



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 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.

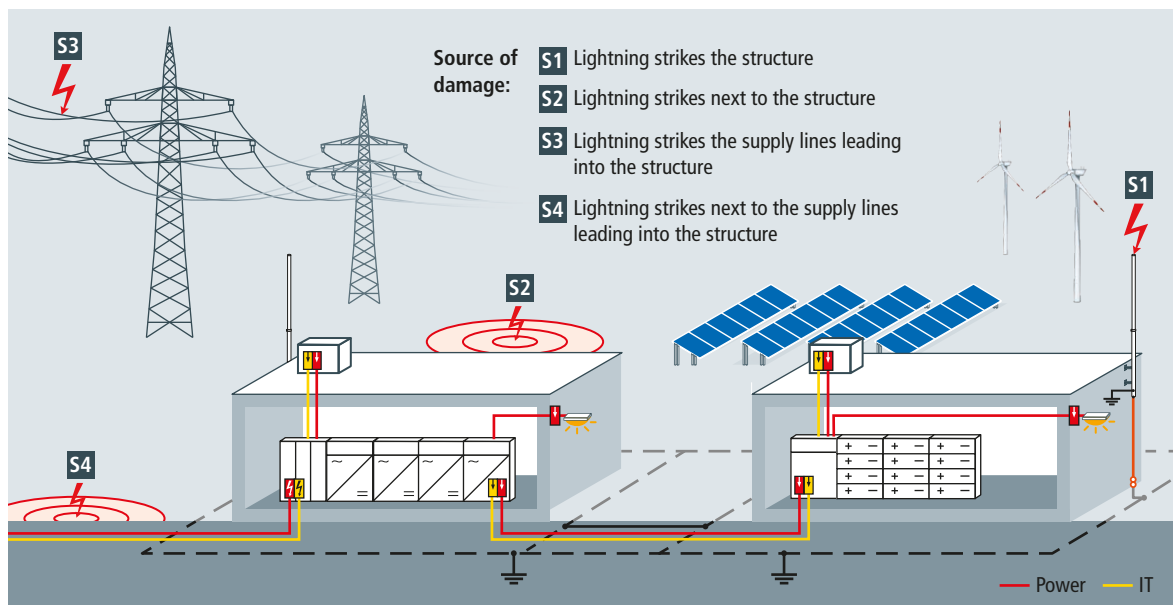


Figure 1 Causes of overvoltages

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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 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

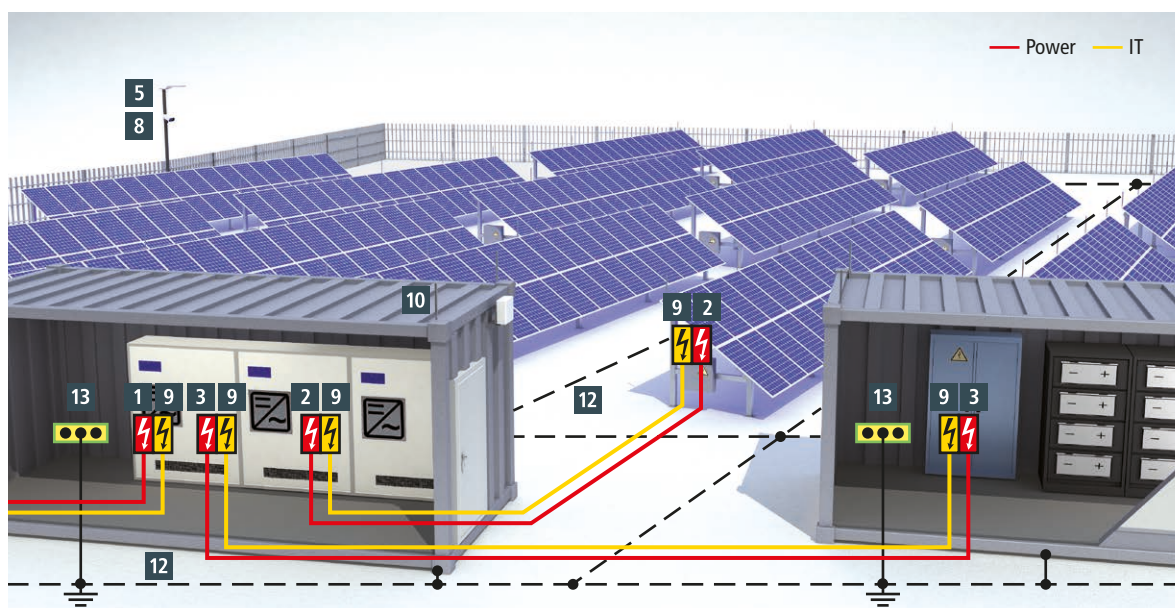


Figure 2 PV battery storage system as a metal construction

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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 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-

