



DEHN + SÖHNE

DEHN stops Surges.



Safety for your Property.

Surges – An often underestimated Risk

Thunderstorms are fascinating and frightening at the same time. They are nice spectacles, but spreading insecurity. Thunderstorms often do not only indicate a change of weather. For industrial companies, service companies and for trade, thunderstorms bring considerable threats.

Protection against potential consequences of a thunderstorm is obligatory in our highly sophisticated world!

Without protection, a company can quickly roll out of play. The effects of a thunderstorm can paralyse EDP systems. Consequently, customers of an affected company cannot be served for a longer period of time. For the hotly contested automotive supplying industry, for example, this would be a disastrous event. Just-in-time deliveries for the automotive industry are nearly impossible in case of such a breakdown. This can even lead to a dramatic fall of the share price of the affected company. For a company expanding at that moment, this is especially fatal, as it is hard to obtain new capital at the stock exchange with such a performance.

However, it is not only the natural force of lightning, that can cause destruction or interferences at sensitive electronic equipment. Often even a low peak voltage on the power supply can be sufficient. Surges can also come up at operational switching of great loads or uncompensated inductances. These can also cause damage even from a distance.

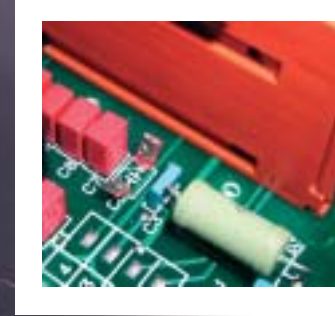
Only split seconds are sufficient to cause a complete chaos in a company, mostly if surges have been underestimated.

The most important consequence is: Prevent damage caused by surges.

What are Surges and how do they come into Existence?

Surges are short-time voltage impulses – so-called transients – coming up only for some split seconds, with peak voltages of several 10 kV.

Surges are caused by:



LEMP (Lightning Electromagnetic Pulse)
Surges caused by atmospherical influences (e.g. direct lightning stroke, electromagnetic lightning fields)



SEMP (Switching Electromagnetic Pulse)
Surges caused by short circuits, operational load switching)



Protection against surges is possible and necessary in the times of World Wide Web & Co. Every company has more than enough sensitive targets for these destructive transients: power supply, EDP system, control system of producing facilities via field bus, telephone system, regulation of the air conditioning system, lighting control,...

These sensitive systems can only be protected by a comprehensive protection concept. Cascading the protection is important here. This makes the protection of systems and equipment effective from lightning currents down to low peak voltages.

For this purpose, lightning current and surge arresters are used. Lightning current arresters are responsible for the conducting of high energies without damage. Surge arresters protect terminal equipment. Lightning current arresters have to be installed as close as possible to the service entrance of the electrical system and surge arresters as close as possible to the equipment to be protected.

With their product families **Red/Line** and **Yellow/Line**, DEHN + SÖHNE provides coordinated surge protective devices (SPDs). This modular system allows a cost-effective realisation of lightning and surge protective concepts for all industrial branches, service companies and sizes of installations.

Safety can be achieved.



Protecting Personal Values.

Surge Protection for Residential Buildings.

In modern residential buildings more and more electronic equipment is used. Today, households have TV-, stereo and satellite receivers as well as PCs with access to the Internet. Also, microwaves, refrigerators and dish washers/washing machines are equipped with microprocessors. For safety, alarm systems have been installed as well as video surveillance.

Values of several 10,000 EUR have to be protected, as surges are fatal for all devices and systems.

First Step: Protection of installations.

All incoming and outgoing lines are inspected first. Generally, this includes lines for power supply, telephone, cable TV, external lighting, etc.

Residential buildings often have supply meters and sub-circuit distributions installed in one enclosure.

DEHNventil® 1 can protect both the installation and the terminal equipment on the power side, even at direct lightning strokes.

The telephone connection, e.g. via ISDN, can be protected by **NT Protector 2**. This protection is sufficient for safe operation of the **NTBA** as well as the closely installed ISDN system.

