# Lightning and surge protection for battery storage systems

**White Paper**

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## 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 lightning 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.

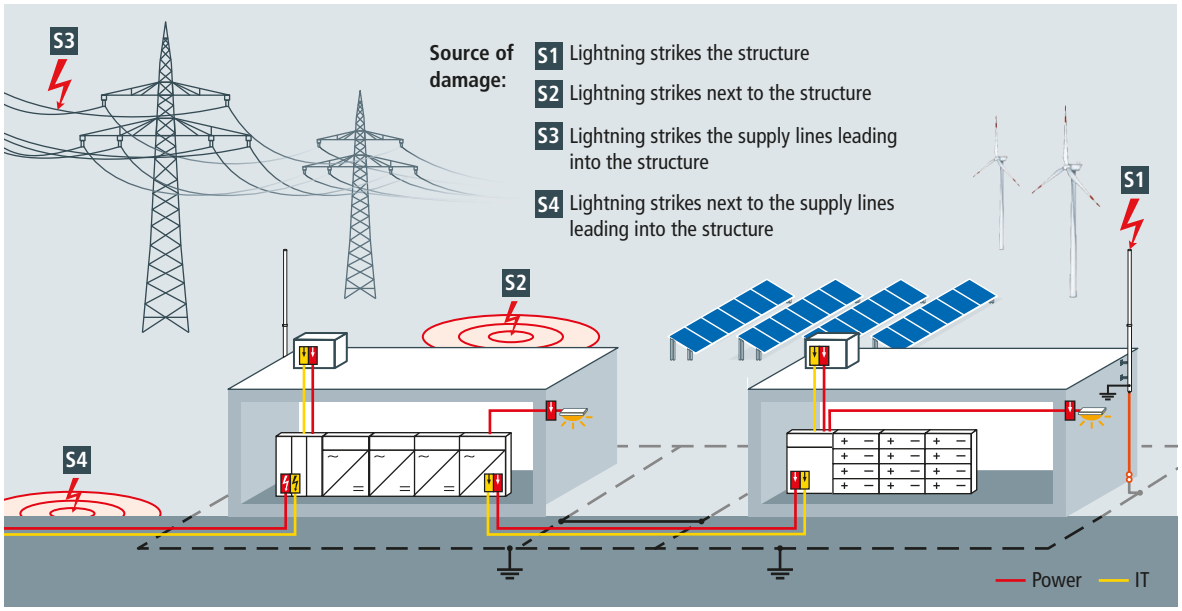


Figure 1 Causes of overvoltages


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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 lighting 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 µs. Distant lightning strikes or so-called indirect lightning strikes lead to conducted partial lightning currents (impulse waveform 10/350 µs) in the supply lines, or also to induced / capacitive couplings (impulse 8/20 µs) 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 lighting 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

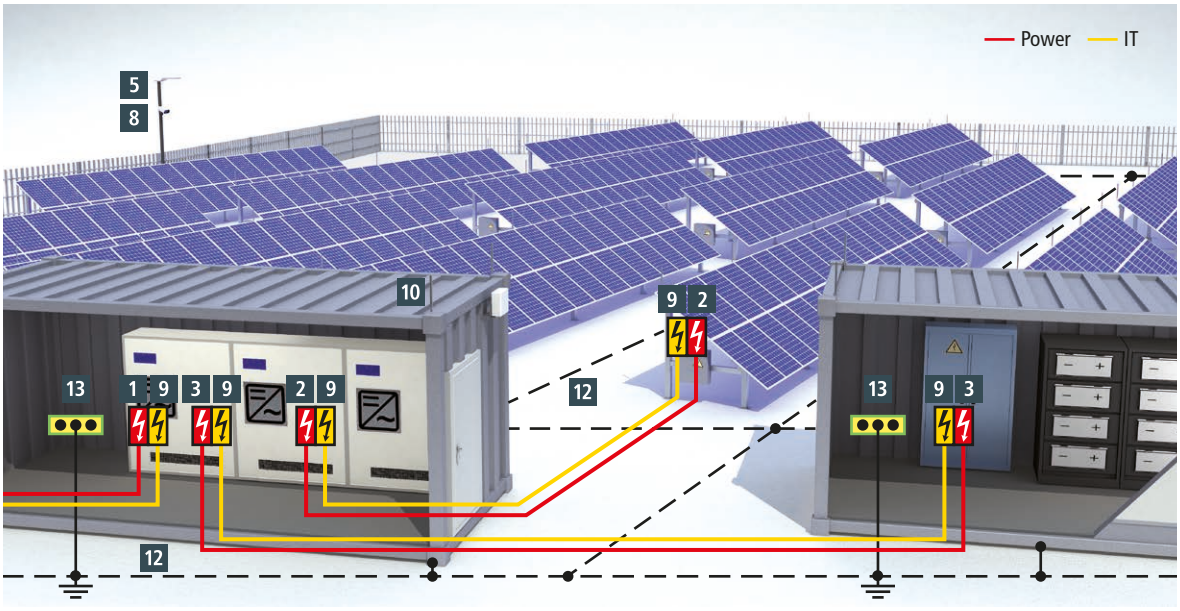


Figure 2 PV battery storage system as a metal construction

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# Lightning and surge protection for battery storage systems

