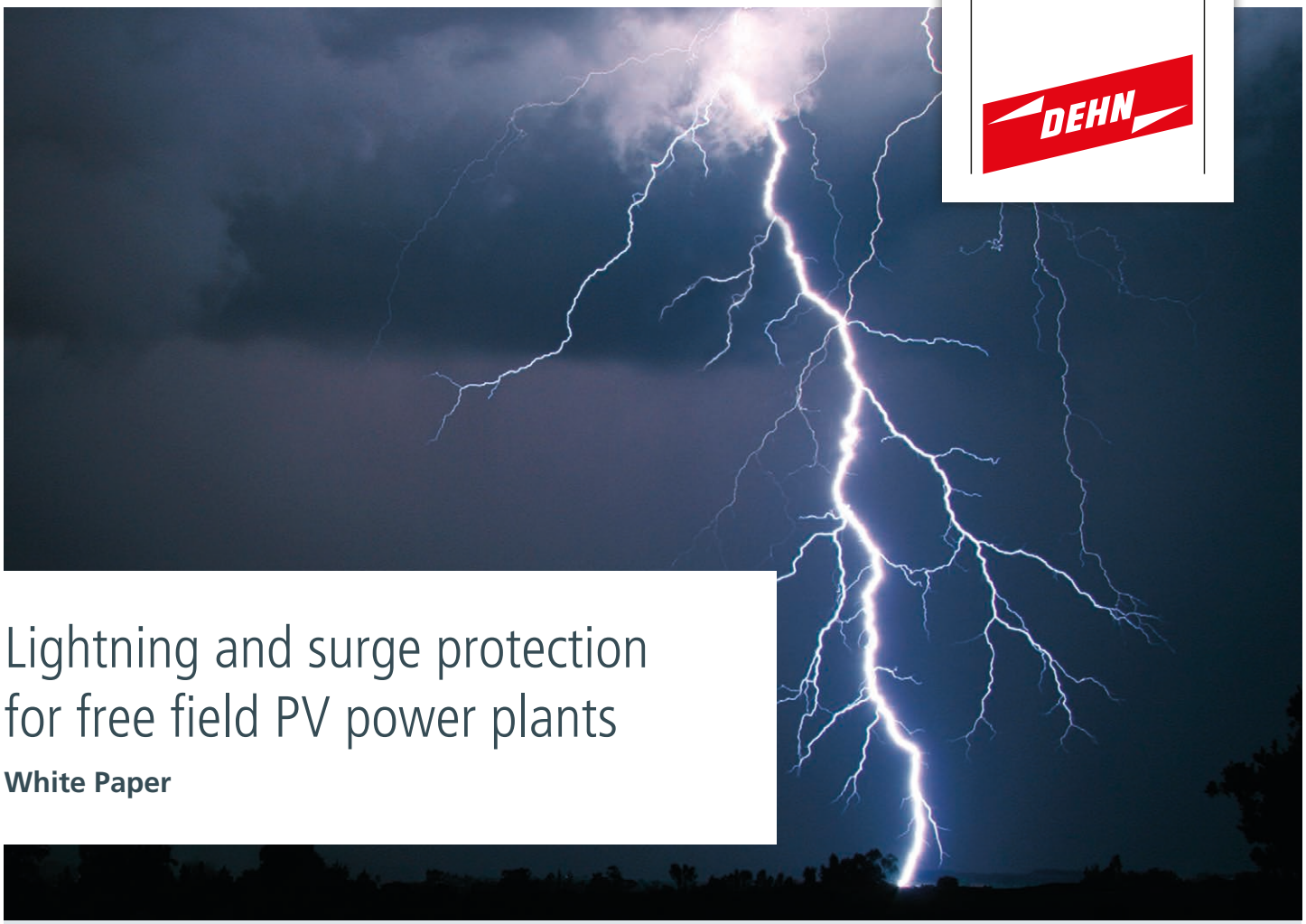

Lightning and surge protection for free field PV power plants

White Paper

Contents

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Lightning and surge protection for free field PV power plants

White Paper

With an annual newly installed capacity of some gigawatts, free field PV power plants are becoming an integral part of modern power supply systems in many countries. Today large-scale power plants with a capacity of 100 MW and higher are installed which are directly connected to the medium and high-voltage level. As an integral part of a power supply system, photovoltaic systems must ensure stable grid operation. In addition, possible production losses, which negatively affect the annual performance ratio of the power plant, are recorded by the yield monitoring system. Consequently, the investment volume and a minimum service life of 20 years require that the risk resulting from a lightning strike be assessed and protection measures be taken.

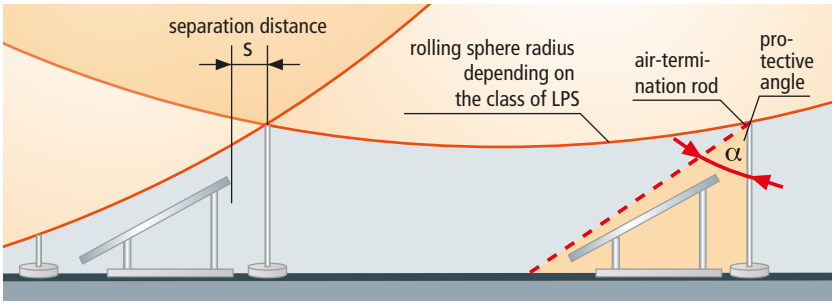

Figure 1 Rolling sphere method vs. protective angle method for determining the protected volume

Risk of a lightning strike to structures such as PV power plants

There is a connection between the solar radiation, air humidity and frequency of lightning discharges. Regions with a high solar radiation and air humidity are more susceptible to lightning strikes. The regional lightning frequency (lightning strikes per square kilometres / year) and the location and size of the PV power plant form the basis for calculating the probability of lightning strikes to the plant. PV systems are exposed to local weather conditions such as thunderstorms over decades.

Necessity of a lightning protection system

Damage to PV systems is caused both by the destructive effects of a direct lightning strike and inductive or capacitive coupling of voltages caused by the electromagnetic lightning field. Moreover, voltage peaks resulting from switching operations on the upstream a.c. system can cause damage to PV modules, inverters, charge controllers and their monitoring and communication systems.

Economic damage leads to replacement and repair costs, yield loss and costs for using the reserve power of the power plant. Lightning impulses also cause premature ageing of bypass diodes, power semiconductors and the input and output circuits of data systems, which leads to increased repair costs.

In addition, network operators place requirements on the availability of the energy produced. In Germany, these requirements are based on e.g. the new Grid Codes. Banks and insurance companies frequently also require to consider lightning protection measures in due diligence analyses. The German VdS 2010 brochure (Risk-oriented lightning and surge protection) published by the German Insurance Association (GDV) requires that lightning protection measures (class of LPS III) be taken for PV systems > 10 kW of objects with alternative renewable power supply systems.

The risk resulting from a lightning strike must be determined according to the IEC 62305-2 (EN 62305-2) standard and the results of this risk analysis must be considered at the design stage. For this purpose, DEHN + SÖHNE offers the DEHNsupport software. A risk analysis performed by means of this software ensures a technically and economically optimised lightning protection concept which is understood by all parties involved and offers the necessary protection at reasonable costs.

Measures for protecting PV power plants from lightning interference

To ensure effective protection, a lightning protection system with optimally coordinated elements (air-termination system, earth-termination system, lightning equipotential bonding, surge protective devices for power supply and data systems) is required.

Air-termination system and down conductors

To prevent direct lightning strikes to the electrical systems of a PV power plant, these systems must be located in the protected volume of air-termination systems. Design according to the German VdS 2010 guideline is based on class of LPS III. According to this class of LPS, the rolling sphere method (**Figure 1**) as per IEC 62305-3 (EN 62305-3) can be used to determine the number of air-termination rods. These air-termination rods form a protected volume above module racks, operations buildings and cables. Due to the inductive coupling of interference, it is advisable to install generator junction boxes mounted on module racks and decentralised inverters as far as possible from air-termination systems. The high masts on which CCTV systems are installed also act as air-termination systems. The CCTV system itself must be mounted in such a way that it is located in the protected volume of the mast. All down conductors of these air-termination systems must be connected to the terminal lugs of the earth-

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Figure 2 Lightning protection by means of DEHNiso spacers

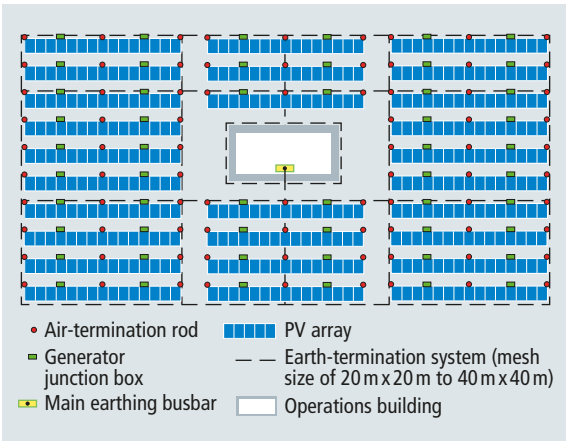

Figure 3 Earth-termination system as per IEC 62305-3 (EN 62305-3)

termination system. Terminal lugs must be corrosion-resistant (stainless steel (V4A), e.g. material No. AISI/ASTM 316 Ti) due to the risk of corrosion at the point where they leave the soil or concrete. Terminal lugs made of galvanised steel must be protected by adequate measures, e.g. Denso tapes or heat shrinkable sleeves.

