



Lightning and surge protection for battery storage systems

White Paper



Contents

- Danger in storms
- Damage to battery storage systems
- What does the standard say?
- Causes of transient overvoltages
- PV storage systems (Metal container with air-termination tips)
- Battery storage systems for the power grid (Concrete container with HVI lightning protection)
- Selection of lightning and surge protective devices

Lightning and surge protection for battery storage systems

White Paper



Danger in storms

Several billion lightning flashes come down in the world each year. In Germany alone, more than 2 million lightning events are recorded annually and the tendency is rising. If lightning strikes in the direct vicinity, it damages buildings and the infrastructure: lightning strikes can cause fires or surge damage to electrical devices and systems. The latter also applies to lightning strikes up to 2 km away. The switching of a battery storage system or of a transformer in the grid may cause switching overvoltages and damage. It often takes only very small surges to damage electronic equipment.

Damage to battery storage systems

Power storage systems are one of the key technologies of the energy revolution as they make it possible to store locally produced electricity on site. The container battery storage systems store the power generated, e.g., by photovoltaic systems and wind turbines, and feed it back on demand. Thanks to decentral storage, they also reinforce network stability and can be used by the network operator to provide balanced power. The constantly increasing proportion of renewable energies leads to an increase in the number of grid-connected storage systems required. Correspondingly, this increases the efficiency of renewable energies. The implementation of inverters with mains filters improves the voltage quality. In addition, battery storage for the power grid forms the basis for energy management (so-called "peak shaving").

In order to provide optimum protection for the high-end electronics in storage containers, one needs a comprehensive light-

ning and surge protection system. Even more so, in view of the fact that the installation location and the operating conditions may vary considerably due to the mobile nature of the containers and their planned worldwide installation. The greatest danger for battery storage systems is lightning discharge. The resulting overvoltage far exceeds the dielectric strength of the electronic components in the storage system. In addition, network-related voltage peaks, e.g., from switching operations or earth and short circuits must be considered a potential threat. The result is defective electronic components, e.g., information and communication technology and defective inverters or battery units. In the case of a direct strike, the metal roof may also be perforated resulting in water damage when it rains.

The constant availability of these storage systems is also a key issue. As damage leads to serious economic consequences and expensive maintenance and repair work, it is important to make provisions for a reliable lightning and surge protection concept.

What does the standard say?

The standard series IEC 60364 comprises installation standards and is therefore applicable to fixed installations. Permanently wired, non-mobile battery storage systems fall under the scope of IEC 60364.

IEC 60364-4-44 deals with the protection of electrical systems in case of transient overvoltages resulting from atmospheric influences transmitted via the supply network, including direct lightning strikes in the supply lines and transient overvoltages caused by switching operations.

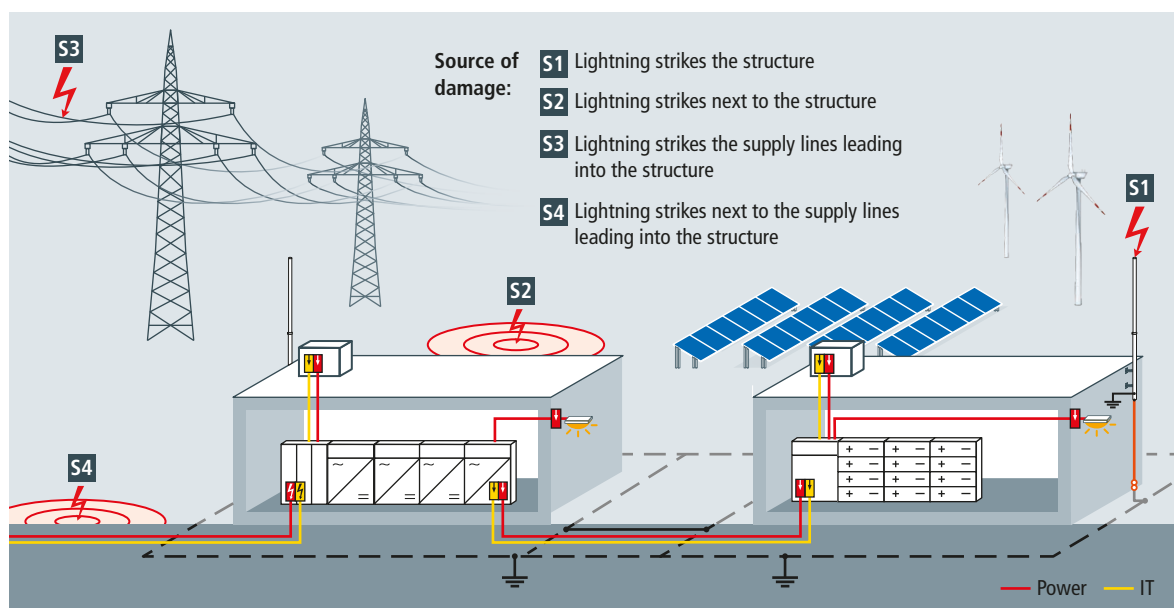


Figure 1 Causes of overvoltages

Lightning and surge protection for battery storage systems

White Paper



It provides conclusions as to whether surge protective measures are required, assesses the risk of the location, defines surge protection categories and the correspondingly required rated impulse withstand voltage levels of the equipment, and defines whether additional surge protective devices are necessary. It also considers the required availability of the system.

A risk analysis according to IEC 62305-2 is carried out to determine which external lightning protection measures are required, for example, which class of LPS needs to be considered in the planning and implemented in the lightning protection concept. If, for example, the risk analysis reveals the necessity for a lightning protection system of class 3 of LPS, IEC 62305-3 must be followed.

The German rule of application VDE-AR-E 2510-2 "Stationary battery energy storage systems for connection to the low-voltage network" also stipulates that provisions should be made for lightning and surge protection measures in the connection concept. If lightning and surge protection measures are implemented in compliance with IEC 60364-4-44 and IEC 62305, they should be installed in accordance with IEC 60364-5-53.

Causes of transient overvoltages

A direct strike in the battery energy storage system or in the supply line is characterised by lightning current with the impulse waveform 10/350 μ s. Distant lightning strikes or so-called indirect lightning strikes lead to conducted partial lightning currents (impulse waveform 10/350 μ s) in the supply lines, or also to induced / capacitive couplings (impulse 8/20 μ s) in the electronic components of the storage system itself (so-

called LEMP = Lightning ElectroMagnetic Pulse) (Figure 1). In addition, overvoltages can be caused by switching operations, earth and short circuits or the tripping of fuses (so-called SEMP = Switching ElectroMagnetic Pulse).

PV storage systems (Metal container with air-termination tips)

If PV power stations are equipped with a battery storage system, the electronic equipment, battery and inverter need to be protected against surges.

Figure 2 shows a PV storage system (container construction) which discharges the direct lightning strike to the soil via the metal housing of the container. To prevent a direct strike from melting holes in the metal roof, the four corners are fitted with air-termination tips as defined strike points. The earthing system illustrated consists of a 30 x 3.5 mm flat strip or, alternatively, a round wire with a diameter of 10 mm.

To ensure the durability and functionality of the earthing system, it is advisable to use a permanently corrosion resistant material such as stainless steel V4A (1.4404). This safeguards personal safety and the discharge of lightning currents to the earth for many years to come. The equipment inside the container is protected in a similar way to a Faraday cage, i.e., the separation distances to the electrical components inside must be kept. Suitable lightning current and surge arresters should be installed as closely as possible to where the mains supply lines enter the container in order to discharge any interference impulse coupling via these copper-based lines. We recommend the use of a protective device from the DEHNventil

