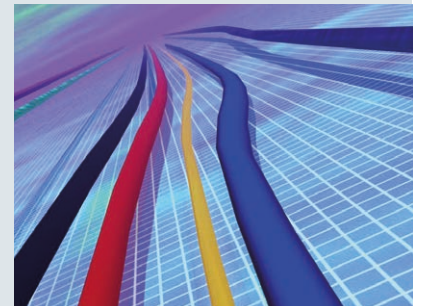




**DEHN**

# Surge protection for Local Operating Networks (LONs)

White Paper



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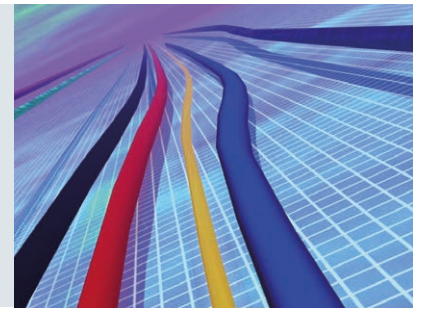
Capacitances of surge protective devices

Surges caused by induction loops

Surge protective devices for an FTT/LPT in a combination topology extending beyond buildings

# Surge protection for Local Operating Networks (LONs)

## White Paper



Medium	Transceiver	Transmission	Network expansion	Node → Node	Node supply
Two-wire	TP/XF-78	78 kbit/s	1400 m bus / line		Separately
Two-wire	TP/XF-1250	1250 kbit/s	130 m bus / line		Separately
Two-wire	<b>FTT10-A</b>	78 kbit/s	2700 m bus / line 500 m open structure	J-Y(ST)Y 2x2x0.8 320 m open structure	Separately
Two-wire	<b>LPT-10</b>	78 kbit/s	2200 m bus / line 500 m open structure	J-Y(ST)Y 2x2x0.8 320 m open structure	Via bus cable

Table 1 Transceivers (most common transceivers are printed in bold) with their transmission rates and maximum network expansion

The LonWorks technology allows the implementation of distributed automation systems. In this context, intelligent nodes communicate via the LonTalkProtocol®. The neuron chip (3120, 3150 and various enhancements), which accesses a transmission medium via a transceiver and features an I/O circuit for connecting, for example, switches, relays, analogue outputs, analogue value measurement systems, is the core of a node (Figure 1).

### Transmission media

In addition to the two-wire connection described below, transmission is possible via 230 V, optical fibre cable, coaxial cable, LAN and radio.

### Two-wire bus cable used as transmission medium

The transceivers for a two-wire bus cable (e.g., J-Y(ST)Y 2x2x0.8) have different transmission rates (kbit/s) and thus a different maximum network expansion (cable length in metres) (Table 1).

Since the two-wire bus cable can be placed in free space, the devices in the LON building installation are mainly equipped with FTTs (Free Topology Transceivers) and LPT (Link Power

Transceivers). LPTs are compatible with FTTs at the same bus.

The transceivers in FTT/LPT networks have the core/core and core/earth capacitances shown in Table 2. If surge protective devices are installed, their capacitances (core/core and core/earth) must also be considered since the maximum number of transceivers to be used is reduced accordingly (Table 3).

### Surges caused by induction loops

When routing the cables, care should be taken not to form any induction loops. Therefore, the bus and low-voltage cables leading to the bus devices must be routed in close proximity to one another (Figure 2). If a J-Y(ST)Y cable has

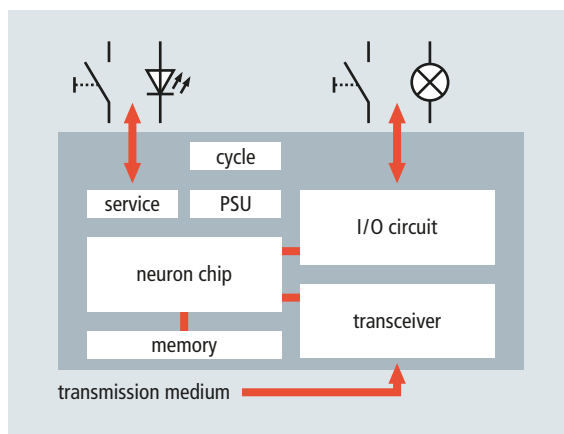


Figure 1 Structure of a LonWorks node with neuron chip, transceiver and I/O circuit