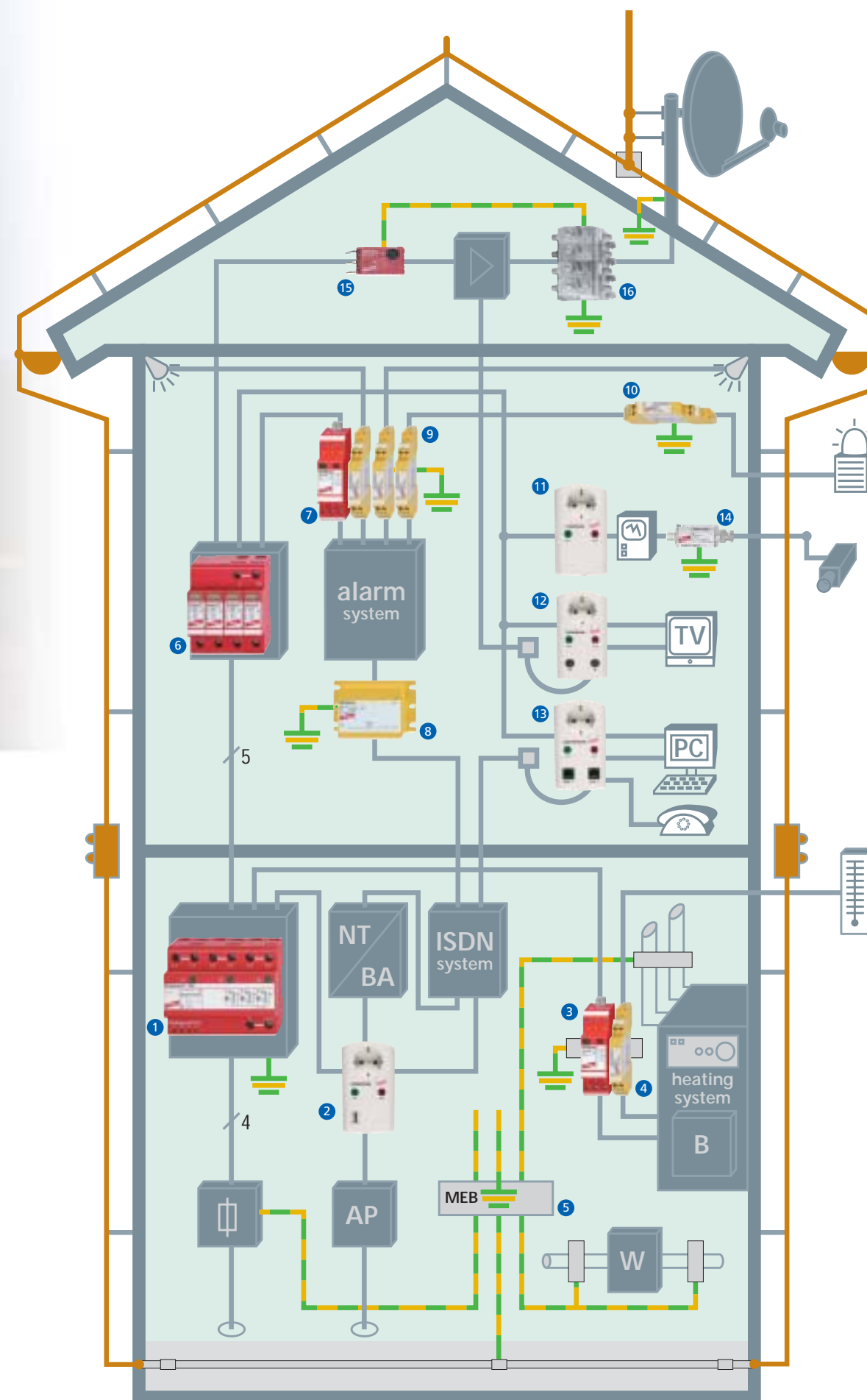
Mostly, the heating system is installed in the basement. Its regulation can be protected by **DEHNrail 3** and **BLITZDUCTOR® CT 4**.

For further distribution boards, SPDs Type **DEHNguard® 6** should be installed.

Second Step: Protection of terminal equipment.

All terminal devices fed by two or several networks require surge protection directly at their entries. These are TV-, Video-, and Stereo equipment as well as alarm-, fire-alarm or video-surveillance systems. The drawing on the right shows an example for the use of different SPDs. The antenna amplifiers can be protected by **DEHNgate FF TV 16**. **DEHNgate** is already designed for digital satellite systems.

The cascaded use of surge protective components makes the electrical installation compatible with the electronic system – and is less expensive than expected.



