Filters for power lines with HEMP-Protection according to MIL-STD 188-125-1

250/440 V, 50/60 Hz, 32/100 A

Series/Type: B84299C/D1101/2320E303/E313
Date: September 2017

© EPCOS AG 2017. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without EPCOS’ prior express consent is prohibited.

EPCOS AG is a TDK Group Company.
Filters for power lines with HEMP-Protection
250/440 V, 50/60 Hz, 32/100 A

Features
- General-purpose use through design with separate lines without intercoupling
- Use of single chokes. Thus the insertion loss values are not reduced under all operating current conditions and not when operated with artificial mains networks (AMN) or other equipment with high leakage currents
- Insertion loss to EN 55017

Design
The electrical components are incorporated in an RF-tight case of stainless steel. The cables enter through glands. The RF-tight termination of the openings is produced by specially shaped lids.

The output conductors and equipment grounding conductor are connected by threaded bolts and the input conductors are connected by bus bars. The surface around the fixing holes is left as bare metal (unpainted) to ensure good RF contact with metal surfaces (chassis, ground).

Protective measures (grounding)
The high capacitances between the lines and ground require special protective measures. If there are no product-specific requirements, protection with a secondary ground wire (cross section min. 10 mm²) in accordance with EN 50178 is necessary. For this purpose the filter case have connecting bolts at each end.

Resistors are incorporated in the filter to discharge capacitors after turn-off.

Scope of supply
Filters are supplied complete with all parts required for RF-tight installation (fixing screws, flanges, RF gaskets, cable glands) and installation instructions.

Installation
No welding is needed on the shielding wall, so any subsequent installation is quite simple.

Accessories and special versions
RF-tight flexible connector fittings are available for installation spaced away from the shielding wall. To match requirements, filters can be supplied with different kinds of EMC or shielding cable glands.

Tests
All filters are 100% tested and the results are archived under a filter's serial number. If required, a test report can be generated for the serial number.
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Technical data and measuring conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage [L–PE / L–L]</td>
<td>250/440 V AC (50/60 Hz)</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>f_R 50/60 Hz</td>
</tr>
<tr>
<td>Rated current</td>
<td>I_R  See characteristics</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>P_D See characteristics</td>
</tr>
<tr>
<td>Test voltage line to line for 2 s¹)</td>
<td>V_{test} 1200 V DC</td>
</tr>
<tr>
<td>Test voltage line to case for 2 s¹)</td>
<td>V_{test} 1200 V DC</td>
</tr>
<tr>
<td>Rated temperature</td>
<td>T_R 40 °C</td>
</tr>
<tr>
<td>Overload capability (thermal)</td>
<td>I_{over} 75 x I_R for 50 ms 10 x I_R for 1 s 2 x I_R for 1 min 1.4 x I_R for 15 min</td>
</tr>
<tr>
<td>Reactive current of each phase line at 230/400 V</td>
<td>I_{reactive} At U_R and 50 Hz, see characteristics</td>
</tr>
<tr>
<td>Leakage current (IEC 60939−1: 2010, Annex A)</td>
<td>I_{LK} At U_R and 50 Hz, see characteristics</td>
</tr>
<tr>
<td>Max. permissible harmonic distortion (THD)</td>
<td>THD_{max} 8% according to EN 50160</td>
</tr>
<tr>
<td>Climatic category (IEC 60068-1: 1992)</td>
<td>THD_{max} 8% according to EN 50160</td>
</tr>
<tr>
<td>Permissible ambient temperature</td>
<td>–25 to +40 °C</td>
</tr>
<tr>
<td>Degree of protection (IEC 60529: 2013)</td>
<td>IP 20</td>
</tr>
<tr>
<td>Max. DC resistance</td>
<td>R_{DC} See characteristics</td>
</tr>
</tbody>
</table>

¹) EMP-protection components disconnected
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Characteristics and ordering codes

