

9.9 Surge protection for hazard alert systems

In a dangerous situation, hazard alert systems (fire alarm systems or burglar alarm systems) shall signal actively, and remain passive in safe situations. Malfunctions of these systems (no response in case of danger, or alarm signal in case of no danger) are undesirable and expensive. False alarms sent by hazard alert systems result in expenses, which, in the industrial countries, amount to several hundred million Euro per year. Another aspect of malfunctions is the possible direct or indirect danger to human lives. In this context, we may remember the malfunction of the fire alarm system in the tower of the Frankfurt Rhein-Main airport in 1992, where a false activation of the fire extinguishing system occurred because of a lightning strike. Within a few minutes, the air traffic controllers had to leave the control room. In this critical situation, approaching airplanes had to be redirected to other airports. Considerable delays occurred in the air traffic.

False alarms of hazard alert systems are also disturbing in another respect:

- ⇒ When false alarms accumulate, the operator can no longer rely on the system and questions the significance of the system (investment) as such.
- ⇒ The guard starts ignoring alarm messages.
- ⇒ Neighbours will be disturbed by acoustic alarms.
- ⇒ Action forces (e.g. fire brigade) will be bound unnecessarily.
- ⇒ The activation of the fire extinguishing system causes interruptions of operations.
- ⇒ Damage is caused by not signalling existing hazard.

All these factors cause unnecessary expenses. They can be avoided, when possible causes for false alarms are already recognised in the design stage and are eliminated by suitable preventive measures. For this purpose, the German Insurance Association (Gesamtverband der Deutschen Versicherungswirtschaft e.V. - GDV) published VdS guidelines (VdS 2095; VdS 2311; VdS 2833). One of the measures also requested in the VdS guidelines is lightning and surge protection.

A coordinated lightning and surge protection prevents a false alarm caused by atmospheric dis-

charges and improves the availability of the early detection of dangers and alarms.

When installing comparable alarm transmission systems, for which, out of financial reasons, a VdS approval is not used (e.g. residential building), the guidelines may also be used for project design and for the construction as well as for agreeing individual measures between constructors and operators.

Indeed, most of the nowadays installed fire alarm systems have an increased surge immunity in accordance with IEC 61000-4-5 for primary and secondary wires as well as for the mains inputs. However, a comprehensive protection against damage by lightning discharge and surges can only be achieved by external and internal lightning protection measures (**Figure 9.9.1** to **Figure 9.9.4**).

Monitoring principles

Different monitoring principles are applied for hazard alert systems:

⇒ Impulse line technology

The information from the triggering alarm device is transferred in digital form. This allows to recognise the alarm device and the exact localisation of the trouble spot (**Figure 9.9.1**).

⇒ d.c. line technology

Each alarm line is permanently monitored according to the closed-circuit principle. If an alarm device is activated in the line, this line is interrupted and an alarm is triggered in the control and indication equipment. Hereby, however, only the alarm line can be identified but not the individual detector (**Figures 9.9.3** and **9.9.4**).

Regardless of the used monitoring principle, the lines of the hazard alert system must be integrated into the lightning and surge protection of the complete system.

Protection recommendations

For protection of alarm lines with d.c. line technology, BLITZDUCTOR XT, Type BXT ML4 BE ... is recommended. It is chosen according to the voltage of the alarm lines, which is normally 12 or 24 V.

BLITZDUCTOR XT, Type BXT ML4 BE is recommended in order not to change the loop resistance of the alarm lines too much.

Regardless of the line topology, the outputs of the control and indication equipment, as e.g. for acoustic and visual signalisation, should be protected by BLITZDUCTOR XT. Care should be taken that the nominal current of the protective devices is not exceeded. In case of nominal currents > 0.5 A, DEHNrail, Type DR M 2P 30 protective device has to be used alternatively.

The control and indication unit is normally connected to an exchange line of a fixed-network operator (e.g. Deutsche Telekom) by means of a telephone dial unit. For this application, the SPD type BLITZDUCTOR XT, BXT ML4 BD 180 is suitable (see also Chapter 9.14 "Surge protection for telecommunications accesses").

The surge protection of the power supply is important, too. It is recommended to use DEHNguard modular surge protective devices here (see Table 9.9.2).

