



# Filters for Converters and Power Electronics

Data Sheet Collection 2000



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## Filters for Converters and Power Electronics

EMC filters are indispensable in industrial installations when it comes to preventing RF disturbance in order to ensure trouble-free operation. The filters reduce both RFI emission and susceptibility to disturbance, thus enabling the equipment manufacturer to fulfill the legal EMC regulations concerning the protection of sensitive electronics.

This brochure covers our **standard** filters for converters and power electronics in a wide range of voltages from 250 to 1500 Vac, covering a current range of 8 through 2500 A. Additionally we can also offer **filter solutions optimized for your application**.

If you have any questions on custom filters or on EMC filters in general, please contact your nearest EPCOS representative. The addresses are given on the last pages of this brochure. Or send a FAX to +49(0)89 636-22575.

General data, terms and definitions can be found in data book "EMC Components", edition 1996.

Do not miss to visit us on Internet. Our website provides detailed information about the complete EMC product line:

<http://www.epcos.com/inf/30/e0000000.htm>

This brochure will also be found at:

[http://www.epcos.com/inf/30/ds/emc\\_fi.pdf](http://www.epcos.com/inf/30/ds/emc_fi.pdf)

**Selector guide**

No. of lines	Voltage $V_R$ V	Current $I_R$ A	Type	Description	Page
2	250 <b>New</b>	10 ... 60	B84142-A*-R	High insertion loss	<a href="#">8</a>
	250	8 ... 25	B84142-B*-R	Very high insertion loss	<a href="#">14</a>
	750	250 ... 1000	B84142-A*-S2	Filters for traction systems	<a href="#">18</a>
	1500	250 ... 1000	B84142-A*-S18	Filters for traction systems	<a href="#">18</a>
3	440	8 ... 180	B84143-A*-R	High insertion loss	<a href="#">24</a>
	440	8 ... 80	B84143-B*-R	Very high insertion loss	<a href="#">31</a>
	480	8 ... 220	B84143-G*-R110	Filter in book format, high insertion loss	<a href="#">37</a>
	480 <b>New</b>	8 ... 200	B84143-B*-R110	Filter in book format, very high insertion loss	<a href="#">44</a>
	500	150 ... 2500	B84143-B*-S20	Very compact size	<a href="#">53</a>
	530 <b>New</b>	8 ... 220	B84143-G*-R112	Filter in book format, high insertion loss	<a href="#">37</a>
	530 <b>New</b>	25 ... 200	B84143-B*-R112	Filter in book format, very high insertion loss	<a href="#">44</a>
	690	150 ... 2500	B84143-B*-S24	For IT mains supply	<a href="#">53</a>
	760	25 ... 180	B84143-A*-R21	Safe-to-touch terminal blocks	<a href="#">61</a>
	760	150 ... 2500	B84143-B*-S21	Terminal lugs	<a href="#">53</a>
4	440	16 ... 180	B84144-A*-R	Safe-to-touch terminal blocks	<a href="#">67</a>
		250 ... 1600	B84144-G*-S	Terminal lugs	

## 1 General technical information

Frequency converters are being used more and more in the field of drive and power electronics. The applications of such circuits in drive engineering are widely varied, e.g. for controlling the motion of conveyors or assembly lines, machine tool and production machinery applications, agitators, textile and printing machinery, pumps and fans, as well as in cranes and lifts.

However, the fast-switching power semiconductor components used in the converters generate RFI on the lines to the motors and on the mains lines.

EPCOS offers a wide variety of filters for suppressing such disturbance, for both the input and the output side of frequency converters.

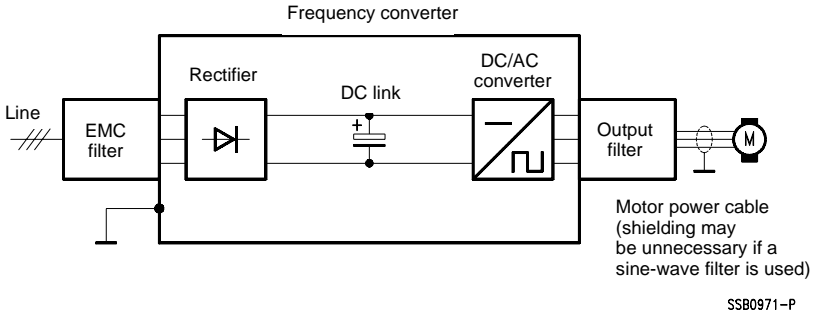
### Technical advantages of our filters

- Low leakage current
- Compact size (patent pending for our filter designs for currents above 250 A)
- Large standard product range
- Rated current 8 to 2500 A
- Rated voltage 250 to 1500 V
- Optimized for full-load operation with long motor power cables
- No saturation effects

Filters by EPCOS have been developed and optimized under real-life operating conditions. High-quality components and materials ensure decades of reliable operation. These filters have large power reserves with respect to the attenuation and load current.

## 2 Examples of applications

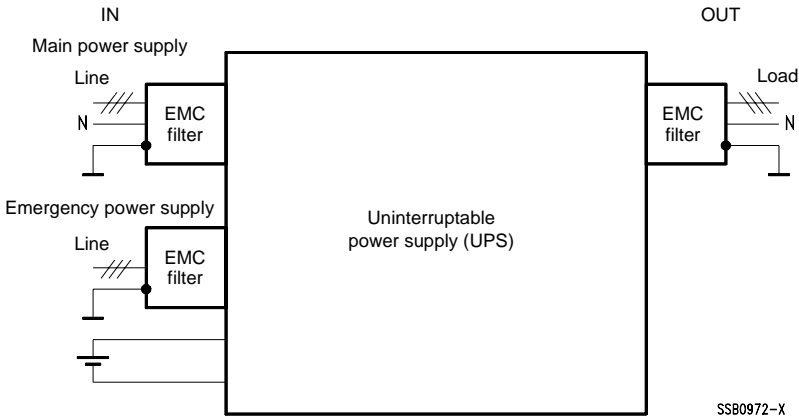
### 1. Block diagram of an electric drive with frequency converter and input and output filters



The same technology is used and similar disturbance suppression is achieved in the following applications:

Induction heating, medical and welding equipment and uninterruptable power supplies (UPS).

### 2. Block diagram, UPS



### 3 Application notes

When installing frequency converter filters, additional design rules should be observed. Very high disturbance levels are caused by the fast switching transients of IGBT, on the high voltages used in the dc link and the parasitic capacitances. This disturbance is propagated as conducted disturbance on the lines and also as radiated disturbance. This means that even the functioning of equipment which is not connected to the same ac line circuits but which is in the vicinity may be impaired by radiated RF disturbance. Because of this, the following must be observed, for EMC reasons, in equipment with frequency converters:

- To eliminate emission, the filter should be bolted directly to the converter. Where this is not possible, shield the connecting cable between converter and filter.
- Filters and converters must have large ground-contact surfaces, preferably mounted on a common, well-earthed metal plate or switchgear cabinet panel.
- The contact surface on which the filter is mounted must be bright metal. Paint or other insulating coatings should be removed before mounting the filter.
- Motor cables should be kept as short as possible. If possible, install the converter directly next to the motor. Special disturbance suppression measures are required in systems which are spread out over larger areas. Such measures must be specially adapted to the respective conditions.
- The motor cable must be shielded (except if suitable sine-wave filters are used).
- All cable shields should have low impedant connections to ground/earth at both ends.
- Never use a tap line to earth shields! (No pigtail!)
- Do not install power supply and motor cables parallel and near to one another.

Obviously, the respective safety regulations must also be complied with, in addition to ensuring that the system is designed to achieve electromagnetic compatibility.

#### 4 Selector guide for converter filters

According to our experience, the filters listed below have been tried and proven in frequency converter applications, both practically and by EMC measurements.

However, the following points must always be taken into consideration:

- Compliance with EMC regulations must be proven by application-related measurements.
- When selecting filters, the nominal data of the converter have to be taken into account.
- Ensure correct installation of the filters and take all additional measures that help to meet the EMC Directive requirements. In this context, refer to paragraph 3 "Applications notes".

#### 2-line filters (250 Vac) for frequency converters for electric drives

Motor power (230 V 1-ph. ac)	Recommended filters for suppression in accordance with	
	EN 55011, Class A EN 61800-3 <sup>1)</sup> , restricted distribution	EN 55011, Class B EN 61800-3 <sup>1)</sup> , unrestricted distribution
550 W	B84142-A10-R	B84142-B8-R
750 W	B84142-A10-R	B84142-B8-R
1100 W	B84142-A20-R	B84142-B12-R
1500 W	B84142-A20-R	B84142-B16-R
2200 W	B84142-A20-R	B84142-B25-R

#### 3-line filters (440 Vac) for frequency converters for electric drives (examples)

Motor power (400 V 3-ph. ac)	Recommended filters for suppression in accordance with	
	EN 55011, Class A EN 61800-3 <sup>1)</sup> , restricted distribution	EN 55011, Class B EN 61800-3 <sup>1)</sup> , unrestricted distribution
1,5 kW	B84143-A8-R / -G8-R110	B84143-B8-R / -B8-R110
2,2 kW	B84143-A8-R / -G8-R110	B84143-B8-R / -B8-R110
3,0 kW	B84143-A12-R / -G20-R110	B84143-B12-R / -B16-R110
4,0 kW	B84143-A12-R / -G20-R110	B84143-B12-R / -B16-R110
5,5 kW	B84143-A16-R / -G20-R110	B84143-B16-R / -B16-R110
7,5 kW	B84143-A25-R / -G20-R110	B84143-B25-R / -B25-R110

1) Table 6 as of EN 61800-3

**Filters for Converters and Power Electronics**

Motor power (400 V 3-ph. ac)	Recommended filters for suppression in accordance with	
	EN 55011, Class A EN 61800-3 <sup>1)</sup> , (un)restricted distribution	EN 55011, Class B EN 61800-3 <sup>2)</sup>
11 kW	B84143-A36-R / -G36-R110	B84143-B36-R / -B36-R110
15 kW	B84143-A36-R / -G36-R110	B84143-B36-R / -B36-R110
18,5 kW	B84143-A50-R / -G50-R110	B84143-B50-R / -B50-R110
22 kW	B84143-A50-R / -G50-R110	B84143-B50-R / -B50-R110
30 kW	B84143-A80-R / -G66-R110	B84143-B80-R / -B66-R110
37 kW	B84143-A80-R / -G90-R110	B84143-B80-R / -B90-R110
45 kW	B84143-A120-R / -G120-R110	B84143-B120-R110
55 kW	B84143-A150-R / -G150-R110	B84143-B150-R110
75 kW	B84143-A150-R / -G150-R110	B84143-B150-R110
90 kW	B84143-A180-R / -G220-R110	B84143-B200-R110
110 kW	B84143-A250-S20 / -G220-R110	
132 kW	B84143-B250-S20	
160 kW	B84143-B320-S20	
200 kW	B84143-B400-S20	
250 kW	B84143-B600-S20	
315 kW	B84143-B600-S20	
400 kW	B84143-B1000-S20	
500 kW	B84143-B1000-S20	
630 kW	B84143-B1600-S20	
710 kW	B84143-B1600-S20	
900 kW	B84143-B1600-S20	
1100 kW	B84143-B2500-S20	
1300 kW	B84143-B2500-S20	
1500 kW	B84143-B2500-S20	

1) Table 6 as of EN 61800-3

2) According to EN 61800-3 above 25 A: same limits for restricted and unrestricted distribution.



**Power line filters for single-phase systems**
**Rated voltage 250 Vac**
**Rated current 10 bis 60 A**
**Construction**

- Two-line filter
- Metal case

**Feature**

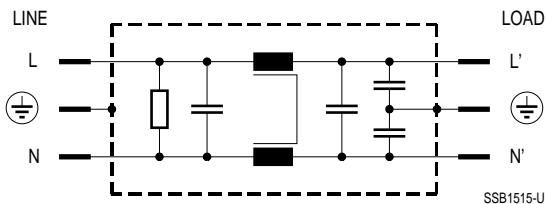
- High insertion loss
- Low leakage current
- Easy to install
- Degree of protection: IP 20<sup>1)</sup>
- Space-saving construction
- Construction complies with EN 133 200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load


**Applications**

- Frequency converters for motor drives, e.g.
  - lifts
  - conveyor systems
  - pumps
  - traction systems
  - air conditioning systems
- Power supplies

**Terminals**

- Safe-to-touch terminal blocks

**Typical circuit diagram**


1) In accordance with EN 60529

**Technical data**

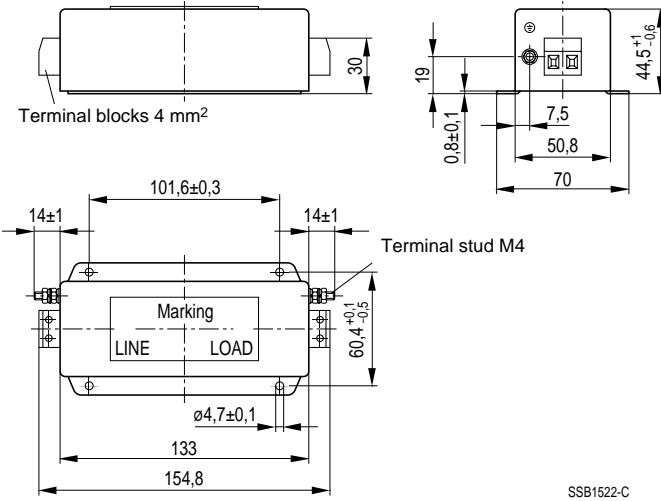
Rated voltage $V_R$	250 Vac, 50/60 Hz
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	1770 Vdc, 2 s (line/line) 2700 Vdc, 2 s (line/case)
Overload capability	1,5 · $I_R$ for 3 min per hour or 2,5 · $I_R$ for 30 s per hour
Leakage current $I_{leak}$	at 250 V~, 50 Hz
Climatic category	25/100/21 (– 25 °C/+ 100 °C/21 days damp heat test) according to IEC 60068-1

**Characteristics and ordering codes**

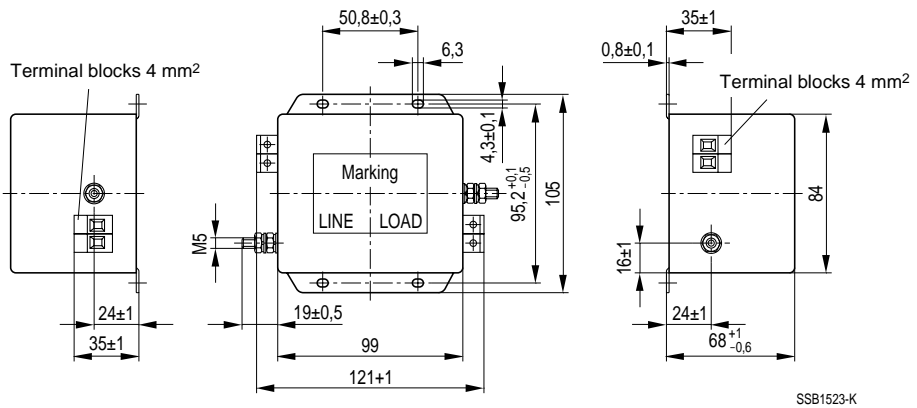
$I_R$	terminal cross section	$I_{leak}$	$R_{typ}$	Approx. weight	Ordering code
A	mm <sup>2</sup>	mA	mΩ	kg	
10	4	< 8	18	0,55	B84142-A10-R
20	4	< 8	10	1,0	B84142-A20-R
30	6	< 8	5	1,0	B84142-A30-R
40	6	< 17	3,6	1,0	B84142-A40-R
50	16	< 26	1,8	2,5	B84142-A50-R
60	16	< 26	1,4	2,5	B84142-A60-R

## Dimensional drawings

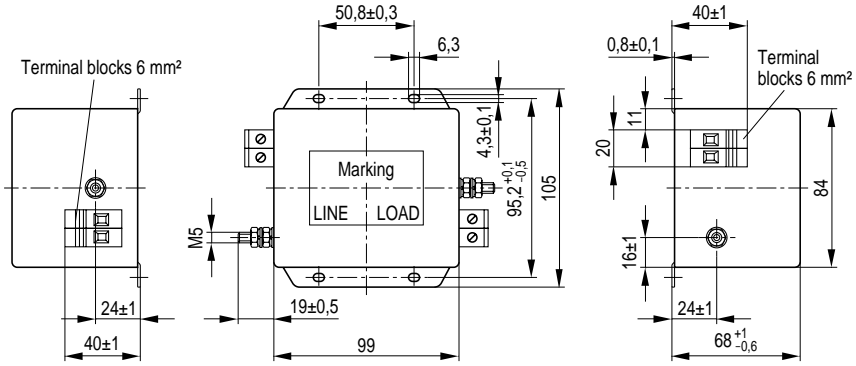
## B84142-A10-R



## B84142-A20-R

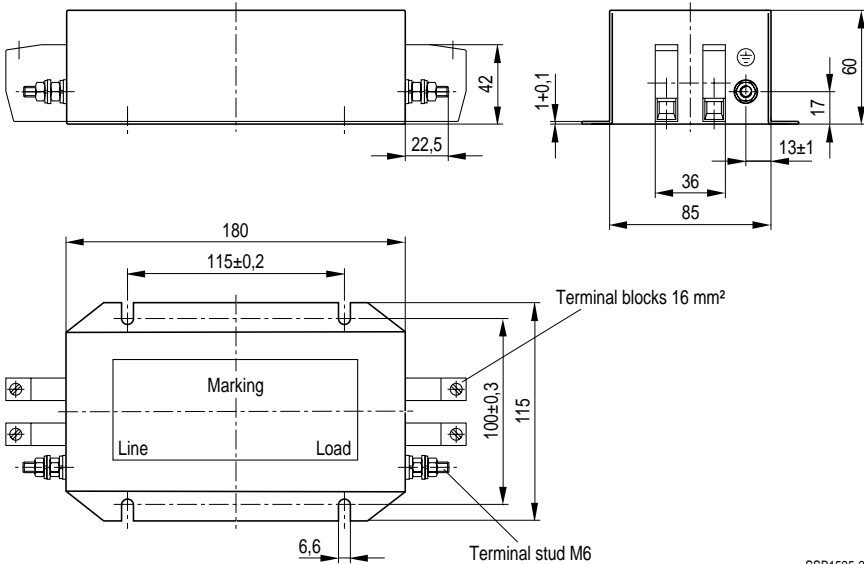


B84142-A30-R, B84142-A40-R



SSB1524-T

B84142-A50-R, B84142-A60-R

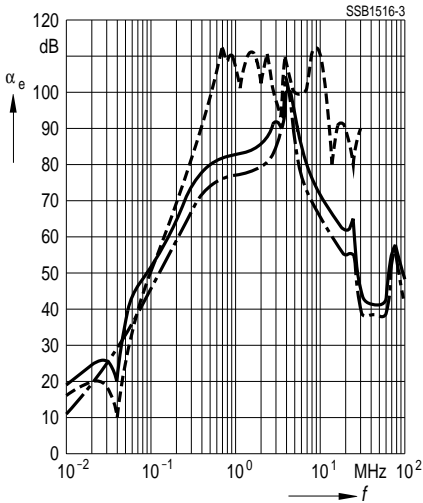


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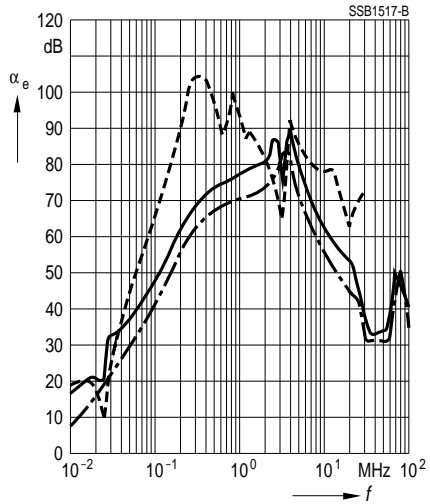
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

