



# Surge protection for sun shading systems

White Paper



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- Lightning protection zones concept (LPZ concept)
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# Surge protection for sun shading systems

## White Paper



Figure 1 Sun shading systems on an administration building and a private home (source: Warema)

The sun and the weather are beyond our control, but sun protection systems in modern buildings offer various ways of adjusting the sunlight to make it agreeable. Shutters, Venetian blinds and awnings, etc., help to regulate direct sunlight in both large buildings with extensive façades and private homes (Figure 1). Sun protection has already been standard in almost all buildings for many years. However, over the years, the type and range of sun shading systems has been optimised and undergone significant changes, both technically and visually. Particularly in terms of their adaptation to various types and style of building. Originally, sun shading systems were usually operated manually. It did not take long before they were controlled electrically using simple switches. Today, in highly complex industrial buildings, large office and administration tracts and even in private homes, modern energy-efficient electric control systems are used to regulate temperature and light (Figure 2). Nowadays, sun protection is more than simple protection against intensive sunlight. It is about combining different aspects like heat influx, glare protection, privacy, the use of daylight and solar

heat generation with one another. Sun protection is primarily about systematically coupling the different modes of action to achieve maximum energy efficiency. For this purpose, diverse electronic control systems are used in combination with PCs and smartphones (apps) for sun shading automation or so-called sunlight management (Figure 3).

Motors and drives of sun shading systems are powered by mains voltage (230 V). The control components are mostly connected to modern bus systems like KNX allowing the modules to communicate with each other and rendering controlling simple and efficient. The operating voltage of the control components is generally 24 V. Smartphones can be integrated in this communication with a Gateway via WLAN and thus used as a control device. Apps which have been specially developed by the different manufacturers for this purpose are available on the market.

However, whilst offering the maximum comfort and energy efficiency possible with state-of-the-art technology, these convenient and complex control and management systems also react very sensitively to surges.



Figure 2 Sun protection management (source: Warema)

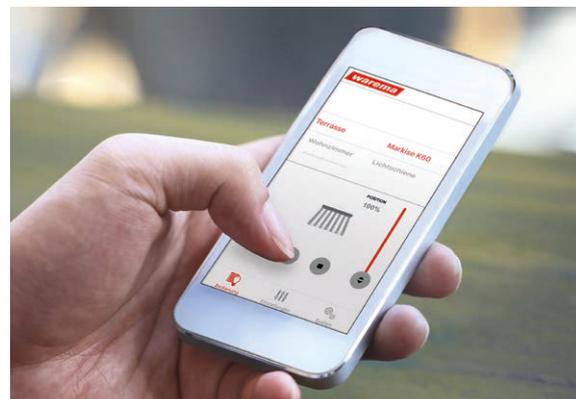


Figure 3 Sun protection control, I-Phone app (source: Warema)

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How do these surges arise and why is damage to electronic systems due to surges on the increase both in commercial buildings and private homes? With dangerous surges one differentiates between transient overvoltages generated by natural lightning events and surges generated and distributed in the grid as a result of switching operations, faults or tripped fuses. This also explains why damage is on the rise. The number of lightning events is growing continuously and our power supply systems are becoming more and more complex, e. g. due to multiple distributed feed-ins (e. g., photovoltaics, wind energy, biogas). These facts greatly encourage the development of dangerous surges. On top of that, our modern electric equipment and control systems are becoming more and more sensitive. This also applies to sun shading systems in buildings. The effects of dangerous overvoltages on sun shading systems are all the greater, the more extensive the wiring and the loops formed when connecting the installation to various grids (230 V, 240 V) or bus systems.

