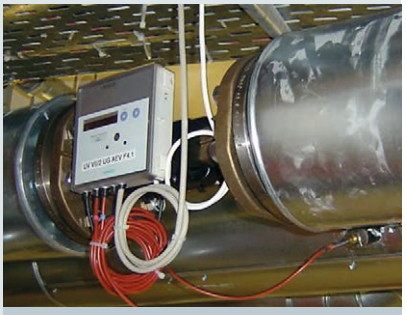
Surge protection for the M-bus

White Paper



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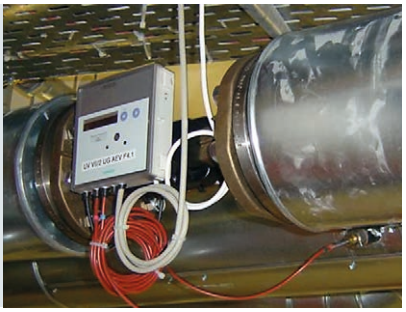

The function of an M-bus (meter bus) is to transfer meter readings of consumption meters. Data can be centrally read off from all devices connected to an M-bus system, either directly on site or via data transfer in an external control room. This increases e.g. the living quality of tenants and allows to check the energy consumption of an entire building at any time.
The M-bus system is used for consumption cost billing and remote monitoring of

- Community and district heating systems as well as
- Multi-family houses

Centralised and distributed systems can be used to read off data from consumption meters.
If the consumption meters are located in close proximity to the system panel, a simple and cost-effective centralised system architecture is preferred. In this case, every single consumption meter is wired to the system panel in a radial configuration. If a distributed system is used, the data of the consumption meters installed on site are collected in sub-stations and are centrally transmitted to the system panel via the bus line.
As shown in **Figure 1**, a central master (in the simplest case a PC with a downstream level converter) communicates with the bus devices via a bus line. The installation can be subdivided into M-bus segments using M-bus repeaters. Up to max. 250 slaves such as heat meters, water meters, electricity meters, gas meters, sensors and actuators of any type can be connected per segment. More and more manufacturers integrate the electric M-bus interface including the protocol level in their consumption meters.
The M-bus is a two-wire bus system which is supplied by the bus master. All other bus devices of the M-bus must not be connected to earth during operation. The maximum bus voltage is 42 V.
Lines as well as the connected M-bus devices and protective circuits stress the M-bus segment due to their resistances and

