Surge protection for emergency alarm systems

White Paper

Contents

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White Paper

The function of emergency alarm systems (fire or burglar alarm systems) is to actively produce an alarm in the event of danger and remain passive when there is no danger. Malfunction of these systems (no alarm is produced if there is danger or alarm is produced if there is no danger) is undesired and expensive and is responsible for several hundred millions of euros in losses annually. Moreover, false alarms have the following consequences:

- If false alarms frequently occur, the operator can no longer rely on the system and questions the significance of such a system and the associated investment.
- Security personnel start ignoring the alarm messages.
- Neighbours are disturbed by acoustic alarms.
- Emergency staff (e.g. fire brigade) is unnecessarily called out.
- Triggering of fire extinguishing systems cause interruption of operations.

All these factors cause unnecessary costs and can be prevented if possible causes of false alarms are recognised at an early design stage and are eliminated by taking suitable preventive measures. For this purpose, the German Insurance Association (GDV) published the VdS 2833 guideline, which describes lightning and surge protection for emergency alarm systems.
Coordinated lightning and surge protection prevents false alarms or the destruction by atmospheric discharges or switching overvoltages and increases the availability of the systems.
When installing emergency alarm systems which are not required by the building law, the VdS guideline should be used for designing and installing these emergency alarm systems and for defining individual measures between the installer and operator.
Many of today's emergency alarm systems have an increased surge immunity according to IEC 61000-4-5 (EN 61000-4-5) on the primary lines, secondary lines and mains voltage cables. Nevertheless, only external and internal lightning protection

