



EMC filters

Sine-wave output filters

Series/Type: **B84143V*R227**

Date: May 2013

Sine-wave output filters

Sine-wave output filters for 3-phase systems

Rated voltage V_R : 520/300 V AC and 690/400 V AC

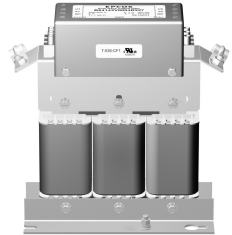
Rated current I_R : 4 A to 320 A

Construction

- 3-line sine-wave output filter

Features

- Reduction of motor noise and eddy current losses
- dv/dt reduction
- Easy to install
- Compact design
- Degree of protection: IP 20 up to 180 A¹⁾
- Optimized for long motor cables and operation under full load²⁾
- Natural cooling
- Wiring between inverter and filter must be shorter than 10 meters!
- cULus approval 



Typical applications

- Frequency converters for motor drives, e.g.
 - elevators
 - pumps
 - traction and conveyer systems
 - HVAC systems (heating, ventilation and air conditioning)

Terminals

- Up to 180 A: Finger-safe terminal blocks
- 250 A and 320 A: Copper busbars

Marking

Marking on component:

Manufacturer's logo, ordering code, approval type, rated voltage, rated current, rated motor frequency, rated switching frequency, rated temperature, climatic category, date code

Minimum data on packaging:

Manufacturer's logo, ordering code, quantity, date code

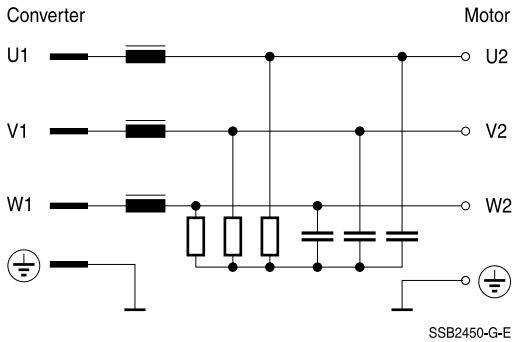
1) To IEC 60529:2001

2) Up to 1000 meters are possible but the actual situation have to considered due to resonances inside the system. Resonances can destroy the filter!

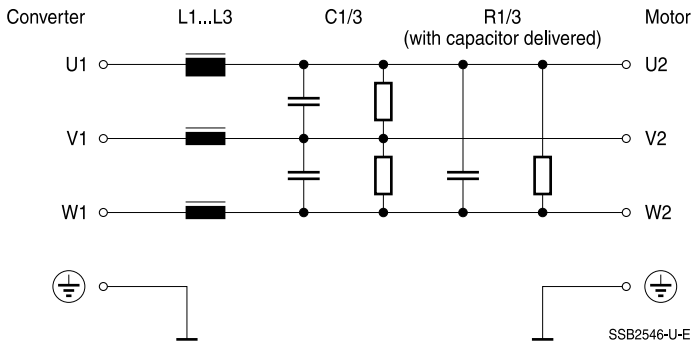
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Typical circuit diagrams

Filters 4 A ... 33 A



Filters 50 A ... 320 A



Sine-wave output filters
Technical data and measuring conditions

Rated voltage V_R	Filters 4 A ... 132 A: 520 V AC (50/60 Hz) Filters 180 A ... 320 A: 690 V AC (50/60 Hz)
Rated current I_R	Referred to 40 °C rated temperature
Test voltage V_{test}	1500 V AC, 10 s (line/line) 1500 V AC, 10 s (lines/case)
Frequency	0 Hz ... 100 Hz
Motor Pulse (Switching)	See table "Characteristics and ordering codes"
Overload capability (thermal)	$1.5 \cdot I_R$ for 1 min per hour
Max. dv/dt on filter input	5 kV/μs (higher values can be approved individually)
Current (I_R) derating depending on altitude	1000 m ... 4000 m: 5%/1000 m
Voltage (V_R) derating depending on altitude	Above 2000 m: 15%/1000 m
Current (I_R) derating depending on ambient temperature	40 °C ... 90 °C: 10%/5 °C
Climatic category (IEC 60068-1)	Filters 4 A ... 33 A: 25/90/21 Filters 50 A ... 95 A: 25/55/21 Filters 132 A ... 150 A: 25/70/21
Approval	UL 1446 (E 320370)