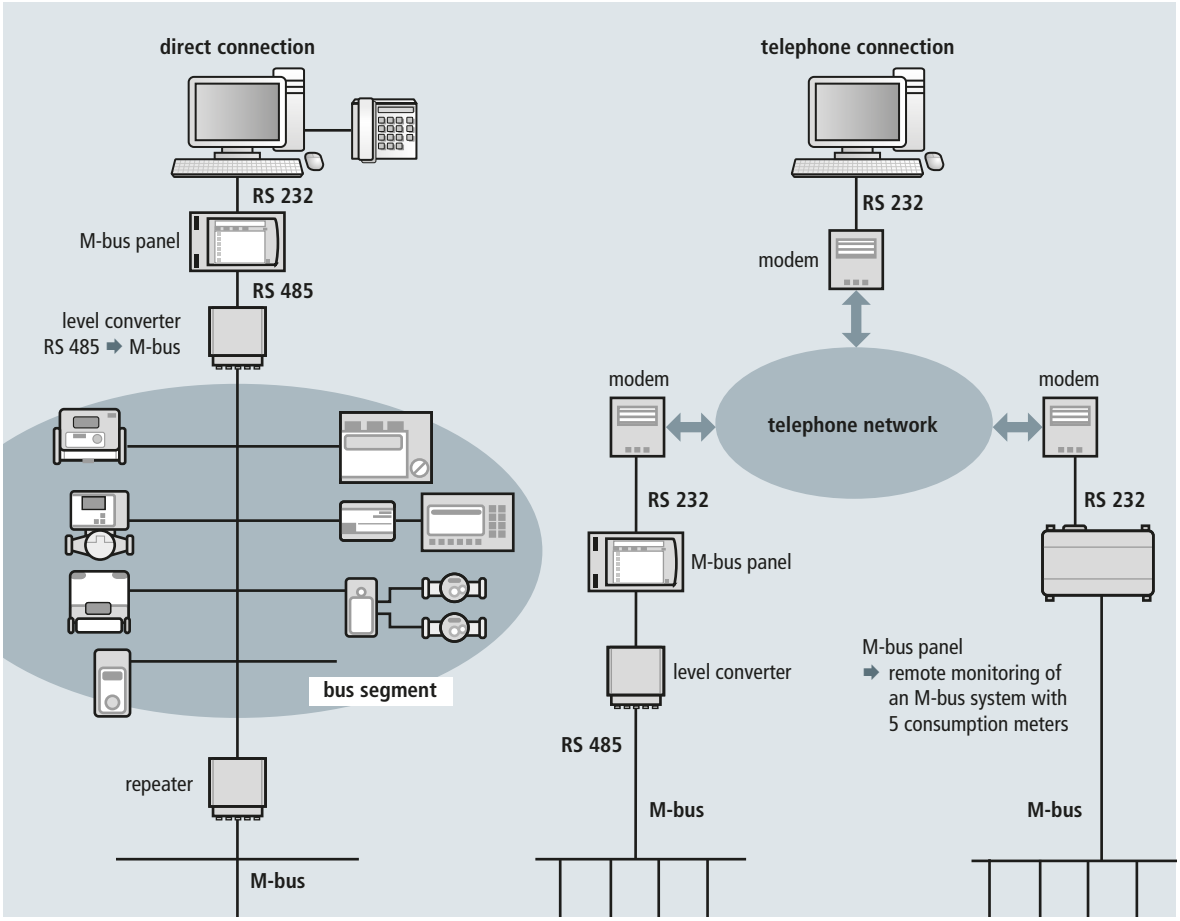

Figure 1 System example for an M-bus

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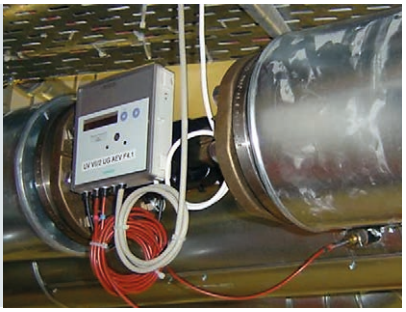

Line J-Y (ST) Y...x 0.8	Number of bus devices	Current per bus device	Max. voltage drop
0.8 km	60	e.g. 1.5 mA	5.4 V

Table 1 Maximum voltage drop on the bus line

Baud rate	Max. bus capacitance at a baud rate of 9600	Total capacitance of the bus devices + line
9600	100 nF	60 meters + 0.8 km J-Y (ST) Y ... · 0.8 60 · 1 nF + 0.8 km · 50 nF/km

Table 2 Maximum baud rate depending on the bus devices (in this case meters) and the line capacitance

Surge protective device		Part No.	Capacitance: core / core	Series impedance per core
BLITZDUCTOR XT	BXT ML2 BD S 48	920 245	0.7 nF	1.0 Ω
BLITZDUCTOR XT	BXT ML2 BE S 24	920 224	0.5 nF	1.8 Ω
BLITZDUCTOR XT	BXT ML2 BE S 5	920 220	2.7 nF	1.0 Ω
DEHNconnect	DCO SD2 MD 48	917 942	0.6 nF	1.8 Ω
DEHNconnect	DCO SD2 ME 24	917 921	0.5 nF	1.8 Ω
DEHNconnect	DCO SD2 E 12	917 987	1.2 nF	–

Table 3 Capacitances and series impedances of surge protective devices

capacitances and have an impact on the length of the bus line / baud rate.
An M-bus panel has an M-bus standby current of e.g. 375 mA (250 standard loads of 1.5 mA each) which supplies different M-bus devices with different standard loads (e.g. three standard loads are equivalent to 4.5 mA). The cross-section of the copper lines and the sum of the voltage drops in the partial sections up to the relevant bus device define the maximum length of the bus line (**Table 1**).

Another aspect is the dependence of the maximum transmitted baud rate on the total capacitance in the bus segment. This is shown based on the example of an M-bus panel with a capacitance of 100 nF at a baud rate of 9600:

- Type of line J-Y (ST) Y… x 0.8
- About 75 Ω/km, about 50 nF/km for M-bus devices, e.g. meters, about 1 nF, about 1.5 mA (**Table 2**).

If surge protective devices are used, their series resistances and core / core capacitances must be observed (**Table 3**).

Building with external lightning protection system

If a building is fitted with an external lightning protection system, lightning equipotential bonding is required.
All cores of power supply and information technology cables and lines entering or leaving the building are connected to the lightning equipotential bonding system via lightning current arresters. **Figure 2** shows an example of how to protect an interconnected M-bus system from lightning currents and surges.

Building without external lightning protection system

If no external lightning protection system is installed, surge protective devices protect the electrical installations and systems. **Figure 3** shows an example of how to protect an interconnected M-bus system from surges.