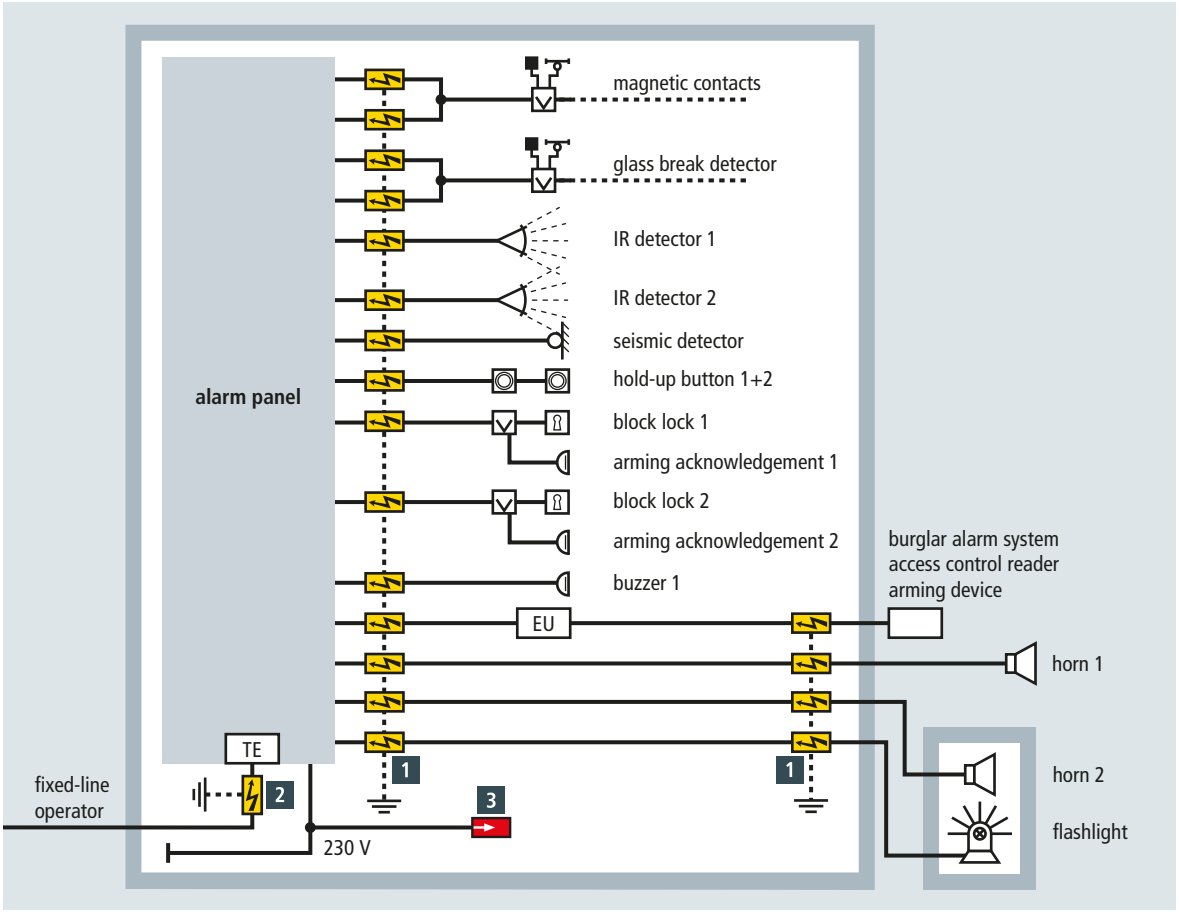

Figure 1 Lightning and surge protection for a burglar alarm system with pulse polling technology

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White Paper

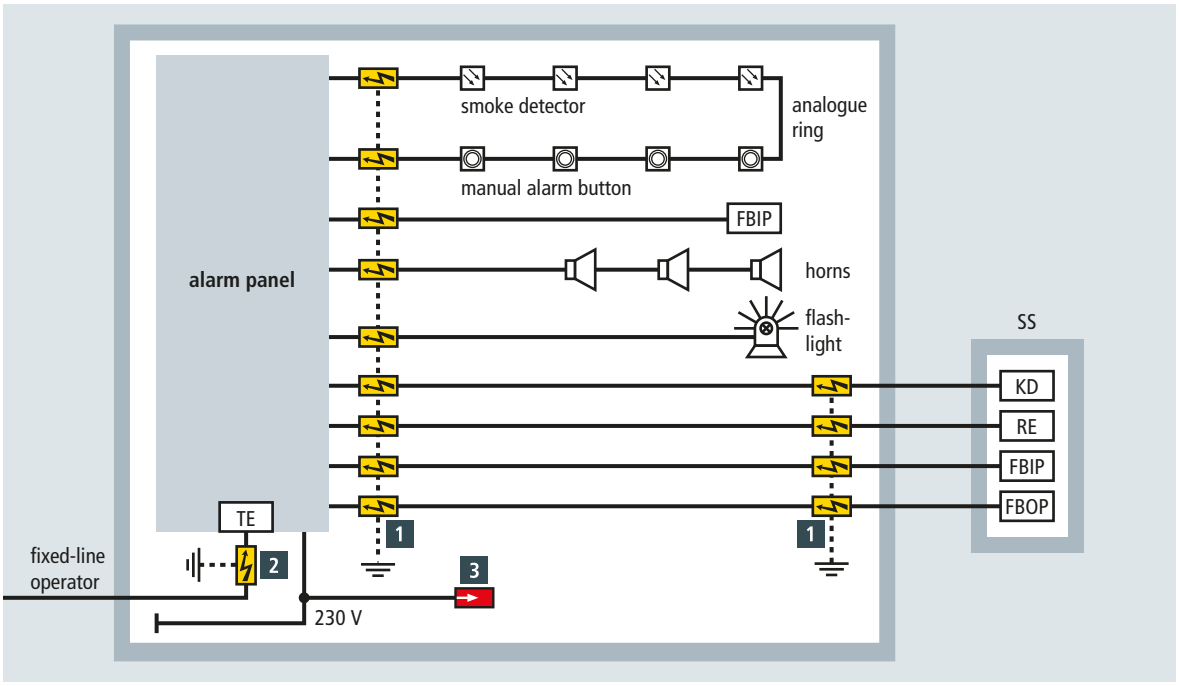

Figure 2 Lightning and surge protection for a fire alarm system with analogue ring technology

