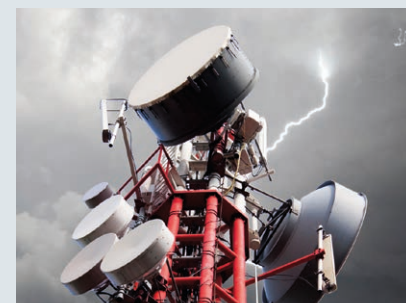




# Protection of cell sites (4G / LTE)

White Paper



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# Protection of cell sites (4G / LTE)

## White Paper



Besides voice communication, mobile data communication gained momentum with the commercial introduction of UMTS technology in 2003. Due to this increased demand for data volumes, the global demand for bandwidth also grew. The increased use of smartphones and other mobile devices pushes current conventional network spectrums to their limits.

The high investment costs for new network infrastructures and system technology as well as high maintenance and operating costs for existing cell sites are disadvantages mobile network operators using this modern and innovative technology have to deal with. Consequently, their aim is to efficiently reduce maintenance and operating costs and to provide an ever growing number of mobile phone users with considerably increased availability and reliability of mobile services.

Mobile network operators and system technology manufacturers worldwide increasingly use remote radio head/unit technology for UMTS (3G) and LTE (4G). Remote radio heads/units (RRHs/RRUs) are an enhancement of the third mobile radio generation.

Remote radio head technology is not only used for commercial mobile radio applications, but also for the digital radio systems of security authorities (BOS) such as police departments and rescue services since these systems require high reliability and availability.

### Conventional cell sites

Conventional cell sites use coaxial cables, also referred to as waveguide cables. A clear disadvantage of this technology is the high transmission loss (up to 50 %), depending on the cable length and cross-sections of the high-frequency cables. Moreover, the complete radio transmission technology is integrated in the base station / radio base station (RBS). This requires permanent cooling of the technical equipment rooms and leads to an increased energy consumption and increased maintenance costs (**Figure 1**).

### Cell sites with remote radio heads / units

Remote radio heads / units incorporate the high-frequency technology which was originally centrally integrated in the base station. The high-frequency signal is directly generated at the antenna and is then transmitted. Therefore, RRHs/RRUs are installed directly at the antennas, thus reducing loss and increasing the transmission speed. Another benefit is that less air-conditioning systems are required due to the self-cooling of the remote radio heads. Optical fibre cables allow to transmit data between the base station / radio base station and the remote radio heads / units up to 20 km. The use of remote system technology and modern small-sized base stations saves energy costs as well as lease and location-related costs due to the reduced number of technical equipment rooms (**Figure 1**).

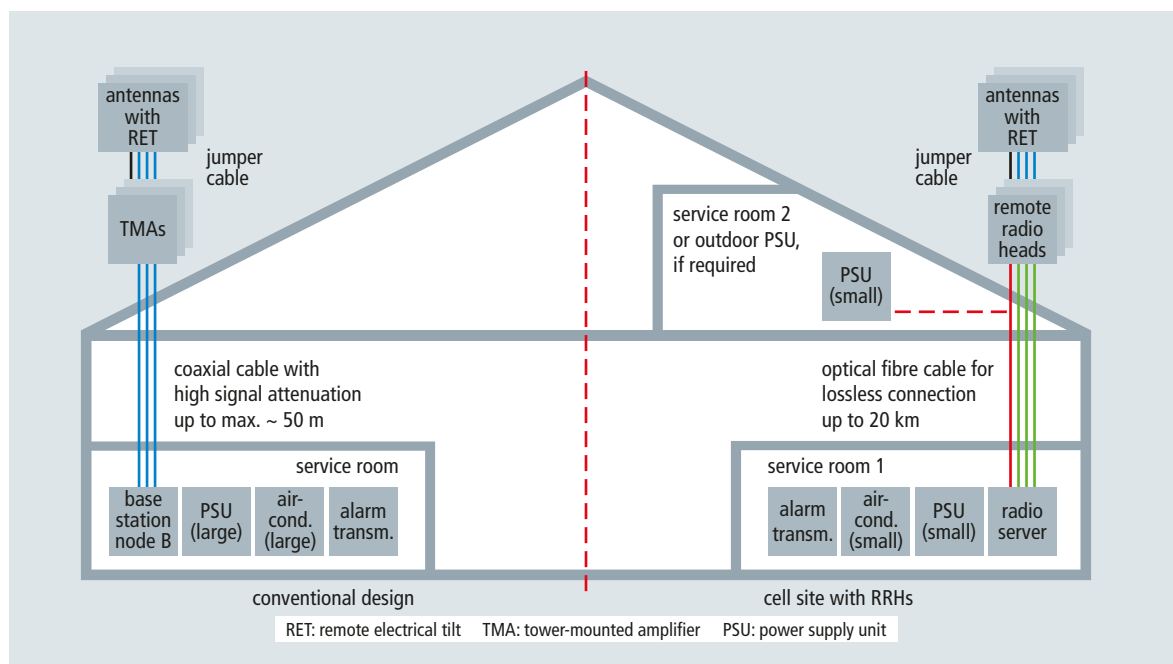


Figure 1 Comparison: Conventional cell site (left) and cell site with remote radio head technology (right)

# Protection of cell sites (4G / LTE)

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### External lightning protection

The antennas of the before mentioned systems are often installed on rented roof space. The antenna operator and the building owner usually agree that the placement of antennas must not present an additional risk for the building. For the lightning protection system this means that no partial lightning currents may enter the building in case of a lightning strike to the antenna tower since partial lightning currents inside the building would threaten the electrical and electronic devices (**Figure 2**).

**Figure 3** shows an antenna tower with an isolated air-termination system.

The air-termination tip must be attached to the antenna tower by means of a supporting tube made of non-conductive material. The height of the air-termination tip depends on the antenna tower, possible electrical equipment of the antenna system and the base station (RBS) and must be selected in such a way that these elements are located in the protected volume of the air-termination system. In case of buildings with several antenna systems, several isolated air-termination systems must be installed.