For alarm systems, which are certified by the German Insurance Association, (systems recognised by VdS), the manufacturer of the alarm system should be contacted. The installations as well as the lightning and surge protection equipment have to be set up in accordance with VdS 2095, VdS 2311 or VdS 2833.

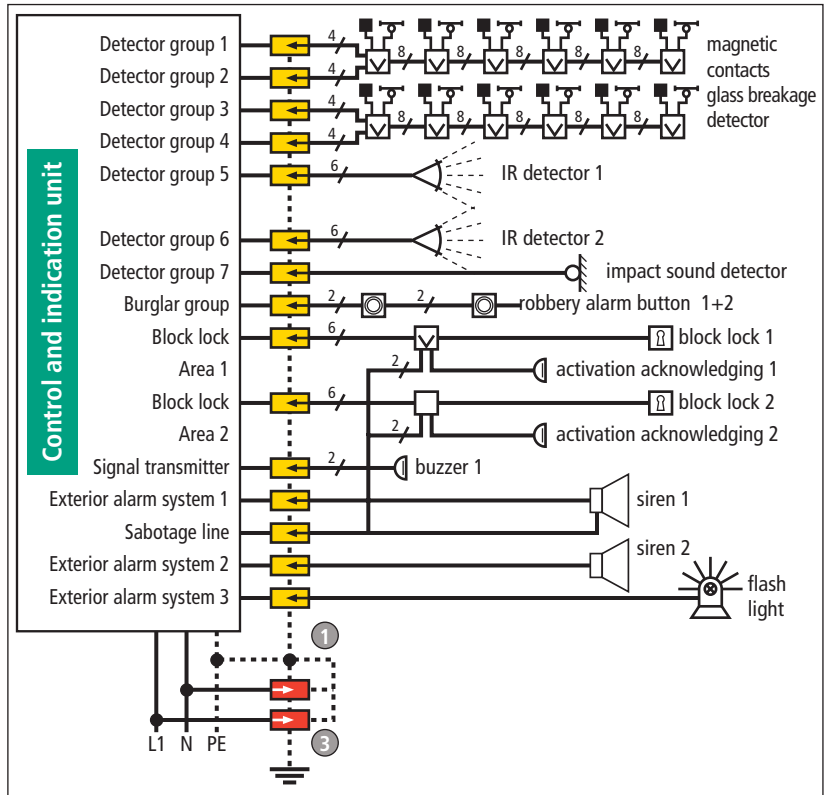


Fig. 9.9.1 Lightning and surge protection for the control unit of a burglar alarm system with impulse line technology

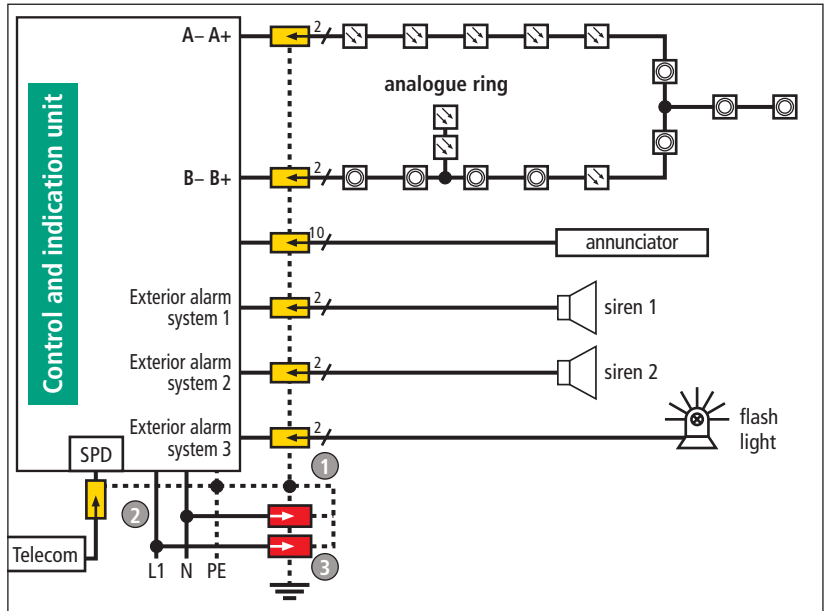


Fig. 9.9.2 Lightning and surge protection for the control unit of a fire alarm system – Analogue ring



