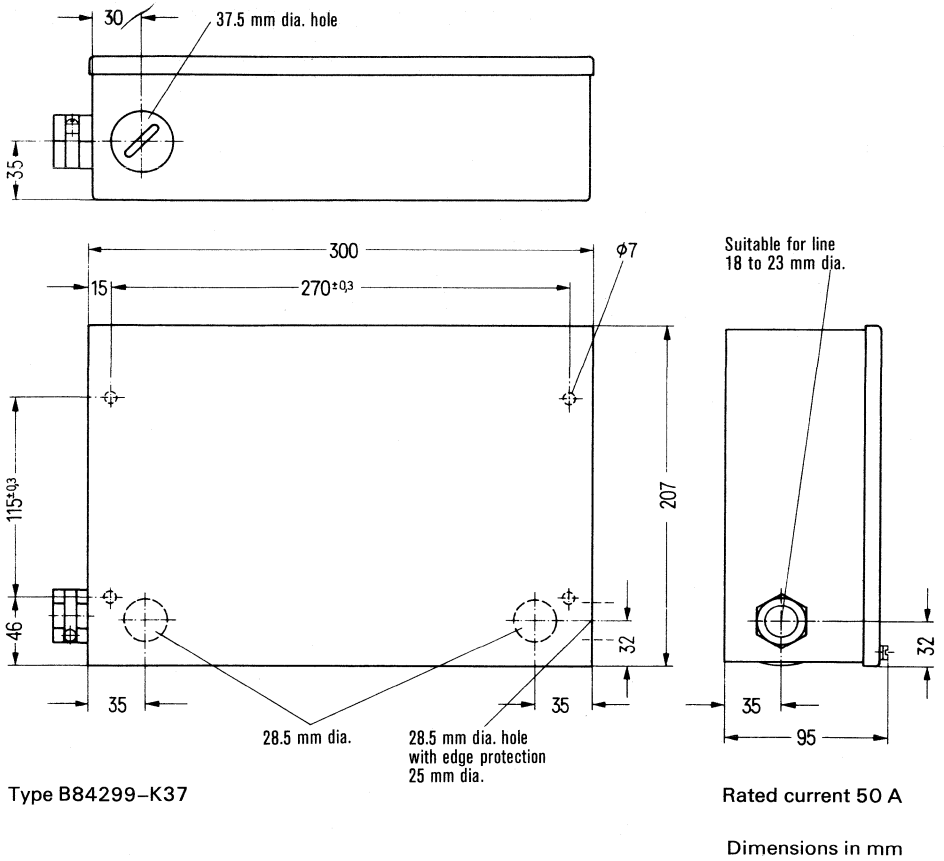
Outline drawings



Dimensions in mm

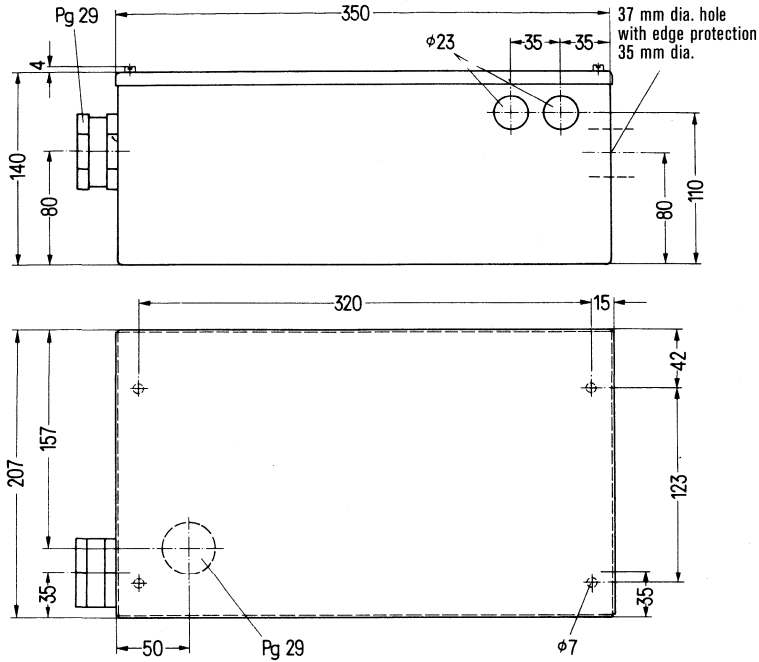
▼ to be preferred

Power Line Filters for Three Phase Systems **▼ B84299–K33...K39**



Power Line Filters for Three Phase Systems ▼ B84299–K33...K39

Filters incl. additional VHF suppression

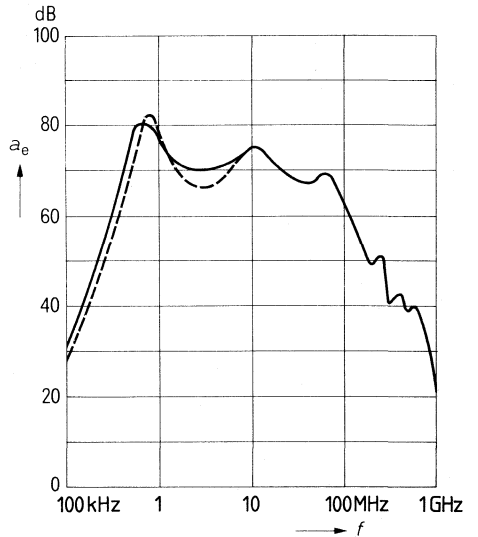


Dimensions in mm

Rated current 75 A

Type B84299–K39

Insertion loss a_e versus frequency f
(typical values of the filter B84299–K35, for example)



———— unsymmetrical measurement
- - - - - symmetrical measurement

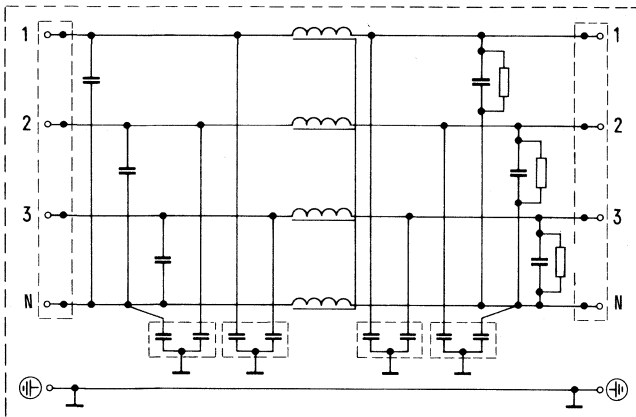
Filters for application in humid rooms

Rated voltage 380 Vac, 50/60 Hz

Rated current 4 x 40 A

Four-wire EMI suppression filters in steel housings; they are intended to suppress EMI from electrical machines, equipment, and installations. The housing complies with protection class IP 65. The cable entries are not connected to the housing. (Cable shieldings are therefore to be attached to the filter base plate with the help of cable clamps).

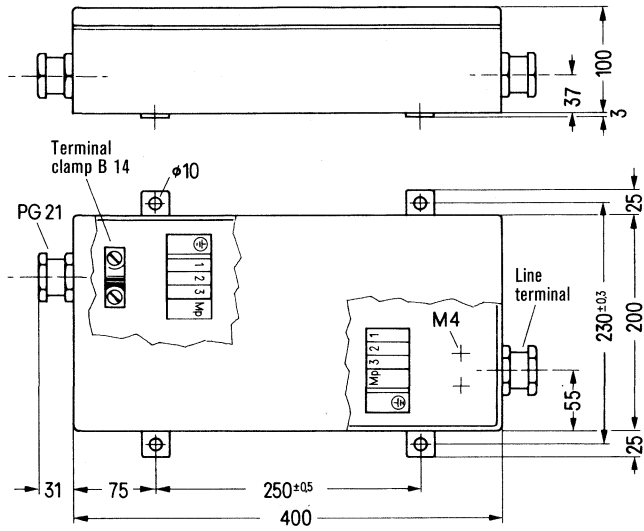
Circuit diagram



Technical data

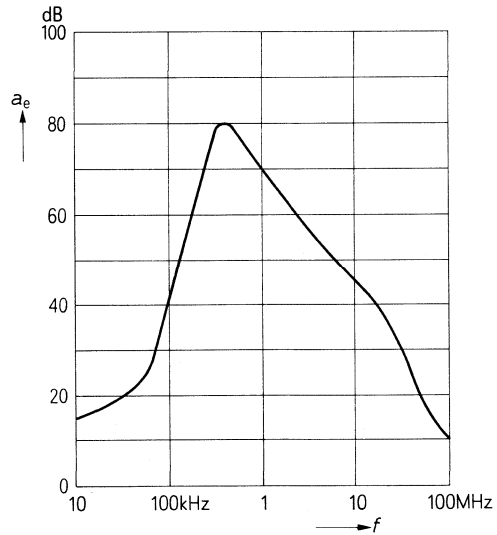
Rated current	referred to +40°C/+104°F ambient temperature
Permissible ambient temperature	-25 to +40°C/-13 to +104°F
Test voltage	1200 V, 2 s (phase to phase, phase to neutral) 2500 V, 2 s (phase connected to neutral conductor/ ground)
Voltage drop at rated current	< 0.6 V at 50 Hz/line
Approx. weight	8.8 kg
Ordering code	B84299-K28

Filters for application in humid rooms



Dimensions in mm

Insertion loss a_e versus frequency f (typical values)

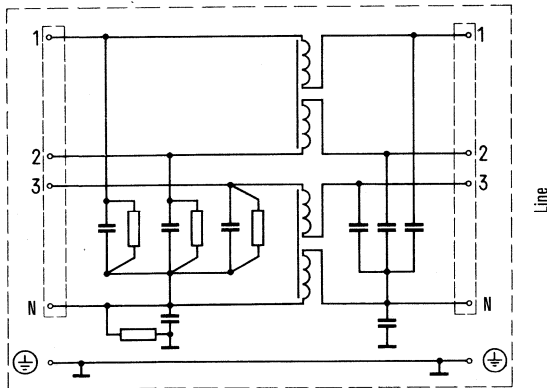


Filters for application in humid rooms

Rated voltage 380 Vac, 50/60 Hz
Rated current 4 x 60 A
 380 Vac/500 Vdc between
 conductor and housing
 500 Vdc/ac between conductors

Four-wire EMI suppression filters in steel housings. They are intended to suppress EMI from electrical machines, equipment, and installations. The housing complies with protection class IP 65. The cable entries are not connected to the housing. (Cable shieldings are, therefore, to be attached to the filter base plate with the help of cable clamps). The neutral conductor (N) takes charge of the leakage current, thus leaving the safety conductor practically current-less during operation.

Circuit diagram



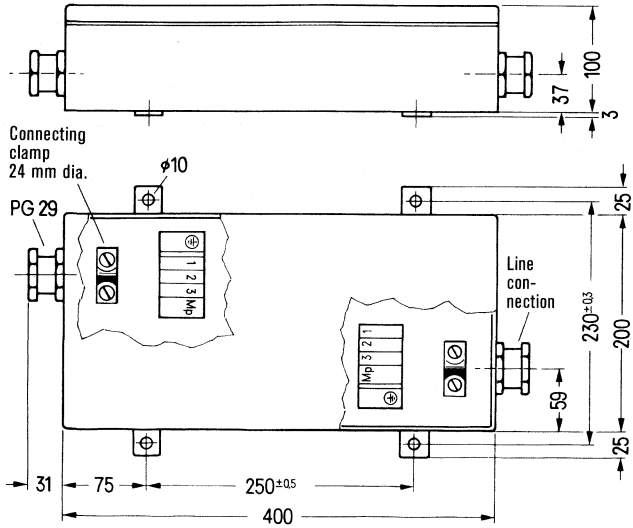
All capacitors 2.2 μ F

Technical data

Rated current	referred to +40°C/+104°F ambient temperature
Permissible ambient temperature	-25 to +40°C/-13 to +104°F
Test voltage	1200 V, 2 s (phase to phase, phase to neutral) 1200 V, 2 s (phase connected to neutral conductor/ ground)
Voltage drop at rated current	3.6 V at 50 Hz/line
Approx. weight	8.8 kg
Ordering code	B84243-C24-E8

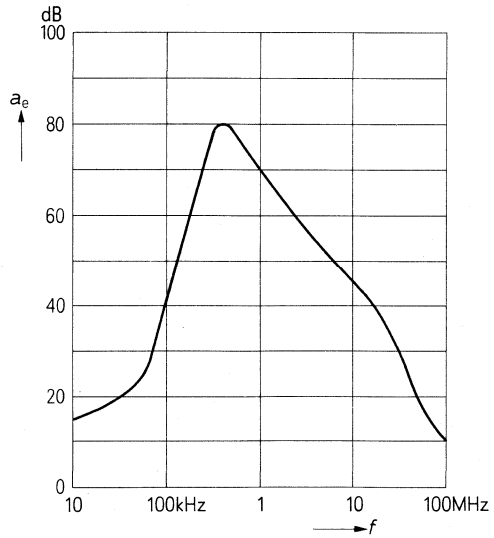
Filters for application in humid rooms

Outline drawing



Dimensions in mm

Insertion loss a_e versus frequency f (typical value)

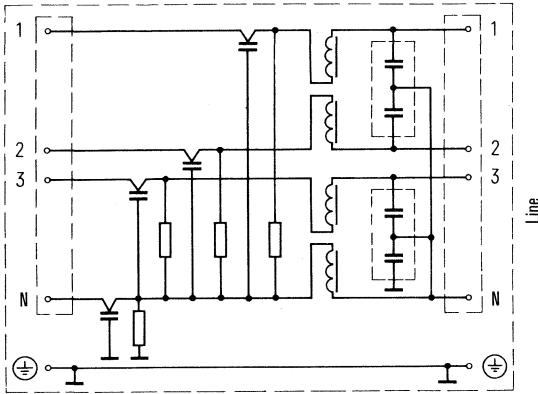


Filters for application in humid rooms

Rated voltage 380 Vac, 50/60 Hz
Rated current 4 x 100 A
 380 Vac/500 Vdc between conductor and housing
 500 Vdc/ac between conductors

Four-wire EMI suppression filters in cast-iron housings. They are intended to suppress EMI from electrical machines, equipment, and installations. The housing complies with the protection class IP 24. The cable entries are connected to the housing so that cable shieldings can be attached to the cable entry. The neutral conductor (N) takes charge of the leakage current thus leaving the neutral conductor practically currentless during operation.

Circuit diagram



Not for new design!

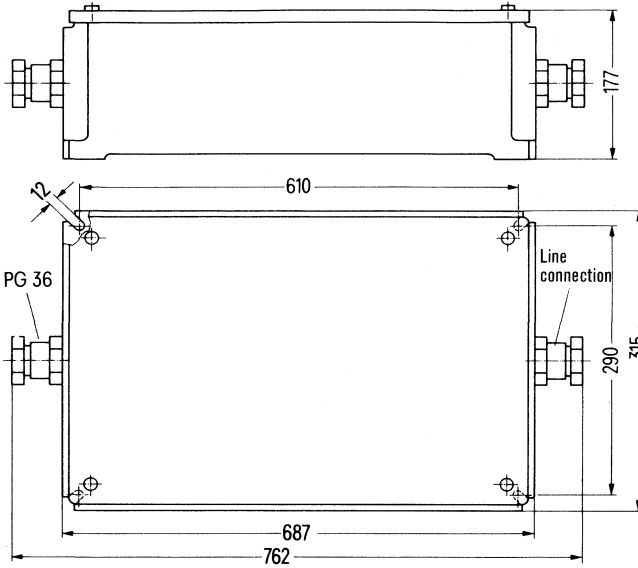
Capacitors at power line input, 1.8 μ F each
 Capacitors at the output, 0.6 μ F each

Technical data

Rated current	referred to +35°C/+95°F ambient temperature
Permissible ambient temperature	-25 to +40°C/-13 to +104°F
Test voltage	2500 V, 2 s (phase to phase, phase to neutral conductor) 2500 V, 2 s (phase connected to neutral conductor/ground)
Voltage drop at rated current	2.2 Vac at 50 Hz/line
Approx. weight	55 kg
Ordering code	B84203-C25-E8

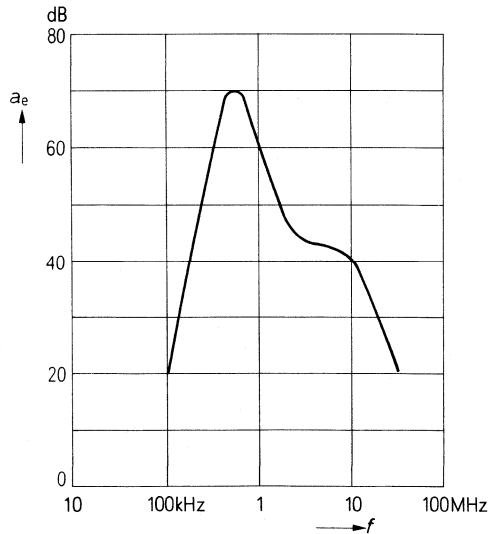
Filters for application in humid rooms

Outline drawing



Not for new design!

Insertion loss a_e versus frequency f (typical values)



Filters for Installations and Shielded Rooms



Filters for Installations and Shielded Rooms

Line filters

General

The filters are designed for EMI suppression of installations and for the wiring of lines in shielded enclosures and rooms (single and three-phase systems).