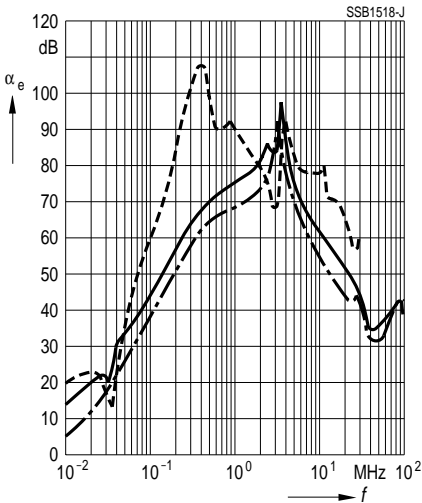
B84142-A10-R



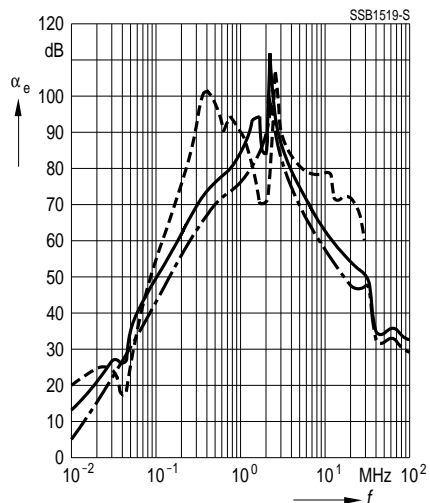
B84142-A20-R



B84142-A30-R



B84142-A40-R

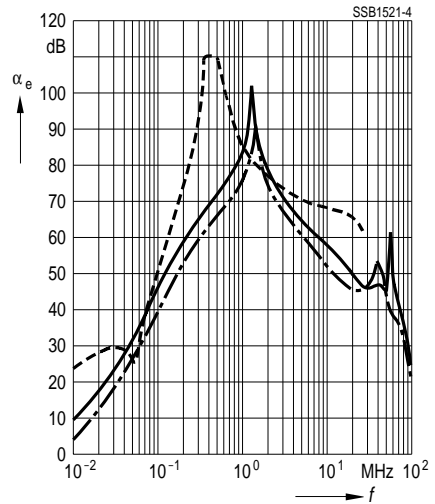
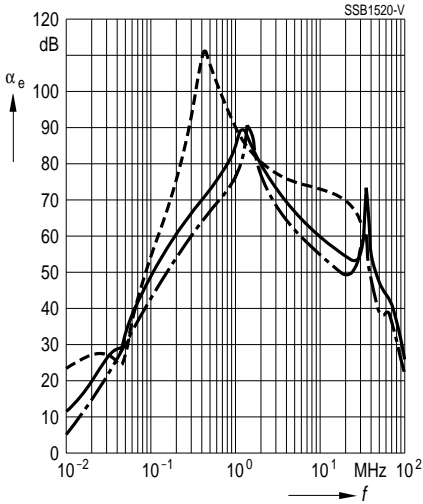


**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

B84142-A50-R

B84142-A60-R



**Power line filters for single-phase systems**

Rated voltage 250 Vac, 50/60 Hz

Rated current 8 A to 25 A

**Construction**

- Two-line filter
- Metal case

**Features**

- Very high insertion loss
- Low leakage current
- Easy to install
- Degree of protection: IP 20<sup>1)</sup>
- Space-saving construction
- Construction complies with EN 133 200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load



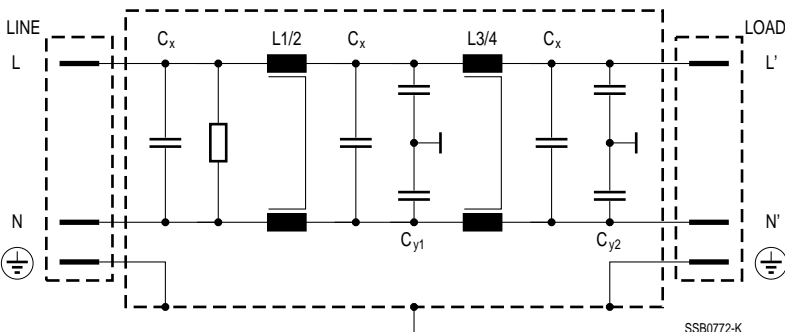
**Applications**

- Frequency converters for motor drives, e.g.
  - lifts
  - pumps
  - conveyor systems
  - air conditioning systems
- Power supplies

**Terminals**

- Safe-to-touch terminal blocks

**Typical circuit diagram**



SSB0772-K

1) In accordance with EN 60529

**Technical data**

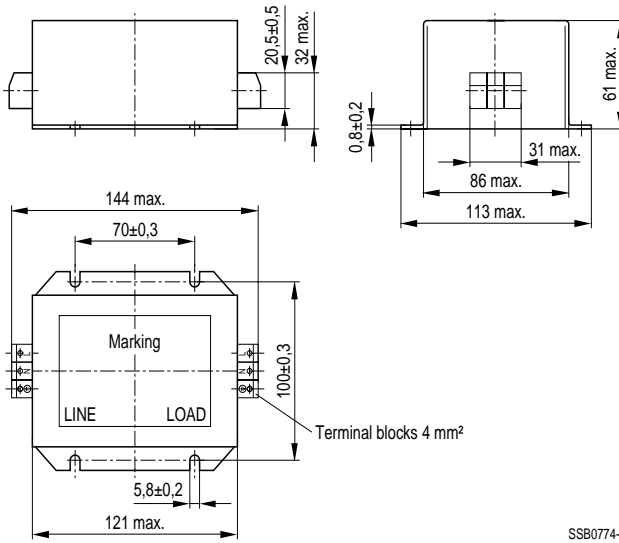
Rated voltage $V_R$	250 Vac, 50/60 Hz
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	2121 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Overload capability	1,5 · $I_R$ for 3 min per hour or 2,5 · $I_R$ for 30 s per hour
Leakage current $I_{leak}$	at 250 Vac, 50 Hz
Climatic category	25/100/21 (– 25 °C/+ 100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

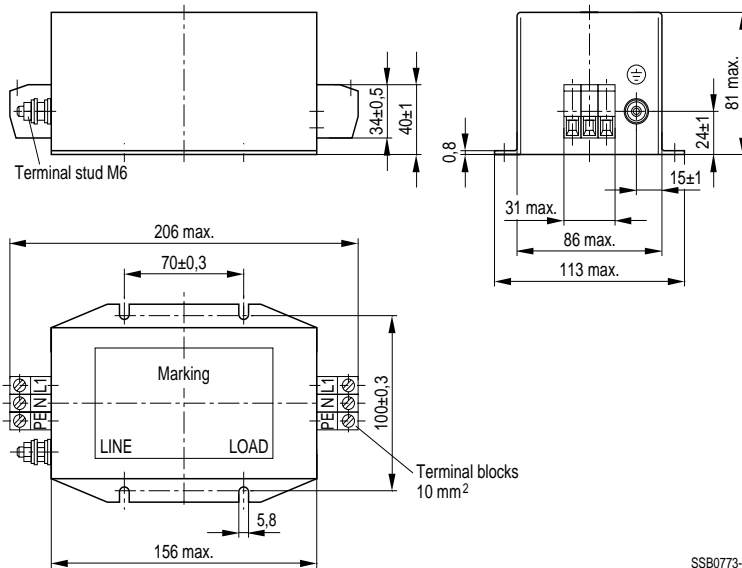
$I_R$ A	Terminal cross section mm <sup>2</sup>	$I_{leak}$ mA	$R_{typ}$ mΩ	Approx. weight kg	Ordering code
8	4	< 3,5	42	1,35	B84142-B8-R
12	4	< 3,5	30	1,45	B84142-B12-R
16	4	< 3,5	21	1,45	B84142-B16-R
25	10	< 3,5	9	3,7	B84142-B25-R



Dimensional drawing B84142-B8-R ... B84142-B16-R



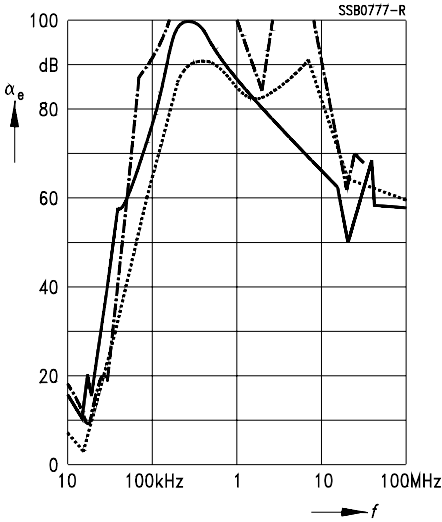
Dimensional drawing B84142-B25-R



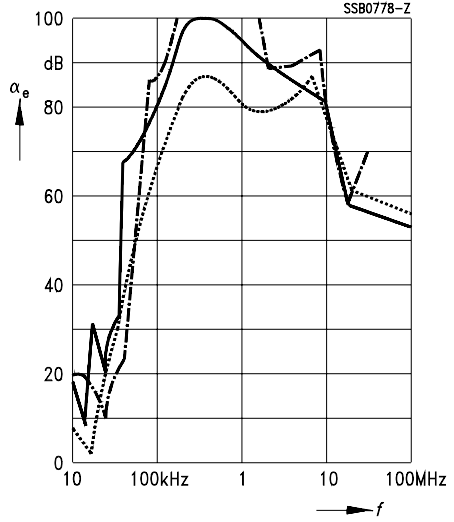
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- ..... asymmetrical, all branches in parallel (common mode)
- - - - - symmetrical (differential mode)

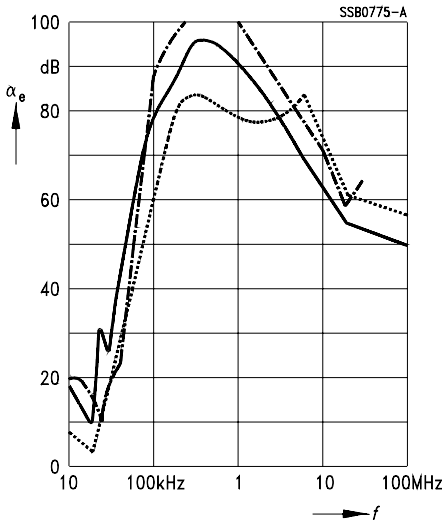
B84142-B8-R



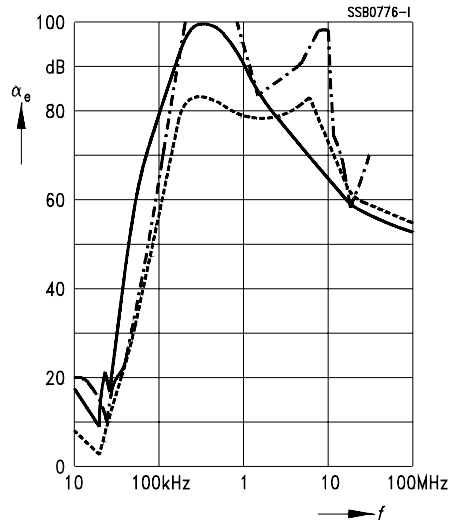
B84142-B12-R



B84142-B16-R



B84142-B25-R



**Power line filters for dc systems**  
**Rated voltage 750 and 1500 Vdc**  
**Rated current 250 to 1000 A**

### Construction

- Two-line filter
- Metal case

### Features

- High insertion loss
- Easy to install
- Space-saving construction
- Construction based on EN 133 200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load

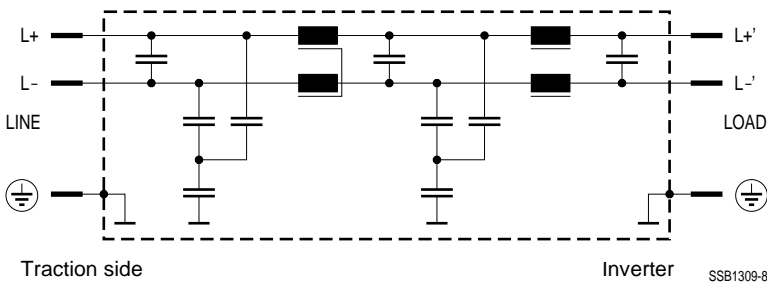
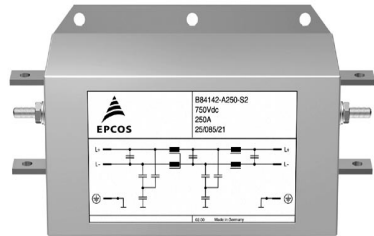
### Applications

- Trams, light rails
- Subways

### Terminals

- Terminal lugs, tin-plated

### Typical circuit diagram



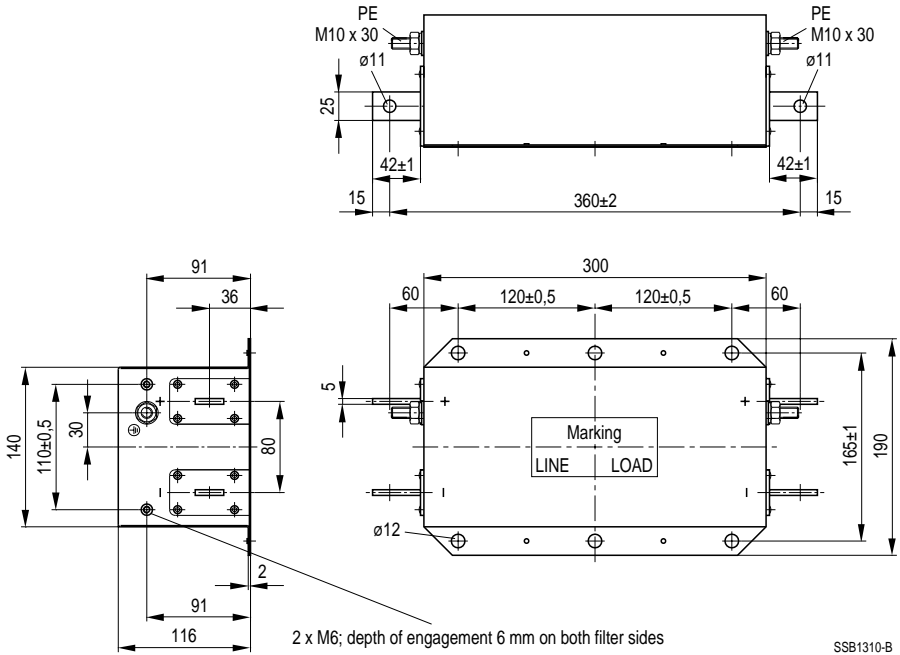
**Technical data**

Rated voltage $V_R$	750 Vdc 1500 Vdc
Rated current $I_R$	Referred to 60 °C ambient temperature
Test voltage $V_P$	For 750 Vdc filters: 2000 Vdc, 2 s (line/line) 6000 Vdc, 2 s (line/case) For 1500 Vdc filters: 3400 Vdc, 2 s (line/line) 6000 Vdc, 2 s (line/case)
Overload capability	$1,5 \cdot I_R$ for 3 min per hour or $2,5 \cdot I_R$ for 30 s per hour
Climatic category	25/100/21 (– 25 °C/+ 100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

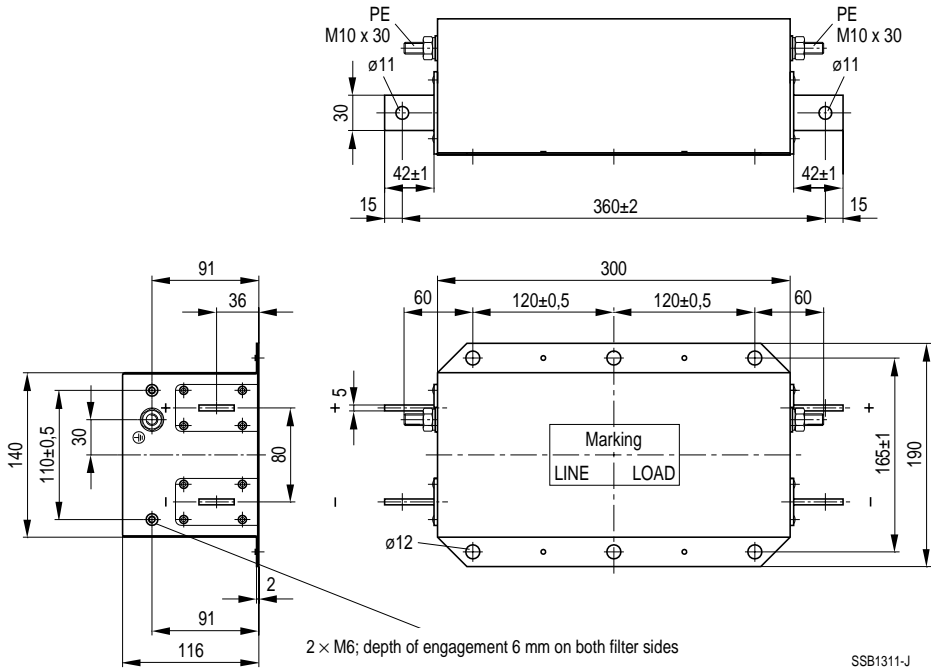
$V_R$	$I_R$	$P_V$	$R_{dc, volume}$ per line $\mu\Omega$	Approx. weight kg	Ordering code
Vdc	A	W			
750	250	8	63	15	B84142-A250-S2
	500	34	67	21	B84142-A500-S2
	1000	66	33	40	B84142-A1000-S2
1500	250	8	63	15	B84142-A250-S18
	500	34	67	21	B84142-A500-S18
	1000	66	33	40	B84142-A1000-S18

Dimensional drawing B84142-A250-S2 / -S18

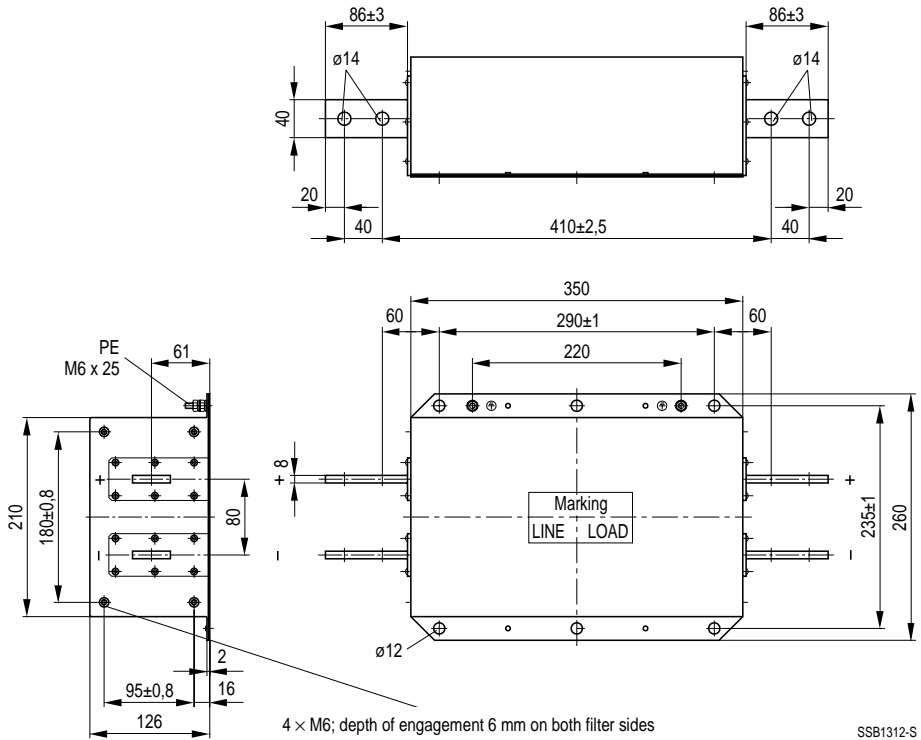


SSB1310-B

Dimensional drawing B84142-A500-S2 / -S18

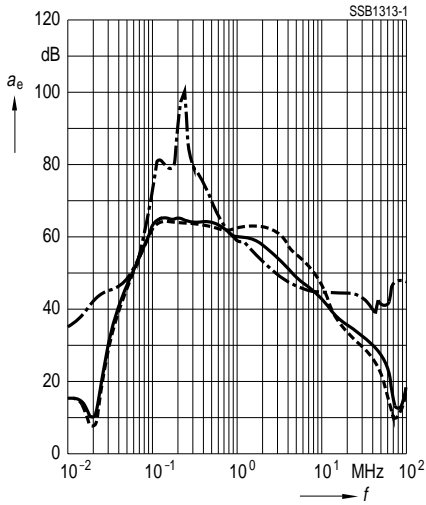


Dimensional drawing B84142-A1000-S2 / -S18



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

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





**Power line filters for three-phase systems**
**Rated voltage 440/250 Vac, 50/60 Hz**
**Rated current 8 A to 180 A**
**Construction**