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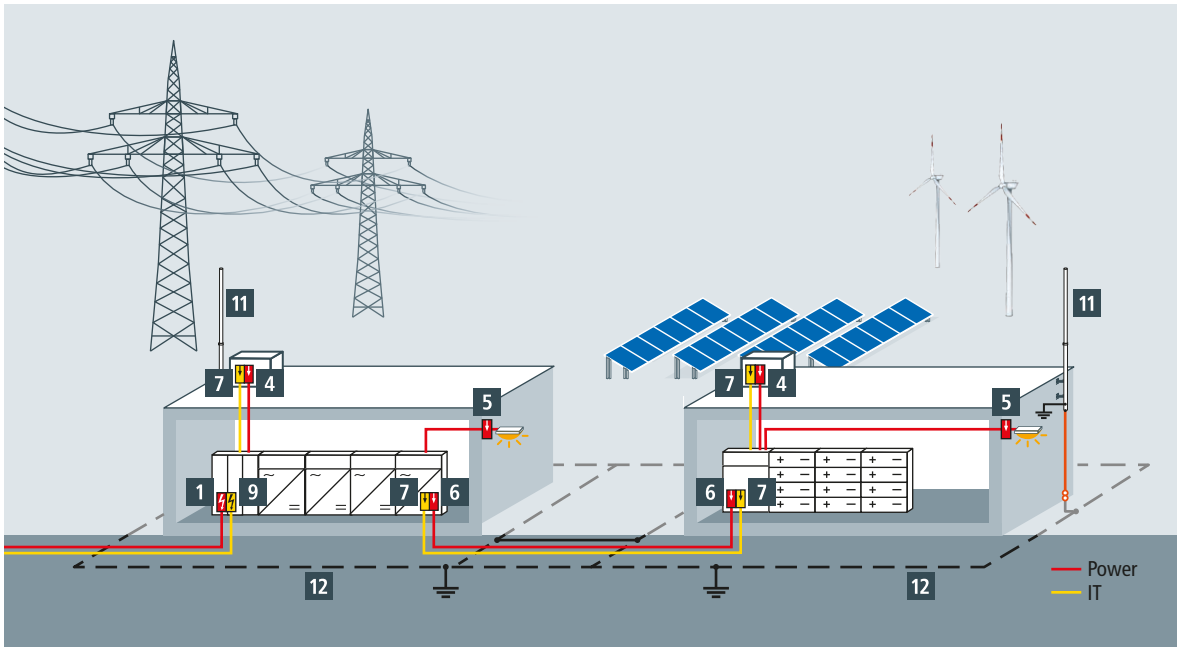


Figure 3 Battery storage system for power grid as a concrete construction with HVI Lightning protection

| | No. | | Type | Part No. | Other |
|---|---|---|---|---|---|
| Type 1 + 2 combined surge arrester 230/400 V (50 Hz) | 1 | DEHNventil M2 | DV M2 TT 255 FM | 954 315 | Modular combined lightning current and surge arrester for TT and TN systems with a nominal voltage of 230/400 V (3+1 configuration) |
| Combined arrester type 1 + 2, DC applications | 2 | DEHNcombo YPV | DCB YPV 1500 FM | 900 076 | Combined lightning current and surge arrester for use in battery storage and power supply systems up to 1500 V DC, with backup fuse up to an $I_{scr}$ of 50kA |
| Combined arrester type 1 + 2, DC applications | 3 | DEHNguard | DG ME DC Y 950 FM | 972 146 | DC current characteristics up to 950 V and a backup fuse up to 50 kA $I_{sccr}$, 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 |
| | | *alternatively:* DEHNguard modular YPV | DG M YPV 1500 FM | 952 567 | For DC currrent characteristics up to 1500 V and tested with backup fuse up to 50 kA $I_{sccr}$. |

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


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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 µs) 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

| | No. | | Type | Part No. | Other |
|---|---|---|---|---|---|
| Data and Communication lines * | 7 | BLITZDUCTORconnect | BCO ML2 BD HF 24 | 927 275 | e.g., for bus systems |
| | | *alternatively:* DEHNpatch | DPA CL8 EA 4PPOE | 929 161 | e.g., Industrial Ethernet, Power over Ethernet |
| | | *alternatively:* 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 | BLITZDUCTORconnect | BCO ML2 B 180 | 927 210 | e.g., for RS485 or XDSL DIN rail mounted devices with integrated LifeCheck function |
| 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 | |
| | 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 V2A, 30 mm x 3.5 mm | BA 30X3.5 V2A R60M | 860 900 | Stainless steel strip |
| | | *alternatively:* 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 | | IRCM adaptor for DEHNpatch | DPA MOD IRCM | 929 309 | Remote monitoring through optional module attachment and DRC IRCM remote signalling unit |
| | | Condition Monitoring Unit for DEHNrecord | DRC IRCM | 910 710 | Condition monitoring unit DEHNrecord, set for DIN rail mounted devices with integrated visual transmitter/receiver and visual reverse unit for monitoring the condition of BCO arresters with LifeCheck. Visual arrester status indication via LED group display in combination with remote signalling contact |
| *Selection depending on the interface | | | | | |

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

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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 l ightning 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. The type 1 + 2 combined arrester DCB YPV 1500 FM is suitable for direct currents up to 1500 V DC.