No.	Protective device BLITZDUCTOR XT ...	Short definition	Part No.
		Four pole, universal device as terminal block for protection of IT systems and devices consisting of a base part and a protection module with integrated LifeCheck	
①	BXT ML4 BE 12 or BXT ML4 BE 24 + BXT BAS	Combined lightning current and surge arrester for use in the EMC-orientated lightning protection zones concept at the boundaries LPZ 0_A to LPZ 1 or LPZ 0_A to LPZ 2	920 322 or 920 324 + 920 300
②	BXT ML4 BD 180 + BXT BAS	Combined lightning current and surge arrester for use in the EMC-orientated lightning protection zones concept at the boundaries LPZ 0_A to LPZ 1 or LPZ 0_A to LPZ 2	920 347 + 920 300

Table 9.9.1 Short definition of the SPDs

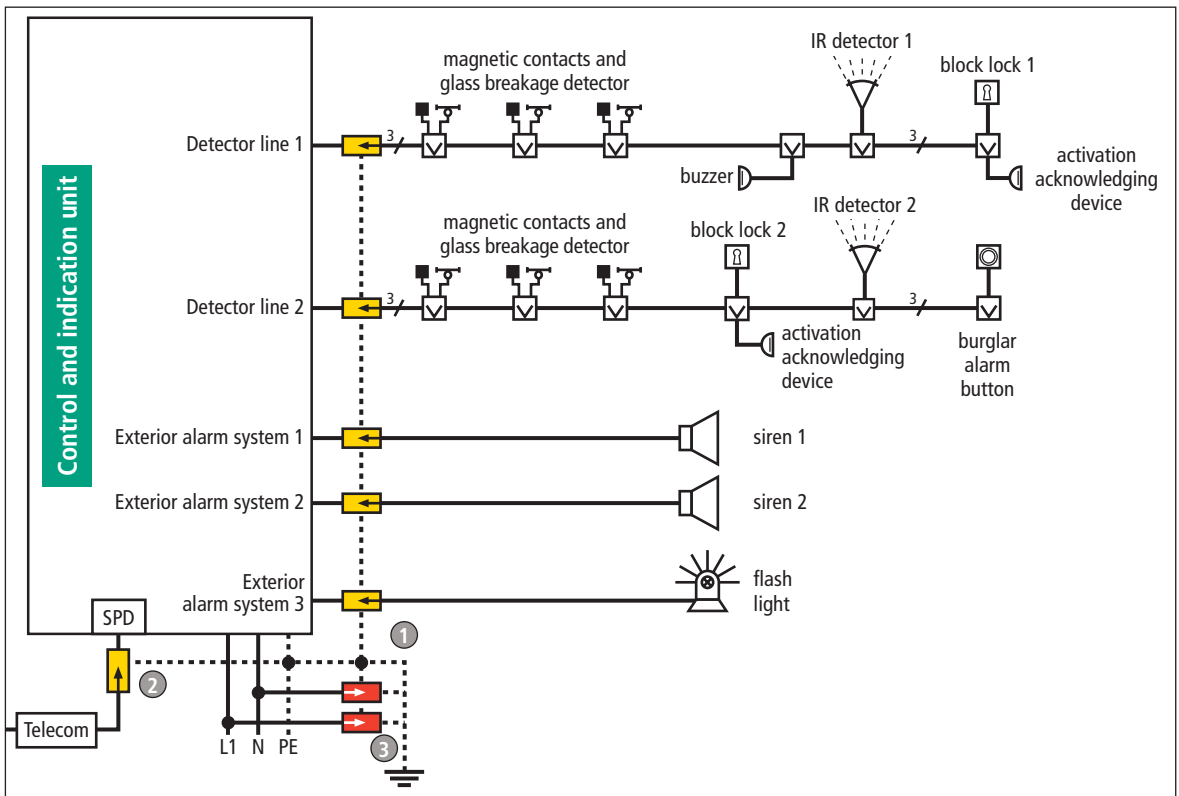


Fig. 9.9.3 Lightning and surge protection for the control unit of a burglar alarm system with d.c. line technology

As an example, the enclosed diagrams contain a proposal for surge protection of fire alarm and burglar alarm control and indication units, which are operated on the principle of d.c. line technology or pulse engineering.