- Three-line filter
- Metal case

**Features**

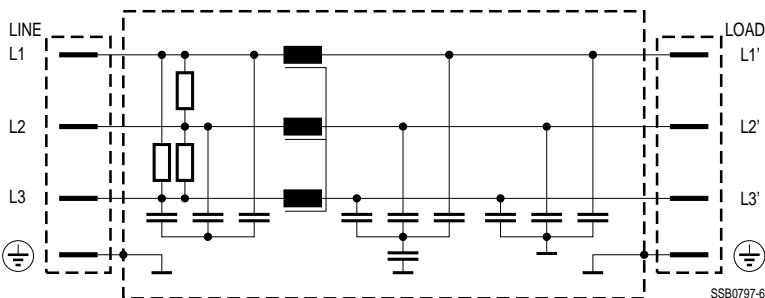
- High insertion loss
- Low leakage current
- Easy to install
- Degree of protection: IP 20<sup>1)</sup>
- Space-saving construction
- Construction complies with EN 133200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load


**Applications**

- Frequency converters for motor drives, e.g.
  - lifts
  - pumps
  - traction systems
  - conveyor systems
  - air conditioning systems
- Wind farms
- Power supplies

**Terminals**

- Safe-to-touch terminal blocks for filters up to 180 A

**Typical circuit diagram**


1) In accordance with EN 60529

**Technical data**

Rated voltage $V_R$	440/250 Vac, 50/60 Hz
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	2121 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Overload capability	1,5 · $I_R$ for 3 min per hour or 2,5 · $I_R$ for 30 s per hour
Leakage current $I_{leak}$	at 250 Vac, 50 Hz
Climatic category	25/100/21 (– 25 °C/100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

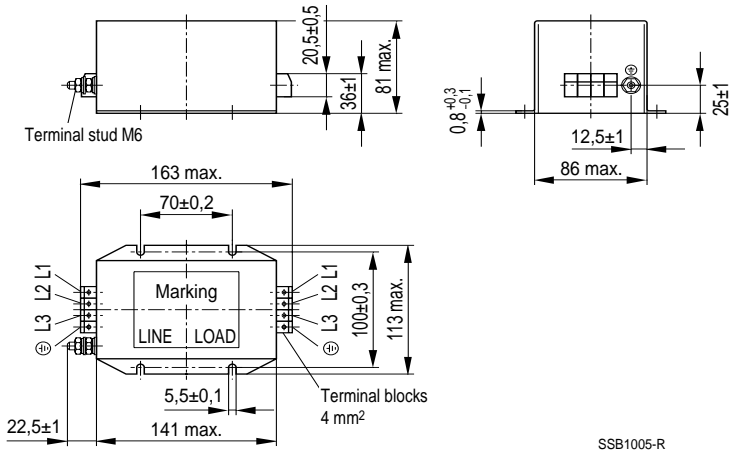
$I_R$ A	Terminal cross section mm <sup>2</sup>	$I_{leak}$ mA	$R_{typ}$ mΩ	Approx. weight kg	Ordering code
8	4	< 3,5	40	2,2	B84143-A8-R
12	4	< 3,5	20	2,2	B84143-A12-R
16	4	< 3,5	15	2,2	B84143-A16-R
25	10	< 3,5	8	3,7	B84143-A25-R
36	10	< 3,5	3,8	3,7	B84143-A36-R
50	10	< 6	2,0	4,0	B84143-A50-R
80	25	< 6	1,0	9,5	B84143-A80-R
120	50	< 6	0,75	10	B84143-A120-R
150	50	< 6	0,4	10	B84143-A150-R
180	95	< 6	0,4	13	B84143-A180-R

For filters for higher currents see B84143-B\*\*\*\*-S20, page 53.

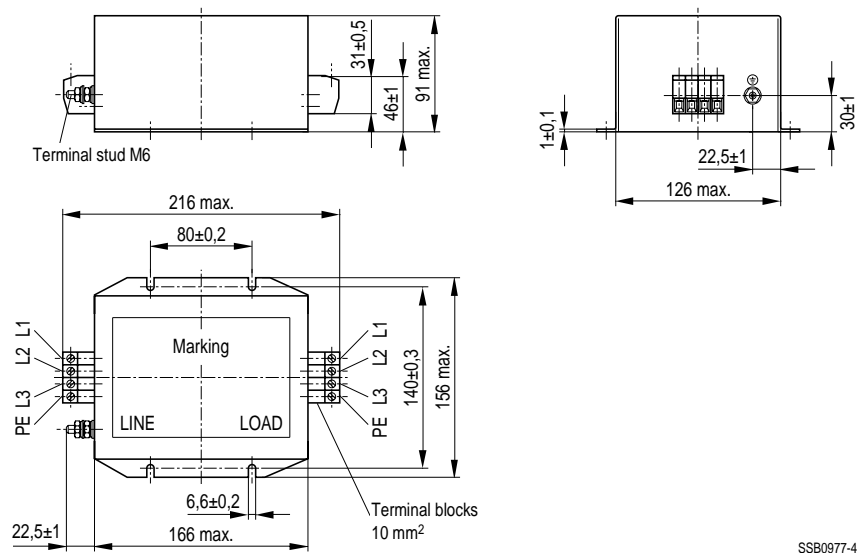
In comparison with the former series B84143-A\*\*\*-S these filters are smaller, lower in weight and optimized in price.

## Dimensional drawings

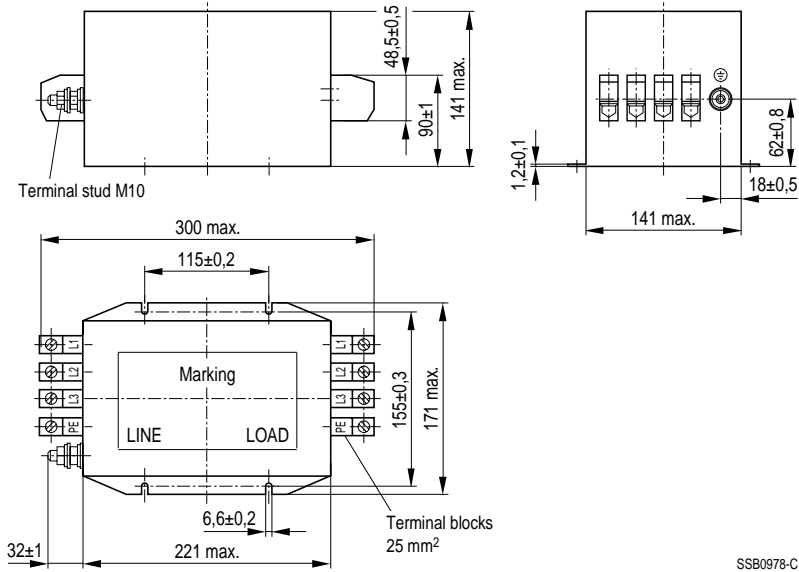
## B84143-A8-R ... B84143-A16-R



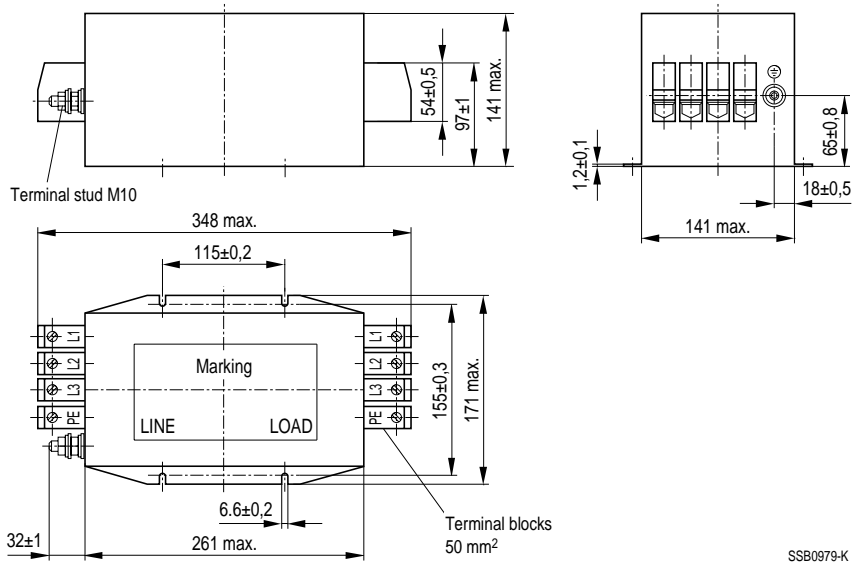
## B84143-A25-R ... A50-R



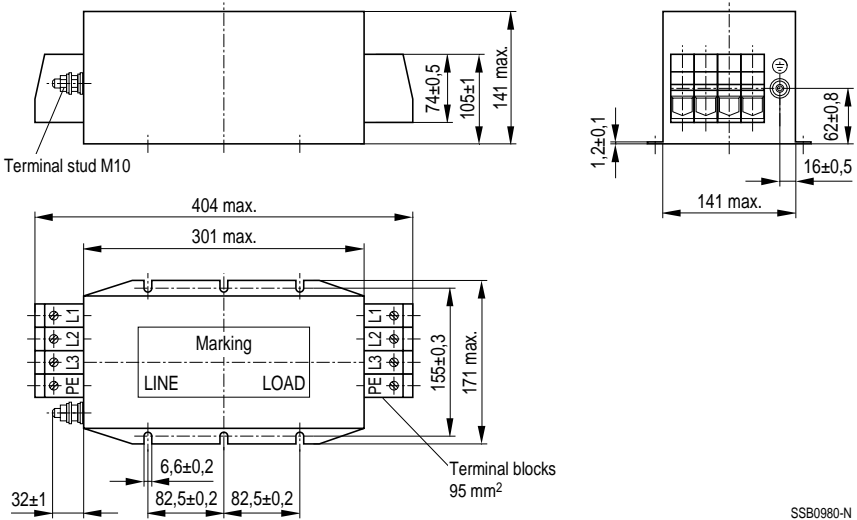
B84143-A80-R



B84143-A120-R, B84143-A150-R



B84143-A180-R

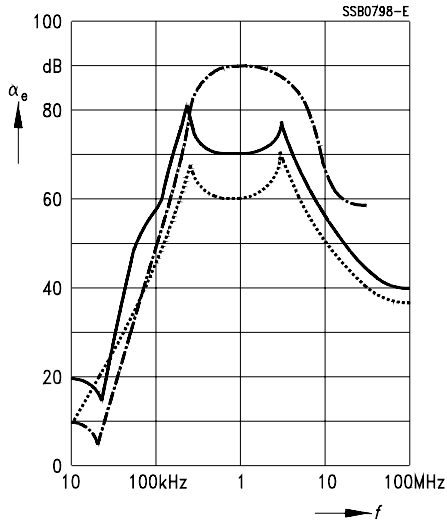


SSB0980-N

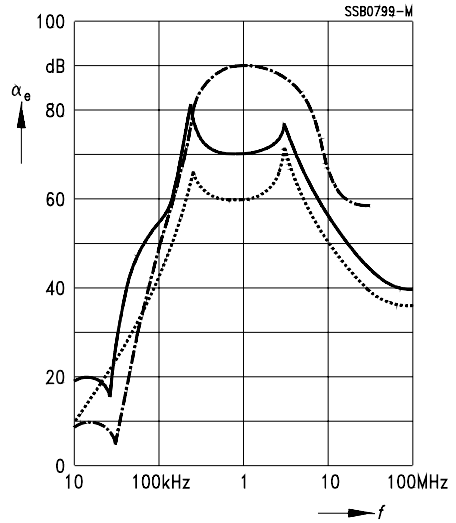
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- ..... asymmetrical, all branches in parallel (common mode)
- - - - - symmetrical (differential mode)

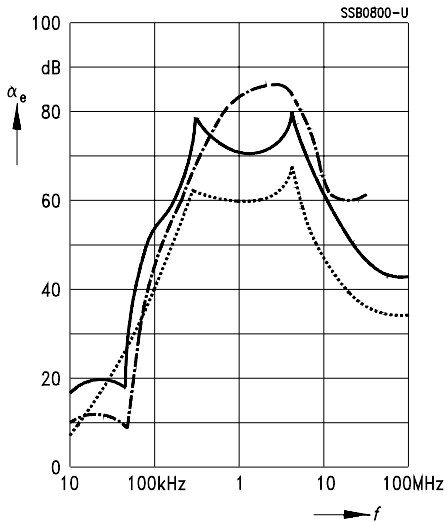
B84143-A8-R



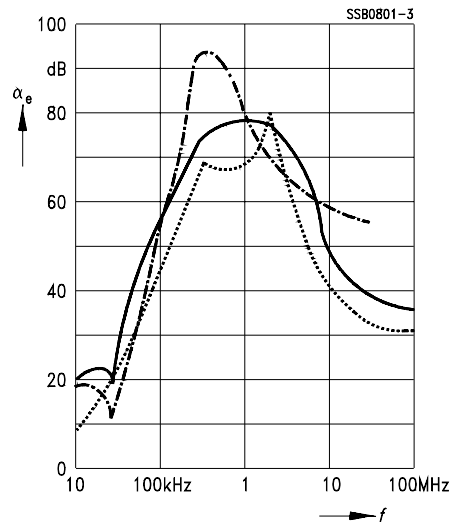
B84143-A12-R



B84143-A16-R



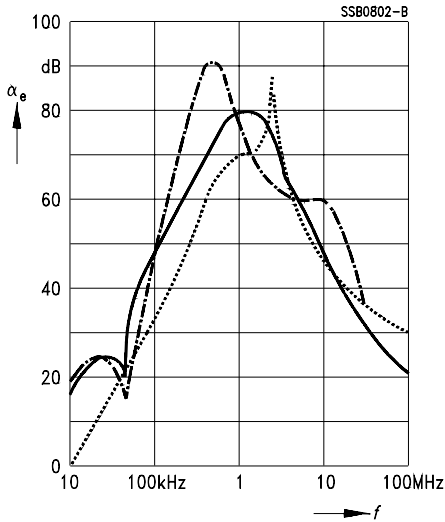
B84143-A25-R



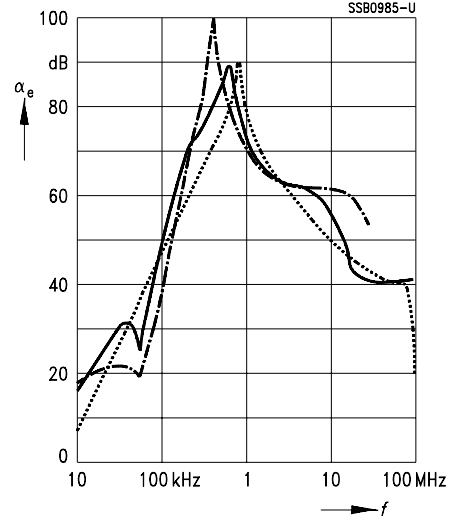
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- ..... asymmetrical, all branches in parallel (common mode)
- - - - - symmetrical (differential mode)

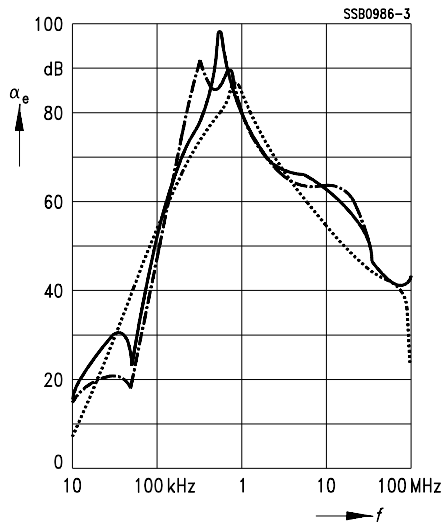
B84143-A36-R



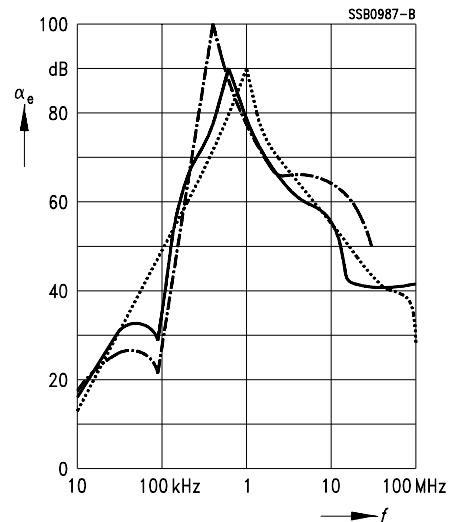
B84143-A50-R



B84143-A80-R



B84143-A120-R ... B84143-A180-R



**Power line filters for three-phase systems**
**Rated voltage 440/250 Vac, 50/60 Hz**
**Rated current 8 A to 80 A**
**Construction**

- Three-line filter
- Metal case

**Features**

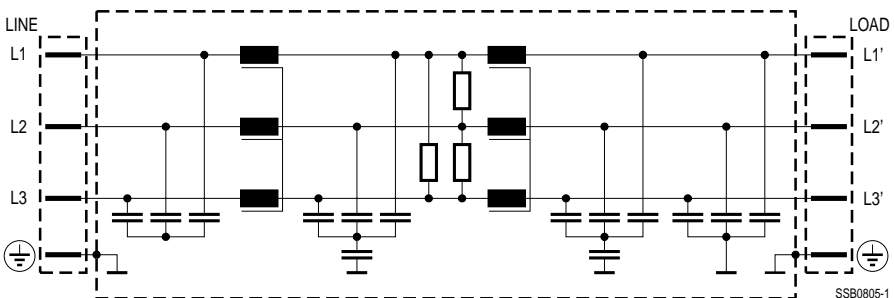
- Very high insertion loss
- Low leakage current
- Easy to install
- Degree of protection: IP 20<sup>1)</sup>
- Space-saving construction
- Construction complies with EN 133200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load


**Applications**

- Frequency converters for motor drives, e.g.
  - lifts
  - pumps
  - traction systems
  - conveyor systems
  - air conditioning systems
- Wind farms
- Power supplies