### Radio base stations (RBS) with DEHNvap CSP combined arresters

The power supply unit of the RBS must have a separate feeder cable that is independent from the power supply unit of the building. A separate power sub-distribution board / floor distributor should be provided for cell sites. Every sub-distribution board is equipped with lightning and surge arresters (type 1 combined arresters) as standard. In addition, a type 1 combined arrester is installed downstream of the meter panel, namely downstream of the fuses. To ensure energy coordination, surge protective devices (SPDs) from the same manufacturer should be used at both places of installation. Extensive laboratory tests at DEHN with power supply units from different manufacturers confirm that coordination of combined arresters such as DEHNvap CSP (CSP = Cell Site Protection) with the integrated input circuits of the power supply unit is essential.

DEHNvap CSP 3P 100 FM spark-gap-based combined arresters are used to protect the power supply unit (PSU) of a base station. These type 1 arresters are specifically designed for protecting power supply units in transmitting / receiving systems. When using combined arresters, "disconnection selectivity" with respect to upstream fuses must be ensured. Only arresters with sufficient follow current extinction and limitation allow to avoid false tripping of system fuses and thus disconnection of the power supply unit.

### Remote radio head / unit applications

Cell sites consist of:

- ➔ Base station / radio base station (indoor or outdoor cabinet)

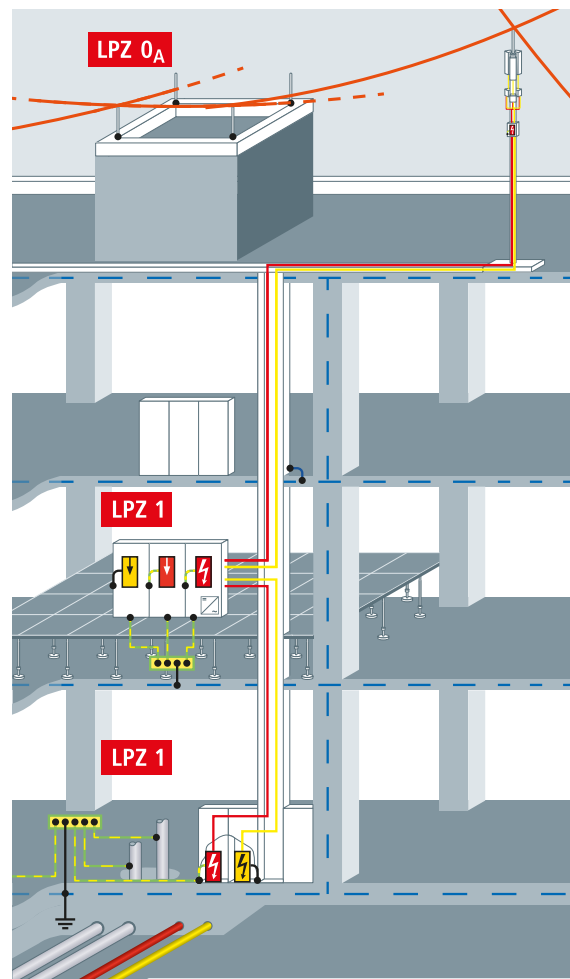


Figure 2 Basic design of the remote radio head / unit in case of roof-mounted systems

- ➔ Baseband unit / radio server
- ➔ Remote radio heads / units (RRHs / RRUs)

The remote radio heads / units (active system technology) require a separate 48 V d.c. power supply from the service room. To this end, shielded multi-wire copper cables with a cross-section of 6 to 16 mm<sup>2</sup> are typically used. In the majority of cases, these d.c. cables are installed outside the building up to the roof surface and the RRHs / RRUs or from the base station to the mast. Data communication between RRHs / RRUs and system technology is done via prewired glass fibre cables instead of the previously used cables with corrugated sheath. In case of both types of installation, the d.c. feeder cables and system technology are exposed to lightning currents in the event of a direct lightning strike.

# Protection of cell sites (4G / LTE)

## White Paper

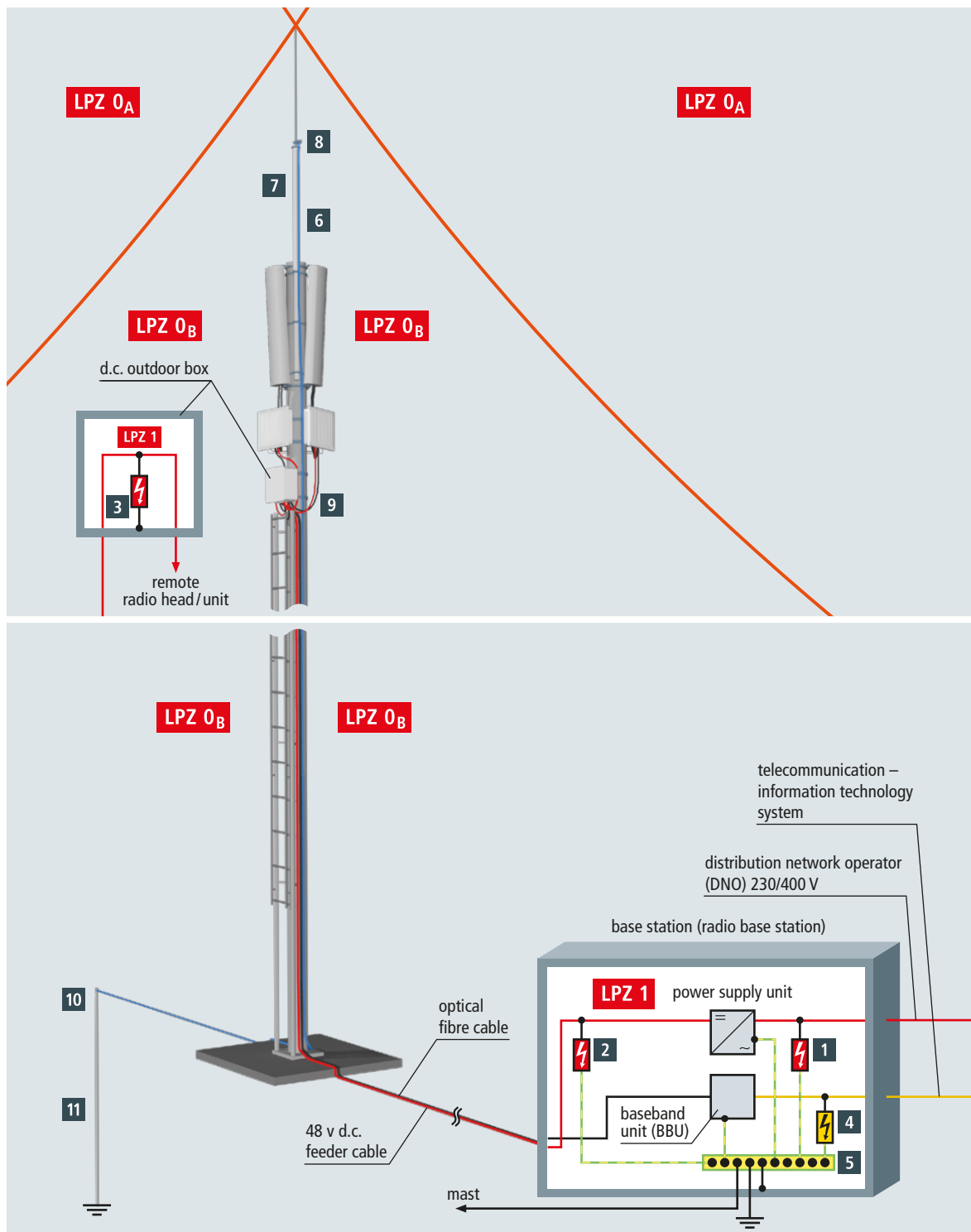
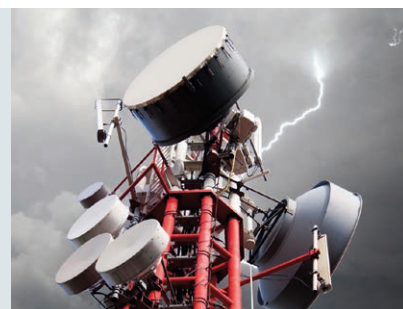