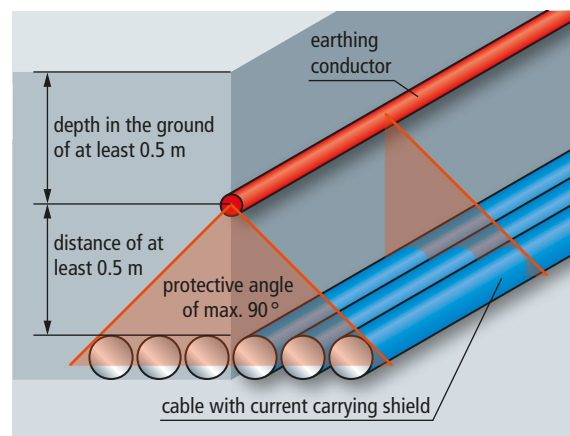


Figure 4 Protected volume for cable route

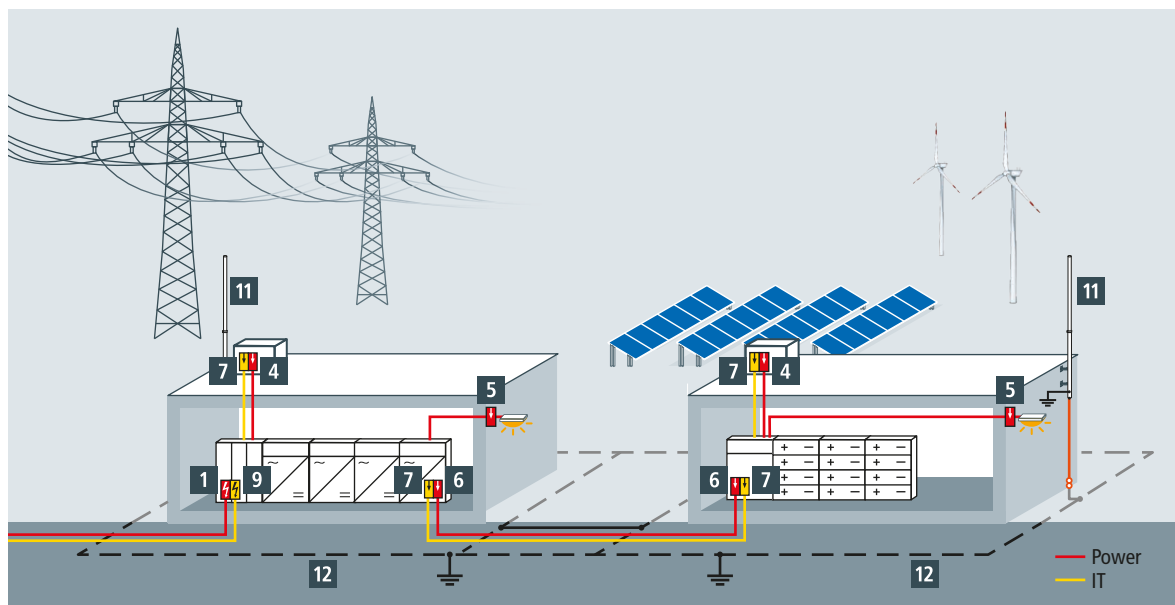


Figure 3 Battery storage system for power grid as a concrete construction with HVI Lightning protection

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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	920 300 920 347	(Type 1) base part and module, e.g., for RS485 or VDSL 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	

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

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	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

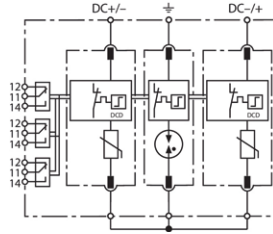
DEHNguard ME

DG ME DC Y 950 FM (972 146)

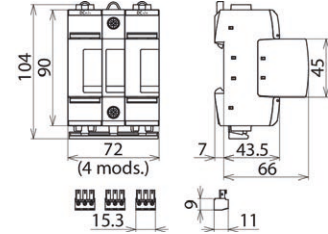
- Powerful d.c. switching device DCD



Figure without obligation



Basic circuit diagram DG ME DC Y 950 FM



Dimension drawing DG ME DC Y 950 FM

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

For more exact technical specifications, please refer to the installation instructions.