To mechanically fix the air-termination systems, they can be frequently connected to the module racks. To this end, DEHNiso spacers can be used (**Figure 2**). The air-termination systems can be connected to the earth-termination system via pile-driven foundations, thus facilitating later maintenance of the premises.

Earth-termination system

An earth-termination system (**Figure 3**) forms the basis for implementing effective lightning and surge protection measures in PV power plants. In Annex D of Supplement 5 of the German DIN EN 62305-3 standard, an earth resistance R_A of less than 10 Ω is recommended for an earth-termination system. A meshed 10 mm stainless steel wire (20 m x 20 m to 40 m x 40 m) buried below the frost line is durable and has proven its worth in practice. The metal module racks can be used as part of the mesh if they have a minimum conductance according to the IEC 62305-3 (EN 62305-3) standard. Supplement 5 of the German DIN EN 62305-3 standard recommends that metal racks be interconnected. The mesh is frequently installed according to the existing cable trenches and should be closed. The IEC 61936-1 (EN 61936-1) and EN 50522 standards must be particularly observed for the earth-termination systems of the operations buildings. The earth-termination systems of the PV generators and the operations buildings must be interconnected by means of a flat strip (30 mm x 3.5 mm) or a round wire (Ø 10 mm) (stainless steel (V4A), e.g. material No. AISI/ASTM 316 Ti, or copper or galvanised steel). This interconnection of the individual earth-termination systems reduces the total earth resistance. By intermeshing the earth-termination systems, an equipotential surface is created which considerably reduces the voltage stress on the electrical connecting lines in case of lightning interference between the PV array and the operations building. To permanently keep the earth resistance stable over the many years of operation of a PV power plant, the influences of corrosion, soil moisture and frost must be taken into account. Only the areas below the frost line must be considered for the effective earth electrode length. The meshes must be interconnected via adequate lightning-current-tested connection components. The metal mounting systems on which the PV modules are installed must be connected to each other and to the earth-termination system. Mounting systems with a pile-driven or screw-in foundation can be used as earth electrodes (**Figure 4**) if they have the material and wall thickness specified in Table 7 of the IEC 62305-3 (EN 62305-3) standard. The required minimum length of 2.5 m in the area below the frost line can be added in case of interconnected lightning-current-proof individual elements. Each PV array must be interconnected in such a way that it can carry lightning currents, for example by means of a 10 mm stainless steel wire (e.g. material No. AISI/ASTM 316 Ti) and a UNI saddle clamp (**Figure 5**).

Lightning equipotential bonding

Lightning equipotential bonding means directly connecting all metal systems in such a way that they can carry

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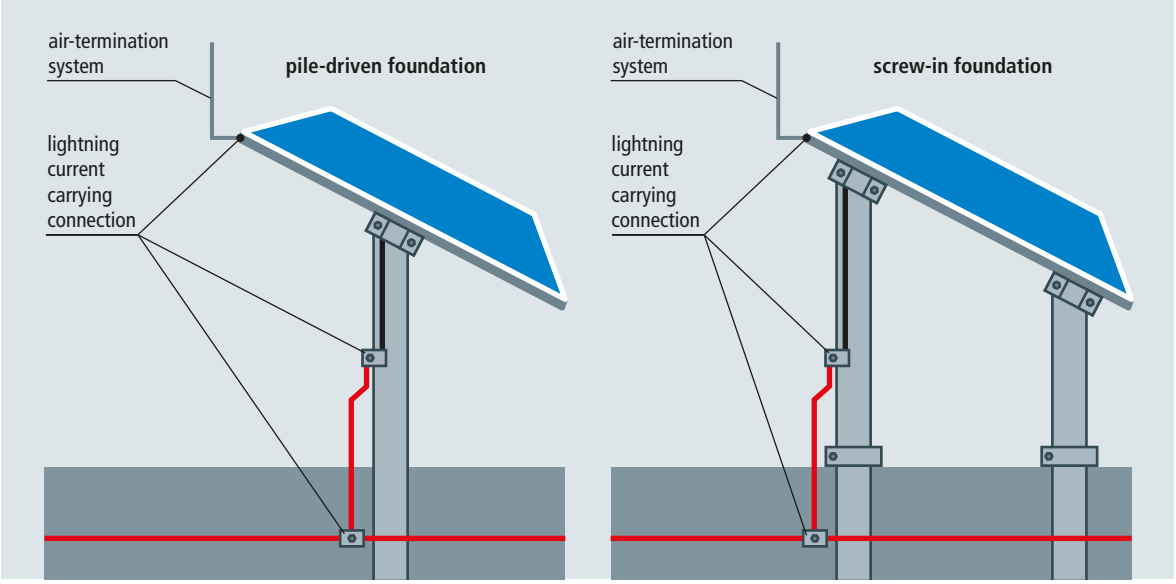

Figure 4 Pile-driven and screw-in foundation with a lightning current carrying connection between the air-termination system and the earth-termination system

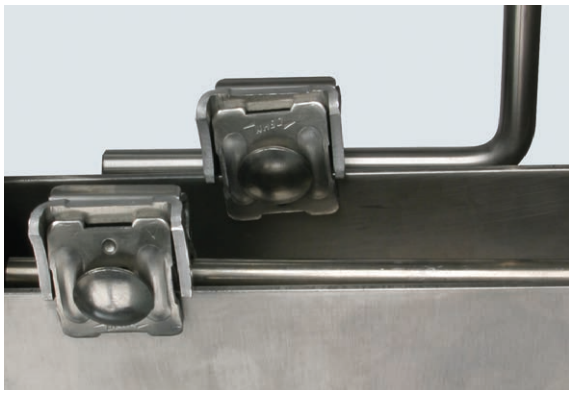

Figure 5 UNI saddle clamp

lightning currents. If the modules, cables and the operations building with the weather station are located in the protected volume of the external lightning protection system, it is not to be expected that direct lightning currents are injected into the lines. If the connection to the distribution network operator (DNO) is established on the low-voltage level, this point is connected to the main earthing busbar (MEB) via type 1 lightning current arresters (e.g. DEHNventil) since partial lightning currents are present. The same applies to the incoming telecommunication cables for which type 1 arresters such as BLITZDUTOR or DEHNbox (**Figure 6**) must be installed.

Solar generator and systems of the external lightning protection system

The air-termination systems of the external lightning protection system are vital. In case of an uncontrolled lightning strike to the PV system, lightning currents will flow into the electrical installation and cause severe damage to the system. When installing the external lightning protection system, it must be observed that solar cells are not shaded, for example, by air-termination rods. Diffuse shadows, which occur in case of distant rods or conductors, do not negatively affect the PV system and the yield. Core shadows, however, unnecessarily stress the cells and the associated bypass diodes. The required distance can be calculated and depends on the diameter of the air-termination rod. For example, if an air-termination rod with a diameter of 10 mm shades a module, only a diffuse shadow is cast on the module if a distance of 1.08 m is maintained between the module and the air-termination rod. Annex A of Supplement 5 of the German DIN EN 62305-3 standard provides more detailed information on the calculation of core shadows.