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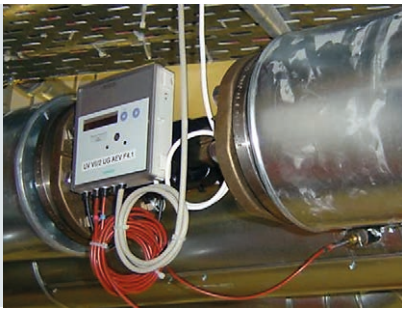

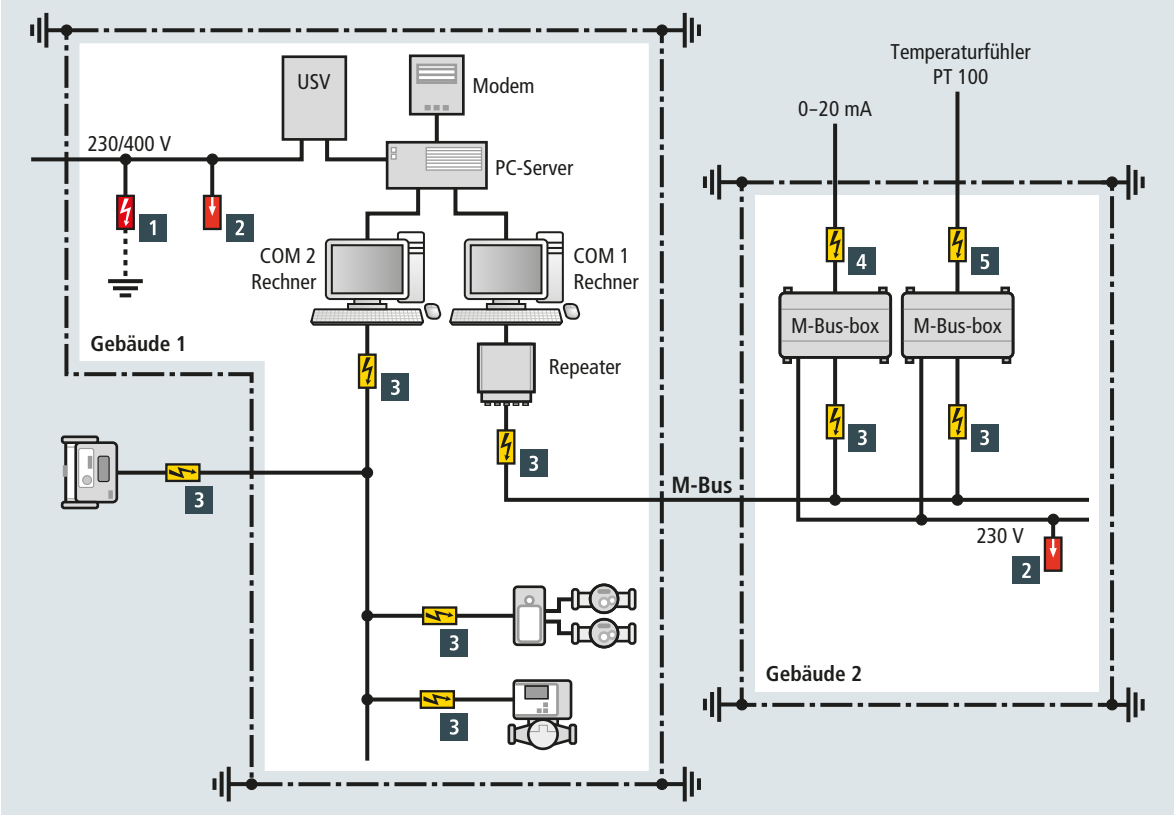

No.	Protection for…	Surge protective device	Part No.
Selection of combined arresters according to the system configuration (in the main distribution board next to the entrance point into the building)			
1	Three-phase TN-C system Three-phase TN-S system Three-phase TT system	DEHNventil DV M TNC 255 DEHNventil DV M TNS 255 DEHNventil DV M TT 255	951 300 951 400 951 310
Surge protective devices for the voltage supply			
2	Three-phase TN-S system Three-phase TT system Alternating current TN system Alternating current TT system	DEHNguard DG M TNS 275 DEHNguard DG M TT 275 DEHNguard DG M TN 275 DEHNguard DG M TT 2P 275	952 400 952 310 952 200 952 110
Surge protective devices for signal interfaces			
3	M-bus	BLITZDUCTOR XT BXT ML2 BD S 48 + BXT BAS base part	920 245 + 920 300
4	0–20 mA	BLITZDUCTOR XT BXT ML2 BE S 24 + BXT BAS base part	920 224 + 920 300
5	PT 100 temperature sensor	BLITZDUCTOR XT BXT ML2 BE S 5 + BXT BAS base part	920 220 + 920 300

Figure 2 Protection concept for an M-bus system in buildings with external lightning protection system