<table>
<thead>
<tr>
<th>$I_R$ A</th>
<th>Mech. version(^1)</th>
<th>Terminal(^2)</th>
<th>$R_{DC}$ mΩ</th>
<th>$P_D$ W</th>
<th>$I_{reactive}$ A</th>
<th>$I_{LK}$ mA</th>
<th>Dimensional drawing</th>
<th>Circuit diagram</th>
<th>Appr. weight kg</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter for assembly from outside to the shielded wall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 x 32 C</td>
<td>Bus bar/M6</td>
<td>&lt; 30</td>
<td>90</td>
<td>2.3</td>
<td>303</td>
<td>1</td>
<td>1</td>
<td>40</td>
<td>B84299C2320E303</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>B84299D2320E303</td>
<td></td>
</tr>
<tr>
<td>4 x 100 C</td>
<td>Bus bar/M8</td>
<td>&lt; 4</td>
<td>120</td>
<td>6.5</td>
<td>680</td>
<td>3</td>
<td>2</td>
<td>76</td>
<td>B84299C1101E303</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>B84299D1101E303</td>
<td></td>
</tr>
<tr>
<td>Filter for assembly from inside to the shielded wall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 x 32 C</td>
<td>Bus bar/M6</td>
<td>&lt; 30</td>
<td>90</td>
<td>2.3</td>
<td>303</td>
<td>5</td>
<td>3</td>
<td>40</td>
<td>B84299C2320E313</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td>B84299D2320E313</td>
<td></td>
</tr>
<tr>
<td>4 x 100 C</td>
<td>Bus bar/M8</td>
<td>&lt; 4</td>
<td>120</td>
<td>6.5</td>
<td>680</td>
<td>7</td>
<td>4</td>
<td>76</td>
<td>B84299C1101E313</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td>B84299D1101E313</td>
<td></td>
</tr>
</tbody>
</table>

1) Connection to the shielding
   C = at front side
   D = at bottom side
2) Bus bars at input side/threaded bolts at protected side

Please read Cautions and warnings and Important notes at the end of this document.
Filters for power lines with HEMP-Protection

Assembly of filters

Filters B84299C2320E303, B84299C1101E303 for assembly at outside to the shielded wall

Filters B84299D2320E303, B84299D1101E303 for assembly at outside to the shielded wall

Filters B84299C2320E313, B84299C1101E313 for assembly at inside to the shielded wall

Please read Cautions and warnings and Important notes at the end of this document.
Filters B84299D2320E313, B84299D1101E313 for assembly at inside to the shielded wall

![Diagram of filter assembly](image)

**Approvals / Test reports acc. to MIL-STD 188-125-1**

<table>
<thead>
<tr>
<th>Ordering code</th>
<th>Test report from EMCCCons DR. RAŠEK GmbH &amp; Co. KG <a href="http://www.emcc.de">www.emcc.de</a></th>
<th>Test acc. MIL-STD 188-125-1 (short and intermediate pulse test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B84299…</td>
<td>Response current pulse</td>
<td>Response current intermediate pulse</td>
</tr>
<tr>
<td>…C2320E303</td>
<td>Test report EMCC-860009.1DBB, 2016-09-16</td>
<td>2.61 A max.</td>
</tr>
<tr>
<td>…D2320E303</td>
<td>Test report EMCC-860009.1DBB, 2016-09-16</td>
<td>9.57 A</td>
</tr>
<tr>
<td>…C1101E303</td>
<td>Test report EMCC-860009.1G, 2016-09-01</td>
<td>2.75 A max.</td>
</tr>
<tr>
<td>…D1101E303</td>
<td>Test report EMCC-860009.1G, 2016-09-01</td>
<td>18.11 A</td>
</tr>
<tr>
<td>Filter for assembly from inside to the shielded wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>…C2320E313</td>
<td>Test report EMCC-860009.1DBB, 2016-09-16</td>
<td>2.61 A max.</td>
</tr>
<tr>
<td>…D2320E313</td>
<td>Test report EMCC-860009.1DBB, 2016-09-16</td>
<td>9.57 A</td>
</tr>
<tr>
<td>…C1101E313</td>
<td>Test report EMCC-860009.1G, 2016-09-01</td>
<td>2.75 A max.</td>
</tr>
<tr>
<td>…D1101E313</td>
<td>Test report EMCC-860009.1G, 2016-09-01</td>
<td>18.11 A</td>
</tr>
</tbody>
</table>
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Circuit diagram 1: B84299C2320E303, B84299D2320E303 (4 × 32 A)