Characteristics and ordering codes

I_R	Terminal cross section mm ²	f_{res} Hz	L_R mH	ΔV %	$f_p^{1)}$ min. kHz	f_p max. kHz	R_{typ} mΩ	$P_{\text{loss}}^{2)}$ W	Approx. weight kg	Ordering code
A										
$V_R = 520 \text{ V AC}$										
4	4	1000	12.0	5	3	16	390	40	3.3	B84143V0004R227
6	4	1170	8.5	5	3	16	290	45	3.5	B84143V0006R227
11	4	1300	4.5	5	3	16	70	55	5.3	B84143V0011R227
16	4	1230	3.0	7	3	10	37	60	8.5	B84143V0016R227
25	6	1100	2.5	7	3	10	28	100	20	B84143V0025R227
33	6	1190	1.8	8	3	10	20	150	18	B84143V0033R227
50	10	1330	1.2	8	3	10	12	190	25	B84143V0050R227
66	25	1210	0.95	8	3	8	9	250	26	B84143V0066R227
75	25	1050	0.86	9	3	8	7	320	38	B84143V0075R227
95	50	1120	0.75	10	3	8	6.3	330	52	B84143V0095R227
132	50	910	0.52	10	3	8	3.7	380	67	B84143V0132R227
$V_R = 690 \text{ V AC}$										
180	150	870	0.40	10	2.4	6	3.8	480	74	B84143V0180R227
250	40 × 3	890	0.32	11	2.4	6	1.4	560	91	B84143V0250R227
320	40 × 3	780	0.25	11	2.4	6	1.2	750	145	B84143V0320R227

1) For lower frequencies please contact EPCOS.

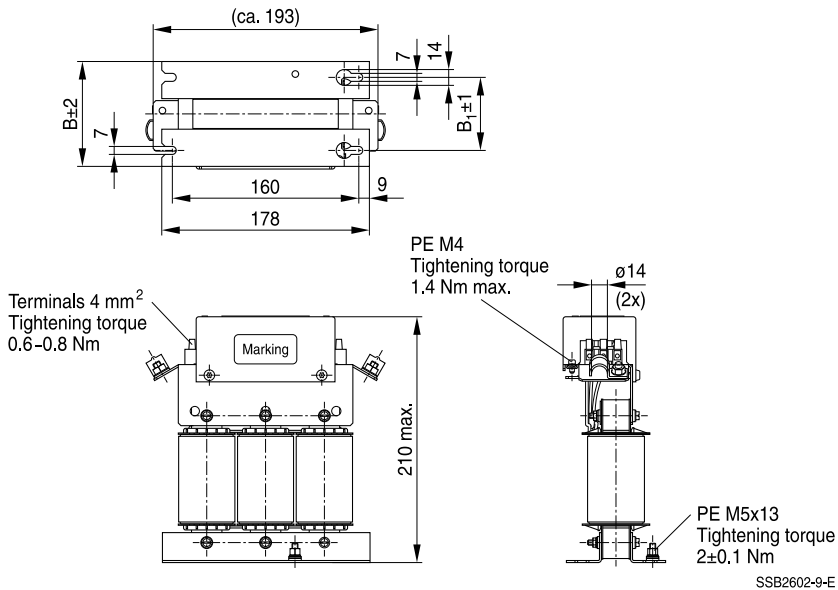
2) Typical value. Varies with type and length of motor cable, pulse frequency and modulation.

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Dimensional drawings

(without capacitor wiring in picture)