Surge protection for the M-bus

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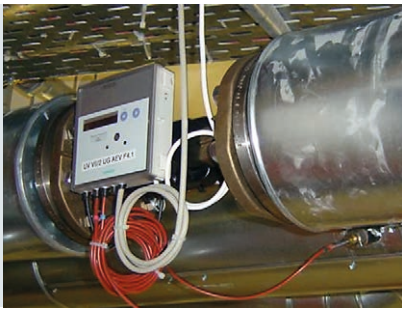
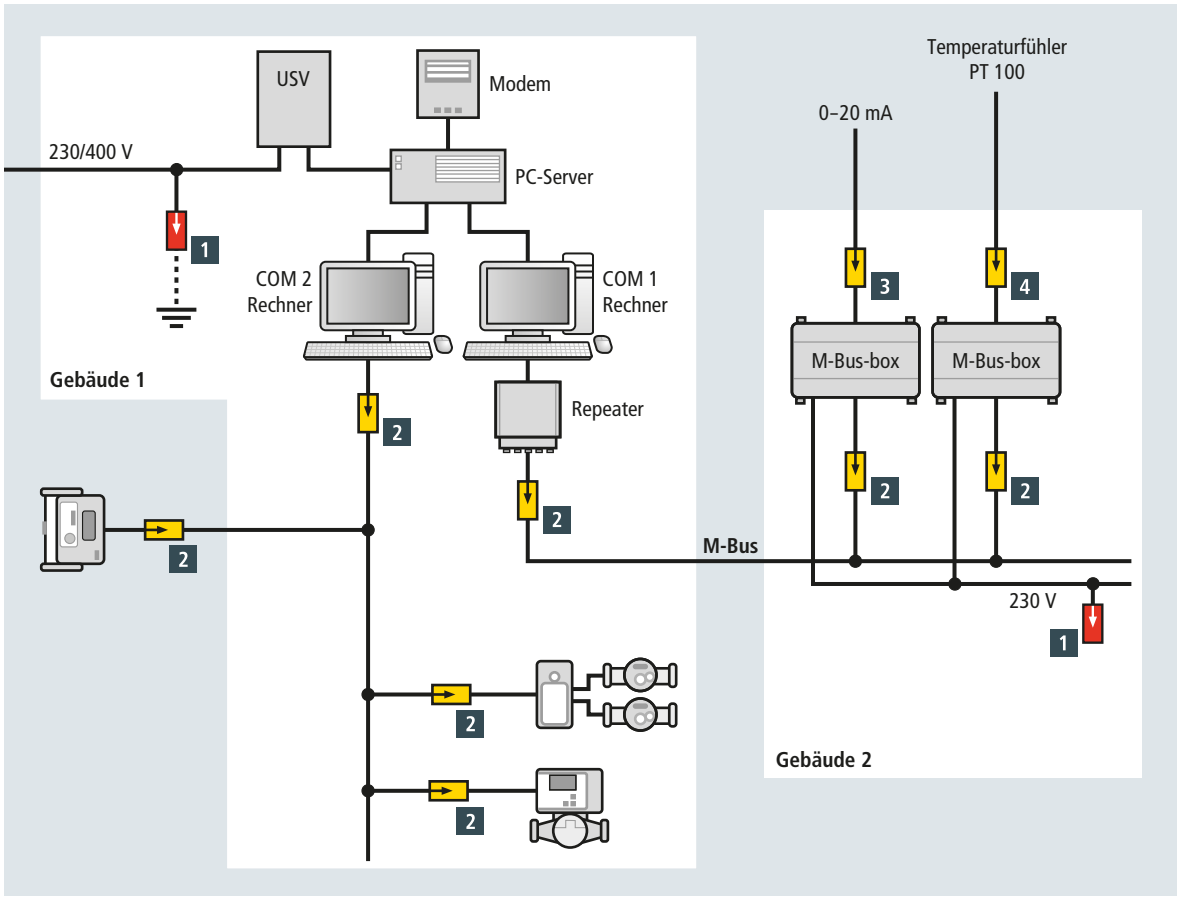




No.	Protection for…	Surge protective device	Part No.
Surge protective devices for the voltage supply			
1	Three-phase TN-S system	DEHNguard DG M TNS 275	952 400
	Three-phase TT system	DEHNguard DG M TT 275	952 310
	Alternating current TN system	DEHNguard DG M TN 275	952 200
	Alternating current TT system	DEHNguard DG M TT 2P 275	952 110
Surge protective devices for signal interfaces			
2	M-bus	DEHNconnect DCO SD2 MD 48	917 942
3	0–20 mA	DEHNconnect DCO SD2 ME 24	917 921
4	PT 100 temperature sensor	DEHNconnect DCO SD2 E 12	917 987

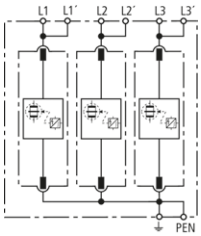
Figure 3 Protection concept for an M-bus system in buildings without external lightning protection system

DEHNventil

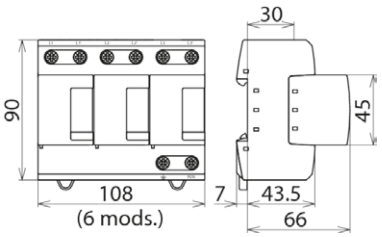
DV M TNC 255 (951 300)

- 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



Dimension drawing DV M TNC 255

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

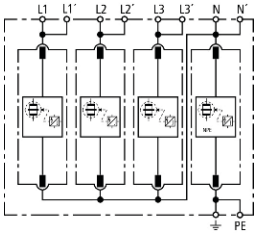
Type Part No.	DV M TNC 255 951 300
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 5 m)	type 1 + type 2 + type 3
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	264 V (50 / 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
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	970 g
Customs tariff number	85363030
GTIN	4013364108134
PU	1 pc(s)