The following versions are available:

Filters (up to 40 A) **in sheet steel housings**

Version A (up to 35 GHz)
filters for the wiring of lines in shielded enclosures and rooms

Version C (up to 1 GHz)
filters for suppression of electrical installations

Filters (up to 200 A) **in the Siemens U system**

Version C (up to 1 GHz)
filters for suppression of electrical installations

Version D (up to 1 GHz)
filters for the wiring of lines in shielded enclosures and rooms

Version E (up to 1 GHz)
as version D, however with prolonged conduit fitting (for thicker walls, particularly for shielded enclosures)

Version F (up to 10 GHz)
for shielded enclosures and rooms

Version G (up to 35 GHz)
for shielded enclosures and rooms

The insertion loss of filters for installations and shielded rooms is determined in accordance with the CISPR specification 17.

This publication is more closely specified than the frequently used MIL STD 220 A requiring a no-load measurement throughout the frequency range below 100 kHz.

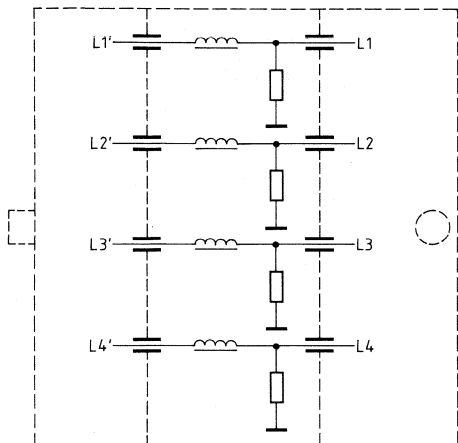
The attenuation characteristics of all Siemens filters, however, apply to full load over the entire frequency range indicated.

Line filters in sheet steel housings

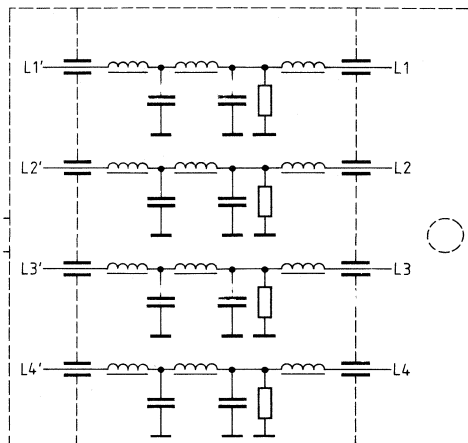
Rated voltage 250 V/440 V, 50/60 Hz
440 V dc
Rated current 4 A

The filters are suitable for use in three-phase systems as well as for four independent control lines.

Circuit diagram



B84264-21-E11



B84266-21-E13

Technical data

Rated voltage 250 V/440 V, 50/60 Hz
440 V dc

Rated current referred to +40°C/104°F ambient temperature

Perm. ambient temperature -40 to +40°C/-40 to +104°F

Humidity category C in acc. with DIN 40040
(for the components used)

Test voltage 1000 V dc, 2 s (line to line, parallel lines to ground)

Rated current A	Number of lines	Voltage drop at rated current per line		Approx. weight kg	Ordering code PU: 1
		V dc	V ac, 50 Hz		
4	4	1	2	5,5	B84264-21-E11 ¹⁾
4	4	2,5	4,5	9	B84266-21-E13 ¹⁾

¹⁾ Insert the appropriate code letter for the requested version (A or C):

Version A (up to 35 GHz):
filters for the wiring of lines in shielded enclosures and rooms

Version C (up to 1 GHz):
filters for suppression of electrical installations

▼ to be preferred

Line filters in sheet steel housings

Version A (up to 35 GHz)

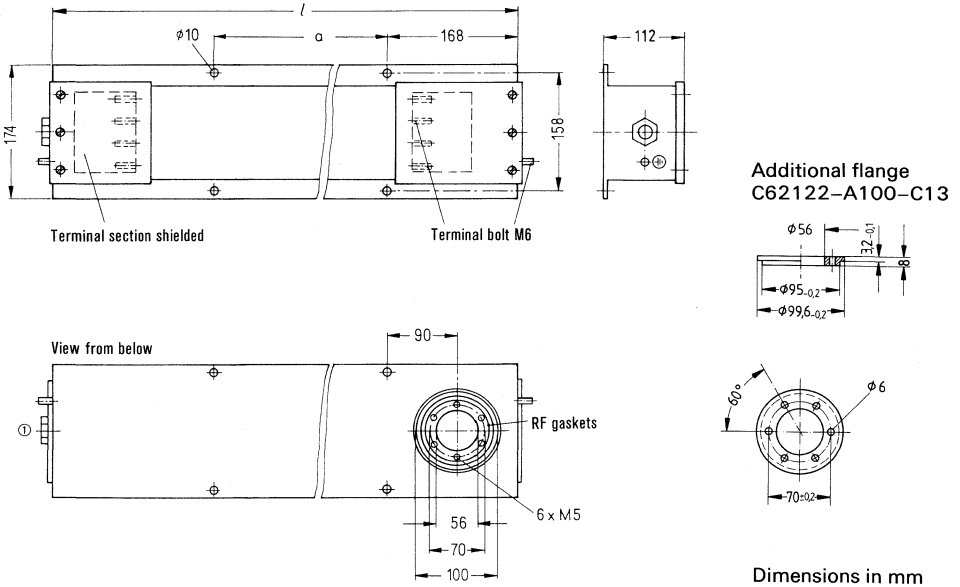
Filters for suppressing EMI from power lines running into shielded enclosures and rooms.

Input section (line side):

Cable entry via conduit bush (PG) with rubber sleeve

Output section:

Flange with double gasket for RF-tight connection of the filter to a shielded enclosure or a shielded room. An additional flange C62122-A100-C13 is required as counterpart at the shielded room.



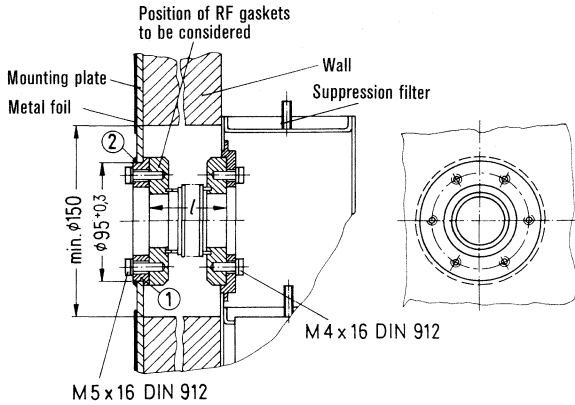
① Cable entry PG 21 with adaptable rubber sleeve for cable diameter 14 to 20 mm

Type	Dimensions	
	a	l
B84264-A21-E11	250	435
B84266-A21-E13	380	649

▀ to be preferred

Connections

A connection is required, for example, if a filter cannot be connected directly to a shielded enclosure because of a wall.



① Additional flange, to be ordered if required, under the ordering code C62 122-A100-C13

② Tightly welded around circumference. Position of holes to be considered.

Dimensions in mm

Ordering code PU: 1	Wall thickness in mm	Ordering code PU: 1	Wall thickness in mm
B84298-A24	57 to 63	B84298-A26-L153	365 to 385
B84298-A25	110 to 130	B84298-A26-L154	385 to 405
B84298-A26-L141	130 to 150	B84298-A26-L155	405 to 425
B84298-A26-L142	145 to 165	B84298-A26-L156	425 to 445
B84298-A26-L143	165 to 185	B84298-A26-L157	445 to 465
B84298-A26-L144	185 to 205	B84298-A26-L158	465 to 485
B84298-A26-L145	205 to 225	B84298-A26-L159	485 to 505
B84298-A26-L146	225 to 245	B84298-A26-L160	505 to 525
B84298-A26-L147	245 to 265	B84298-A26-L161	525 to 545
B84298-A26-L148	265 to 285	B84298-A26-L162	545 to 565
B84298-A26-L149	285 to 305	B84298-A26-L163	565 to 585
B84298-A26-L150	305 to 325	B84298-A26-L164	585 to 605
B84298-A26-L151	325 to 345	B84298-A26-L165	605 to 625
B84298-A26-L152	345 to 365	B84298-A26-L166	625 to 645

Line filters in sheet steel housings

Version C (up to 1 GHz¹⁾)

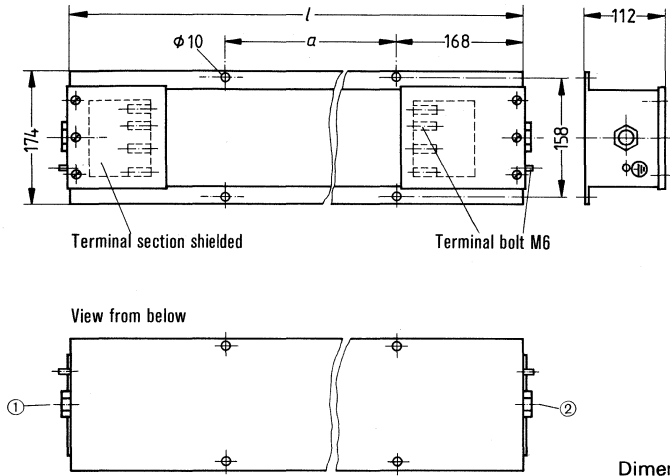
Filter for wiring electrical machines, equipment, and installations

Input section (line side):

Cable entry via conduit bush (PG) with rubber sleeve

Output side:

Conduit bush without rubber sleeve, however with metal ring for pressing the cable shielding on.



Dimensions in mm

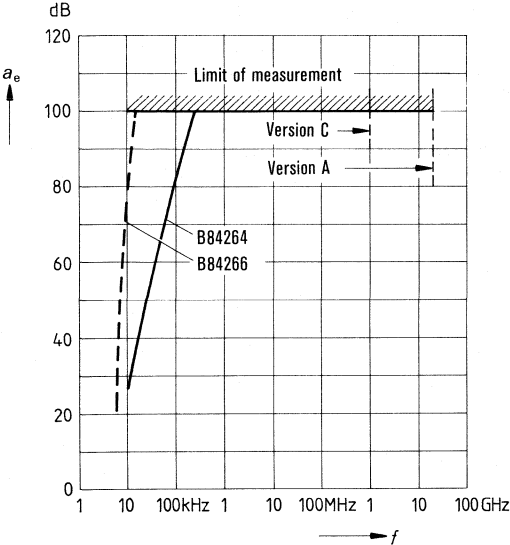
- ① Cable entry PG 21 with adaptable rubber sleeve for cable diameter 14 to 20 mm
- ② Cable entry PG 21 with metal ring to connect cable shield

Type	Dimensions	
	a	l
B84264-C21-E11	250	435
B84266-C21-E13	380	649

¹⁾ Limitation to 1 GHz because in practice the shielding effect of shielded cables (supply lines) decreases at high frequencies.

▼ to be preferred

Insertion loss a_e versus frequency f
Symmetrical and unsymmetrical attenuation are approximately equal; the worst case is indicated



Line filters in sheet steel housings

Rated voltage 250/440 V 50/60 Hz
120/250 V 400 Hz
Rated current 40 A

The filters are outstanding for their low volume, low voltage drop, and favorable operating current behavior at 400 Hz.

The circuitry of the capacitors (capacitive wiring to ground only across neutral conductor) ensures that the neutral conductor remains practically currentless during normal operation.

Design

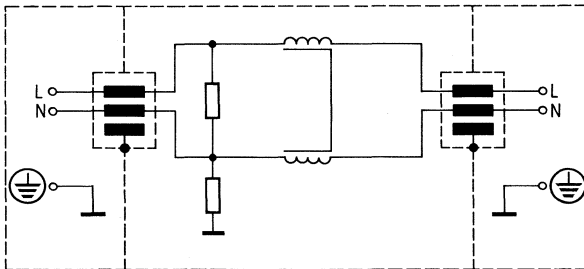
The electrical components are enclosed in an RF-tight stainless steel housing. Screw-type conduit fittings are used for the cable entry. The RF-tight covering of the opening for the connections is obtained by means of specially formed covers. Neutral conductor and conductor are connected via threaded bolts M6. The space around the fixing holes is left unpainted in order to ensure good RF contacting to metal areas (ground).

Protective measures

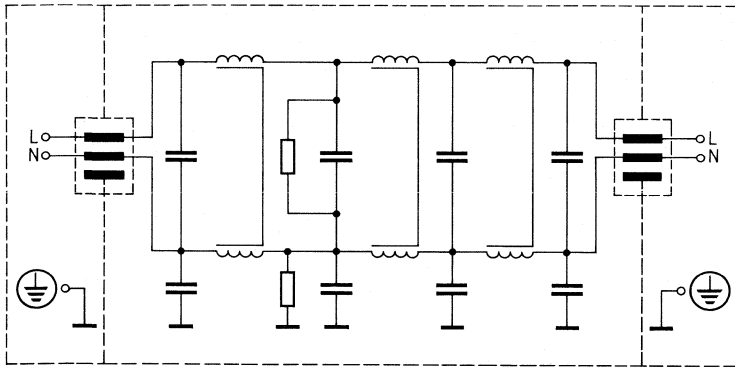
Due to the high capacitances between outer and neutral conductor as well as between neutral and safety conductor, protective measures in accordance with VDE 0100 and VDE 0875 (additional ground connection) are necessary if the relevant VDE specifications do not include adequate measures.

In order to ensure discharging of the capacitors after turning off, resistors are incorporated into the filters, which are able to reduce the voltage to less than 34 V in approximately 30 sec. or 70 sec., depending on the filter type used.

Circuit diagrams



B84261



B84263

Technical data

Rated voltage	250 V	50/60 Hz
	120 V	400 Hz
	250 V 400 Hz are permitted; increased reactive current must, however, be considered	
Test voltage	1100 V dc; 2 s	
Rated current	referred to 40°C ambient temperature	
Climatic category	GPC (-40°C to +85°C/-40°F to +185°F; humidity category C)	
Number of suppressed lines	2	

Types

Rated current		Symmetrical capacitive capacitance µF	Capacitance between N and case µF	Inductance mH	Symmetrical reactive current ¹⁾		Voltage drop at the filter ²⁾		Ordering code PU: 1
50 Hz A	400 Hz A				50 Hz A	400 Hz A	50 Hz V	400 Hz V	
40	40	14	2	2×4,7	1,1	4,3	1,25	9	B84261-+23-B11 ³⁾
40	20	64	8	6×4,7	5	19,3	4	15	B84263-+23-B13 ³⁾

▼ to be preferred

¹⁾ at rated current

²⁾ across both lines at rated current

³⁾ -: Insert the appropriate code letter for the requested version (A or C):

Version A (up to 35 GHz):

filters for the wiring of lines in shielded enclosures and rooms

Version C (up to 1 GHz):

filters for suppression of electrical installations

Line filters in sheet steel housings

Version A (up to 35 GHz)

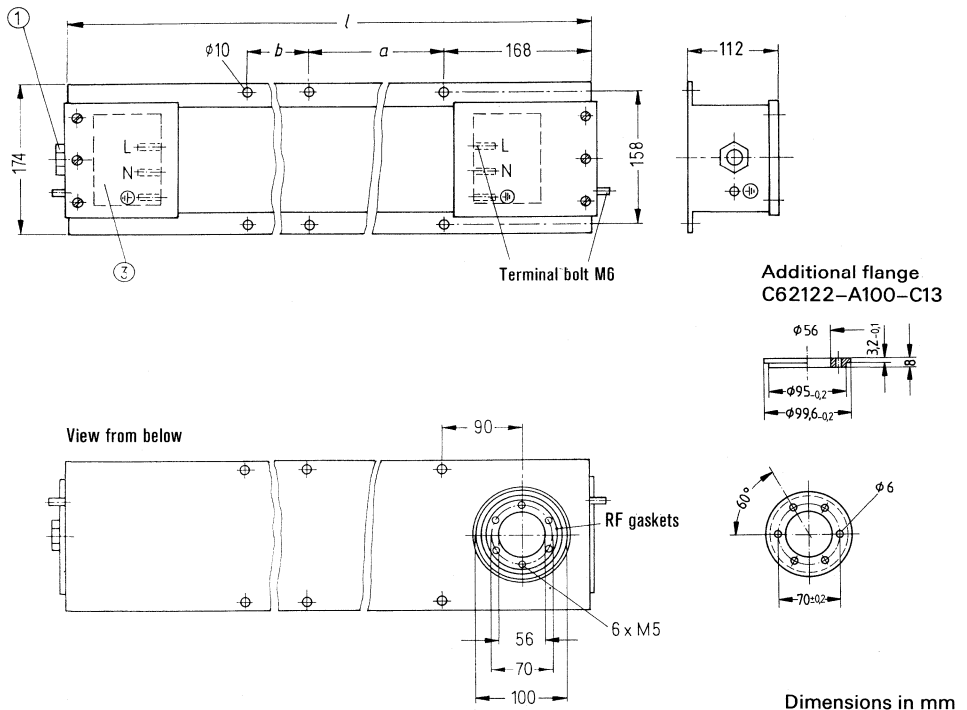
Filters for suppressing power line connections into shielded enclosures and rooms.

Input section (line side):

Cable entry via conduit bush (PG) with rubber sleeve

Output section:

Flange with double gasket for RF-tight connection of the filter to a shielded enclosure or a shielded room. An additional flange C62122-A100-C13 is required as counterpart at the shielded room.