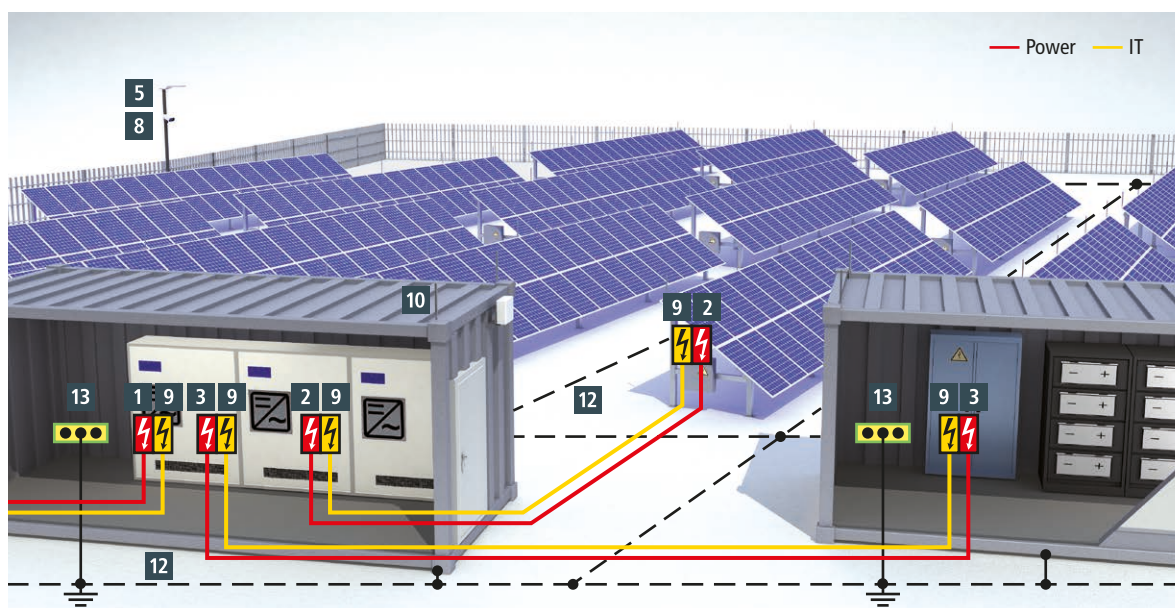


Figure 2 PV battery storage system as a metal construction

Lightning and surge protection for battery storage systems

White Paper



family to protect the 230/400 V supply line. This is a prewired, modular type 1 and 2 combined lightning current and surge arrester, based purely on spark gap technology with a discharge capacity of up to 100 kA (10/350 μ s) which reliably protects terminal devices due to its excellent protection level and energy absorbing capacity. The type 1 combined arrester family, BLITZDUCTOR XT, is suitable for wired data interfaces, e.g., RS 485 interfaces. The integrated LifeCheck[®] monitoring technology enables the implementation of a predictive maintenance concept. The relevant signal statuses can be communicated via Modbus TCP/RTU using floating remote signalling contacts, RS 485 interfaces or DEHNrecord Alert. Further information and communication interfaces like Ethernet are reliably protected by DEHNpatch, and coaxial antenna interfaces by DEHNgate. The connection lines between the battery and the DC outputs of the inverter must be protected by a type 1 SPD because they cross different lightning protection zones. The type 1 + 2 combined arrester DG ME DC Y 950 FM for use up to a direct current of 950 V is an excellent choice here.

When fitted with air-termination devices, the DC connection lines of a PV module must be protected by a type 1 surge arrester especially designed for use in photovoltaic systems, such as the DEHNcombo YPV SCI type 1 + 2 combined lightning current and surge arrester with no need for a backup fuse. DEHNpatch outdoor provides protection for external monitoring units, like cameras with PoE connections. If, in addition, the solar park is lit with LED lighting, this should also be protected against the effects of surges and wear and tear from switching operations using DEHNCord. The equipotential bonding required in the standard

is achieved with a K12 equipotential bonding bar. These busbars are specially tested for application as protective and functional equipotential bonding according to IEC 60364-4-41/60364-5-54 and lightning equipotential bonding to IEC 62305-3

Battery storage systems for the power grid (Concrete container with HVI lightning protection)

If battery storage systems for the power grid have a concrete construction (Figure 3), is often impossible, or at least very difficult, to maintain separation distances to the external lightning protection system. This problem can be solved by installing high-voltage resistant insulated conductors, so-

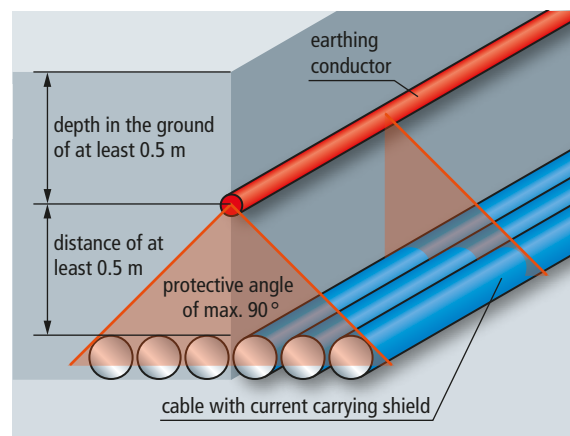


Figure 4 Protected volume for cable route

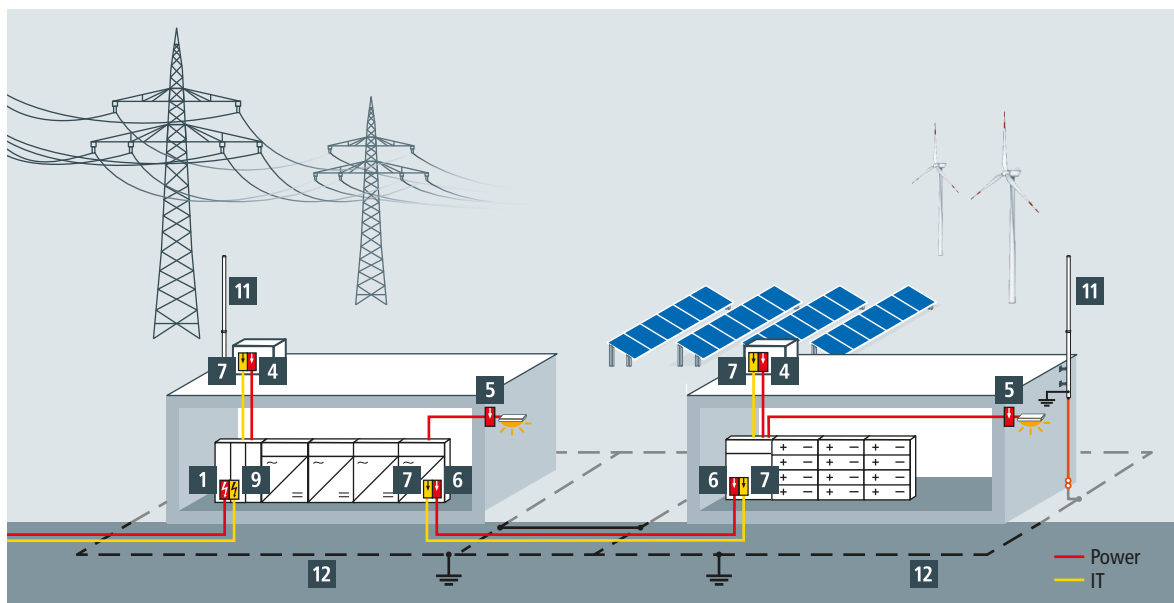


Figure 3 Battery storage system for power grid as a concrete construction with HVI Lightning protection

Lightning and surge protection for battery storage systems

White Paper



called HVI conductors. In this way, one can prevent dangerous flashover from the external lightning protection system to conductive parts such as supply lines. If the batteries and inverters are in separate containers, in the event of direct and nearby lightning strikes galvanic lightning currents are coupled in the connecting cables. To prevent this from happening, an earthing conductor must be laid above the cables to include them in the protected volume (**Figure 4**). It is therefore enough to connect the cables on both sides to type 2 surge arresters, e.g., DEHNguard SE DC. These are specially

constructed for application in DC circuits and include a high-capacity DC switching device DCD to prevent fire damage due to DC switching arcs.

Selection of lightning and surge protective devices

When selecting appropriate lightning current and surge protective devices, many things play an important role in addition to details about the location: information on the local system configuration, the system voltage and the nominal current of the relevant interfaces. A possible selection can be seen in **Table 1**.

| | No. | | Type | Part No. | Other |
|---|----------------|---|--|--|--|
| Type 1 +2 combined surge arrester 230/400V (50Hz) | 1 | DEHNventil | DV M TT 255 FM | 951 315 | Modular combined lightning current and surge arrester for TT and TN systems with a nominal voltage of 230/400V (3+1 configuration) |
| Combined arrester type 1 +2, DC applications (PV) | 2 | DEHNcombo YPV SCI | DCB YPV SCI 1500 FM | 900 067 | Combined lightning current and surge arrester for use in photovoltaic power supply systems up to 1500 V DC |
| Combined arrester type 1 +2, DC applications | 3 | DEHNguard | DG ME DC Y 950 FM | 972 146 | DC current characteristics up to 950 V, with powerful DC switching device DCD |
| Type 2 +3 surge arrester | 4 | DEHNguard modular | DG M TT 275 FM | 952 315 | For TT and TN systems with 230/400 V nominal voltage (3+1 configuration) |
| | 5 | DEHNcord | DCOR L 2P 275 SO IP | 900 448 | Universal surge arrester with IP 65 design for outdoor use, e.g., LED lighting |
| Type 2 +3 surge arrester DC application (battery) | 6 | DEHNguard SE DC | DG SE DC 900 FM | 972 145 | DC current characteristics up to 950 V, with powerful DC switching device DCD |
| Data and Communication lines * | 7 | BLITZDUCTOR SP | BSP M4 BD HF 24 BXT ML4 BD 180 | 926 375 920 347 | (Type 2) base part and module, e.g., for bus systems |
| | | <i>alternatively:</i> DEHNpatch | DPA M CLE RJ45B 48 | 929 121 | e.g., Industrial Ethernet, Power over Ethernet |
| | | <i>alternatively:</i> DEHNgate | DGA G SMA | 929 039 | Universal combined arrester for coaxial connections with SMA technology |
| | 8 | DEHNpatch outdoor | DPA CLE IP66 | 929 221 | For outdoor applications, e.g., surveillance cameras, PoE++ /4PoE |
| 9 | BLITZDUCTOR XT | BXT BAS BXT ML4 BD 180 | 920 300 | (Type 1) base part and module, e.g., for RS485 or VDSL DIN rail mounted devices with integrated LifeCheck function | |
| | | | 920 347 | | |
| External lightning protection | 10 | Air-termination rod 1000 mm with connection lugs and clamping frame | FS 10 1000 AL + AL ZF KB 6.10STTZN B5.2 6.5 L81 AL | 101 000 +377 100 | |