Type	DG ME DC Y 950 FM
Part No.	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
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	496 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364347960
PU	1 pc(s)

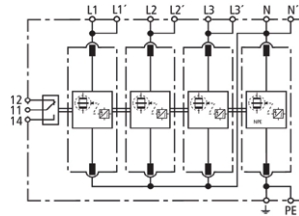
DEHNventil

DV M TT 255 FM (951 315)

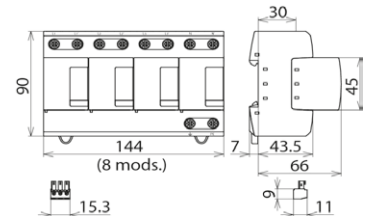
- Prewired spark-gap-based type 1 and type 2 combined lightning current and surge arrester consisting of a base part and plug-in protection modules
- Maximum system availability due to RADAX Flow follow current limitation, Capable of protecting terminal equipment



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)

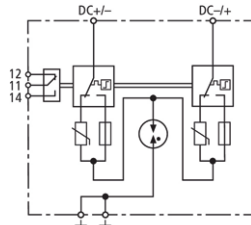
DEHNcombo

DCB YPV SCI 1500 FM (900 067)

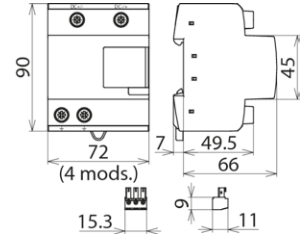
- Prewired type 1 and type 2 combined lightning current and surge arrester for use in photovoltaic generator circuits
- Combined disconnection and short-circuiting device with safe electrical isolation (patented SCI principle)
- Space-saving enclosure with a width of four modules



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
Weight	530 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364153752
PU	1 pc(s)

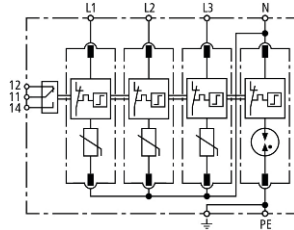
DEHNguard

DG M TT 275 FM (952 315)

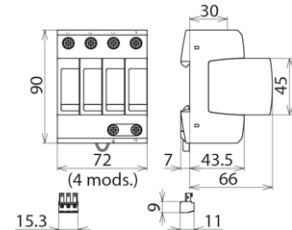
- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device



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
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_R)	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)

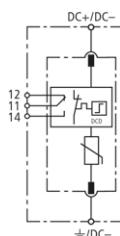
DEHNguard

DG SE DC 900 FM (972 145)

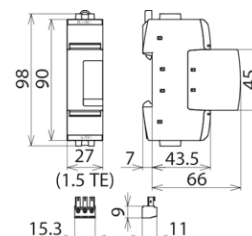
- Universal single-pole surge arrester consisting of a base part and a plug-in protection module
- Powerful d.c. switching device DCD
- Can be used without additional backup fuse



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
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 gG
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 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)

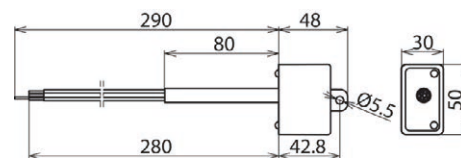
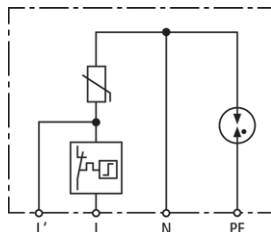
DEHNcord

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

Surge arrester for all installation systems; compact design. IP 65 degree of protection.

Type Part No.	DCOR L 2P 275 SO IP 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
Place of installation	indoor installation
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

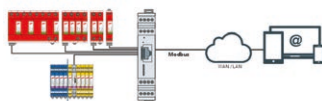


Figure without obligation

DEHNrecord Alert sends status reports on surge protective devices (SPDs) via Modbus TCP/RTU to an evaluation system. It enables transmission to devices like notebooks, tablets, smartphones and PCs or to the system control room. With an app, the start-up of DEHNrecord Alert is quick and easy. The app relays device information, e.g. part number, type designation and replacement modules, to DEHNrecord Alert. Sending this data to the user's device facilitates the efficient, cost-effective co-ordination and conduct of service and maintenance work.