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 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-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 included 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.

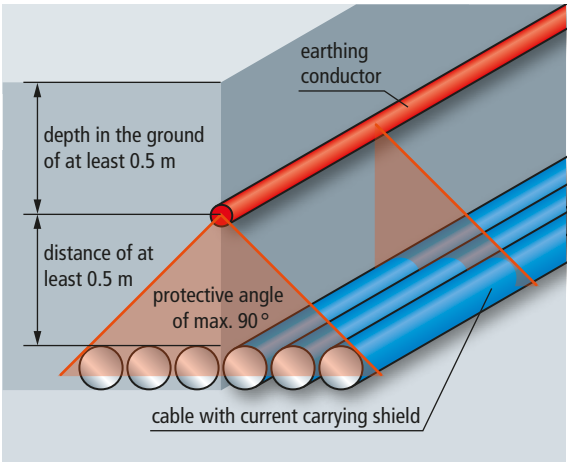


Figure 4 Protected volume for cable route

### 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**.


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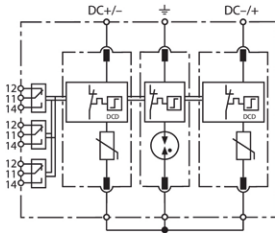
## DEHNguard ME

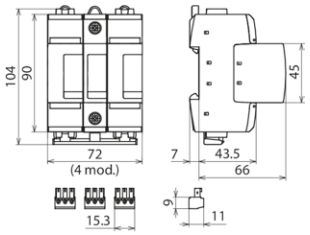
# DG ME DC Y 950 FM (972 146)

- 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<br>Part No. | DG ME DC Y 950 FM<br>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 µs) ($I_{imp}$) | 5 kA |
| Nominal discharge current (8/20 µs) ($I_n$) | 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 mm² solid / flexible |
| Cross-sectional area (max.) | 35 mm² stranded / 25 mm² 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 mm² solid / flexible |
| Extended technical data: | ---------- |
| – Residual voltage ($U_{res}$) @ 1.2 kA | 2,5 kV |
| – Use in DC battery storage systems up to $I_{SCCR}$ | ≤ 50 kA (t ≤ 4 ms) |
| – Backup fuse for DC battery storage systems up to $I_{SCCR}$ | Bussman HLS 2000Vdc / 200 A 2+/A173 DST aR, manufacturer's Part No.: 170M2040 |
| Weight | 497 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363030 |
| GTIN | 4013364347960 |
| PU | 1 pc(s) |

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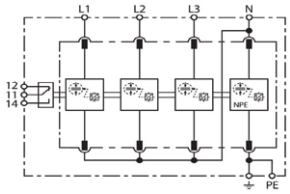
## DEHNventil

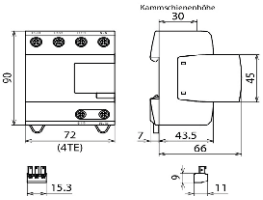
# DV M2 TT 255 FM (954 315)

- Prewired spark-gap-based type 1, type 2 and type 3 combined arrester consisting of a base part and plug-in protection modules
- Compact unit meets maximum safety requirements thanks to Rapid Arc Control (RAC)
- Capable of protecting terminal equipment

Figure without obligation




Basic circuit diagram DV M2 TT 255 FM




Dimension drawing DV M2 TT 255 FM

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

| Type<br>Part No. | DV M2 TT 255 FM<br>954 315 |
|---|---|
| SPD according to EN 61643-11 / IEC 61643-11 | type 1 + type 2 + type 3 / class I + class II + class III |
| Nominal voltage (a.c.) ($U_N$) | 230 / 400 V (50 / 60 Hz) |
| Max. continuous operating voltage (a.c.) [L-N] ($U_C$) | 255 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 µs) [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 µs) [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 µs) [L-N]/[N-PE] ($I_n$) | 25 / 100 kA |
| Voltage protection level [L-N]/[N-PE] ($U_P$) | ≤ 1.5 / ≤ 1.5 kV |
| Open-circuit voltage of the combination wave generator ($U_{OC}$) | 6 kV |
| Follow current extinguishing capability [L-N]/[N-PE] ($I_{fi}$) | 50 $kA_{rms}$ / 100 $A_{rms}$ |
| Follow current limitation / Selectivity | No tripping of a 32 A gG fuse up to 50 $kA_{rms}$ (prosp.) |
| Short-circuit current rating [L-N]/[N-PE] ($I_{SCCR}$) | 50 $kA_{rms}$ / 100 $A_{rms}$ |
| Response time ($t_A$) | ≤ 100 ns |
| Max. backup fuse (L) up to $I_K$ = 50 $kA_{rms}$ | 250 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 |
| Let-through energy with an S20K275 ($I_{imp}$ = 2.5 to 25 kA) | < 1 J |
| 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, L2, L3, N, PE, ⏚) (min.) | 10 $mm^2$ solid / flexible |
| Cross-sectional area (L1, L2, L3, N, PE, ⏚) (max.) | 35 $mm^2$ stranded / 25 $mm^2$ flexible |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Place of installation / Degree of protection | indoors / IP 20 |
| Capacity | 4 module(s), DIN 43880 |
| Approvals | VDE, KEMA, UL |
| Type of remote signalling contact | yes / 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] ($U_P$) | 1.8 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 $kA_{rms}$ | 250 A gG |