Figure 3 Remote radio head/unit and radio base station (RBS) in case of ground-mounted masts

# Protection of cell sites (4G / LTE)

## White Paper



No. in Fig. 3	Protection	Type	Part No.
<b>a.c. power supply</b>			
<b>1</b>	Base station (230/400 V a.c.)	DEHNvap CSP 3P 100 FM	900 360
<b>d.c. power supply</b>			
<b>2</b>	Power supply unit (48 V d.c.)	DEHNsecure DSE M 1 60 FM	971 126
<b>3</b>	Remote radio head (48 V d.c.)	DEHNsecure DSE M 2P 60 FM	971 226
<b>Fixed-line connection</b>			
<b>4</b>	Telecommunication lines	BLITZDUCTOR XT BXT ML4 B 180 + BXT BAS base part	920 310 920 300
<b>External lightning protection</b>			
<b>5</b>	Ground-mounted system / roof-mounted system	Equipotential bonding bar, 10 terminals	472 219
<b>6</b>	Ground-mounted system / roof-mounted system	HVI long conductor + connection element	819 223 410 229
<b>7</b>	Ground-mounted system / roof-mounted system	GRP/Al supporting tube	105 306
<b>8</b>	Ground-mounted system / roof-mounted system	Connection element	819 228
<b>9</b>	Ground-mounted system / roof-mounted system	Pipe clamp for antennas	540 100
<b>10</b>	Ground-mounted system	Stainless steel terminal bracket	620 915
<b>11</b>	Ground-mounted system	Stainless steel earth rod	620 902

Table 1 Lightning and surge protection for cell sites

Thus, lightning current and surge arresters must be capable of safely conducting lightning currents to the earth-termination system. To this end, type 1 lightning current arresters in conformity with EN 61643-11 (class I, IEC 61643-1/-11) are used. Only spark-gap-based type 1 arresters ensure reliable energy coordination with downstream protective circuits integrated in the input of terminal equipment. If spark gaps are used to protect base stations, power supply units and remote radio heads/units, lightning currents are prevented from entering system technology, thus providing maximum protection and ensuring availability of the station even under lightning conditions (**Figures 2 and 3**).

### Customised solutions for 48 V d.c. remote radio heads/units (type 1 arresters)

#### D.c. arresters: Modular DEHNsecure 60 ... (FM) type 1 lightning current arresters

RRHs/RRUs are centrally supplied with direct current from the service room. The shielded feeder cable must be integrated in the antenna earthing as per IEC 60728-11 (EN 60728-11) and, if a lightning protection system is installed on the building, as per IEC 62305-3 (EN 62305-3).

Type 1 d.c. arresters with a low voltage protection level that are specifically developed for RRH/RRU applications are installed in the d.c. indoor box near the power supply unit in the technical equipment room and in the d.c. outdoor box at the antenna mast. The d.c. box at the mast features a "1+1" circuit, meaning that the positive pole and cable shield are interconnected indirectly via a so-called total spark gap to prevent corrosion and stray currents. In the power supply unit, the positive pole is directly earthed and single-pole type 1 d.c. arresters are typically installed.

Prewired d.c. assembly systems (d.c. box) for indoor and outdoor installations with DEHNsecure DSE M 1 60 FM and DSE 2P 60 FM type 1 d.c. lightning current arresters ensure efficient protection. The voltage protection level  $U_p$  of the type 1 lightning current arresters must be lower than the dielectric strength of the system technology.

Benefits of the new d.c. arrester concept are, for example, enough leeway for future extensions of the site in case of nominal load currents up to 2000 A, no mains follow currents up to max. 60 V d.c., no leakage currents and a high degree of protection for terminal equipment due to the low residual voltage of  $\leq 0.4$  kV at 5 kA (voltage protection level of 1.5 kV (10/350  $\mu$ s)).