DEHNventil

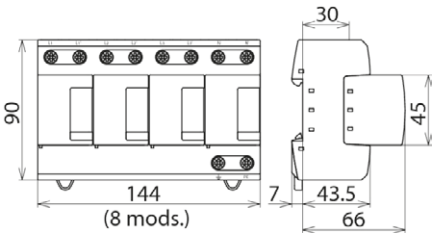
DV M TT 255 (951 310)

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

Figure without obligation



Basic circuit diagram DV M TT 255



Dimension drawing DV M TT 255

Modular combined lightning current and surge arrester for TT and TN-S systems ("3+1" circuit).

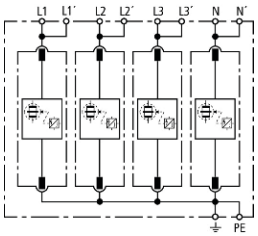
Type Part No.	DV M TT 255 951 310
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 5 m)	type 1 + type 2 + type 3
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [L-N] (U_C)	264 V (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
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	1,27 kg
Customs tariff number	85363030
GTIN	4013364108172
PU	1 pc(s)

DEHNventil

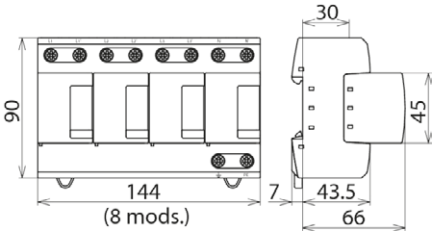
DV M TNS 255 (951 400)

- 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



Dimension drawing DV M TNS 255

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

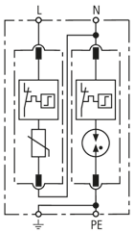
Type Part No.	DV M TNS 255 951 400
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment (≤ 5 m)	type 1 + type 2 + type 3
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	264 V (50 / 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
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	1,35 kg
Customs tariff number	85363030
GTIN	4013364108158
PU	1 pc(s)

DEHNguard

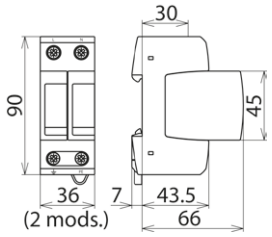
DG M TT 2P 275 (952 110)

- 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" circuit).

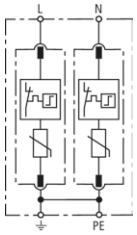
Type Part No.	DG M TT 2P 275 952 110
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Nominal a.c. voltage (U_N)	230 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [L-N] (U_C)	275 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [N-PE] (U_C)	255 V (50 / 60 Hz)
Nominal discharge 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] (U_P)	≤ 1.5 kV
Voltage protection level [L-N] at 5 kA (U_P)	≤ 1 kV
Voltage protection level [N-PE] (U_P)	≤ 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, VdS
Weight	242 g
Customs tariff number	85363030
GTIN	4013364108417
PU	1 pc(s)

DEHNguard

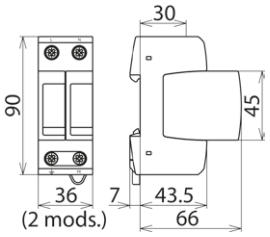
DG M TN 275 (952 200)

- 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 TN 275



Dimension drawing DG M TN 275

Modular surge arrester for use in single-phase TN systems.

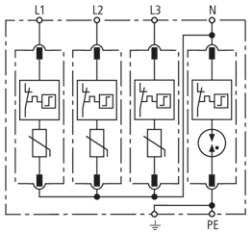
Type Part No.	DG M TN 275 952 200
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Nominal a.c. voltage (U_N)	230 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	20 kA
Max. discharge current (8/20 µs) (I_{max})	40 kA
Voltage protection level (U_P)	≤ 1.5 kV
Voltage protection level at 5 kA (U_P)	≤ 1 kV
Response time (t_A)	≤ 25 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) (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^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, VdS
Weight	229 g
Customs tariff number	85363030
GTIN	4013364108394
PU	1 pc(s)

DEHNguard

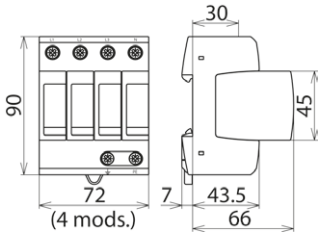
DG M TT 275 (952 310)

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

Figure without obligation



Basic circuit diagram DG M TT 275



Dimension drawing DG M TT 275

Modular surge arrester for use in TT and TN-S systems ("3+1" circuit).