Transceiver	Capacitance	
	Core / Core	Core / Earth
FTT10-A	300 pF	10 max. 20 pF
LPT-10	150 pF	10 pF

Table 2 Capacitances of transceivers in FTT/LPT networks

Surge protective device	Capacitance	
	Core / Core	Core / Earth
BXT ML2 BD S 48	700 pF	25 pF

Table 3 Capacitances of surge protective devices

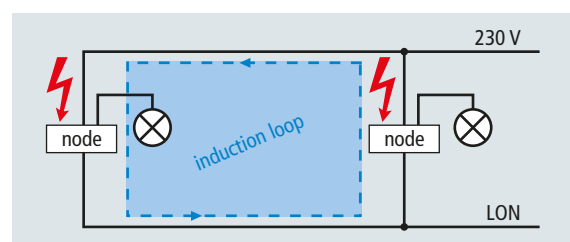


Figure 2 Induction loop caused by two nodes

# Surge protection for Local Operating Networks (LONs)

## White Paper

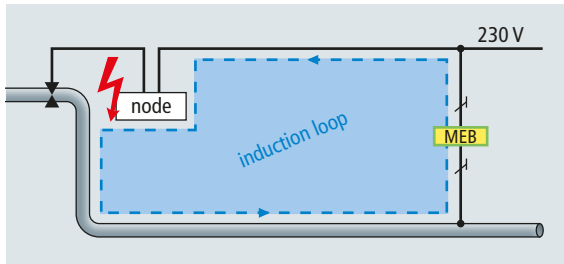
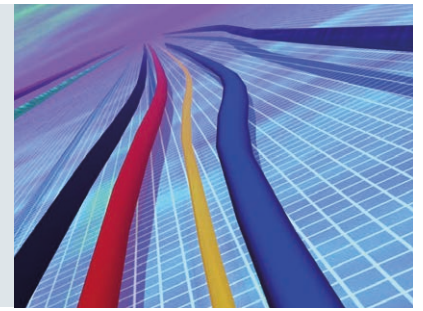


Figure 3 Induction loop caused by a magnetic valve attached to a metallic pipe

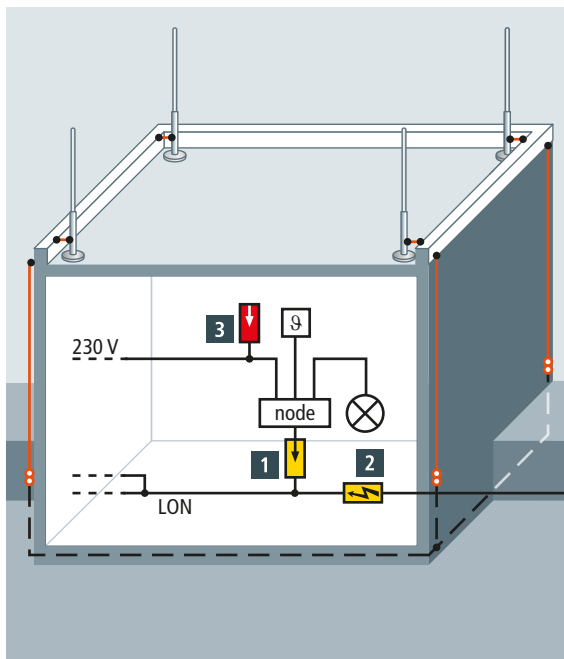
10 mm must be kept where the J-Y(ST)Y cable sheath has been removed. Loops are also formed if a node is attached to a metallic construction/pipe which is connected to the main earthing busbar (**Figure 3**). Also in this case, it is advisable to route the cables as close as possible to the construction/pipe.

### Surge protection in case of a combination topology

If the inputs/outputs connected to the node are located in close proximity to the node, surge protective devices are not required.