**Terminals**

- Safe-to-touch terminal blocks

**Typical circuit diagram**


1) In accordance with EN 60529



**Technical data**

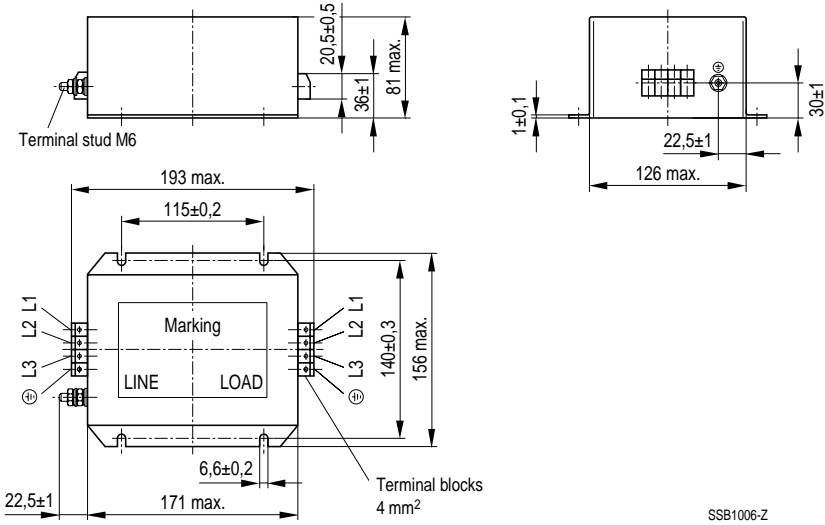
Rated voltage $V_R$	440/250 Vac, 50/60 Hz
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	2121 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Overload capability	1,5 · $I_R$ for 3 min per hour or 2,5 · $I_R$ for 30 s per hour
Leakage current $I_{leak}$	at 250 Vac, 50 Hz
Climatic category	25/100/21 (– 25 °C/+ 100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

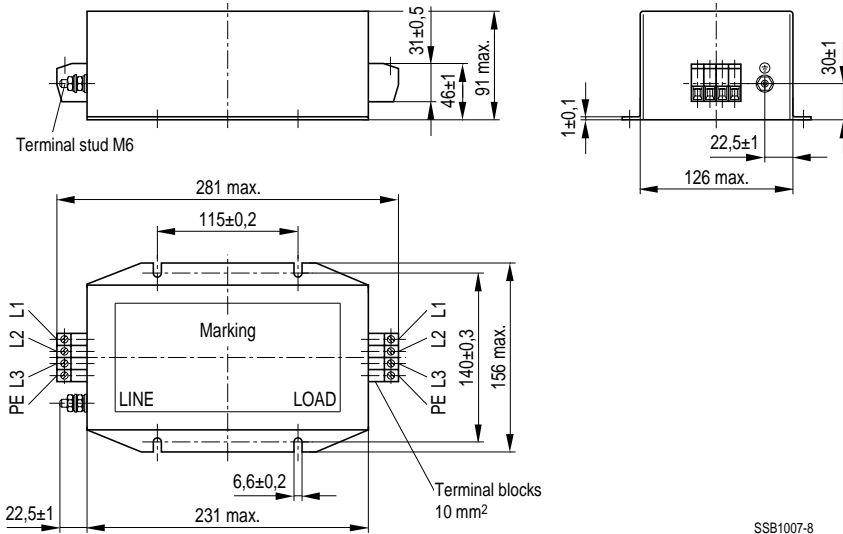
$I_R$ A	Terminal cross section mm <sup>2</sup>	$I_{leak}$ mA	$R_{typ}$ mΩ	Approx. weight kg	Ordering code
8	4	< 3,5	80	3,8	B84143-B8-R
12	4	< 3,5	40	3,8	B84143-B12-R
16	4	< 3,5	25	3,8	B84143-B16-R
25	10	< 3,5	10	5,7	B84143-B25-R
36	10	< 3,5	5	5,7	B84143-B36-R
50	10	< 6	3,5	5,7	B84143-B50-R
80	25	< 6	2	16	B84143-B80-R

Dimensional drawings

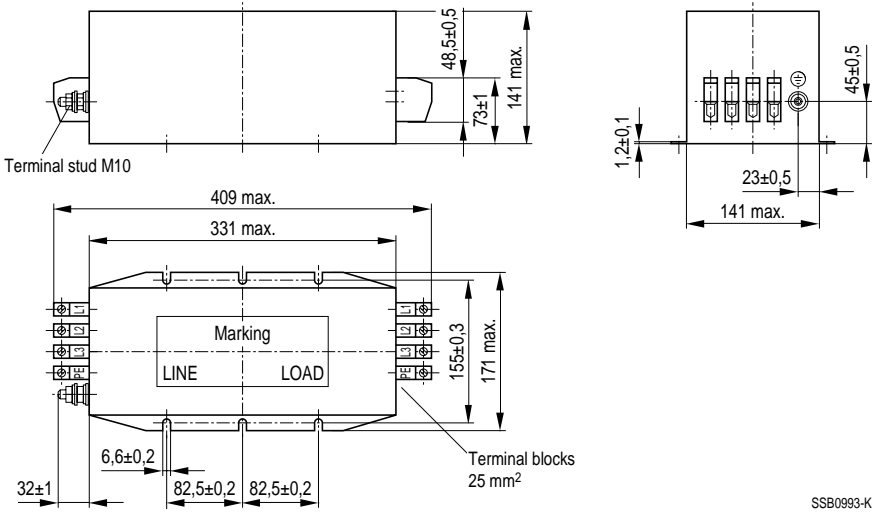
B84143-B8-R ... B84143-B16-R



B84143-B25-R ... B84143-B50-R



B84143-B80-R

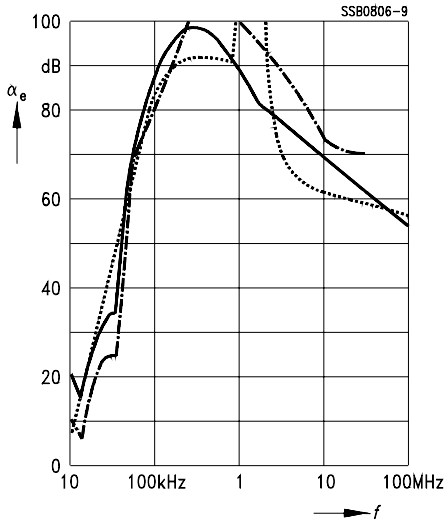


SSB0993-K

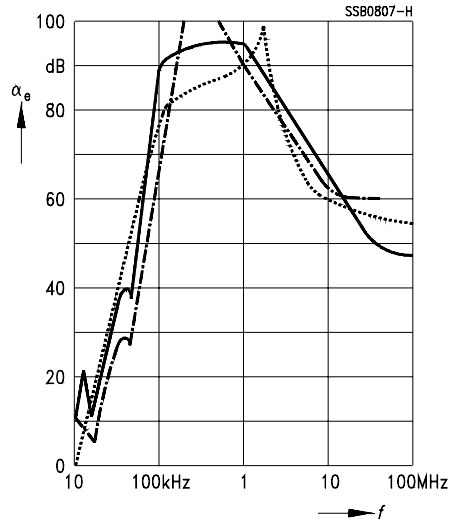
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- ..... asymmetrical, all branches in parallel (common mode)
- - - - - symmetrical (differential mode)

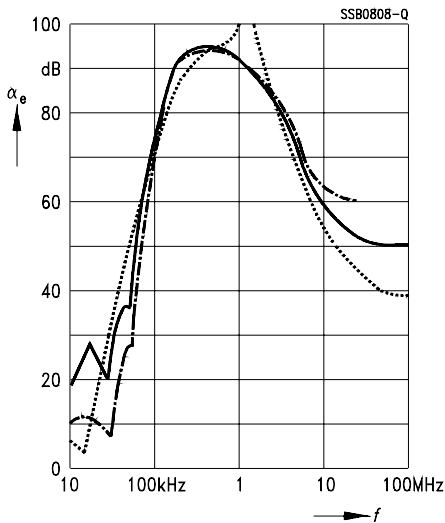
B84143-B8-R



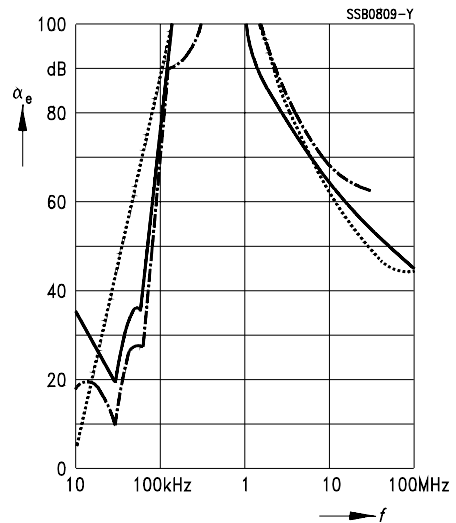
B84143-B12-R



B84143-B16-R



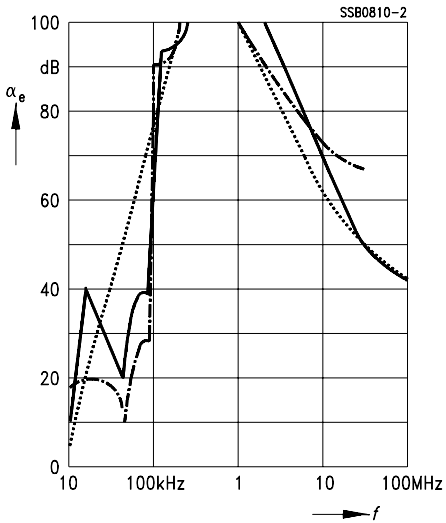
B84143-B25-R



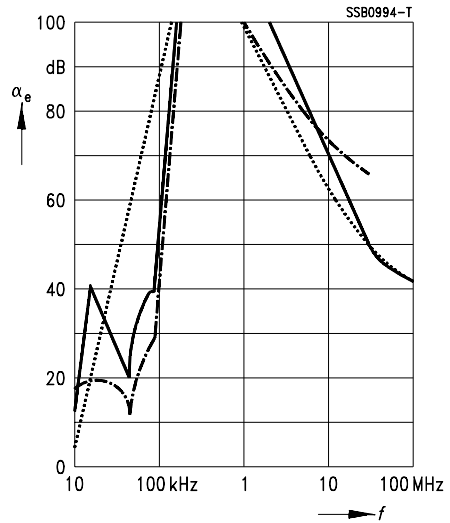
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- ..... asymmetrical, all branches in parallel (common mode)
- - - - - symmetrical (differential mode)

B84143-B36-R



B84143-B50-R  
B84143-B80-R



### Power line filters for three-phase systems


Rated voltage 480 and 530 Vac

Rated current 8 to 220 A

#### Construction

- Three-line filters
- Metal case

#### Features

- High insertion loss
- Low leakage current
- Compact design in book format
- Low weight
- Degree of protection: IP 20<sup>1)</sup>
- Construction based on EN 133 200, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load
- Optionally for 480 or 530 V
- UL 1283 approval for type -R110 



#### Applications

- Frequency converters for motor drives, e.g.
  - lifts
  - pumps
  - traction systems
  - conveyor systems
  - air conditioning systems
- Wind farms
- Power supplies

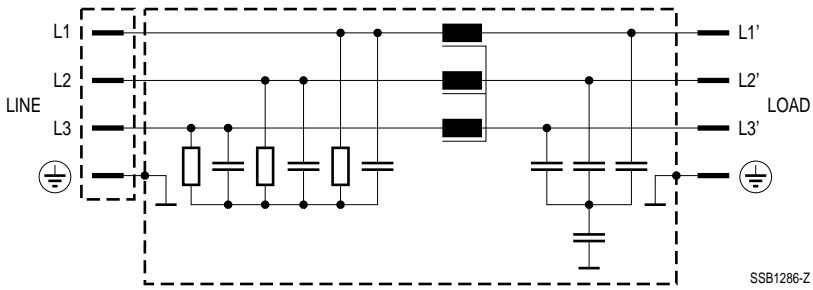
#### Terminals

- Line: Safe-to-touch terminal blocks
- Load: Litz wires

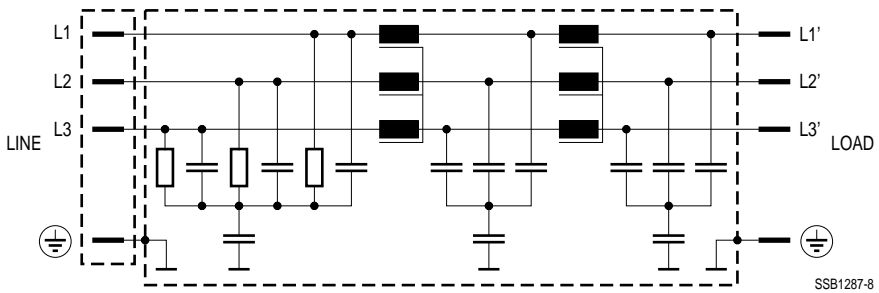
1) In accordance with EN 60529

Typical circuit diagrams

B84143-G8 ... G20-R110 / -R112



B84143-G36 ... G220-R110 / -R112



**Technical data**

Rated voltage $V_R$	480/275 Vac, 50/60 Hz (type -R110) 530/305 Vac, 50/60 Hz (type -R112)
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	1770 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Overload capability	$1,5 \cdot I_R$ for 3 min per hour or $2,5 \cdot I_R$ for 30 s per hour
Climatic category	25/100/21 (- 25 °C/+ 100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

$I_R$	Terminal cross section		$I_{leak}$ (480 V/50 Hz)		$R_{typ}$	Approx. weight	Ordering code
	line side: terminal blocks mm <sup>2</sup>	load side: litz wires mm <sup>2</sup>	typ. <sup>1)</sup> mA	max. <sup>2)</sup> mA			
A					mΩ	kg	
8	4	1,5	< 6	60	40	1,3	B84143-G8-R11*
20	4	2,5	< 6	60	10	1,3	B84143-G20-R11*
36	6	6,0	< 16	180	5,2	2,8	B84143-G36-R11*
50	16	10	< 16	180	2,4	3,3	B84143-G50-R11*
66	25	16	< 16	180	1,8	4,4	B84143-G66-R11*
90	25	25	< 16	180	1,2	4,9	B84143-G90-R11*
120	50	35	< 16	180	1,0	7,5	B84143-G120-R11*
150	50	35	< 16	180	0,7	8,0	B84143-G150-R11*
220	95	70	< 16	180	0,4	11,5	B84143-G220-R11*

**Compilation of ordering code**

Replace the asterisk \* by the code number for the required version:

0 = 480 V

2 = 530 V

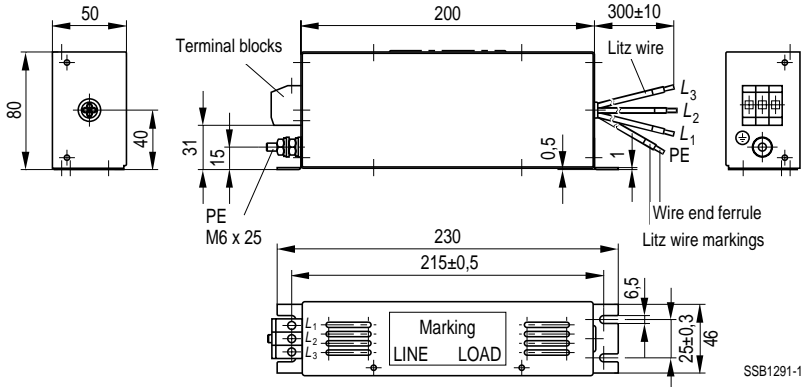
1) At rated operation

2) At failure of two phases

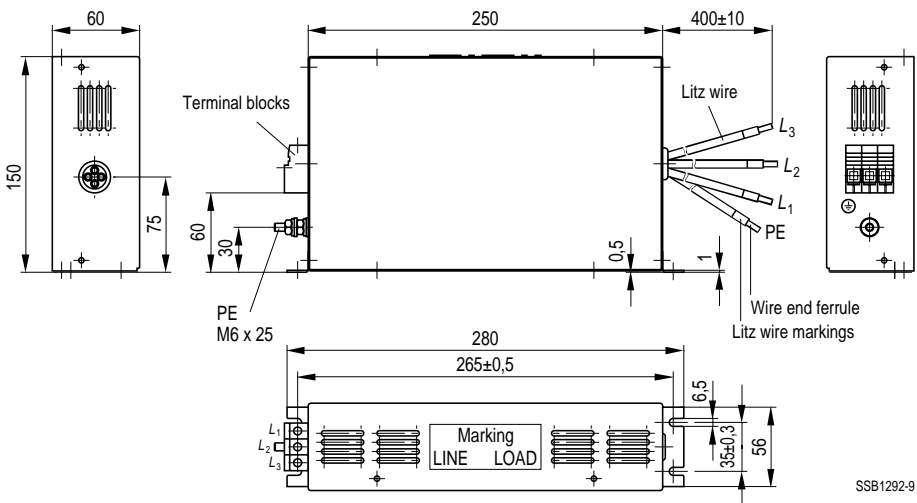


## Dimensional drawings

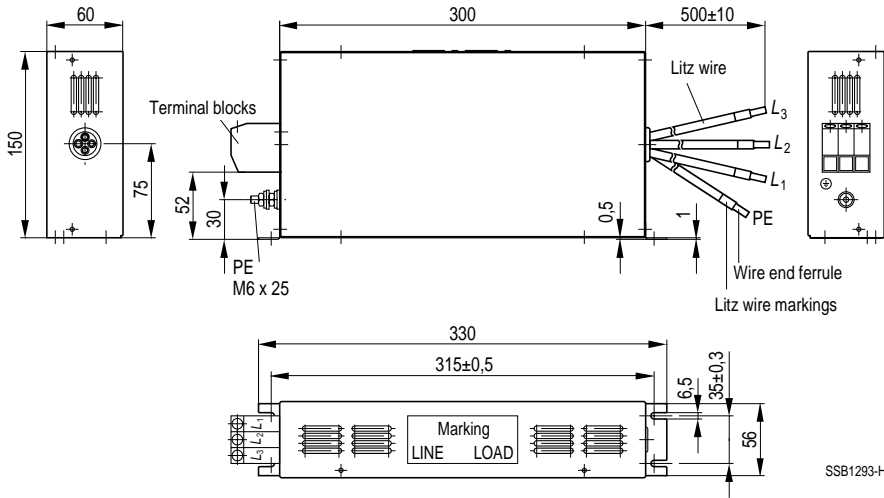
## B84143-G8-R11\*, B84143-G20-R11\*



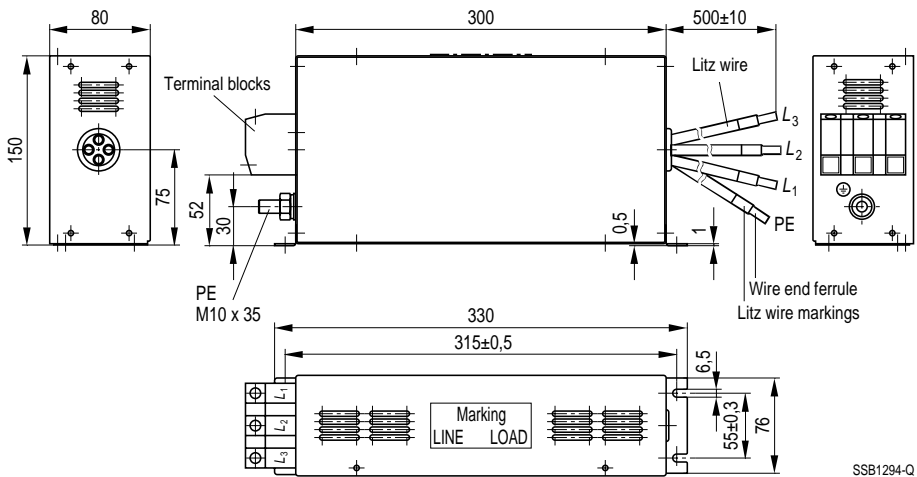
## B84143-G36-R11\*



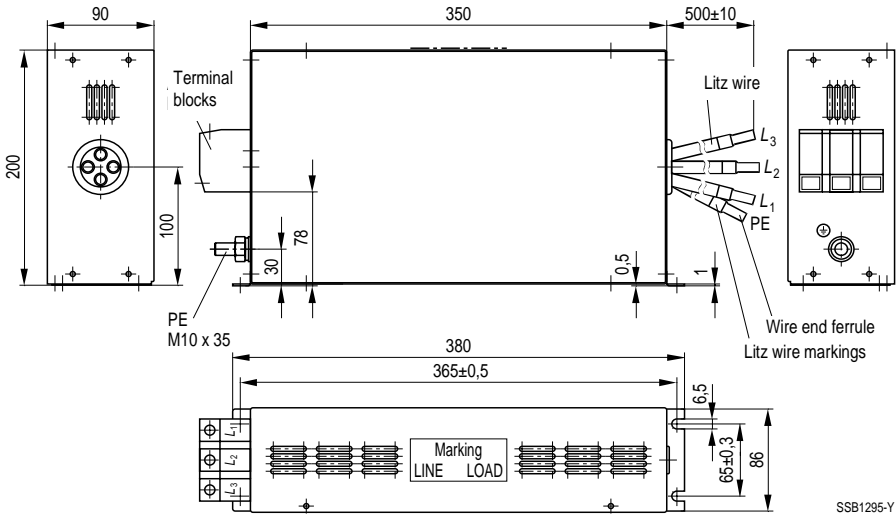
**B84143-G50-R11\***



**B84143-G66-R11\*, B84143-G90-R11\***

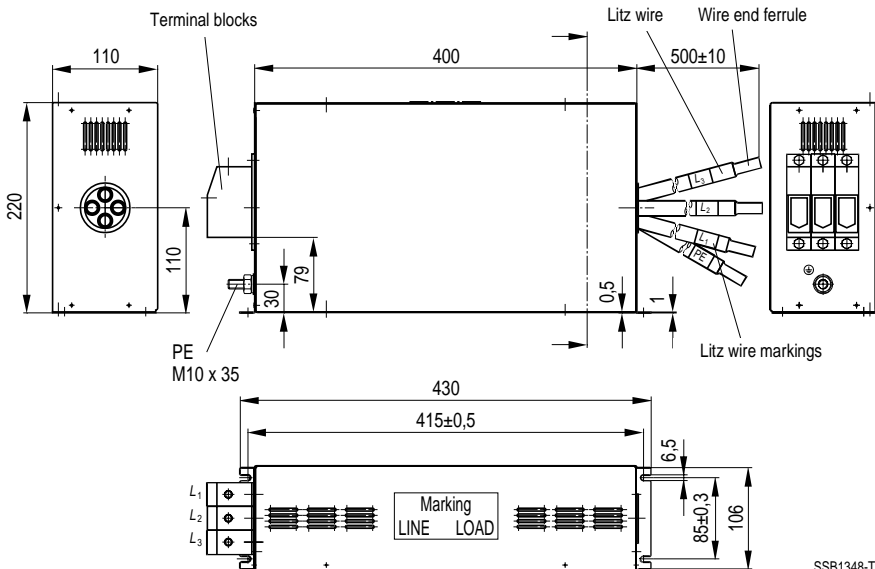


**B84143-G120-R11\*, B84143-G150-R11\***



SSB1295-Y

**B84143-G220-R11\***

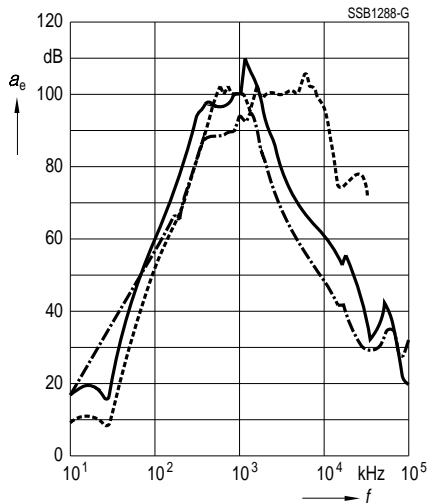


SSB1348-T

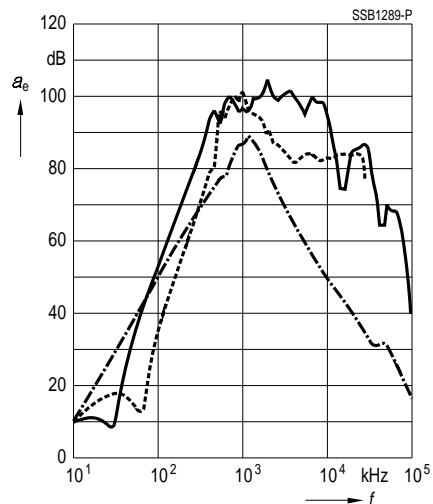
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- ..... symmetrical (differential mode)
- - - - - asymmetrical, all branches in parallel (common mode)

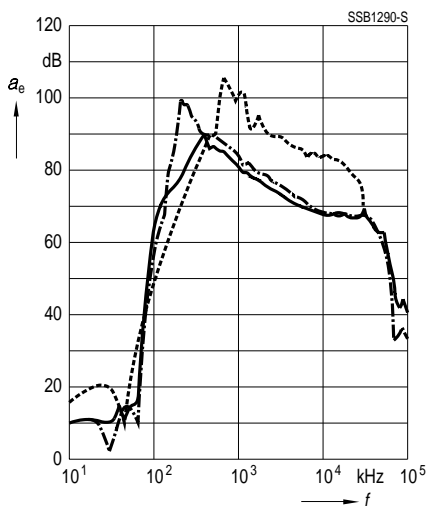
B84143-G8-R11\*



B84143-G20-R11\*



B84143-G36 ... G220-R11\*



### Power line filters for three-phase systems

Rated voltage 480 and 530 Vac

Rated current 8 to 200 A

#### Construction

- Three-line filters
- Metal case

#### Features

- Very high insertion loss
- Low leakage current
- Compact design in book format
- Low weight
- Degree of protection: IP 20<sup>1)</sup>
- Construction based on EN 133 200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load
- UL approval pending

#### Applications

- Frequency converters for motor drives, e.g.
  - lifts
  - pumps
  - traction systems
  - conveyor systems
  - air conditioning systems
- Wind farms
- Power supplies

#### Terminals

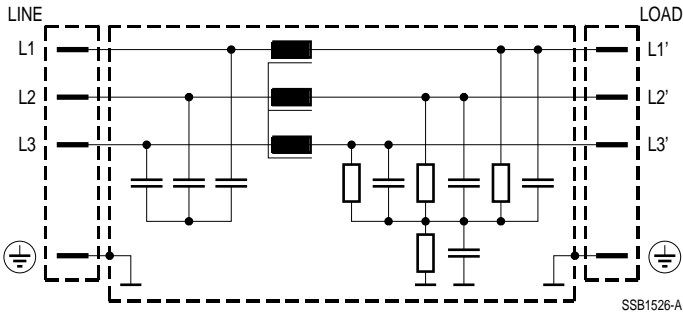
- Line: Safe-to-touch terminal blocks
- Load: Litz wires



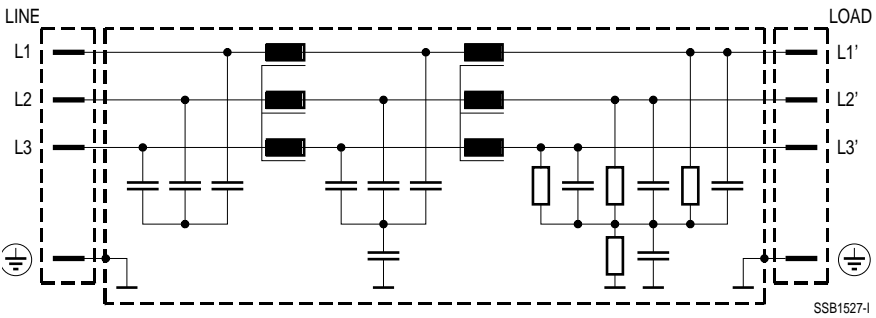
1) In accordance with EN 60529

Typical circuit diagrams

B84143-B8 ... B16-R11\*



B84143-B25 ... B200-R11\*



**Technical data**

Rated voltage $V_R$ , max.	480/275 Vac, 50/60 Hz (type -R110) 530/305 Vac, 50/60 Hz (type -R112)
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	1770 Vdc, 2 s (line/line) 2700 Vdc, 2 s (line/case)
Overload capability	1,5 · $I_R$ for 3 min per hour or 2,5 · $I_R$ for 30 s per hour
Climatic category	25/100/21 (– 25 °C/+ 100 °C/21 days damp heat test) according to IEC 60068-1

**Characteristics and ordering codes**

$I_R$	Terminal cross section		$I_{leak}$ (480 V/50 Hz)		$R_{typ}$	Approx. weight	Ordering code
	line side: terminal blocks mm <sup>2</sup>	load side: litz wires mm <sup>2</sup>	typ <sup>1)</sup>	max. <sup>2)</sup>			
A			mA	mA	mΩ	kg	
8	4	1,5	<14	<140	26	1,5	B84143-B8-R110
16	4	2,5	<14	<140	13	1,5	B84143-B16-R110
25	6	4	<14	<140	10	2,7	B84143-B25-R11*
36	6	6	<14	<140	6,5	3,2	B84143-B36-R11*
50	16	10	<14	<140	4,3	3,7	B84143-B50-R11*
66	25	16	<14	<140	2,7	4,3	B84143-B66-R11*
90	25	25	<14	<140	2,0	7,7	B84143-B90-R11*
120	50	35	<14	<140	1,4	8,3	B84143-B120-R11*
150	50	35	<14	<140	0,9	9,7	B84143-B150-R11*
200	95	70	<14	<140	0,5	13,5	B84143-B200-R11*

**Compilation of ordering code**

Replace the asterisk \* by the code number for the required version:

0 = 480 V

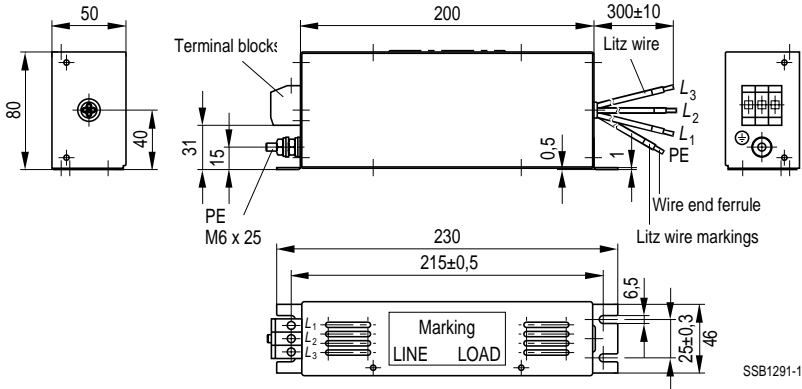
2 = 530 V

1) At rated operation

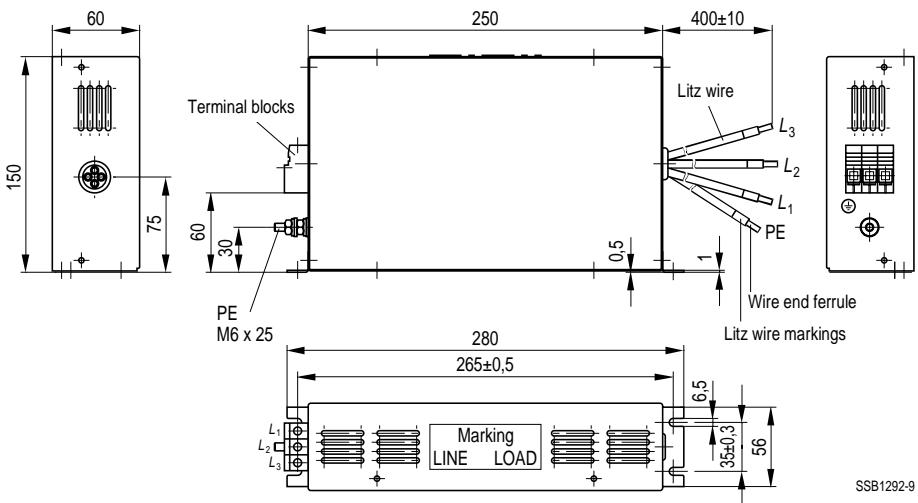
2) At failure of two phases

## Dimensional drawings

## B84143-B8-R110, B84143-B16-R110

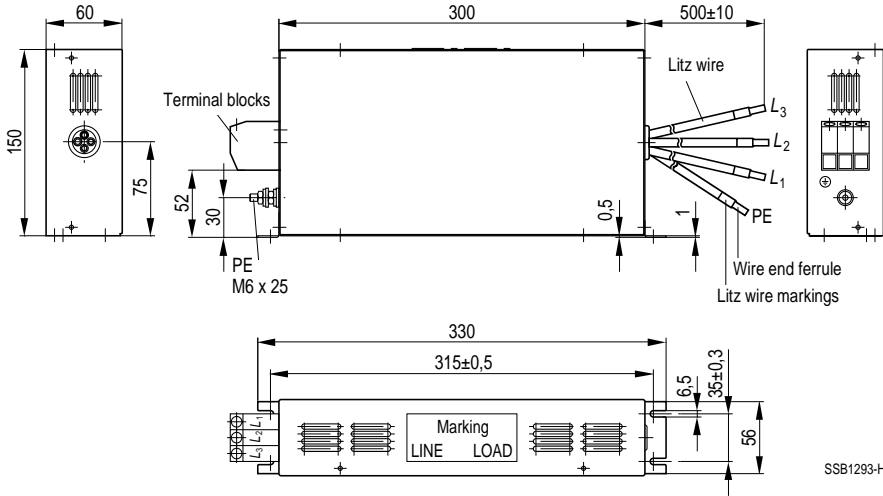


## B84143-B25-R11\*, B84143-B36-R11\*

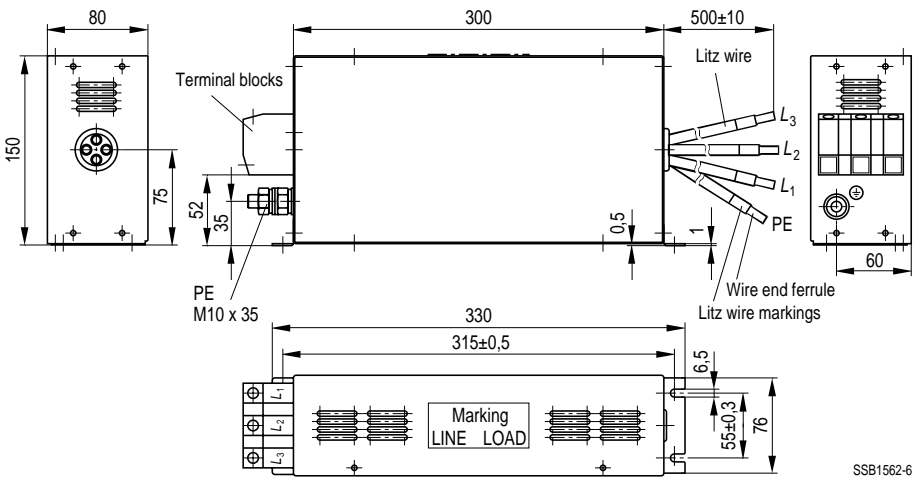




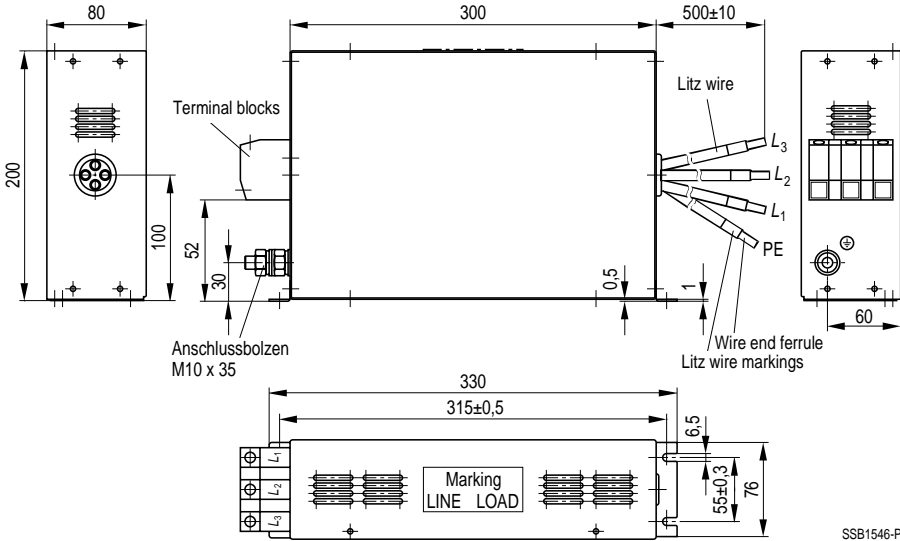
**B84143-B50-R11\***



**B84143-B66-R11\***

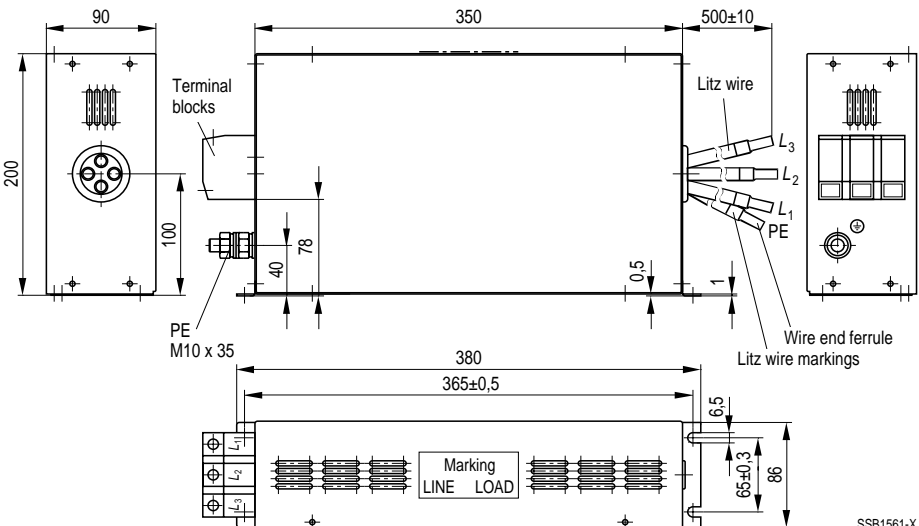


**B84143-B90-R11\***



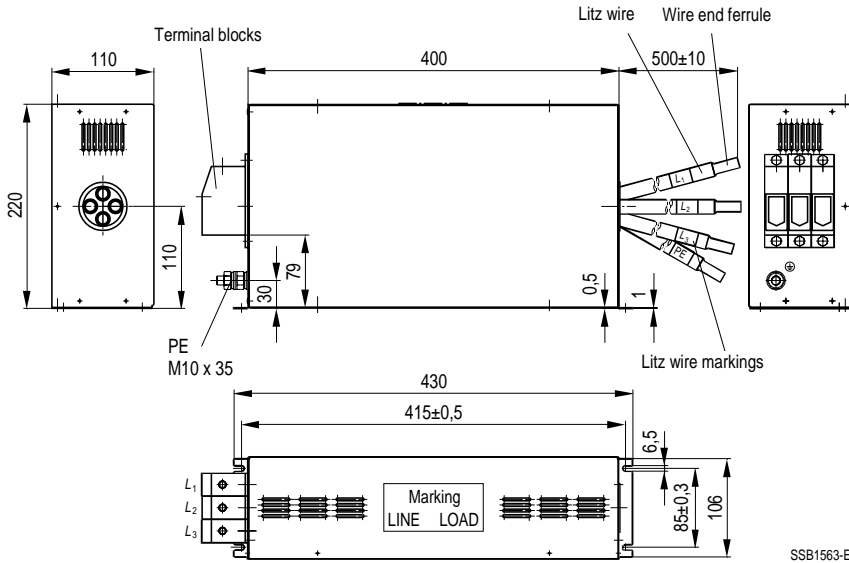
SSB1546-P

**B84143-B120-R110, B84143-B150-R11\***



SSB1561-X

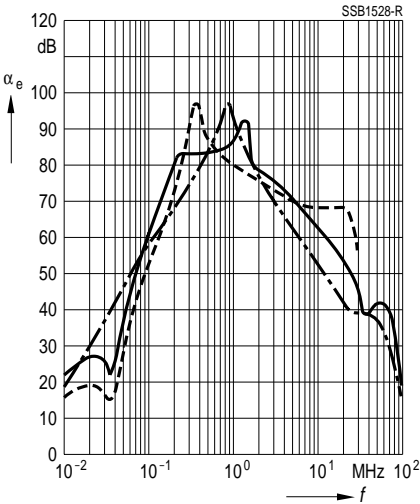
B84143-B200-R11\*



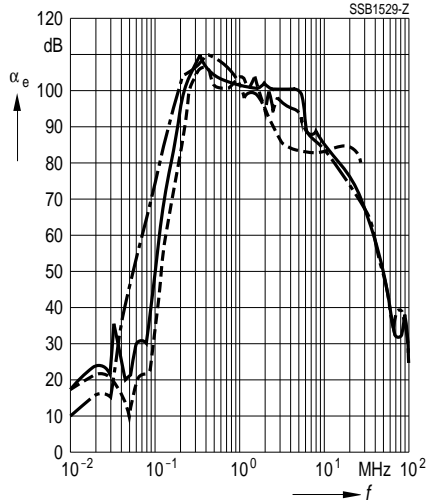
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