Products for residential buildings			
Pos.	SPD	Type	Part No.
1	DEHNventil® TNC	DV TNC 255	900 373
	Alternative: DEHNventil® TT	DV TT 255	900 375
	Alternative: DEHNventil® TNS	DV TNS 255	900 374
2	NT Protector	NT PRO	909 958
3	DEHNrail 230 FML	DR 230 FML	901 100
4	BLITZDUCTOR® CT ME 5	BCT MOD ME 5	919 520
	BLITZDUCTOR® CT Base Part	BCT BAS	919 506
5	Earthing Busbar	K12	563 200
6	DEHNguard® TNS	DG TNS 230 400	900 530
	Alternative: DEHNguard® TT	DG TT 230 400	900 520
	Alternative: DEHNguard® TNC	DG TNC 230 400	900 510
7	DEHNrail 230 FML	DR 230 FML	901 100
8	DEHNlink ISDN I	DLI ISDN I	929 024
9	BLITZDUCTOR® CT ME XX*	BCT MOD ME XX	919 5XX
	BLITZDUCTOR® CT Base Part	BCT BAS	919 506
10	BLITZDUCTOR® CT ME XX*	BCT MOD ME XX	919 5XX
	BLITZDUCTOR® CT Base Part	BCT BAS	919 506
11	S Protector	S PRO	909 821
12	TV Protector	TV PRO	909 921
13	ISDN Protector	ISDN PRO	909 954
14	UGKF BNC	UGKF BNC	929 010
15	DEHNflex	DFL M 255	924 396
16	DEHNgate	DGA FF TV	909 703

* The SPDs have to be chosen according to the system technology used

Protection of Communication.

Surge Protection for Office and Administration Buildings.



For administration data processing has become indispensable. PCs, servers and networks have become part of the minimum equipment. A breakdown is unacceptable. The workflow has been adapted too much to these systems. Also important are telephone systems and fax machines. Moreover, there are building automation systems interconnected by bus systems like EIB/KNX and LON. Everything has to work without interference, even during thunderstorms.

Protection of power supply systems.

The drawing on the right shows an example of an office building. For power supply, lightning current arresters e.g. **DEHNBloc® 1** can be used as well as surge arresters Type **DEHNguard® 4 + 14**. For protection of the terminal equipment, e.g. **DEHNrail 18 + 19**, **SFL Protector 9** or **DEHNsafe, 11** can be used. Thus, also induced voltages and switching voltages are reduced safely.

Protection of communication.

Data or voice transmission, both require corresponding protective components for safe operation. Networks are generally constructed as universal wirings in accordance with EN 50173. Even if glass-fibre lines between buildings and floor distribution boards are standard today, copper lines are normally installed from the floor distribution board to the terminal equipment. Therefore, protection for the HUBs, bridges or switches by **NET Protector LSA 4 TP 8** is required. Terminal equipment can be protected by socket outlets **DSM RJ45 4 TP 12** or a patch cable **DEHNpatch 6**.

For the telephone system, a lightning current capable surge protection has to be provided already in the main building distribution board. **DPL 1F Surge Arrester 2** can be plugged into LSA disconnection blocks.

For protecting the telecommunication system, **NET Protector TC 2 LSA 10** is used in the floor distribution board for the outgoing lines to the system telephones. For the system telephones, e.g. the protection module **DSM TC 1 SK 13** can be used.

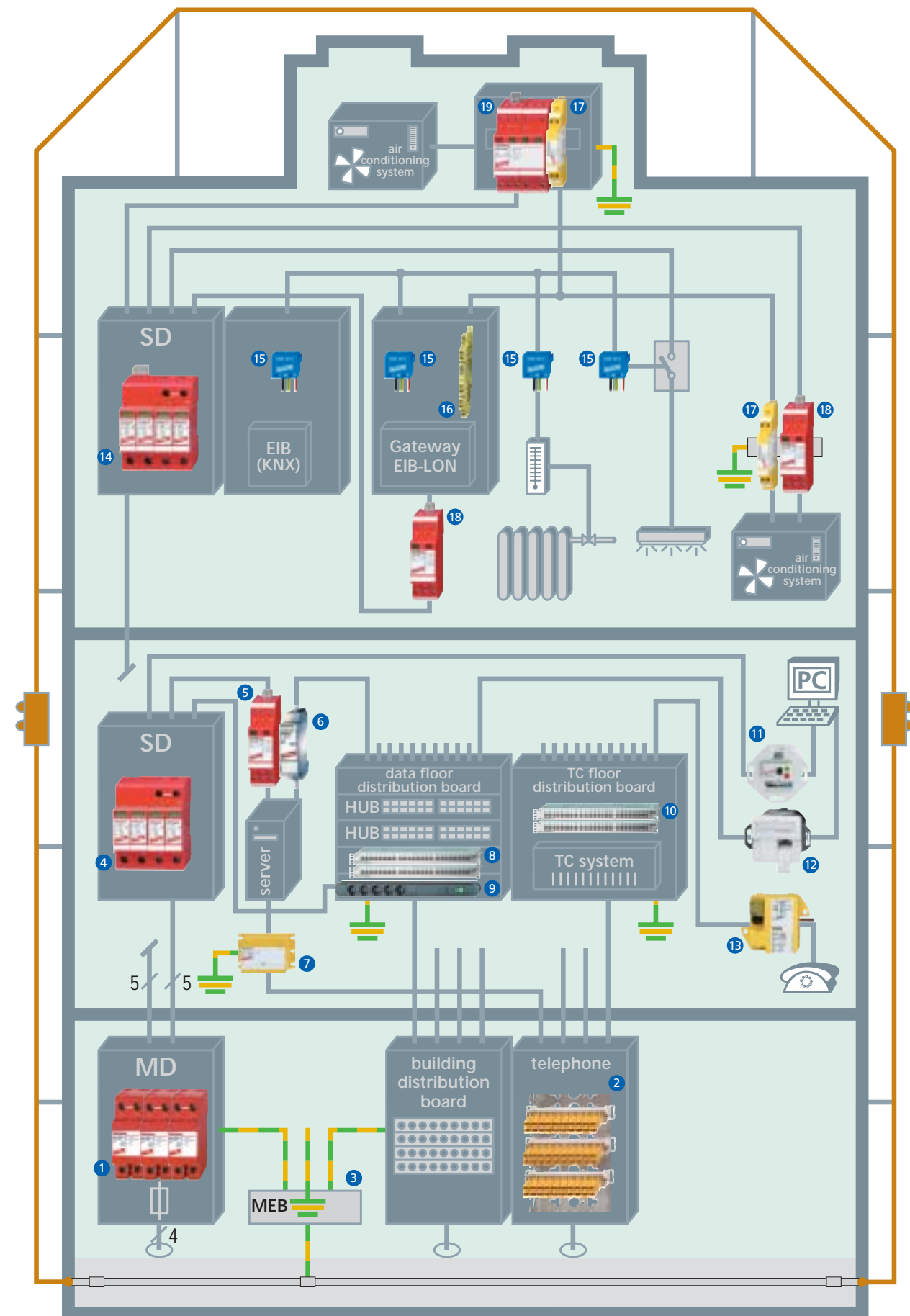
Building automation protected from surges.