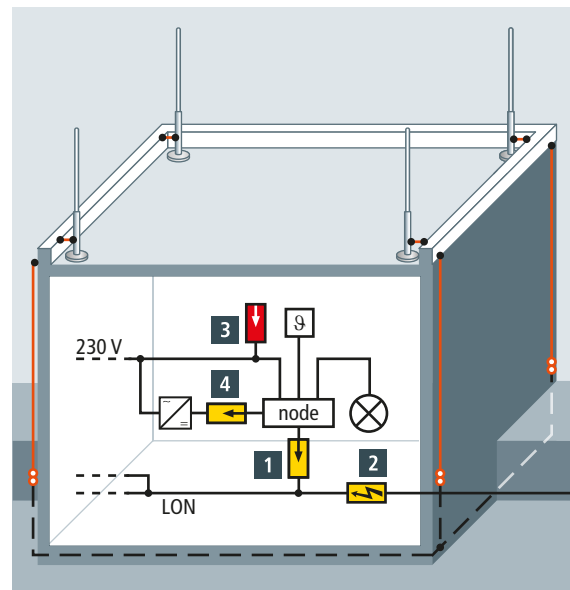
**Figure 4** shows surge protective devices for LPTs which are supplied by means of a two-wire bus cable. **Figure 5** shows surge protective devices for directly supplied FTTs (typically 24 V DC) in case of longer power supply cables..

a dielectric strength of 2.5 kV, this cable can be connected in parallel with a low-voltage cable. However, a distance of



SPD	Info	Part No.
1	BXT ML2 BD S 48 + BXT BAS	Earthing 6 mm <sup>2</sup> Cu 920 245 920 300
2	see 1	Earthing 6 mm <sup>2</sup> Cu
3	DR M 2P 255	953 200

Figure 4 Surge protective devices for an LPT in a combination topology extending beyond buildings



SPD	Info	Part No.
1	BXT ML2 BD S 48 + BXT BAS	Earthing 6 mm <sup>2</sup> Cu 920 245 920 300
2	see 1	Earthing 6 mm <sup>2</sup> Cu
3	DR M 2P 255	953 200
4	BXT ML2 BE S 24 + BXT BAS	Earthing 6 mm <sup>2</sup> Cu 920 224 920 300

Figure 5 Surge protective devices for an FTT in a combination topology extending beyond buildings

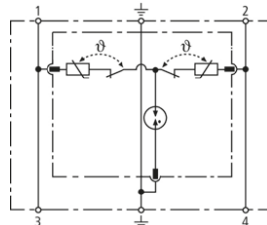
## DEHNrail

### DR M 2P 255 (953 200)

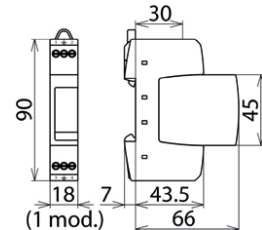
- Two-pole surge arrester consisting of a base part and a plug-in protection module
- High discharge capacity due to heavy-duty zinc oxide varistor / spark gap combination
- Energy coordination with other arresters of the Red/Line product family



Figure without obligation



Basic circuit diagram DR M 2P 255



Dimension drawing DR M 2P 255

Two-pole surge arrester consisting of a base part and a plug-in protection module.

Type	DR M 2P 255
Part No.	953 200
SPD according to EN 61643-11 / IEC 61643-11	type 3 / class III
Nominal voltage (a.c.) ( $U_N$ )	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) ( $U_C$ )	255 V (50 / 60 Hz)
Max. continuous operating voltage (d.c.) ( $U_C$ )	255 V
Nominal load current (a.c.) ( $I_L$ )	25 A
Nominal discharge current (8/20 $\mu$ s) ( $I_n$ )	3 kA
Total discharge current (8/20 $\mu$ s) [L+N-PE] ( $I_{total}$ )	5 kA
Combination wave ( $U_{OC}$ )	6 kV
Combination wave [L+N-PE] ( $U_{OC total}$ )	10 kV
Voltage protection level [L-N] / [L/N-PE] ( $U_P$ )	$\leq 1250$ / $\leq 1500$ V
Response time [L-N] ( $t_A$ )	$\leq 25$ ns
Response time [L/N-PE] ( $t_A$ )	$\leq 100$ ns
Max. mains-side overcurrent protection	25 A gG or B 25 A
Short-circuit withstand capability for mains-side overcurrent protection with 25 A gG ( $I_{SCCR}$ )	6 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) [L/N-PE] ( $U_T$ ) – Characteristic	335 V / 120 min. – withstand
Temporary overvoltage (TOV) [L/N-PE] ( $U_T$ ) – Characteristic	440 V / 5 sec. – withstand
Temporary overvoltage (TOV) [L+N-PE] ( $U_T$ ) – Characteristic	1200 V + $U_{REF}$ / 200 ms – 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.)	0.5 mm <sup>2</sup> solid / flexible
Cross-sectional area (max.)	4 mm <sup>2</sup> solid / 2.5 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	1 module(s), DIN 43880
Approvals	KEMA, VDE, UL, CSA
Weight	81 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364108301
PU	1 pc(s)