Table 1a Selection guide for the protection of battery storage systems – part 1

Lightning and surge protection for battery storage systems

White Paper



| | No. | | Type | Part No. | Other |
|-------------------------------|-----|--|----------------------------------|----------|---|
| External lightning protection | 11 | HVI light conductor inside supporting tube with air-termination rod and fastening fixtures | HVI LI 20 L6M SR1990 FSP1000 GFK | 819 256 | |
| Earthing material | 12 | Strip StSt V4A, printed 30 mm x 3.5 mm | BA 30x3,5 TB V4A R60M | 861 335 | Stainless steel strip is printed with the material designation V4A |
| | | <i>alternatively:</i> Round wire StSt V4A, Rd. 10 mm | RD 10 V4A R80M | 860 010 | |
| Equipotential bonding | 13 | K12 equipotential bonding bar | PAS 11AK | 563 200 | For protective and functional equipotential bonding and lightning equipotential bonding |
| Accessories | | DEHNrecord Alert | DRC AL MODBUS | 910 694 | Compact DIN rail mounted device communicates SPD status information, like the functional state, part no. of SPD, part no. of replacement part, via Modbus RTU/TCP |
| | | Condition Monitoring | DRC MCM AL XT | 910 698 | DIN rail mounted device with integrated LifeCheck sensor for condition monitoring of max. 10 BLITZDUCTORS XT with LifeCheck function |

*Selection depending on the interface

Table 1b Selection guide for the protection of battery storage systems – part 2

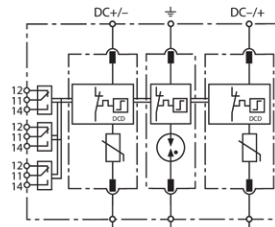
DEHNguard ME

DG ME DC Y 950 FM (972 146)

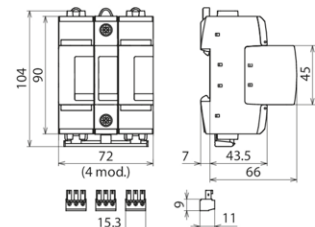
- Powerful d.c. switching device DCD



Figure without obligation



Basic circuit diagram DG ME DC Y 950 FM



Dimension drawing DG ME DC Y 950 FM

Modular combined lightning current and surge arrester for d.c. applications; with floating remote signalling contact.

| Type Part No. | DG ME DC Y 950 FM 972 146 |
|--|---|
| SPD analogous to EN 61643-11 / IEC 61643-11 | type 1 + type 2 / class I + class II |
| Nominal voltage (d.c.) (U_N) | 860 V |
| Max. continuous operating voltage (d.c.) (U_C) | 950 V |
| Lightning impulse current (10/350 μ s) (I_{imp}) | 5 kA |
| Nominal discharge current (8/20 μ s) (I_n) | 12.5 kA |
| Voltage protection level [DC+ -> DC-] (U_P) | ≤ 4 kV |
| Voltage protection level [(DC+/DC-) -> PE] (U_P) | ≤ 3.2 kV |
| Max. short circuit withstand capability (I_{SCCR}) | 500 A / 170 ms |
| Temporary overvoltage (TOV) [DC+ -> DC-] (U_T) – Characteristic | 950 V ($U_{TOV} = U_C$) |
| Temporary overvoltage (TOV) [DC+/- -> PE] (U_T) – Characteristic | 950 V / 10 sec. – withstand |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Operating state / fault indication | green / red |
| Number of ports | 1 |
| Cross-sectional area (min.) | 1.5 mm ² solid / flexible |
| Cross-sectional area (max.) | 35 mm ² stranded / 25 mm ² flexible |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | thermoplastic, red, UL 94 V-0 |
| Place of installation | indoor installation |
| Degree of protection | IP20 |
| Capacity | 4 module(s), DIN 43880 |
| Approvals | UL |
| Type of remote signalling contact | changeover contact |
| Switching capacity (a.c.) | 250 V / 0.5 A |
| Switching capacity (d.c.) | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A |
| Cross-sectional area for remote signalling terminals | max. 1.5 mm ² solid / flexible |
| Extended technical data: | ----- |
| - Residual voltage (U_{res}) @ 1,2 kA | 2,5 kV |
| Weight | 497 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363030 |
| GTIN | 4013364347960 |
| PU | 1 pc(s) |

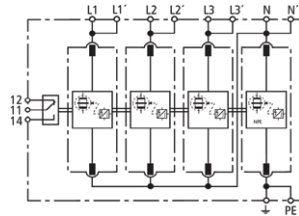
DEHNventil

DV M TT 255 FM (951 315)

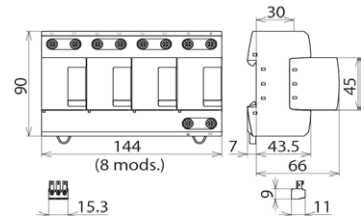
- Prewired spark-gap-based type 1 and type 2 combined lightning current and surge arrester consisting of a base part and plug-in protection modules
- Maximum system availability due to RADAX Flow follow current limitation, Capable of protecting terminal equipment



Figure without obligation



Basic circuit diagram DV M TT 255 FM



Dimension drawing DV M TT 255 FM

Modular combined lightning current and surge arrester for TT and TN-S systems (3+1 configuration).

| Type | DV M TT 255 FM |
|--|---|
| Part No. | 951 315 |
| SPD according to EN 61643-11 / IEC 61643-11 | type 1 + type 2 / class I + class II |
| Energy coordination with terminal equipment (≤ 10 m) | type 1 + type 2 + type 3 |
| Nominal voltage (a.c.) (U_N) | 230 / 400 V (50 / 60 Hz) |
| Max. continuous operating voltage (a.c.) [L-N] (U_C) | 264 V (50 / 60 Hz) |
| Max. continuous operating voltage (a.c.) [N-PE] ($U_{C(N-PE)}$) | 255 V (50 / 60 Hz) |
| Lightning impulse current (10/350 μ s) [L1+L2+L3+N-PE] (I_{total}) | 100 kA |
| Specific energy [L1+L2+L3+N-PE] (W/R) | 2.50 MJ/ohms |
| Lightning impulse current (10/350 μ s) [L-N]/[N-PE] (I_{imp}) | 25 / 100 kA |
| Specific energy [L-N]/[N-PE] (W/R) | 156.25 kJ/ohms / 2.50 MJ/ohms |
| Nominal discharge current (8/20 μ s) [L-N]/[N-PE] (I_n) | 25 / 100 kA |
| Voltage protection level [L-N]/[N-PE] (U_p) | ≤ 1.5 / ≤ 1.5 kV |
| Follow current extinguishing capability [L-N]/[N-PE] (I_f) | 50 kA _{rms} / 100 A _{rms} |
| Follow current limitation / Selectivity | no tripping of a 20 A gG fuse up to 50 kA _{rms} (prosp.) |
| Response time (t_A) | ≤ 100 ns |
| Max. backup fuse (L) up to $I_K = 50$ kA _{rms} | 315 A gG |
| Max. backup fuse (L-L') | 125 A gG |
| Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic | 440 V / 120 min. – withstand |
| Temporary overvoltage (TOV) [N-PE] (U_T) – Characteristic | 1200 V / 200 ms – withstand |
| Operating temperature range [parallel] / [series] (T_U) | -40 °C ... +80 °C / -40 °C ... +60 °C |
| Operating state / fault indication | green / red |
| Number of ports | 1 |
| Cross-sectional area (L1, L1', L2, L2', L3, L3', N, N', PE, $\frac{1}{2}$) (min.) | 10 mm ² solid / flexible |
| Cross-sectional area (L1, L2, L3, N, PE) (max.) | 50 mm ² stranded / 35 mm ² flexible |
| Cross-sectional area (L1', L2', L3', N', $\frac{1}{2}$) (max.) | 35 mm ² stranded / 25 mm ² flexible |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | thermoplastic, red, UL 94 V-0 |
| Place of installation / Degree of protection | indoors / IP 20 |
| Capacity | 8 module(s), DIN 43880 |
| Approvals | KEMA, VDE, UL |
| Type of remote signalling contact | changeover contact |
| Switching capacity (a.c.) | 250 V / 0.5 A |
| Switching capacity (d.c.) | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A |
| Cross-sectional area for remote signalling terminals | max. 1.5 mm ² solid / flexible |
| Extended technical data: | ----- |
| Voltage protection level [L-PE] (U_p) | 2.2 kV |
| For use in switchgear installations with prospective short-circuit currents of more than 50 kA _{rms} (tested by the German VDE) | ----- |
| – Max. prospective short-circuit current | 100 kA _{rms} (220 kA _{peak}) |
| – Limitation / Extinction of mains follow currents | up to 100 kA _{rms} (220 kA _{peak}) |
| – Max. backup fuse (L) up to $I_K = 100$ kA _{rms} | 315 A gG |
| Weight | 1,28 kg |
| Customs tariff number (Comb. Nomenclature EU) | 85363090 |
| GTIN | 4013364108189 |
| PU | 1 pc(s) |