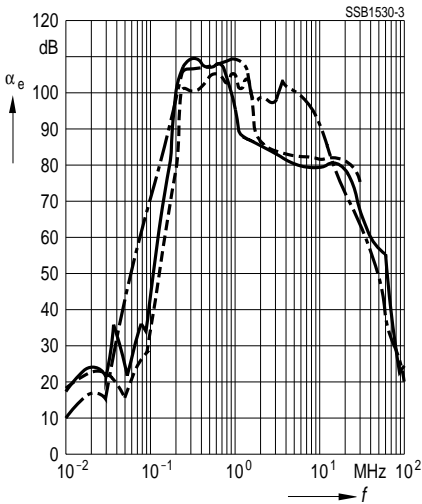
B84143-B8-R110, B84143-B16-R110



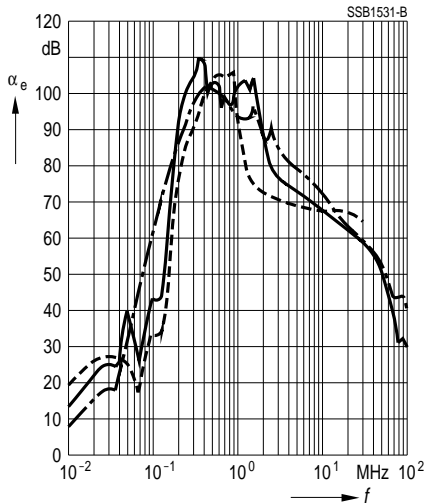
B84143-B25-R11\*, B84143-B36-R11\*



B84143-B50-R11\*



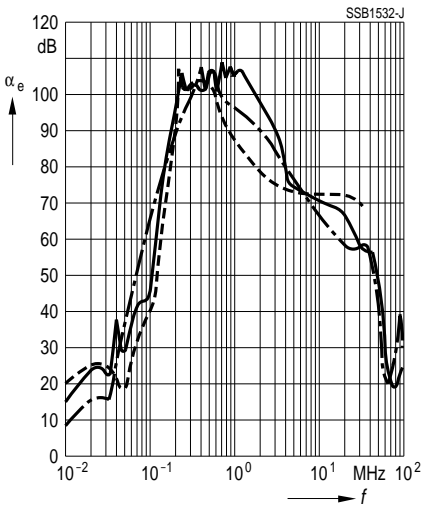
B84143-B66-R11\*



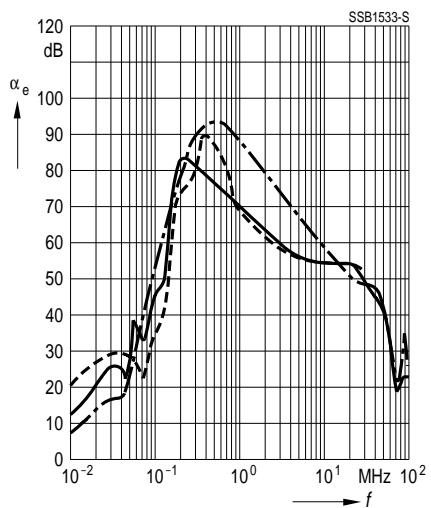
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

B84143-B90-R11\*, B84143-B120-R11\*



B84143-B150-R11\*, B84143-B200-R11\*



**Power line filters for three-phase systems**  
**Rated voltage 500, 690 and 760 Vac**  
**Rated current 150 A to 2500 A**

### Construction

- Three-line filter
- Metal case

### Features

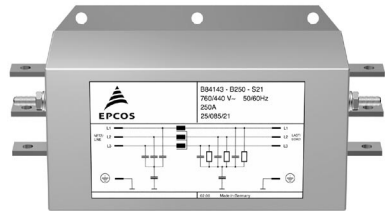
- High insertion loss
- Low leakage current
- Easy to install
- Degree of protection up to 180 A: IP 20<sup>1)</sup>
- Space-saving construction
- Construction based on EN 133200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load
- Low weight

### Applications

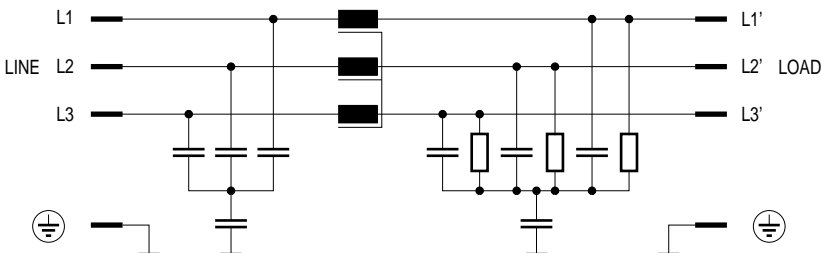
- B84143-\*\*\*-S24 for IT mains supply
- Frequency converters for motor drives, e.g.
  - lifts
  - pumps
  - traction systems
  - conveyor systems
  - air conditioning systems
- Wind farms
- Power supplies

### Terminals

- Terminal lugs



### Typical circuit diagram



SSB1212-L

1) In accordance with EN 60529

**Technical data**

Rated voltage $V_R$	500/290 Vac, 50/60 Hz (type -S20) 690/400 Vac, 50/60 Hz (type -S24) 760/440 Vac, 50/60 Hz (type -S21)
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	2121 Vdc, 2 s (line/line) 2121 Vdc, 2 s (line/case)
Overload capability	1,5 · $I_R$ for 3 min per hour or 2,5 · $I_R$ for 30 s per hour
Leakage current $I_{leak}$	at $V_R$ , 50 Hz
Climatic category	25/100/21 (– 25 °C/+ 100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

$I_R$	$I_{leak}$	$R_{typ}$	Approx. weight	Ordering code
A	mA	$\mu\Omega$	kg	
150	< 6	140	13	B84143-B150-S**
180	< 6	140	13	B84143-B180-S**
250	< 6	63	15	B84143-B250-S**
320	< 6	67	21	B84143-B320-S**
400	< 6	63	21	B84143-B400-S**
600	< 6	52	22	B84143-B600-S**
1000	< 6	33	28	B84143-B1000-S**
1600	< 6	22	34	B84143-B1600-S**
2500	< 6	15	105	B84143-B2500-S**

**Compilation of ordering code**

Replace the asterisks \*\* by the code number for the required version:

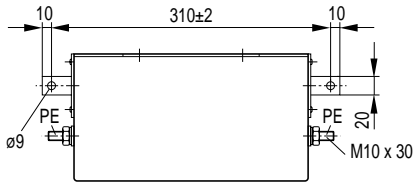
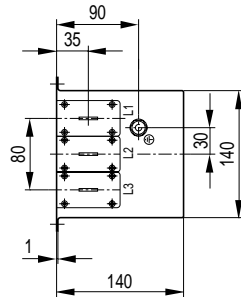
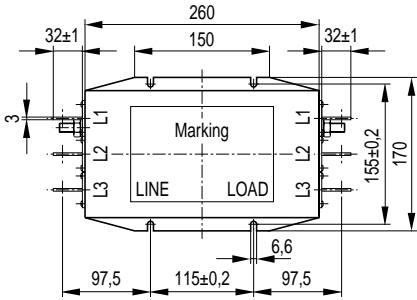
20 = 500 V

21 = 760 V

24 = 690 V (filter for IT mains supply)

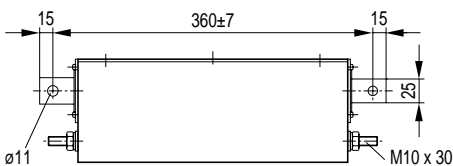
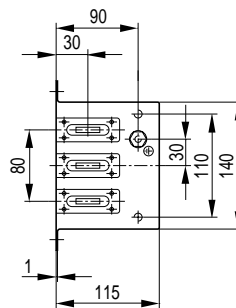
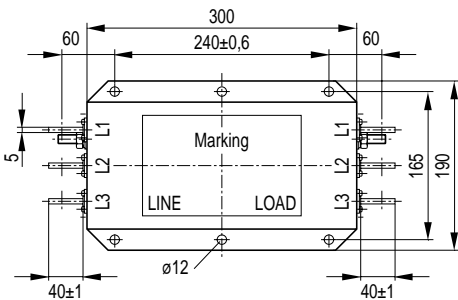
Dimensional drawings

B84143-B150-S\*\*, B84143-B180-S\*\*



SSB1266-K

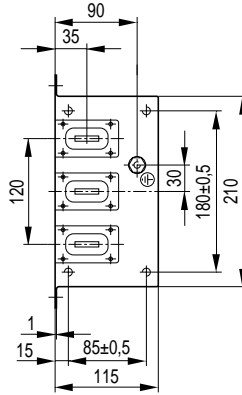
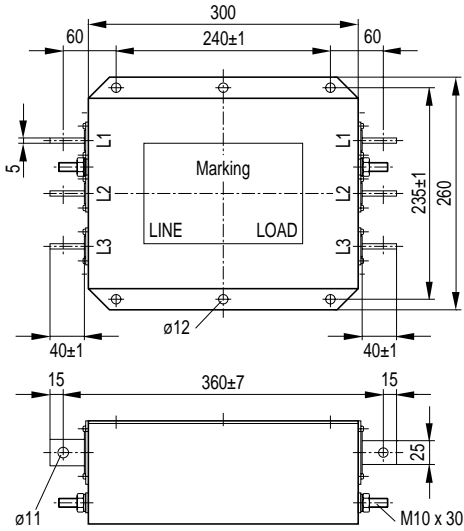
B84143-B250-S\*\*



SSB1206-C

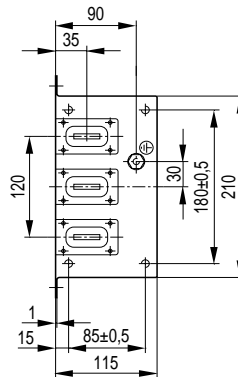
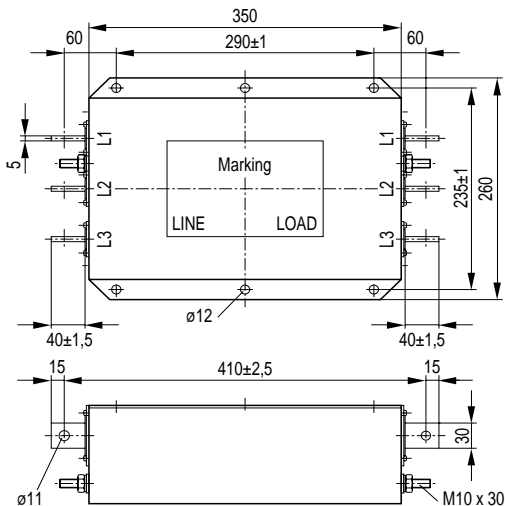


**B84143-B320-S\*\*, B84143-B400-S\*\***

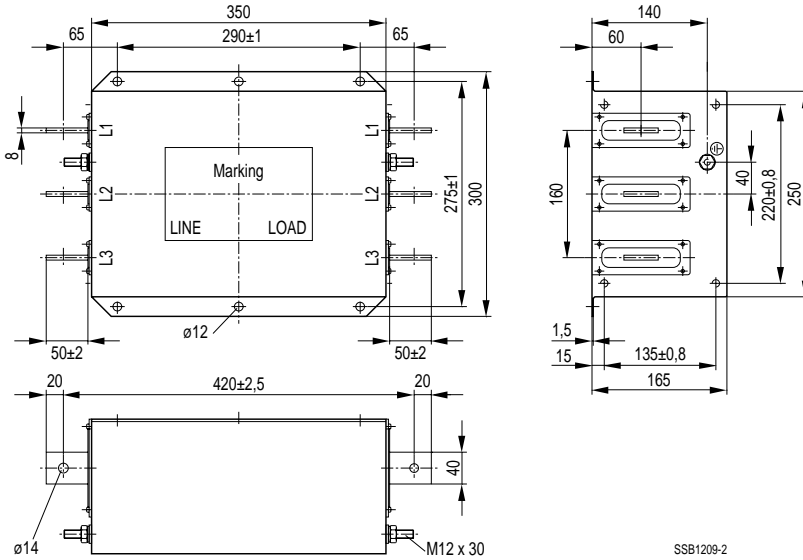


SSB1207-K

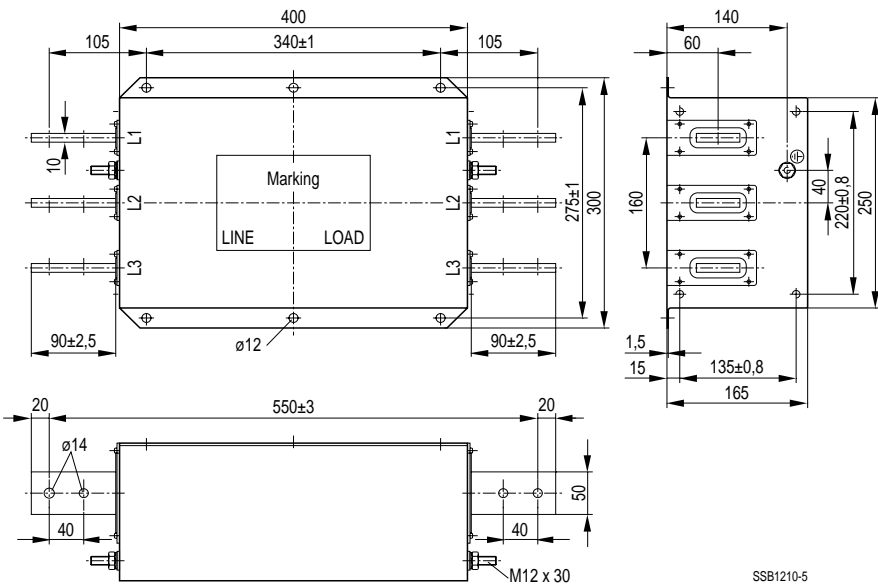
**B84143-B600-S\*\***



SSB1208-T

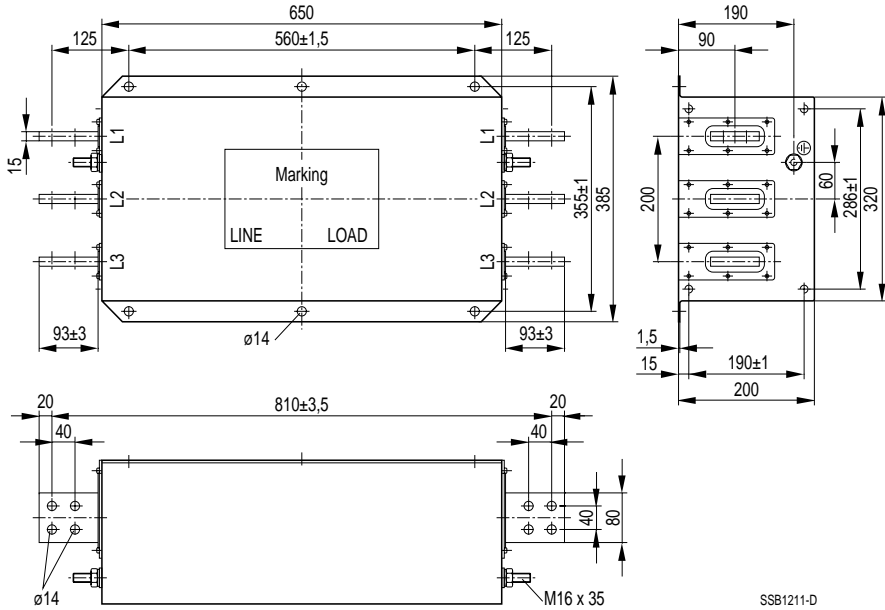
**B84143-B1000-S\*\***


SSB1209-2

**B84143-B1600-S\*\***


SSB1210-5

**B84143-B2500-S\*\***

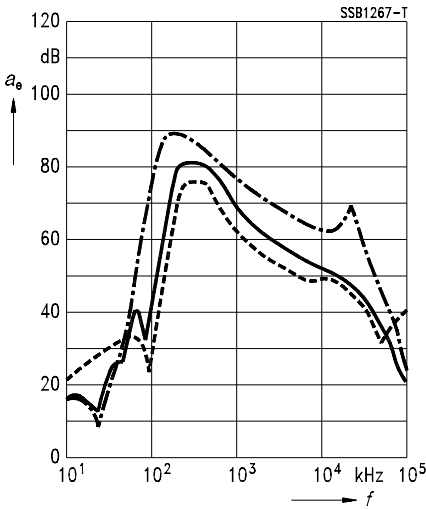


SSB1211-D

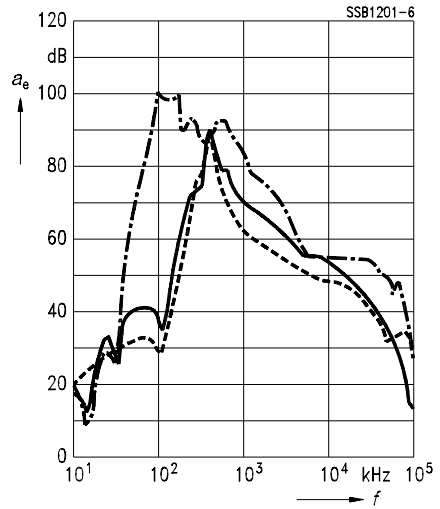
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