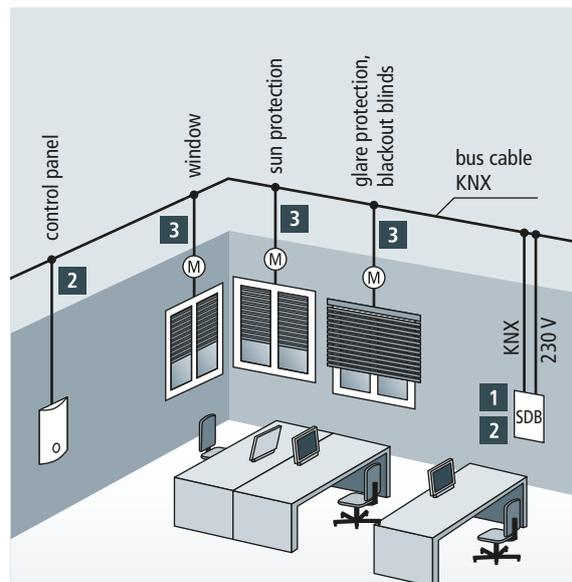
Damage to sun shading systems resulting from surges can have many negative effects (Figure 4). In many offices, production workplaces or other industrial settings, for example, sun protection is crucial. At certain times, it would be impossible to work in many areas without adequate glare reduction measures.

Consequent implementation of surge protective measures is a must for the prevention of surge damage to control components and drives and the elimination of downtime and maintenance work.

Surge protective measures in industrial and public facilities have been standard for many years now. In Germany, surge protective measures have also been obligatory for private homes since October 2016. As a result, central protection for supply voltages in the feeder and the sub-distribution board already exists in most cases. However, the surge protective measures for the entire building should be checked and supplemented where necessary. In buildings with an external lightning protection system, a higher electromagnetic field load occurs inside the building when lightning strikes. This means that a building with an external lightning protection system requires comprehensive protection in the form of type 2 surge arresters. In line with the lightning protection zones concept according to EN 62305-4/IEC 62305-4, all cables should be equipped with the required surge protection at the boundaries of the lightning protection zones. As far as the wiring of sun shading systems is concerned, this means that the power supply and control line must be protected by surge arresters at least in the area of the façade/wall to the boundary into the room (boundary of lightning protection zones LPZ 0B to 1 or higher). Primarily, this prevents the dangerous spread of lightning energy within the building via the wires and cables of the sun shading system. Figure 5 shows examples for product applications.



Figure 4 Damage to control components



	SPD	Remark	Part No.
1	DEHNguard (acc. to system configuration)	type 2 surge arrester in the sub-distribution board	952 400 (TNS) 952 381 (TT)
2	BUSsector BT 24	KNX components	925 001
3	DEHNcord R 3P 275	for drives with Hirschmann plug	900 449
	Alternative: DEHNcord L3P 275	for drives directly connected	900 447

Figure 5 Control system

# Surge protection for sun shading systems

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In order to protect the various different drives, prevent dangerous overvoltages from spreading through the extensive installation network of the sun shading automation and protect the sun shading system as a whole, specially adapted surge arresters are available like, e.g., DEHNcord R 3P for electronic

sun shading drives (**Figure 6**). This type 2 surge arrester, which takes the form of an adapter installed in the connecting cable of the drive of a control element for shutters/Venetian blinds to protect the drive and the building installation against induced overvoltages at the building façade, has the following features:

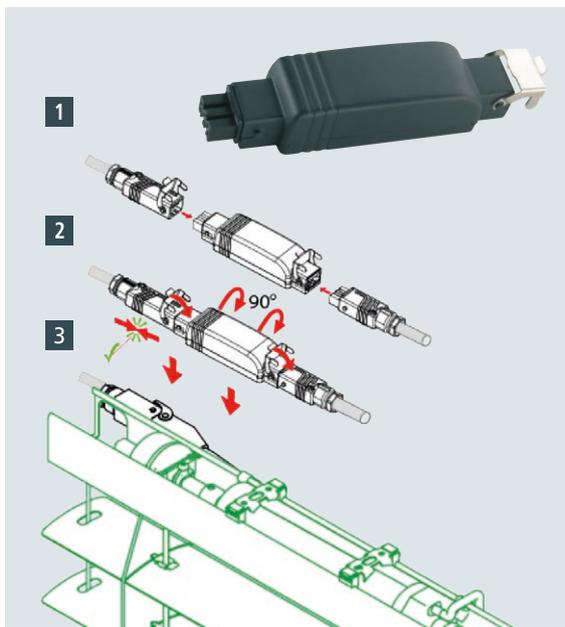


Figure 6 DEHNcord R 3P (source: Warema)