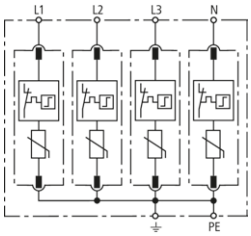
Type Part No.	DG M TT 275 952 310
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [L-N] (U_C)	275 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [N-PE] (U_C)	255 V (50 / 60 Hz)
Nominal discharge 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] (U_P)	≤ 1.5 kV
Voltage protection level [L-N] at 5 kA (U_P)	≤ 1 kV
Voltage protection level [N-PE] (U_P)	≤ 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	4 module(s), DIN 43880
Approvals	KEMA, VDE, UL, VdS
Weight	450 g
Customs tariff number	85363030
GTIN	4013364108479
PU	1 pc(s)

DEHNguard

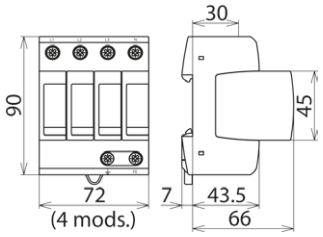
DG M TNS 275 (952 400)

- 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.

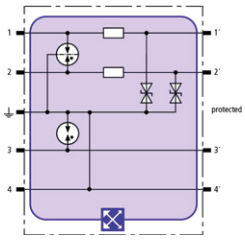
Type Part No.	DG M TNS 275 952 400
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Nominal a.c. voltage (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	20 kA
Max. discharge current (8/20 µs) (I_{max})	40 kA
Voltage protection level (U_P)	≤ 1.5 kV
Voltage protection level at 5 kA (U_P)	≤ 1 kV
Response time (t_A)	≤ 25 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) (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^2 solid / flexible
Cross-sectional area (max.)	35 mm^2 stranded / 25 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	4 module(s), DIN 43880
Approvals	KEMA, VDE, UL, VdS
Weight	443 g
Customs tariff number	85363030
GTIN	4013364108455
PU	1 pc(s)

BLITZDUCTOR XT

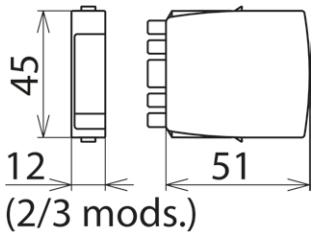
BXT ML2 BE S 5 (920 220)

- 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 5



Dimension drawing BXT ML2 BE S 5

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 5 920 220
SPD monitoring system	LifeCheck
SPD class	TYPE 1 P1
Nominal voltage (U_N)	5 V
Max. continuous operating d.c. voltage (U_C)	6.0 V
Max. continuous operating a.c. voltage (U_C)	4.2 V
Nominal current at 45 °C (I_L)	1.0 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)	≤ 29 V
Voltage protection level line-PG for I_{imp} D1 (U_p)	≤ 27 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 18 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 9 V
Series resistance per line	1.0 ohm(s)
Cut-off frequency line-PG (f_G)	1.0 MHz
Capacitance line-line (C)	≤ 2.7 nF
Capacitance line-PG (C)	≤ 5.4 nF
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 *)
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, GOST, VdS
Weight	36 g
Customs tariff number	85363010
GTIN	4013364118331
PU	1 pc(s)

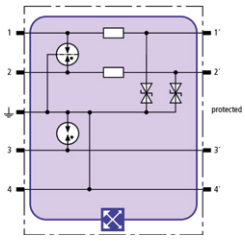
*)For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR XT

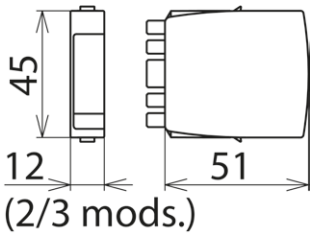
BXT ML2 BE S 24 (920 224)

- 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 24



Dimension drawing BXT ML2 BE S 24

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 24 920 224
SPD monitoring system	LifeCheck
SPD class	TYPE 1 P1
Nominal voltage (U_N)	24 V
Max. continuous operating d.c. voltage (U_C)	33 V
Max. continuous operating a.c. voltage (U_C)	23.3 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)	≤ 102 V
Voltage protection level line-PG for I_{imp} D1 (U_p)	≤ 66 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 90 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 45 V
Series resistance per line	1.8 ohm(s)
Cut-off frequency line-PG (f_G)	6.8 MHz
Capacitance line-line (C)	≤ 0.5 nF
Capacitance line-PG (C)	≤ 1.0 nF
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 *)
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, GOST, VdS
Weight	37 g
Customs tariff number	85363010
GTIN	4013364117785
PU	1 pc(s)

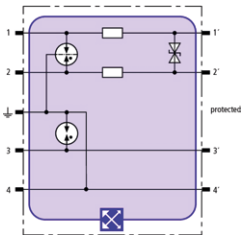
*)For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR XT

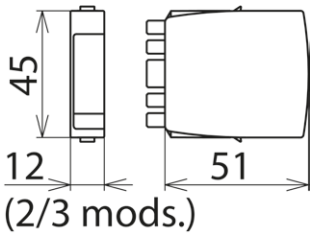
BXT ML2 BD S 48 (920 245)