# Protection of cell sites (4G / LTE)

## White Paper

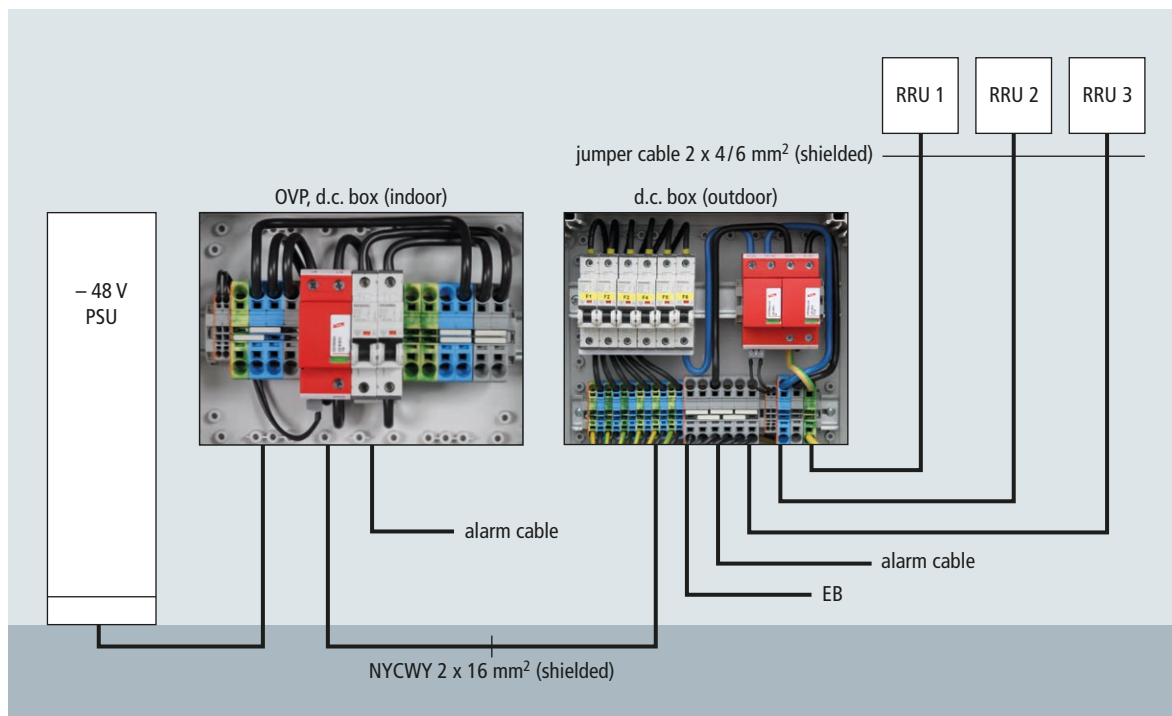


Figure 4 Basic circuit diagram of remote radio heads (RRHs) in case of physically separated functional equipotential bonding levels with d.c. box (outdoor) and DEHNsecure DSE M 2P 60 FM as well as with OVP box (indoor) and DEHNsecure DSE M 1 60 FM

**Figure 4** shows the protection concept for RRHs / RRUs in case of physically separated functional equipotential bonding levels.

### Type 1 combined arresters for RRH / RRU installations

**Figure 5** shows an example of a customised assembly system with a spark-gap-based type 1 arrester according to IEC 61643-1/11 (EN 61643-1/11).

The space-saving DEHNshield arrester with a width of only two modules has a maximum discharge capacity of 12.5 kA per pole (10/350  $\mu$ s) and a voltage protection level  $U_p$  of 1.5 kV and is thus ideally suited for protecting terminal equipment. This assembly system allows to supply up to six RRHs / RRUs with a nominal voltage of 48 V d.c. (max. 60 V and max. 80 A) via glass fibre cables for data communication. Moreover, the design of the d.c. box ensures an extremely low wind load and easy installation on the mast.

### Customised solutions for 48 V d.c. remote radio heads / units (type 2 arresters)

Type 2 assembly systems as per IEC 61439-1 (EN 61439-1) / IEC 61439-2 (EN 61439-2) are also used depending on the protection philosophy of mobile network operators and system manufacturers, technical specifications and country-specific

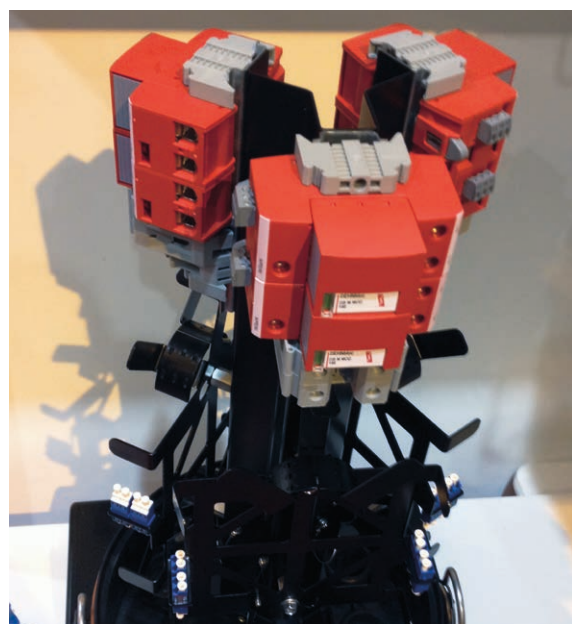


Figure 5 RRH installation protected by a type 1 arrester in a typical installation environment

# Protection of cell sites (4G / LTE)

## White Paper

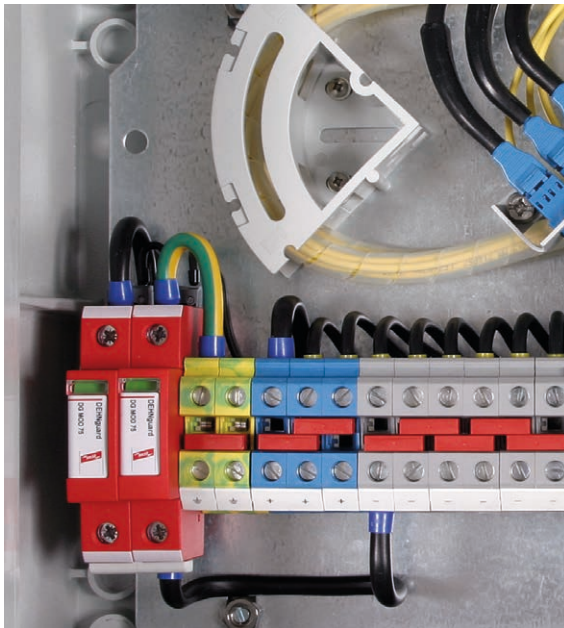


Figure 6 Prewired hybrid box for 48 V d.c. outdoor installations with DEHNGuard type 2 arrester

conditions. Varistor-based type 2 arresters with an extremely low voltage protection level such as DEHNGuard DG S 75 FM protect terminal equipment and are used for RRH / RRU installations with a nominal voltage up to 48 V d.c.