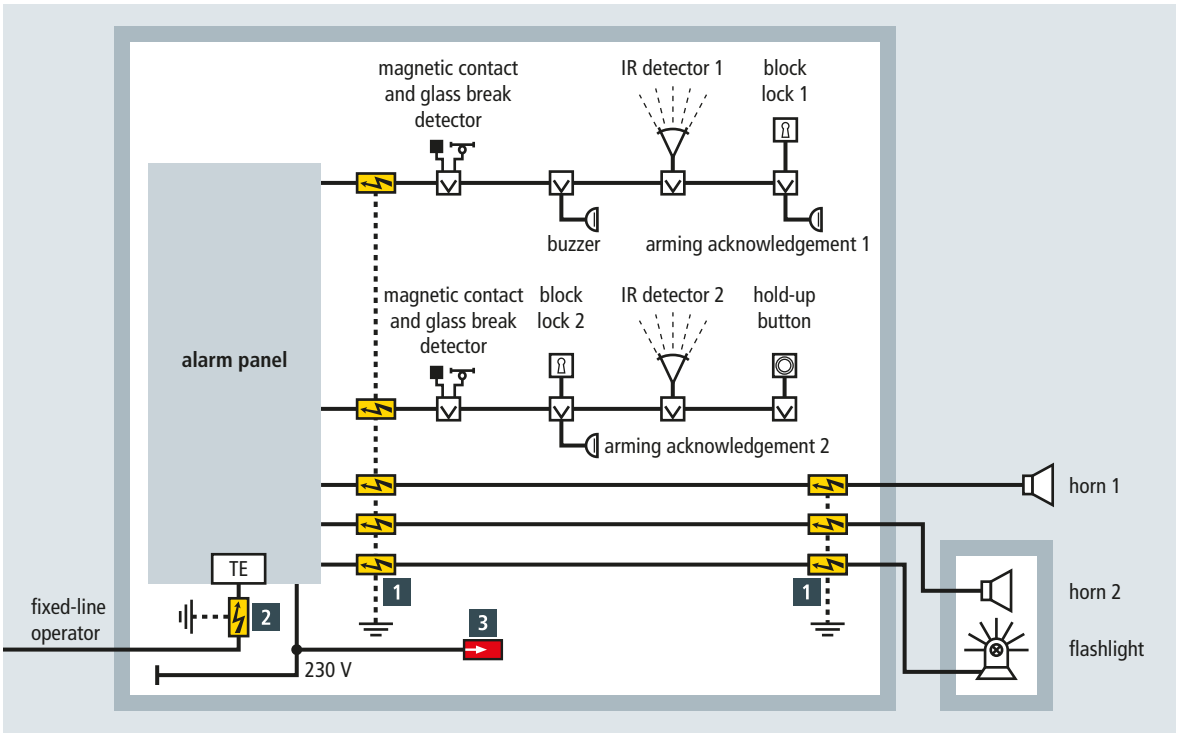

Figure 3 Lightning and surge protection for a burglar alarm system with d.c. circuit technology

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No.	Protection for...	Surge protective device	Part No.
Combined arresters for information technology systems at the boundaries from LPZ 0_A (0_B) ⬌ LPZ 1 or area 0/A (0/B) ⬌ area 1			
1	Alarm line groups, external alarms (24 V) (in this case max. 0.75 A)	BXT ML2 BE S 24 (2 cores + earth drain wire) BXT ML4 BE 24 (4 cores) + BXT BAS + SAK BXT LR (for earth drain wire)	920 224 920 324 920 300 920 395
2	Exchange line U_{K0} of the fixed-line operator	BXT ML2 BD 180 + BXT BAS	920 247 920 300
Surge arresters for power supply systems at the boundaries from LPZ 0_B ⬌ LPZ 1 or area 0/B ⬌ area 1			
3	a.c.TN-S system a.c. TT system	DG M TN 275 DG M TT 2P 275	952 200 952 110

Table 1 Combined arresters and surge arresters in Figures 9.9.1 to 9.9.3

measures provide comprehensive protection against damage resulting from lightning strikes and surges (**Figures 1 to 3**).

Monitoring principles

Different monitoring principles are used for emergency alarm systems:

- **Pulse polling technology**
  Information from the detector which has triggered the alarm is digitally transmitted. This allows to identify the detector and its exact location (**Figure 1**).
- **Analogue ring**
  The addressable detectors define each detector in a ring. Line interruptions or short-circuits do not compromise the function (**Figure 2**).
- **d.c. circuit technology**
  According to the closed-circuit principle, every alarm line is permanently monitored. If a detector in a line is triggered, the line is interrupted and an alarm is produced in the alarm panel. However, only the alarm line, but not the individual detector can be identified (**Figure 3**).

Irrespective of the monitoring principle used, all cables extending between the different areas of the emergency alarm system must be integrated in the lightning and surge protection concept of the overall system.

