Surge protection for KNX systems

Electrical installations in buildings with complex operator control units, displays and control devices are frequently equipped with an installation bus system. The EIB (European Installation Bus), which was developed at the beginning of the 1990s, is a widely used installation bus system. Today this installation bus system is still the core of a KNX system which is the world's first open standard described in the European EN 50090 standard.
An advantage of the KNX standard is the interoperability between different devices in all industries independent of the manufacturer. Thus, the values of a wind and rain sensor or a temperature and sun sensor can be processed in different building systems. Lighting systems can be switched on or off as needed depending on the light level and different lighting scenarios can be programmed. Consumption values can be recorded and used for load management. These are only some of the many applications where KNX systems can be used. In addition to these advantages, the installation time and the costs of such systems can be considerably reduced.

The smallest installation unit in the bus topology is a line. It consists of max. 64 bus devices (ETS 3 starters). If more than 64 bus devices are required, up to 15 lines can branch off from each main line via a line coupler. The area line connects a maximum of 15 area couplers to each other (**Figure 9.10.1**).

The KNX bus is supplied with a safety extra-low voltage (SELV) of max. 29 V. The cable length within a line segment and the length of the bus cable between two bus devices are limited. In case of a maximum length of 1000 m per line segment, the KNX systems may be destroyed by coupling despite of their high dielectric strength.

Moreover, it must be observed that no induction loops are formed when installing the cables. Therefore, the bus and low-voltage cables leading to the bus devices must be installed close to each other (**Figure 9.10.2**).
Loops are also formed if a metal construction or pipe is connected to the main earthing busbar (**Figure 9.10.3**). Also in this case, it is advisable to install the cables as close as possible to the construction or pipe.

Structure with external lightning protection system

The standard calls for lightning equipotential bonding, therefore all cables at the zone transition from LPZ 0_A to 1 must be protected by lightning current arresters. Since the electromagnetic field inside a structure with external lightning protection system is higher in case of a direct lightning strike than in case of a remote lightning strike, a structure with external lightning protection system must be equipped with surge arresters (**Figure 9.10.4**).

