KNX Hardware Requirements and Tests

4

Installation Safety Requirements

4

Summary

This document specifies installation Safety Requirements for KNX.

This document is part of the KNX Specifications v2.1.

Version 01.03.01 is a KNX Approved Standard.

Document Updates

Version	Date	Modifications
1.0	1999.08	Approved Standard
1.1RfV	2005.05	Restructuring of Volume 4 – updating of Overvoltage requirements
1.1FV	2005.11	Resolution of comments from RfV cycle – change in clause 5 following recent standard publications
1.1AS	2007.11	Resolution of comments from FV cycle – taking into account final publication of AN106 and AN109
1.2RfV	2009.10	Additions to clause 6, addition of clause 4
1.2FV	2010.03	Resolution of comments from Release for Voting – readying document for final voting
1.3 WD	2011.10	Update taking into account AN 126
01.03.01	2013.10.22	Editorial updates for the publication of KNX Specifications 2.1.

References

[01] Part 4/1 “Safety and Environmental Requirements – General”

[02] Part 9/1 “Cables and Connectors”

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Contents

1 General Rules

The general installation rules are given in EN 61140 and IEC 60364-7-701 respectively their derived national standards. For TP-cabling the requirements of EN 50491-6-1 and EN 50090-5-2 apply.

In addition the local or national codes of practice shall be obeyed.

Additional rules and information for the installation of KNX bus are given below. If specification of separation/insulation is required **Overvoltage category** and the rated insulation voltage (**U_R)** shall be taken into account.

2 Use of Protective Impedances

Clause 2.1 of [01] applies.

3 Connection of KNX Bus to other SELV/PELV Circuits

1. Other circuits shall not be connected to the (SELV/PELV) bus even if they are SELV or PELV circuits.
2. For connection to other circuits Bus Coupling Units, Line Couplers or KNX Data Interfaces shall be used.
3. For connections of ancillary power feeding circuits to KNX bus, see clause 2.1 of [01].

4 Touch current [1)] of KNX devices

1. The KNX manufacturer shall declare in the product instruction sheet the measured touch current between mains and SELV. The sum of the touch currents of all devices within a line segment shall not exceed 3,5 mA according to EN 61140.

5 Earthing, Handling of the Screen

1. KNX SELV circuits shall not be connected to ground or PE.
2. If a device is screened and the screen is part of the bus circuit, the same protective separation as for the bus circuit shall be provided between the device screen and other circuits or ground (in case of SELV). If a device is screened and the screen is connected to ground, protective separation shall be provided between the device screen and the bus circuit.
3. The KNX TP1 bus cable also contains a screen, which shall neither be connected to the bus circuit nor to PE or ground (the latter only permitted in case 4). In this case, the following separation shall be provided:
   - basic separation between bus circuit and screen for UR ≥ 50V.
   - basic separation between PE and screen for UR ≥ 50V.
   - For non specified ground (see [01], Table 9).
4. If the cable screen is included in the lightning protection measure, all parts of the cable screen shall be connected together and shall be connected to ground/PE as often as possible.
5. The earth terminal of the TP1 Power Supply Unit may be connected to PE with a cable, which is marked with **yellow/green** providing the required cross-section. Cables marked with green or yellow shall not be used.

1) Sometimes also referred to as ‘leakage current’

6 Installation of KNX Bus Cables

For the installation of KNX bus cables the following requirements shall be complied with:

KNX bus cables as specified in [02] may be installed in close contact with:

- Mains cables.
- Other cables for control networks with voltages not higher than the mains supply voltage.
- Cables for SELV/PELV or data and multimedia networks.

The uninsulated cores of the KNX bus cable and the uninsulated cores of mains cables or other cables (excluding SELV cables) shall be separated by at least 6 mm.

In the case where TP1 standardised bus cable is combined with non-standardised and untwisted cable (e.g. to hook up movable device with cable to a bus access unit in a wall outlet), the total length of this type of cable shall be negligible in comparison to the length of the standardised cable length of the line to which the device is connected to. All characteristics of the cable shall moreover comply with the M requirements for TP1 cable as set out in [02] of the KNX standard.

7 Usage of the 2nd Twisted Pair (if available)

The second twisted pair provided by a KNX bus cable shall be used as follows:

Table 1 – Usage of the 2nd Twisted Pair

No	Use of 2nd Pair	Requirements	Installation Note
1	Let free	The free ends of the cable shall be protected against direct contact to live parts of all other circuits or ground.	Use e.g. Bus Connection Block
2	2nd pair in parallel to the bus pair (for reducing Voltage Drop)		1. Connect yellow/white and red/dark grey respectively for correct polarity in case of KNX bus cable. 2. Although the voltage drop is reduced by the parallel 2nd pair, the limits of total cable length remain valid.
3	Supporting bus applications	1. The usage shall be within the frame of SELV/PELV (25 V AC / 60 V DC).	
		2. Max current 2,5 A Overcurrent protection is required.	Overcurrent protection may be provided by the Power Supply Unit or an extra limiter or circuit breaker/fuse.
		3. Voice communication is allowed on the 2nd pair	
		4. The voltage level chosen for the 2nd pair shall be the same throughout one autonomous bus installation	Example: same voltage level for - one building or home - one workshop with few separate buildings - one floor of a big building
		5. No undue generation of EMI or of overvoltages shall occur on the 2nd pair	additional/extra suppression measures may be required
		6. Both ends of the 2nd pair wires shall be marked (durable and legible)	
4	2nd KNX Bus line on 2nd pair or other TP medium	tbd	tbd

8 Bus Cable Overcurrent Protection

The current in a TP1 bus line is limited to 3 A.