Recommended protection

BLITZDUCTOR XT of type BXT ML2 BE … must be installed to protect two-wire alarm lines (approval from the manufacturer required, please contact DEHN + SÖHNE GmbH + Co.KG.) and allows to connect the earth drain wire by means of an EMC spring terminal. For cables with more than two wires, a four-wire version of type BXT ML4 BE … is available. Surge protective devices are selected according to the voltage of the alarm lines, which is typically between 12 and 48 V (**Table 1**). The low internal resistance of BLITZDUCTOR arresters is also a clear advantage since the maximum resistances of the alarm lines must not be exceeded.
For the outputs of the alarm panels (acoustic and visual alarm) it must be ensured that the nominal current of the surge protective devices is not exceeded.

A telephone dialler is typically used if the alarm panel is connected to the exchange line of a fixed-line operator e.g. Deutsche Telekom. BLITZDUCTOR XT of type BXT ML2 BD 180 is ideally suited for this purpose. The power supply system can be protected by means of DEHNguard modular surge protective devices (**Table 1**).
Emergency alarm systems, which must be approved by the German Insurance Association (VdS approval), must comply with VDS 2095 (fire alarm systems), VDS 2311 (burglar alarm systems) and VDS 2833 (surge protective devices for emergency alarm systems).

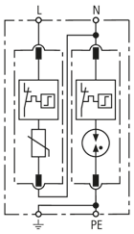
The Executive Board or Executive Director of a company is responsible for the health and safety of all employees. In the legal sense, a system operator is an ordinary person who is not able to assess whether risks may arise from a technical solution. Therefore, electricians, who provide technical solutions, must make sure in every single case whether their solutions meet the actual requirements.

DEHNguard

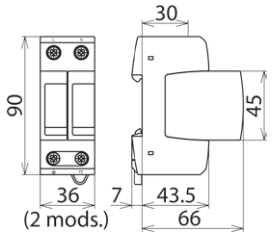
DG M TT 2P 275 (952 110)

- 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).

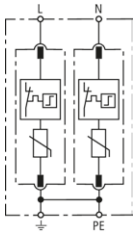
Type Part No.	DG M TT 2P 275 952 110
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Nominal a.c. voltage (U_N)	230 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [L-N] (U_C)	275 V (50 / 60 Hz)
Max. continuous operating a.c. voltage [N-PE] (U_C)	255 V (50 / 60 Hz)
Nominal discharge 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

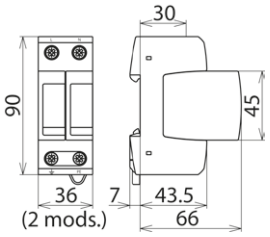
DG M TN 275 (952 200)

- 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.

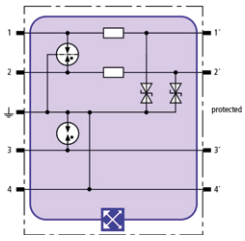
Type Part No.	DG M TN 275 952 200
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Nominal a.c. voltage (U_N)	230 V (50 / 60 Hz)
Max. continuous operating a.c. voltage (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	20 kA
Max. discharge current (8/20 µs) (I_{max})	40 kA
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)

BLITZDUCTOR XT

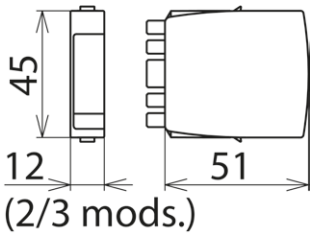
BXT ML2 BE S 24 (920 224)

- 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)

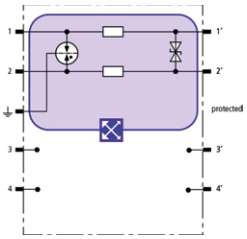
*)For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR XT

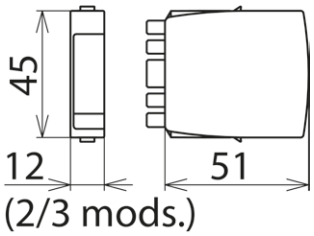
BXT ML2 BD 180 (920 247)

- LifeCheck SPD monitoring function
- Optimal protection of one pair
- 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 180