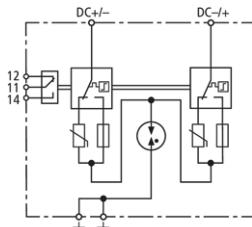
DEHNcombo

DCB YPV SCI 1500 FM (900 067)

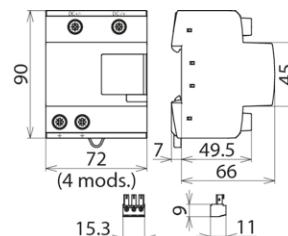
- Prewired type 1 and type 2 combined lightning current and surge arrester for use in photovoltaic generator circuits
- Combined disconnection and short-circuiting device with safe electrical isolation (patented SCI principle)
- Space-saving enclosure with a width of four modules



Figure without obligation



Basic circuit diagram DCB YPV SCI 1500 FM



Dimension drawing DCB YPV SCI 1500 FM

Combined lightning current and surge arrester for use in photovoltaic power supply systems up to 1500 V d.c.; with floating remote signalling contact.

| Type Part No. | DCB YPV SCI 1500 FM 900 067 |
|--|---|
| SPD according to EN 50539-11 | type 1 + type 2 |
| Max. PV voltage [DC+ -> DC-] (U_{CPV}) | ≤ 1500 V |
| Max. PV voltage [DC+/DC- -> PE] (U_{CPV}) | ≤ 1100 V |
| Short-circuit current rating (I_{SCPV}) | 1000 A |
| Nominal discharge current (8/20 μ s) (I_n) | 15 kA |
| Total discharge current (8/20 μ s) [DC+/DC- -> PE] (I_{total}) | 30 kA |
| Total discharge current (10/350 μ s) [DC+/DC- -> PE] (I_{total}) | 12.5 kA |
| Specific energy [DC+/DC- -> PE] (I) | 39.06 kJ/ohms |
| Lightning impulse current (10/350 μ s) [DC+ -> PE/DC- -> PE] (I_{imp}) | 6.25 kA |
| Specific energy [DC+ -> PE/DC- -> PE] (W/R) | 9.76 kJ/ohms |
| Voltage protection level [(DC+/DC-) -> PE] (U_p) | 3.75 kV |
| Voltage protection level [DC+ -> DC-] (U_p) | 7.25 kV |
| Response time (t_A) | ≤ 25 ns |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Operating state / fault indication | green / red |
| Number of ports | 1 |
| Cross-sectional area (min.) | 1.5 mm ² solid / flexible |
| Cross-sectional area (max.) | 35 mm ² stranded / 25 mm ² flexible |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | thermoplastic, red, UL 94 V-0 |
| Place of installation | indoor installation |
| Degree of protection | IP 20 |
| Dimensions | 4 module(s), DIN 43880 |
| Approvals | KEMA |
| Type of remote signalling contact | changeover contact |
| Switching capacity (a.c.) | 250 V / 0.5 A |
| Switching capacity (d.c.) | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A |
| Cross-sectional area for remote signalling terminals | max. 1.5 mm ² solid / flexible |
| Extended technical data: | ----- |
| - Short-circuit current rating (I_{SCPV}) | 2.5 kA |
| Weight | 530 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363030 |
| GTIN | 4013364153752 |
| PU | 1 pc(s) |

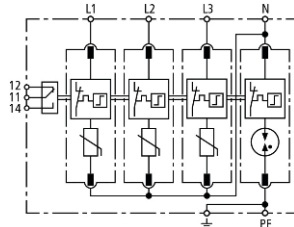
DEHNguard

DG M TT 275 FM (952 315)

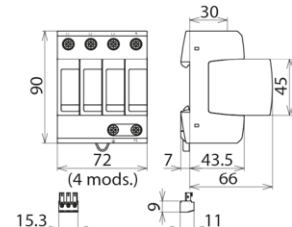
- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device



Figure without obligation



Basic circuit diagram DG M TT 275 FM



Dimension drawing DG M TT 275 FM

Modular surge arrester for use in TT and TN-S systems (3+1 configuration); with floating remote signalling contact.

| Type | DG M TT 275 FM |
|--|---|
| Part No. | 952 315 |
| SPD according to EN 61643-11 / IEC 61643-11 | type 2 / class II |
| Energy coordination with terminal equipment (≤ 10 m) | type 2 + type 3 |
| Nominal voltage (a.c.) (U_N) | 230 / 400 V (50 / 60 Hz) |
| Max. continuous operating voltage (a.c.) [L-N] (U_C) | 275 V (50 / 60 Hz) |
| Max. continuous operating voltage (a.c.) [N-PE] (U_C) | 255 V (50 / 60 Hz) |
| Nominal discharge current (8/20 μ s) (I_n) | 20 kA |
| Max. discharge current (8/20 μ s) (I_{max}) | 40 kA |
| Lightning impulse current (10/350 μ s) [N-PE] (I_{imp}) | 12 kA |
| Voltage protection level [L-N]/[N-PE] (U_p) | ≤ 1.5 / ≤ 1.5 kV |
| Voltage protection level [L-N] / [N-PE] at 5 kA (U_p) | ≤ 1 / ≤ 1.5 kV |
| Follow current extinguishing capability [N-PE] (I_f) | 100 A _{rms} |
| Response time [L-N] (t_A) | ≤ 25 ns |
| Response time [N-PE] (t_A) | ≤ 100 ns |
| Max. mains-side overcurrent protection | 125 A gG |
| Short-circuit withstand capability for max. mains-side overcurrent protection (I_{SCCR}) | 50 kA _{rms} |
| Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic | 335 V / 5 sec. – withstand |
| Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic | 440 V / 120 min. – safe failure |
| Temporary overvoltage (TOV) [N-PE] (U_T) – Characteristic | 1200 V / 200 ms – withstand |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Operating state / fault indication | green / red |
| Number of ports | 1 |
| Cross-sectional area (min.) | 1.5 mm ² solid / flexible |
| Cross-sectional area (max.) | 35 mm ² stranded / 25 mm ² flexible |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | thermoplastic, red, UL 94 V-0 |
| Place of installation | indoor installation |
| Degree of protection | IP 20 |
| Capacity | 4 module(s), DIN 43880 |
| Approvals | KEMA, VDE, UL |
| Type of remote signalling contact | changeover contact |
| Switching capacity (a.c.) | 250 V / 0.5 A |
| Switching capacity (d.c.) | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A |
| Cross-sectional area for remote signalling terminals | max. 1.5 mm ² solid / flexible |
| Extended technical data: | ----- |
| Voltage protection level [L-PE] (U_p) | 1.5 kV |
| Weight | 415 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363030 |
| GTIN | 4013364108486 |
| PU | 1 pc(s) |

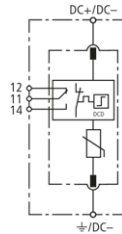
DEHNguard

DG SE DC 900 FM (972 145)

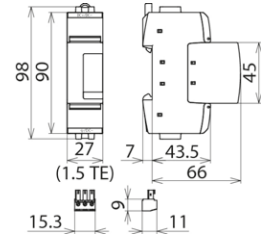
- Universal single-pole surge arrester consisting of a base part and a plug-in protection module
- Powerful d.c. switching device DCD
- Can be used without additional backup fuse



Figure without obligation



Basic circuit diagram DG SE DC 900 FM



Dimension drawing DG SE DC 900 FM

Modular single-pole surge arrester for d.c. applications; with floating remote signalling contact.

| Type | DG SE DC 900 FM |
|---|---|
| Part No. | 972 145 |
| SPD according to EN 61643-11 / IEC 61643-11 | type 2 / class II |
| Energy coordination with terminal equipment (≤ 10 m) | type 2 + type 3 |
| Nominal voltage (d.c.) (U_N) | 750 V |
| Max. continuous operating voltage (d.c.) (U_C) | 900 V |
| Nominal discharge current (8/20 μ s) (I_n) | 12.5 kA |
| Voltage protection level (U_P) | ≤ 3.0 kV |
| Response time (t_A) | ≤ 25 ns |
| Short-circuit withstand capability without backup fuse (d.c.) (I_{SCCR}) | 100 A |
| Short-circuit withstand capability for max. mains-side overcurrent protection (d.c.) (I_{SCCR}) | 25 kA |
| Max. mains-side overcurrent protection | 80 A gPV |
| Temporary overvoltage (TOV) d.c. (U_T) - Characteristic | 1089 V / 5 sec. – withstand |
| Temporary overvoltage (TOV) d.c., $2 \times U_C$ (U_T) - Characteristic | 1800 V / 120 min. – safe failure |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Operating state / fault indication | green / red |
| Number of ports | 1 |
| Cross-sectional area (min.) | 1.5 mm ² solid / flexible |
| Cross-sectional area (max.) | 35 mm ² stranded / 25 mm ² flexible |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | thermoplastic, red, UL 94 V-0 |
| Place of installation | indoor installation |
| Degree of protection | IP20 |
| Capacity | 1.5 module(s), DIN 43880 |
| Type of remote signalling contact | changeover contact |
| Switching capacity (a.c.) | 250 V / 0.5 A |
| Switching capacity (d.c.) | 250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A |
| Cross-sectional area for remote signalling terminals | max. 1.5 mm ² solid / flexible |
| Extended technical data: | use for safety lighting systems |
| – d.c. and a.c. operation | no |
| Weight | 172 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363030 |
| GTIN | 4013364158658 |
| PU | 1 pc(s) |

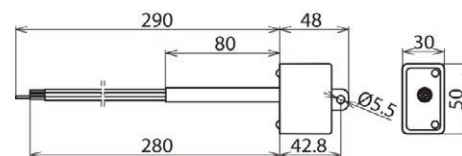
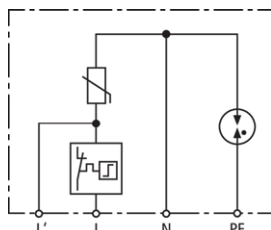
DEHNcord

DCOR L 2P 275 SO IP (900 448)

- Visual fault indication
- Interruption of the load circuit in the event of a fault
- Compact design



Figure without obligation



Dimension drawing DCOR L 2P 275 SO IP

Two-pole arrester for all installation systems; compact design. IP 65 degree of protection. With disconnection of the load circuit in the event of a fault.

