EMC filters

3-phase line reactors for converters
4 A ... 900 A, 40 °C, 50/60 Hz

Series/Type: **B86305L**
Date: November 2018

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3-phase line reactors for converters
Rated voltage V_R: 520 V AC
Rated current I_R: 4 A to 900 A

Construction
- 3-phase line reactor
- Natural cooling

Features
- Easy to install
- Low weight
- Compact design
- Design complies with IEC 60076-6
- Degree of protection[1]:
  IP20 (4 A ... 21 A, 35 A, 46 A)
  IP10 (30 A, 50 A, 60 A)
  IP00 (75 A ... 900 A)
- Inductance constant up to $1.5 \times I_R$
- Inductance higher than 60% rated value at $3 \times I_R$
- UL approved insulation system
  T-EIS-CF1 c UL us

Typical applications
- Frequency converters for motor drives, e.g.
  - elevators
  - pumps
  - traction systems
  - conveyor systems
  - HVAC systems (heating, ventilation and air conditioning)
- Power supplies

Terminals
- Finger-safe terminal blocks (< 75 A)
- Busbars from 75 A

Marking
Marking on component:
Manufacturer's logo, ordering code, rated current, rated frequency, inductance, approximate weight, date code

Minimum data on packaging:
Manufacturer's logo, ordering code, quantity, date code

1) According to IEC 60529

Technical data and measuring conditions

Rated voltage V_R	520 V AC (50/60 Hz)
Rated current I_R	Referred to 40 °C rated temperature
Test voltage V_{test}	1100 V DC, 2 s (line/line) 2500 V DC, 2 s (lines/case)
Relative voltage drop u_k in %	At I_R; 50 Hz and 400 V AC
Insulation class	F (155 °C)
Overload capability (thermal)	$3 \cdot I_R$, t < 3 s in 300 s
Climatic category (IEC 60068-1)	25/100/21 (−25 °C/+100 °C/21 days damp heat test)
Approvals	Insulation system class 155 (F); T-EIS-CF1 UL 1446

Characteristics and ordering codes

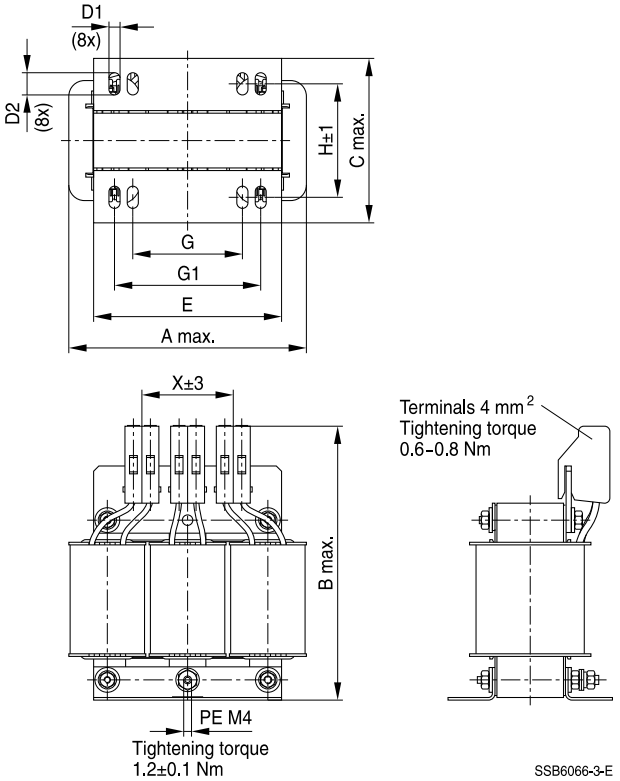
I_R* A	u_k %	R_{typ} [1] mΩ	L_R [2] mH	P_L [3] W	Approx. weight kg	Ordering code
V_R = 520 V AC						
4	5.4	335.0	10.0	25	1.5	B86305L0004R000
7	4.0	112.0	4.2	31	2.1	B86305L0007R000
10	5.4	78.0	4.0	43	2.6	B86305L0010R000
11	3.6	63.0	2.6	37	2.5	B86305L0011R000
16	4.4	42.2	2.0	65	3.0	B86305L0016R000
21	4.0	24.0	1.4	62	4.8	B86305L0021R000
30	4.1	12.4	1.0	50	5.5	B86305L0030R000
35	4.0	11.0	0.84	80	6.6	B86305L0035R000
46	4.0	8.0	0.64	94	8.5	B86305L0046R000
50	4.1	7.8	0.6	120	8.4	B86305L0050R000
60	4.1	6.2	0.5	100	8.5	B86305L0060R000
75	4.1	5.7	0.4	170	12.0	B86305L0075S000
100	4.1	3.2	0.3	160	15.0	B86305L0100S000
156	4.2	1.47	0.2	250	21.5	B86305L0156S000
230	4.7	0.9	0.15	340	32.0	B86305L0230S000
390	4.0	0.46	0.075	400	49.2	B86305L0390S000
600	4.1	0.3	0.05	650	65.5	B86305L0600S000
800	4.1	0.2	0.038	880	84.5	B86305L0800S000
900	4.2	0.19	0.034	990	90.5	B86305L0900S000