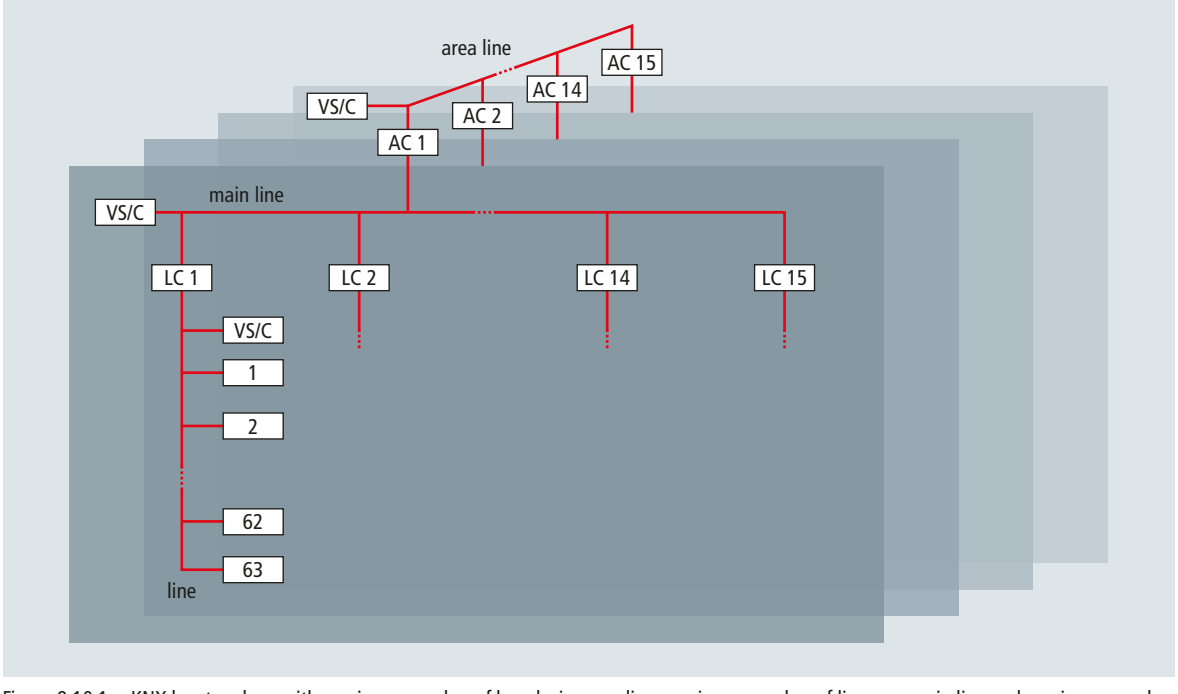


Figure 9.10.1 KNX bus topology with maximum number of bus devices per line, maximum number of lines per main line and maximum number of main lines per area line

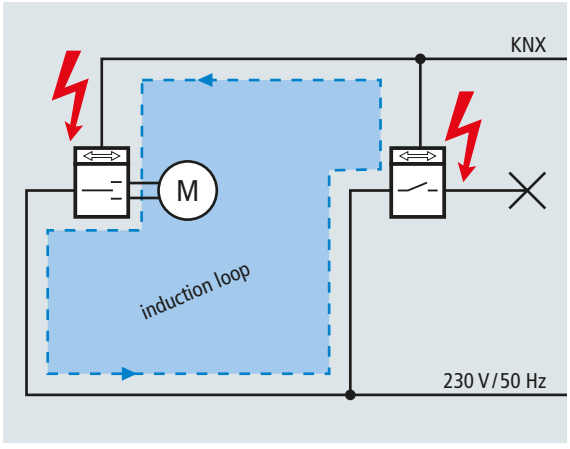


Figure 9.10.2 Induction loop formed by two KNX bus devices supplied with low voltage

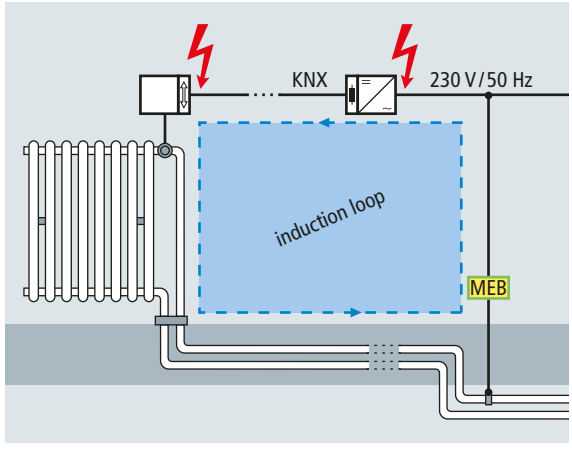
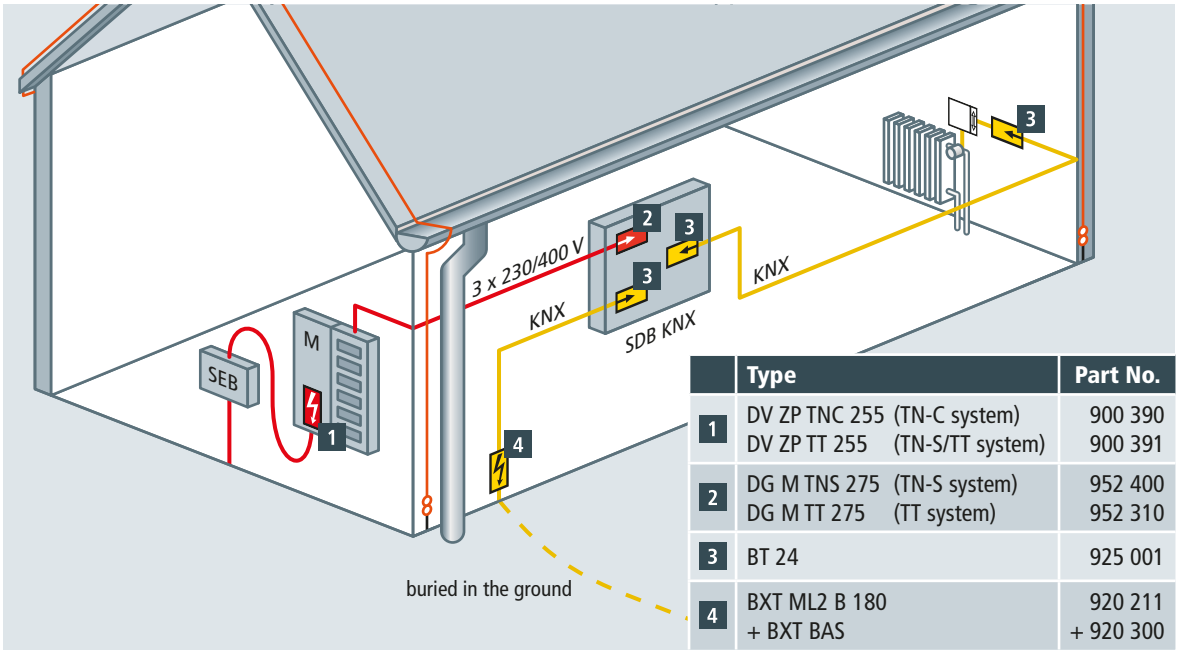