A breakdown of the building automation can have severe consequences. For example, if the air conditioning system breaks down due to surges, the data processing centre or a server might have to be downed. This can be prevented.

As can also be taken from the drawing, bus systems such as EIB/KNX or LON can be protected by components like **BUSstector 15**, **DEHNconnect 16** or **BLITZDUCTOR® CT 17**.

Installing SPDs in accordance with the concept and in a consequent way, helps to increase availability considerably.

Products for office buildings			
Pos.	SPD	Type	Part No.
1	DEHNBloc® H	DB 1 255 H	900 222
	Alternative: DEHNventil® TNC	DV TNC 255	900 373
	Alternative: DEHNventil® TNS	DV TNS 255	900 374
	Alternative: DEHNventil® TT	DV TT 255	900 375
2	Surge Arrester DPL 1F	DPL 1F ARD 110	907 145
	Disconnection Block LSA	TL2 10DA LSA	907 996
	Earthing Busbar	ES 10DA	907 998
	Mounting Frame (Terminal Blocks 10 x 10 TC)	MB2 10 LSA	907 995
3	Earthing Busbar	K12	563 200
4	DEHNguard® TNS	DG TNS 230 400	900 530
5	DEHNrail	DR 230 FML	901 100
6	DEHNpatch	DPA m CAT6	929 100
7	DEHNlink ISDN I	DLI ISDN I	929 024
8	NET Protector LSA 4 TP for 8 Ports	NET PRO LSA 4TP	929 036
	19" Shield Enclosure for 3 x NET Protector	EG NET PRO 19"	929 034
9	SFL Protector	SFL PRO	912 260
10	NET Protector TC 2 LSA for 8 x 2 TC	NET PRO TC 2 LSA	929 072
	19" Shield Enclosure for 3 x NET Protector	EG NET PRO 19"	929 034
11	DEHNsafe	DSA 230 LA	924 370
12	Data Protection Module DSM RJ45 4 TP	DSM RJ45 4TP	924 263
13	Data Protection Module DSM TC 1 SK	DSM TC 1 SK	924 271
14	DEHNguard® TNS FM	DG TNS 230 400 FM	900 560
15	BUSstector	BT 24	925 001
16	DEHNconnect MD 48	DCO RK MD 48	919 942
17	BLITZDUCTOR® CT MD 48	BCT MOD MD 48	919 545
	BLITZDUCTOR® CT Base Part	BCT BAS	919 506
18	DEHNrail 230 FML	DR 230 FML	901 100
19	DEHNrail 230 3N FML	DR 230 3N FML	901 130



Increasing Operational Safety.

Surge Protection for Industry.



Industrial automation is standard in most companies. A breakdown of the production can lead a company to its financial ruin and insurances against operational breakdowns are often not existing.

Surge protection increases operational safety.