**Use for 16.7 Hz traction power supply systems**

| Type<br>Part No. | DV M2 TT 255 FM<br>954 315 |
|---|---|
| – Test voltage AC ($U_C$) | 266 V |
| – Nominal voltage (a.c.) ($U_N$) | 230 / 400 V |
| – Nominal frequency (a.c.) ($f_N$) | 16.7 Hz |
| – Max. backup fuse | 160 A gG @ 16,7 Hz |
| Weight | 537 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363090 |
| GTIN | 4013364400917 |
| PU | 1 pc(s) |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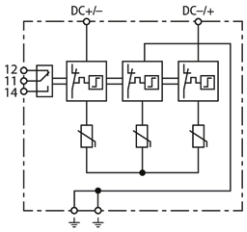
## DEHNcombo

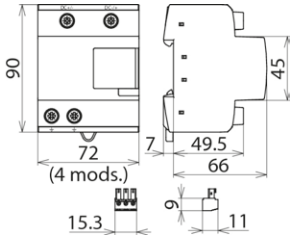
# DCB YPV 1500 FM (900 076)

- Applicable in PV systems in accordance with IEC 60364-7-712 / DIN VDE 0100-712
- Universally applicable in earthed and unearthed PV systems
- Prewired type 1 and type 2 combined lightning current and surge arrester for use in photovoltaic generator circuits
- Fault-resistant Y circuit prevents damage to the surge protective device in case of insulation faults in the generator circuit

Figure without obligation




Basic circuit diagram DCB YPV 1500 FM




Dimension drawing DCB YPV 1500 FM

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

| Type<br>Part No. | DCB YPV 1500 FM<br>900 076 |
|---|---|
| SPD according to EN 61643-31 / IEC 61643-31 | type 1 + type 2 / class I + class II |
| Max. PV voltage [DC+ -> DC-] ($U_{CPV}$) | ≤ 1500 V |
| Max. PV voltage [DC+/DC- -> PE] ($U_{CPV}$) | ≤ 1500 V |
| Short-circuit current rating ($I_{SCPV}$) | 10 kA |
| Nominal discharge current (8/20 µs) ($I_n$) | 20 kA |
| Max. discharge current (8/20 µs) ($I_{max}$) | 40 kA |
| Total discharge current (8/20 µs) [DC+/DC- -> PE] ($I_{total}$) | 40 kA |
| Total discharge current (10/350 µs) [DC+/DC- -> PE] ($I_{total}$) | 12.5 kA |
| Lightning impulse current (10/350 µs) [DC+ -> PE/DC- -> PE] ($I_{imp}$) | 6.25 kA |
| Voltage protection level [(DC+/DC-) -> PE] ($U_P$) | < 4.5 kV |
| Voltage protection level [DC+ -> DC-] ($U_P$) | < 4.5 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 mm² solid / flexible |
| Cross-sectional area (max.) | 35 mm² stranded / 25 mm² 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, 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 mm² solid / flexible |
| Extended technical data: | ---------- |
| – Use in DC battery storage systems up to $I_{SCCR}$ | ≤ 50 kA (t ≤ 4 ms) |
| – Backup fuse for DC battery storage systems up to $I_{SCCR}$ | Bussman HLS 2000Vdc / 200 A 2+/A173 DST aR, manufacturer's Part No.: 170M2040 |
| Weight | 564 g |
| Customs tariff number (Comb. Nomenclature EU) | 85354000 |
| GTIN | 6942299504552 |
| PU | 1 pc(s) |

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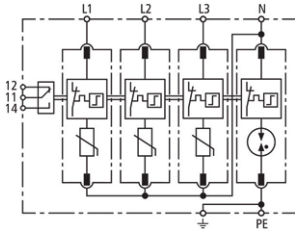
## DEHNguard

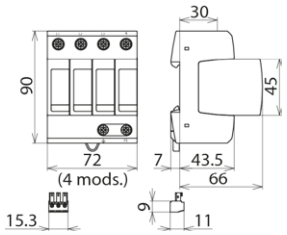
# DG M TT 275 FM (952 315)

- 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<br>Part No. | DG M TT 275 FM<br>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 µs) ($I_n$) | 20 kA |
| Max. discharge current (8/20 µs) ($I_{max}$) | 40 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] ($I_{fi}$) | 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: | ---------- |
| Lightning impulse current (10/350 µs) [N-PE] ($I_{imp}$) | 12 kA |
| 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) |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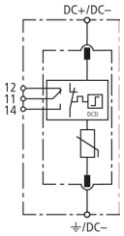
## DEHNguard

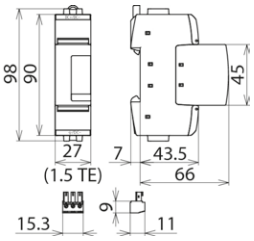
# DG SE DC 900 FM (972 145)

- 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<br>Part No. | DG SE DC 900 FM<br>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 µs) ($I_n$) | 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., 2x $U_C$ ($U_T$) - 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 mm² solid / flexible |
| Cross-sectional area (max.) | 35 mm² stranded / 25 mm² 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 mm² 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) |