**Figure 6** shows a prewired type 2 assembly system in the form of a hybrid box (d.c. box) for indoor and outdoor installations. The lockable glass-fibre reinforced (GRP) enclosure with an IP 66 degree of protection provides space for up to and including six RRHs / RRUs. All incoming and outgoing lines up to 48 V d.c. are wired on terminal blocks. This provides significant installation benefits for the installer, in particular in case of mast installation and retrofitting. For data communication, the d.c. hybrid box houses up to 12 LC Duplex adapters that accept the prewired glass fibre cable from the technical equipment room. These adapters are connected to the RRHs / RRUs via so-called jumper cables by the most direct path. Easy-to-install accessories such as wall and mast brackets with tensioning strap ensure easy and fast installation.

### Comparison of the protective effect of spark-gap-based type 1 arresters with that of varistor-based type 1 arresters

Energy coordination with terminal equipment to be protected is an important advantage of spark gaps used in type 1 arresters (10/350  $\mu$ s) over MOVs (metal oxide varistors).

A so-called "wave breaker function" is achieved by the fast triggering of the spark gap within a matter of microseconds,

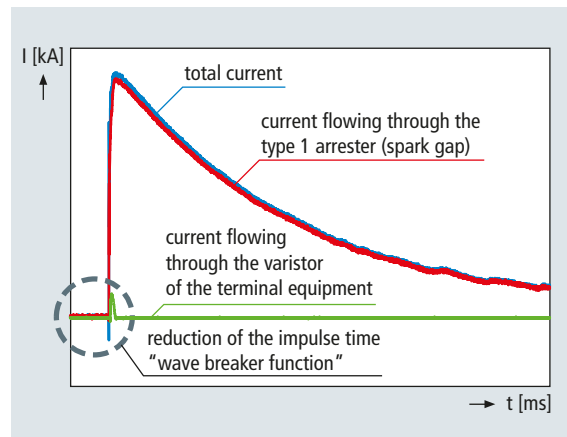


Figure 7 Spark-gap-based type 1 arrester (typical characteristic curve)

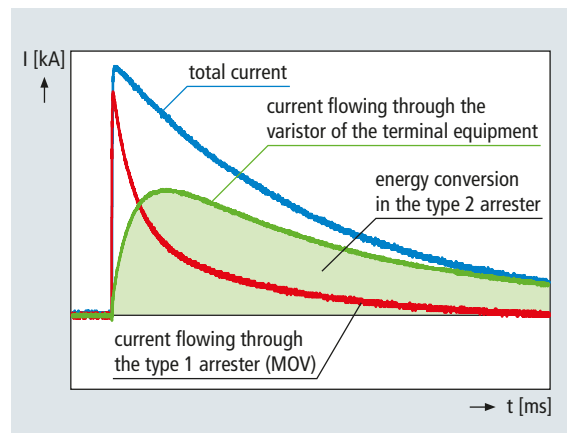


Figure 8 Varistor-based type 1 arrester (typical characteristic curve)

meaning that almost no current flows into the terminal equipment to be protected after the spark gap has ignited (**Figure 7**). Thus, a relatively small amount of energy enters the terminal equipment even in case of extremely high impulse currents. This energy, however, is uncritical for the protective circuit integrated in the input of the terminal equipment.

If MOV-based surge protective devices are used, the current flows into the terminal equipment to be protected over the entire impulse duration. In many cases, the connected a.c./d.c. power supply unit and system technology are damaged and in the worst case completely destroyed (**Figure 8**).

System tests with mobile radio equipment from different manufacturers clearly show that only spark gaps ensure the required degree of protection in this field of application.

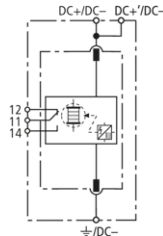
## DEHNselect

### DSE M 1 60 FM (971 126)

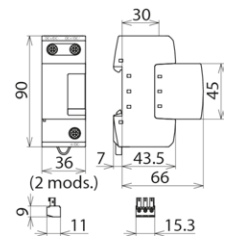
- Coordinated spark-gap-based lightning current arrester consisting of a base part and plug-in protection module
- Spark gap technology particularly suited for use in d.c. circuits
- Directly coordinated with DEHNguard surge protective device without additional cable length



Figure without obligation



Basic circuit diagram DSE M 1 60 FM



Dimension drawing DSE M 1 60 FM

Coordinated and modular single-pole lightning current arrester for d.c. applications from 12 to 60 volts; with remote signalling contact for monitoring device (floating changeover contact).

Type Part No.	DSE M 1 60 FM 971 126
SPD classification according to EN 61643-11 / IEC 61643-11	type 1 / class I
Max. continuous operating d.c. voltage ( $U_c$ )	60 V
Lightning impulse current (10/350 $\mu$ s) ( $I_{imp}$ )	25 kA
Specific energy (W/R)	156.25 kJ/ohms
Nominal discharge current (8/20 $\mu$ s) ( $I_n$ )	25 kA
Voltage protection level ( $U_p$ )	$\leq 1.5$ kV
Directly coordinated with DEHNguard	DG S 150 FM (Part No. 952 092)
Response time ( $t_A$ )	$\leq 100$ ns
Short-circuit withstand capability for max. mains-side overcurrent protection d.c. ( $I_{SCCR}$ )	2000 A
Max. mains-side overcurrent protection	250 A gL/gG
Max. backup fuse (DC+/DC- $\rightarrow$ DC+/DC-)	125 A gL/gG
Operating temperature range (parallel connection) ( $T_{UP}$ )	-40 °C ... +80 °C
Operating temperature range (series connection) ( $T_{US}$ )	-40 °C ... +60 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (DC+/DC-, DC+/DC-, $\neq$ /DC-) (min.)	10 mm <sup>2</sup> solid / flexible
Cross-sectional area (DC+/DC-, $\neq$ /DC-) (max.)	50 mm <sup>2</sup> stranded / 35 mm <sup>2</sup> flexible
Cross-sectional area (DC+/DC-) (max.)	35 mm <sup>2</sup> stranded / 25 mm <sup>2</sup> 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	2 module(s), DIN 43880
Approvals	UL
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 <sup>2</sup> solid / flexible
Extended technical data:	used for safety lighting systems
– d.c. and a.c. operation	no
Weight	288 g
Customs tariff number	85363030
GTIN	4013364138599
PU	1 pc(s)