In order to increase operational safety, lines between buildings have to be localised and protected first. The drawing shows an example of the power supply and information transmission via Profibus and Industrial Ethernet. For the power supply, the potential short-circuit currents have to be especially taken into consideration. Lightning current arrester **DEHNbloc® Maxi 1** safely discharges prospective short-circuit currents of up to 50 kA and protects the backup fuses used against damage at the same time. **BLITZDUCTOR® CT**, equipped with modules B... **2 + 3** protects IT lines even at direct lightning strokes.

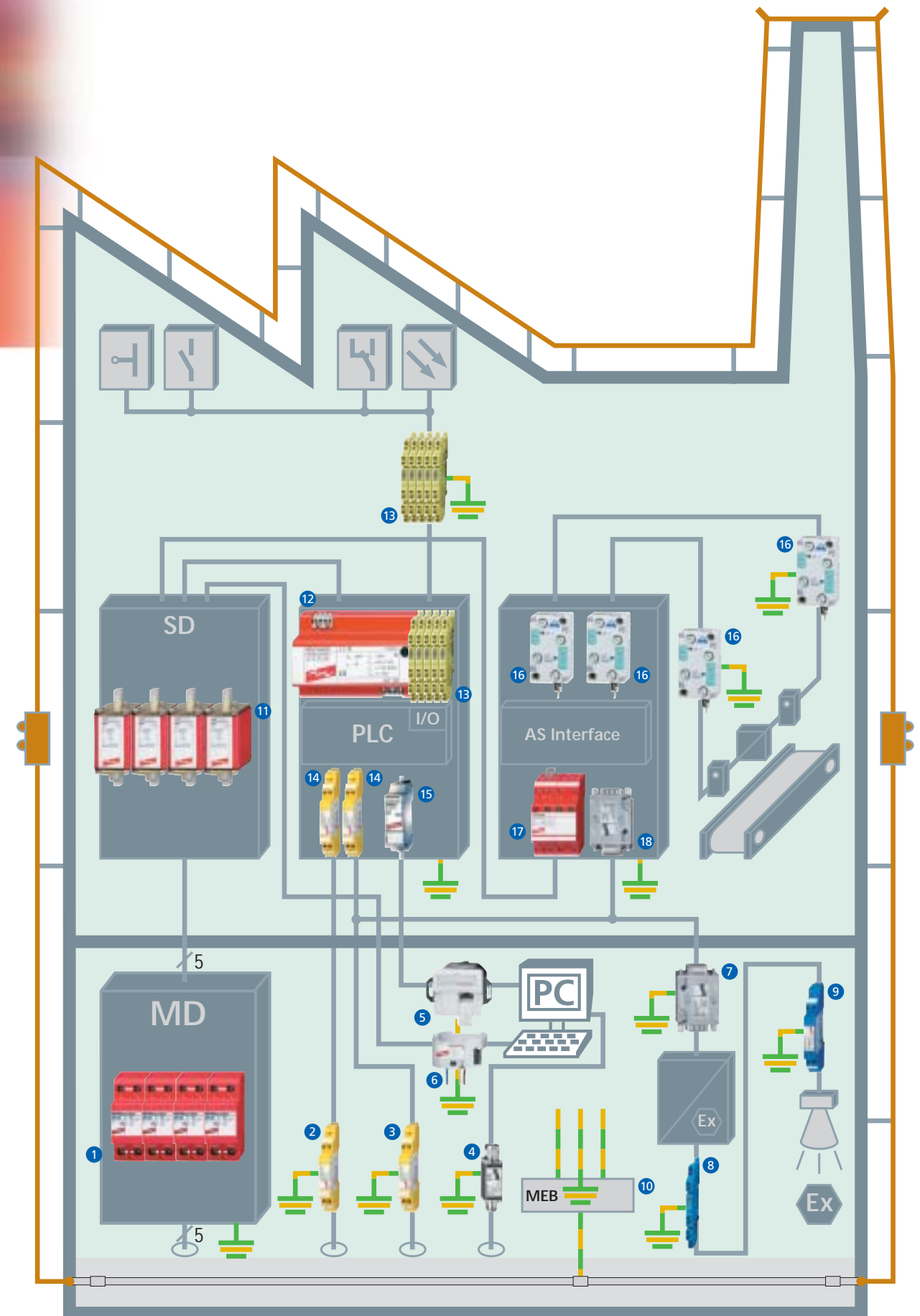
Forming equipotential bonding areas.

PLC or AS Interface, sensors/actuators or Ex barriers – to all applies that upcoming surges have to be compensated in system engineering and on all connected lines – an “equipotential bonding area” comes into existence.