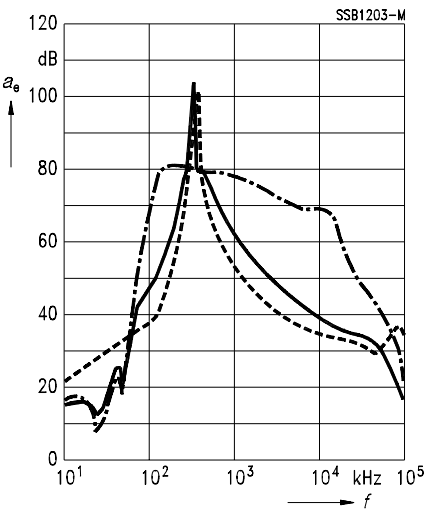
B84143-B150-S20  
B84143-B180-S20



B84143-B250-S20  
B84143-B320-S20



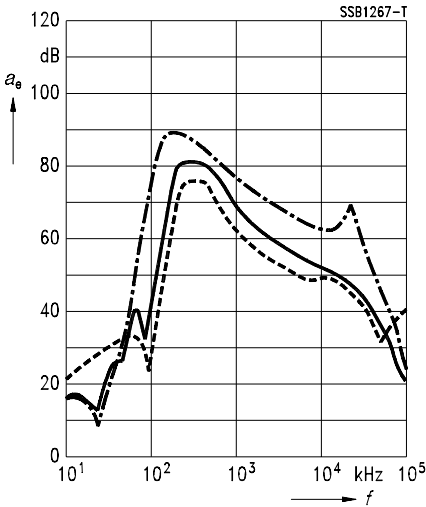
B84143-B600-S20 ... B84143-B2500-S20



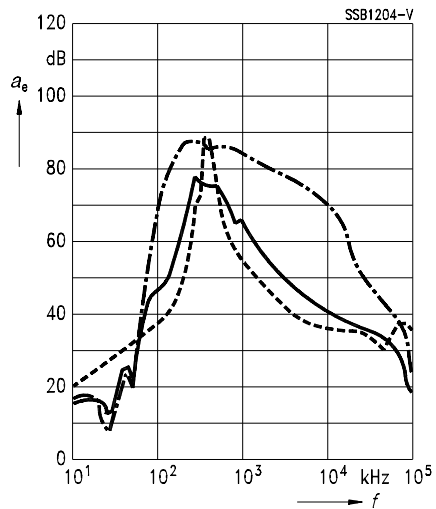
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

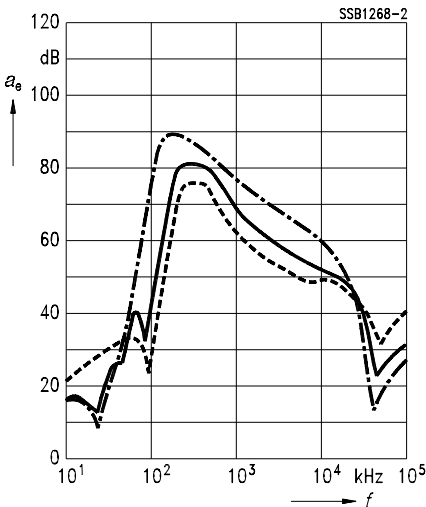
B84143-B150-S21, B84143-B180-S21



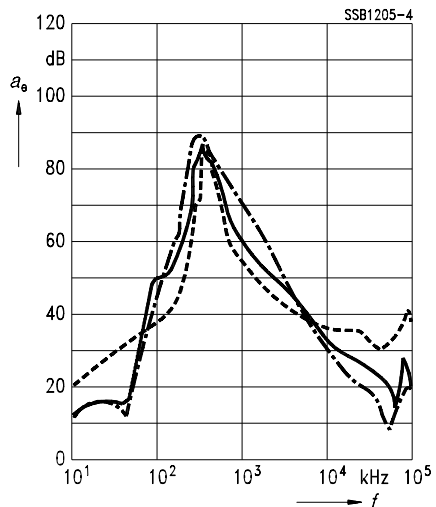
B84143-B250-S21 ... B84143-B2500-S21



B84143-B150-S24, B84143-B180-S24



B84143-B250-S24 ... B84143-B2500-S24



**Power line filters for three-phase systems**
**Rated voltage 760/440 Vac, 50/60 Hz**
**Rated current 25 A to 180 A**
**Construction**

- Three-line filter
- Metal case

**Features**

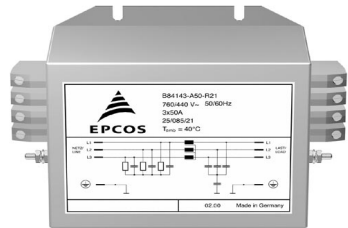
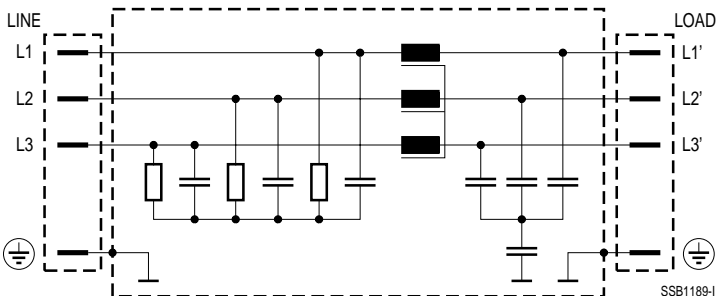
- High insertion loss
- Low leakage current
- Easy to install
- Degree of protection: IP 20<sup>1)</sup>
- Space-saving construction
- Construction based on EN 133200, UL 1283, CSA 22.2 No.8 1986
- Optimized for long motor cables and operation under full load

**Applications**

- Frequency converters for motor drives, e.g.
  - lifts
  - pumps
  - traction systems
  - conveyor systems
  - air conditioning systems
- Wind farms
- Power supplies

**Terminals**

- Safe-to-touch terminal blocks


**Typical circuit diagram**


1) In accordance with EN 60529

**Technical data**

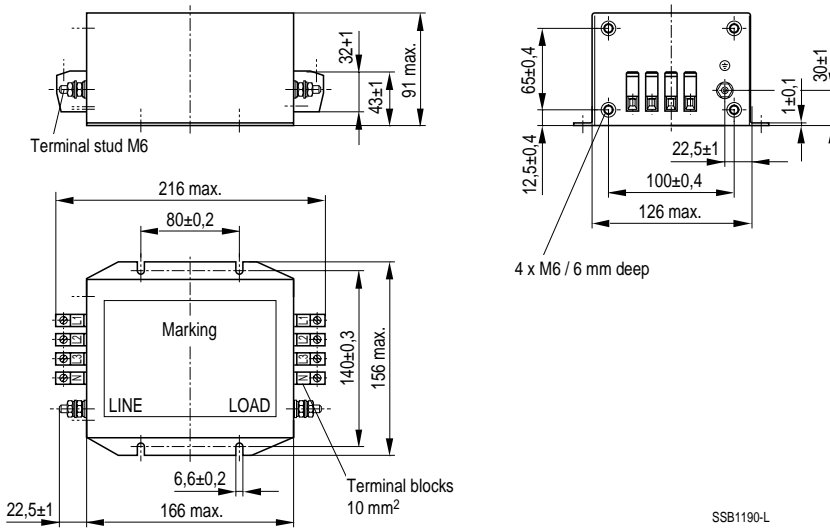
Rated voltage $V_R$	760/440 Vac, 50/60 Hz
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	3000 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case)
Overload capability	$1,5 \cdot I_R$ for 3 min per hour or $2,5 \cdot I_R$ for 30 s per hour
Leakage current $I_{leak}$	at 400 Vac, 50 Hz
Climatic category	25/1005/21 (– 25 °C/+ 100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

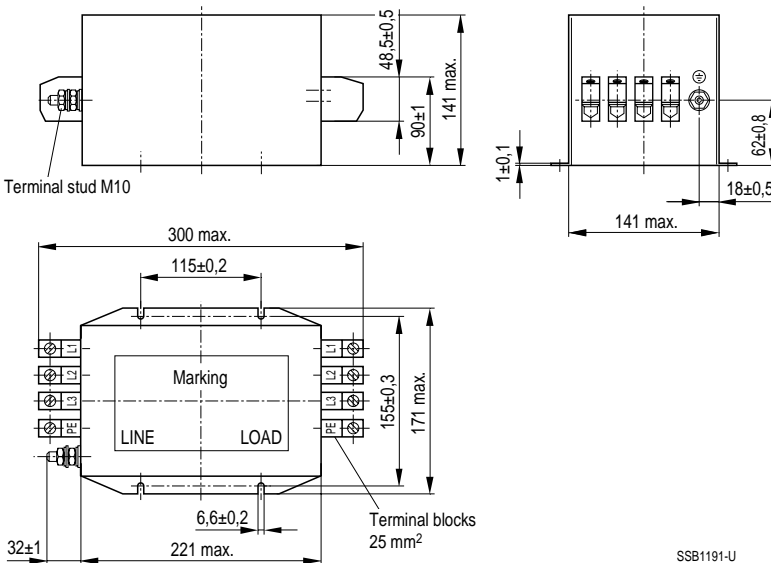
$I_R$ A	Terminal cross section mm <sup>2</sup>	$I_{leak}$ mA	$R_{typ}$ mΩ	Approx. weight kg	Ordering code
25	10	< 7	8,0	4	B84143-A25-R21
36	10	< 7	2,5	4	B84143-A36-R21
50	10	< 12	2,0	4	B84143-A50-R21
80	25	< 12	1,0	9,5	B84143-A80-R21
120	50	< 12	0,75	10	B84143-A120-R21
150	50	< 12	0,4	10	B84143-A150-R21
180	95	< 12	0,4	13	B84143-A180-R21

## Dimensional drawings

## B84143-A25-R21 ... A50-R21

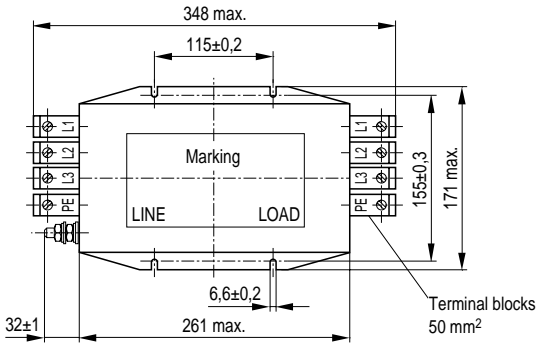
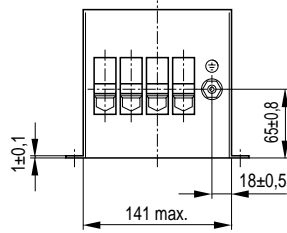
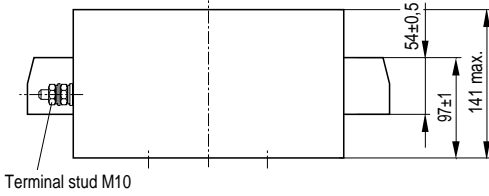


## B84143-A80-R21



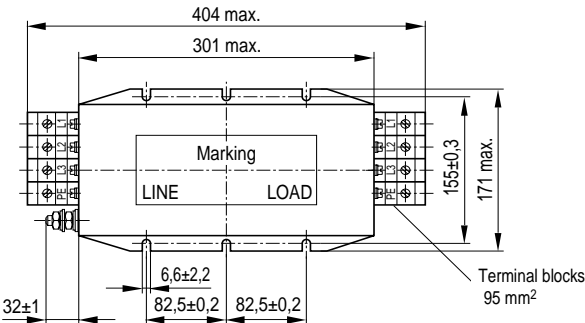
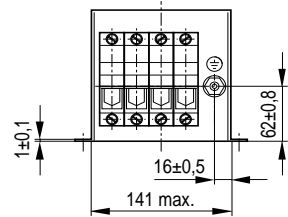
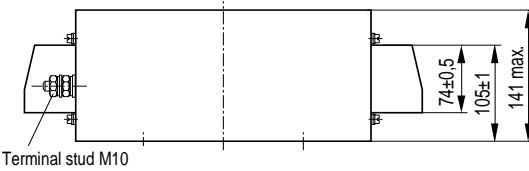


**B84143-A120-R21, B84143-A150-R21**



SSB1192-3

**B84143-A180-R21**

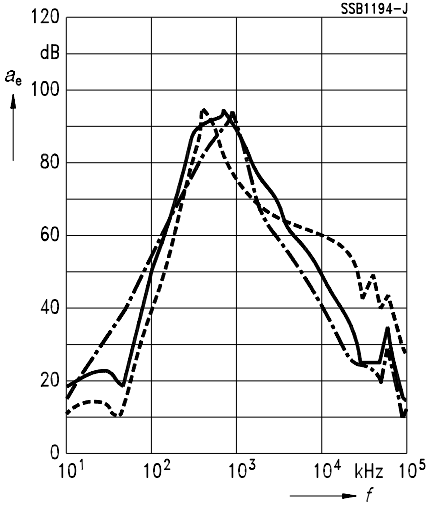


SSB1193-B

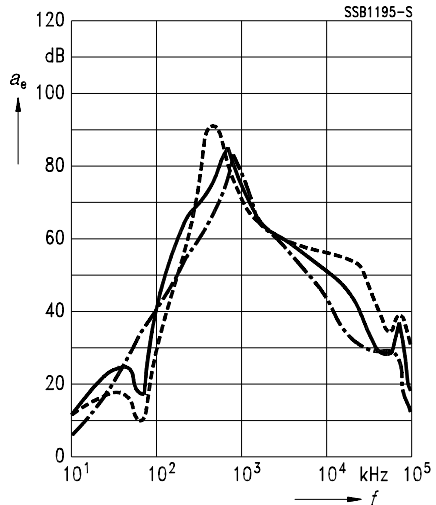
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

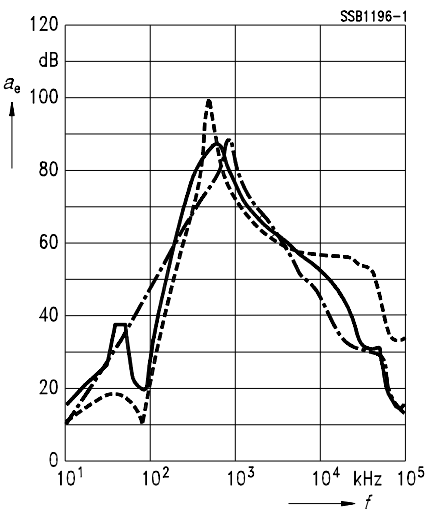
B84143-A25-R21



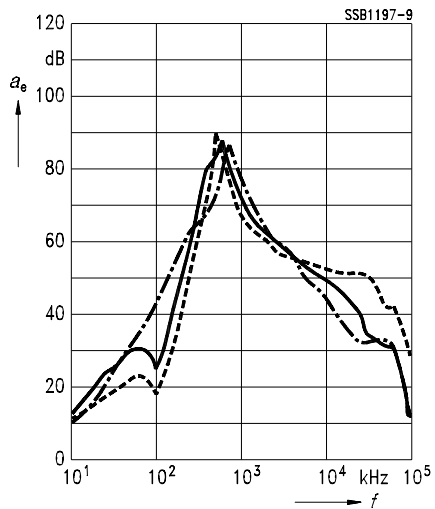
B84143-A36-R21



B84143-A50-R21/ B84143-A80-R21



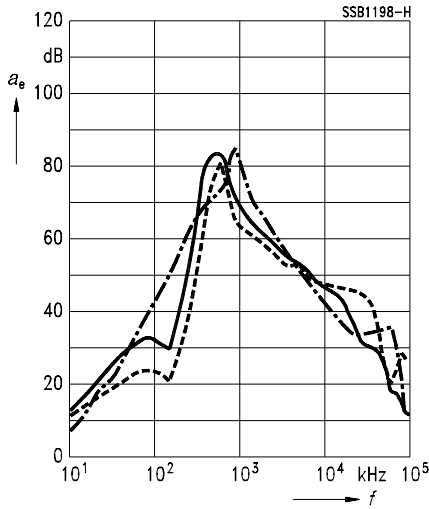
B84143-A120-R21



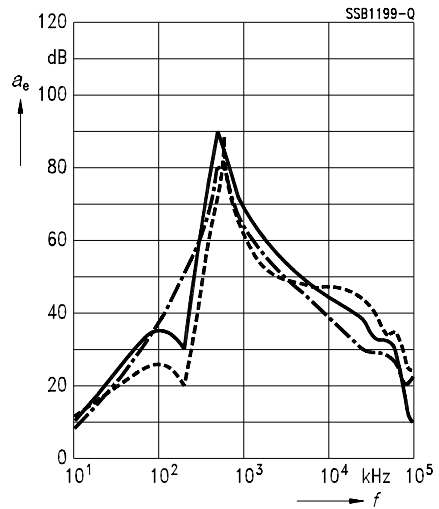
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- - - - - asymmetrical, all branches in parallel (common mode)
- ..... symmetrical (differential mode)

B84143-A150-R21



B84143-A180-R21



**Power line filters for three-phase systems**
**Rated voltage 440/250 Vac, 50/60 Hz**
**Rated current 16 A to 1600 A**
**Construction**

- Four-line filter
- Metal case
- Threaded bushes at end faces for RF-tight installation


**Features**

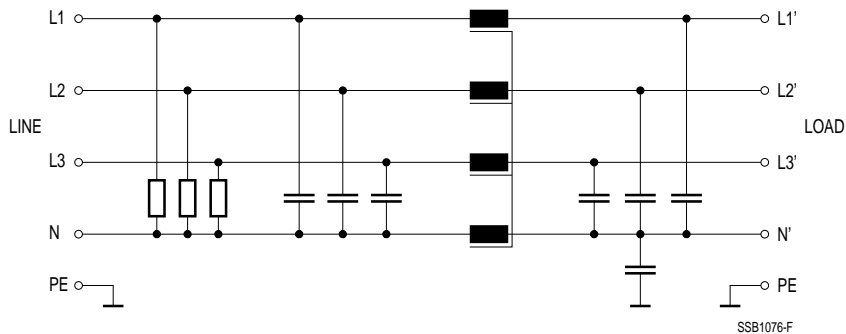
- High insertion loss
- Low leakage current
- Easy to install
- Degree of protection up to 180 A: IP 20<sup>1)</sup>
- Space-saving construction
- Construction based on EN 133200, UL 1283, CSA 22.2 No.8 1986

**Applications**

- General-purpose application in power electronics
- UPS
- Wind farms

**Terminals**

- Safe-to-touch terminal blocks for filters up to 180 A
- Terminal lugs for filters 250 to 1600 A

**Typical circuit diagram**


1) In accordance with EN 60529

**Technical data**

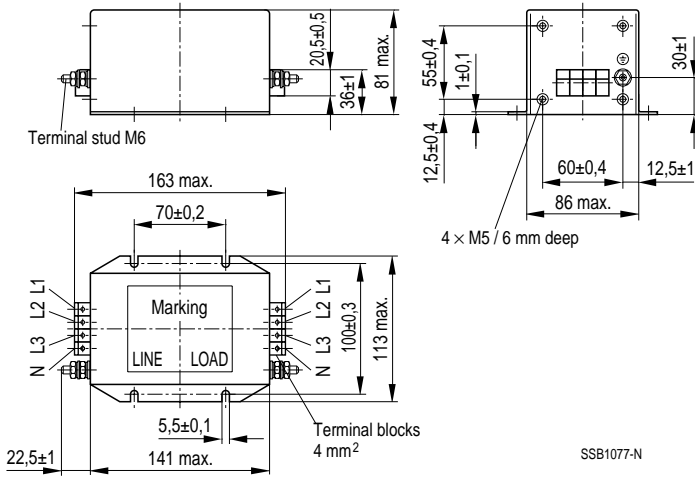
Rated voltage $V_R$	440/250 Vac, 50/60 Hz
Rated current $I_R$	Referred to 40 °C ambient temperature
Test voltage $V_P$	1770 Vdc, 2 s (line/line) 2700 Vdc, 2 s (lines/case), for 16 ... 50 A 2550 Vdc, 2 s (lines/case), for 80 ... 180 A 2121 Vdc, 2 s (lines/case), for 250 ... 1600 A
Overload capability	$1,5 \cdot I_R$ for 3 min per hour or $2,5 \cdot I_R$ für 30 s per hour
Climatic category	25/100/21 (– 25 °C/+100 °C/21 days damp heat test) in accordance with IEC 60068-1