Cable routing in PV systems

All cables must be routed in such a way that large conductor loops are avoided. This must be observed for the single-pole series connections of the d.c. circuits (string) and for the interconnection of several strings. Moreover, data or sensor lines must not be routed across several strings and form large conductor loops with the string lines. For this reason, power

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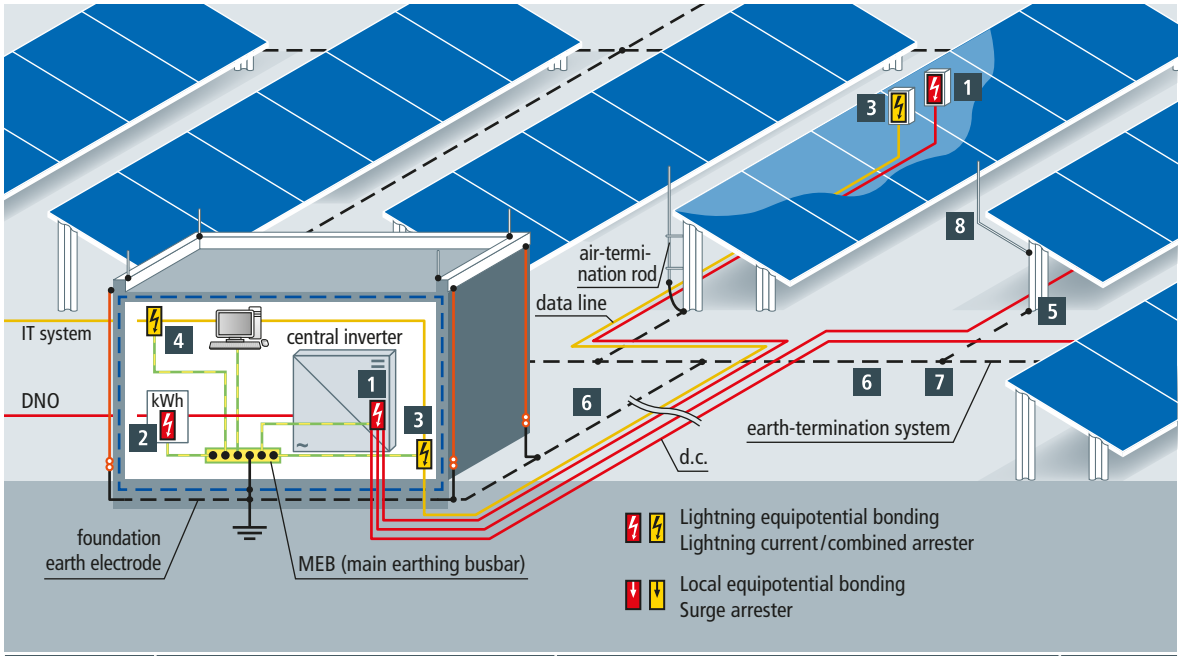

No. in Fig.	Protection for	SPD * FM = Floating remote signalling contact	Part No.
d.c. input of the inverter			
1	Central inverter + GJB	DEHNcombo DCB YPV SCI 1500 FM *	900 067
a.c. side of the grid connection			
2	TN-C system	DEHNventil DV M TNC 255 FM *	951 305
	TN-S system	DEHNventil DV M TNS 255 FM *	951 405
	TT system	DEHNventil DV M TT 255 FM *	951 315
Data interface			
3	One pair, even with operating voltages up to 180 V	BLITZDUCTOR BXTU ML2 BD 0-180 + BXT BAS base part	920 249 + 920 300
Remote maintenance			
4	ISDN or DSL	DEHNbox DBX U4 KT BD S 0-180	922 400
Earth-termination system			
5	Equipotential bonding	UNI saddle clamp	365 250
6	Earthing conductor	Round wire (Ø 10 mm) St/tZn Round wire (Ø 10 mm) StSt (V4A) Strip steel (30 x 3.5 mm) St/tZn Strip steel (30 x 3.5 mm) StSt (V4A)	800 310 860 010 852 335 860 325
7	Connection element	MV clamp StSt (V4A) alternative: SV clamp St/tZn	390 079 308 220
8	Air-termination system	Angled air-termination tip (including two saddle clamps)	101 110

Figure 6 Lightning protection concept for a PV power plant with central inverter

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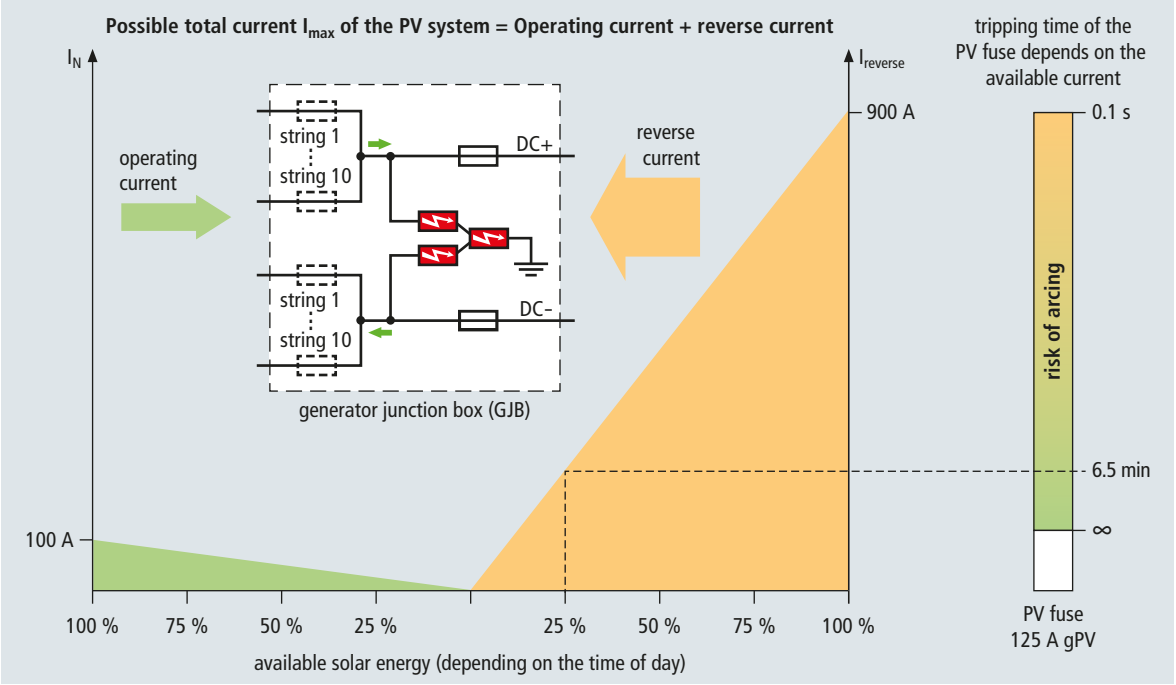

Figure 7 PV system with I_{max} of 1000 A: Prospective short-circuit current at the PV arrester depending on the time of day

(d.c. and a.c.), data and equipotential bonding conductors must be routed together as far as practicable.

Surge protection measures for PV power plants

Surge protective devices (SPDs) (**Figure 6**) must be installed to protect the electrical systems in PV power plants. In case of a lightning strike to the external lightning protection system of a free field PV system, high voltage impulses are induced on all electrical conductors and partial lightning currents flow into all sort of park cables (d.c., a.c. and data cables). The magnitude of the partial lightning currents depends on, for example, the type of earth-termination system, soil resistivity on site and the type of cables. In case of power plants with central inverters (**Figure 6**), extended d.c. cables are routed in the field. Annex D of Supplement 5 of the German DIN EN 62305-3 standard requires a minimum discharge capacity I_{total} of 10 kA (10/350 µs) for voltage-limiting type 1 d.c. SPDs.

SPDs with a sufficiently high short-circuit current rating I_{SCPV}, which is determined by means of the EN 50539-11 standard and must be specified by the manufacturer, must be used. This also applies with respect to possible reverse currents.

In PV systems with central inverters, fuses protect from reverse currents. The maximum available current depends on the actual solar radiation. In certain operating states, fuses only trip after some minutes (**Figure 7**). Therefore, surge protective devices installed in generator junction boxes must be designed for the possible total current consisting of the operating current and the reverse current and ensure automatic disconnection without arcing in case of overload ($I_{SCPV} > I_{max}$ of the PV system).

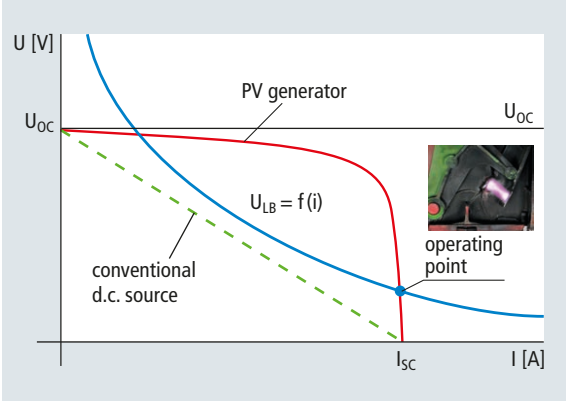

Figure 8 Source characteristic of a conventional d.c. source versus the source characteristic of a PV generator. When switching PV sources, the source characteristic of the PV generator crosses the arc voltage range.

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Class of LPS and maximum lightning current (10/350 µs)		Values for voltage-limiting or combined type 1 SPDs (series connection)				Values for voltage-switching or combined type 1 SPDs (parallel connection)	
		$I_{10/350}$		$I_{8/20}$		$I_{10/350}$	
		Per protective path [kA]	I_{total} [kA]	Per protective path [kA]	I_{total} [kA]	Per protective path [kA]	I_{total} [kA]
III and IV	100 kA	5	10	15	30	10	20

Table 1 Minimum discharge capacity of voltage-limiting or combined type 1 SPDs and voltage-switching type 1 SPDs for free field PV systems in case of LPL III; according to CENELEC CLC/TS 50539-12 (Table A.3)

Special surge protective devices for the d.c. side of PV systems

The typical U/I characteristic curves of photovoltaic current sources are very different from that of conventional d.c. sources: They have a non-linear characteristic (**Figure 8**) and a different d.c. arc behaviour. This unique nature of photovoltaic current sources does not only affect the design and size of PV d.c. switches and PV fuses, but also requires that the surge protective devices are adapted to this unique nature and capable of coping with PV d.c. follow currents. Supplement 5 of the German DIN EN 62305-3 standard and the CENELEC CLC/TS 50539-12 standard require safe operation of surge protective devices on the d.c. side even in case of overload.