SPDs like **VNH 11**, **SPS Protector 12** and **DEHNrail 17** fulfil this function from the power supply side. For IT lines e.g. **DEHNconnect 13**, **DEHNpatch 15**, **AS Interface Surge Protection Module 16** or **Fine Protection Adapters 18** can compensate the surges within microseconds.

Thus, in connection with an intermeshed equipotential bonding and earthing system, breakdowns due to surges and consequently operational interruptions can be avoided. An investment, which can easily pay off.

Products for industry			
Pos.	SPD	Type	Part No.
1	DEHNbloc® Maxi	DBM 1 255	900 025
	Alternative: DEHNventil® TNC	DV TNC 255	900 373
	Alternative: DEHNventil® TNS	DV TNS 255	900 374
	Alternative: DEHNventil® TT	DV TT 255	900 375
2 + 3	BLITZDUCTOR® CT BD HF 5	BCT MOD BD HF 5	919 670
	BLITZDUCTOR® CT Base Part	BCT BAS	919 506
4	UGKF N L	UGKF N L	929 012
5	Data Protection Module DSM RJ45 4TP	DSM RJ45 4TP	924 263
6	ÜS Module STC	STC 230	924 350
7 + 18	Fine Protection Adapter D-Sub. 9 pole PB	FS 9E PB 6	924 017
8	DEHNconnect MD EX 24	DCO RK MD EX 24	919 960
9	BLITZDUCTOR® CT MD EX 24	BCT MOD MD EX 24	919 580
	BLITZDUCTOR® CT Base Part EX	BCT BAS EX	919 507
10	Earthing Busbar 10 CU		472 217
	Cover (stainless steel)		472 289
11	Surge Arrester VNH	V NH00 280	900 261
12	SPS Protector	SPS PRO	912 253
13	DEHNconnect ME 24	DCO RK ME 24	919 921
14	BLITZDUCTOR® CT MD HF 5	BCT MOD MD HF 5	919 570
	BLITZDUCTOR® CT Base Part	BCT BAS	919 506
15	DEHNpatch	DPA M CAT6	929 100
16	AS Interface Surge Protection Module	AS IMOD	925 010
17	DEHNrail 230 3N FML	DR 230 3N FML	901 130



Safety according to Specification

Lightning Protection Zones Concept

Failures of technical systems and installations are very unpleasant for the operators. These require faultless operation from the equipment both under "normal" conditions and in case of thunderstorms. Loss reports of insurance companies show clearly that there is a backlog demand both in the private and the commercial sector. A comprehensive protection concept would help to compensate it. The Lightning Protection Zones Concept enables designers, constructors and operators to plan, perform and control protection measures. Thus, all relevant devices, installations and systems are protected reliably and furthermore with economically acceptable efforts.

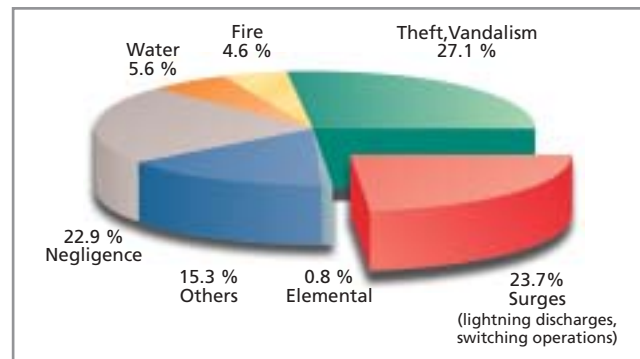


Fig. 1: Causes of damage to electronic equipment for 2001
Analysis of 7370 damage claims
(Ref.: Württembergische Versicherung AG)

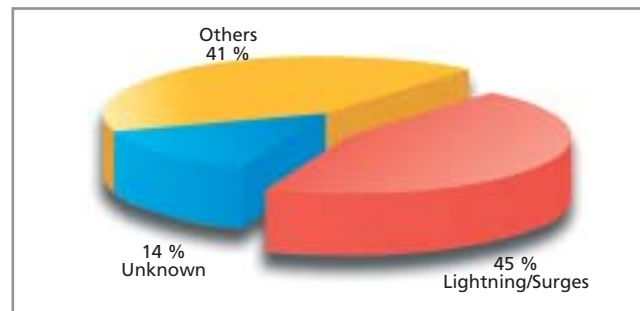


Fig. 2: Average damage causes for the last years
(Ref.: Gesamtverband der Deutschen Versicherungswirtschaft e.V., Berlin 2001)

Sources of interferences

Surges arising due to thunderstorms, are caused by direct / close lightning strokes or distant lightning strokes (Fig. 3). **Direct or close lightning strokes** are strokes into the lightning protection system of a structure, into its immediate surroundings or into the conductive systems entering the structure (e.g. low voltage power supply, telecommunication and control lines...). Due to their amplitudes and energy loads, the arising impulse currents and impulse voltages as well as their corresponding electromagnetic field (LEMP) represent a special risk for the system to be protected.