- ➔ Multipole type 2 surge arrester with monitoring and disconnection device
- ➔ Easy installation in the form of a plug-in adapter (Hirschmann STAK3/STAS3), no risk of incorrect installation (**Figure 7**)
- ➔ For installation in the lightning protection zones concept at the boundaries LPZ 0<sub>B</sub>-1 and higher
- ➔ Disconnection of the lowering function of the shutter in case of a defective surge arrester
- ➔ Acoustic warning in case of a defective surge arrester and blocking of the lowering function
- ➔ Protection of both phases up/down
- ➔ Degree of protection IP54, allows use in protected outside areas
- ➔ Disconnection and acoustic warning for all discharge paths
- ➔ High discharge capacity up to  $I_n/I_{max} = 2.5/5$  kA (8/20  $\mu$ s) per pole and total discharge capacity of  $I_{total} = 15$  kA

Surge protection really pays off in sun shading systems using simple and effective components especially developed and adapted for the purpose.

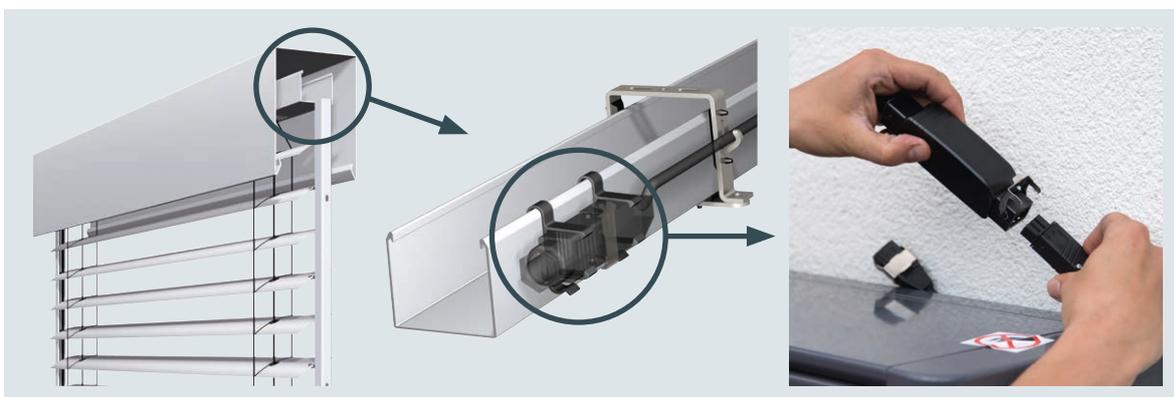


Figure 7 Installation of a DEHNcord for the drive of a sun shading system (source: Warema)

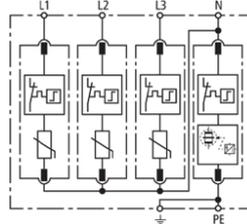
## DEHNguard

### DG M H TT 275 (952 381)

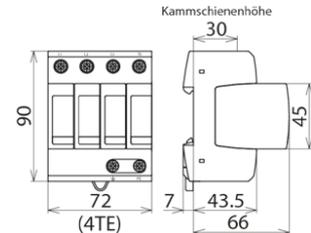
- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device



Figure without obligation



Basic circuit diagram DG M H TT 275



Dimension drawing DG M H TT 275

Modular surge arrester with an increased discharge capacity for TT and TN-S systems (3+1 configuration).