Circuit diagram 2: B84299C1101E303, B84299D1101E303 (4 × 100 A)

Please read Cautions and warnings and Important notes at the end of this document.
Filters for power lines with HEMP-Protection
250/440 V, 50/60 Hz, 32/100 A
B84299C/D1101/2320E303/E313

Circuit diagram 3: B84299C2320E313, B84299D2320E313 (4 × 32 A)

Circuit diagram 4: B84299C1101E313, B84299D1101E313 (4 × 100 A)

Please read Cautions and warnings and Important notes at the end of this document.
Insertion loss $a_e$ as a function of frequency $f$ (typical values at $Z = 50$ Ohm)

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

1) According to MIL-STD 285

Test setup:

![Diagram of test setup]

Shielding effectiveness of filter housing acc. MIL-STD 188-125-1/2

Requirement of MIL-STD 188-125
Filters for power lines with HEMP-Protection
250/440 V, 50/60 Hz, 32/100 A B84299C/D1101/2320E303/E313

Dimensional drawings
Drawing 1 – B84299C2320E303 (4 × 32 A) for assembly from outside to the shielded wall

Shielded, protected output side
Drawing 1 – B84299C2320E303 (4 × 32 A) – details of connection

Input side

Shielded, protected output side

1) Cable glands PG 29* with indented sealing ring,
   for cable diameters [mm]: 17 ... 19 / 20 ... 22 / 23 ... 25 / 26 ... 28
   With reducer*:
2) Cable glands PG 21* with indented sealing ring,
   for cable diameters [mm]: 9 ... 11 / 12 ... 14 / 15 ... 17 / 18 ... 20

* Included in delivery
Drawing 2 – B84299D2320E303 (4 × 32 A) for assembly from outside to the shielded wall

Shielded, protected output side

Please read Cautions and warnings and Important notes at the end of this document.
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Drawing 2 – B84299D2320E303 (4 × 32 A) – details of connection

Input side

Shielded, protected output side

4x ø11
M10 x 20

PE-bolt M8 x 25

1), 2)

PE-bolt M6 x 20

Bolt M6

RF-sealing

1) Cable glands PG 29* with indented sealing ring,
for cable diameters [mm]: 17 ... 19 / 20 ... 22 / 23 ... 25 / 26 ... 28
With reducer*:
2) Cable glands PG 21* with indented sealing ring,
for cable diameters [mm]: 9 ... 11 / 12 ... 14 / 15 ... 17 / 18 ... 20

* Included in delivery
Drawings 3 – B84299C1101E303 (4 × 100 A) for assembly from outside to the shielded wall

View B

Shielded, protected side

RF-tight partition

M8 x 20

View A

Input side
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Drawing 3 – B84299C1101E303 (4 × 100 A) – details of connection

View A

View B

Input side

Shielded, protected output side

4x ø11 M10 x 20

PE-bolt M8 x 25

PE-bolt M8 x 25

1) Cable glands PG 42* with indented sealing ring,
   for cable diameters [mm]: 29 … 31 / 32 … 34 / 35 … 37 / 38 … 40

* Included in delivery

Please read Cautions and warnings and Important notes at the end of this document.
Drawing 4 – B84299D1101E303 (4 × 100 A) for assembly from outside to the shielded wall

Shielded, protected output side

RF-tight partition

M8 x 20

Input side

Please read Cautions and warnings and Important notes at the end of this document.
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Drawing 4 – B84299D1101E303 (4 × 100 A) – details of connection

Input side

Shielded, protected output side

1) Cable glands PG 42* with indented sealing ring,
   for cable diameters [mm]: 29 ... 31 / 32 ... 34 / 35 ... 37 / 38 ... 40

* Included in delivery
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Drawing 5 – B84299C2320E313 (4 × 32 A) for assembly from inside to the shielded wall