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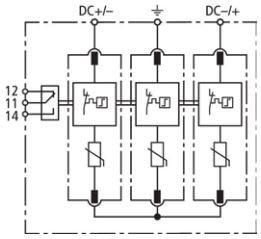
## DEHNguard YPV

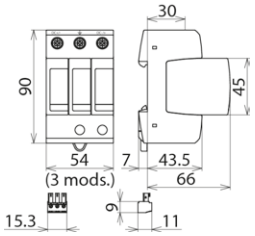
# DG M YPV 1500 FM (952 567)

- High discharge capacity due to powerful zinc oxide varistors
- Modular prewired complete unit for use in photovoltaic systems consisting of a base part and plug-in protection modules
- Tried and tested fault-resistant Y circuit

Figure without obligation




Basic circuit diagram DG M YPV 1500 FM




Dimension drawing DG M YPV 1500 FM

Multipole modular surge arrester for use in PV systems; with remote signalling contact for monitoring unit (floating changeover contact).

| Type<br>Part No. | DG M YPV 1500 FM<br>952 567 |
|---|---|
| SPD according to EN 61643-31 / IEC 61643-31 | type 2 / class II |
| Max. PV voltage ($U_{CPV}$) | 1500 V |
| Short-circuit current rating ($I_{SCPV}$) | 10 kA |
| Total discharge current (8/20 µs) ($I_{total}$) | 40 kA |
| Nominal discharge current (8/20 µs) [(DC+/DC-) --> PE] ($I_n$) | 15 kA |
| Max. discharge current (8/20 µs) [(DC+/DC-) --> PE] ($I_{max}$) | 40 kA |
| Voltage protection level ($U_P$) | ≤ 5 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 |
| Capacity | 3 module(s), DIN 43880 |
| Approvals | UL, 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 mm2 solid / flexible |
| Extended technical data: | ---------- |
| – Use in DC battery storage systems up to $I_{SCCR}$ | ≤ 50 kA (t ≤ 4 ms) |
| – Backup fuse for DC battery storage systems up to $I_{SCCR}$ | Bussman HLS 2000Vdc / 200 A 2+/A173 DST aR, manufacturer's Part No.: 170M2040 |
| Weight | 329 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363030 |
| GTIN | 4013364327726 |
| PU | 1 pc(s) |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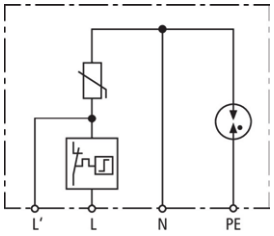
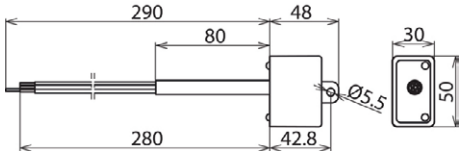
## DEHNcord

# 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<br>Part No. | DCOR L 2P 275 SO IP<br>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 µs) ($I_n$) | 5 kA |
| Max. discharge current (8/20 µs) ($I_{max}$) | 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] ($I_{fi}$) | 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) |

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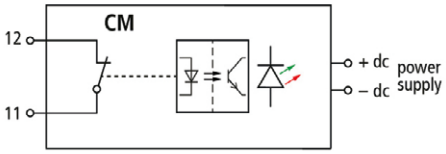
## DEHNrecord

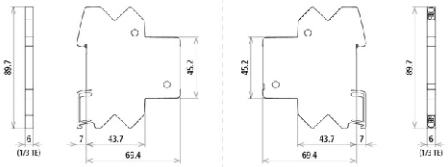
# DRC IRCM (910 710)

- Condition monitoring of BLITZDUCTORconnect arresters with integrated LifeCheck
- Quick and simple installation and initial operation (without addressing arresters)
- Remote signalling via floating remote signalling contact (break contact)

Figure without obligation




Basic circuit diagram DRC IRCM



Dimension drawing DRC IRCM

Condition monitoring unit DEHNrecord, set for DIN rail mounted devices with integrated visual transmitter/receiver and visual reverse unit for monitoring the condition of BLITZDUCTORconnect arresters with LifeCheck. Visual status indication via LED group display in combination with remote signalling contact (break contact).

| Type<br>Part No. | DRC IRCM<br>910 710 |
|---|---|
| Input voltage range (d.c.) ($U_{IN}$) | 6-35 V d.c. |
| Max. rated current consumption ($I_{IN}$) | ≤ 10 mA |
| Distance between transmitter / receiver and reverse unit | ≤ 305 mm |
| Message: Replacing of SPD recommended | LED, remote signalling contact (break contact) |
| Indicator | two-colour LED (green, red) |
| Type of remote signalling contact | break contact (nc) |
| Technical data of remote signalling contact | contact resistance < 2.5 ohms; leakage current < 1 µA |
| Switching capacity (d.c.) | 48 V / 500 mA / Pmax 300 mW |
| Test cycle | continuous |
| Operating temperature range ($T_U$) | -30 °C ... +70 °C |
| Degree of protection | IP 20 |
| For mounting on | 35 mm DIN rails acc. to EN 60715 |
| Connection (input / output) | Push-in / Push-in |
| Cross-sectional area (solid) | 0.2-2.5 $mm^2$ |
| Cross-sectional area (flexible) | 0.2-2.5 $mm^2$ |
| Enclosure material | polyamide PA 6.6 |
| Colour | grey |
| Test standards | EN 61010-1 |
| Approvals | UL |
| Delivery includes | Transmitter-/receiver unit /reverse unit |
| Weight | 52 g |
| Customs tariff number (Comb. Nomenclature EU) | 90308900 |
| GTIN | 4013364424678 |
| PU | 1 pc(s) |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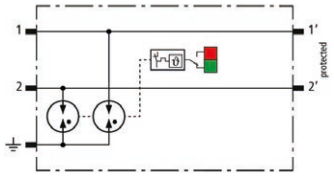
## BLITZDUCTOR