Figure 9.10.3 Induction loop formed by one KNX bus device installed at a metal construction or pipe



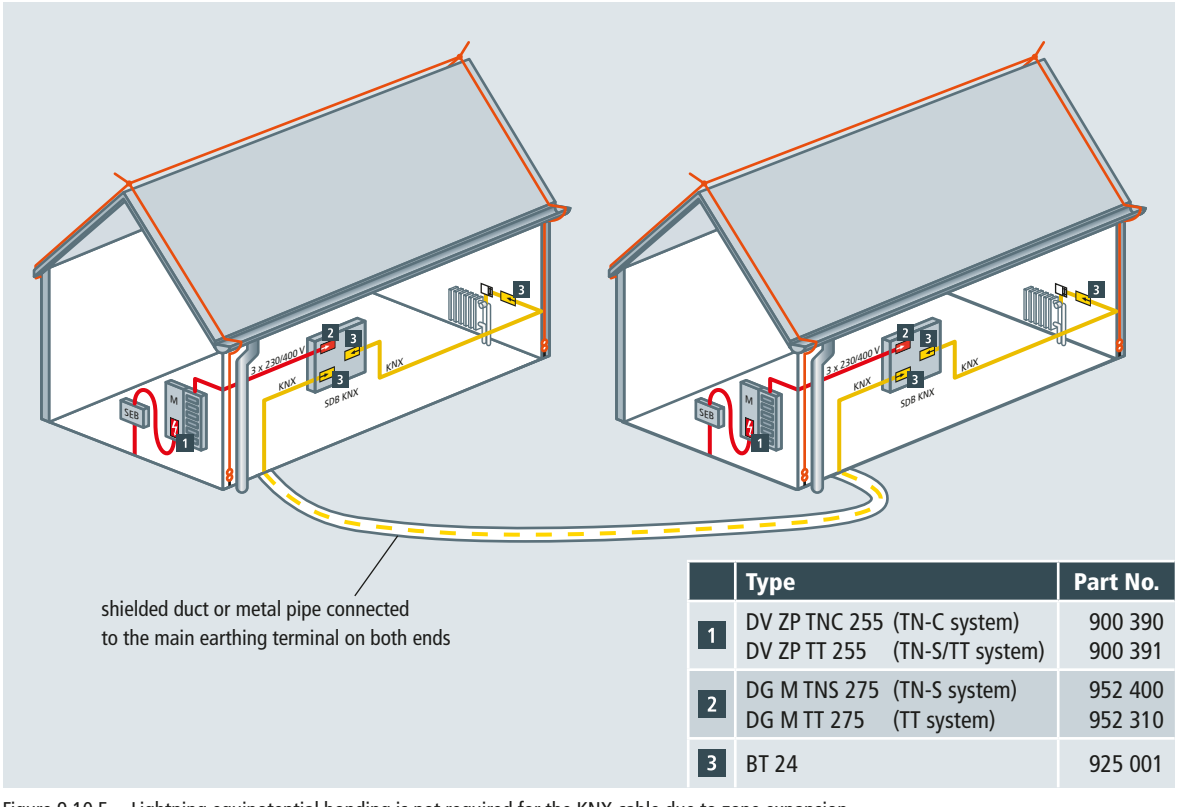
	Type	Part No.
1	DV ZP TNC 255 (TN-C system) DV ZP TT 255 (TN-S/TT system)	900 390 900 391
2	DG M TNS 275 (TN-S system) DG M TT 275 (TT system)	952 400 952 310
3	BT 24	925 001
4	BXT ML2 B 180 + BXT BAS	920 211 + 920 300