Technical data

| Type | DCOR L 2P 275 SO IP |
|--|-----------------------------------|
| Part No. | 900 448 |
| SPD according to EN 61643-11 / IEC 61643-11 | type 2 / class II |
| Energy coordination with terminal equipment (≤ 10 m) | type 2 + type 3 |
| Nominal voltage (a.c.) (U_N) | 230 V (50 / 60 Hz) |
| Max. continuous operating voltage (a.c.) [L-N] (U_C) | 275 V (50 / 60 Hz) |
| Max. continuous operating voltage (a.c.) [N-PE] (U_C) | 255 V (50 / 60 Hz) |
| Nominal discharge current (8/20 μ s) (I_n) | 5 kA |
| Max. discharge current (8/20 μ s) (I_{max}) | 10 kA |
| Voltage protection level [L-N] (U_p) | ≤ 1.5 kV |
| Voltage protection level [L-N] at 3 kA (U_p) | ≤ 1 kV |
| Voltage protection level [L-N] at 1.5 kA (U_p) | ≤ 0.85 kV |
| Voltage protection level [N-PE] (U_p) | ≤ 1.5 kV |
| Follow current extinguishing capability [N-PE] (I_f) | 100 A _{rms} |
| Response time [L-N] (t_A) | ≤ 25 ns |
| Response time [L/N-PE] (t_A) | ≤ 100 ns |
| Max. load current (I_L) | 10 A |
| Max. mains-side overcurrent protection | B 16 A |
| Short-circuit withstand capability for mains-side overcurrent protection (I_{SCCR}) | 1 kA _{rms} |
| Short-circuit withstand capability for mains-side overcurrent protection with 16 A gG (I_{SCCR}) | 6 kA _{rms} |
| Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic | 335 V / 5 sec. – withstand |
| Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic | 440 V / 120 min. – safe failure |
| Temporary overvoltage (TOV) [N-PE] (U_T) – Characteristic | 1200 V / 200 ms – safe failure |
| Fault indication | red |
| Interruption of the load circuit in the event of a fault | yes |
| Number of ports | 1 |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Connecting cable | 1.5 mm ² , 230 mm long |
| Enclosure material | thermoplastic, red, UL 94 V-2 |
| Degree of protection of installed device | IP 65 |
| Additional tests: | ----- |
| – Total discharge current (I_{sum}) | 20 kA |
| Extended technical data: | ----- |
| – Combination wave (U_{oc}) | 10 kV |
| Weight | 113 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363030 |
| GTIN | 4013364293007 |
| PU | 1 pc(s) |

DEHNrecord Alert

DRC AL MODBUS (910 694)

- Communication of the device status via Modbus TCP / RTU
- Integration of Red/Line® SPDs via remote signalling contacts and Yellow/Line SPDs via serial interfaces
- Monitoring of up to 4 surge arresters with remote signalling contacts and up to 150 BLITZDUCTOR®XT arresters
- Integration of the remote signalling contacts of further user-defined functional modules in the monitoring system

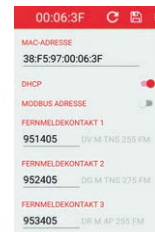
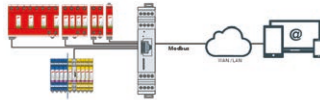


Figure without obligation

Compact DIN rail mounted device for the transmission of SPD status information, e.g. functional status, part number of SPD and part numbers of the replacement modules via Modbus RTU/TCP.

| Type | DRC AL MODBUS |
|---|---|
| Part No. | 910 694 |
| Integration of | up to 15 DRC MCM AL XT modules (maximum 150 Blitzductor XT/XTU), up to 4 remote signalling contacts |
| Operating | via App |
| Integration | in Modbus RTU / TCP areas |
| Input voltage range (d.c.) (U_{IN}) | 11-28 V |
| Power max. | 600 mW |
| Terminating resistor | 120 Ω |
| Connection Modbus RTU | RS 485 |
| Connection Modbus TCP | RJ45 |
| Communication type | Master-Slave |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Degree of protection | IP 10 |
| Dimensions | 1 module(s), DIN 43880 |
| For mounting on | 35 mm DIN rail acc. to EN 60715 |
| Connection supply/digital inputs/RS 485 | screw 2.5 mm2 |
| Connection Ethernet | RJ45 |
| Cross-sectional area, solid / flexible | 0.14-1.5 mm ² |
| Enclosure material | Ultramid B3UGM210 |
| Colour | grey |
| Test standards | CU |
| Inputs | 4 universally usable FM contacts and up to 150 BLITZDUCTOR XT via DRC MCM AL XT (910 698) |
| Communication | Modbus RTU/TCP |
| Connection of remote signalling contacts | 4 digital inputs (IEC 61131-2) |
| Input wiring | open = 0; 12 V / 24 V = 1 |
| Input voltage | 0-28 V |
| Input current of remote signalling contacts | < 6 mA |
| Connection DRC MCM AL XT | RS 485 |
| Dimensions | 18 x 90 x 61 mm |
| Weight | 67 g |
| Customs tariff number (Comb. Nomenclature EU) | 85389091 |
| GTIN | 4013364350212 |
| PU | 1 pc(s) |

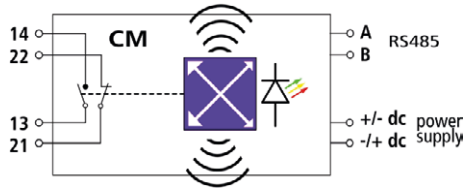
DEHNrecord Alert

DRC MCM AL XT (910 698)

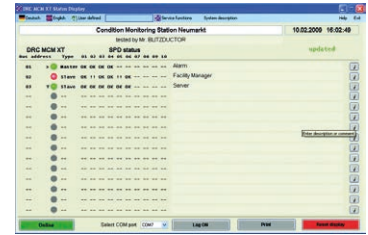
- Condition monitoring of LifeCheck-equipped SPDs
- Permanent monitoring of up to 10 SPDs (40 signal lines)
- Minimum wiring effort
- Remote signalling via remote signalling contact or optional RS485 interface
- Connection to DEHNrecord Alert
- Additional transmission of the part number



Figure without obligation



Basic circuit diagram DRC MCM AL XT



DRC MCM AL XT status display software

DIN rail mounted device with integrated LifeCheck sensor for condition monitoring of max. ten LifeCheck-equipped BLITZDUCTOR XT / XTU arresters. Transmission of the status of the bus address and BXT part numbers to the DEHNrecord Alert communication unit.

| Type | DRC MCM AL XT |
|---|---|
| Part No. | 910 698 |
| For testing | up to 10 BLITZDUCTOR XT / XTU ML arresters |
| For testing | up to 10 BLITZDUCTOR XT / XTU ML EX arresters; for use in non-hazardous atmospheres only! Observe thread measure! |
| Operating elements | multiway button, DIP switch |
| Indicator | three-coloured LED (green, orange, red) |
| Input voltage range (d.c.) (U_{IN}) | 18-48 V |
| Max. rated current consumption (I_{IN}) | 100 mA |
| RFID transmission frequency | 125 kHz |
| Physical interface | RS 485 |
| Message: Replacing of SPD recommended | LED, remote signalling contact (break and make contact) |
| Test cycle | continuous |
| Operating temperature range for monitoring 10 BXT / BXTU arresters | -20 °C ... +60 °C |
| Operating temperature range for monitoring 8 BXT / BXTU arresters | -40 °C ... +80 °C |
| Operating temperature range for addressing the BXT of 10 BXT / BXTU | 0 °C ... +60 °C |
| Degree of protection | IP 20 |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Connection | screw |
| Cross-sectional area, solid / flexible | 0.08-2.5 mm ² |
| Tightening torque (terminal) | 0.4 Nm |
| Enclosure material | polyamide PA 6.6 |
| Colour | grey |
| Test standards | EN 61010-1, 61000-6-2/4, ETSI EN 300 330-1 V1.7.1 |
| Type of remote signalling contact | make (no) and break contact (nc) |
| Technical data of remote signalling contact | contact resistance < 25 ohms; leakage current < 1 µA |
| Switching capacity (d.c.) | 350 V / 0.12 A |
| Switching capacity (a.c.) | 250 V / 0.07 A |
| Delivery includes | base part, monitoring module, quick guide and labelling system |
| Weight | 67 g |
| Customs tariff number (Comb. Nomenclature EU) | 85389091 |
| GTIN | 4013364337053 |
| PU | 1 pc(s) |