Filters 4 A ... 11 A

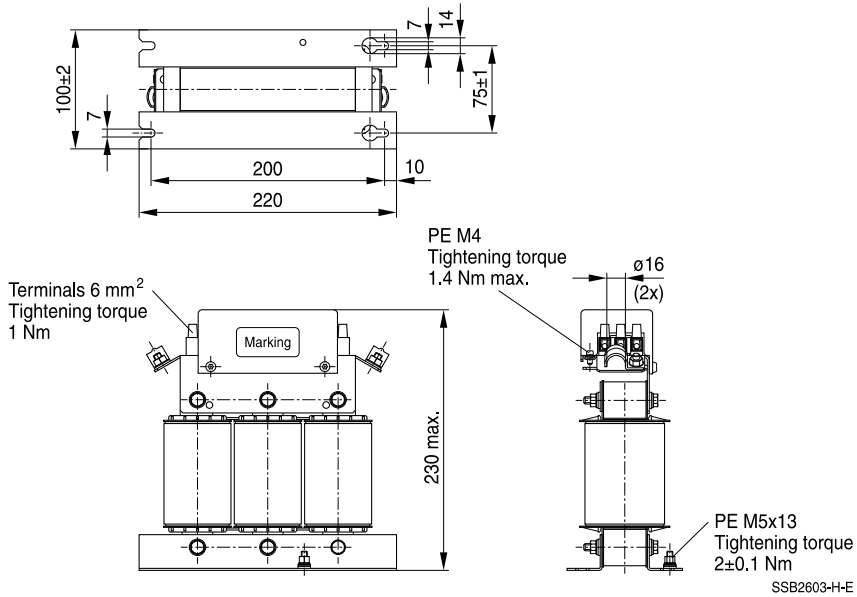


General tolerances according to ISO 2768–cL
Dimensions in mm

Ordering code	B	B ₁
B84143V0004R227	85	60
B84143V0006R227	85	60
B84143V0011R227	100	75

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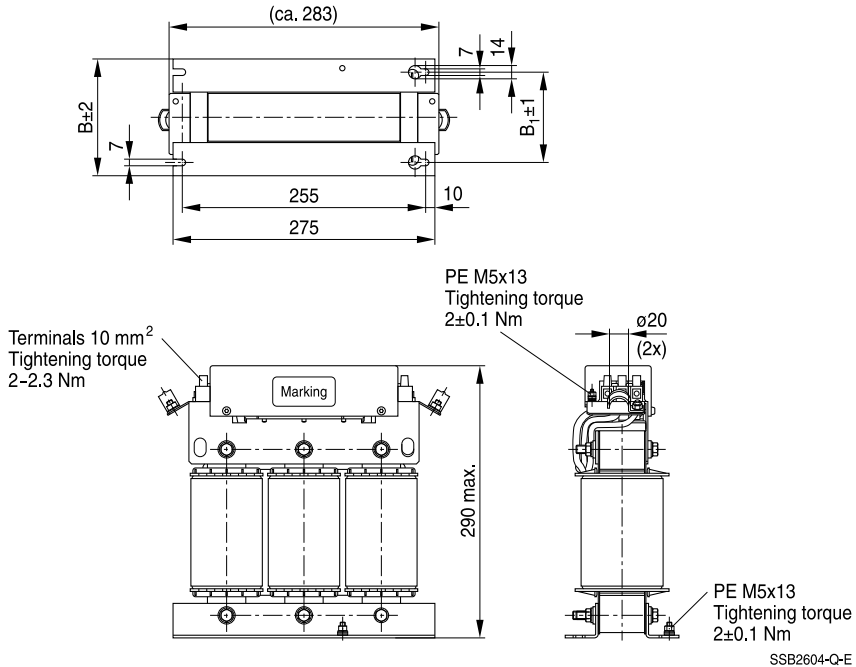
Filters 16 A