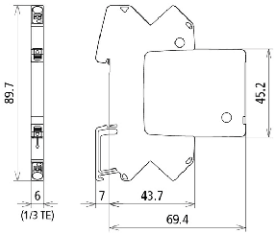
# BCO ML2 B 180 (927 210)

- LifeCheck arrester monitoring and iIntegrated status indication
- Modular two-pole arrester for lightning equipotential bonding
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_A$ –1 and higher

Figure without obligation




Basic circuit diagram BCO ML2 B 180




Dimension drawing BCO ML2 B 180

Space-saving, modular lightning current arrester with a width of 6 mm and push-in connection technology with status indication for protecting two single lines for lightning equipotential bonding as well as indirect earthing of shielded cables. With signal disconnection for maintenance purposes.

| Type<br>Part No. | BCO ML2 B 180<br>927 210 |
|---|---|
| SPD class | TYPE 1 |
| Impulse category | D1, C2, C3 |
| 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 ($I_L$) | 1.2 A |
| D1 Total lightning impulse current (10/350 µs) ($I_{imp}$) | 3 kA |
| D1 Lightning impulse current (10/350 µs) per line ($I_{imp}$) | 1.5 kA |
| C2 Total nominal discharge current (8/20 µs) ($I_n$) | 10 kA |
| C2 Nominal discharge current (8/20 µs) per line ($I_n$) | 5 kA |
| Voltage protection level line-line for $I_n$ C2 ($U_p$) | ≤ 1100 V |
| Voltage protection level line-PG for $I_n$ C2 ($U_p$) | ≤ 800 V |
| Voltage protection level line-line at 1 kV/µs C3 ($U_p$) | ≤ 950 V |
| Voltage protection level line-PG at 1 kV/µs C3 ($U_P$) | ≤ 700 V |
| Series resistance per line | 0 ohm(s) |
| Cut-off frequency line-line at 100 ohms ($f_G$) | 150 MHz |
| Operating temperature range ($T_U$) | -40 °C ... +80 °C |
| Operating state / fault indication | green / red |
| Degree of protection | IP 20 |
| Connection (input / output) | push-in / push-in |
| Cross-sectional area (solid) | 0.2-2.5 $mm^2$ |
| Cross-sectional area (flexible) | 0.2-2.5 $mm^2$ |
| Earthing via | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | polyamide PA 6.6 |
| Colour | yellow |
| Test standards | IEC 61643-21 / EN 61643-21 |
| Approvals | UL, CSA, EAC, ATEX, IECEx, CCC, SIL |
| ATEX approvals | TÜV 20 ATEX 8527 X: II 3G Ex ec IIC T4 Gc |
| IECEx approvals | IECEx TUR 20.0063X: Ex ec IIC T4 Gc |
| China Compulsory Certification | CCC no. 2021312304001192 |
| Extended technical data: | - - - - - - - - - - - - - - - - - - - |
| – Discharge current (8/20 µs) [1/2 - PG], [1+2 - PG] | 10 kA (10x) |
| – Voltage protection level line-PG at 1 kV/µs C3 after being subjected to $I_{max}$ ($U_p$) | ≤ 700 V |
| Weight | 33 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363010 |
| GTIN | 4013364405585 |
| PU | 1 pc(s) |

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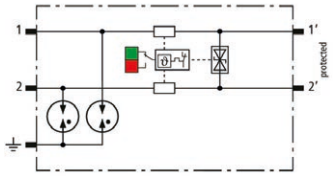
## BLITZDUCTOR

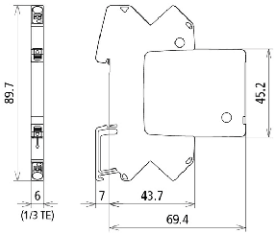
# BCO ML2 BD HF 24 (927 275)

- LifeCheck arrester monitoring and integrated status indication
- Modular two-pole arrester for optimal protection of one pair of high-frequency signal circuits
- 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 BCO ML2 BD HF 24




Dimension drawing BCO ML2 BD HF 24

Space-saving, modular combined arrester with a width of 6 mm and push-in connection technology with status indication for protecting one pair of unearthed high-frequency bus systems as well as balanced interfaces. With signal disconnection for maintenance purposes.