Supplement 5 of the German DIN EN 62305-3 standard includes a more detailed assessment of the lightning current distribution (computer simulations) than Supplement 1 of the German DIN EN 62305-4 standard. To calculate the lightning current distribution, the down conductors of the lightning protection system, possible earth connections of the PV array and the d.c. lines must be considered. It is shown that the magnitude and amplitude of the partial lightning currents flowing via the SPDs into the d.c. lines does not only depend on the number of down conductors, but is also influenced by the impedance of the SPDs. The impedance of the SPDs depends on the rated voltage of the SPDs, the SPD topology and the type of SPD (voltage-switching or voltage-limiting). The reduction of the impulse form is characteristic of partial lightning currents flowing via SPDs on the d.c. side of the PV system. When selecting adequate surge protective devices, both the maximum impulse current and the impulse load must be considered. These correlations are described in Supplement 1 of the German DIN EN 62305-4 standard.

To facilitate the selection of adequate arresters, **Table 1** shows the required lightning impulse current carrying capability I_{imp} of type 1 SPDs depending on the type of SPD (voltage-limiting varistor-based arrester or voltage-switching spark-gap-based arrester). The maximum impulse currents and partial lightning currents of 10/350 µs wave form are considered to ensure that the SPDs are capable of discharging the impulse load of the lightning currents.

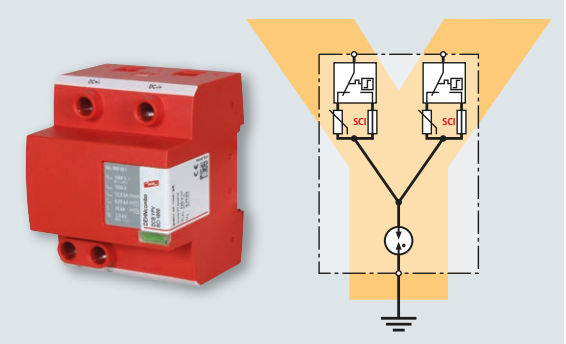

Figure 9 DEHNcombo YPV SCI type 1 + type 2 combined arrester with fault-resistant Y circuit and three-step d.c. switching device

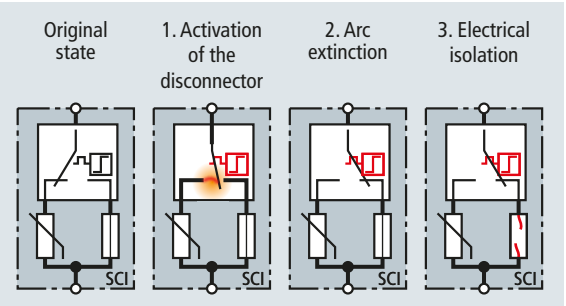

Figure 10 Switching phases of the three-step d.c. switching device integrated in DEHNcombo YPV SCI … (FM)

In addition to the tried and tested fault-resistant Y circuit, DEHNcombo YPV SCI … (FM) also features a three-step d.c. switching device (**Figure 9**). This d.c. switching device consists of a combined disconnection and short-circuiting device with Thermo Dynamic Control. The fuse integrated in the bypass path interrupts the current flow in case of a fault and puts

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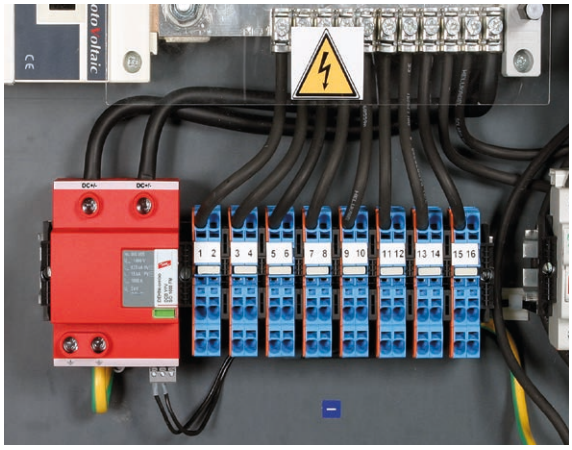

Figure 11 Surge protective device in a monitoring generator junction box

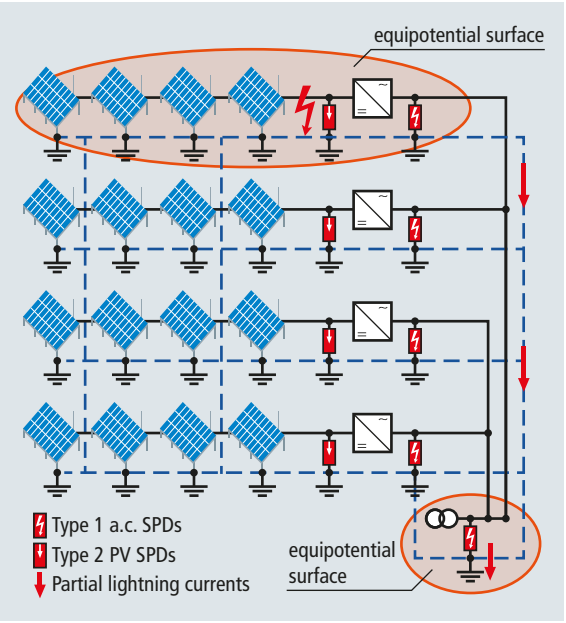

Figure 12 Lightning current distribution in case of free field PV systems with string inverter

the entire unit into a safe state (**Figure 10**). Thus, DEHNcombo YPV SCI … (FM), which is installed at the inverter and in the generator junction box (GJB), reliably protects PV generators up to 1000 A without backup fuse (**Figure 11**). DEHNcombo YPV SCI is available for 600 V, 1000 V and 1500 V. If string monitoring systems are used, the floating remote signalling contacts for condition monitoring of the SPDs can be integrated in these monitoring systems.

The combination of the numerous technologies integrated in the DEHNcombo YPV SCI combined arrester prevents damage to the surge protective device due to insulation faults in the PV circuit, minimises the risk of fire of an overloaded arrester and puts the arrester in a safe electrical state without disrupting the operation of the PV system. Thanks to the protective circuit, the voltage-limiting characteristic of varistors can now be fully used in the d.c. circuits of PV systems. In addition, the arrester minimises numerous small voltage peaks. Thus, the SCI technology increases the service life of the bypass diodes and the d.c. inputs of the inverters.

PV power plants with decentralised string inverters

If PV power plants with decentralised string inverters are used, most of the power cables are installed on the a.c. side. The inverters are installed in the field underneath the module racks of the relevant solar generators. Due to the proximity to the modules, the inverter assumes typical functions of generator junction boxes.

Supplement 5 of the German DIN EN 62305-3 standard describes that the lightning current distribution is influenced by the power cables (string or central inverter). In addition to Supplement 5, **Figure 12** exemplarily shows the lightning current distribution in case string inverters. If string inverters are installed, the power cables are also used as equipotential bonding conductor between the local earth potential of the PV array hit by lightning and the remote equipotential surface of the infeed transformer. The only difference from plants with central inverters is that in case of PV systems with string inverters the partial lightning currents flow into the a.c. lines. Therefore, type 1 arresters are installed on the a.c. side of the string inverters and on the low-voltage side of the infeed transformer. **Table 1** shows the minimum discharge capacity of type 1 SPDs depending on the SPD technology. Type 2 SPDs such as DEHNcube YPV SCI are sufficient for the d.c. side of string inverters. If an earth-termination system according to Supplement 5 is installed, the string inverters and the PV array connected to them form a local equipotential surface so that it is not to be expected that lightning currents are injected into the d.c. lines since the arresters limit induced interference. They thus also protect the modules in close proximity from surges. Several a.c. outputs of these outdoor inverters are collected and stored in a.c. boxes. If type 1 arresters such as DEHNshield…255 are installed there, these devices protect all inverter outputs up to a distance of 10 m (conducted). Further a.c. field cables are routed into the operations building where the powerful type 1 and type 2 DEHNventil combined arrester protects the electrical equipment for the grid connection point. Other equipment such as the grid and plant protection, alarm panel or web server which is located less than 10 m (conducted) from this SPD is also protected.