1) Typical value at 20 °C, tolerance ±10%
2) Tolerance −0%/+20%,
3) At I_R , 50 Hz, 20 °C

* Higher current values upon request

Dimensional drawings

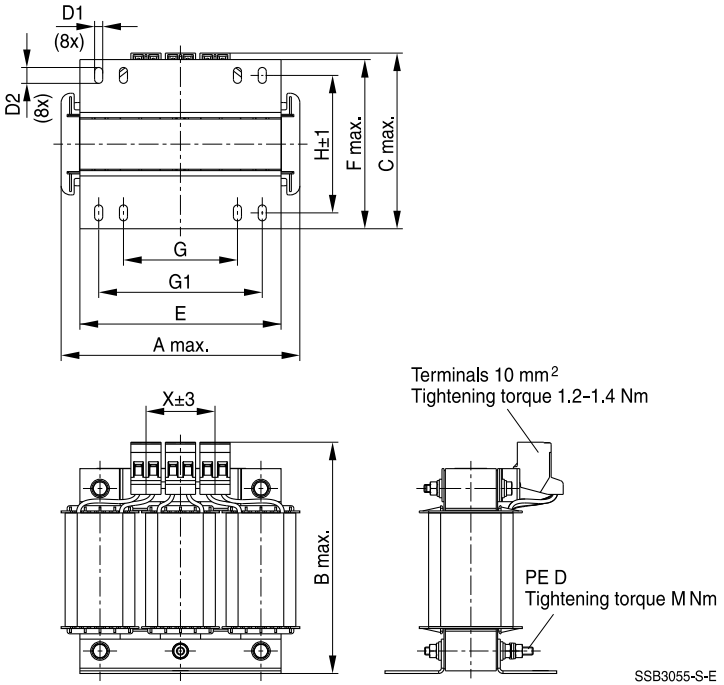
B86305L0004R000 ... B86305L0021R000 (4 A ... 21 A)



Ordering code	A	B	C	D1 × D2	E	G	G1	H	X
B86305L0004R000	100	135	60	6 × 9	80	40	60	42	40
B86305L0007R000	124	123	93	6 × 12	100	60	80.5	60	34
B86305L0010R000	130	150	90	6 × 12	100	60	80.5	62	50
B86305L0011R000	124	123	93	6 × 12	100	60	80.5	60	34
B86305L0016R000	130	150	90	6 × 12	100	60	80.5	62	50
B86305L0021R000	154	149	117	6 × 12	125	75	107	88	50