Type Part No.	DRC AL MODBUS 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 mm ²
Connection Ethernet	RJ45
Cross-sectional area, solid / flexible	0.14-1.5 mm ²
Enclosure material	Ultramid B3UGM210
Colour	grey
Test standards	CU
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)

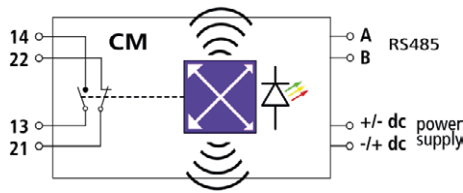
DEHNrecord Alert

DRC MCM AL XT (910 698)

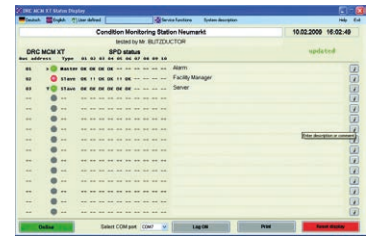
- Condition monitoring of LifeCheck-equipped SPDs
- Permanent monitoring of up to 10 SPDs (40 signal lines)
- Minimum wiring effort
- Remote signalling via remote signalling contact or optional RS485 interface
- Connection to DEHNrecord Alert
- Additional transmission of the part number



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. Visual operating state indication via three-coloured LED in conjunction with remote signalling contact (break or make contact). An RS 485 interface allows to connect up to 15 DRC MCM XT and the connection to DEHNrecord Alert.

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
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)

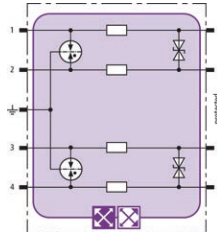
BLITZDUCTOR XT

BXT ML4 BD 180 (920 347)

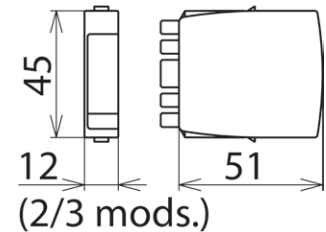
- LifeCheck SPD monitoring function
- Optimal protection of two pairs
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_A -2$ and higher



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.

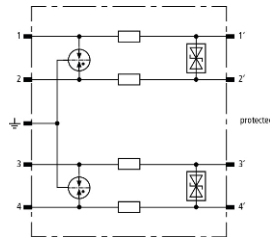
BLITZDUCTOR SP

BSP M4 BD HF 24 (926 375)

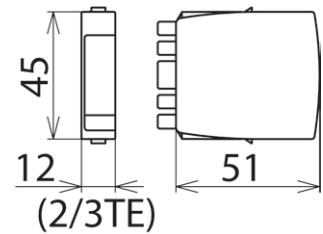
- Minimum signal interference
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B - 2$ and higher



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.

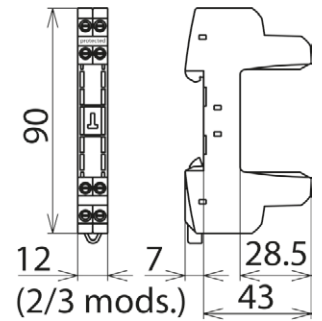
BLITZDUCTOR

BXT BAS (920 300)



Base part as a very 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.

Type	BXT BAS
Part No.	920 300
Colour	yellow
Weight	34 g
Customs tariff number (Comb. Nomenclature EU)	85369010
GTIN	4013364109179
PU	1 pc(s)



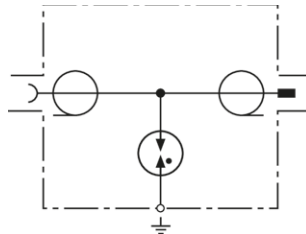
DEHNgate

DGA G SMA (929 039)

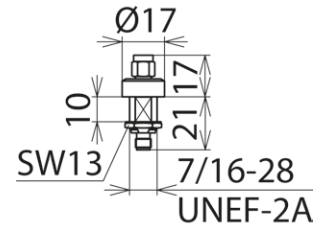
- Compact dimensions
- Extremely wide transmission range
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B - 1$ and higher