**Characteristics and ordering codes**

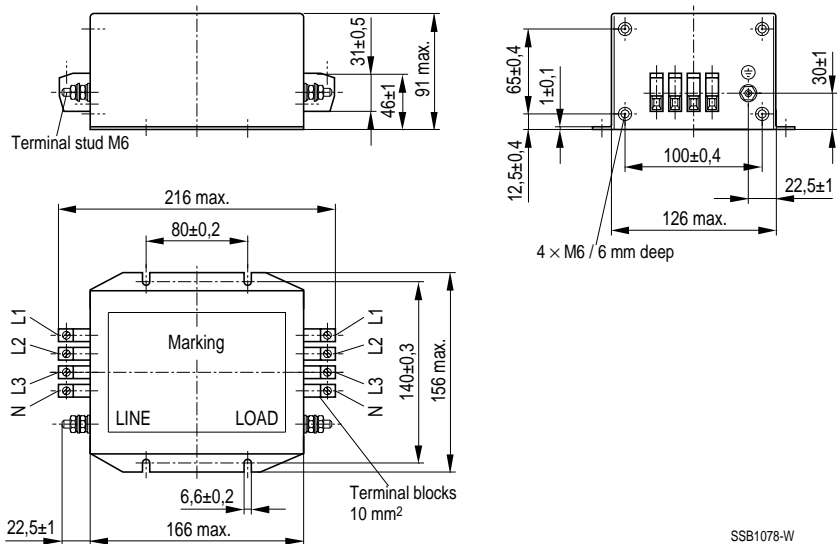
$I_R$ A	Terminal cross sect. mm <sup>2</sup>	$I_{leak}$ mA	$R_{typ}$ mΩ	$P_V$ W	Approx. weight kg	Ordering code
16	4	< 3,5	10	8	2,2	B84144-A16-R
25	10	< 3,5	6	11	3,7	B84144-A25-R
36	10	< 3,5	3,5	14	3,7	B84144-A36-R
50	10	< 6	1,3	10	4,0	B84144-A50-R
80	25	< 6	0,7	13	9,5	B84144-A80-R
120	50	< 6	0,5	22	10	B84144-A120-R
150	50	< 6	0,35	24	10	B84144-A150-R
180	95	< 6	0,25	24	13	B84144-A180-R
250	Terminal lugs	< 6	0,095	18	21	B84144-G250-S
500		< 6	0,060	45	53	B84144-G500-S
1000		< 6	0,030	90	140	B84144-G1000-S
1600		< 6	0,020	150	185	B84144-G1600-S

Dimensional drawings

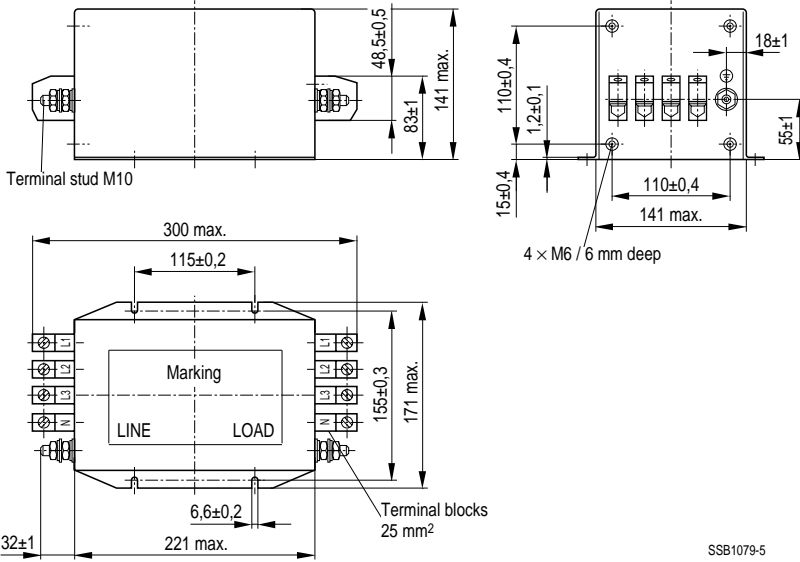
B84144-A16-R



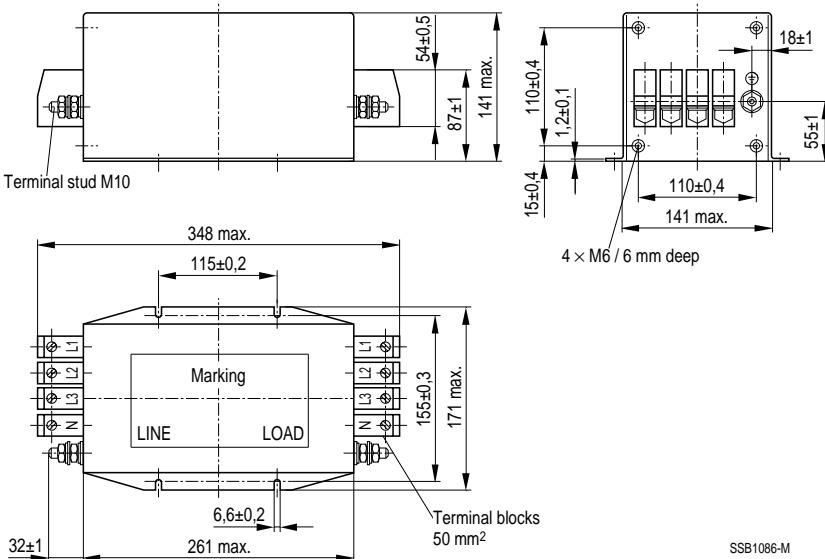
B84144-A25-R ... B84144-A50-R



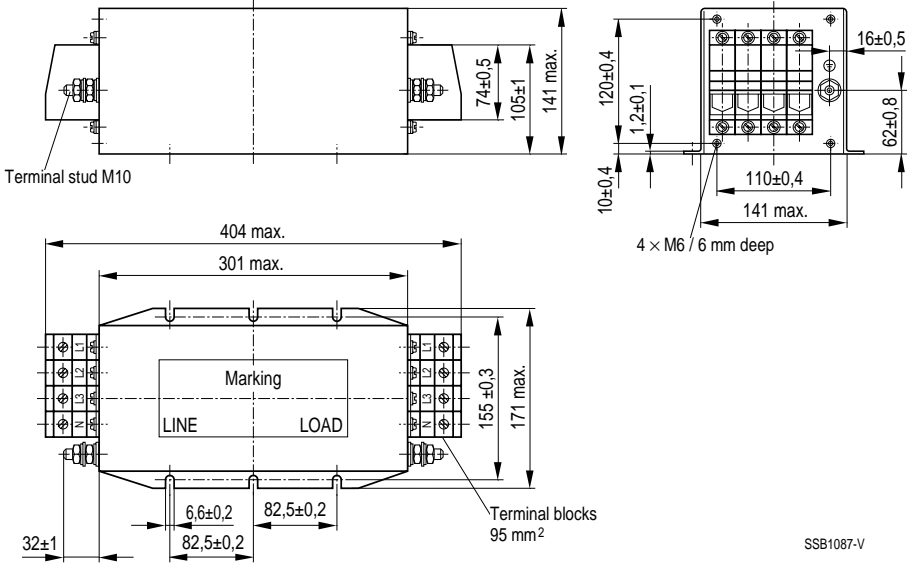
**B84144-A80-R**



**B84144-A120-R, B84144-A150-R**

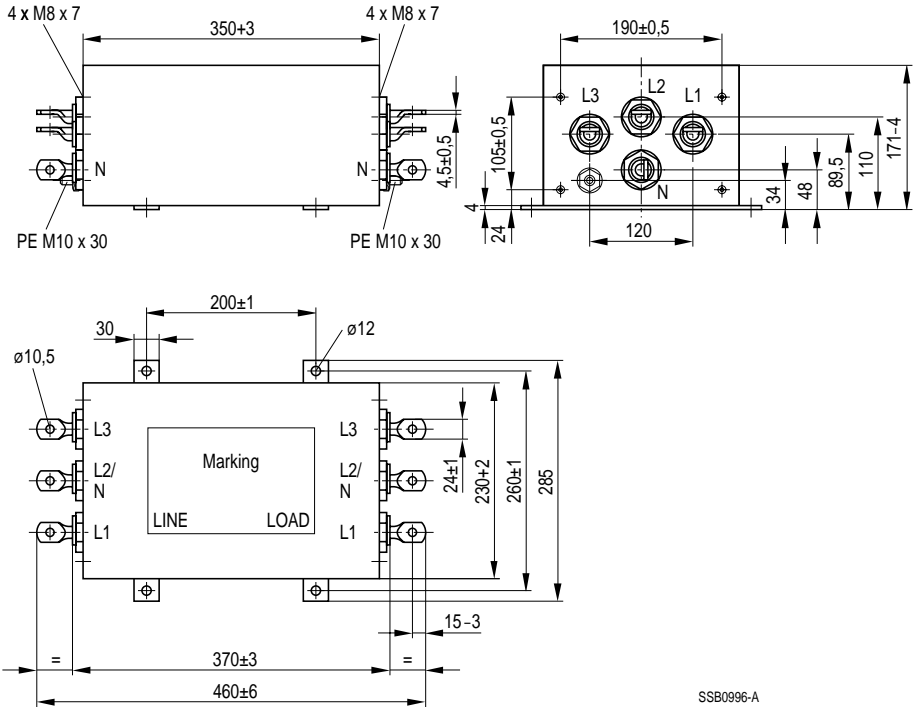


B84144-A180-R



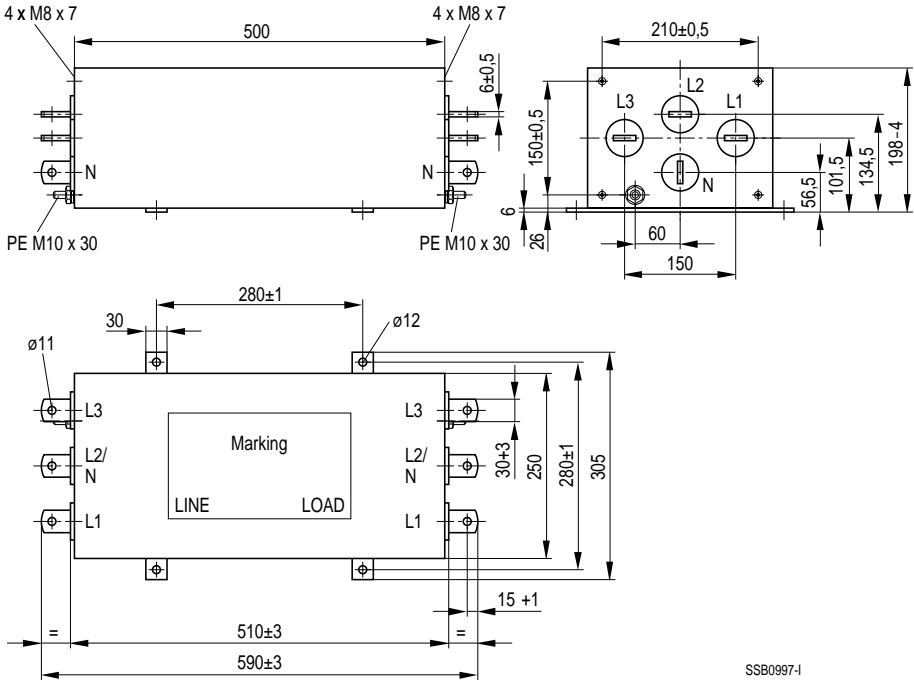


B84144-G250-S



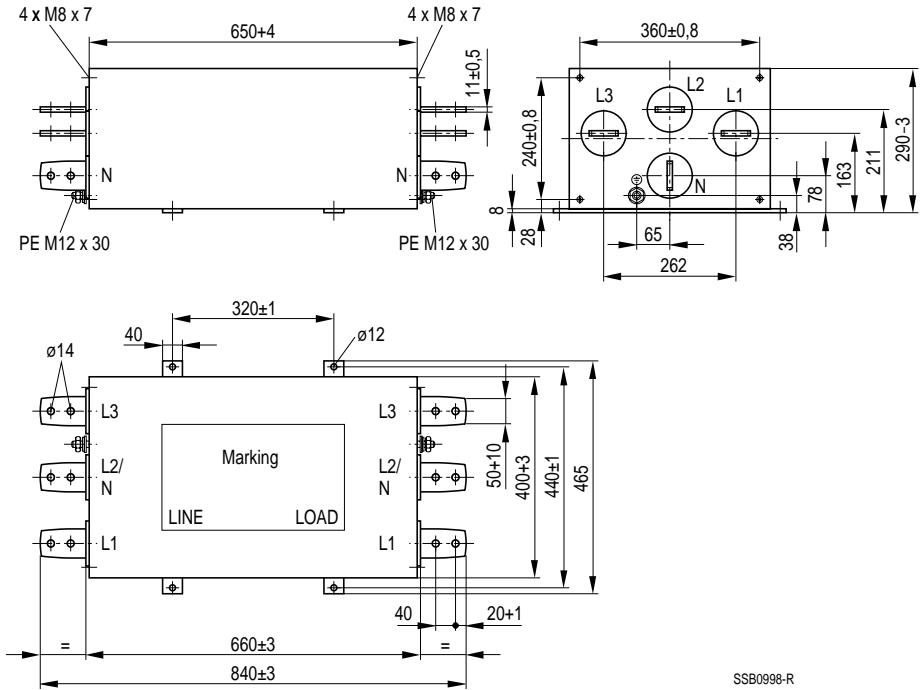
SSB0996-A

B84144-G500-S



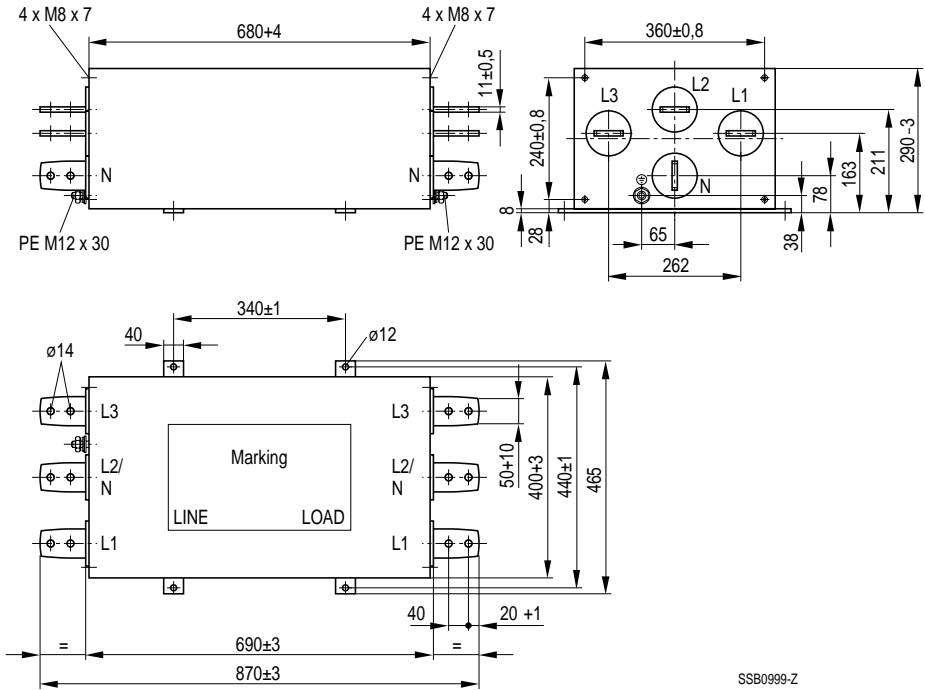
SS80997-I

B84144-G1000-S



SSB0998-R

B84144-G1600-S

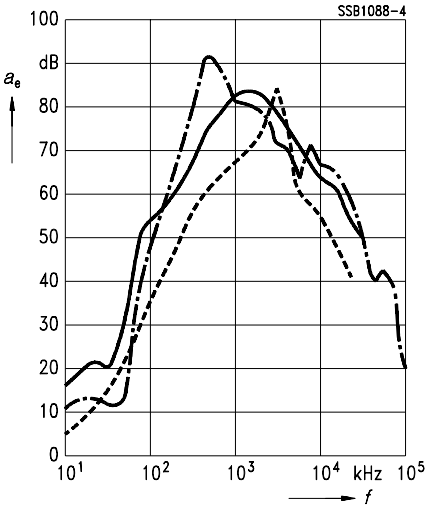


SSB0999-Z

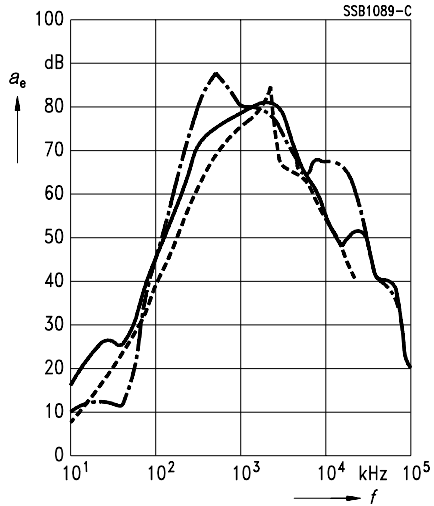
**Insertion loss** (typical values at  $Z = 50 \Omega$ )

- unsymmetrical, adjacent branches terminated
- ..... asymmetrical, all branches in parallel (common mode)
- - - - - symmetrical (differential mode)

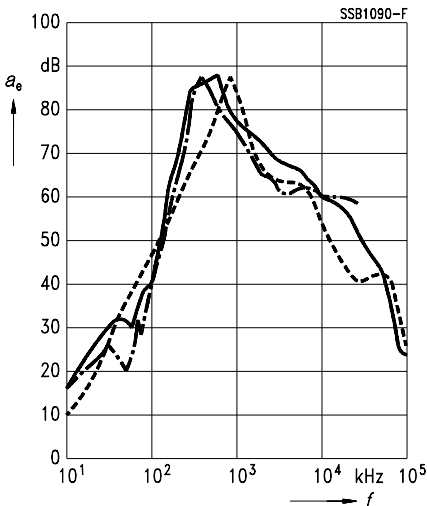
B84144-A16-R ... -A36-R



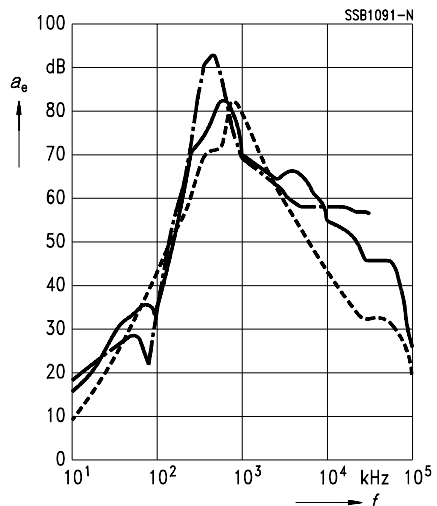
B84144-A50-R



B84144-A80-R



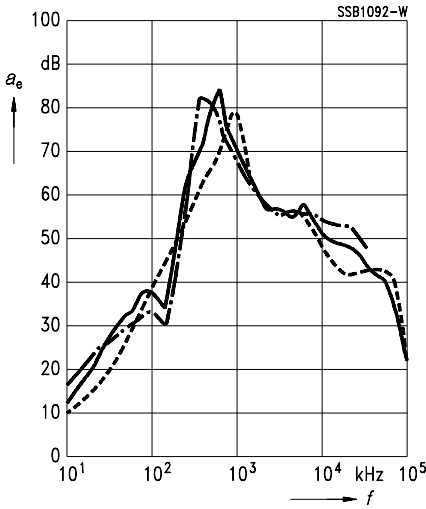
B84144-A120 ... -A150-R



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

- unsymmetrical, adjacent branches terminated
- ..... asymmetrical, all branches in parallel (common mode)
- - - - - symmetrical (differential mode)

B84144-A180-R



B84144-G250-S ... -G1600-S