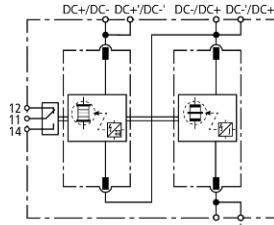
## DEHNselect

### DSE M 2P 60 FM (971 226)

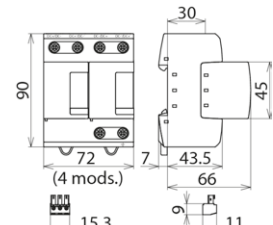
- Coordinated spark-gap-based lightning current arrester consisting of a base part and plug-in protection module
- Spark gap technology particularly suited for use in d.c. circuits
- Directly coordinated with DEHNguard surge protective device without additional cable length



Figure without obligation



Basic circuit diagram DSE M 2P 60 FM



Dimension drawing DSE M 2P 60 FM

Coordinated modular two-pole lightning current arrester for d.c. applications from 12 to 60 volts ("1+1" circuits); FM version with floating remote signalling contact.

Type Part No.	DSE M 2P 60 FM 971 226
SPD classification according to EN 61643-11 / IEC 61643-11	type 1 / class I
Max. continuous operating d.c. voltage ( $U_c$ )	60 V
Lightning impulse current (10/350 $\mu$ s) (DC+/DC- $\rightarrow$ DC-/DC+) / (DC-/DC+ $\rightarrow$ $\pm$ ) ( $I_{imp}$ )	25 / 50 kA
Specific energy (DC+/DC- $\rightarrow$ DC-/DC+) / (DC-/DC+ $\rightarrow$ $\pm$ ) (W/R)	156.25 / 625.00 kJ/ohms
Voltage protection level (DC+/DC- $\rightarrow$ DC-/DC+) / (DC-/DC+ $\rightarrow$ $\pm$ ) ( $U_p$ )	$\leq 1.5$ / $\leq 1.5$ kV
Response time ( $t_A$ )	$\leq 100$ ns
Short-circuit withstand capability for max. mains-side overcurrent protection d.c. ( $I_{SCCR}$ )	2000 A
Max. mains-side overcurrent protection	250 A gL/gG
Max. backup fuse (DC+/DC- $\rightarrow$ DC+/DC-)	125 A gL/gG
Operating temperature range (parallel connection) ( $T_{UP}$ )	-40 °C ... +80 °C
Operating temperature range (series connection) ( $T_{US}$ )	-40 °C ... +60 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	10 mm <sup>2</sup> solid / flexible
Cross-sectional area (DC+/DC-, DC-/DC+, $\pm$ ) (max.)	50 mm <sup>2</sup> stranded / 35 mm <sup>2</sup> flexible
Cross-sectional area (DC+ / DC-, DC- / DC+) (max.)	35 mm <sup>2</sup> stranded / 25 mm <sup>2</sup> 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	UL
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 <sup>2</sup> solid / flexible
Weight	614 g
Customs tariff number	85363030
GTIN	4013364138629
PU	1 pc(s)

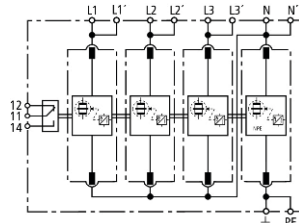
## DEHNvap

### DVA CSP 3P 100 FM (900 360)

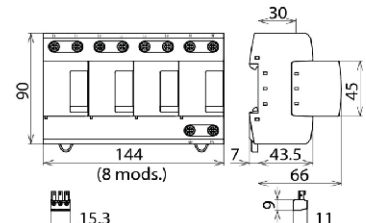
- Prewired combined lightning current and surge arrester, energy-coordinated with power supply systems for cell sites (DEHNvap CSP ... Cell Site Protection)
- Maximum system availability due to follow current limiting RADAX Flow spark gap technology
- Easy replacement of protection modules without tools due to module release button



Figure without obligation



Basic circuit diagram DVA CSP 3P 100 FM



Dimension drawing DVA CSP 3P 100 FM

Modular combined lightning current and surge arrester for use in TT and TN-S systems ("3+1" circuits) for protecting 230/400 V power supply systems of cell sites

Type Part No.	DVA CSP 3P 100 FM 900 360
SPD according to EN 61643-11 / ... IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment ( $\leq 5\text{m}$ )	type 1 + type 2 + type 3
Nominal a.c. voltage ( $U_N$ )	230 / 240 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 $\mu\text{s}$ ) [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 $\mu\text{s}$ ) [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 $\mu\text{s}$ ) ( $I_n$ )	25 / 100 kA
Voltage protection level [L-N]/[N-PE] ( $U_p$ )	$\leq 1.5\text{ kV}$ / $\leq 1.5\text{ kV}$ kV
Follow current extinguishing capability [L-N]/[N-PE] ( $I_{fl}$ )	25 kA <sub>rms</sub> / 100 A <sub>rms</sub>
Follow current limitation/Selectivity	no tripping of a 20 A gL/gG fuse up to 25 kA <sub>rms</sub> (prosp.)
Response time ( $t_A$ )	$\leq 100\text{ ns}$
Max. backup fuse (L) up to $I_K = 25\text{ kA}_{rms}$	315 A gL/gG
Max. backup fuse (L) up to $I_K > 25\text{ kA}_{rms}$	200 A gL/gG
Max. backup fuse (L-L')	125 A gL/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, $\pm$ ) (min.)	10 mm <sup>2</sup> solid / flexible
Cross-sectional area (L1, L2, L3, N, PE) (max.)	50 mm <sup>2</sup> stranded / 35 mm <sup>2</sup> flexible
Cross-sectional area (L1', L2', L3', N', $\pm$ ) (max.)	35 mm <sup>2</sup> stranded / 25 mm <sup>2</sup> 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
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 <sup>2</sup> solid / flexible
Weight	1,3 kg
Customs tariff number	85363030
GTIN	4013364111332
PU	1 pc(s)