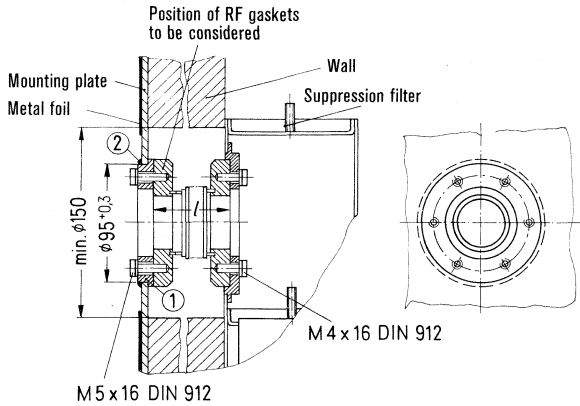
- ① Cable entry PG 21 with adaptable rubber sleeve for cable diameter 14 to 20 mm
- ③ Terminal section shielded

Type	Dimensions			Approx. weight kg
	a	b	l	
B84261-A23-B11	380	—	590	9
B84263-A23-B13	380	380	1128	29

▶ to be preferred

Connector fittings

A connector fitting is required, for example, if a filter cannot be connected directly to a shielded enclosure because of a wall.



- ① Additional flange, to be ordered, if required, under the ordering code C62122-A100-C13
- ② Tightly welded around circumference. Position of holes to be considered.

Dimensions in mm

Ordering code PU: 1	Wall thickness in mm	Ordering code PU: 1	Wall thickness in mm
B84298-A24	57 to 63	B84298-A26-L153	365 to 385
B84298-A25	110 to 130	B84298-A26-L154	385 to 405
B84298-A26-L141	130 to 150	B84298-A26-L155	405 to 425
B84298-A26-L142	145 to 165	B84298-A26-L156	425 to 445
B84298-A26-L143	165 to 185	B84298-A26-L157	445 to 465
B84298-A26-L144	185 to 205	B84298-A26-L158	465 to 485
B84298-A26-L145	205 to 225	B84298-A26-L159	485 to 505
B84298-A26-L146	225 to 245	B84298-A26-L160	505 to 525
B84298-A26-L147	245 to 265	B84298-A26-L161	525 to 545
B84298-A26-L148	265 to 285	B84298-A26-L162	545 to 565
B84298-A26-L149	285 to 305	B84298-A26-L163	565 to 585
B84298-A26-L150	305 to 325	B84298-A26-L164	585 to 605
B84298-A26-L151	325 to 345	B84298-A26-L165	605 to 625
B84298-A26-L152	345 to 365	B84298-A26-L166	625 to 645

Line filters in sheet steel housings

Version C (up to 1 GHz¹⁾)

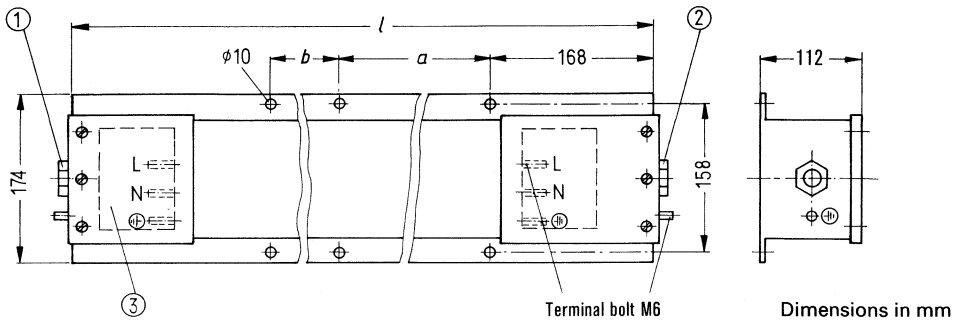
Filter for wiring electrical machines, equipment, and installations

Input section (line side):

Cable entry via conduit bush (PG) with rubber sleeve

Output side:

Conduit bush without rubber sleeve, however, with metal ring for pressing the cable shielding on.



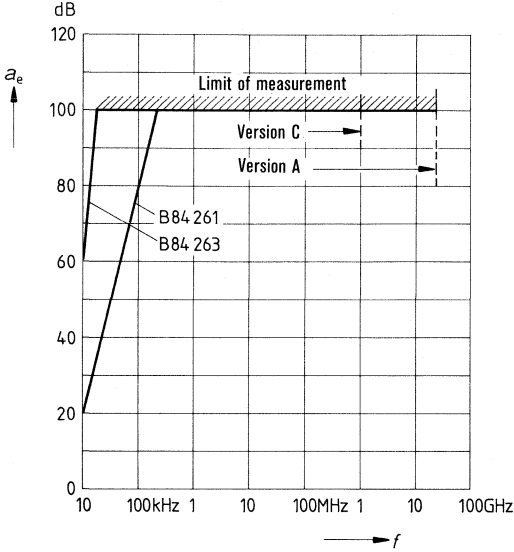
- ① Cable entry PG 21 with adaptable rubber sleeve for cable diameter 14 to 20 mm
- ② Cable entry PG 21 with metal ring to connect cable shield
- ③ Terminal section shielded

Type	Dimensions			Approx. weight kg
	a	b	l	
B84261-C23-B11	380	-	590	9
B84263-C23-B13	380	380	1128	20

▾ to be preferred

¹⁾ Limitation to 1 GHz because, in practice, the shielding effect of shielded cables (supply lines) decreases at high frequencies.

Insertion loss a_e versus frequency f
Symmetrical and unsymmetrical attenuation are approximately equal; the worst case is indicated



Filters for Installations and Shielded Rooms

Line filters in Siemens U system

Rated current up to 200 A

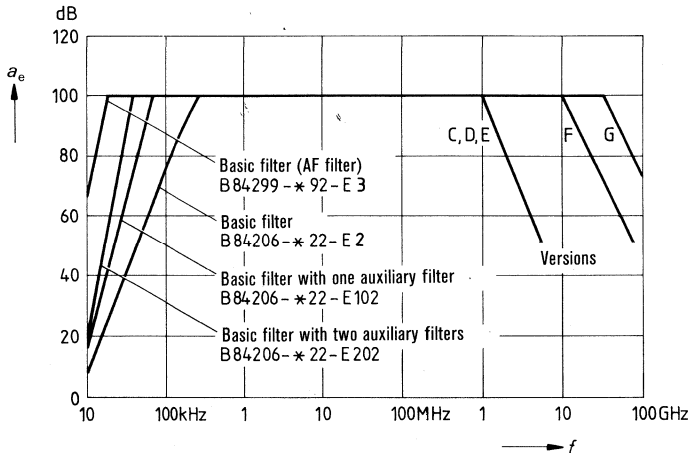
General

Filters in the Siemens U system are available for single and three-phase systems with rated frequencies of 50/60 Hz and 400 Hz.

As to attenuation requirements, versions C to G (marked in the ordering codes in the following tables by an *) determine the upper frequency limit of 1, 10, or 35 GHz. For choosing the mode of operation at lower frequencies, the following variants are available:

- **basic filters B84204 to B84227**
standard filters which generally cover an attenuation range of greater than 100 dB, starting at the MF range
- **basic filters B84204 to B84227 with one or two auxiliary filters**
as a result of one or two auxiliary filters used in addition to the basic filters, the range of attenuation greater than 100 dB is expanded to the AF range.
- **basic filters B84299; rated frequency 50/60 Hz (AF filter)**
filters having attenuation values greater than 100 dB throughout the entire AF range. A combination with auxiliary filters will not improve the attenuation characteristics and is, therefore, not provided.
- **basic filters B84299; rated frequency 400 Hz**
for rated frequencies of 400 Hz a filter series is available featuring attenuation of greater than 100 dB starting at the MF range. A combination with auxiliary filters is excluded.

Obtainable insertion loss, shown with a 25 A power line filter for three-phase systems, for example.



Filters for Installations and Shielded Rooms

Voltage drop

A voltage drop occurs across the chokes, which is approximately proportional to the operating current. The tables indicate the voltage drop at rated dc and rated ac current with 50 Hz. For 60 Hz, the tabulated values must be multiplied by 1.2.

Safety precautions

Safety conductor and neutral conductor terminals are provided in the filter. The high capacitance values in each line path against case require that safety precautions be taken in accordance with VDE 0100 and VDE 0875 (additional grounding line). The safety conductor can also be connected to the case from outside.

Where a neutral line connection is permitted by the local regulations and when the neutral line is allowed to be grounded, the neutral conductor must be connected to the non-suppressed line joined to the case. Otherwise a filter would be necessary in which a suppressed line is also available for the neutral line (e.g. a four-wire filter).

Technical data

Basic filters B84204 ... B84227 incl. auxiliary filters

Rated voltage	500 Vac (phase to phase) 380 Vac/500 Vdc (phase to case) at operating frequencies ≤ 60 Hz
Test voltage	1500 Vac, 1 min. 2500 Vdc, 1 s
Rated current	referred to +40°C/+104°F ambient temperature and 60 Hz
Permissible ambient temperature	-40 to +40°C/-40 to +104°F
Humidity category C	for the EMI suppression components used

Basic filters B84299 (AF filters)

Rated voltage	500 Vdc/ac (phase to phase) 500 Vdc/380 Vac (phase to chassis)
Rated current	referred to +40°C/+104°F ambient temperature
Test voltage	1000 Vdc 2 s (phase to phase) 1000 Vdc 2 s (phase to chassis)
Leakage current to phase	measured at 50 Hz
Voltage drop to phase	measured at rated current and 50 Hz
Permissible ambient temperature	-25 to +40°C/-13 to +104°F
Humidity category C	for the EMI suppression components used

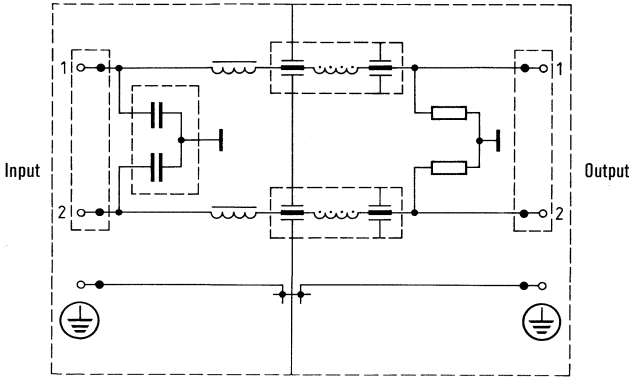
Basic filters B84299 (rated frequency 400 Hz)

Rated voltage	380/220 V, 400 Hz
Rated current	referred to +40°C/+104°F ambient temperature and 400 Hz
Test voltage	2500 Vdc, 2 s (for filters up to 40 A) 1000 Vdc, 2 s (for filters up to 60 A)
Permissible ambient temperature	-40 to +40°C/-40 to +104°F
Humidity category C	for the EMI suppression components used

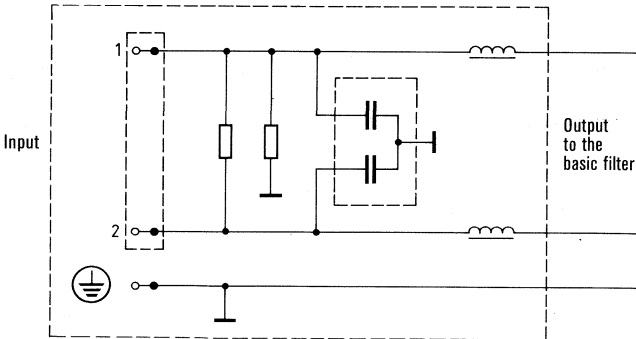
Filters for Installations and Shielded Rooms

Line filters in the Siemens U system Circuit diagrams with two-wire filters, for example

Basic filters B84204 to B84227

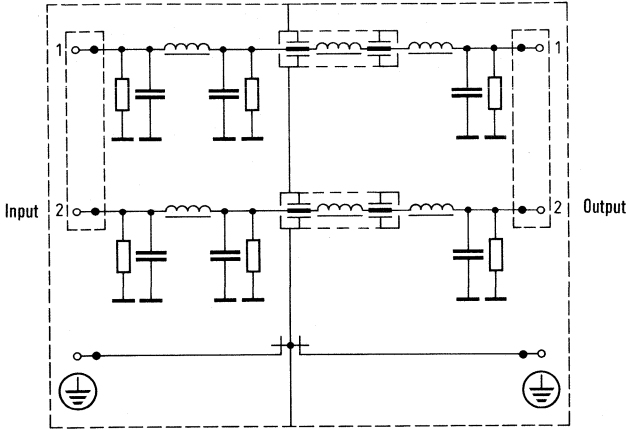


Auxiliary filter

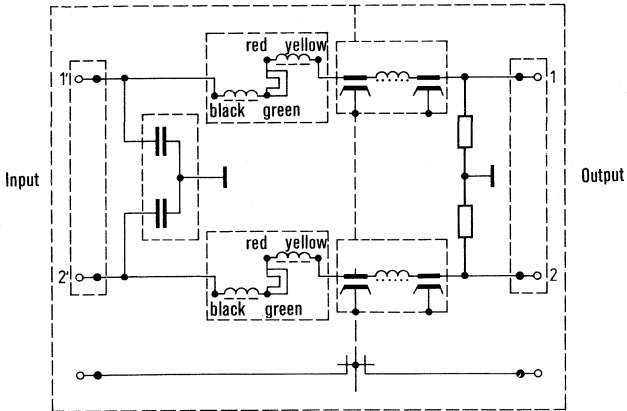


Filters for Installations and Shielded Rooms

Basic filter B84299 (AF filter)



Basic filter B84299 (rated frequency 400 Hz)



Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Rated current A	Number of lines	Rated frequency Hz	Basic filters					
			a_e [dB] at f [kHz]				Ordering code ¹⁾	
			14	50	100	1000		
5	2	50/60			76	>100	B84204-*21-B2 B84206-*21-E2	
	4							
6	4		97	>100	>100	>100	B84299-*91-E3	
25	2		19	56	76	>100	B84204-*22-B2 B84206-*22-E2	
	4							
	2		96	>100	>100	>100	B84299-*86-B3 B84299-*92-E3	
	2	400		46	64	>100	B84299-*33-B2 B84299-*20-E2	
40	2	50/60			68	>100	B84204-*23-B2 B84206-*23-E2	
	4							
	2	96	>100	>100	>100	B84299-*89-B3 B84299-*94-E3		
	4	400		94	>100	>100	B84299-*46-E2	
60	4	50/60			70	>100	B84224-*24-E2	
	2							
	4	96	>100	>100	>100	B84299-*90-B3 B84299-*87-E3		
	4	400	30	76	80	>100	B84299-*93-E3	
100	4	50/60			58	>100	B84226-*25-E2	
	4							
	4		68	>100	>100	>100	B84299-*97-E3	
200 ²⁾	4				58	>100	B84209-*26-E2	

1) *: Insert the appropriate code letter for the requested version:

Version C (up to 1 GHz):

filters for suppression of electrical installations

Version D (up to 1 GHz):

filters for the wiring of lines in shielded enclosures and rooms

Version E (up to 1 GHz):

as version D, however with prolonged connector fitting (for thicker walls, particularly for shielded enclosures)

Version F (up to 10 GHz):

for shielded enclosures and rooms

Version G (up to 35 GHz):

for shielded enclosures and rooms

2) 200 A filters are available as versions C, D, and E

Filters for Installations and Shielded Rooms

Basic filters incl. one auxiliary filter					Basic filters incl. two auxiliary filters				
a _e [dB] at f [kHz]				Ordering code ¹⁾	a _e [dB] at f [kHz]				Ordering code ¹⁾
14	50	100	1000		14	50	100	1000	
52	>100	>100	>100	B84204-→21-B102 B84206-→21-E102	73	>100	>100	>100	B84204-→21-B202 B84206-→21-E202
32	88	100	>100	B84204-→22-B102 B84206-→22-E102	45	>100	>100	>100	B84204-→22-B202 B84206-→22-E202
9	73	85	>100	B84204-→23-B102 B84206-→23-E102	14	94	>100	>100	B84204-→23-B202 B84206-→23-E202
14	69	80	>100	B84224-→24-E102	18	90	100	>100	B84224-→24-E202
	40	65	>100	B84226-→25-E102	14	60	80	>100	B84226-→25-E202
	40	65	>100	B84209-→26-E102	14	60	80	>100	B84209-→26-E202

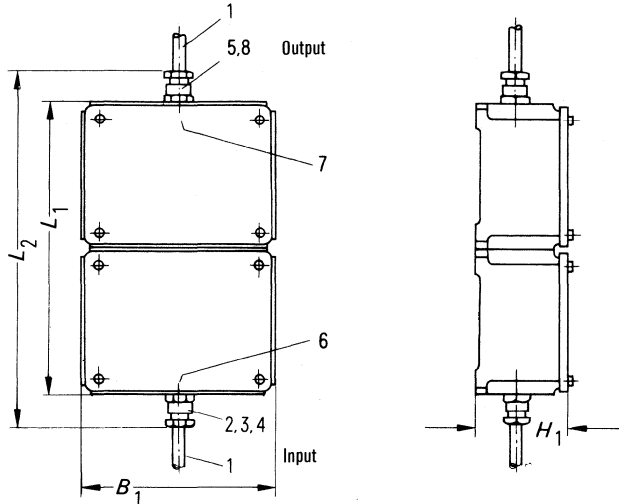
Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Rated current 5 to 200 A

Basic filters B84204...B84226

Version C (up to 1 GHz)



Dimensions in mm

Types

Number of suppressed lines Rated current A	Ordering code PU: 1	Voltage drop at rated current per line		Dimensions (typical values)			
		V dc	50 Hz V ac	mm			
				L_1	L_2	B_1	H_1
2 × 5	B84204-C21-B2	<0,5	1,7	525	587	248	157
4 × 5	B84206-C21-E2	<0,5	1,7	525	587	315	157
2 × 25	B84204-C22-B2	<0,5	4,2	525	587	248	157
4 × 25	B84206-C22-E2	<0,5	4,2	525	587	315	157
2 × 40	B84204-C23-B2	<0,5	2,4	525	587	248	157
4 × 40	B84206-C23-E2	<0,5	2,4	525	587	315	157
4 × 60	B84224-C24-E2	<0,5	3,6	777	839	315	157
4 × 100	B84226-C25-E2	<0,5	2,6	912	1010	315	177
4 × 200	B84209-C26-E2	<0,5	5,2	1039	1110	315	177

Filters for Installations and Shielded Rooms

1	2	3	4	5	6	7	8	
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush		Max. available cross-section of the clamps mm ²		Thread for conduit bush	Approx. net weight
			mm		Thread of the screw (M8 or M10)			
1,5	PG 21	14 to 20	21		6 mm ²	6 mm ²	PG 29/21 ¹⁾	28
1,5	PG 21	14 to 20	21		6 mm ²	6 mm ²	PG 29/21 ¹⁾	36
4	PG 21	14 to 20	21		10 mm ²	10 mm ²	PG 29/21 ¹⁾	30
4	PG 29	23 to 29	30		10 mm ²	10 mm ²	PG 29	38
6	PG 21	14 to 20	21		10 mm ²	10 mm ²	PG 29/21 ¹⁾	31
6	PG 29	23 to 29	30		10 mm ²	10 mm ²	PG 29	39
10 to 16	PG 29	23 to 29	30		35 mm ²	M8	PG 29	52
35	PG 36	31 to 37	38		M8	M8	PG 42/36 ²⁾	82
95/50	PG 42/36 ²⁾	39 to 41	43		M10	M10	PG 42	96

¹⁾ Pg 29/21 indicates: Reducing adaptor to Pg 21 screwed into Pg 29 threaded hole in case.