General tolerances according to ISO 2768–cL
Dimensions in mm

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Filters 25 A and 33 A

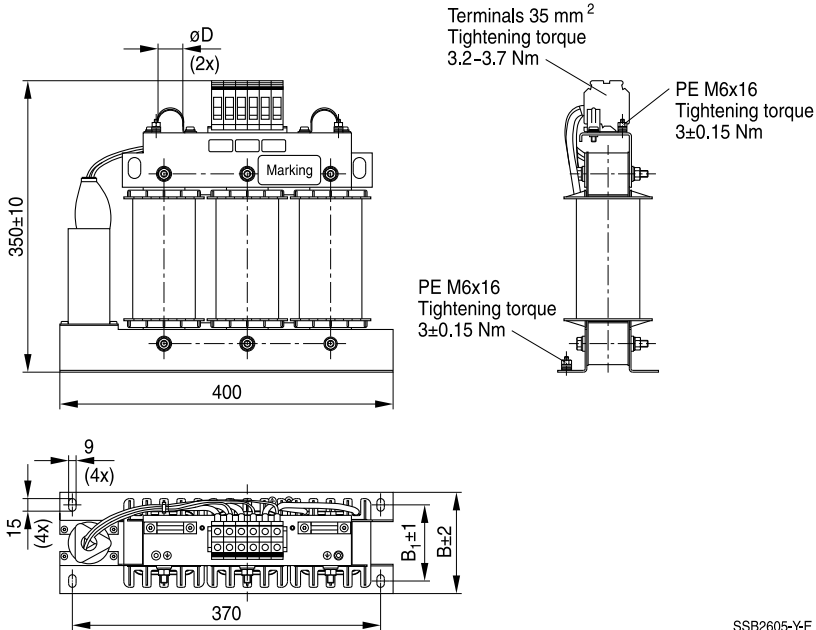


General tolerances according to ISO 2768–cL
Dimensions in mm

Ordering code	B	B ₁
B84143V0025R227	110	82
B84143V0033R227	120	92

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Filters 50 A ... 75 A



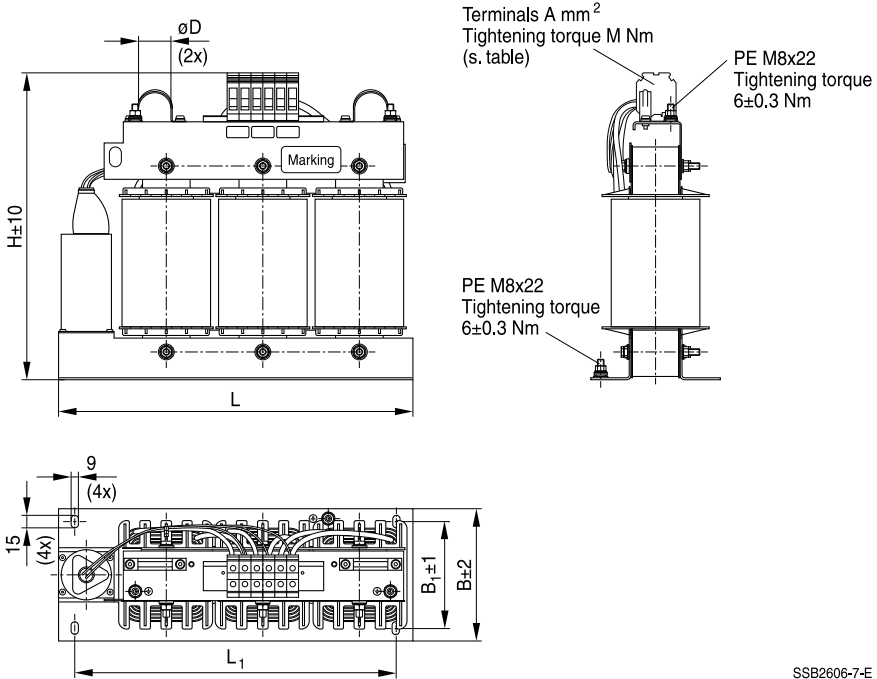
SSB2605-Y-E

General tolerances according to ISO 2768-cL
Dimensions in mm

Ordering code	B	B ₁	ØD
B84143V0050R227	91	121	30
B84143V0066R227	91	121	30
B84143V0075R227	116	146	43