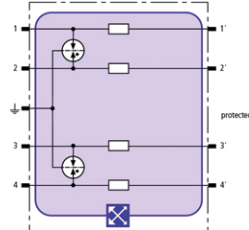
## BLITZDUCTOR XT

### BXT ML4 B 180 (920 310)

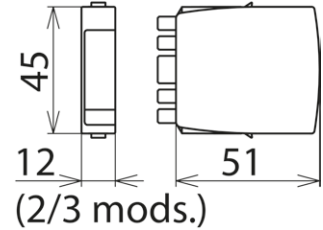
- LifeCheck SPD monitoring function
- Four-pole lightning equipotential bonding
- For installation in conformity with the lightning protection zone concept at the boundaries from 0<sub>A</sub> – 1 and higher



Figure without obligation



Basic circuit diagram BXT ML4 B 180



Dimension drawing BXT ML4 B 180

Space-saving four-pole lightning current arrester module with LifeCheck feature for almost all types of applications. For use in connection with downstream **TYPE2P1** surge arresters or combined lightning current and surge arresters with a lower or equal voltage level. 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 B 180
Part No.	920 310
SPD monitoring system	LifeCheck
SPD class	<b>TYPE2P1</b>
Nominal voltage (U <sub>N</sub> )	180 V
Max. continuous operating d.c. voltage (U <sub>C</sub> )	180 V
Max. continuous operating a.c. voltage (U <sub>C</sub> )	127 V
Nominal current at 45 °C (I <sub>N</sub> )	1.2 A
D1 Total lightning impulse current (10/350 µs) (I <sub>imp</sub> )	10 kA
D1 Lightning impulse current (10/350 µs) per line (I <sub>imp</sub> )	2.5 kA
C2 Total nominal discharge current (8/20 µs) (I <sub>n</sub> )	20 kA
C2 Nominal discharge current (8/20 µs) per line (I <sub>n</sub> )	10 kA
Voltage protection level line-line for I <sub>imp</sub> D1 (U <sub>p</sub> )	≤ 600 V
Voltage protection level line-PG for I <sub>imp</sub> D1 (U <sub>p</sub> )	≤ 550 V
Voltage protection level line-line at 1 kV/µs C3 (U <sub>p</sub> )	≤ 650 V
Voltage protection level line-PG at 1 kV/µs C3 (U <sub>p</sub> )	≤ 550 V
Series resistance per line	0.4 ohm(s)
Capacitance line-line (C)	≤ 16 pF
Capacitance line-PG (C)	≤ 16 pF
Operating temperature range (T <sub>U</sub> )	-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 <sup>*)</sup>
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
Approvals	CSA, VdS, GOST
Weight	25 g
Customs tariff number	85363010
GTIN	4013364109124
PU	1 pc(s)

<sup>\*)</sup> For more detailed information, please visit [www.dehn-international.com](http://www.dehn-international.com).

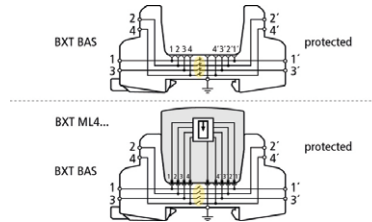
## BLITZDUCTOR XT

### BXT BAS (920 300)

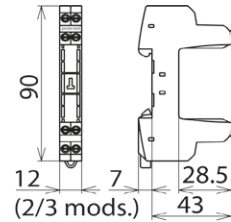
- Four-pole version for universal use with all types of BSP and BXT / BXTU protection modules
- No signal interruption if the protection module is removed
- Universal design without protection elements



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	BXT BAS
Part No.	920 300
Operating temperature range (T <sub>U</sub> )	-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 <sup>2</sup>
Cross-sectional area, flexible	0.08-2.5 mm <sup>2</sup>
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 <sup>*)</sup>
IECEx approvals	DEK 11.0032X: Ex nA IIC T4 Gc <sup>*)</sup>
Approvals	CSA, VdS, UL, GOST
Weight	34 g
Customs tariff number	85369010
GTIN	4013364109179
PU	1 pc(s)

<sup>\*)</sup> only in connection with an approved protection module



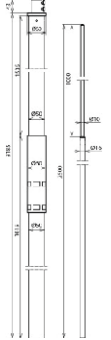
## DEHNiso combi set

### Supporting Tube GI

One-piece, combined with air-termination rod Ø16 / 10 mm, Al, length 2500 mm.



Part No.	105 306
Material of supporting tube	GRP / Al
Length of supporting tube	3200 mm
Diameter Ø outside	50 mm
Transport length	3200 mm
Length of insulating clearance	1535 mm
Permanent temperature range	-50 °C ... +100 °C
Weight	5,23 kg
Customs tariff number	85389099
GTIN	4013364106024

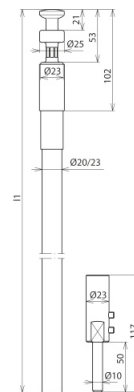


## HVI long conductor

### HVI RIV 75 23 L6M GR (819 223)



Figure without obligation



Part No.	819 223
Material of conductor	Cu
Material of insulation	PE
Material of coating	PVC
Colour of conductor	grey •
Colour RAL	similar to 7035
Cross section of core (solid / stranded)	19 mm <sup>2</sup>
Equivalent separation distance s (in air)	≤ 75 cm
Diameter Ø conductor	23 mm
Coating characteristics	UV stabilised and weather resistant
Connection diameter	10 mm
Material of connection elements	StSt
Minimum order length	6 m
Weight	4 kg
Customs tariff number	85389099
GTIN	4013364157675
PU	1 pc(s)

## Connection Element

### AP SR D50 4AE HVI V2A (819 288)



Figure without obligation

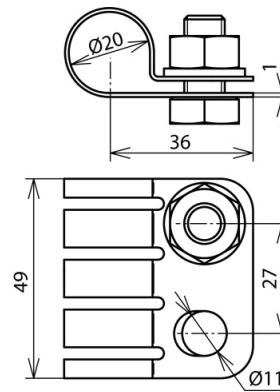
Connection plate (for four conductors, incl. two serrated lock nuts) for installing the HVI long Conductor at the supporting tube D 50 mm (e.g. Part No. 105 330, 105 331, 105 332, 105 333).