²⁾ Pg 42/36 indicates: Reducing adaptor to Pg 36 screwed into Pg 42 threaded hole in case.

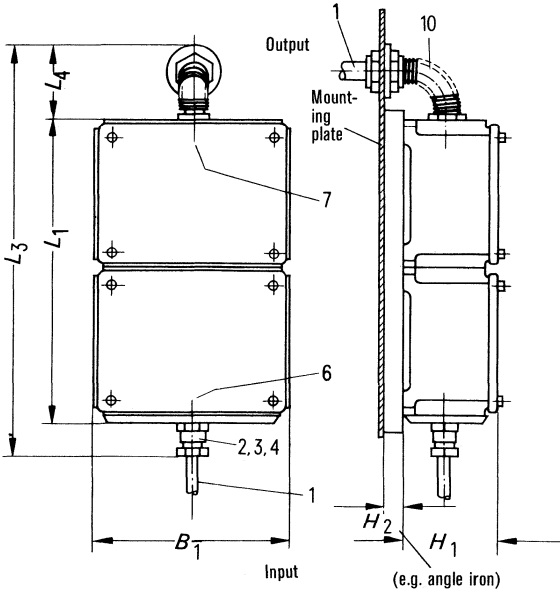
Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

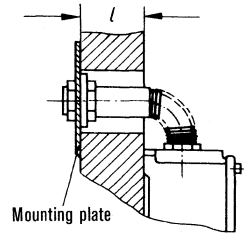
Rated current 5 to 200 A

Basic filters B84204...B84226

Version D (up to 1 GHz)



Version E (up to 1 GHz)



When ordering, the wall thickness l must be indicated (when $l \leq 40$ mm Version D is to be used)

$l_{\max} = 600$ mm

Dimensions in mm

Types

Number of suppressed lines Rated current A	Ordering code ¹⁾	Voltage drop at rated voltage per line		Dimensions (typical values)					
		V dc	50 Hz V ac	mm					
				L_1	L_3	L_4	B_1	H_1	H_2
2 × 5	B84204-21-B2	<0,5	1,7	525	694	140	248	157	30 ⁺¹⁰
4 × 5	B84206-21-E2	<0,5	1,7	525	694	140	315	157	30 ⁺¹⁰
2 × 25	B84204-22-B2	<0,5	4,2	525	694	140	248	157	30 ⁺¹⁰
4 × 25	B84206-22-E2	<0,5	4,2	525	694	140	315	157	30 ⁺¹⁰
2 × 40	B84204-23-B2	<0,5	2,4	525	694	140	248	157	30 ⁺¹⁰
4 × 40	B84206-23-E2	<0,5	2,4	525	694	140	315	157	30 ⁺¹⁰
4 × 60	B84224-24-E2	<0,5	3,6	777	948	140	315	157	30 ⁺¹⁰
4 × 100	B84226-25-E2	<0,5	2,6	912	1085	200	315	177	30 ⁺¹⁰
4 × 200	B84209-26-E2	<0,5	5,2	1039	1217	200	315	177	30 ⁺¹⁰

¹⁾ - Insert the appropriate code letter for the requested version (D or E):

Version D (up to 1 GHz):

filters for the wiring of lines in shielded enclosures and rooms

Version E (up to 1 GHz):

as version D, however with prolonged connector fitting (for thicker walls, particularly for shielded enclosures)

Filters for Installations and Shielded Rooms

1	2	3	4	6	7	10	
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush mm	Max. available cross-section of the clamps mm ²		Clearance hole for conduit bush mm	Approx. net weight kg
				Thread of the screw (M8 or M10)			
1,5	PG 21	14 to 20	21	6 mm ²	6 mm ²	23,5	30
1,5	PG 21	14 to 20	21	6 mm ²	6 mm ²	23,5	38
4	PG 21	14 to 20	21	10 mm ²	10 mm ²	23,5	32
4	PG 29	23 to 29	30	10 mm ²	10 mm ²	23,5	40
6	PG 21	14 to 20	21	10 mm ²	10 mm ²	23,5	33
6	PG 29	23 to 29	30	10 mm ²	10 mm ²	23,5	41
10 to 16	PG 29	23 to 29	30	35 mm ²	M8	23,5	54
35	PG 36	31 to 37	38	M8	M8	42	84
95/50	PG 42/36 ¹⁾	39 to 41	43	M10	M10	42	98

¹⁾ PG 42/36 indicates: Reducing adaptor to Pg 36 screwed into Pg 42 threaded hole in case.

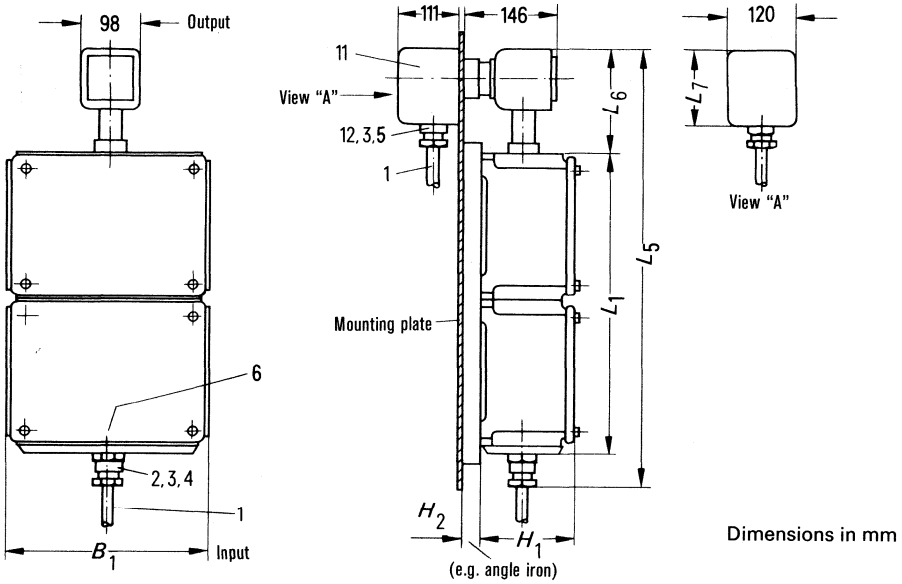
Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Rated current 5 to 100 A

Basic filters B84204...B84226

Version F (up to 10 GHz) or G (up to 35 GHz)



Types

Number of suppressed lines Rated current A	Ordering code ¹⁾ PU: 1	Voltage drop at rated current per line		Dimensions (typical values)						
		V dc	50 Hz V ac	mm						
				L ₁	L ₅	L ₆	L ₇	B ₁	H ₁	H ₂
2 × 5	B84204--*21-B2	<0,5	1,7	525	812	258	151	248	157	30 ⁺¹⁰
4 × 5	B84206--*21-E2	<0,5	1,7	525	812	258	151	315	157	30 ⁺¹⁰
2 × 25	B84204--*22-B2	<0,5	4,2	525	812	258	151	248	157	30 ⁺¹⁰
4 × 25	B84206--*22-E2	<0,5	4,2	525	812	258	151	315	157	30 ⁺¹⁰
2 × 40	B84204--*23-B2	<0,5	2,4	525	812	258	151	248	157	30 ⁺¹⁰
4 × 40	B84206--*23-E2	<0,5	2,4	525	812	258	151	315	157	30 ⁺¹⁰
4 × 60	B84224--*24-E2	<0,5	3,6	777	1066	258	151	315	157	30 ⁺¹⁰
4 × 100	B84226--*25-E2	<0,5	2,6	912	1203	258	151	315	157	30 ⁺¹⁰

¹⁾ *: Insert the appropriate code letter for the requested version (F or G):

Version F (up to 10 GHz):
for shielded enclosures and rooms

Version G (up to 35 GHz):
for shielded enclosures and rooms

Filters for Installations and Shielded Rooms

1	2	3	4	5	6	11	12	
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush mm		Max. available cross-section of the clamps (mm ²) Thread of the screw (M8)	Conduit bolt	Thread for conduit bush	Approx. net weight kg
1,5	PG 21	14 to 20	21		6 mm ²	M8	PG 29/21 ¹⁾	32
1,5	PG 21	14 to 20	21		6 mm ²	M8	PG 29/21 ¹⁾	40
4	PG 21	14 to 20	21		10 mm ²	M8	PG 29/21 ¹⁾	34
4	PG 29	23 to 29	30		10 mm ²	M8	PG 29	42
6	PG 21	14 to 20	21		10 mm ²	M8	PG 29/21 ¹⁾	35
6	PG 29	23 to 29	30		10 mm ²	M8	PG 29	43
10 to 16	PG 29	23 to 29	30		35 mm ²	M8	PG 29	56
35	PG 36	31 to 37	38		M8	M8	PG 36	86

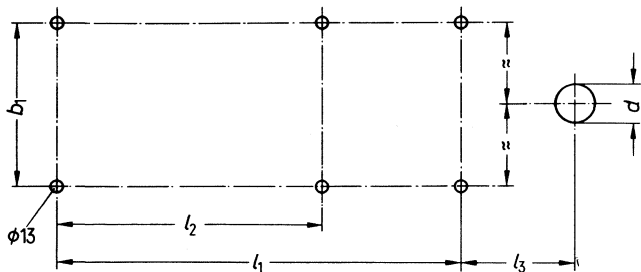
¹⁾ Pg 29/21 indicates: Cable screwed into Pg 29 in case; reducing adaptor to Pg 21 screwed into Pg 29; loosely supplied.

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84204...B84226

Fixing dimensions



Dimensions in mm

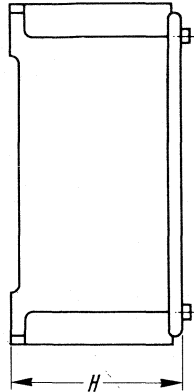
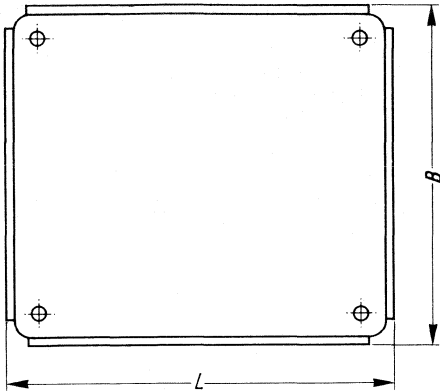
Ordering code	Versions						
	C			D and E ¹⁾		F and G ¹⁾	
	b_1 mm	l_1 mm	l_2 mm	l_3 mm	dia. d mm	l_3 mm	dia. d mm
B84204-→21-B2	223	475	–	103	55	220	71
B84204-→22-B2	223	475	–	103	55	220	71
B84204-→23-B2	223	475	–	103	55	220	71
B84206-→21-E2	290	475	–	103	55	220	71
B84205-→22-E2	290	475	–	103	55	220	71
B84206-→23-E2	290	475	–	103	55	220	71
B84209-→26-E2	290	989	610	168	81	–	–
B84224-→24-E2	290	727	475	103	55	220	71
B84225-→25-C2	290	727	475	168	81	220	71
B84226-→25-E2	290	862	610	168	81	220	71

¹⁾ For the dimensions b_1 , l_1 , and l_2 see version C.

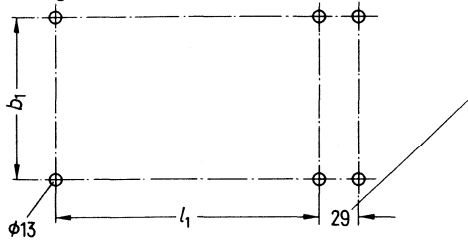
Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Auxiliary filters



Fixing dimensions



“Dimension 29” indicates the hole spacing between basic filter and AF auxiliary filter.

Dimensions in mm

Built-in dimensions		Dimensions ¹⁾ (typical values)			Approx. net weight	Voltage drop at rated current per line		No. of lines	Rated current
b_1 mm	l_1 mm	L	B mm	H		V dc	50 Hz V ac		
223	223	248	248	157	14	<0,5	1,7	2	5
290	223	248	315	157	17	<0,5	1,7	4	5
223	223	248	248	157	15	<0,5	4,2	2	25
290	223	248	315	157	21	<0,5	4,2	4	25
223	223	248	248	157	17	<0,5	2,4	2	40
290	223	248	315	157	22	<0,5	2,4	4	40
290	475	500	315	157	36	<0,5	3,6	4	60
290	610	635	315	177	65	<0,5	2,6	4	100
290	610	635	315	177	71	<0,5	5,2	4	200

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (AF filters)

Types

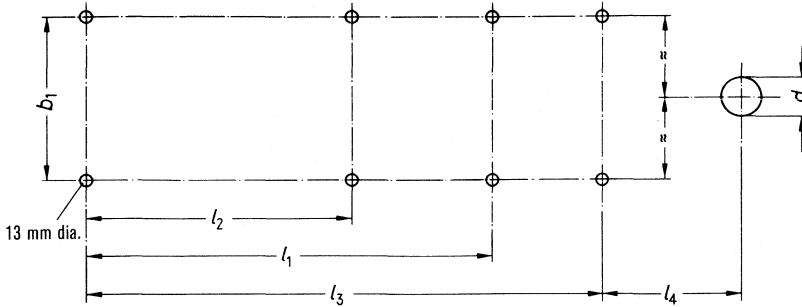
Ordering code B84299-	--86-B3	--89-B3	--90-B3	--91-E3	--92-E3	--94-E3	--87-E3	--97-E3
Number of lines	2			4				
Rated current	25 A	40 A	60 A	6 A	25 A	40 A	60 A	100 A
DC resistance/ line	20 mΩ		5 mΩ	160 mΩ	20 mΩ	5 mΩ		3 mΩ
Ohmic voltage drop/ line	0,5 V	0,8 V	0,3 V	0,65 V	0,5 V	0,2 V	0,3 V	0,3 V
Voltage drop/ phase	6 V	9,6 V	9,2 V	8,3 V	6 V	6,6 V	9,2 V	9 V
Leakage current/ phase	5,3 A	5,2 A	7,1 A	1,8 A	5,2 A	7,1 A		7,1 A

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (AF filters¹⁾)

Fixing dimensions



Ordering code	Versions							
	C				D and E ²⁾		F and G ²⁾	
	b_1 mm	l_1 mm	l_2 mm	l_3 mm	l_4 mm	dia. d mm	l_4 mm	dia. d mm
B84299-→86-B3	290	854	475	-	103	55	220	71
B84299-→87-E3	290	979	475	1483	103	55	220	71
B84299-→89-B3	290	854	475	-	103	55	220	71
B84299-→90-B3	290	854	475	-	103	55	220	71
B84299-→91-E3	290	729	350	-	103	55	220	71
B84299-→92-E3	290	979	475	1483	103	55	220	71
B84299-→94-E3	290	979	475	1483	103	55	220	71
B84299-→97-E3	290	979	475	1483	155	81	220	71

¹⁾ AF = Audio frequency

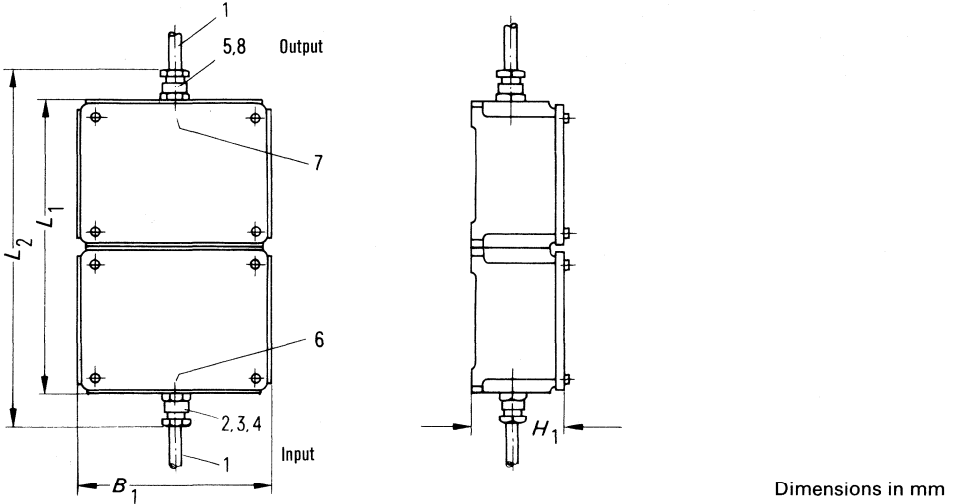
²⁾ For the dimensions b_1 , l_1 , and l_2 see version C.