Figure 9.10.4 Lightning equipotential bonding at the entrance point of the KNX bus cable into the building and surge protective devices installed at the distribution board of the KNX system and at the actuator of the heater

If the bus cable is routed between different buildings in a lightning current carrying and shielded duct/metal pipe that is earthed on both ends, lightning equipotential bonding does not have to be established for the KNX cable extending beyond the buildings and it is sufficient to install surge arresters (**Figure 9.10.5**).

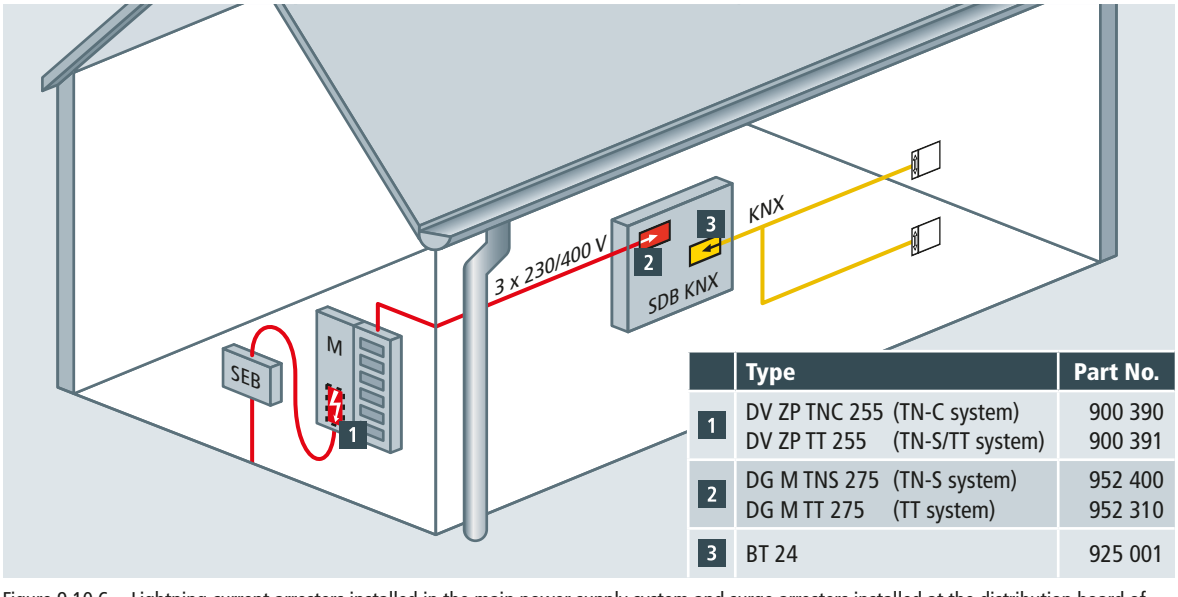
Structure without external lightning protection system

If there is a risk of nearby lightning strikes, it is advisable to install lightning current carrying combined arresters at the entrance point into the building to protect the incoming power cable (**Figure 9.10.6**).