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Filters 95 A ... 180 A

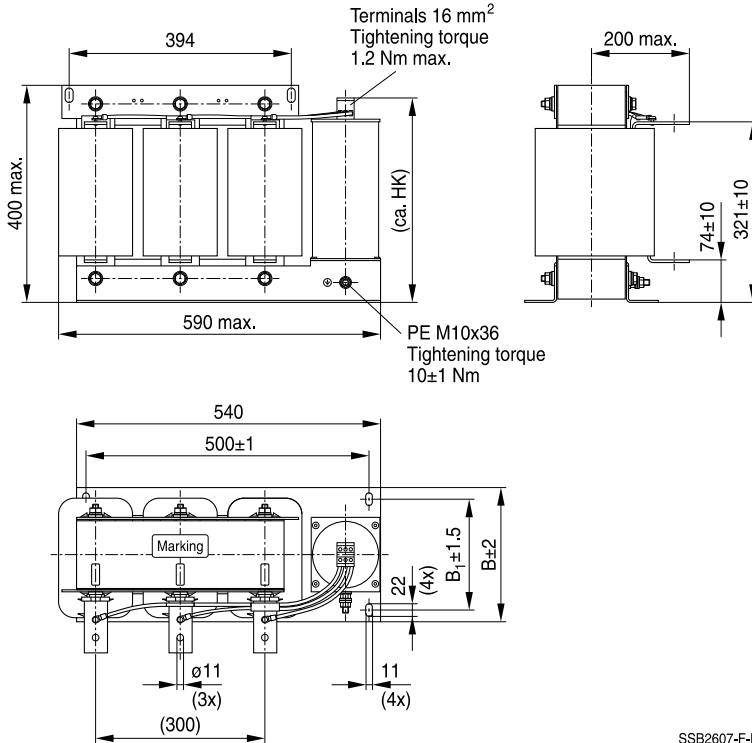


General tolerances according to ISO 2768–cL
Dimensions in mm

Ordering code	L	L ₁	B	B ₁	H	X	A	M
B84143V0095R227	440	400	161	125	400	43	35	3.2 – 3.7
B84143V0132R227	480	400	176	140	430	55	95	15 – 20
B84143V0180R227	500	460	191	155	430	55	95	15 – 20

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Filters 250 A and 320 A



SSB2607-F-E

General tolerances according to ISO 2768–cL
Dimensions in mm

Ordering code	B	B ₁	HK
B84143V0250R227	236	194	370
B84143V0320R227	261	219	450

Sine-wave output filters

Cautions and warnings

Please read all safety and warning notes carefully before installing the EMC filter or filter and putting it into operation (see ). The same applies to the warning signs on the filter. Please ensure that the signs are not removed nor their legibility impaired by external influences.

Death, serious bodily injury and substantial material damage to equipment may occur if the appropriate safety measures are not carried out or the warnings in the text are not observed.

Using according to the terms

The EMC filters and filters may be used only for their intended application within the specified values in low-voltage networks in compliance with the instructions given in the data sheets and the data book. The conditions at the place of application must comply with all specifications for the filter used.

Warning

- It shall be ensured that only qualified persons (electricity specialists) are engaged on work such as planning, assembly, installation, operation, repair and maintenance. They must be provided with the corresponding documentation.
- Danger of electric shock. EMC filters and filters contain components that store an electric charge. Dangerous voltages can continue to exist at the filter terminals for longer than five minutes even after the power has been switched off.
- The protective earth connections shall be the first to be made when the EMC filter or filter is installed and the last to be disconnected. Depending on the magnitude of the leakage currents, the particular specifications for making the protective-earth connection must be observed.
- Impermissible overloading of the EMC filter or filter, such as with circuits able to cause resonances, impermissible voltages at higher frequencies etc. can lead to bodily injury and death as well as cause substantial material damages (e.g. destruction of the filter housing).
- EMC filters and filters must be protected in the application against impermissible exceeding of the rated currents by overcurrent protective circuitry.
- In case of leakage currents >3.5 mA you shall mount the PE conductor stationary with the required cross section before beginning of operation and save it against disconnecting. For leakage currents $I_L^{(1)} < 10$ mA the PE conductor must have a KU value²⁾ of 4.5 A³⁾; for leakage currents $I_L \geq 10$ mA the PE conductor must have a KU value of 6 .⁴⁾
- Sine-wave filters must be protected in the application against impermissible exceeding of the component temperature.
- The converter output frequency must be within the specified range to avoid resonances and uncontrolled warming of the sinusoidal output filter.

1) I_L = leakage current let-go

2) The KU value (symbol KU) is a classification parameter of safety-referred failure types designed to ensure protection against hazardous body currents and excessive heating.

3) A value of KU = 4.5 with respect to interruptions is attained with: a) a permanently connected protective earth circuit ≥ 2.5 mm² connected via shroud connectors (IEC 60309–2) and b) a protective earth circuit.

4) KU = 6 with respect to interruptions is achieved for fixed–connection lines ≥ 10 mm² where the type of connection and line layout correspond to the requirements for PEN conductors as specified in relevant standards.

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The table below summarizes the safety instructions that must be observed without fail. A detailed description can be found in the relevant chapters of the databook.

