Surge protection for gutter heating systems

White Paper

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White Paper

Solar radiation and waste heat from buildings may melt ice or snow even under frosty conditions. Such melt water then refreezes, preventing water from draining away and causing it to back up. As a result, the roof drainage is blocked and icicles, which present an increased risk, may form.

An even more serious problem is heavy snow and ice build up that may exceed the maximum load capacity of the roof. Gutter heating systems can prevent damage provided that their reliable function is ensured even under lightning and surge conditions.

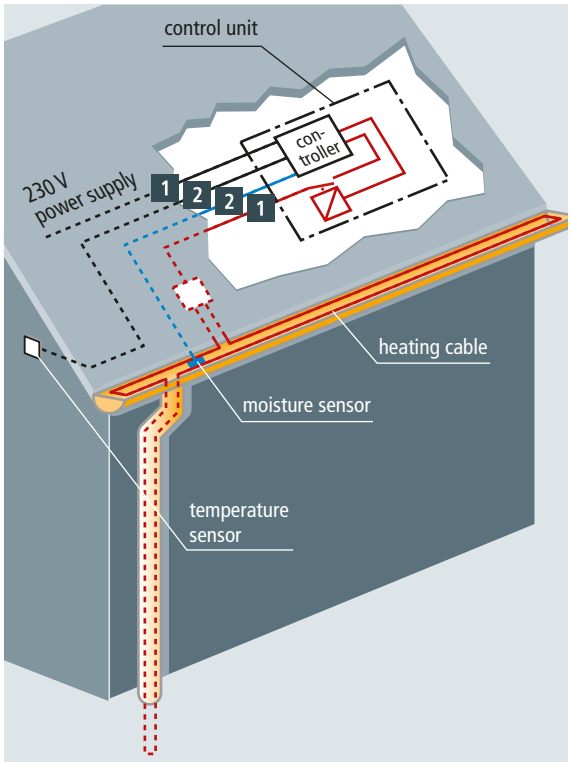
Structure without external lightning protection system

If a structure has no external lightning protection system, it can be assumed that the operator considers the probability of lightning striking the structure to be low. In this case, type 2 surge arresters according to IEC 60364-1 (HD 60364-1) must be used to protect the structure from inductive coupling.

Since both the heating bands and the temperature and moisture sensors are located outside the structure, their connecting cables are exposed to inductive coupling which may cause damage to the structure. For this reason, type 2 surge arresters are installed to protect these cables directly at the entry point into the structure and the feeder cable upstream of the control unit (**Figure 1**).

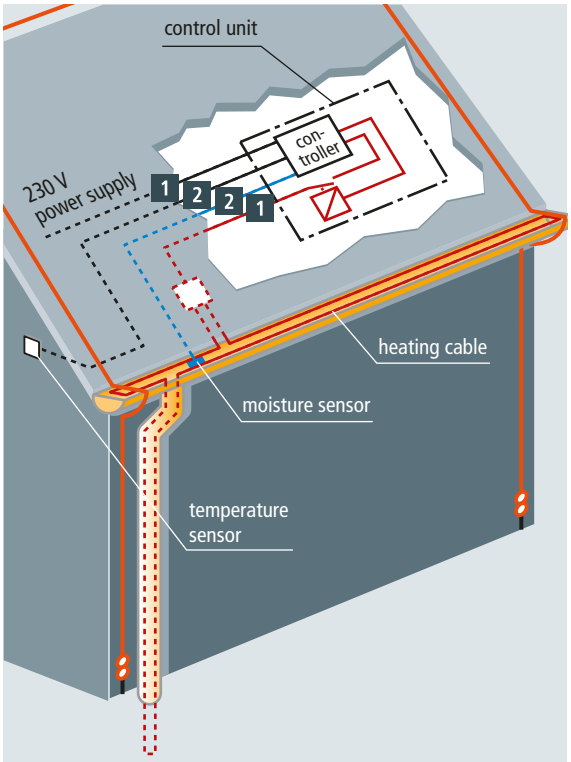
Structure with external lightning protection system

The IEC 62305-1 to 4 (EN 62305-1 to 4) standard must be observed when installing lightning protection systems on structures. In such systems, the gutters and / or downpipes are typi-



	Type	Info	Part No.
1	DG M TT 2P 275		952 110
2	BXT ML2 BE S 12 + BXT BAS	earthing 6 mm² Cu	920 222 920 300

Figure 1 Control unit protected by surge arresters in a structure without external lightning protection system



	Type	Info	Part No.
1	DSH TT 2P 255	earthing 16 mm² Cu	941 110
2	BXT ML2 BE S 12 + BXT BAS	earthing 6 mm² Cu	920 222 920 300

Figure 2 Installation of lightning current and surge arresters if the control unit is located far from the entry point into a structure with external lightning protection system