General tolerances according to ISO 2768−cL
Dimensions in mm

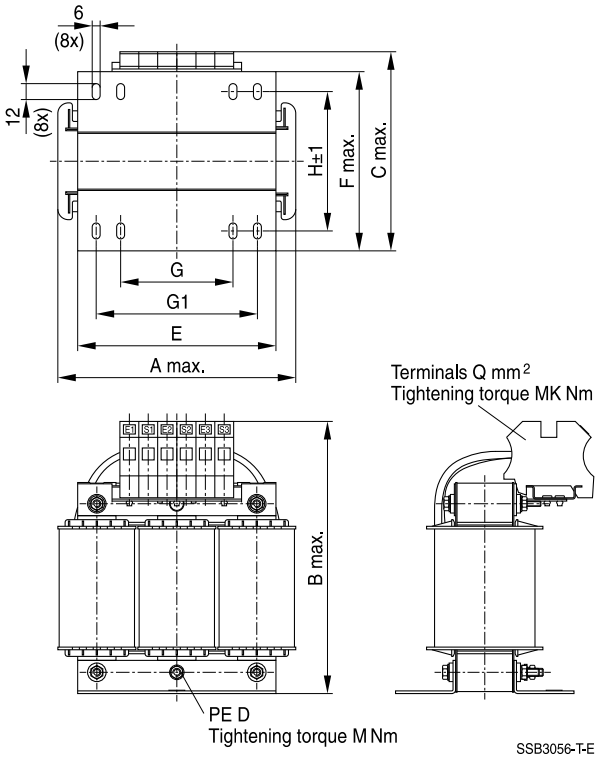
B86305L0035R000, B86305L0046R000 (35 A, 46 A)



Ordering code	A	B	C	D1 × D2	E	F	G	G1	H	X	D	M (Nm)
B86305L0035R000	154	153	137	6 × 12	125	127	75	107	98	51.5	M4	1.2±0.1
B86305L0046R000	183	180	138	6 × 12	150	133	85	122	104	51.5	M6	3.0±0.15

General tolerances according to ISO 2768−cL
Dimensions in mm

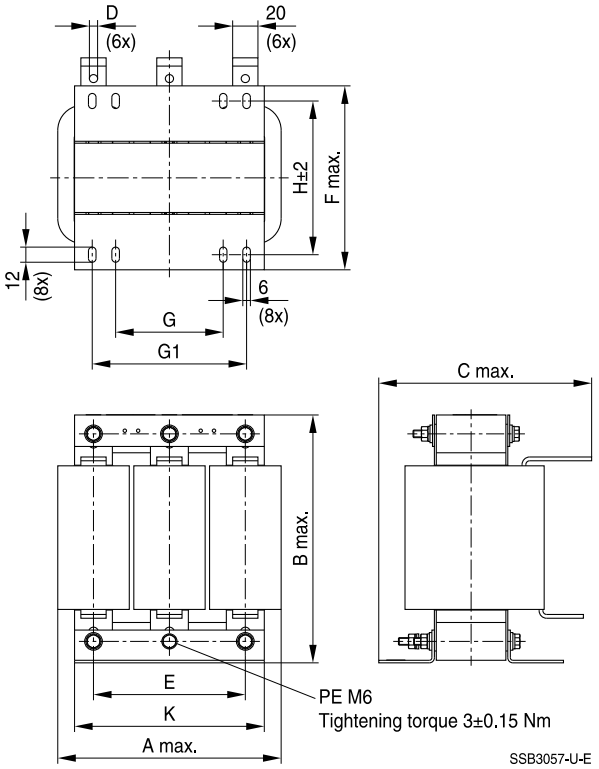
B86305L0030R000, B86305L0050R000, B86305L0060R000 (30 A, 50 A, 60 A)



Ordering code	A	B	C	E	F	G	G1	H	Q (mm^2)	MK (Nm)	D	M (Nm)
B86305L0030R000	155	170	135	125	120	75	107	90	16	2.0-2.3	M4	1.2±0.1
B86305L0050R000	185	200	150	150	131	85	122	104.5	16	2.0-2.3	M6	3.0±0.15
B86305L0060R000	180	205	150	150	135	85	122	105	35	3.2-3.7	M6	3.0±0.15