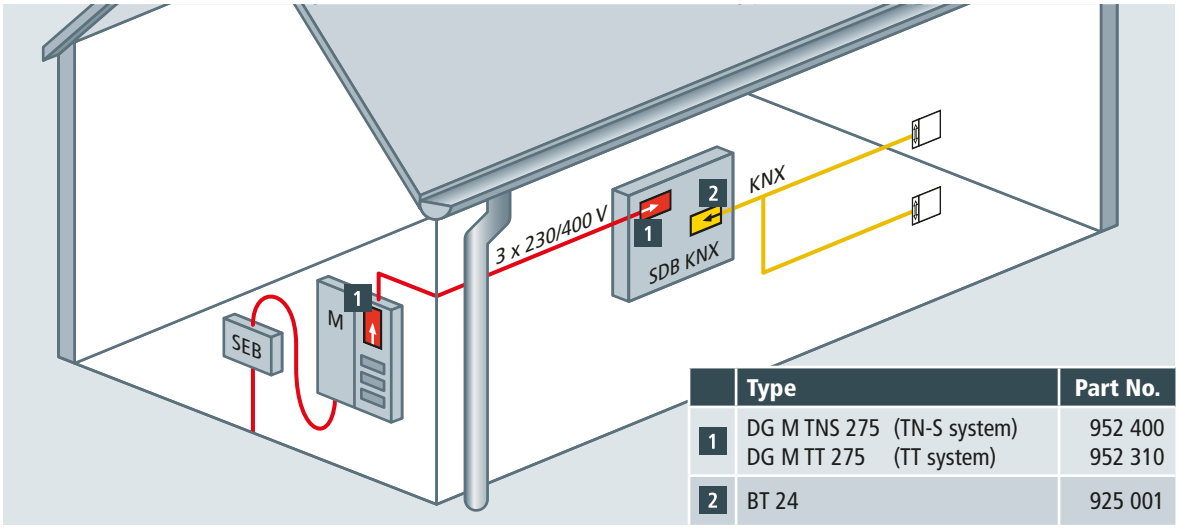
	Type	Part No.
1	DV ZP TNC 255 (TN-C system) DV ZP TT 255 (TN-S/TT system)	900 390 900 391
2	DG M TNS 275 (TN-S system) DG M TT 275 (TT system)	952 400 952 310
3	BT 24	925 001

Figure 9.10.5 Lightning equipotential bonding is not required for the KNX cable due to zone expansion



	Type	Part No.
1	DV ZP TNC 255 (TN-C system) DV ZP TT 255 (TN-S/TT system)	900 390 900 391
2	DG M TNS 275 (TN-S system) DG M TT 275 (TT system)	952 400 952 310
3	BT 24	925 001

Figure 9.10.6 Lightning current arresters installed in the main power supply system and surge arresters installed at the distribution board of the KNX system



	Type	Part No.
1	DG M TNS 275 (TN-S system) DG M TT 275 (TT system)	952 400 952 310
2	BT 24	925 001

Figure 9.10.7 Surge protective devices installed at the main distribution board and at the distribution board of the KNX system

Independent of the point of strike, surge protective devices always have to be installed at the distribution board of the KNX system (**Figures 9.10.6 and 9.10.7**).

Due to the high dielectric strength of the bus cable, it is unlikely that short bus cables with isolated sensors (e.g. in a socket outlet combination without earthed installation devices) are destroyed. In this case, it is not necessary to install surge arresters directly at the bus devices (**Figures 9.10.6 and 9.10.7**).