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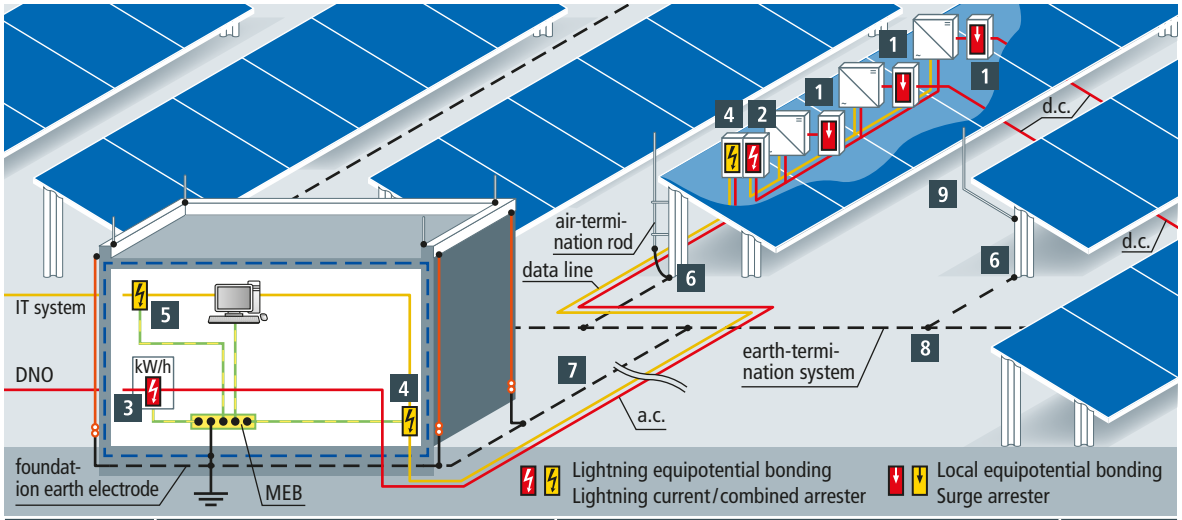


No. in Figure	Protection for	SPD * FM = Floating remote signalling contact	Part No.
d.c. input of the inverter			
1	For 1 MPPT	DEHNcube DCU YPV SCI 1000 1M	900 910
	For 2 MPPTs	DEHNcube DCU YPV SCI 1000 2M	900 920
	Per MPPT	DEHNguard DG M YPV SCI 1000 FM *	952 515
a.c. side of the inverter			
2	TN-S system	DEHNshield DSH TNS 255	941 400
a.c. side of the grid connection			
3	TN-C system	DEHNventil DV M TNC 255 FM *	951 305
	TN-S system	DEHNventil DV M TNS 255 FM *	951 405
	TT system	DEHNventil DV M TT 255 FM *	951 315
Data interface			
4	One pair, with operating voltages up to 180 V	BLITZDUCTOR BXTU ML2 BD 0-180 + BXT BAS base part	920 249 + 920 300
Remote maintenance			
5	ISDN or DSL	DEHNbox DBX U4 KT BD S 0-180	922 400
Earth-termination system / external lightning protection system			
6	Equipotential bonding	UNI saddle clamp	365 250
7	Earthing conductor	Round wire (Ø 10 mm) St/tZn Round wire (Ø 10 mm) StSt (V4A) Strip steel (30 x 3,5 mm) St/tZn Strip steel (30 x 3,5 mm) StSt (V4A)	800 310 860 010 852 335 860 325
8	Connection element	MV clamp StSt (V4A) alternative: SV clamp St/tZn	390 079 308 220
9	Air-termination system	Angled air-termination tip (including 2 saddle clamps)	101 110

Figure 13 Lightning protection concept for a PV power plant with string inverter

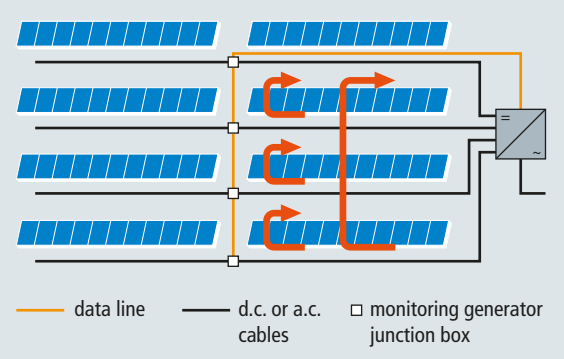


Figure 14 Basic principle of induction loops in PV power plants

Surge protection measures for information technology systems

Data from the field as well as data acquired from remote maintenance by the plant operator and capacity measurements and control by the grid operator are collected in operations buildings. To ensure that the service staff is able to specifically determine causes of failure via remote diagnostics and eliminate them on site, reliable data transfer must be ensured at any time. The string and inverter monitoring system, weather data acquisition unit, anti-theft protection and external communication system are based on different physical interfaces. Wind and radiation sensors with analogue signal transmission can be protected by DEHNbox DBX. Thanks to its actiVsense technology, DEHNbox DBX can be used for signal voltages up to 180 V and automatically adapts the voltage protection level. BLITZDUCTOR XT is ideally suited to protect an RS 485 interface for communication between the inverters. DEHNgate BNC VC devices are used to protect CCTV systems with coaxial video transmission which is used for anti-theft protection systems. If the sub-stations of large-scale PV power plants are interconnected via Ethernet, DEHNpatch M CAT6, which can also be used for PoE (Power over Ethernet) applications, can be installed. No matter if it is an ISDN or ADSL connection – the data lines of devices which provide a connection to the outside world are also protected by the relevant surge protective devices.

In case of power plants with central inverters, generator junction boxes with additional measuring sensors are installed in the field. In case of power plants with string inverters (**Figure 13**), their integrated string monitoring system takes over this task. In both cases, the measured values from the field are transmitted via data interfaces. The data lines from the service room are installed together with the power cables (a.c. or d.c.). Due to the short line lengths of field bus systems, data cables are individually routed transversely to the module racks. In case of a direct lightning strike, these transverse connections also carry partial lightning currents which may damage the input circuits and cause flashover to power cables. Large induction loops are formed due to the interaction of power cables, metal module racks rows and data lines (**Figure 14**). This is an ideal environment for transients caused by lightning discharges which can be injected into these lines. Such voltage peaks are capable of exceeding the insulation strength / dielectric strength of these systems which leads to surge damage. Therefore, SPDs must be installed in these monitoring generator junction boxes or in the decentralised string inverters to protect data transmission. Cable shields must be connected to all connection points in line with the EN 50174-2 standard (section 5.3.6.3). This can also be achieved by indirect shield earthing to prevent malfunction such as ripples and stray currents. BLITZDUCTOR XT, for example, can be used together with an EMC spring terminal of type SAK BXT LR for indirect shield earthing.

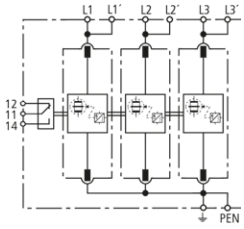
Consistent lightning and surge protection for all systems allows to considerably increase the performance ratio of these power plants. The service and maintenance time as well as repair and spare part costs are reduced.

DEHNventil

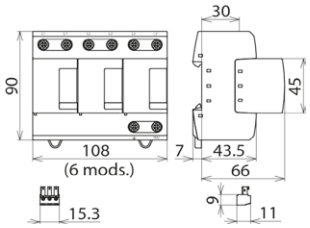
DV M TNC 255 FM (951 305)

- Prewired combined type 1 and type 2 spark-gap-based 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 TNC 255 FM



Dimension drawing DV M TNC 255 FM

Modular combined lightning current and surge arrester for TN-C systems.

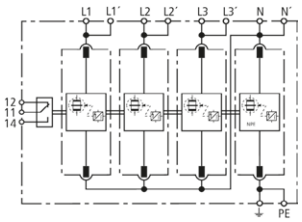
Type Part No.	DV M TNC 255 FM 951 305
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 5 m)	type 1 + type 2 + type 3
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	264 V (50 / 60 Hz)
Lightning impulse current (10/350 µs) [L1+L2+L3-PEN] (I_{total})	75 kA
Specific energy [L1+L2+L3-PEN] (W/R)	1.40 MJ/ohms
Lightning impulse current (10/350 µs) [L-PEN] (I_{imp})	25 kA
Specific energy [L-PEN] (W/R)	156.25 kJ/ohms
Nominal discharge current (8/20 µs) [L-PEN]/[L1+L2+L3-PEN] (I_n)	25 / 75 kA
Voltage protection level (U_P)	≤ 1.5 kV
Follow current extinguishing capability a.c. (I_{fi})	50 kA_{rms}
Follow current limitation / Selectivity	no tripping of a 20 A gL/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) (U_T) – Characteristic	440 V / 120 min. – 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', PEN, ⏚) (min.)	10 mm^2 solid / flexible
Cross-sectional area (L1, L2, L3, PEN) (max.)	50 mm^2 stranded / 35 mm^2 flexible
Cross-sectional area (L1', L2', L3', ⏚) (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	6 module(s), DIN 43880
Approvals	KEMA, VDE, UL, VdS
Type of remote signalling contact	changeover contact
a.c. switching capacity	250 V / 0.5 A
d.c. switching capacity	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 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 gL/gG
Weight	962 g
Customs tariff number	85363030
GTIN	4013364108141
PU	1 pc(s)

DEHNventil

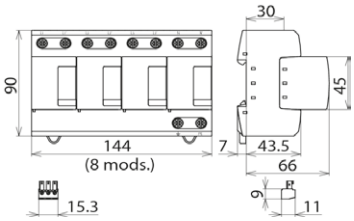
DV M TT 255 FM (951 315)

- 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 equipmen

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" circuit).