General tolerances according to ISO 2768−cL
Dimensions in mm

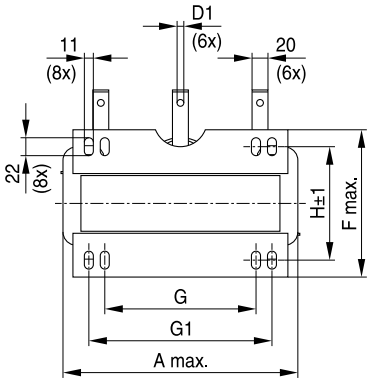
B86305L0075S000 (75 A)

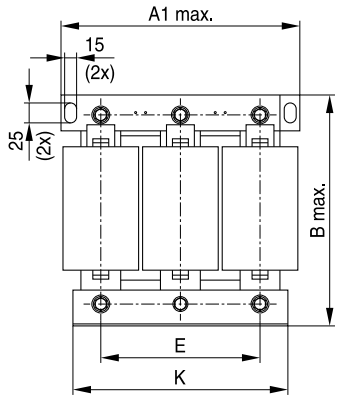


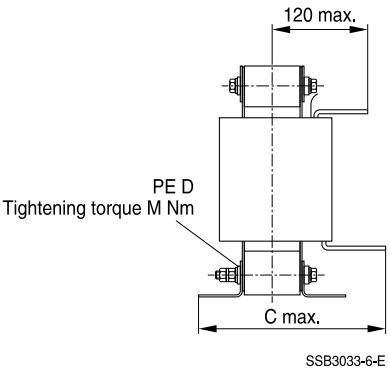
Ordering code	A	B	C	∅D	E	F	G	G1	H	K
B86305L0075S000	185	202	175	6.5	120	148	85	122	122	150

General tolerances according to ISO 2768−cL
Dimensions in mm

B86305L0100S000 ... B86305L0390S000 (100 A ... 390 A)