Type	DG M H TT 275
Part No.	952 381
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment ( $\leq 10$ m)	type 2 + type 3
Nominal voltage (a.c.) ( $U_N$ )	230 / 400 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) [L-N] ( $U_C$ )	275 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) [N-PE] ( $U_C$ )	255 V (50 / 60 Hz)
Nominal discharge current (8/20 $\mu$ s) [L-N] ( $I_n$ )	20 kA
Nominal discharge current (8/20 $\mu$ s) [N-PE] ( $I_n$ )	80 kA
Max. discharge current (8/20 $\mu$ s) [L-N] ( $I_{max}$ )	40 kA
Max. discharge current (8/20 $\mu$ s) [N-PE] ( $I_{max}$ )	120 kA
Lightning impulse current (10/350 $\mu$ s) [N-PE] ( $I_{imp}$ )	40 kA
Voltage protection level [L-N]/[N-PE] ( $U_P$ )	$\leq 1.5$ / $\leq 1.5$ kV
Voltage protection level [L-N] / [N-PE] at 5 kA ( $U_P$ )	$\leq 1$ / $\leq 1.5$ kV
Follow current extinguishing capability [N-PE] ( $I_R$ )	100 A <sub>rms</sub>
Response time [L-N] ( $t_A$ )	$\leq 25$ ns
Response time [N-PE] ( $t_A$ )	$\leq 100$ ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection ( $I_{SCCR}$ )	50 kA <sub>rms</sub>
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 <sup>2</sup> solid / flexible
Cross-sectional area (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	KEMA
Weight	405 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364318144
PU	1 pc(s)

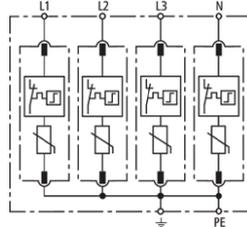
## DEHNguard

### DG M TNS 275 (952 400)

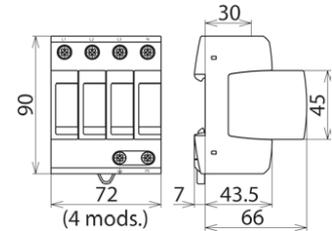
- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device



Figure without obligation



Basic circuit diagram DG M TNS 275



Dimension drawing DG M TNS 275

Modular surge arrester for use in TN-S systems.

Type	DG M TNS 275
Part No.	952 400
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment ( $\leq 10$ m)	type 2 + type 3
Nominal voltage (a.c.) ( $U_N$ )	230 / 400 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) ( $U_C$ )	275 V (50 / 60 Hz)
Nominal discharge current (8/20 $\mu$ s) ( $I_n$ )	20 kA
Max. discharge current (8/20 $\mu$ s) ( $I_{max}$ )	40 kA
Voltage protection level [L-PE]/[N-PE] ( $U_P$ )	$\leq 1.5$ / $\leq 1.5$ kV
Voltage protection level [L-PE] / [N-PE] at 5 kA ( $U_P$ )	$\leq 1$ / $\leq 1$ kV
Response time ( $t_A$ )	$\leq 25$ ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection ( $I_{SCCR}$ )	50 kA <sub>rms</sub>
Temporary overvoltage (TOV) ( $U_T$ ) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) ( $U_T$ ) – Characteristic	440 V / 120 min. – safe failure
Operating temperature range ( $T_U$ )	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	1.5 mm <sup>2</sup> solid / flexible
Cross-sectional area (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	KEMA, VDE, UL
Weight	414 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364108455
PU	1 pc(s)