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (AF filter¹⁾)

Version C (up to 1 GHz)



Dimensions in mm

Figure 1

Types

Number of suppressed lines	Ordering code	Figure	Dimensions (typical values)			
			mm			
Rated current A	PU: 1		L_1	L_2	B_1	H_1
4 × 6	B84299-C91-E3	1	754	816	315	157
2 × 25	B84299-C86-B3	1	879	941	315	177
4 × 25	B84299-C92-E3	2	1508	1570	315	177
2 × 40	B84299-C89-B3	1	879	941	315	177
4 × 40	B84299-C94-E3	2	1508	1570	315	177
2 × 60	B84299-C90-B3	1	879	941	315	177
4 × 60	B84299-C87-E3	2	1508	1570	315	177
4 × 100	B84299-C97-E3	2	1508	1570	315	177

¹⁾ AF = Audio frequency

Filters for Installations and Shielded Rooms

Version C (up to 1 GHz)

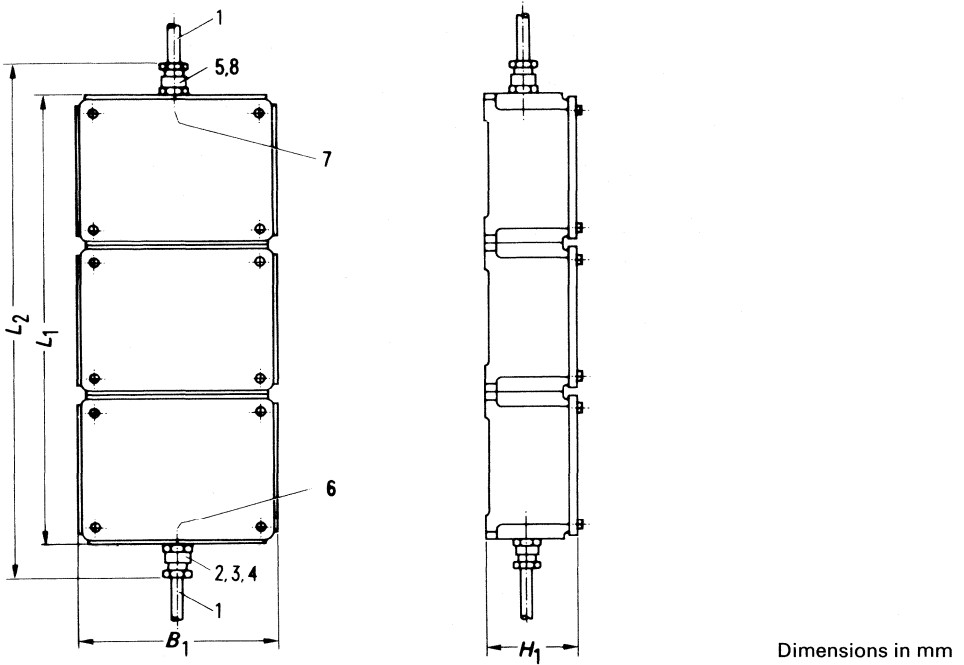


Figure 2

1	2	3	4	5	6	7	8	
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush mm		Max. available cross-section of the clamps mm ²		Thread for conduit bush	Approx. net weight kg
1,5	PG 21	20 to 27	32 24		6		PG 29/21 ¹⁾	34
4	PG 29	20 to 27	32		10		PG 29	35
4	PG 29	20 to 27	32		10		PG 29	55
6	PG 29	20 to 27	32		10		PG 29	35
6	PG 29	20 to 27	32		10		PG 29	69
10 to 16	PG 29	20 to 27	32		35		PG 29	40
10 to 16	PG 29	20 to 27	32		35		PG 29	70
95/50	PG 42	39 to 41	43		70		PG 42	70

¹⁾ Pg 29/21 indicates: Cable screwed into Pg 29 in case; reducing adaptor to Pg 21 screwed into Pg 29; loosely supplied.

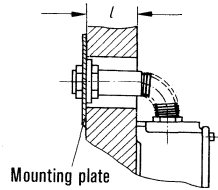
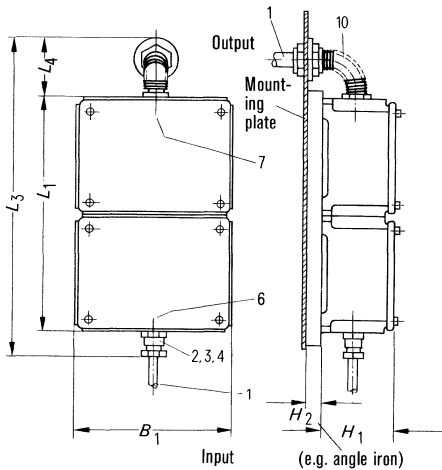
Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (AF filters¹⁾)

Version D (up to 1 GHz)

Version E (up to 1 GHz)



When ordering the wall thickness l must be indicated (when $l \leq 40$ mm Version D is to be used).

$l_{\max} = 600$ mm

Dimensions in mm

Figure 1

Types

Number of suppressed lines Rated current A	Ordering code ²⁾ PU: 1	Fig.	Dimensions (typical values)					
			mm					
			L_1	L_3	L_4	B_1	H_1	H_2
4 × 6	B84299-•91-E3	1	754	925	140	315	157	30 ⁺¹⁰
2 × 25	B84299-•86-B3	1	879	1050	140	315	177	30 ⁺¹⁰
4 × 25	B84299-•92-E3	2	1508	1679	140	315	177	30 ⁺³⁰
2 × 40	B84299-•89-B3	1	879	1050	140	315	177	30 ⁺¹⁰
4 × 40	B84299-•94-E3	2	1508	1679	140	315	177	30 ⁺¹⁰
2 × 60	B84299-•90-B3	1	879	1050	140	315	177	30 ⁺¹⁰
4 × 60	B84299-•87-E3	2	1508	1679	140	315	177	30 ⁺¹⁰
4 × 100	B84299-•97-E3	2	1508	1695	155	315	177	30 ⁺¹⁰

¹⁾ AF = Audio frequency

²⁾ •: Insert the appropriate code letter for the requested version (D or E):

Version D (up to 1 GHz):

filters for the wiring of lines in shielded enclosures and rooms

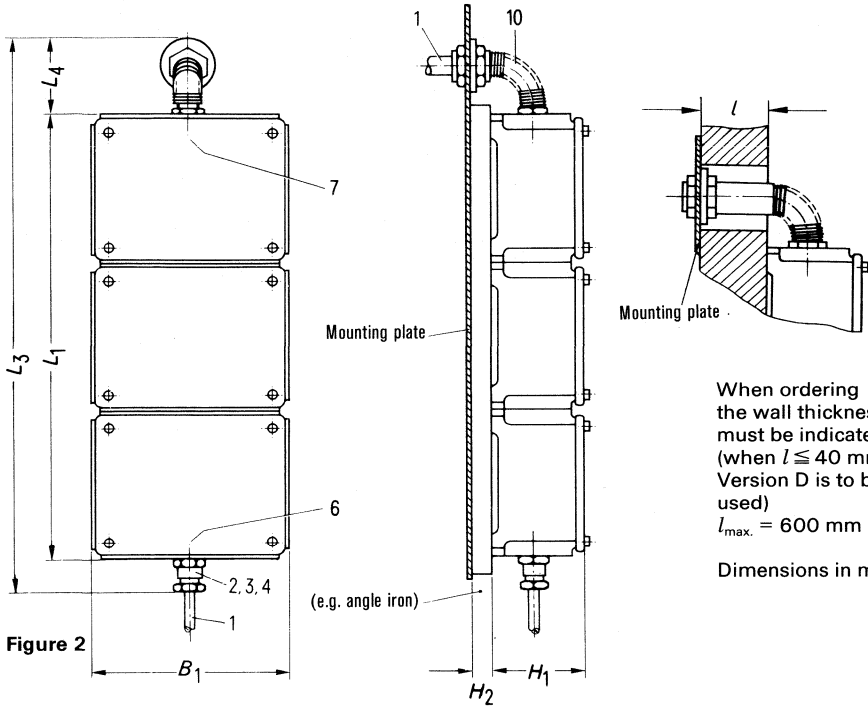
Version E (up to 1 GHz):

as version D, however with prolonged connector fitting (for thicker walls, particularly for shielded enclosures)

Filters for Installations and Shielded Rooms

Version D (up to 1 GHz)

Version E (up to 1 GHz)



1	2	3	4	6	7	10	Approx. net weight
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush mm	Max. available cross-section of the clamps mm ²		Clearance hole for conduit bush mm	kg
1,5	PG 21	20 to 27	32	6		23,5	36
4	PG 29	20 to 27	32	10		23,5	37
4	PG 29	20 to 27	32	10		23,5	57
6	PG 29	20 to 27	32	10		23,5	37
6	PG 29	20 to 27	32	10		23,5	71
10 to 16	PG 29	20 to 27	32	35		23,5	42
10 to 16	PG 29	20 to 27	32	35		23,5	72
95 to 50	PG 42	39 to 41	43	70		42	72

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (AF filters¹⁾)

Version F (up to 10 GHz) or G (up to 35 GHz)

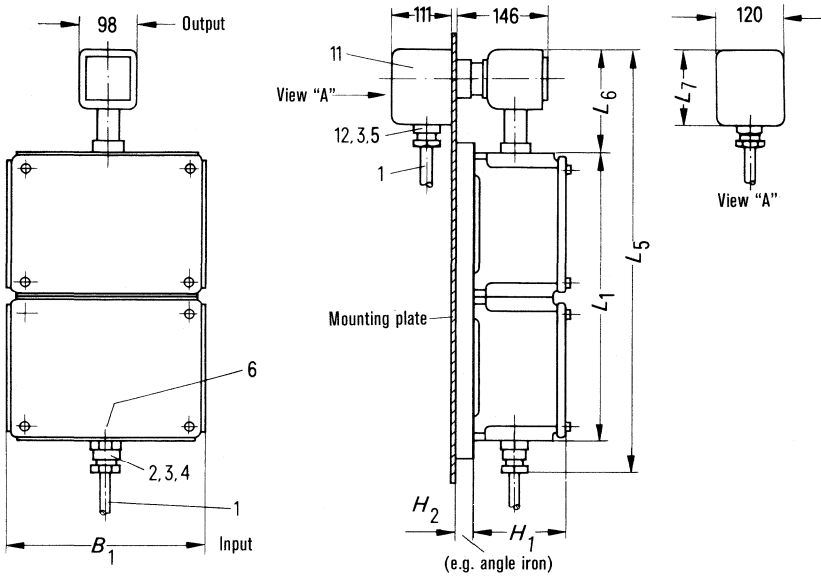


Figure 1

Dimensions in mm

Types

Number of suppressed lines Rated current A	Ordering code ²⁾	Fig.	Dimensions (typical values)						
			mm						
			L ₁	L ₅	L ₆	L ₇	B ₁	H ₁	H ₂
4 × 6	B84299-+91-E3	1	754	1043	268	151	315	157	30 ⁺¹⁰
2 × 25	B84299-+86-B3	1	879	1168	268	151	315	177	30 ⁺¹⁰
4 × 25	B84299-+92-E3	2	1508	1797	268	151	315	177	30 ⁺¹⁰
2 × 40	B84299-+89-B3	1	879	1168	268	151	315	177	30 ⁺¹⁰
4 × 40	B84299-+94-E3	2	1508	1797	268	151	315	177	30 ⁺¹⁰
2 × 60	B84299-+90-B3	1	879	1168	268	151	315	177	30 ⁺¹⁰
4 × 60	B84299-+87-E3	2	1508	1797	268	151	315	177	30 ⁺¹⁰
4 × 100	B84299-+97-E3	2	1508	1797	268	151	315	177	30 ⁺¹⁰

¹⁾ AF = Audio frequency

²⁾ *: Insert the appropriate code letter for the requested version (F or G):

Version F (up to 10 GHz):

for shielded enclosures and rooms

Version G (up to 35 GHz):

for shielded enclosures and rooms

Filters for Installations and Shielded Rooms

Version F (up to 10 GHz) or G (up to 35 GHz)

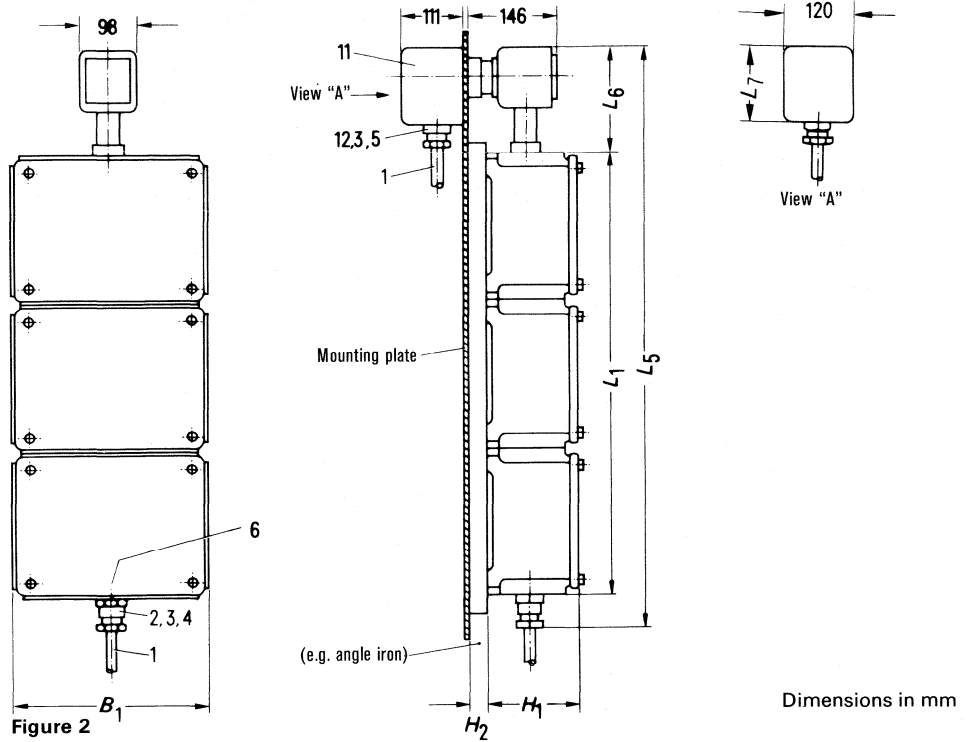


Figure 2

Dimensions in mm

1	2	3	4	5	6	11	12	Approx. net weight
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush mm		Max. available cross-section of the clamps mm ²	Conduit bolt	Thread for conduit bush	kg
1,5	PG 21	20 to 27	32	24	6	M8	PG 29/21 ¹⁾	38
4	PG 29	20 to 27	32	24	10	M8	PG 29/21 ¹⁾	39
4	PG 29	20 to 27	32		10	M8	PG 29	59
6	PG 29	20 to 27	32	24	10	M8	PG 29/21 ¹⁾	39
6	PG 29	20 to 27	32		35	M8	PG 29	73
10 to 16	PG 29	20 to 27	32		35	M8	PG 29	44
10 to 16	PG 29	20 to 27	32		35	M8	PG 29	74
95 to 50	PG 42	39 to 41	43	38	70	M8	PG 36	74

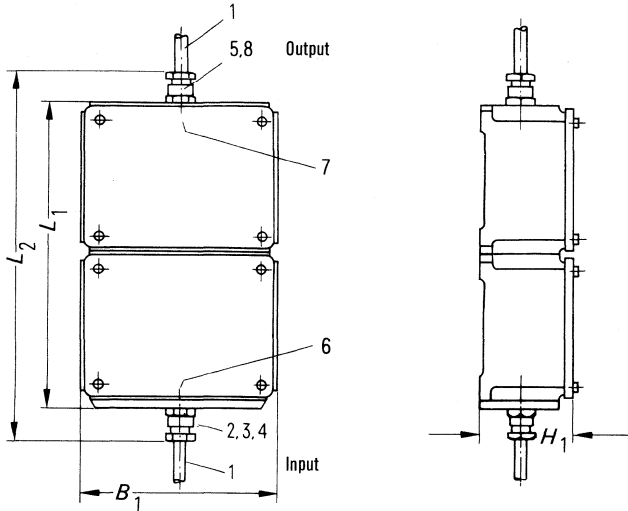
¹⁾ PG 29/21 indicates: Cable screwed into PG 29 in case; reducing adaptor to PG 21 screwed into PG 29.

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (rated frequency 400 Hz)

Version C (up to 1 GHz)



Dimensions in mm

Types

Number of suppressed lines Rated current A	Ordering code PU: 1	Voltage drop a rated current		Dimensions (typical values)			
		V dc	400 Hz V ac	mm			
				L_1	L_2	B_1	H_1
2×25	B84299-C33-B2	<0,5	2,5 ¹⁾	525	587	248	157
4×25	B84299-C20-E2	<0,5	2,5 ¹⁾	525	587	315	157
4×40	B84299-C46-E2	<0,5	7	777	839	315	157
4×60	B84299-C93-E3	<0,5	5,2	1139	1201	315	157

¹⁾ Voltage drop of the chokes connected in parallel; with series-connected chokes 5 V.