Topic	Instructions	Reference chapter (databook), paragraph
Selecting a filter	When selecting a filter, it is mandatory to observe the rated data of the equipment (such as its rated input current, rated voltage, harmonic content etc.) as well as the derating instructions in Chapters 9 and 10.	Selector guide for converter filters
Protection from residual voltages Discharge resistors	Active parts must be discharged within 5 s to a voltage of less than 60 V (or 50 μ C). If this limit cannot be observed due to the operating mode, the hazardous point must be permanently marked in a clearly visible way. Filters which are not permanently connected (e.g. when the test voltage is applied to the filter at the incoming goods inspection) must be discharged after the voltage has been switched off.	Safety regulations, 6.1 Safety regulations, 6.2
Installing and removing of EMC filters and filters Installation	When installing and removing our EMC filters und filters, a voltage-free state must be set up and secured with observance of the five safety rules described in EN 50110-1.	Safety regulations, 6.4
Use in IT systems	The special features of the IT system ("first fault case" and other fault cases) shall be observed.	Power distribution system (network types), 7.6
Safety notes on leakage currents	The filter leakage currents specified in the data book are intended for user information only. The maximum leakage current of the entire electrical equipment or appliance is limited for safety reasons. Please obtain the applicable limits for your application from the relevant regulations, provisions and standards.	Leakage current, 8.4 Leakage current, 8.6
Voltage derating Hazards caused by overloading the filters	If the permissible limits for the higher-frequency voltages at the filter are exceeded, the filter may be damaged or destroyed.	Voltage derating, 9.8
Current derating at elevated ambient temperatures	Non-observance of the current derating may lead to overheating and consequently represents a fire hazard.	Current derating, 10.1
Protective earth connection at operating currents >250 A	For operating currents greater than 250 A, we recommend the PE connection to be set up between the feed (filter: line) and output (filter: load) not via the PE terminal bolt in the filter housing.	Mounting instructions, point 2

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Topic	Instructions	Reference chapter (databook), paragraph
Mounting position	Note the mounting position of the filters! It must always be ensured that natural convection is not impaired.	Mounting instructions, point 13
Long motor cables	Long motor cables cause parasitic currents in the installation.	Mounting instructions, point 15

Sine-wave output filters

Symbols and terms

Symbol	English	German
α	Insertion loss	Einfügungsdämpfung
C_R	Rated capacitance	Bemessungskapazität
C_X	Capacitance X capacitor	Kapazität X-Kondensator
C_Y	Capacitance Y capacitor	Kapazität Y-Kondensator
ΔV	Voltage drop (input to output)	Spannungsabfall im Filter
dv/dt	Rate of voltage rise	Spannungsanstiegsgeschwindigkeit
f	Frequency	Frequenz
f_M	Converter output frequency	Motorfrequenz
f_P	Pulse frequency	Pulsfrequenz
f_R	Rated frequency	Bemessungsfrequenz
f_{res}	Resonant frequency	Resonanzfrequenz
I_{LK}	Filter leakage current	Filter-Ableitstrom
I_C	Current through capacitor	Strom durch Kondensator
I_{max}	Maximum current	Maximalstrom
I_N	Nominal current	Nennstrom
I_{op}	Operating current (design current)	Betriebsstrom
I_{pk}	Rated peak withstand current	Bemessungs-Stoßstromfestigkeit
I_q	Capacitive reactive current	Kapazitiver Blindstrom
I_R	Rated current	Bemessungsstrom
I_S	Interference current	Störstrom
L	Inductance	Induktivität
L_R	Rated inductance	Bemessungsinduktivität
L_{stray}	Stray inductance	Streuinduktivität
P_{loss}	Power loss	Verlustleistung
R	Resistance	Widerstand
R_{is}	Insulation resistance	Isolationswiderstand
R_{typ}	DC resistance, typical value	Gleichstromwiderstand, Richtwert
T_A	Ambient temperature	Umgebungstemperatur
T_{max}	Upper category temperature	Obere Kategorietemperatur
T_{min}	Lower category temperature	Untere Kategorietemperatur
T_R	Rated temperature	Bemessungstemperatur
V_{eff}	RMS voltage	Effektivspannung
V_K	Voltage drop in %	Kurzschlußspannung in %
V_{LE}	Voltage line to earth; voltage line to ground	Spannung Phase zu Erdpotential
V_N	Nominal voltage	Netzspannung
V_R	Rated voltage	Bemessungsspannung
V_{peak}	Peak voltage	Spitzenspannung
V_{test}	Test voltage	Prüfspannung
V_X	Voltage over X capacitor	Spannung über X-Kondensator
V_Y	Voltage over Y capacitor	Spannung über Y-Kondensator
Z	Impedance	Scheinwiderstand
$ Z $	Impedance, absolute value	Scheinwiderstand (Betragswert)

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The following applies to all products named in this publication:

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