Shielded input side

Protected output side
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Drawing 5 – B84299C2320E313 (4 × 32 A) – details of connection

Shielded input side

Protected output side

1) Cable glands PG 29* with indented sealing ring,
   for cable diameters [mm]: 17 ... 19 / 20 ... 22 / 23 ... 25 / 26 ... 28
   With reducer*:
2) Cable glands PG 21* with indented sealing ring,
   for cable diameters [mm]: 9 ... 11 / 12 ... 14 / 15 ... 17 / 18 ... 20

* Included in delivery

SS82905-H-E

Please read Cautions and warnings and Important notes at the end of this document.
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Drawing 6 – B84299D2320E313 (4 × 32 A) for assembly from inside to the shielded wall

Shielded input side

Protected output side

Please read Cautions and warnings and Important notes at the end of this document.
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

Drawing 6 – B84299D2320E313 (4 × 32 A) – details of connection

Shielded input side

Protected output side

1) Cable glands PG 29* with indented sealing ring,
   for cable diameters [mm]: 17 ... 19 / 20 ... 22 / 23 ... 25 / 26 ... 28
   With reducer*:
2) Cable glands PG 21* with indented sealing ring,
   for cable diameters [mm]: 9 ... 11 / 12 ... 14 / 15 ... 17 / 18 ... 20

* Included in delivery
Drawing 7 – B84299C1101E313 (4 × 100 A) for assembly from inside to the shielded wall
Filters for power lines with HEMP-Protection
250/440 V, 50/60 Hz, 32/100 A
B84299C/D1101/2320E303/E313

Drawing 7 – B84299C1101E313 (4 × 100 A) – details of connection

Protected output side

Shielded input side

1) Cable glands PG 42* with indented sealing ring,
   for cable diameters [mm]: 29 … 31 / 32 … 34 / 35 … 37 / 38 … 40

* Included in delivery
Please read Cautions and warnings and Important notes at the end of this document.
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

Drawing 8 – B84299D1101E313 (4 × 100 A) – details of connection

View A

View B

Bolt M8

PE-bolt M6 × 20

PE-bolt M8 × 25

PE-bolt M8 × 25

1) Cable glands PG 42* with indented sealing ring,
for cable diameters [mm]: 29 ... 31 / 32 ... 34 / 35 ... 37 / 38 ... 40

* Included in delivery

1)
Filters for power lines with HEMP-Protection

250/440 V, 50/60 Hz, 32/100 A

B84299C/D1101/2320E303/E313

RF-tight connection of types B84299C2… with connection hole 37 mm

Note: The bending radius of the flexible conduit depends on the used type of cable

RF-tight connection of types B84299C1… with connection hole 54 mm

Note: The bending radius of the flexible conduit depends on the used type of cable

RF-tight connection of types B84299D2… with connection hole 37 mm

1) Included in delivery

Please read Cautions and warnings and Important notes at the end of this document.
RF-tight connection of types B84299D1… with connection hole 54 mm

1) Included in delivery
Please read all safety and warning notes carefully before installing the filter and putting it into operation. 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 \( I_L \leq 10 \text{ mA} \) the PE conductor must have a KU value of \( 4.5 \) \(^2\); for leakage currents \( I_L >10 \text{ mA} \) the PE conductor must have a KU value of \( 6 \). 
- 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!

**Display of ordering codes for EPCOS products**

The ordering code for one and the same EPCOS product can be represented differently in data sheets, data books, other publications, on the EPCOS website, or in order-related documents such as shipping notes, order confirmations and product labels. The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products. Detailed information can be found on the Internet under [www.epcos.com/orderingcodes](http://www.epcos.com/orderingcodes)

---

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) \( I_L \) = A value of KU = 4.5 with respect to interruptions is attained with: a) permanently connected protective earth connection \( \geq 1.5 \text{ mm}^2 \) and b) a protective earth connection \( \geq 2.5 \text{ mm}^2 \) via connectors for industrial equipment (IEC 6030902)
4) KU = 6 with respect to interruptions is achieved for fixed-connection lines \( \geq 10 \text{ mm}^2 \) where the type of connection and installation correspond to the requirements for PEN conductors as specified in relevant standards.
## Symbols and terms