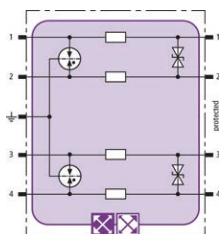
BLITZDUCTOR XT

BXT ML4 BD 180 (920 347)

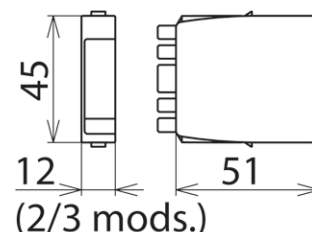
- LifeCheck SPD monitoring function
- Optimal protection of two pairs
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_A -2$ and higher



Figure without obligation



Basic circuit diagram BXT ML4 BD 180



Dimension drawing BXT ML4 BD 180

Space-saving combined lightning current and surge arrester module with LifeCheck feature for protecting two pairs of unearthed balanced interfaces. If LifeCheck detects thermal or electrical overload, the arrester has to be replaced. This status is indicated contactlessly by the DEHNrecord LC / SCM / MCM reader.

| Type | BXT ML4 BD 180 |
|--|--|
| Part No. | 920 347 |
| SPD monitoring system | LifeCheck |
| SPD class | TYPE 1P2 |
| Nominal voltage (U_N) | 180 V |
| Max. continuous operating voltage (d.c.) (U_c) | 180 V |
| Max. continuous operating voltage (a.c.) (U_c) | 127 V |
| Nominal current at 45 °C (I_L) | 0.75 A |
| D1 Total lightning impulse current (10/350 μ s) (I_{imp}) | 10 kA |
| D1 Lightning impulse current (10/350 μ s) per line (I_{imp}) | 2.5 kA |
| C2 Total nominal discharge current (8/20 μ s) (I_n) | 20 kA |
| C2 Nominal discharge current (8/20 μ s) per line (I_n) | 10 kA |
| Voltage protection level line-line for I_{imp} D1 (U_p) | ≤ 270 V |
| Voltage protection level line-PG for I_{imp} D1 (U_p) | ≤ 550 V |
| Voltage protection level line-line at 1 kV/ μ s C3 (U_p) | ≤ 250 V |
| Voltage protection level line-PG at 1 kV/ μ s C3 (U_p) | ≤ 550 V |
| Series resistance per line | 1.8 ohm(s) |
| Cut-off frequency line-line (f_c) | 25.0 MHz |
| Capacitance line-line (C) | ≤ 240 pF |
| Capacitance line-PG (C) | ≤ 16 pF |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Degree of protection (with plugged-in protection module) | IP 20 |
| Pluggable into | BXT BAS / BSP BAS 4 base part |
| Earthing via | BXT BAS / BSP BAS 4 base part |
| Enclosure material | polyamide PA 6.6 |
| Colour | yellow |
| Test standards | IEC 61643-21 / EN 61643-21, UL 497B |
| Approvals | CSA, UL, EAC, ATEX, IECEx, CSA & USA Hazloc, SIL |
| SIL classification | up to SIL3 [*] |
| ATEX approvals | DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc |
| IECEx approvals | DEK 11.0032X: Ex nA IIC T4 Gc |
| CSA & USA Hazloc approvals (1) | 2516389: Class I Div. 2 GP A, B, C, D T4 |
| CSA & USA Hazloc approvals (2) | 2516389: Class I Zone 2, AEx nA IIC T4 |
| Weight | 24 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363010 |
| GTIN | 4013364109018 |
| PU | 1 pc(s) |

^{*}For more detailed information, please visit www.dehn-international.com.

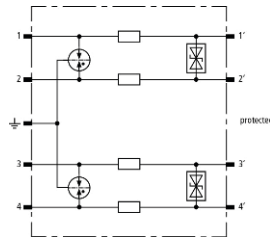
BLITZDUCTOR SP

BSP M4 BD HF 24 (926 375)

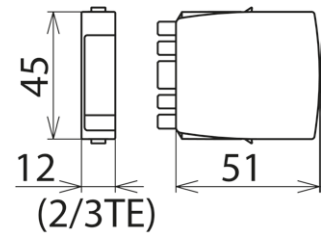
- Minimum signal interference
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B - 2$ and higher



Figure without obligation



Basic circuit diagram BSP M4 BD HF 24



Dimension drawing BSP M4 BD HF 24

Space-saving surge arrester module for protecting two pairs of high-frequency bus systems or video transmission systems with galvanic isolation.

| Type Part No. | BSP M4 BD HF 24 926 375 |
|--|-------------------------------|
| SPD class | TYPE 2 P1 |
| Nominal voltage (U_N) | 24 V |
| Max. continuous operating voltage (d.c.) (U_C) | 33 V |
| Max. continuous operating voltage (a.c.) (U_C) | 23.3 V |
| Nominal current at 45 °C (I_L) | 1.0 A |
| D1 Lightning impulse current (10/350 μ s) per line (I_{imp}) | 1 kA |
| C2 Total nominal discharge current (8/20 μ s) (I_n) | 20 kA |
| C2 Nominal discharge current (8/20 μ s) per line (I_n) | 10 kA |
| Voltage protection level line-line for I_n C2 (U_p) | ≤ 67 V |
| Voltage protection level line-PG for I_n C2 (U_p) | ≤ 600 V |
| Voltage protection level line-line at 1 kV/ μ s C3 (U_p) | ≤ 47 V |
| Voltage protection level line-PG at 1 kV/ μ s C3 (U_p) | ≤ 550 V |
| Series impedance per line | 1.0 ohm(s) |
| Cut-off frequency line-line (f_c) | 100.0 MHz |
| Capacitance line-line (C) | ≤ 25 pF |
| Capacitance line-PG (C) | ≤ 16 pF |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Degree of protection (with plugged-in protection module) | IP 20 |
| Pluggable into | BXT BAS / BSP BAS 4 base part |
| Earthing via | BXT BAS / BSP BAS 4 base part |
| Enclosure material | polyamide PA 6.6 |
| Colour | yellow |
| Test standards | IEC 61643-21, UL 497B |
| Approvals | UL, CSA, EAC |
| Weight | 22 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363010 |
| GTIN | 4013364129382 |
| PU | 1 pc(s) |

*) For more detailed information, please visit www.dehn-international.com.

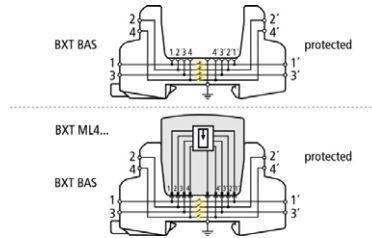
BLITZDUCTOR

BXT BAS (920 300)

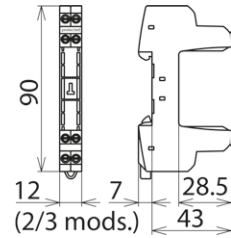
- Four-pole version for universal use with all types of BSP and BXT / BXTU protection modules
- No signal interruption if the protection module is removed
- Universal design without protection elements



Figure without obligation



Basic circuit diagram with and without plugged-in module



Dimension drawing BXT BAS

The BLITZDUCTOR XT base part is an extremely space-saving and universal four-pole feed-through terminal for the insertion of a protection module without signal disconnection if the protection module is removed. The snap-in mechanism at the supporting foot of the base part allows the protection module to be safely earthed via the DIN rail. Since no components of the protective circuit are situated in the base part, maintenance is only required for the protection modules.

| Type Part No. | BXT BAS 920 300 |
|---|--|
| Operating temperature range (T _U) | -40 °C ... +80 °C |
| Degree of protection | IP 20 |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Connection (input / output) | screw / screw |
| Signal disconnection | no |
| Cross-sectional area, solid | 0.08-4 mm ² |
| Cross-sectional area, flexible | 0.08-2.5 mm ² |
| Tightening torque (terminals) | 0.4 Nm |
| Earthing via | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | polyamide PA 6.6 |
| Colour | yellow |
| ATEX approvals | DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc ^{*)} |
| IECEX approvals | DEK 11.0032X: Ex nA IIC T4 Gc ^{*)} |
| Approvals | CSA, UL, EAC, ATEX, IECEX ^{*)} |
| Weight | 34 g |
| Customs tariff number (Comb. Nomenclature EU) | 85369010 |
| GTIN | 4013364109179 |
| PU | 1 pc(s) |

^{*)} only in connection with an approved protection module

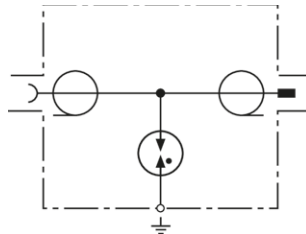
DEHNgate

DGA G SMA (929 039)

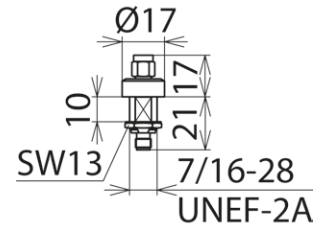
- Compact dimensions
- Extremely wide transmission range
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B - 1$ and higher



Figure without obligation



Basic circuit diagram DGA G SMA



Dimension drawing DGA G SMA

Surge arrester for remote supply with integrated gas discharge tube. Ideally suited for wireless applications for the coaxial interfaces of devices and antennas.