Part No.	819 288
Material	StSt
Connection plate support	square hole 13
Weight	172 g
Customs tariff number	85389099
GTIN	4013364236479
PU	1 pc(s)

### PAE 20 23 AB11 V2A (410 229)



Figure without obligation



For discharging the electric field of the HVI long Conductor in the sealing end range. Special slotted design for electrically contacting of the semi-conductive sheath.

Part No.	410 229
Material	StSt
Clamping range Ø	20 mm
Connection bore Ø	11 mm
Screw	● M10 x 20 mm
Material of screw / nut	StSt
Weight	72 g
Customs tariff number	85389099
GTIN	4013364107731
PU	1 pc(s)

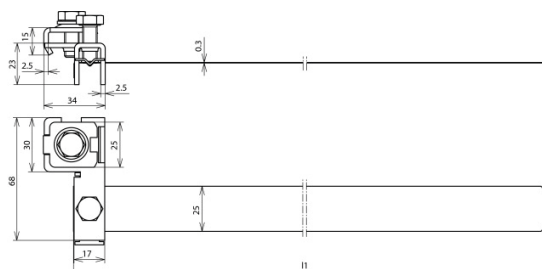
## Pipe clamp



### BRS 27.168 AK1X10 2X6.8 V2A (540 100)



Figure without obligation



Part No.	540 100
Material	StSt
Clamping range pipe Ø	27-168 mm ( $\frac{3}{4}$ -6")
Screw	⚙ M8 x 20 mm
Material of screw	StSt
Dimension of strap (l1 x w x d)	570 x 25 x 0.3 mm
Connection Rd	1-2 x 6-8 mm / 1 x 10 mm
Connection (solid / stranded)	4-50 mm <sup>2</sup>
Standard	EN 62561-1
Weight	133 g
Customs tariff number	85389099
Military Name	VG 96953 T05 B0002
Stock No.	5975-12-120-7744
GTIN	4013364094109
PU	10 pc(s)

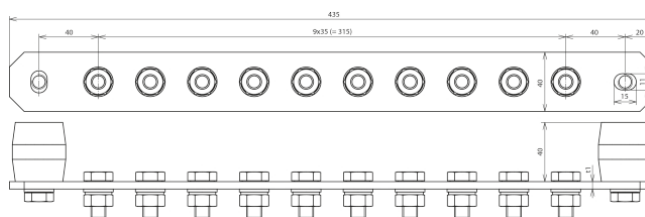
## Equipotential busbar



### PAS I 10AP M10 V2A (472 219)



Figure without obligation



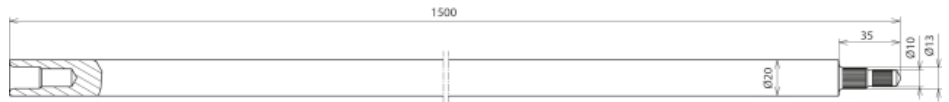
Part No.	472 219
Quantity of terminals	10
Material	StSt
Material No.	1.4301 / 1.4303
Dimension (l x w x t1)	435 x 40 x 6 mm
Cross section	240 mm <sup>2</sup>
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	8.9 kA
Screw	⚙ M10 x 25 mm
Material of screw / nut	StSt
Design	with spring washer
Material of insulator	UP
Colour of insulator	red ●
Standard	EN 62561-1
Weight	1,41 kg
Customs tariff number	85389099
GTIN	4013364090958
PU	1 pc(s)

## Earth rod

### TE 20 1500 AZ V4A (620 902)



Figure without obligation



Part No.	620 902
Component protection	German Patent No. P 32 22 201.7
Material	StSt (V4A)
Material No.	1.4571 / 1.4404 / 1.4401
ASTM / AISI:	316Ti / 316L / 316
Rod length (l1)	1500 mm
Diameter Ø (d1)	20 mm
Pin diameter	10 / 13 mm
Tensile strength	500-730 N/mm <sup>2</sup>
Specific conductivity	≥ 1.25 m/Ohm mm <sup>2</sup>
Specific resistance	≤ 0.8 Ohm mm <sup>2</sup> / m
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	4.2 kA
Standard	EN 62561-2
Weight	3,67 kg
Customs tariff number	85389099
GTIN	4013364021914
PU	6 pc(s)



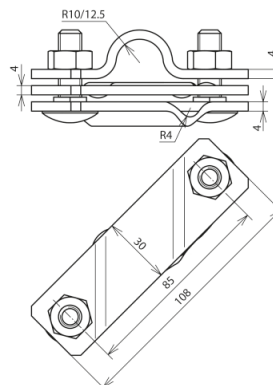
## Connection bracket



### AS S TE 20 7.10 FL40 V4A (620 915)



Figure without obligation



Part No.	620 915
Material	StSt (V4A)
Clamping range Rd / FI	7-10 / -40 mm
Clamping range (stranded / cable)	35-95 mm <sup>2</sup>
Type for earth rods	Ø20 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
Short-circuit current (50 Hz) (1 s; ≤ 300 °C)	7.3 kA
Standard	EN 62561-1
Weight	298 g
Customs tariff number	85389099
GTIN	4013364026629
PU	20 pc(s)



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Safety Equipment  
DEHN protects.**

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GmbH + Co.KG.

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