- LifeCheck SPD monitoring function
- Optimal protection of one pair and the cable shield
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_A –2 and higher

Figure without obligation



Basic circuit diagram BXT ML2 BD S 24 48



Dimension drawing BXT ML2 BD S 48

Space-saving combined lightning current and surge arrester module with LifeCheck feature for protecting one pair of unearthed balanced 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 BD S 48 920 245
SPD monitoring system	LifeCheck
SPD class	TYPE 1 P1
Nominal voltage (U_N)	48 V
Max. continuous operating d.c. voltage (U_C)	54 V
Max. continuous operating a.c. voltage (U_C)	38.1 V
Nominal current at 45 °C (I_L)	1.0 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)	≤ 80 V
Voltage protection level line-PG for I_{imp} D1 (U_p)	≤ 550 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 70 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 550 V
Series resistance per line	1.0 ohm(s)
Cut-off frequency line-line (f_G)	8.7 MHz
Capacitance line-line (C)	≤ 0.7 nF
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
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
Approvals	CSA, GOST, VdS
Weight	36 g
Customs tariff number	85363010
GTIN	4013364118386
PU	1 pc(s)

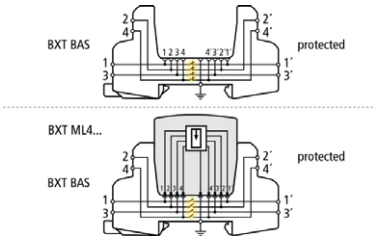
*) For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR XT

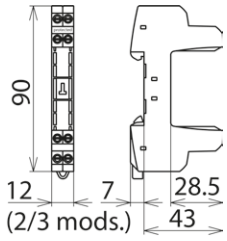
BXT BAS (920 300)

- 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 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)

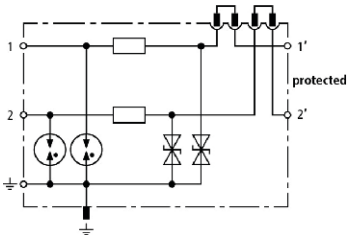
*) only in connection with an approved protection module

DEHNconnect

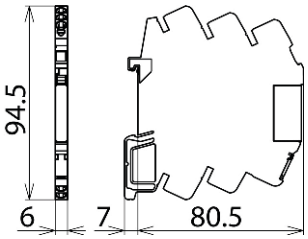
DCO SD2 ME 24 (917 921)

- Space-saving terminal block with integrated surge protection
- Disconnection module for disconnecting signal circuits for maintenance work
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_B –2 and higher

Figure without obligation



Basic circuit diagram DCO SD2 ME 24



Dimension drawing DCO SD2 ME 24

Energy-coordinated two-stage arrester with disconnection function for protecting two single lines sharing a common reference potential as well as unbalanced interfaces.

Type Part No.	DCO SD2 ME 24 917 921
SPD class	TYPE 2 P1
Nominal voltage (U_N)	24 V
Max. continuous operating d.c. voltage (U_C)	33 V
Max. continuous operating a.c. voltage (U_C)	23 V
Nominal current at 80 °C (I_L)	0.5 A
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	1 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	10 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	5 kA
Voltage protection level line-line for I_n C2 (U_p)	≤ 120 V
Voltage protection level line-PG for I_n C2 (U_p)	≤ 75 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 90 V
Voltage protection level line-PG at 1 kV/µs C3 (U_P)	≤ 45 V
Series resistance per line	1.8 ohms
Cut-off frequency line-PG (f_G)	6 MHz
Capacitance line-line (C)	≤ 0.5 nF
Capacitance line-PG (C)	≤ 1.0 nF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection	IP 00
For mounting on	35 mm DIN rails acc. to EN 60715
Connection (input / output)	spring / spring
Cross-sectional area (solid)	0.34-2.5 mm²
Cross-sectional area (flexible)	0.34-2.5 mm²
Earthing via	DIN rail / terminal
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21 / EN 61643-21
SIL classification	up to SIL3 *)
Approvals	UL, CSA
Extended technical data:	- - - - - - - - - - - - - - - - - - -
– Max. discharge current (8/20 µs) [1/2 - PG], [1+2 - PG] (I_{max})	20 kA
– Voltage protection level line-PG at 1 kV/µs C3 after being subjected to I_{max} (U_p)	≤ 45 V
Weight	31 g
Customs tariff number	85363010
GTIN	4013364150577
PU	1 pc(s)

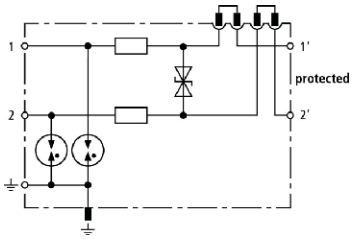
*) For more detailed information, please visit www.dehn-international.com.