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)

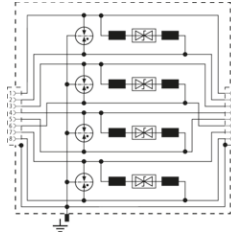
DEHNpatch

DPA M CLE RJ45B 48 (929 121)

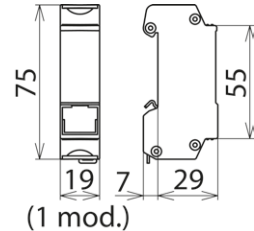
- Ideally suited for retrofitting, protection of all lines
- Cat. 6 in the channel (class E)
- Power over Ethernet (PoE+ according to IEEE 802.3at)
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B -2$ and higher



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 (PoE+ acc. to IEEE 802.3at up to 57 V) 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).

Accessories: Earthing bracket with flat connector sleeve

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 Total nominal discharge current (8/20 μ s) line-PG (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
Accessories	fixing material
Weight	109 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364118935
PU	1 pc(s)

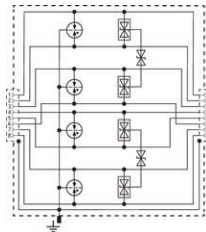
DEHNpatch

DPA CLE IP66 (929 221)

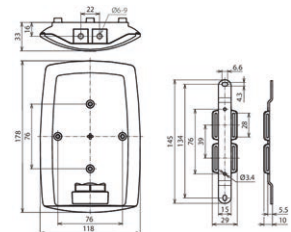
- Indoor / outdoor applications (IP 66)
- GBit Ethernet applications up to Cat 6A cable performance
- Power over Ethernet IEEE 802.3 (up to PoE++ / 4PPoE)
- For installation in conformity with the lightning protection zone concept at the boundaries from $0_B -2$ and higher



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 in indoor and outdoor areas in an IP66 rated enclosure impervious to dust and water jets. 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 Total nominal discharge current (8/20 μ s) line-PG (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
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)

For protecting roof-mounted structures, chimneys.



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

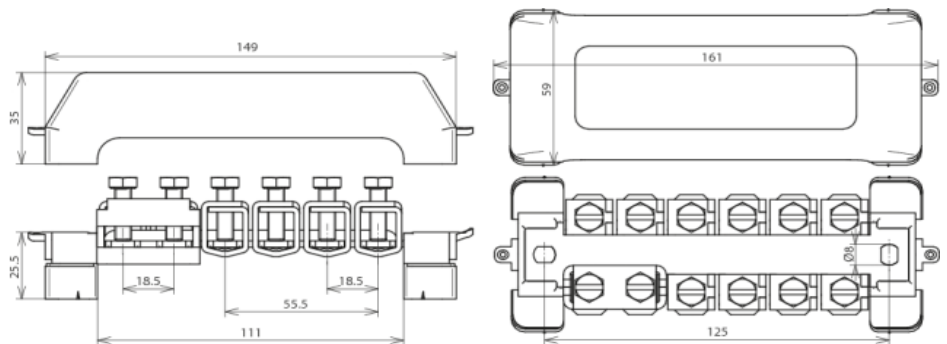


Equipotential busbar

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
Contact bar	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)

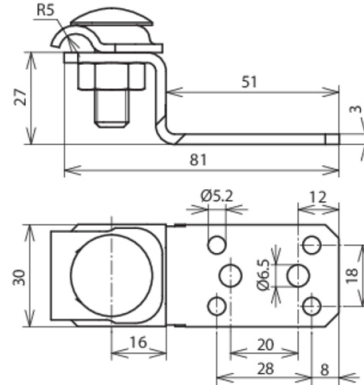
Connection lug with clamping frame



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)

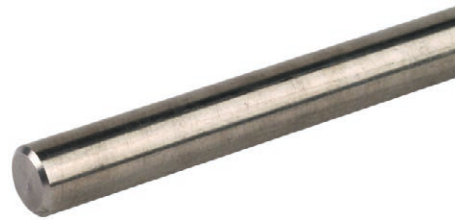


Figure without obligation

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 Part No.	RD 10 V4A R80M 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 Part No.	BA 30X3.5 TB V4A R60M 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

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