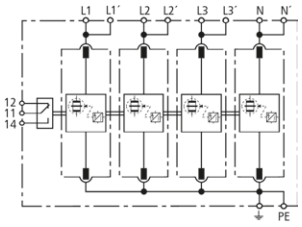
Type Part No.	DV M TT 255 FM 951 315
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 5 m)	type 1 + type 2 + type 3
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [L-N] (U_C)	264 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [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
Follow current extinguishing capability [L-N]/[N-PE] (I_{fi})	50 kA_{rms} / 100 A_{rms}
Follow current limitation / Selectivity	no tripping of a 20 A gL/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, ⏚) (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', ⏚) (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	8 module(s), DIN 43880
Approvals	KEMA, VDE, UL, VdS
Type of remote signalling contact	changeover contact
a.c. switching capacity	250 V / 0.5 A
d.c. switching capacity	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 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 gL/gG
Weight	1,28 kg
Customs tariff number	85363030
GTIN	4013364108189
PU	1 pc(s)

DEHNventil

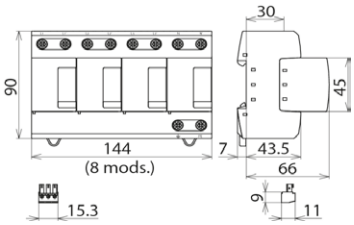
DV M TNS 255 FM (951 405)

- 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 TNS 255 FM



Dimension drawing DV M TNS 255 FM

Modular combined lightning current and surge arrester for TN-S systems.

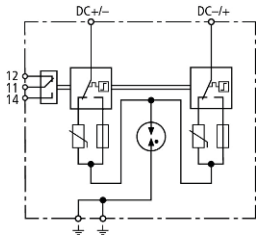
Type Part No.	DV M TNS 255 FM 951 405
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 5 m)	type 1 + type 2 + type 3
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	264 V (50 / 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-PE] (I_{imp})	25 kA
Specific energy [L,N-PE] (W/R)	156.25 kJ/ohms
Nominal discharge current (8/20 µs) [L/N-PE]/[L1+L2+L3+N-PE] (I_n)	25 / 100 kA
Voltage protection level [L-PE]/[N-PE] (U_P)	≤ 1.5 / ≤ 1.5 kV
Follow current extinguishing capability a.c. (I_{fi})	50 kA_{rms}
Follow current limitation / Selectivity	no tripping of a 20 A gL/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
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, ⏚) (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', ⏚) (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	8 module(s), DIN 43880
Approvals	KEMA, VDE, UL, VdS
Type of remote signalling contact	changeover contact
a.c. switching capacity	250 V / 0.5 A
d.c. switching capacity	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 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 gL/gG
Weight	1,36 kg
Customs tariff number	85363030
GTIN	4013364108165
PU	1 pc(s)

DEHNcombo

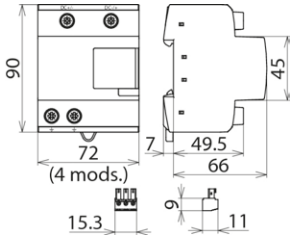
DCB YPV SCI 1500 FM (900 067)

- 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 prevents fire damage caused by d.c. switching arcs (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.

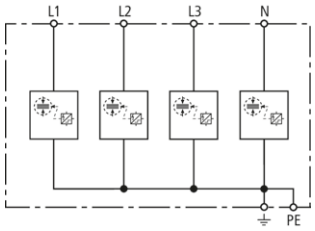
Type Part No.	DCB YPV SCI 1500 FM 900 067
SPD according to EN 50539-11	type 1 + type 2
Max. PV voltage [DC+ -> DC-] (U_{CPV})	≤ 1500 V
Max. PV voltage [DC+/DC- -> PE] (U_{CPV})	≤ 1100 V
Short-circuit current rating (I_{SCPV})	1000 A
Nominal discharge current (8/20 µs) (I_n)	15 kA
Total discharge current (8/20 µs) [DC+/DC- -> PE] (I_{total})	30 kA
Total discharge current (10/350 µs) [DC+/DC- -> PE] (I_{total})	12.5 kA
Specific energy [DC+/DC- -> PE] (I)	39.06 kJ/ohms
Lightning impulse current (10/350 µs) [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
a.c. switching capacity	250 V / 0.5 A
d.c. switching capacity	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	85363030
GTIN	4013364153752
PU	1 pc(s)

DEHNshield

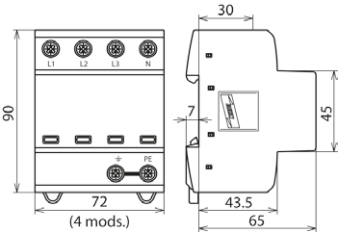
DSH TNS 255 (941 400)

- Application-optimised and prewired type 1 and type 2 spark-gap-based combined lightning current and surge arrester
- Space-saving arrester for compact and simply equipped electrical installations with reduced technical requirements
- Capable of protecting terminal equipment

Figure without obligation



Basic circuit diagram DSH TNS 255



Dimension drawing DSH TNS 255

Application-optimised and prewired combined lightning current and surge arrester for TN-S systems.

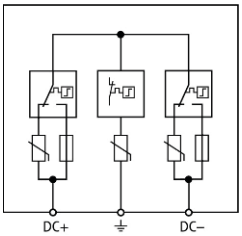
Type Part No.	DSH TNS 255 941 400
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 5 m)	type 1 + type 2 + type 3
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	255 (50 / 60 Hz)
Lightning impulse current (10/350 µs) [L1+L2+L3+N-PE] (I_{total})	50 kA
Specific energy [L1+L2+L3+N-PE] (W/R)	625.00 kJ/ohms
Lightning impulse current (10/350 µs) [L, N-PE] (I_{imp})	12.5 kA
Specific energy [L,N-PE] (W/R)	39.06 kJ/ohms
Nominal discharge current (8/20 µs) [L/N-PE]/[L1+L2+L3+N-PE] (I_n)	12.5 / 50 kA
Voltage protection level [L-PE]/[N-PE] (U_P)	≤ 1.5 / ≤ 1.5 kV
Follow current extinguishing capability a.c. (I_{fi})	25 kA_{rms}
Follow current limitation / Selectivity	no tripping of a 32 A gL/gG fuse up to 25 kA_{rms} (prosp.)
Response time (t_A)	≤ 100 ns
Max. mains-side overcurrent protection	160 A gL/gG
Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic	440 V / 120 min. – withstand
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (L1, L2, L3, N, PE, ⏚) (min.)	1.5 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
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
Weight	525 g
Customs tariff number	85363030
GTIN	4013364133563
PU	1 pc(s)

DEHNcube

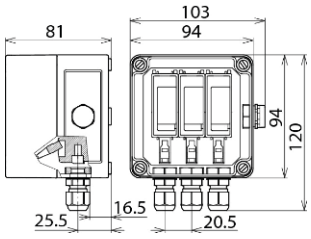
DCU YPV SCI 1000 1M (900 910)

- Prewired multipole surge arrester with IP 65 degree of protection for photovoltaic systems
- Combined disconnection and short-circuiting device with safe electrical isolation in the protection module prevents fire damage caused by d.c. switching arcs (patented SCI principle)
- Easy and fast implementation of surge protection measures since no space is required in a separate insulating enclosure

Figure without obligation



Basic circuit diagram DCU YPV SCI 1000 1M



Dimension drawing DCU YPV SCI 1000 1M

Multipole surge arrester with three-step d.c. switching device for PV inverters with one MPP input.