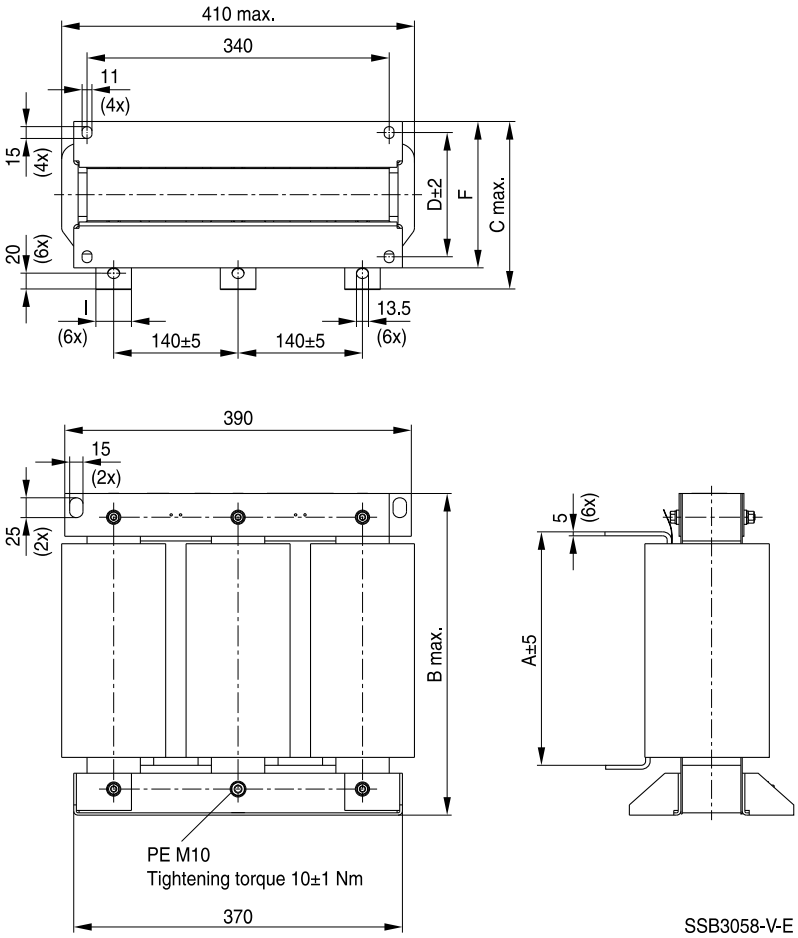




Ordering code	A	A1	B	C	∅D1	E	F	G	G1	H	K	D	M (Nm)
B86305L0100S000	270	270	210	180	6.5	180	145	105	181	100	240	M8	6±0.3
B86305L0156S000	280	270	215	200	8.5	180	155	105	181	113	240	M8	6±0.3
B86305L0230S000	320	300	290	235	8.5	200	185	190	230	142	270	M10	10±1
B86305L0390S000	320	300	300	235	11	200	210	190	230	169	270	M8	6±0.3

General tolerances according to ISO 2768−cL
Dimensions in mm

B86305L0600S000…B86305L0900S000 (600 A…900 A)



Ordering code	A	$B_{max.}$	$C_{max.}$	D	I	$F_{max.}$
B86305L0600S000	295	410	230	157	40	190
B86305L0800S000	370	470	250	167	50	200
B86305L0900S000	370	470	260	177	50	210

General tolerances according to ISO 2768−cL
Dimensions in mm

Cautions and warnings

Please read all safety and warning notes carefully before installing the 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 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. 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 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 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).
- Filters must be protected in the application against impermissible exceeding of the rated currents by overcurrent protective devices.
- 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 value[2] of 4.5[3]; for leakage currents I_L >10 mA the PE conductor must have a KU value of 6[4].
- Output chokes and output 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 output chokes and output filters.
- Because the product can become very hot during operation, there is the risk of burns if touched. The product can remain hot for some time after the power is switched off!

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) permanently connected protective earth connection ≥1.5 mm² and b) a protective earth connection ≥2.5 mm² via connectors for industrial equipment (IEC 60309−2)
4) KU = 6 with respect to interruptions is achieved for fixed-connection lines ≥10 mm² where the type of connection and installation correspond to the requirements for PEN conductors as specified in relevant standards.

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 (data book), 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.	Selection guide for converter filters
Rated voltage	When power distribution systems deviating from the symmetric TN-S system is to check the suitability of the filters and the allowed voltages including the fault cases.	Power distribution systems, 7
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.	Safety regulations, 6.1
	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, 6.2
Installing and removing of filters Installation	When installing and removing our 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 has to be 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 exeeded, 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

Topic	Instructions	Reference chapter (data book), paragraph
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
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. The cable lengths indicated for the output chokes and output filters serve for orientation. The user must check the technical parameters and especially the choke temperatures for the respective application.	Mounting instructions, point 15

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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_C	Current through capacitor	Strom durch Kondensator
I_{LK}	Filter leakage current	Filter-Ableitstrom
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_L	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
u_k	Refered voltage drop in %	Bezogener Spannungsabfall in %
V_{eff}	RMS voltage	Effektivspannung
V_K	Voltage drop	Spannungsabfall
V_{LE}	Voltage line to earth; voltage line to ground	Spannung Phase zu Erdpotential
V_N	Nominal voltage	Nennspannung
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
X_L	Inductive reactance	Induktiver Blindwiderstand
Z	Impedance	Scheinwidertand
|Z|	Impedance, absolute value	Scheinwiderstand (Betragswert)

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or lifesaving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.
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Important notes

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Release 2018-10

Mouser Electronics

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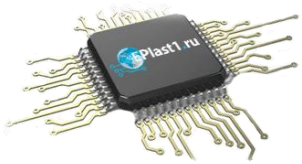
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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