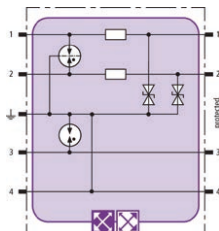
## BLITZDUCTOR XT

### BXT ML2 BE S 24 (920 224)

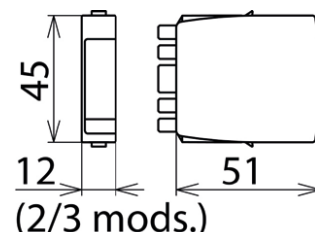
- LifeCheck SPD monitoring function
- Optimal protection of two single lines and the cable shield
- For use in conformity with the lightning protection zone concept at the boundaries from  $0_A -2$  and higher



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	BXT ML2 BE S 24
Part No.	920 224
SPD monitoring system	LifeCheck
SPD class	<b>TYPE 1</b> <b>PI</b>
Nominal voltage ( $U_N$ )	24 V
Max. continuous operating voltage (d.c.) ( $U_c$ )	33 V
Max. continuous operating voltage (a.c.) ( $U_c$ )	23.3 V
Nominal current at 45 °C ( $I_L$ )	0.75 A
D1 Total lightning impulse current (10/350 $\mu$ s) ( $I_{imp}$ )	9 kA
D1 Lightning impulse current (10/350 $\mu$ s) per line ( $I_{imp}$ )	2.5 kA
C2 Total nominal discharge current (8/20 $\mu$ s) ( $I_n$ )	20 kA
C2 Nominal discharge current (8/20 $\mu$ s) per line ( $I_n$ )	10 kA
Voltage protection level line-line for $I_{imp}$ D1 ( $U_p$ )	$\leq 102$ V
Voltage protection level line-PG for $I_{imp}$ D1 ( $U_p$ )	$\leq 66$ V
Voltage protection level line-line at 1 kV/ $\mu$ s C3 ( $U_p$ )	$\leq 90$ V
Voltage protection level line-PG at 1 kV/ $\mu$ s C3 ( $U_p$ )	$\leq 45$ V
Series resistance per line	1.8 ohm(s)
Cut-off frequency line-PG ( $f_c$ )	6.8 MHz
Capacitance line-line (C)	$\leq 0.5$ nF
Capacitance line-PG (C)	$\leq 1.0$ 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 <sup>*</sup>
ATEX approvals	DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc
IECEx approvals	DEK 11.0032X: Ex nA IIC T4 Gc
CSA & USA Hazloc approvals (1)	2516389: Class I Div. 2 GP A, B, C, D T4
CSA & USA Hazloc approvals (2)	2516389: Class I Zone 2, AEx nA IIC T4
Weight	37 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364117785
PU	1 pc(s)

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



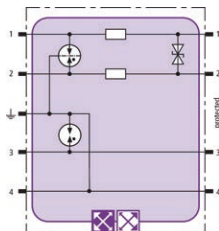
## BLITZDUCTOR XT

### BXT ML2 BD S 48 (920 245)

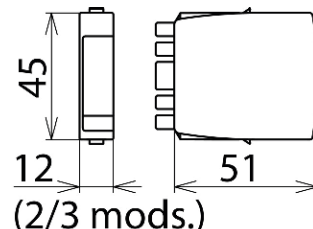
- LifeCheck SPD monitoring function
- Optimal protection of one pair and the cable shield
- For installation in conformity with the lightning protection zone concept at the boundaries from  $0_A -2$  and higher