A close or direct lightning stroke, causes the surges (Fig.3: Case 1a) by a voltage drop at the impulse earthing resistance and the resulting potential increase of the structure towards the distant surroundings. This is the maximum load on electrical installations in structures.

The characteristic parameters of flowing impulse currents (peak value, rate of current rise, load, specific energy) can be described with the impulse current wave form 10/350 μ s (Fig. 4) and defined in international, European and national standards as test currents for components and devices for the protection against direct lightning strokes.

Additionally to the voltage drop at the impulse earthing resistance, surges are caused in the electrical structure and the connected systems and equipment due to the induction effect of the electromagnetic lightning field (Fig 3: Case 1b). The power of these induced surges and the resulting impulse currents is considerably lower than the power of a direct lightning impulse current and is therefore only described with impulse current wave 8/20 μ s (Fig. 4). Components and equipment, which do not have to carry currents out of direct lightning strokes, are therefore tested with impulse currents of 8/20 μ s.

Protection philosophy

Distant strokes are lightning strokes from a distance to the object to be protected, lightning strokes into the medium voltage overhead line network or into its immediate surroundings, or lightning discharges from cloud to cloud (Fig. 3: Cases 2a, 2b and 2c). In analogy to induced surges, the effects of distant lightning strokes on the electrical system of a structure are controlled by devices and components, which are designed accordingly for impulse current wave 8/20 μ s.

Surges due switching operations (SEMP) are caused by e.g.:

- switching off inductive loads (e.g. transformers, coils, motors),
- ignition and interruption of electric arcs (e.g. arc welding device),
- tripping of fuses.

The effects of switching operations in electrical installations of structures are also emulated for test engineering with impulse currents of wave form 8/20 μ s.

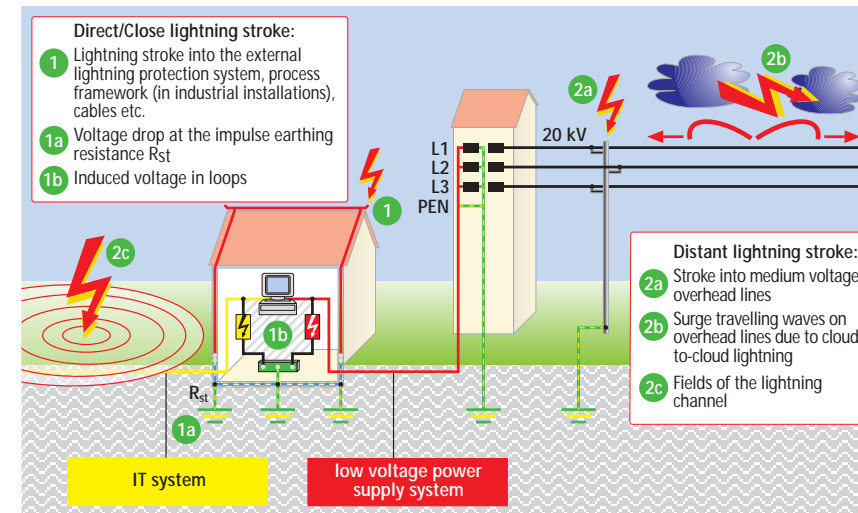


Fig. 3: Causes of surges at lightning discharges

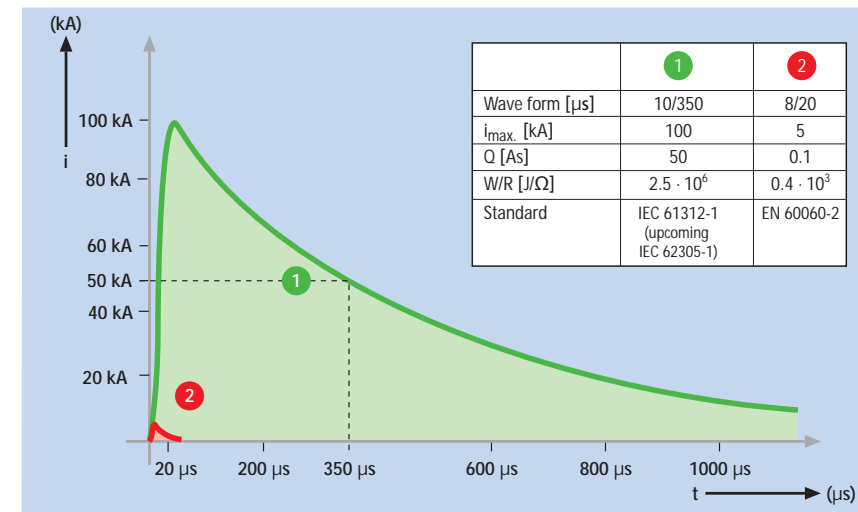


Fig. 4: ● Test impulse current for lightning current arresters ● Test impulse current for surge arresters