Filters for Installations and Shielded Rooms

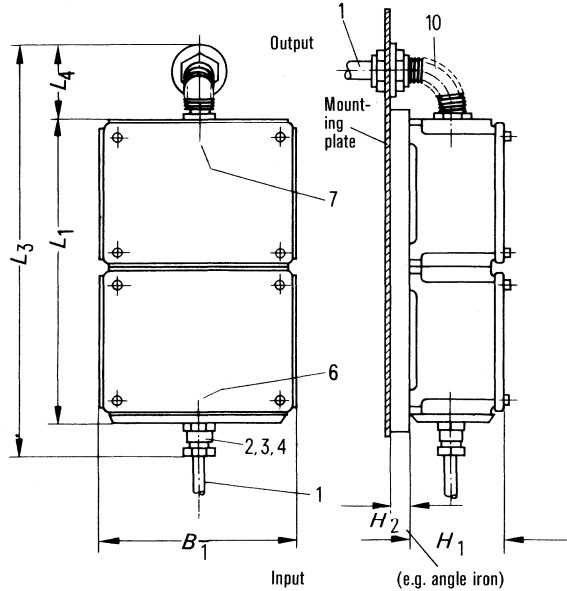
1	2	3	4	5	6	7	8	
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush		Max. available cross-section of the clamps (mm ²)		Clearance hole for conduit bush mm	Approx. net weight kg
				mm	Thread of the screw (M8 or M10)			
4	PG 21	14 to 20	24	32	10 mm ²	10 mm ²	PG 29	32
4	PG 29	23 to 29		32	10 mm ²	10 mm ²	PG 29	40
16	PG 29	23 to 29		32	35 mm ²	M8	PG 29	54
16	PG 29	23 to 29		32	35 mm ²	35 mm ²	PG 29	50

Filters for Installations and Shielded Rooms

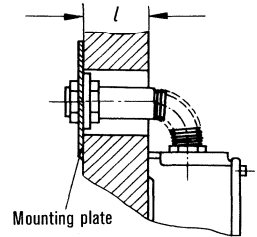
Line filters in the Siemens U system

Basic filters B84299 (rated frequency 400 Hz)

Version D (up to 1 GHz)



Version E (up to 1 GHz)



When ordering the wall thickness l must be indicated (when $l \leq 40$ mm Version D is to be used)

$$l_{\max.} = 600 \text{ mm}$$

Dimensions in mm

Types

Number of suppressed lines Rated current A	Ordering code ¹⁾ PU: 1	Voltage drop at rated current		Dimensions (typical values)					
		V dc	400 Hz	mm					
			V ac	L_1	L_3	L_4	B_1	H_1	H_2
2 × 25	B84299-•33-B2	<0,5	2,5 ²⁾	525	694	140	248	157	30 ⁺¹⁰
4 × 25	B84299-•20-E2	<0,5	2,5 ²⁾	525	694	140	315	157	30 ⁺¹⁰
4 × 40	B84299-•46-E2	<0,5	7	777	946	140	315	157	30 ⁺¹⁰
4 × 60	B84299-•93-E3	<0,5	5,2	1139	1310	140	315	157	30 ⁺¹⁰

¹⁾ •: Insert the appropriate code letter for the requested version (D or E):

Version D (up to 1 GHz):

filters for the wiring of lines in shielded enclosures and rooms

Version E (up to 1 GHz):

as version D, however with prolonged connector fitting (for thicker walls, particularly for shielded enclosures)

²⁾ Voltage drop of the chokes connected in parallel; with series-connected chokes 5 V.

Filters for Installations and Shielded Rooms

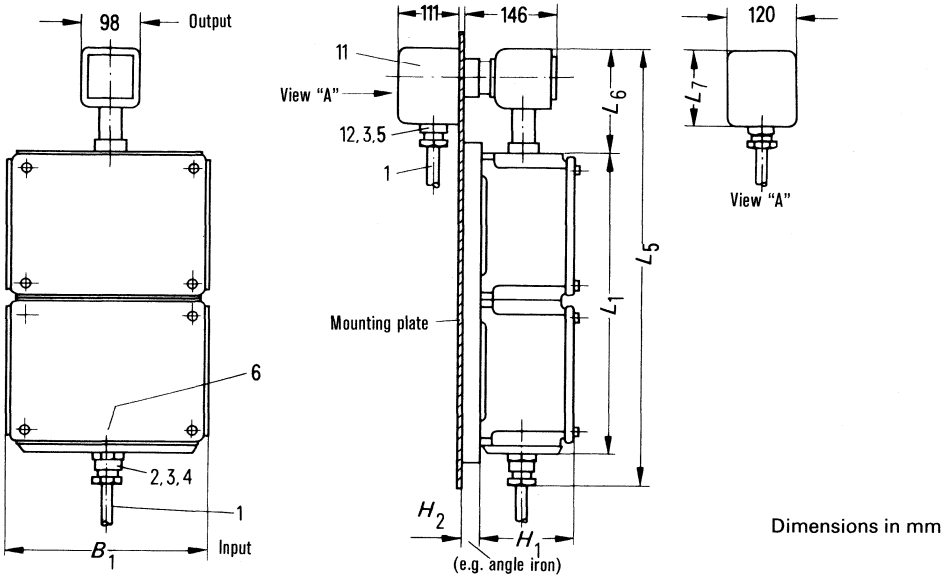
1	2	3	4	6	7	10	
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush mm	Max. available cross-section of the clamps (mm ²)		Thread for conduit bush	Approx. net weight kg
				Thread of the screw (M8 or M10)			
4	PG 21	14 to 20	32	10 mm ²	10 mm ²	23,5	34
4	PG 29	23 to 29	32	10 mm ²	10 mm ²	23,5	42
16	PG 29	23 to 29	32	35 mm ²	M8	23,5	56
16	PG 29	23 to 29	32	35 mm ²	35 mm ²	23,5	52

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (rated frequency 400 Hz)

Version F (up to 10 GHz) or G (up to 35 GHz)



Dimensions in mm

Types

Number of suppressed lines Rated current A	Ordering code ¹⁾ PU: 1	Voltage drop at rated current		Dimensions (typical values)							
		V dc	400 Hz	mm							
			V ac	L ₁	L ₅	L ₆	L ₇	B ₁	H ₁	H ₂	
2 × 25	B84299-+33-B2	<0,5	2,5 ²⁾	525	814	258	151	248	157	30 ⁺¹⁰	
4 × 25	B84299-+20-E2	<0,5	2,5 ²⁾	525	814	258	151	315	157	30 ⁺¹⁰	
4 × 40	B84299-+46-E2	<0,5	7	777	1066	258	151	315	157	30 ⁺¹⁰	
4 × 60	B84299-+93-E3	<0,5	5,2	1139	1428	258	151	315	157	30 ⁺¹⁰	

1) *: Insert the appropriate code letter for the requested version (F or G):

Version F (up to 10 GHz):

for shielded enclosures and rooms

Version G (up to 35 GHz):

for shielded enclosures and rooms

2) Voltage drop of the chokes connected in parallel; with series-connected chokes 5 V.

Filters for Installations and Shielded Rooms

1	2	3	4	5	6	11	12	Approx. net weight
Cable cross-section (recommended) mm ²	Thread for conduit bush	Possible inside diameter for rubber sleeve mm	Clearance hole for bush mm		Max. available cross-section of the clamps (mm ²) Thread of the screw (M8)	Conduit bolt	Thread for conduit bush	kg
4	PG 21	14 to 20	32		10 mm ²	M8	PG 29/21 ¹⁾	36
4	PG 29	23 to 29	32		10 mm ²	M8	PG 29	44
16	PG 29	23 to 29	32		35 mm ²	M8	PG 29	58
16	PG 29	23 to 29	32		35 mm ²	M8	PG 29	54

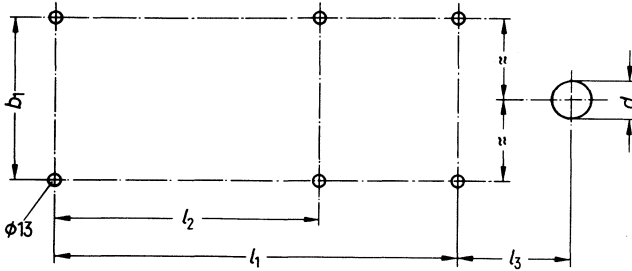
¹⁾ PG 29/21 indicates: Cable screwed into PG 29 in case; reducing adaptor to PG 21 screwed into PG 29; loosely supplied.

Filters for Installations and Shielded Rooms

Line filters in the Siemens U system

Basic filters B84299 (rated frequency 400 Hz)

Fixing dimensions



Dimensions in mm

Ordering code	Versions						
	C			D and E ¹⁾		F and G ¹⁾	
PU: 1	b_1 mm	l_1 mm	l_2 mm	l_3 mm	dia. d mm	l_3 mm	dia. d mm
B84299-•20-E2	290	475	–	103	55	220	71
B84299-•33-B2	223	475	–	103	55	220	71
B84299-•46-E2	290	727	475	103	55	220	71
B84299-•93-E3	290	1114	475	103	55	220	71

¹⁾ For dimensions b_1 , l_1 , and l_2 refer to version C.

Filters for communication lines

Rated voltage 250 Vdc

Rated current up to 1 A

Two-wire filters for EMI suppression up to 35 GHz

General information

Filters comprising individual chokes as well as filters with current-compensated chokes are available for suppressing EMI from communication and control lines, in particular cables in shielded enclosures and rooms. Those components for the wiring of two lines, each, are enclosed in a completely shielded housing. The input and output capacitors are constructed as feed-through elements with the result of an attenuation that covers up to 35 GHz.

Filter design comprising individual chokes

B84311-C10-B3 EMI suppression filters for communication lines
matched to 600 Ω
pass-band up to 10 kHz

B84311-C20-B3 EMI suppression filters for telephone lines
matched to 600 Ω
pass-band up to 3.4 kHz

The filters B84311-C10-B3 and B84311-C20-B3 can also be used for wiring lines of ionization fire-alarm systems.

B84311-C30-B3 EMI suppression filters for control lines
not matched

B84311-C40-B1 EMI suppression filters for communication lines
matched to 600 Ω
pass-band up to 50 Hz

Filter design comprising current-compensated chokes

B84311-C50-B1 EMI suppression filters for communication lines
matched to 150 Ω
pass-band up to 120 kHz

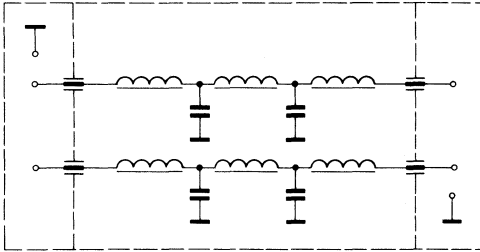
B84311-C60-B1 EMI suppression filters for communication lines
matched to 150 Ω
pass-band up to 300 Hz

Care should be taken that the entry and exit lines of filters with compensated chokes be fed through **one** filter.

Filters for communication lines

Circuit diagram

(of the filter B84311-C20-B3, for example)



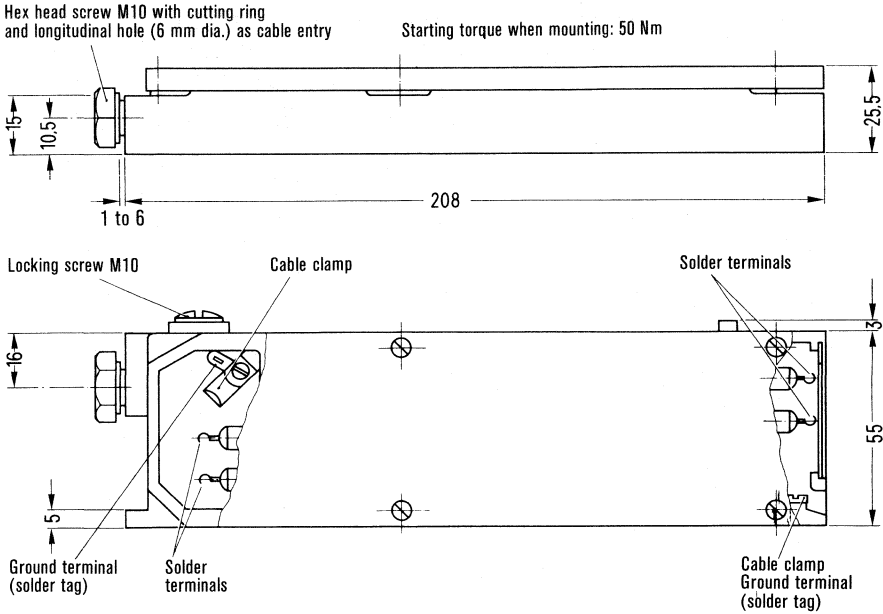
Technical data

Number of lines	2
Rated current	referred to +40°C/+104°F ambient temperature
Permissible ambient temperature	-40 to +40°C/-40 to +104°F
Protection class	IP 30 (in acc. with DIN 40 050)
Approx. weight	450 g

Rated current A	Rated voltage		DC resistance/ line Ω	Test voltage phase/phase phase/ground V dc	Pass-band kHz	Ordering code PU: 1
	V dc	V ac				
0,1	250	100	4	800	0 to 10	B84311-C10-B3
0,1	250	100	11	400	0 to 3,4	B84311-C20-B3
1	250	80	0,5	400	not matched!)	B84311-C30-B3
0,1	250	100	1,1	800	0 to 50	B84311-C40-B1
0,1	250	100	4,4	800	0 to 120	B84311-C50-B1
0,1	250	100	1,1	800	0 to 300	B84311-C60-B1

▼ to be preferred

) Capacitance to case 1.5 µF/line



Dimensions in mm

The filters have a grey lacquer coating according to RAL 7035.

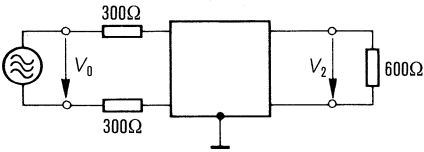
Locking and hex head screw can be interchanged to enable mounting either at the longitudinal or at the narrow side.

Mounting hole 10.5 mm dia.
(Cr Ni sheet or sheet steel with galv. surface, 1 to 6 mm thick)

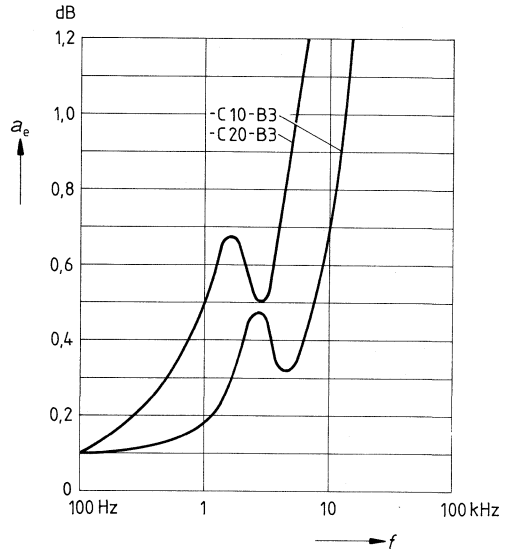
Filters for communication lines

Insertion loss a_e in the pass band

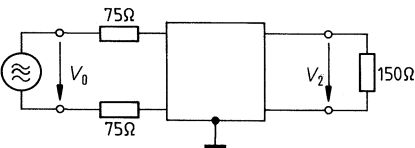
Test set-up, $Z = 600 \Omega$



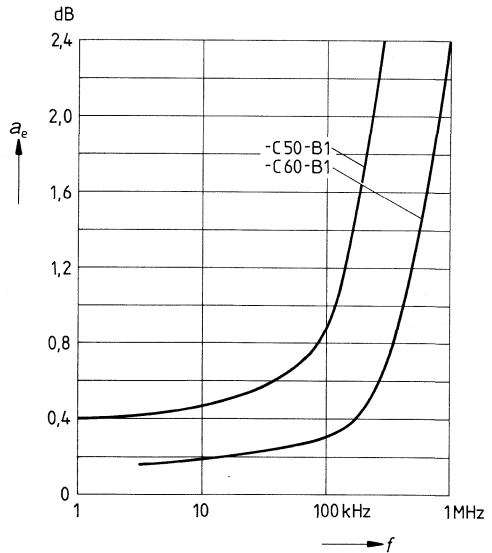
$$a_e = 20 \cdot \log \frac{V_0}{2 \times V_2} \text{ [dB]}$$



Test set-up, $Z = 150 \Omega$

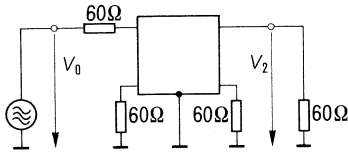


$$a_e = 20 \cdot \log \frac{V_0}{2 \times V_2} \text{ [dB]}$$

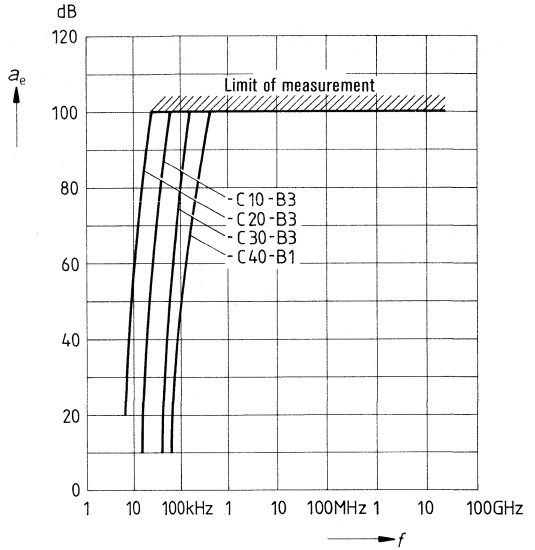


Insertion loss a_e in the stop-band

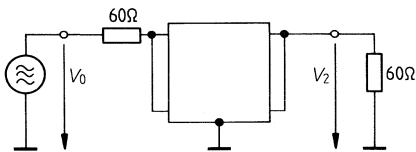
Test set-up (measuring individual branches)