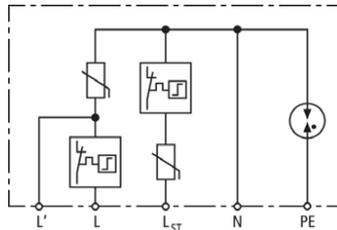
## DEHNcord

### DCOR L 3P 275 SO IP (900 447)

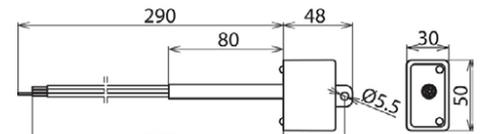
- Visual fault indication for both protective paths
- Interruption of the load circuit in the event of a fault
- Compact design



Figure without obligation



Basic circuit diagram DCOR L 3P 275 SO IP



Dimension drawing DCOR L 3P 275 SO IP

Three-pole surge arrester for all installation systems; compact design. IP 65 degree of protection. With disconnection of the load circuit in the event of a fault and protection of the control phase

#### Technical data

Type	DCOR L 3P 275 SO IP
Part No.	900 447
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment ( $\leq 10$ 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 $\mu$ s) ( $I_n$ )	5 kA
Max. discharge current (8/20 $\mu$ s) ( $I_{max}$ )	10 kA
Total discharge current (8/20 $\mu$ s) [L+N-PE] ( $I_{total}$ )	20 kA
Voltage protection level [L-N] ( $U_p$ )	$\leq 1.5$ kV
Voltage protection level [L-N] at 3 kA ( $U_p$ )	$\leq 1$ kV
Voltage protection level [L-N] at 1.5 kA ( $U_p$ )	$\leq 0.85$ kV
Voltage protection level [N-PE] ( $U_p$ )	$\leq 1.5$ kV
Follow current extinguishing capability [N-PE] ( $I_n$ )	100 $A_{rms}$
Response time [L-N] ( $t_A$ )	$\leq 25$ ns
Response time [L/N-PE] ( $t_A$ )	$\leq 100$ ns
Max. load current ( $I_L$ )	10 A
Max. mains-side overcurrent protection	B 16 A
Short-circuit withstand capability for mains-side overcurrent protection ( $I_{SCCR}$ )	1 $kA_{rms}$
Short-circuit withstand capability for mains-side overcurrent protection with 16 A gG ( $I_{SCCR}$ )	6 $kA_{rms}$
Temporary overvoltage (TOV) [L-N] ( $U_T$ ) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) [L-N] ( $U_T$ ) – Characteristic	440 V / 120 min. – safe failure
Temporary overvoltage (TOV) [N-PE] ( $U_T$ ) – Characteristic	1200 V / 200 ms – safe failure
Fault indication	red
Interruption of the load circuit in the event of a fault	yes
Number of ports	1
Operating temperature range ( $T_U$ )	-40 °C ... +80 °C
Connecting cable	1.5 mm <sup>2</sup> , 230 mm long
Enclosure material	thermoplastic, red, UL 94 V-2
Degree of protection of installed device	IP 65
Extended technical data:	-----
– Combination wave ( $U_{OC}$ )	10 kV
Weight	130 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364282216
PU	1 pc(s)

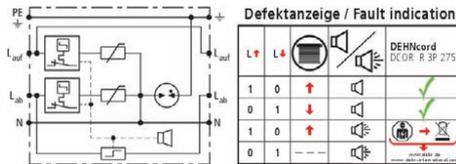
## DEHNcord

### DCOR R 3P 275 (900 449)

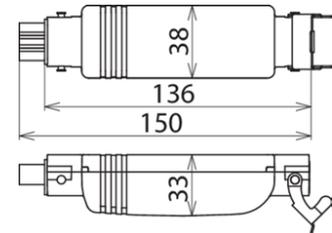
- Acoustic fault indication for both protective paths
- Interruption of the load current circuit in the event of a fault for downstream operation
- Compact design with IP54 degree of protection (adapter)



Figure without obligation



Basic circuit diagram DCOR R 3P 275



Dimension drawing DCOR R 3P 275

Surge arrester for electric Venetian blinds; compact dimensions.