<table>
<thead>
<tr>
<th>Symbol</th>
<th>English</th>
<th>German</th>
</tr>
</thead>
<tbody>
<tr>
<td>$dv/dt$</td>
<td>Rate of voltage rise</td>
<td>Spannungsanstiegsgeschwindigkeit</td>
</tr>
<tr>
<td>$f_R$</td>
<td>Rated frequency</td>
<td>Bemessungsfrequenz</td>
</tr>
<tr>
<td>$f_{Pass}$</td>
<td>Passband</td>
<td></td>
</tr>
<tr>
<td>$I_{LK}$</td>
<td>Filter leakage current</td>
<td>Filter-Ableitstrom</td>
</tr>
<tr>
<td>$I_{reactive}$</td>
<td>Capacitive reactive current</td>
<td>Kapazitiver Blindstrom</td>
</tr>
<tr>
<td>$I_N$</td>
<td>Nominal current</td>
<td>Nennstrom</td>
</tr>
<tr>
<td>$I_R$</td>
<td>Rated current</td>
<td>Bemessungsstrom</td>
</tr>
<tr>
<td>$I_{over}$</td>
<td>Overcurrent</td>
<td>Überstrom</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Power dissipation</td>
<td>Verlustleistung</td>
</tr>
<tr>
<td>$R_I$</td>
<td>Internal resistance</td>
<td>Innenwiderstand</td>
</tr>
<tr>
<td>$R_{DC}$</td>
<td>Maximum DC resistance</td>
<td>Max. Gleichstromwiderstand</td>
</tr>
<tr>
<td>$T_A$</td>
<td>Ambient temperature</td>
<td>Umgebungstemperatur</td>
</tr>
<tr>
<td>$T_D$</td>
<td>Transverse delay time</td>
<td></td>
</tr>
<tr>
<td>$T_R$</td>
<td>Rated temperature</td>
<td>Bemessungstemperatur</td>
</tr>
<tr>
<td>$THD_{max}$</td>
<td>Max. permissible harmonic distortion</td>
<td></td>
</tr>
<tr>
<td>$V_{br}$</td>
<td>Breakdown voltage</td>
<td></td>
</tr>
<tr>
<td>$V_{cl}$</td>
<td>Max. clamping voltage</td>
<td></td>
</tr>
<tr>
<td>$V_N$</td>
<td>Nominal network voltage</td>
<td>Netzspannung</td>
</tr>
<tr>
<td>$V_{test}$</td>
<td>Test voltage</td>
<td>Prüfspannung</td>
</tr>
<tr>
<td>$V_R$</td>
<td>Rated voltage</td>
<td>Bemessungsspannung</td>
</tr>
<tr>
<td>$Z$</td>
<td>Impedance</td>
<td>Scheinwiderstand</td>
</tr>
<tr>
<td>$Z_L$</td>
<td>Line impedance</td>
<td>Leitungsimpedanz</td>
</tr>
<tr>
<td>$\alpha_e$</td>
<td>Insertion loss</td>
<td>Einfügungsdämpfung</td>
</tr>
<tr>
<td>$\Delta V$</td>
<td>Voltage drop</td>
<td>Spannungsabfall</td>
</tr>
</tbody>
</table>
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 life-saving 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.

5. We constantly strive to improve our products. Consequently, the products described in this publication may change from time to time. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.

We also reserve the right to discontinue production and delivery of products. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

6. Unless otherwise agreed in individual contracts, all orders are subject to our General Terms and Conditions of Supply.

7. Our manufacturing sites serving the automotive business apply the IATF 16949 standard. The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that only requirements mutually agreed upon can and will be implemented in our Quality Management System. For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.

8. The trade names EPCOS, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, ThermoFuse, WindCap are trademarks registered or pending in Europe and in other countries. Further information will be found on the Internet at www.tdk-electronics.tdk.com/trademarks.

Release 2018-10