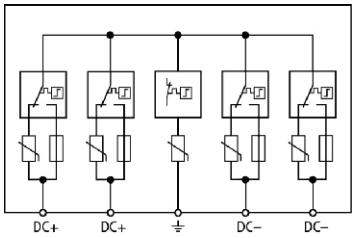
Type Part No.	DCU YPV SCI 1000 1M 900 910
SPD according to EN 50539-11	type 2
Max. PV voltage (U_{CPV})	≤ 1000 V
Short-circuit withstand capability (I_{SCPV})	1000 A
Total discharge current (8/20 µs) (I_{total})	40 kA
Nominal discharge current (8/20 µs) [(DC+/DC-) --> PE] (I_n)	12.5 kA
Max. discharge current (8/20 µs) [(DC+/DC-) --> PE] (I_{max})	25 kA
Voltage protection level (U_P)	≤ 4 kV
Voltage protection level at 5 kA (U_P)	≤ 3.5 kV
Response time (t_A)	≤ 25 ns
Operating temperature range (T_U)	-35 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	2.5 mm^2 solid / flexible
Cross-sectional area (max.)	6 mm^2 solid / flexible
Place of installation	outdoor
Degree of protection	IP 65
Type	with pressure compensating element
Cover	transparent cover with product label
Colour of enclosure	grey
Number of cable entries	3x Ø3-7 mm
Enclosure dimensions (w x h x d)	94 x 94 x 81 mm
Approvals	KEMA
Weight	426 g
Customs tariff number	85363030
GTIN	4013364155046
PU	1 pc(s)

DEHNcube

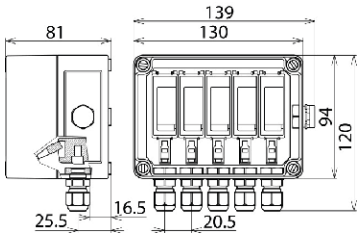
DCU YPV SCI 1000 2M (900 920)

- Prewired multipole surge arrester with IP 65 degree of protection for photovoltaic systems
- Combined disconnection and short-circuiting device with safe electrical isolation in the protection module prevents fire damage caused by d.c. switching arcs (patented SCI principle)
- Easy and fast implementation of surge protection measures since no space is required in a separate insulating enclosure

Figure without obligation



Basic circuit diagram DCU YPV SCI 1000 2M



Dimension drawing DCU YPV SCI 1000 2M

Multipole surge arrester with three-step d.c. switching device for PV inverters with two MPP inputs.

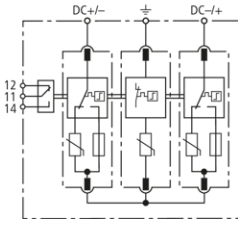
Type Part No.	DCU YPV SCI 1000 2M 900 920
SPD according to EN 50539-11	type 2
Max. PV voltage (U_{CPV})	≤ 1000 V
Short-circuit withstand capability (I_{SCPV})	1000 A
Total discharge current (8/20 µs) (I_{total})	40 kA
Nominal discharge current (8/20 µs) [(DC+/DC-) --> PE] (I_n)	12.5 kA
Max. discharge current (8/20 µs) [(DC+/DC-) --> PE] (I_{max})	25 kA
Voltage protection level (U_P)	≤ 4 kV
Voltage protection level at 5 kA (U_P)	≤ 3.5 kV
Response time (t_A)	≤ 25 ns
Operating temperature range (T_U)	-35 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	2.5 mm^2 solid / flexible
Cross-sectional area (max.)	6 mm^2 solid / flexible
Place of installation	outdoor
Degree of protection	IP 65
Type	with pressure compensating element
Cover	transparent cover with product label
Colour of enclosure	grey
Number of cable entries	5x Ø3-7 mm
Enclosure dimensions (w x h x d)	130 x 94 x 81 mm
Approvals	KEMA
Weight	617 g
Customs tariff number	85363030
GTIN	4013364155053
PU	1 pc(s)

DEHNguard

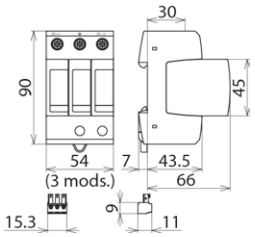
DG M YPV SCI 1000 FM (952 515)

- Prewired modular complete unit for use in photovoltaic systems consisting of a base part and plug-in protection modules
- Combined disconnection and short-circuiting device with safe electrical isolation in the protection module prevents fire damage caused by d.c. switching arcs (patented SCI principle)
- Safe replacement of protection modules without arc formation due to integrated d.c. fuses

Figure without obligation



Basic circuit diagram DG M YPV SCI 1000 FM



Dimension drawing DG M YPV SCI 1000 FM

Modular multipole surge arrester with three-step d.c. switching device for use in PV systems with remote signalling contact (floating changeover contact).

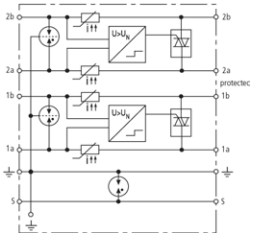
Type Part No.	DG M YPV SCI 1000 FM 952 515
SPD according to EN 50539-11	Type 2
Max. PV voltage (U_{CPV})	≤ 1000 V
Short-circuit current rating (I_{SCPV})	1000 A
Total discharge current (8/20 µs) (I_{total})	40 kA
Nominal discharge current (8/20 µs) [(DC+/DC-) --> PE] (I_n)	12.5 kA
Max. discharge current (8/20 µs) [(DC+/DC-) --> PE] (I_{max})	25 kA
Voltage protection level (U_P)	≤ 4 kV
Voltage protection level at 5 kA (U_P)	≤ 3.5 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	KEMA, UL, CSA
Type of remote signalling contact	changeover contact
a.c. switching capacity	250 V / 0.5 A
d.c. switching capacity	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	323 g
Customs tariff number	85363030
GTIN	4013364126435
PU	1 pc(s)

DEHNbox

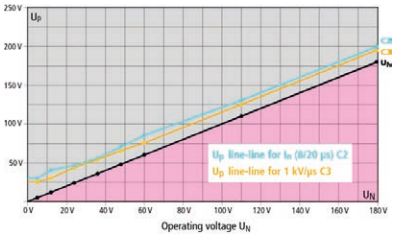
DBX U4 KT BD S 0-180 (922 400)

- Universal voltage type with actiVsense technology
- Suitable for wall mounting, IP65
- 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 DBX U4 KT DB S 0-180



Voltage protection level diagram DBX U4 KT DB S 0-180

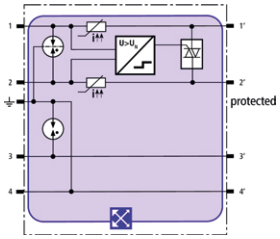
Compact combined lightning current and surge arrester in a surface-mounted plastic enclosure with actiVsense technology for protecting two pairs with the same or a different signal voltage of galvanically isolated balanced interfaces. Direct or indirect shield earthing.

Type Part No.	DBX U4 KT BD S 0-180 922 400
SPD class	TYPE 1 P1
Nominal voltage (U_N)	0-180 V
Frequency of the nominal voltage (f_{UN})	0-400 Hz
Max. continuous operating d.c. voltage (U_C)	180 V
Permissible superimposed signal voltage (U_{signal})	≤ +/- 5 V
Cut-off frequency line-line (U_{signal}, balanced 100 ohms) (f_G)	50 MHz
Nominal current I_L (equals max. short-circuit current)	100 mA
D1 Total lightning impulse current (10/350 µs) (I_{imp})	10 kA
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	2.5 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	20 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	10 kA
Voltage protection level line-line for I_n C2 (U_p)	see diagram, line C2
Voltage protection level line-line at 1 kV/µs C3 (U_p)	see diagram, line C3
Voltage protection level line-line for I_{imp} D1 (U_p)	≤ U_N + 50 V
Voltage protection level line-PG for D1/C2/C3	≤ 550 V
Series resistance per line	≤ 9 ohms; typically 7.9 ohms
Capacitance line-line (C)	≤ 80 pF
Capacitance line-PG (C)	≤ 70 pF
Operating temperature range (T_U)	-25 °C ... +40 °C
Degree of protection	IP 65
Cross-sectional area of the signal lines	0.08-1.5 mm^2
Cross-sectional area of the earth terminal	2.5-4 mm^2
Dimensions (L x W x H)	93 x 93 x 55 mm
Enclosure material	polycarbonate
Colour	grey
Test standards	IEC 61643-21 / EN 61643-21
Weight	220 g
Customs tariff number	85363010
GTIN	4013364137349
PU	1 pc(s)

BLITZDUCTOR XTU

BXTU ML2 BD S 0-180 (920 249)