Available with SMA, BNC or N connection for bushing installation.

| Type Part No. | DGA G SMA 929 039 |
|---|----------------------------------|
| SPD class | TYPE2 |
| Max. continuous operating voltage (d.c.) (U_c) | 135 V |
| Nominal current (I_n) | 2 A |
| Max. transmission capacity | 60 W |
| D1 Lightning impulse current (10/350 μ s) (I_{imp}) | 1 kA |
| C2 Nominal discharge current (8/20 μ s) (I_n) | 5 kA |
| Voltage protection level for I_n C2 (U_p) | ≤ 700 V |
| Frequency range | 0-5.8 GHz |
| Insertion loss | ≤ 0.2 dB |
| Return loss (d.c. - 3 GHz) | ≥ 20 dB |
| Return loss (3 GHz-5.8 GHz) | ≥ 18 dB |
| Characteristic impedance (Z) | 50 ohms |
| Operating temperature range (T_u) | -40 °C ... +85 °C |
| Degree of protection (if lines are connected) | IP 65 |
| Connection | SMA socket / SMA plug |
| Earthing via | bushing ($\varnothing 11.2$ mm) |
| Enclosure material | gold-plated brass |
| Colour | gold |
| Test standards | IEC 61643-21 / EN 61643-21 |
| Weight | 24 g |
| Customs tariff number (Comb. Nomenclature EU) | 85366910 |
| GTIN | 4013364135185 |
| PU | 1 pc(s) |

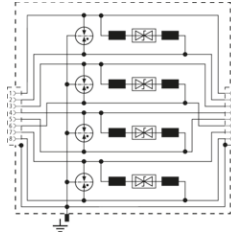
DEHNpatch

DPA M CLE RJ45B 48 (929 121)

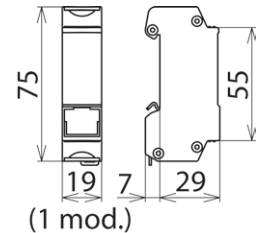
- Ideally suited for retrofitting, protection of all lines
- Cat. 6 in the channel (class E)
- Power over Ethernet IEEE 802.3 compliant (up to PoE++ / 4PPoE)
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B -2$ and higher



Figure without obligation



Basic circuit diagram DPA M CLE RJ45B 48



Dimension drawing DPA M CLE RJ45B 48

Universal arrester for Industrial Ethernet, Power over Ethernet (IEEE 802.3 compliant up to PoE++ / 4PPoE) and similar applications in structured cabling systems according to class E up to 250 MHz. Protection of all pairs by means of powerful gas discharge tubes and one adapted filter matrix per pair. Fully shielded type with sockets for DIN rail mounting (up to 1 Gbit Ethernet).

| Type | DPA M CLE RJ45B 48 |
|--|--------------------------------------|
| Part No. | 929 121 |
| SPD class | TYPE 2 Pt |
| Nominal voltage (U_N) | 48 V |
| Max. continuous operating voltage (d.c.) (U_c) | 48 V |
| Max. continuous operating voltage (a.c.) (U_c) | 34 V |
| Max. continuous operating voltage (d.c.) pair-pair (PoE) (U_c) | 57 V |
| Nominal current (I_N) | 1 A |
| D1 Lightning impulse current (10/350 μ s) per line (I_{imp}) | 0.5 kA |
| C2 Nominal discharge current (8/20 μ s) line-line (I_n) | 150 A |
| C2 Nominal discharge current (8/20 μ s) line-PG (I_n) | 2.5 kA |
| C2 Nominal discharge current (8/20 μ s) total (I_n) | 10 kA |
| C2 Nominal discharge current (8/20 μ s) pair-pair (PoE) (I_n) | 150 A |
| Voltage protection level line-line for I_n C2 (U_p) | ≤ 180 V |
| Voltage protection level line-PG for I_n C2 (U_p) | ≤ 500 V |
| Voltage protection level line-line for I_n C2 (PoE) (U_p) | ≤ 600 V |
| Voltage protection level line-line at 1 kV/ μ s C3 (U_p) | ≤ 180 V |
| Voltage protection level line-PG at 1 kV/ μ s C3 (U_p) | ≤ 500 V |
| Voltage protection level pair-pair at 1 kV/ μ s C3 (PoE) (U_p) | ≤ 600 V |
| Cut-off frequency (f_c) | 250 MHz |
| Insertion loss at 250 MHz | ≤ 3 dB |
| Capacitance line-line (C) | ≤ 30 pF |
| Capacitance line-PG (C) | ≤ 25 pF |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Degree of protection | IP 10 |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Connection (input / output) | RJ45 socket / RJ45 socket |
| Pinning | 1/2, 3/6, 4/5, 7/8 |
| Earthing via | 35 mm DIN rail acc. to EN 60715 |
| Enclosure material | zinc die-casting |
| Colour | bare surface |
| Test standards | IEC 61643-21 / EN 61643-21 / UL 497B |
| Approvals | CSA, UL, GHMT, EAC |
| External accessories | fixing material |
| Weight | 109 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363010 |
| GTIN | 4013364118935 |
| PU | 1 pc(s) |

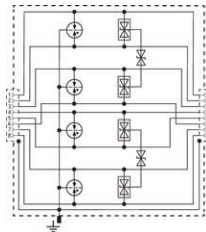
DEHNpatch

DPA CLE IP66 (929 221)

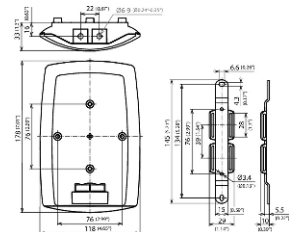
- Indoor / outdoor applications (IP 66)
- GBit Ethernet applications and structured cabling systems according to class E up to 250 MHz
- Power over Ethernet IEEE 802.3 (up to PoE++ / 4PPoE)
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B -2$ and higher



Figure without obligation



Basic circuit diagram DPA CLE IP66



Dimension drawing DPA CLE IP66

Universal surge arrester for GBit Ethernet applications, Power over Ethernet (IEEE 802.3 compliant up to PoE++ / 4PPoE) and similar applications in structured cabling systems up to class E in indoor and outdoor areas in an IP66 rated enclosure impervious to dust and water. Protection of all pairs with gas discharge tubes and one adapted filter matrix for each pair. Fully shielded surge protective solution with RJ 45 sockets. Universal mounting bracket for pole and wall mounting.

External accessories: Tensioning straps for pole mounting

| Type Part No. | DPA CLE IP66 929 221 |
|--|-------------------------------------|
| SPD class | TYPE 2 Pt |
| Nominal voltage (U_N) | 5 V |
| Max. continuous operating voltage d.c. line-line (U_c) | 8.5 V |
| Max. continuous operating voltage (a.c.) (U_c) | 6 V |
| Max. continuous operating voltage (d.c.) pair-pair (PoE) (U_c) | 60 V |
| Nominal current (I_L) | 1 A |
| D1 Lightning impulse current (10/350 μ s) per line (I_{imp}) | 0.8 kA |
| D1 Lightning impulse current (10/350 μ s) total (I_{imp}) | 4 kA |
| C2 Nominal discharge current (8/20 μ s) line-line (I_n) | 400 A |
| C2 Nominal discharge current (8/20 μ s) line-PG (I_n) | 2.5 kA |
| C2 Nominal discharge current (8/20 μ s) total (I_n) | 10 kA |
| Voltage protection level line-line for I_n C2 (U_p) | ≤ 170 V |
| Voltage protection level line-PG for I_n C2 (U_p) | ≤ 600 V |
| Voltage protection level line-line for I_n C2 (PoE) (U_p) | ≤ 120 V |
| Voltage protection level line-line at 1 kV/ μ s C3 (U_p) | ≤ 180 V |
| Voltage protection level line-PG at 1 kV/ μ s C3 (U_p) | ≤ 500 V |
| Voltage protection level pair-pair at 1 kV/ μ s C3 (PoE) (U_p) | ≤ 120 V |
| Cut-off frequency (f_c) | 250 MHz |
| Operating temperature range (T_U) | -40 °C ... +80 °C |
| Degree of protection (with installed cables) | IP 66 |
| For mounting on | pole / wall |
| Connection (input / output) | RJ45 socket / RJ45 socket |
| Pinning | 1/2, 3/6, 4/5, 7/8 |
| Earthing via | enclosure with pole / wall bracket |
| Enclosure material | aluminium die-cast, nickel plated |
| Colour | bare surface |
| Test standards | IEC 61643-21 / EN 61643-21 |
| Approvals | UL, CSA, EAC |
| External accessories | tensioning straps for pole mounting |
| Weight | 606 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363010 |
| GTIN | 4013364342866 |
| PU | 1 pc(s) |

HVI light Conductor inside of supporting tube with air-termination rod

HVI LI 20 L6M SR1990 FSP1000 GFK AL V2A (819 256)