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	BXT ML2 BD S 48
Part No.	920 245
SPD monitoring system	LifeCheck
SPD class	<b>TYPE 1</b> <b>PI</b>
Nominal voltage ( $U_N$ )	48 V
Max. continuous operating voltage (d.c.) ( $U_C$ )	54 V
Max. continuous operating voltage (a.c.) ( $U_C$ )	38.1 V
Nominal current at 45 °C ( $I_L$ )	1.0 A
D1 Total lightning impulse current (10/350 $\mu$ s) ( $I_{imp}$ )	9 kA
D1 Lightning impulse current (10/350 $\mu$ s) per line ( $I_{imp}$ )	2.5 kA
C2 Total nominal discharge current (8/20 $\mu$ s) ( $I_n$ )	20 kA
C2 Nominal discharge current (8/20 $\mu$ s) per line ( $I_n$ )	10 kA
Voltage protection level line-line for $I_{imp}$ D1 ( $U_p$ )	$\leq 80$ V
Voltage protection level line-PG for $I_{imp}$ D1 ( $U_p$ )	$\leq 550$ V
Voltage protection level line-line at 1 kV/ $\mu$ s C3 ( $U_p$ )	$\leq 70$ V
Voltage protection level line-PG at 1 kV/ $\mu$ s C3 ( $U_p$ )	$\leq 550$ V
Series resistance per line	1.0 ohm(s)
Cut-off frequency line-line ( $f_c$ )	8.7 MHz
Capacitance line-line (C)	$\leq 0.7$ nF
Capacitance line-PG (C)	$\leq 25$ pF
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
Approvals	CSA, EAC, ATEX, IECEx, CSA & USA Hazloc, SIL
SIL classification	up to SIL3 <sup>*)</sup>
ATEX approvals	DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc
IECEx approvals	DEK 11.0032X: Ex nA IIC T4 Gc
CSA & USA Hazloc approvals (1)	2516389: Class I Div. 2 GP A, B, C, D T4
CSA & USA Hazloc approvals (2)	2516389: Class I Zone 2, AEx nA IIC T4
Weight	36 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364118386
PU	1 pc(s)

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

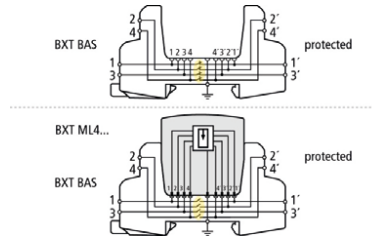
## BLITZDUCTOR XT

### BXT BAS (920 300)

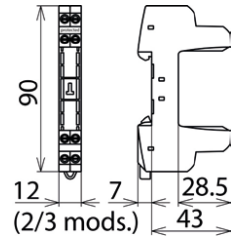
- Four-pole version for universal use with all types of BSP and BXT / BXTU protection modules
- No signal interruption if the protection module is removed
- Universal design without protection elements



Figure without obligation



Basic circuit diagram with and without plugged-in module



Dimension drawing BXT BAS

The BLITZDUCTOR XT base part is 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 <sub>U</sub> )	-40 °C ... +80 °C
Degree of protection	IP 20
For mounting on	35 mm DIN rails acc. to EN 60715
Connection (input / output)	screw / screw
Signal disconnection	no
Cross-sectional area, solid	0.08-4 mm <sup>2</sup>
Cross-sectional area, flexible	0.08-2.5 mm <sup>2</sup>
Tightening torque (terminals)	0.4 Nm
Earthing via	35 mm DIN rails acc. to EN 60715
Enclosure material	polyamide PA 6.6
Colour	yellow
ATEX approvals	DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc <sup>*)</sup>
IECEX approvals	DEK 11.0032X: Ex nA IIC T4 Gc <sup>*)</sup>
Approvals	CSA, UL, EAC, ATEX, IECEX <sup>*)</sup>
Weight	34 g
Customs tariff number (Comb. Nomenclature EU)	85369010
GTIN	4013364109179
PU	1 pc(s)

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

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

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