Figure without obligation



Basic circuit diagram BXTU ML2 BD S 0-180

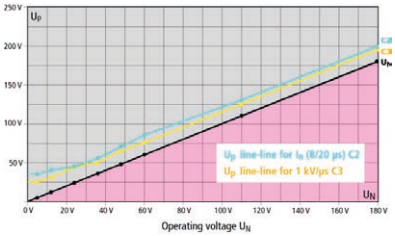


Diagram of the voltage protection level BXTU

Type Part No.	BXTU ML2 BD S 0-180 920 249
SPD class	TYPE 1 P1
SPD monitoring system	LifeCheck
Operating voltage (U_N)	0-180 V
Frequency of the operating voltage (f_{UN})	0-400 Hz
Max. continuous operating d.c. voltage (U_C)	180 V
Max. continuous operating a.c. voltage (U_C)	127 V
Permissible superimposed signal voltage (U_{signal})	≤ +/- 5 V
Cut-off frequency line-line (U_{signal}, balanced 100 ohms) (f_G)	50 MHz
Nominal current at 80 °C (equal to max. short-circuit current) (I_L)	100 mA
D1 Total lightning impulse current (10/350 µs) (I_{imp})	9 kA
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	2.5 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	20 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	10 kA
Voltage protection level line-line for I_n C2 (U_p)	see diagram, line C2
Voltage protection level line-line at 1 kV/µs C3 (U_p)	see diagram, line C3
Voltage protection level line-line for I_{imp} D1 (U_p)	≤ U_N + 53 V
Voltage protection level line-PG for C2/C3/D1	≤ 550 V
Series resistance per line	≤ 10 ohms; typically 7.5 ohms
Capacitance line-line (C)	≤ 80 pF
Capacitance line-PG (C)	≤ 25 pF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection (plugged-in)	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
SIL classification	up to SIL3 *)
Approvals	CSA, UL, GOST
Weight	23 g
Customs tariff number	85363010
GTIN	4013364127845
PU	1 pc(s)

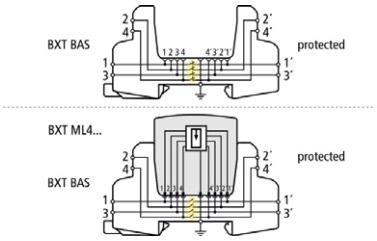
*) For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR

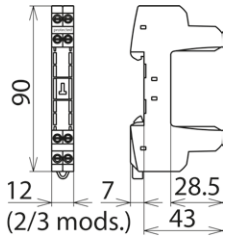
BXT BAS (920 300)

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

Figure without obligation



Basic circuit diagram with and without plugged-in module



Dimension drawing BXT BAS

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

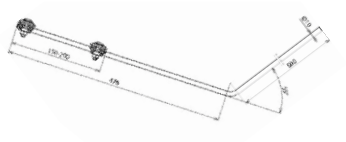
Type Part No.	BXT BAS 920 300
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection	IP 20
For mounting on	35 mm DIN rails acc. to EN 60715
Connection (input / output)	screw / screw
Signal disconnection	no
Cross-sectional area, solid	0.08-4 mm^2
Cross-sectional area, flexible	0.08-2.5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

*) only in connection with an approved protection module

Air-termination rod

FSPS 10 1000 W55 FK AL (101 110)

Figure without obligation

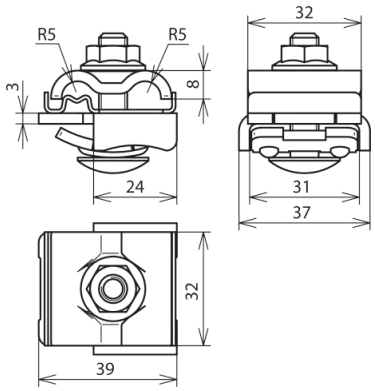


Part No.	101 110
Total length	1000 mm
Material	Al
Diameter	10 mm
Weight	305 g
Customs tariff number	85389099
GTIN	4013364138704
PU	1 pc(s)

UNI saddle clamp

UNI FK 8.10 KBF0.7 8 AL V2A (365 250)

Figure without obligation



Saddle clamp for integrating the mounting systems e.g. of PV installations into the functional equipotential bonding/functional earthing (optionally black conductor) and lightning protection equipotential bonding according to IEC/EN 62305-3.

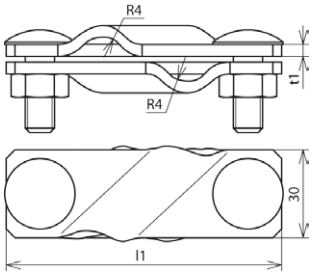
The StSt contact plate (intermediate element) allows for different conductor materials (Cu, Al, St/tZn and StSt) to be connected to the ususal mounting systems e.g. to aluminium, without risk of contact corrosion.
Easy and quick interconnection of profiles is possible e.g. by means of feed-through wiring due to the double cleat design.

Part No.	365 250
Clamping range of saddle	0.7-8 mm
Material of clamping bracket	Al
Material thickness	3 mm
Clamping range Rd	8-10 mm
Connection (solid / stranded)	4-50 mm^2
Material of double cleat	StSt
Screw	M8 x 35 mm
Self-locking nut	width across flats 13 mm
Material of screw / nut	StSt
Connecting direction	lengthwise / crosswise
Standard	EN 62561-1
Weight	83 g
Customs tariff number	85389099
GTIN	4013364148307
PU	50 pc(s)

SV clamp

SVK 7.10 7.10 FL30 STTZN (308 220)

Figure without obligation

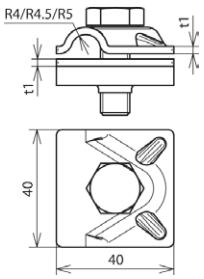


Part No.	308 220
Material of clamp	St/tZn
Clamping range Rd / Rd	7-10 / 7-10 mm
Clamping range Rd / Fl	7-10 / 30 mm
Clamping range Fl / Fl	30 / 30 mm
Screw	M10 x 30 mm
Material of screw / nut	St/tZn
Dimension (l1 x t1)	94 x 4 mm
Standard	EN 62561-1
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	7.3 kA
Weight	250 g
Customs tariff number	85389099
GTIN	4013364084216
PU	25 pc(s)

MV clamp

MVK 8.10 SKM10X35 V4A (390 079)

Figure without obligation



Clamp also suits for underground application.

Part No.	390 079
Material of clamp	StSt (V4A)
Clamping range Rd	8-10 mm
Material thickness (t1 / t2)	2.5 mm
Screw	M10 x 35 mm
Material of screw / nut	StSt (V4A)
Material No.	1.4571 / 1.4404 / 1.4401
ASTM / AISI:	316Ti / 316L / 316
Standard	EN 62561-1
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	4.7 kA
Weight	96 g
Customs tariff number	85389099
GTIN	4013364128996
PU	50 pc(s)

Note: Part No. 390 079 made of StSt(V4A) also suits for underground application.

Round wire

RD 10 STTZN R30M (800 310)

Figure without obligation

Steel wire according to EN 62561-2 with zinc coating ≥ 50 µm average (about 350 g/m2), for use in lightning protection and earth-termination systems.

Part No.	800 310 ✔
Diameter Ø conductor	10 mm
Cross section	78 mm^2
Material	St/tZn
Standard	EN 62561-2
Zinc sheath	≥ 50 µm average (about 350g/m^2)
Specific conductance	≥ 6.66 m / Ohm mm^2
Specific resistance	≤ 0.15 Ohm mm^2 / m
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	5.5 kA
Weight	0,62 kg
Customs tariff number	72172030
GTIN	4013364131064
PU	31 m

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.

Part No.	860 010
Diameter Ø conductor	10 mm
Cross section	78 mm^2
Material	StSt (V4A)
Material No.	1.4571 / 1.4404
ASTM / AISI:	316Ti / 316L
Standard	EN 62561-2
Specific conductance	≥ 1.25 m / Ohm mm^2
Specific resistance	≤ 0.8 Ohm mm^2 / m
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	2.9 kA
Weight	0,62 kg
Customs tariff number	72210010
GTIN	4013364019997
PU	81 m

Flat strip

BA 30X3.5 STTZN R25M (852 335)

Figure without obligation

Steel strip according to EN 62561-2 with zinc coating ≥ 70 µm average (about 500 g/m2), for use in lightning protection and earth-termination systems.

Part No.	852 335
Width	30 mm
Thickness	3.5 mm
Cross-section	105 mm^2
Material	St/tZn
Standard	EN 62561-2
Zinc coating	≥ 70 µm average (about 500 g/m^2)
Specific conductivity	≥ 6.66 m / Ohm mm^2
Specific resistance	≤ 0.15 Ohm mm^2 / m
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	7.3 kA
Weight	0,84 kg
Customs tariff number	72123000
GTIN	4013364031067
PU	25 m

BA 30X3.5 V4A R25M (860 325)

Figure without obligation

Stainless steel strip according to EN 62561-2, for use in lightning protection systems and ring equipotential bonding.
According to EN 62561-2 and IEC/EN 62305-3, stainless steel strip to be installed in soil has to be made of StSt (V4A) with > 2 % molybdenum, e.g. 1.4571, 1.4404.

Part No.	860 325
Width	30 mm
Thickness	3.5 mm
Cross-section	105 mm^2
Material	StSt (V4A)
Material No.	1.4571 / 1.4404
ASTM / AISI:	316Ti / 316L
Standard	EN 62561-2
Specific conductivity	≥ 1.25 m / Ohm mm^2
Specific resistance	≤ 0.8 Ohm mm^2 / m
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	3.9 kA
Weight	0,83 kg
Customs tariff number	72202021
GTIN	4013364093157
PU	25 m

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