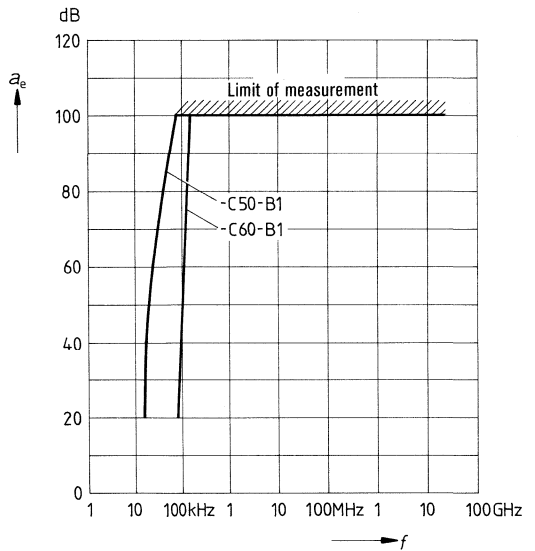
$$a_e = 20 \cdot \log \frac{V_0}{2 \times V_2} \text{ [dB]}$$



Test set-up (branches connected in parallel)



$$a_e = 20 \cdot \log \frac{V_0}{2 \times V_2} \text{ [dB]}$$

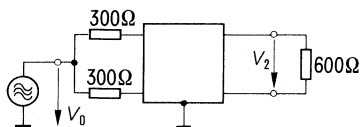


Filters for communication lines

Common-mode-rejection

for B84311–C10–B3 and –C20–B3

Test set-up



$$\text{CMR} = 20 \cdot \log \frac{V_0}{V_2} \text{ [dB]}$$

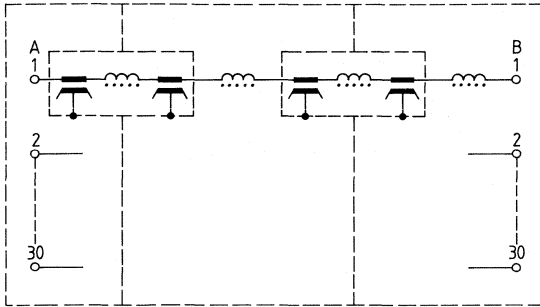
Measured values in the pass-band > 40 dB

Filters for communication lines

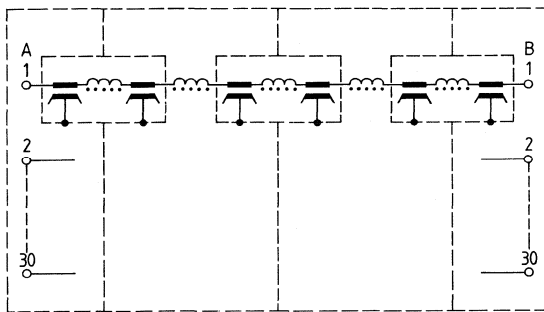
Rated voltage 60 Vdc
Rated current 0.1 A

30-line filters for EMI suppression up to 1 GHz

Circuit diagrams



B84299-H12



B84299-H13

Technical data

Number of lines	30
Rated voltage	60 Vdc (higher voltages upon request)
Rated current	referred to +40°C/+104°F ambient temperature
Test voltage	375 Vdc, 2 s
Perm. ambient temperature	-25 to +40°C/-13 to +104°F
Capacitance	0.014 μF for -H12; 0.021 μF for -H13
DC resistance	approx. 12 Ω
Approx. weight	5.5 kg

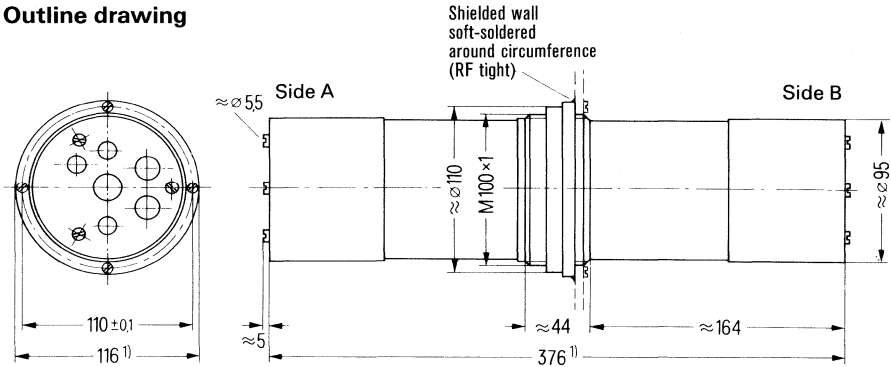
Types

Rated current	Capacitance	Ordering code PU: 1
0.1 A	0.014 μF	B84299-H12
	0.021 μF	B84299-H13

The filter B84299-H13 exhibits a lower attenuation in the pass-band than the filter B84299-H12.

Filters for communication lines

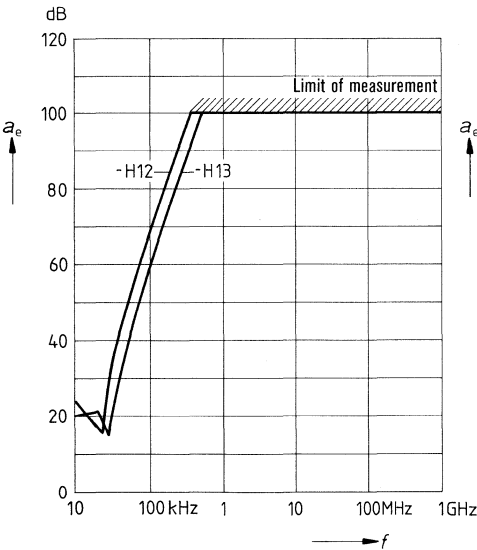
Outline drawing



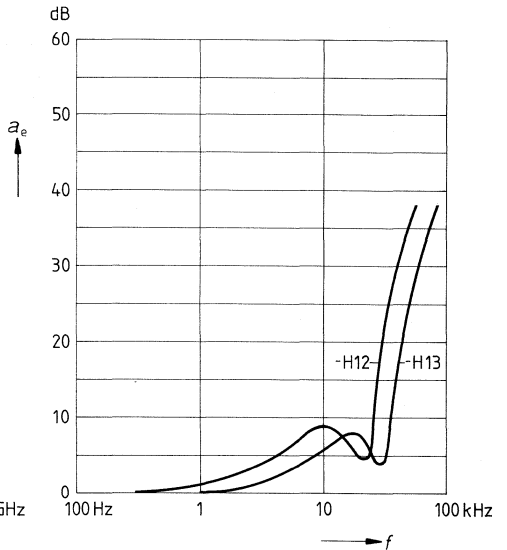
B84299-H12, -H13

Dimensions in mm

Insertion loss a_e versus frequency f (typical values)

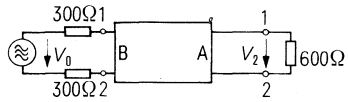
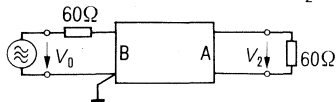


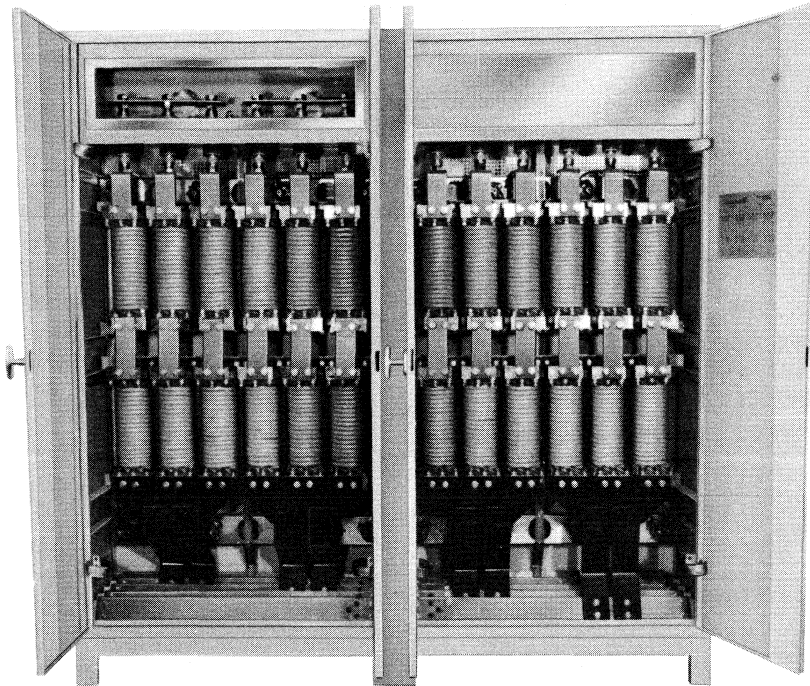
Unsymmetrical measurement (in the stop-band)



Symmetrical measurement (in the pass-band)

Test set-up $a_e = 20 \cdot \log \frac{V_0}{2 \times V_2}$ [dB]



Filters in cabinet construction for power plants

EMI suppression filters in cabinet construction are used where, because of high voltages, high current intensities and a large number of supply leads, the built-in volume of the standard Siemens filter cases is insufficient. The EMI suppression elements are housed in a steel cabinet designed in accordance with the regulations of RF engineering and the VDE requirements. The feed-through filters for the higher frequency range are carried into an RF-tight section within the steel cabinet.

Filter cabinets including overvoltage protection (EMP) upon request.

Filters in cabinet construction for power plants

Rated voltage 440 Vdc/ac
 Rated current 10 A

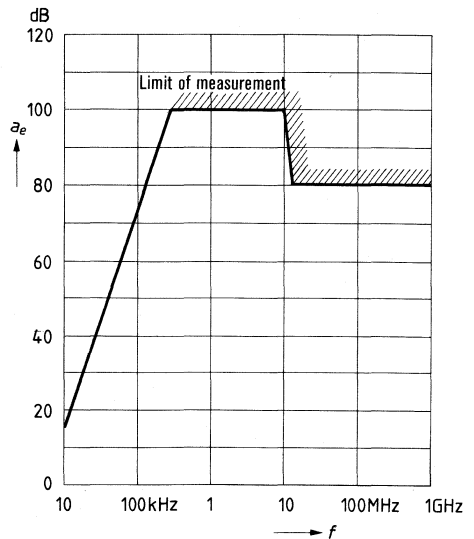
Technical data

Rated voltage	440 Vdc/ac (conductor to ground)
Rated current	referred to +40°C/+104°F ambient temperature
Number of lines	76
Inductance (at 50 Hz)	700 μH/line
Capacitance (to ground)	3.8 μF/line
Perm. ambient temperature	-25 to +40°C/-13 to +104°F
Voltage drop (at 50 Hz and rated current)	approx. 2.2 V/line
Approx. weight	300 kg
Dimensions (width x height x depth)	950 mm x 1950 mm x 500 mm

Ordering code

B84299-G35

Insertion loss a_e versus frequency f (typical value)



Filters in cabinet construction for power plants

Rated voltage 500 Vdc
 380 Vac
 Rated current 400 A

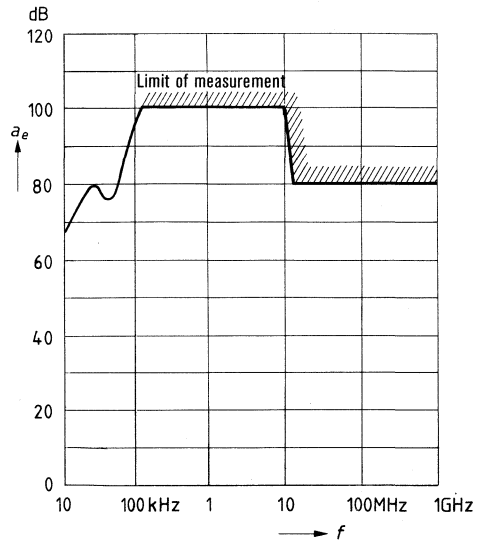
Technical data

Rated voltage	500 Vdc 380 Vac (conductor to ground)
Rated current	referred to +40°C/+104°F ambient temperature
Number of lines	4
Inductance (at 50 Hz)	55 µH/line
Capacitance (to ground)	154 µF/line
Perm. ambient temperature	-25 to +40°C/-13 to +104°F
Voltage drop (at 50 Hz and rated current)	approx. 6 V/line
Approx. weight	400 kg
Dimensions (width x height x depth)	950 mm x 1950 mm x 500 mm

Ordering code

B84299-G59

Insertion loss a_e versus frequency f (typical value)



Filters in cabinet construction for power plants

Rated voltage 1000 Vac
 Rated current 300 A

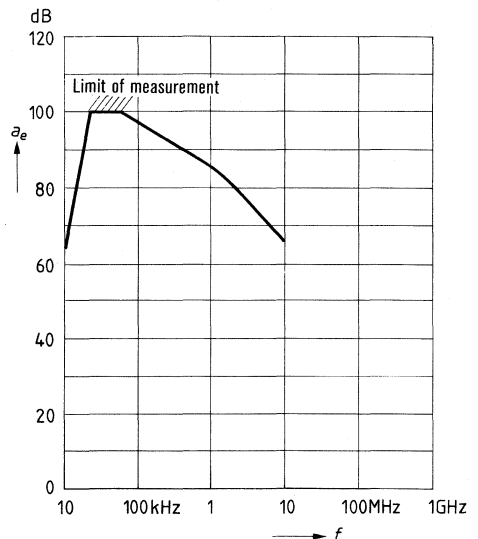
Technical data

Rated voltage	1000 Vac (conductor to ground)
Rated current	referred to +40°C/+104°F ambient temperature
Number of lines	2
Inductance (at 50 Hz)	200 µH/line
Capacitance (to ground)	70 µF/line
Perm. ambient temperature	-25 to +40°C/-13 to +104°F
Voltage drop (at 50 Hz and rated current)	approx. 20 V/line
Approx. weight	400 kg
Dimensions (width x height x depth)	950 mm x 1950 mm x 500 mm

Ordering code

B84299-G60

Insertion loss a_e versus frequency f (typical value)



Filters in cabinet construction for power plants

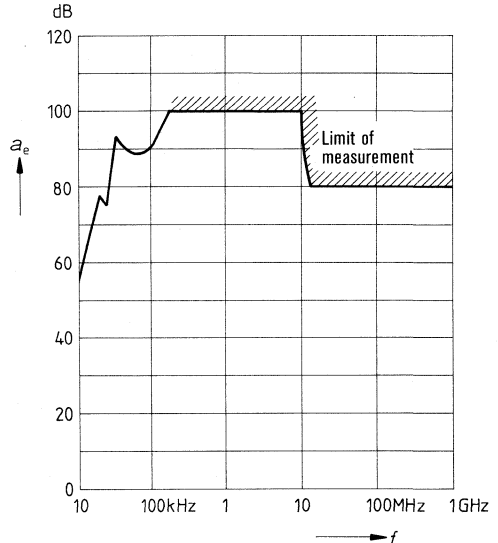
Rated voltage 500 Vdc
 380 Vac
 Rated current 1200 A

Technical data

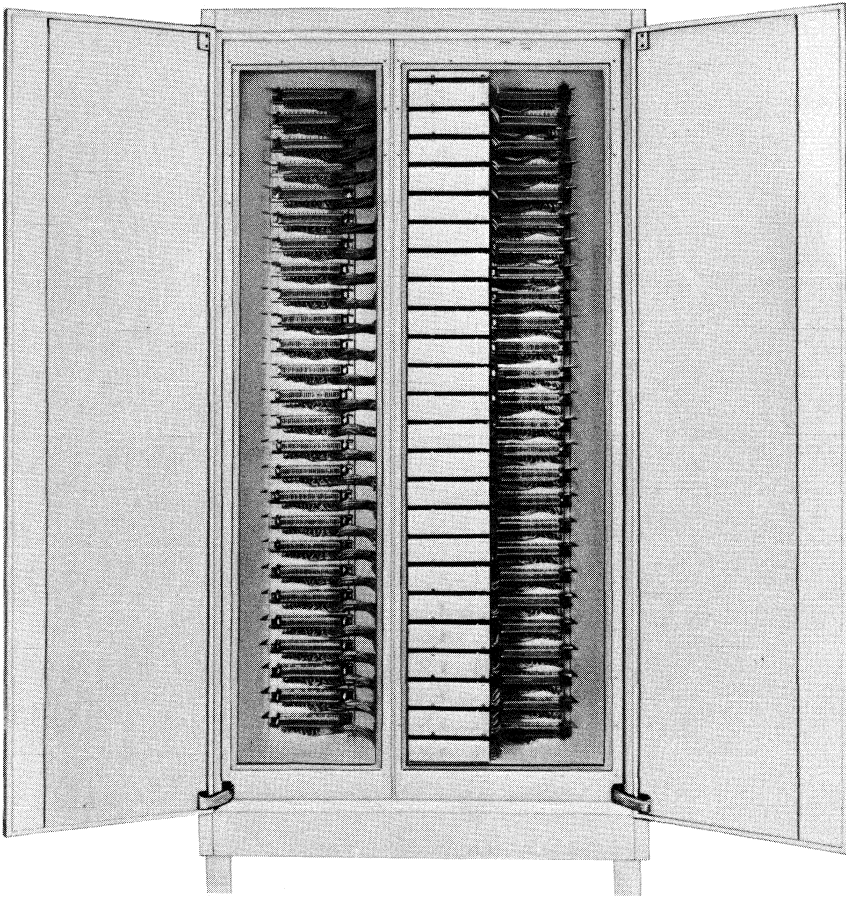
Rated voltage	500 Vdc 380 Vac (conductor to ground)
Rated current	referred to +40°C/+104°F ambient temperature
Number of lines	4
Inductance (at 50 Hz)	20 µH/line
Capacitance (to ground)	231 µF/line
Perm. ambient temperature	-25 to +40°C/-13 to +104°F
Voltage drop (at 50 Hz and rated current)	approx. 8 V/line
Approx. weight	800 kg
Dimensions (width x height x depth)	2 cabinets of 950 mm x 1950 mm x 500 mm, each

Ordering code **B84299-G65**

Insertion loss a_e versus frequency f (typical value)



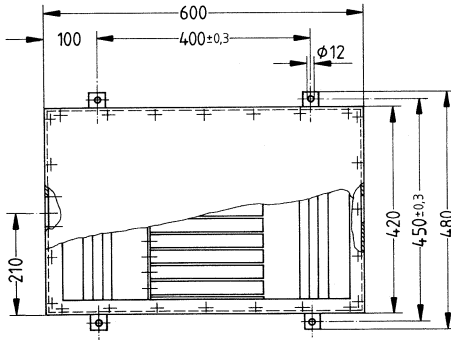
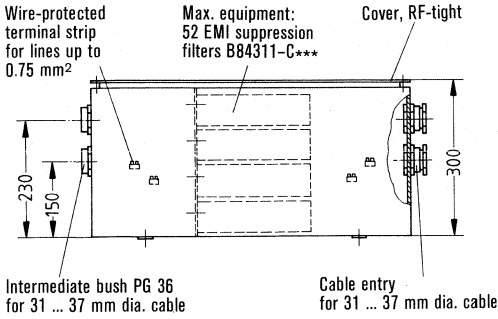
Filters in cabinet construction for communication lines



EMI suppression filters for communication lines B84311-C*** can also be combined to filter cabinets, if required. Maximal 336 filters for 672 lines can be housed in a standard cabinet 950 mm x 1950 mm x 500 mm in size. The equipment can be varied throughout the spectrum of the B84311-C*** filters depending on the requirements and determined for every particular case.