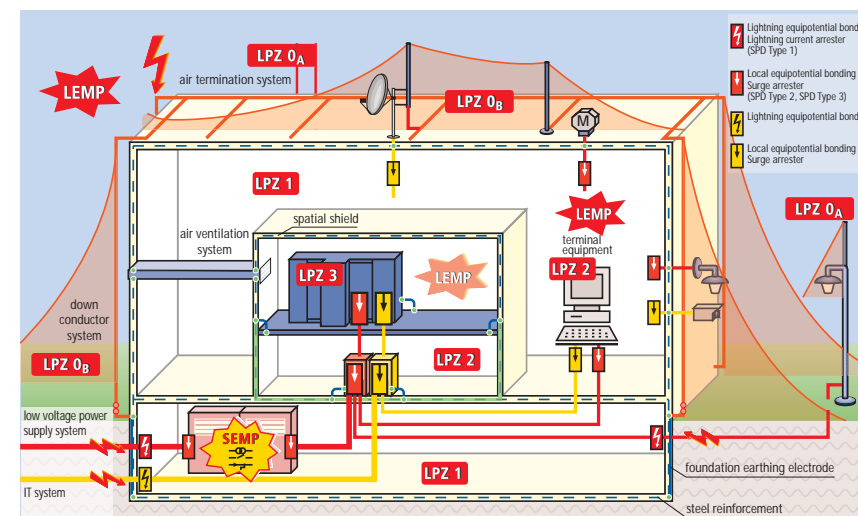


Fig. 5: Lightning protection zones concept

Lightning Protection Zone	Description
LPZ 0A	Threat by direct lightning strokes, impulse currents up to complete lightning currents and the entire lightning field.
LPZ 0B	Protected against direct lightning strokes. Threat by impulse currents up to partial lightning currents and the entire lightning field.
LPZ 1	Impulse currents are further limited by current distribution and SPDs situated at the zone boundaries. The lightning field is mostly attenuated by spatial shielding.
LPZ 2	Impulse currents are further limited by current distribution and SPDs situated at the zone boundaries. The lightning field is mostly attenuated by spatial shielding.

Table 1: Definition of lightning protection zones (LPZ)

For ensuring a continuous availability of complex electrical and IT systems, even in the case of a direct lightning effect, further measures for surge protection of electrical and electronic installations are necessary, based on a building lightning protection system. Taking all causes of surges into consideration is very important. For this purpose, the Lightning Protection Zones Concept described in IEC 61312-1 and in the upcoming IEC 62305-4 is applied (Fig. 5). Here, a structure is subdivided in different risk zones. These zones help to define the necessary devices and components for the lightning and surge protection.

Part of an EMC-conform lightning protection zones concept is an external lightning protection system (including air-termination system, down conductor, earthing), equipotential bonding, room shielding and surge protection for the power supply and IT systems.

The definition of the lightning protection zones is subject to the predeterminations stated in Table 1.

In correspondence with the requirements and loads made on surge protective devices regarding their installation site, these are classified as lightning current arresters, surge arresters and combined lightning current and surge arresters. The highest requirements on discharge capacity are made on lightning current and combined lightning current and surge arresters, which realise the transition from Lightning Protection Zone 0A to 1 or 0A to 2.

These arresters must be able to conduct partial lightning currents, wave form 10/350 μ s several times without destruction in order to prevent the penetration of destructive partial lightning currents into the electrical installation of a building. At the boundary from LPZ 0B to 1 or downstream of the lightning current arrester at the boundary from LPZ 1 to 2 and higher, surge arresters are used for protection against surges. Their function is to further reduce both the residual load of the upstream protection stages and limit the induced or own surges.

The aforementioned lightning and surge protective measures at the boundaries of the lightning protection zones apply to both the power supply and IT system to the same extent.

Due to the entirety of the measures described in the EMC-conform Lightning Protection Zones Concept, a permanent system availability of a modern infrastructure can be achieved.

For further more detailed technical information, we shall be please to send you our "Lightning Protection Guide".



DEHN + SÖHNE

More Information

I would like to have more information material about the following topics:

- Main Catalogue "Surge Protection"
- Main Catalogue "Lightning Protection"
- DS 649 E: "Surge Protection - Easy Choice"

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Safety Equipment

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