Dimension drawing BXT ML2 BD 180

Space-saving combined lightning current and surge arrester module with LifeCheck feature for protecting one pair of unearthed balanced interfaces. 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 180 920 247
SPD monitoring system	LifeCheck
SPD class	TYPE 1 P2
Nominal voltage (U_N)	180 V
Max. continuous operating d.c. voltage (U_C)	180 V
Max. continuous operating a.c. voltage (U_C)	127 V
Nominal current at 45 °C (I_L)	0.75 A
D1 Total lightning impulse current (10/350 µs) (I_{imp})	5 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)	≤ 270 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)	≤ 250 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 550 V
Series resistance per line	1.8 ohm(s)
Cut-off frequency line-line (f_G)	25.0 MHz
Capacitance line-line (C)	≤ 240 pF
Capacitance line-PG (C)	≤ 16 pF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection (plugged-in)	IP 20
Pluggable into	BXT BAS / BSP BAS 4 base part
Earthing via	BXT BAS / BSP BAS 4 base part
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21 / EN 61643-21, UL 497B
SIL classification	up to SIL3 *)
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	43 g
Customs tariff number	85363010
GTIN	4013364116078
PU	1 pc(s)

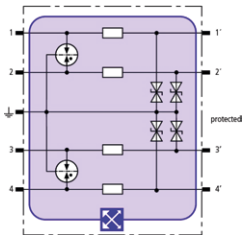
*) For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR XT

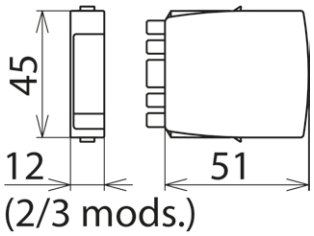
BXT ML4 BE 24 (920 324)

- LifeCheck SPD monitoring function
- Optimal protection of four single lines
- 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 ML4 BE 24



Dimension drawing BXT ML4 BE 24

Space-saving combined lightning current and surge arrester module with LifeCheck feature for protecting four single lines sharing a common reference potential as well as unbalanced interfaces. 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 ML4 BE 24 920 324
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})	10 kA
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	2.5 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	20 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	10 kA
Voltage protection level line-line for I_{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, VdS, UL, GOST
Weight	38 g
Customs tariff number	85363010
GTIN	4013364109056
PU	1 pc(s)

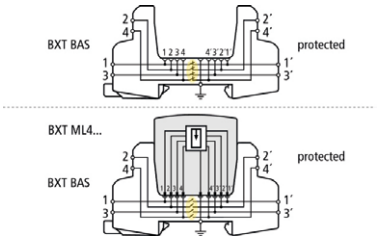
*) For more detailed information, please visit www.dehn-international.com.

BLITZDUCTOR XT

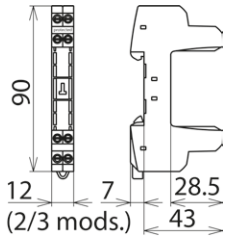
BXT BAS (920 300)

- 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

BLITZDUCTOR XT

SAK BXT LR (920 395)

- Capable of carrying lightning current
- Low-impedance flat conductor
- Flexible spring terminal

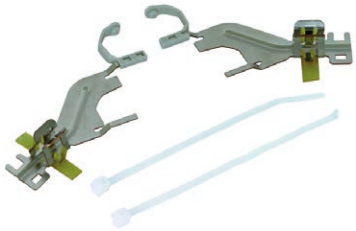
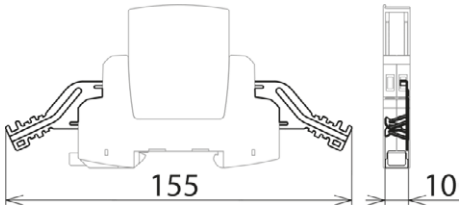


Figure without obligation



Dimension drawing SAK BXT LR

Two spring terminals for the protected and unprotected side of a BLITZDUCTOR BSP/XT/XTU arrester for permanent low-impedance shield contact with a shielded signal line. Insulating cap for indirect shield earthing (BXT only), cable ties and insulating strips included. Suitable for BXT(U) ML2 ...S ... / BSP M2 ... types.

Type Part No.	SAK BXT LR 920 395
D1 Lightning impulse current (10/350 µs)	5 kA
Plugs into	clamp connection BXT BAS / BSP BAS 4
Clamping range	3-10 mm
Colour	bare surface
Accessories	insulating caps, cable tie, insulating strips
Weight	12 g
Customs tariff number	85363090
GTIN	4013364118157
PU	1 Sa

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Surge Protection
Lightning Protection
Safety Equipment
DEHN protects.

DEHN + SÖHNE
GmbH + Co.KG.

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