DEHNconnect

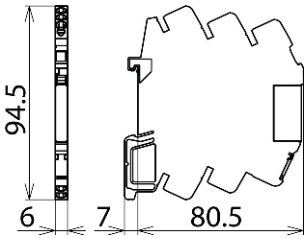
DCO SD2 MD 48 (917 942)

- Space-saving terminal block with integrated surge protection
- Disconnection module for disconnecting signal circuits for maintenance work
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_B –2 and higher

Figure without obligation



Basic circuit diagram DCO SD2 MD 48



Dimension drawing DCO SD2 MD 48

Energy-coordinated two-stage arrester with disconnection function that has no leakage current to earth protects one unearthed pair as well as balanced interfaces.

Type Part No.	DCO SD2 MD 48 917 942
SPD class	TYPE 2 P1
Nominal voltage (U_N)	48 V
Max. continuous operating d.c. voltage (U_C)	55 V
Max. continuous operating a.c. voltage (U_C)	38.5 V
Nominal current at 80 °C (I_L)	0.5 A
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	1 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	10 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	5 kA
Voltage protection level line-line for I_n C2 (U_p)	≤ 100 V
Voltage protection level line-PG for I_n C2 (U_p)	≤ 750 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 72 V
Voltage protection level line-PG at 1 kV/µs C3 (U_P)	≤ 650 V
Series resistance per line	1.8 ohms
Cut-off frequency line-PG (f_G)	8 MHz
Capacitance line-line (C)	≤ 0.6 nF
Capacitance line-PG (C)	≤ 6 pF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection	IP 00
For mounting on	35 mm DIN rails acc. to EN 60715
Connection (input / output)	spring / spring
Cross-sectional area (solid)	0.34-2.5 mm²
Cross-sectional area (flexible)	0.34-2.5 mm²
Earthing via	DIN rail / terminal
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21 / EN 61643-21
SIL classification	up to SIL3 *)
Approvals	UL, CSA
Extended technical data:	- - - - - - - - - - - - - - - - - - -
– Max. discharge current (8/20 µs) [1/2 - PG], [1+2 - PG] (I_{max})	20 kA
– Voltage protection level line-PG at 1 kV/µs C3 after being subjected to I_{max} (U_p)	≤ 650 V
Weight	31 g
Customs tariff number	85363010
GTIN	4013364150614
PU	1 pc(s)

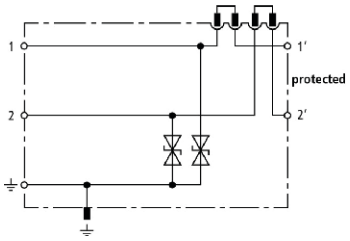
*) For more detailed information, please visit www.dehn-international.com.

DEHNconnect

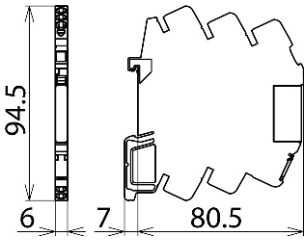
DCO SD2 E 12 (917 987)

- Space-saving terminal block with integrated surge protection
- Disconnection module for disconnecting signal circuits for maintenance work
- For installation in conformity with the lightning protection zone concept at the boundaries from 1 –2 and higher

Figure without obligation



Basic circuit diagram DCO SD2 E 12



Dimension drawing DCO SD2 E 12

Finely-limiting surge protective device with disconnection function and powerful diodes to earth for two single lines sharing a common reference potential and unbalanced interfaces.

Type Part No.	DCO SD2 E 12 917 987
SPD class	TYPE 3 P1
Nominal voltage (U_N)	12 V
Max. continuous operating d.c. voltage (U_C)	13 V
Max. continuous operating a.c. voltage (U_C)	9 V
Nominal current at 60 °C (I_L)	10 A
C1 Total nominal discharge current (8/20 µs) (I_n)	0.8 kA
C1 Nominal discharge current (8/20 µs) per line (I_n)	0.4 kA
Voltage protection level line-line for I_n C1 (U_p)	≤ 50 V
Voltage protection level line-PG for I_n C1 (U_p)	≤ 25 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 36 V
Voltage protection level line-PG at 1 kV/µs C3 (U_P)	≤ 18 V
Cut-off frequency line-PG (f_G)	2.3 MHz
Capacitance line-line (C)	≤ 2.5 nF
Capacitance line-PG (C)	≤ 1.3 nF
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)	spring / spring
Cross-sectional area (solid)	0,34-2.5 mm²
Cross-sectional area (flexible)	0.34-2.5 mm²
Earthing via	DIN rail / terminal
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21 / EN 61643-21
SIL classification	up to SIL3 *)
Approvals	UL, CSA
Weight	30 g
Customs tariff number	85363010
GTIN	4013364150645
PU	1 pc(s)

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

www.dehn-international.com/partners

Surge Protection
Lightning Protection
Safety Equipment
DEHN protects.

DEHN + SÖHNE
GmbH + Co.KG.

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