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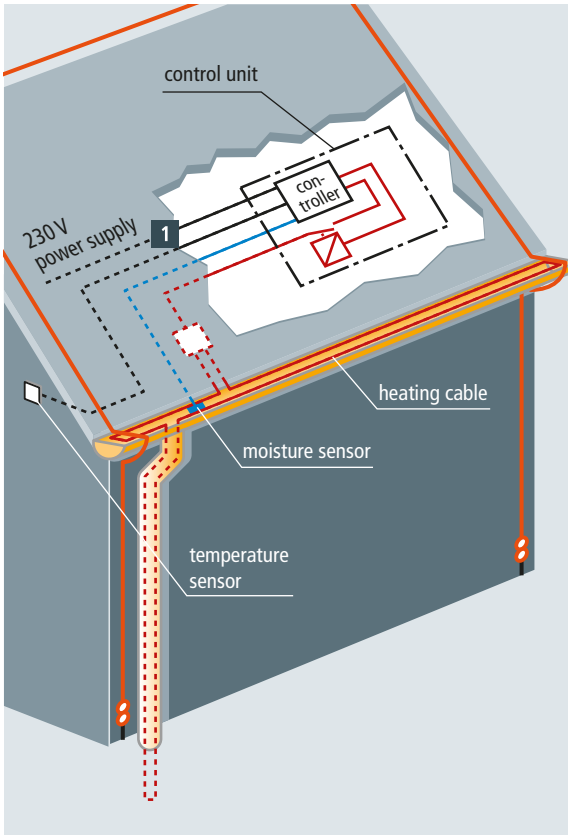


	Type	Info	Part No.
1	DSH TT 2P 255	earthing 16 mm² Cu	941 110

Figure 3 Installation of lightning current arresters if the control unit (loss is accepted) is located near the entry point into a structure with external lightning protection

cally conductively connected to the air-termination systems and are therefore at a high potential in case of a lightning strike. Both the heating band and moisture sensor cables directly contact these lightning current carrying gutters and downpipes, meaning that lightning currents are automatically injected on the cables. For this reason, type 1 lightning current arresters must be installed directly at the point where the cables enter the structure (**Figure 2**).

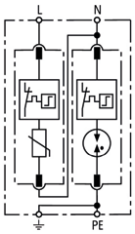
If loss of the control unit is acceptable (the control unit and/or the incoming cables do not present a risk of fire), the structure can be protected by installing combined arresters directly at the point where the cables enter the structure (**Figure 3**).

DEHNguard

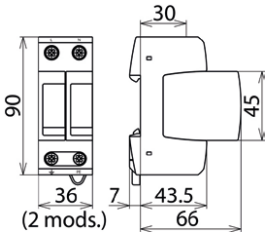
DG M TT 2P 275 (952 110)

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

Figure without obligation



Basic circuit diagram DG M TT 2P 275



Dimension drawing DG M TT 2P 275

Modular surge arrester for use in single-phase TT and TN systems (1+1 configuration).

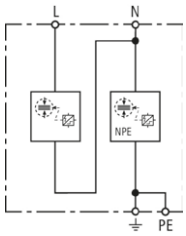
Type Part No.	DG M TT 2P 275 952 110
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment (≤ 10 m)	type 2 + type 3
Nominal voltage (a.c.) (U_N)	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) [L-N] (U_C)	275 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) [N-PE] (U_C)	255 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	20 kA
Max. discharge current (8/20 µs) (I_{max})	40 kA
Lightning impulse current (10/350 µs) [N-PE] (I_{imp})	12 kA
Voltage protection level [L-N]/[N-PE] (U_P)	≤ 1.5 / ≤ 1.5 kV
Voltage protection level [L-N] / [N-PE] at 5 kA (U_P)	≤ 1 / ≤ 1.5 kV
Follow current extinguishing capability [N-PE] (I_{fi})	100 A_{rms}
Response time [L-N] (t_A)	≤ 25 ns
Response time [N-PE] (t_A)	≤ 100 ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection (I_{SCCR})	50 kA_{rms}
Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic	440 V / 120 min. – safe failure
Temporary overvoltage (TOV) [N-PE] (U_T) – Characteristic	1200 V / 200 ms – withstand
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	1.5 mm^2 solid / flexible
Cross-sectional area (max.)	35 mm^2 stranded / 25 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	2 module(s), DIN 43880
Approvals	KEMA, VDE, UL
Extended technical data:	----------
Voltage protection level [L-PE] (U_P)	1.5 kV
Weight	242 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364108417
PU	1 pc(s)

DEHNshield

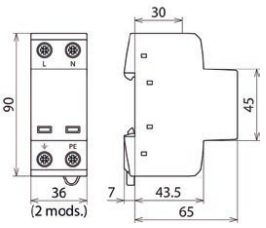
DSH TT 2P 255 (941 110)

- Application-optimised and prewired spark-gap-based type 1 and type 2 combined lightning current and surge arrester
- Compact design due to space-saving spark gap technology with a width of only 1 module / pole
- Allows compact lightning equipotential bonding including protection of terminal equipment

Figure without obligation



Basic circuit diagram DSH TT 2P 255



Dimension drawing DSH TT 2P 255

Application-optimised and prewired combined lightning current and surge arrester for single-phase TT and TN-S systems (1+1 configuration).