#### Technical data

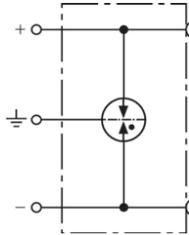
Type	DCOR R 3P 275
Part No.	900 449
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment ( $\leq 10$ m)	type 2 + type 3
Nominal voltage (a.c.) ( $U_N$ )	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) [L-N] ( $U_C$ )	275 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) [N-PE] ( $U_C$ )	255 V (50 / 60 Hz)
Nominal load current (a.c.) ( $I_L$ )	10 A
Nominal discharge current (8/20 $\mu$ s) ( $I_n$ )	2.5 kA
Max. discharge current (8/20 $\mu$ s) ( $I_{max}$ )	5 kA
Total discharge current (8/20 $\mu$ s) [L+N-PE] ( $I_{total}$ )	15 kA
Voltage protection level [L-N] ( $U_p$ )	$\leq 1.5$ kV
Follow current extinguishing capability [N-PE] ( $I_f$ )	100 A <sub>rms</sub>
Response time [L-N] ( $t_A$ )	$\leq 25$ ns
Response time [L/N-PE] ( $t_A$ )	$\leq 100$ ns
Short-circuit withstand capability for mains-side overcurrent protection ( $I_{SCCR}$ )	1 kA <sub>rms</sub>
Temporary overvoltage (TOV) [L-N] ( $U_T$ ) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) [L-N] ( $U_T$ ) – Characteristic	440 V / 120 min. – safe failure
Temporary overvoltage (TOV) [N-PE] ( $U_T$ ) – Characteristic	1200 V / 200 ms – safe failure
Acoustic fault indication	yes
Interruption of the load circuit in the event of a fault	yes for downstream operation
Number of ports	1
Connector	Hirschmann STAK 3 / STAS 3
Operating temperature range ( $T_U$ )	-20 °C ... +70 °C
Degree of protection of installed device	IP 54
Weight	129 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364320031
PU	1 pc(s)

## BUSector

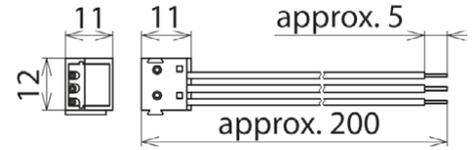
### BT 24 (925 001)



Figure without obligation



Basic circuit diagram BT 24



Dimension drawing BT 24

Surge arrester with KNX bus terminal design, adapted to the immunity of KNX / EIB systems. EIBA-certified.

Type Part No.	BT 24 925 001
SPD class	TYPE2
Nominal voltage ( $U_n$ )	24 V
Max. continuous operating voltage (d.c.) ( $U_c$ )	45 V
Nominal current ( $I_n$ )	6 A
D1 Lightning impulse current (10/350 $\mu$ s) per line	1 kA
C2 Nominal discharge current per line ( $I_n$ )	5 kA
Voltage protection level line-line for $I_n$ C2	$\leq 1200$ V
Voltage protection level line-PG for $I_n$ C2	$\leq 650$ V
Voltage protection level line-line at 1 kV/ $\mu$ s C3	$\leq 750$ V
Voltage protection level line-PG at 1 kV/ $\mu$ s C3	$\leq 500$ V
Cut-off frequency line-line ( $f_c$ )	70 MHz
Capacitance line-line	$\leq 10$ pF
Capacitance line-PG	$\leq 10$ pF
Operating temperature range ( $T_u$ )	-40 °C ... +80 °C
Degree of protection	IP 20
Connection	spring contacts ( $\varnothing 1$ mm) / connecting leads ( $\varnothing 0.8$ mm)
Earthing via	lead (0.75 mm <sup>2</sup> ), 200 mm long
Enclosure material	thermoplastic
Colour	blue
Test standards	IEC 61643-21
Approvals	EIBA certification No. Z 32/1399/95, EAC
Weight	10 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364047365
PU	1 pc(s)

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

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