If the fire and burglar alarm post and the control unit shall be integrated into a lightning protection

system, then all lines entering the building shall be connected with lightning current arresters or combined lightning current and surge arresters. See **Tables 9.9.1** and **9.9.2**.

A distinct increase of the operational reliability of these systems can be reached with specific light-

No.	Multi pole, modular combined lightning current and surge arrester, Type 1 (LPZ 0 _A – LPZ 2)		
	Protection for ...	SPDs	Part No.
3	TN system	DEHNventil DV M TN 255	951 200
	TT system	DEHNventil DV M TT 2P 255	951 110
	Multi pole, modular surge arrester, Type 2 (LPZ 0 _B – LPZ 1 and higher)		
	Protection for ...	SPDs	Part No.
	3-phase TN-C system	DEHNguard DG M TNC 275	952 300
	3-phase TN-S system	DEHNguard DG M TNS 275	952 400
	3-phase TT system	DEHNguard DG M TT 275	952 310
	Single-phase TN-S system	DEHNguard DG M TN 275	952 200
	Single-phase TN-C system	DEHNguard DG S 275	952 070
	Single-phase TT system	DEHNguard DG M TT 2P 275	952 110

Table 9.9.2 Selection of SPDs

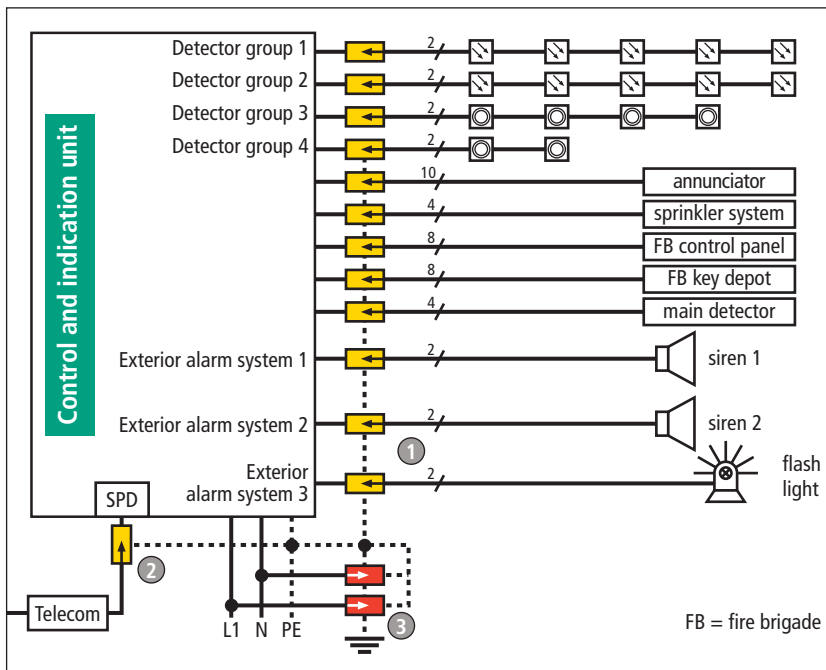


Fig. 9.9.4 Lightning and surge protection for the control unit of a fire alarm system with d.c. line technology

ning and surge protection of hazard alert systems. On the one hand, this refers to the prevention of false alarms when no danger exists, and on the other, costs eventually arising from this, can be prevented. This again, allows an effective damage limitation by informing the auxiliary personnel reliably. This counteracts a possible formation of

catastrophic conditions (e.g. danger to human lives, pollution of the environment, etc.). Notice that in case of injuries to persons or environmental damage, the operator of a plant is liable first. This comprehensive responsibility for security can normally be expected from managers or executives of a company. However, in the legal sense, an operator of a plant is a technical layman, who is not able to estimate, if threats can arise from a technical solution. Therefore, skilled persons as suppliers of technical solutions must ensure in each individual case, that the solutions offered also correspond to the actual requirements. Retreating to the accepted rules of technology is not sufficient, if

the state of the art already describes a higher quality solution. This may entitle a technical layman (plant operator) to claim recourses.

Regardless of the fact, whether fire alarm systems are VdS-approved systems or not, they should be furnished with a surge protection.