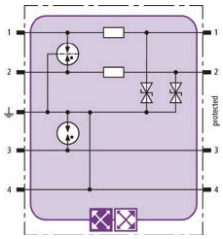
Type Part No.	DSH TT 2P 255 941 110
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 10 m)	type 1 + type 2 + type 3
Nominal voltage (a.c.) (U_N)	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) (U_C)	255 V (50 / 60 Hz)
Lightning impulse current (10/350 µs) [L+N-PE] (I_{total})	25 kA
Specific energy [L+N-PE] (W/R)	156.25 kJ/ohms
Lightning impulse current (10/350 µs) [L-N]/[N-PE] (I_{imp})	12.5 / 25 kA
Specific energy [L-N]/[N-PE] (W/R)	39.06 / 156.25 kJ/ohms
Nominal discharge current (8/20 µs) [L-N]/[N-PE] (I_n)	12.5 / 25 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})	25 kA_{rms} / 100 A_{rms}
Follow current limitation / Selectivity	no tripping of a 32 A gG fuse up to 25 kA_{rms} (prosp.)
Response time (t_A)	≤ 100 ns
Max. mains-side overcurrent protection	160 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 (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (L, N, PE, ⏚) (min.)	1.5 mm^2 solid / flexible
Cross-sectional area (L, 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	2 module(s), DIN 43880
Approvals	KEMA, VDE, UL
Extended technical data:	----------
Voltage protection level [L-PE] (U_P)	2.0 kV
Weight	275 g
Customs tariff number (Comb. Nomenclature EU)	85363090
GTIN	4013364137899
PU	1 pc(s)

BLITZDUCTOR XT

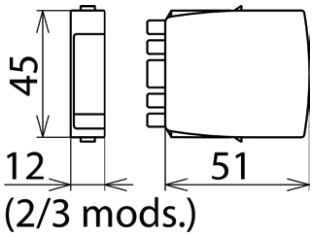
BXT ML2 BE S 12 (920 222)

- LifeCheck SPD monitoring function
- Optimal protection of two single lines and the cable shield
- For use in conformity with the lightning protection zone concept at the boundaries from 0_A –2 and higher

Figure without obligation



Basic circuit diagram BXT ML2 BE S 12



Dimension drawing BXT ML2 BE S 12

Space-saving combined lightning current and surge arrester module with LifeCheck feature for protecting two single lines sharing a common reference potential as well as unbalanced interfaces, with direct or indirect shield earthing. 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 Part No.	BXT ML2 BE S 12 920 222
SPD monitoring system	LifeCheck
SPD class	TYPE 1 P1
Nominal voltage (U_N)	12 V
Max. continuous operating voltage (d.c.) (U_C)	15 V
Max. continuous operating voltage (a.c.) (U_C)	10.6 V
Nominal current at 45 °C (I_L)	0.75 A
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_{imp} D1 (U_p)	≤ 50 V
Voltage protection level line-PG for I_{imp} D1 (U_p)	≤ 37 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 38 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 19 V
Series resistance per line	1.8 ohm(s)
Cut-off frequency line-PG (f_G)	2.7 MHz
Capacitance line-line (C)	≤ 1.0 nF
Capacitance line-PG (C)	≤ 2.0 nF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection (with plugged-in protection module)	IP 20
Pluggable into	BXT BAS / BSP BAS 4 base part
Earthing via	BXT BAS / BSP BAS 4 base part
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21 / EN 61643-21, UL 497B
Approvals	CSA, EAC, ATEX, IECEx, CSA & USA Hazloc, SIL
SIL classification	up to SIL3 *)
ATEX approvals	DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc
IECEx approvals	DEK 11.0032X: Ex nA IIC T4 Gc
CSA & USA Hazloc approvals (1)	2516389: Class I Div. 2 GP A, B, C, D T4
CSA & USA Hazloc approvals (2)	2516389: Class I Zone 2, AEx nA IIC T4
Weight	21 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364118355
PU	1 pc(s)

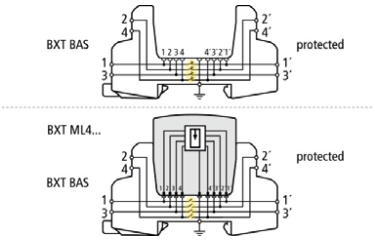
*)For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR XT

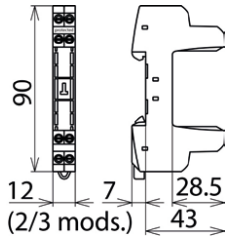
BXT BAS (920 300)

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

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

*) only in connection with an approved protection module

Surge Protection
Lightning Protection
Safety Equipment
DEHN protects.

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