| Type<br>Part No. | BCO ML2 BD HF 24<br>927 275 |
|---|---|
| SPD class | TYPE 1 P2 |
| Impulse category | D1, C1, C2, C3, B2 |
| Nominal voltage ($U_N$) | 24 V |
| Max. continuous operating voltage (d.c.) ($U_C$) | 36 V |
| Max. continuous operating voltage (a.c.) ($U_C$) | 25.4 V |
| Nominal current at 70 °C ($I_L$) | 0.75 A |
| D1 Total lightning impulse current (10/350 µs) ($I_{imp}$) | 3 kA |
| D1 Lightning impulse current (10/350 µs) per line ($I_{imp}$) | 1.5 kA |
| C2 Total nominal discharge current (8/20 µs) ($I_n$) | 10 kA |
| C2 Nominal discharge current (8/20 µs) per line ($I_n$) | 5 kA |
| Voltage protection level line-line for $I_n$ C2 ($U_p$) | ≤ 85 V |
| Voltage protection level line-PG for $I_n$ C2 ($U_p$) | ≤ 650 V |
| Voltage protection level line-line for $I_n$ C1 ($U_p$) | ≤ 85 V |
| Voltage protection level line-PG for $I_n$ C1 ($U_p$) | ≤ 650 V |
| Voltage protection level line-line at 1 kV/µs C3 ($U_p$) | ≤ 48 V |
| Voltage protection level line-PG at 1 kV/µs C3 ($U_P$) | ≤ 600 V |
| Series resistance per line | 1 ohm(s) |
| Cut-off frequency line-line ($f_G$) | 100 MHz |
| Operating temperature range ($T_U$) | -40 °C ... +80 °C |
| Operating state / fault indication | green / red |
| Degree of protection | IP 20 |
| Connection (input / output) | push-in / push-in |
| Cross-sectional area (solid) | 0.2-2.5 $mm^2$ |
| Cross-sectional area (flexible) | 0.2-2.5 $mm^2$ |
| Earthing via | 35 mm DIN rails acc. to EN 60715 |
| Enclosure material | polyamide PA 6.6 |
| Colour | yellow |
| Test standards | IEC 61643-21 / EN 61643-21 |
| Approvals | UL, EAC |
| Extended technical data: | - - - - - - - - - - - - - - - - - - - |
| – Max. discharge current (8/20 µs) [1/2 - PG], [1+2 - PG] ($I_{max}$) | 20 kA |
| – Discharge current (8/20 µs) [1/2 - PG], [1+2 - PG] | 10 kA (10x) |
| – Voltage protection level line-PG at 1 kV/µs C3 after being subjected to $I_{max}$ ($U_p$) | ≤ 600 V |
| Weight | 34 g |
| Customs tariff number (Comb. Nomenclature EU) | 85363010 |
| GTIN | 4013364468566 |
| PU | 1 pc(s) |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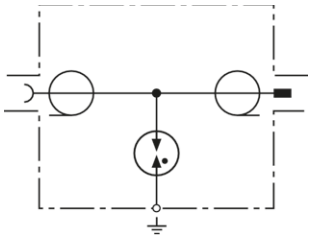
## DEHNgate

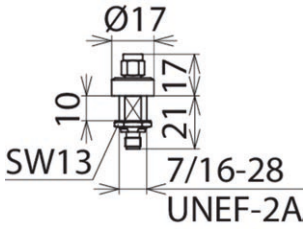
# DGA G SMA (929 039)

- 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<br>Part No. | DGA G SMA<br>929 039 |
|---|---|
| SPD class | TYPE 2 |
| Max. continuous operating voltage (d.c.) ($U_C$) | 135 V |
| Nominal current ($I_L$) | 2 A |
| Max. transmission capacity | 60 W |
| D1 Lightning impulse current (10/350 µs) ($I_{imp}$) | 1 kA |
| C2 Nominal discharge current (8/20 µs) ($I_n$) | 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 (Ø11.2 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) |

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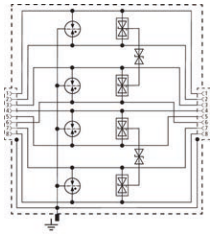
## DEHNpatch

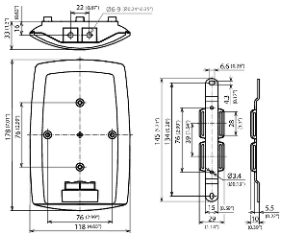
# DPA CLE IP66 (929 221)

- 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<br>Part No. | DPA CLE IP66<br>929 221 |
|---|---|
| SPD class | TYPE 2 P1 |
| 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 µs) per line ($I_{imp}$) | 0.8 kA |
| D1 Total lightning impulse current (10/350 µs) ($I_{imp}$) | 4 kA |
| C2 Nominal discharge current (8/20 µs) line-line ($I_n$) | 400 A |
| C2 Nominal discharge current (8/20 µs) line-PG ($I_n$) | 2.5 kA |
| C2 Total nominal discharge current (8/20 µs) ($I_n$) | 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/µs C3 ($U_P$) | ≤ 180 V |
| Voltage protection level line-PG at 1 kV/µs C3 ($U_P$) | ≤ 500 V |
| Voltage protection level pair-pair at 1 kV/µs C3 (PoE) ($U_P$) | ≤ 120 V |
| Cut-off frequency ($f_G$) | 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) |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## 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<br>Part No. | HVI LI 20 L6M SR1990 FSP1000 GFK AL V2A<br>819 256 |
|---|---|
| Material of supporting tube | GRP / Al |
| Length of supporting tube | 1990 mm |
| Transport length | 1990 mm |
| Material of air-termination tip | StSt |
| Length of air-termination tip | 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 mm² |
| Lightning current carrying capability (class / $I_{imp}$) | H1 / 150 kA |
| 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 |
| Standard | DIN IEC/TS 62561-8 (VDE V 0185-561-8) |
| Weight | 6,03 kg |
| Customs tariff number (Comb. Nomenclature EU) | 85389099 |
| GTIN | 4013364255388 |
| PU | 1 pc(s) |