Figure without obligation



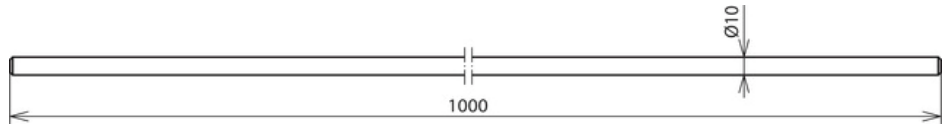
| Type | HVI LI 20 L6M SR1990 FSP1000 GFK AL V2A |
|---|---|
| Part No. | 819 256 |
| Material of supporting tube | GRP / Al |
| Length of supporting tube | 1990 mm |
| Transport length | 1990 mm |
| Material of air-termination rod | StSt |
| Length of air-termination rod | 1000 mm |
| Diameter Ø conductor | 20 mm |
| Colour of conductor | grey * |
| Material of conductor | Cu |
| RAL colour | similar to 7000 |
| Cross section of core | 19 mm ² |
| Equivalent separation distance s (air) | ≤ 45 cm |
| Material of insulation | PE |
| Material of sheath | PVC |
| Characteristics of sheath | UV stabilized and weather resistant |
| Connection diameter | 10 mm |
| EB connection cable | strip StSt 1000 x 18 x 0.4 mm |
| Material of connection elements | StSt |
| Minimum order length | 6 m |
| Max. gust wind speed | 198 km/h |
| Max. free length | 2390 mm |
| Min. clamping length | 600 mm |
| Weight | 6,03 kg |
| Customs tariff number (Comb. Nomenclature EU) | 85389099 |
| GTIN | 4013364255388 |
| PU | 1 pc(s) |

Air-termination rod

FS 10 1000 AL (101 000)



Figure without obligation



Air-termination rod chamfered on both sides, for protecting roof-mounted structures, chimneys etc., also for erection with concrete base (8.5 kg) for wedge mounting or for fixing with rod holders / spacers.

| Type | FS 10 1000 AL |
|---|---------------|
| Part No. | 101 000 |
| Total length (l1) | 1000 mm |
| Material | Al |
| Diameter Ø | 10 mm |
| Standard | EN 62561-2 |
| Weight | 212 g |
| Customs tariff number (Comb. Nomenclature EU) | 85389099 |
| GTIN | 4013364094505 |
| PU | 20 pc(s) |

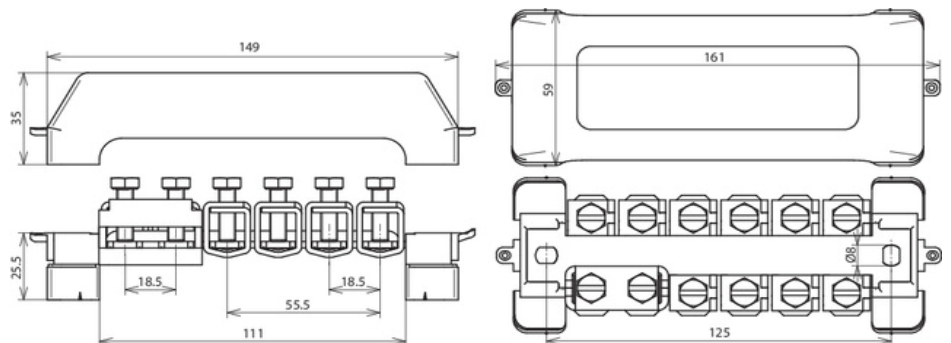
Equipotential busbar



PAS 11AK (563 200)



Figure without obligation



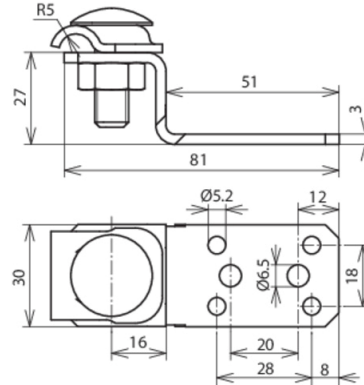
| Type | PAS 11AK |
|---|-----------------------------|
| Part No. | 563 200 |
| Connection (solid / stranded) | 10 x 2.5-95 mm ² |
| Connection Rd | or 10 x -10 mm |
| Connection FI | 1 x -30 x 4 mm |
| Material (cage clamp) | St/tZn |
| Material (contact rail) | Cu/gal Sn |
| Cross section | 30 mm ² |
| Fixing | [2x] 6 x 8 mm |
| Fixing frames | P (grey) |
| Cover | P (grey/sealable) |
| Standard | EN 62561-1 |
| Type | halogen-free |
| Weight | 410 g |
| Customs tariff number (Comb. Nomenclature EU) | 85389099 |
| GTIN | 4013364056558 |
| PU | 1 pc(s) |

Connection lug with clamping frame

 **AL ZF KB 6.10STTZN B5.2 6.5 L81 AL (377 100)**



Figure without obligation



| Type | AL ZF KB 6.10STTZN B5.2 6.5 L81 AL |
|---|--|
| Part No. | 377 100 |
| Material of bracket | Al |
| Material thickness (t1) | 3 mm |
| Fixing | [4x] Ø5.2 / [2x] Ø6.5 mm |
| Fixing possibility | blind rivets or drilling screws |
| Application note | according to EN 62305-3 Suppl. 1 4 rivets Ø5mm, 2 rivets Ø6mm shall be used to connect materials ≥ 0.5mm thick or 2 Parker screws StSt Ø6.3mm for materials ≥ 2mm thick. |
| Material of clamping frame | St/tZn |
| Screw | ⬆ M10 x 30 mm |
| Material of screw / nut | StSt |
| Connection | lengthwise / crosswise |
| Connection with | clamping frame |
| Clamping range Rd | 6-10 mm |
| Standard | EN 62561-1 |
| Weight | 74 g |
| Customs tariff number (Comb. Nomenclature EU) | 85389099 |
| GTIN | 4013364078604 |
| PU | 50 pc(s) |

Round wire

RD 10 V4A R80M (860 010)

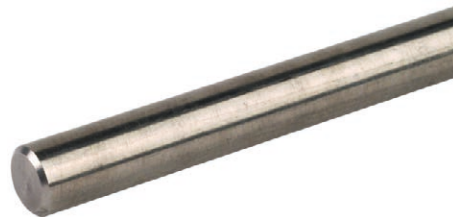


Figure without obligation

Stainless steel wire according to EN 62561-2, for use in lightning protection and earth-termination systems or equipotential bonding.

Stainless steel wire for use in soil has to be made of StSt (V4A) with a molybdenum proportion > 2 % e.g. 1.4571, 1.4404, in accordance with EN 62561-2 and IEC/EN 62305-3.

| Type | RD 10 V4A R80M |
|---|--------------------------------|
| Part No. | 860 010 ✓ |
| Diameter Ø conductor | 10 mm |
| Cross-section | 78 mm ² |
| Material | StSt (V4A) |
| Material No. | 1.4571 / 1.4404 |
| ASTM / AISI: | 316Ti / 316L |
| Standard | based on EN 62561-2 |
| Conductivity | ≥ 1.25 m / Ohm mm ² |
| Resistivity | ≤ 0.8 Ohm mm ² / m |
| Short-circuit current (50 Hz) (1 s; ≤ 300 °C) | 2.9 kA |
| Weight | 617 g/m |
| Customs tariff number (Comb. Nomenclature EU) | 72210010 |
| GTIN | 4013364019997 |
| PU | 80 m |

Strip

BA 30X3.5 TB V4A R60M (861 335)



Figure without obligation

| Type | BA 30X3.5 TB V4A R60M |
|---|--------------------------------|
| Part No. | 861 335 □ |
| Width | 30 mm |
| Thickness | 3.5 mm |
| Cross-section | 105 mm ² |
| Material | StSt (V4A) |
| Material No. | 1.4404 |
| ASTM / AISI: | 316L |
| Type | with print |
| Standard | based on EN 62561-2 |
| Conductivity | ≥ 1.25 m / Ohm mm ² |
| Resistivity | ≤ 0.8 Ohm mm ² / m |
| Short-circuit current (50 Hz) (1 s; ≤ 300 °C) | 3.9 kA |
| Weight | 824 g/m |
| Customs tariff number (Comb. Nomenclature EU) | 72202021 |
| GTIN | 4013364292628 |
| PU | 60 m |

www.dehn-international.com/partners



Surge Protection
Lightning Protection
Safety Equipment
DEHN protects.

DEHN SE + Co KG
Hans-Dehn-Str. 1
Postfach 1640
92306 Neumarkt, Germany

Tel. +49 9181 906-0
Fax +49 9181 906-1100
info@dehn.de
www.dehn-international.com



www.dehn-international.com/partners

Type designations of products mentioned in this white paper which are at the same time registered trademarks are not especially marked. Hence the absence of TM or © markings does not indicate that the type designation is a free trade name. Nor can it be seen whether patents or utility models and other intellectual and industrial property rights exist. We reserve the right to introduce changes in performance, configuration and technology, dimensions, weights and materials in the course of technical progress. The figures are shown without obligation. Misprints, errors and modifications excepted. Reproduction in any form whatsoever is forbidden without our authorisation.

For information on our registered trademarks, please visit de.hn/tm.