The cabinets are also available with EMP protection.

Filters in cabinet construction for communication lines



Dimensions in mm

EMI suppression filters for communication lines B84311-C*** can be combined also in units of max. 52 filters according to 104 individual lines, if required.

Filters for Installations and Shielded Rooms

Filters incl. overvoltage protection (EMP protection)

General information

The threat of electrical and electronic devices and equipment by electromagnetic pulses, caused by lightning or nuclear discharges, is characterized by field strength magnitudes measured in kV/m and A/m as well as by rise and fall times in the ns range.

Should phenomena in the ns-range, based on these field strength magnitudes, appear on the lines, suppression filters are capable of damping these pulses. In this context, input capacitors of extremely low-inductive construction (e.g. feed-through capacitors) take effect.

Both, power lines and signal lines act as low pass filters. Transmission of the pulses to the filter input is therefore only possible in the μs -range, which the filter cannot damp sufficiently. Moreover, the filter components may be destroyed.

In this case, suppression filters with integrated overvoltage protection are necessary. The internal resistance of the influencing source is a decisive factor for studying the overvoltage stress of filters.

Referring to the main part of the frequency spectrum of ns and μs pulses, characteristic impedances for power and signal lines of some 10 Ohms result. It is not realistic to assume internal resistance values of less than 10 Ohms for the influencing source. On the other hand, the internal resistance should not be rated too high, as otherwise the overvoltage protection will perhaps be dimensioned without a sufficient safety margin.

The range of

$$10 \text{ Ohms} < R_i < 50 \text{ Ohms}$$

is adapted best to practical cases (see also literature listed next page).

The voltage peak value is clearly defined by the dielectric strength of the line (cable). For common power lines (220/380 V), a value of $> 20 \text{ kV}$ cannot be expected. The value for communications lines is accordingly lower.

Filters for Installations and Shielded Rooms

With the above mentioned value of $Z = 10$ Ohms, the unsymmetric total current of a cable cannot exceed 2 kA. The current of one wire in the cable is reduced according to the number of wires.

The following data is necessary for specifying the overvoltage protection:

amplitude	}	open-circuit voltage and short-circuit current
waveform		
internal resistance or		

The following methods are used for testing the suppression filters with integrated overvoltage protection:

Surge voltages

Steepness 100 V/ μ s	}	$R_i = 15$ Ohms
1 kV/ μ s		
10 kV/ μ s		$R_i = 50$ Ohms
1 kV/ns		

Damped oscillation 100 kHz; rise time 200 ns;
 $R_i = 50$ Ohms/50 μ H.

Surge currents

Standard pulse	8/20 μ s
Long duration current	10/700 μ s

The waveforms are usually defined in open-circuit operation or short-circuit operation, respectively.

References

EMP Engineering Practices Handbook
NATO File No. 1460.2 October 1977
DNA EMP Awareness Course Notes
Second Edition
Prepared by ITT-Research Institute
Chicago/Ill. Sept. 1973
Transient Control Level Philosophy and Implementation
F. D. Martzloff and F. A. Fisher
Proceedings, 2nd EMC Symposium June 1977, Montreux
pp. 383 to 394
Guideline on Surge Voltages in AC Power Circuits
IEEE, Working Group 3.4.4
CISPR-Publ. 16
CCITT Recommendation K 117

Filters for Installations and Shielded Rooms

Filters incl. overvoltage protection (EMP)
Line filters for 1 and 3 phase systems

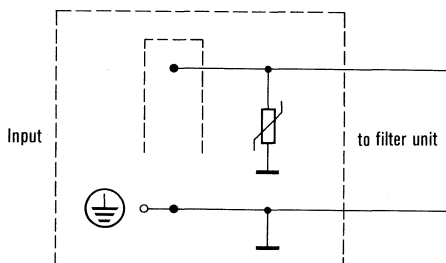
Rated current up to 40 A

"Filters in the Siemens U system" are the basic unit for these filters. The overvoltage protection is housed in the auxiliary case, completed by further arresters in the filter itself.

On principle, the technical data, circuit diagrams, mechanical data, and attenuation values of the filters in the Siemens U system are adhered to, as far as possible. The following contain only deviating and additional data. For reasons of clearness, the attenuation values are repeated in the tubulated technical data.

Circuit diagram

of overvoltage protection (auxiliary filter) per line



Technical data

Rated voltage	250 V/440 Vac, 50/60 Hz 250 Vdc
Test voltage	as filter data, however, with separated overvoltage protection
DC resistance	increased by approx. 1 m Ω /line
Rated pulse current	10 kA (8/20 μ s)
Max. single surge operation	65 kA (4/10 μ s)
Long duration current	1 kA
Power follow condition	none
Power follow characteristic	self restoring

Filters for Installations and Shielded Rooms

Max. voltage at the filter output.

	Basic filter B84204 to B84206 incl. auxiliary filter	Basic filter B84299 (AF filter)
$dv/dt = 1\text{ kV}/\mu\text{s}$	$\hat{v} = 700\text{ V}$	$\hat{v} = 900\text{ V}$
$dv/dt = 5\text{ kV}/\mu\text{s}$	$\hat{v} = 700\text{ V}$	$\hat{v} = 900\text{ V}$
$dv/dt = 10\text{ kV}/\mu\text{s}$	$\hat{v} = 700\text{ V}$	$\hat{v} = 900\text{ V}$
$dv/dt = 1\text{ kV}/\text{ns}^1)$	$\hat{v} = 40\text{ V}$	$\hat{v} = 40\text{ V}$
long duration current 10/700 μs	$\hat{v} = 700\text{ V}$	$\hat{v} = 900\text{ V}$
rated pulse current 8/20 μs	$\hat{v} = 800\text{ V}$	$\hat{v} = 1200\text{ V}$

¹⁾ rise time 10 ns; time to half value 150 ns, peak value 12 kV

The specified voltages apply to non-load filter operation (worst case). With rated load, the voltages are lower.

Filters for Installations and Shielded Rooms

Filters incl. overvoltage protection (EMP) Line filters for 1 and 3 phase systems

Rated current A	No. of lines	Rated frequency Hz	Auxiliary unit ²⁾ (EMP)	Basic filter incl. EMP				Ordering code ¹⁾
			Type	a _e [dB] at f [kHz]				
				14	50	100	1000	
5	2 4	50/60	A			76	>100	B84204-•21-B12
			B					B84206-•21-E12
B	97		>100	>100	>100	B84299-•91-E13		
A	19		56	76	>100	B84204-•22-B12		
							B	B84206-•22-E12
B	96		>100	>100	>100	B84299-•86-B13		
						B	B84299-•92-E13	
A	68		>100	B84204-•23-B12				
					B	B84206-•23-E12		
B	96		>100	>100	>100	B84299-•89-B13		
		B				B84299-•94-E13		

1) •: Insert appropriate letter for the desired version:

Version C (up to 1 GHz):
filters for suppression of electrical equipment

Version D (up to 1 GHz):
filters for the wiring of lines in shielded enclosures and rooms

Version E (up to 1 GHz):
as version D, however with prolonged connector fitting (for thicker walls, particularly for shielded enclosures)

Version F (up to 10 GHz):
for shielded enclosures and rooms

Version G (up to 35 GHz):
for shielded enclosures and rooms

2) For dimensions and fixing dimensions refer to page 336

Filters for Installations and Shielded Rooms

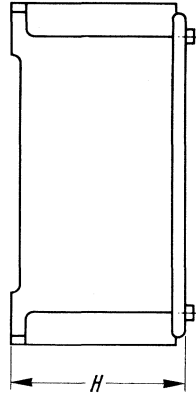
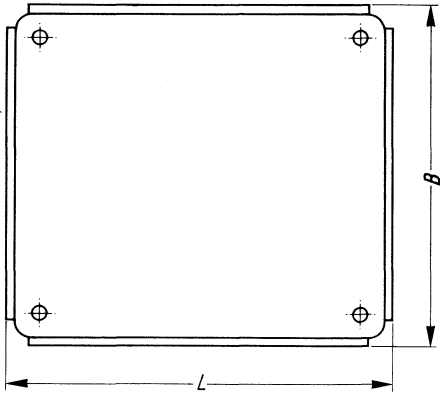
Basic filter with one auxiliary filter and EMP					Basic filter with two auxiliary filters and EMP				
a _e [dB] at f [kHz]				Ordering code ¹⁾	a _e [dB] at f [kHz]				Ordering code ¹⁾
14	50	100	1000		14	50	100	1000	
52	>100	>100	>100	B84204--*21-B112 B84206--*21-E112	73	>100	>100	>100	B84204--*21-B212 B84206--*21-E212
32	88	100	>100	B84204--*22-B112 B84206--*22-E112	45	>100	>100	>100	B84204--*22-B212 B84206--*22-E212
9	73	85	>100	B84204--*23-B112 B84206--*23-E112	14	94	>100	>100	B84204--*23-B212 B84206--*23-E212

Filters for Installations and Shielded Rooms

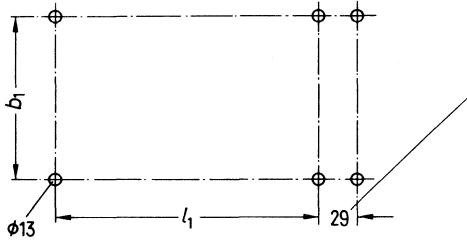
Filters incl. overvoltage protection (EMP)

Line filters for 1 and 3 phase systems

The basic filters and/or the basic filters with auxiliary filters are completed by an auxiliary unit (EMP) of the following dimensions:



Fixing dimensions



"Dimension 29" indicates the hole spacing between basic filter or basic filter with auxiliary filter (n) and auxiliary unit (EMP)

Dimensions in mm

Version	Dimensions (typ. values)			Fixing dimensions	
	<i>L</i>	<i>B</i> mm	<i>H</i>	<i>b</i> ₁ mm	<i>l</i> ₁
A	248	248	157	223	223
B	248	315	157	290	223

Filters for Installations and Shielded Rooms

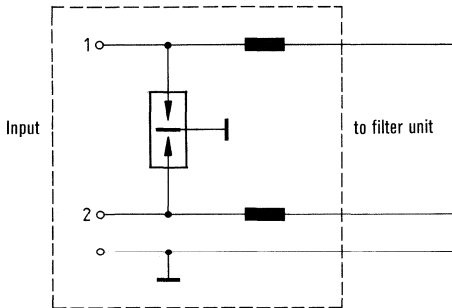
Filters for overvoltage protection (EMP) Filters for communication lines

Filters for the suppression of communication lines, suppression up to 35 GHz.

Filters for communication lines are the basic unit of these filters. The overvoltage protection is housed in the auxiliary case.

On principle, the technical data, circuit diagrams, mechanical data, and attenuation values of the filters for communication lines are as far as possible adhered to. The following contain only deviating and additional data.

Circuit diagram of overvoltage protection (auxiliary unit)



Technical data

Test voltage	as filter data, however with separated overvoltage protection	
Approx. weight	500 g	
DC resistance	increased by approx. 0.3 Ω/line	
DC striking voltage	< 500 V	
Surge striking voltage	< 800 V at 1 kV/μs < 1600 V at 1 kV/ns	
Rated pulse current	5/10 kA (8/20 μs)	
Power follow condition	$I < I_R$	
Max. voltage at the filter output:		

	unsymmetrical	symmetrical
at dv/dt		
= 1 kV/ns	$\hat{v} \leq 1 \text{ V}$	$\hat{v} < 1 \text{ V}$
= 1 kV/μs	$\hat{v} \leq 30 \text{ V}$	$\hat{v} < 1 \text{ V}$
= 0,1 kV/μs	$\hat{v} \leq 30 \text{ V}$	$\hat{v} < 1 \text{ V}$
rated pulse current (8/20 μs)	$\hat{v} \leq 30 \text{ V}$	

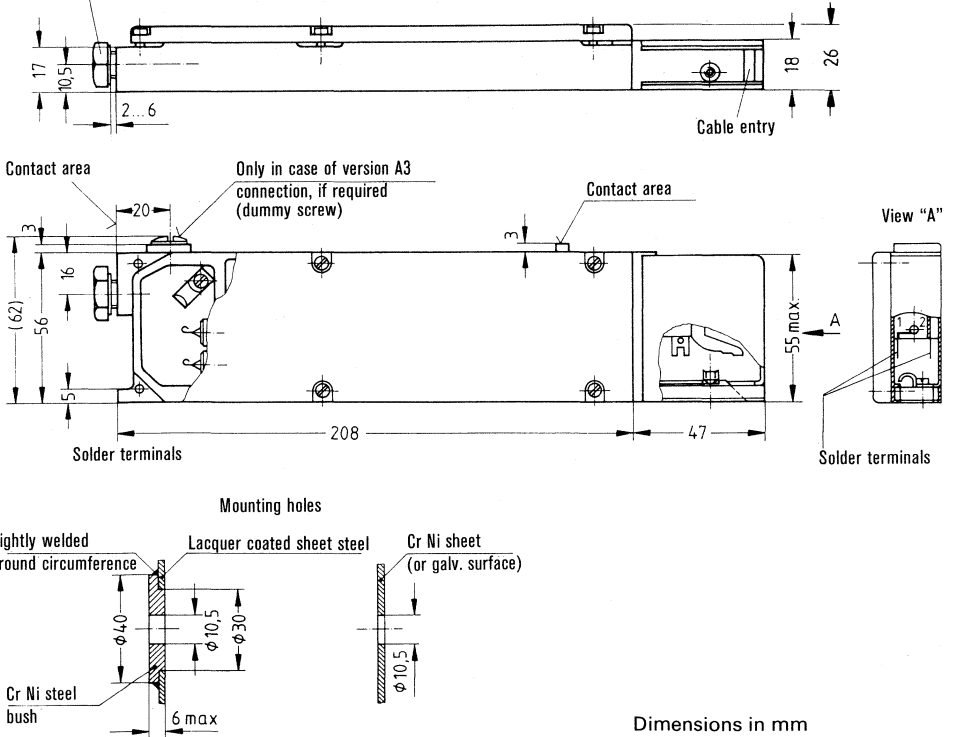
Filters for Installations and Shielded Rooms

Filters for overvoltage protection (EMP) Filters for communication lines

Ordering code	Application
Filter design comprising individual chokes	
B84311-C10-B103	Suppression filters for communication lines matched to 600 Ω pass-band up to 10 kHz
B84311-C20-B103	Suppression filters for telephone lines matched to 600 Ω pass-band up to 3.4 kHz
B84311-C30-B103	Suppression filters for control lines not matched
B84311-C40-B101	Suppression filters for communication lines matched to 600 Ω pass-band up to 50 kHz
Filter design comprising current-compensated chokes	
B84311-C50-B101	Suppression filters for communication lines matched to 150 Ω pass-band up to 120 kHz
B84311-C60-B101	Suppression filters for communication lines matched to 150 Ω pass-band up to 300 kHz

Filters for Installations and Shielded Rooms

Hex-head screw M10 with cutting ring and longitudinal hole (6 mm dia) as cable entry (Starting torque when mounting: 50 Nm)



Dimensions in mm

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