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## Air-termination rod

### FS 10 1000 AL (101 000)

Figure without obligation

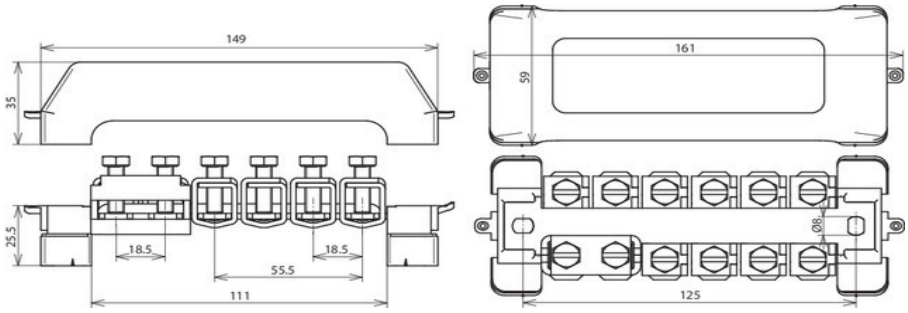
Air-termination rod chamfered on both sides, for protecting roof-mounted structures, chimneys etc., can be fixed in a concrete base (8.5 kg) with fixing wedge or by means of rod holders / spacers.

| Type<br>Part No. | FS 10 1000 AL<br>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




Arrangement:

| Type<br>Part No. | PAS 11AK<br>563 200 |
|---|---|
| Connection (solid / stranded) | 10 x 2.5-95 mm² |
| Connection Rd | or 10 x -10 mm |
| Connection Fl | 1 x -30 x 4 mm |
| Material of cage clamp | St/tZn |
| Material of contact rail | Cu/gal Sn |
| Cross section | 30 mm² |
| Fixing | [2x] 6 x 8 mm |
| Fixing frames | P (grey) |
| Cover | P (grey/sealable) |
| Lightning current carrying capability (10/350 µs) | $I_{imp}$ 100 kA / $I_{imp}$ 50 kA *) |
| Standard | EN 62561-1 |
| Type | halogen-free |
| Weight | 410 g |
| Customs tariff number (Comb. Nomenclature EU) | 85389099 |
| GTIN | 4013364056558 |
| PU | 1 pc(s) |

*) For exact assignment, see test certificate.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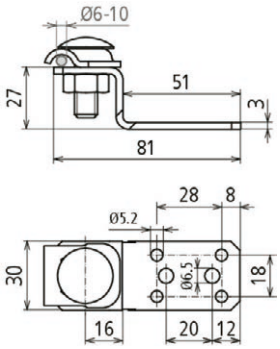
## Connection lug with clamping frame

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

Figure without obligation




Arrangement:

| Type<br>Part No. | AL ZF KB 6.10STTZN B5.2 6.5 L81 AL<br>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 piece | St/tZn |
| Screw | M10 x 30 mm |
| Material of screw / nut | StSt |
| Connection | lengthwise / crosswise |
| Connection with | clamping piece |
| Clamping range Rd | 6-10 mm |
| Lightning current carrying capability (10/350 µs) | $I_{imp}$ 50 kA *) |
| Standard | EN 62561-1 |
| Weight | 74 g |
| Customs tariff number (Comb. Nomenclature EU) | 85389099 |
| GTIN | 4013364078604 |
| PU | 50 pc(s) |

*) For exact assignment, see test certificate.

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## Round wire

### RD 10 V4A R80M (860 010)

Figure without obligation

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

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

| Type<br>Part No. | RD 10 V4A R80M<br>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 (a.c. 50 Hz / d.c.) (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 V2A R60M (860 900)

Figure without obligation

Stainless steel strip according to EN 62561-2, for lightning protection systems and ring equipotential bonding.

| Type<br>Part No. | BA 30X3.5 V2A R60M<br>860 900 ✔ |
|---|---|
| Width | 30 mm |
| Thickness | 3.5 mm |
| Cross-section | 105 mm$^2$ |
| Material | StSt |
| Material No. | 1.4301 / 1.4303 |
| Standard | EN 62561-2 |
| Conductivity | ≥ 1.25 m / Ohm mm$^2$ |
| Resistivity | ≤ 0.8 Ohm mm$^2$ / m |
| Short-circuit current (a.c. 50 Hz / d.c.) (1 s; ≤ 300 °C) | 3.9 kA |
| Weight | 824 g/m |
| Customs tariff number (Comb. Nomenclature EU) | 72202021 |
| GTIN | 4013364143395 |
| PU | 60 m |


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**Surge Protection**
**Lightning Protection**
**Safety Equipment**
**DEHN protects.**

DEHN SE
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

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