9 Overvoltage Protection

For further information see also the KNX installation handbook available from KNX Association.

9.1 Surge protection (Secondary Protection)

In a KNX bus installation, it shall be ensured, e.g. by surge protection devices (secondary protection), that surges are not greater than 2 kV.

Protection devices for secondary protection:

- Requirements for Overvoltage arresters connected to mains:

  Protection level: Common Mode: <2 kV

  Differential Mode: <1 kV

  Nominal discharge current (8/20, single line to ground): 5 kA according to EN 61643-11.

- Requirements for Overvoltage arresters connected to data and signal lines:

  Protection level: Common Mode: <2 kV

  Differential Mode: no requirements for media interface, for other interfaces < 0,5 kV

  Nominal discharge current (8/20, single line to ground): 5 kA according to EN 61643-21.
  If bus devices are connected to networks of different topology (mains-bus, bus-bus, bus-telephone, bus-pipeline), loops shall be avoided or surge protective devices (SPD) shall be installed.

9.2 Lightning (primary) protection

In case the Secondary Protection cannot withstand the high-energy interference (such as e.g. switching or lightning overvoltage), additional protective measures are required. This is denoted as Primary Protection.

Protection devices for Primary Protection:

- Requirements for Lightning arresters connected to mains, data or signal lines :

  Protection level: <4 kV for mains, < 2 kV for data and signal lines

  Nominal discharge current (10/350): mains -> in accordance with lightning protection level:
  Level I: 100 kA

  Level II: 75 kA

  Level III/IV: 50 kA

  data and signal lines: 5 kA according EN 62305-4

SPD's for Secondary and Primary Protection shall be co-ordinated according EN 61643-22, EN 61643-12 and EN 62305-4. An easy way to achieve co-ordination is the use of co-ordinated SPD families. In this case, the manufacturer of the SPD shall prove the co-ordination.

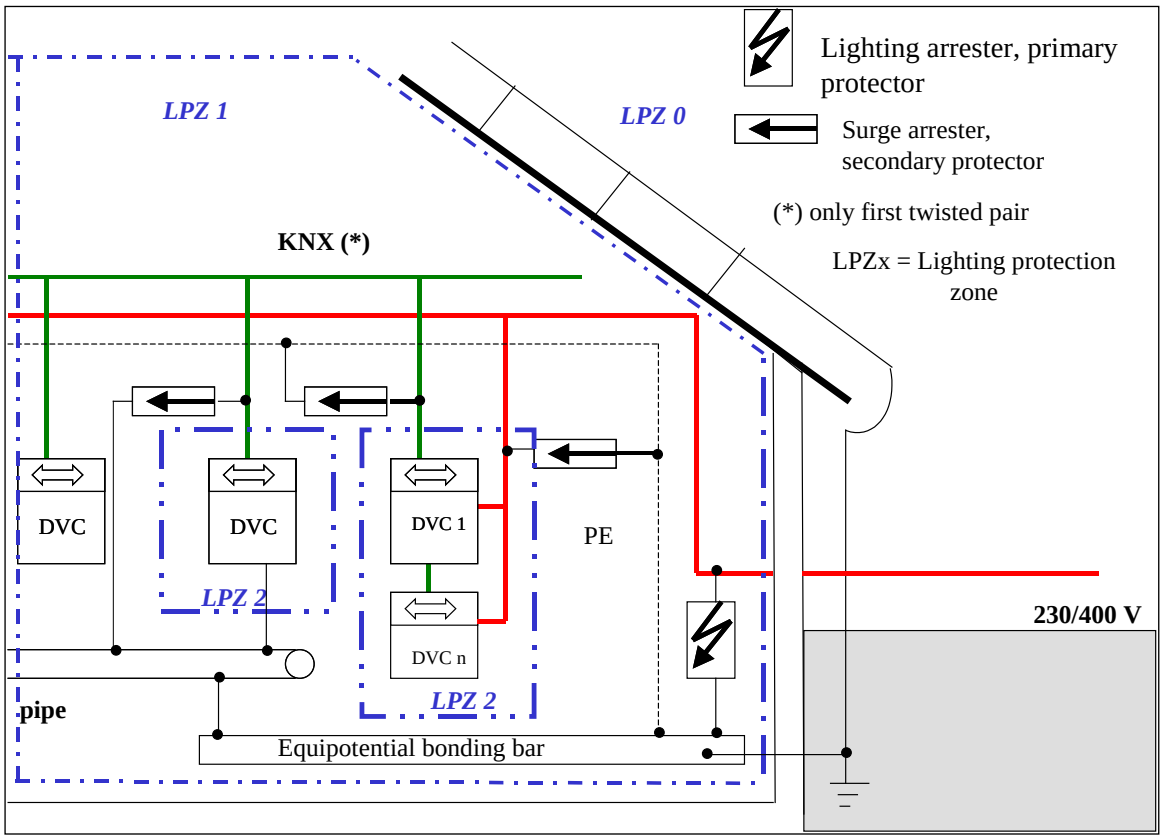

Figure 1 - Primary and secondary protection – no bus connection with other building

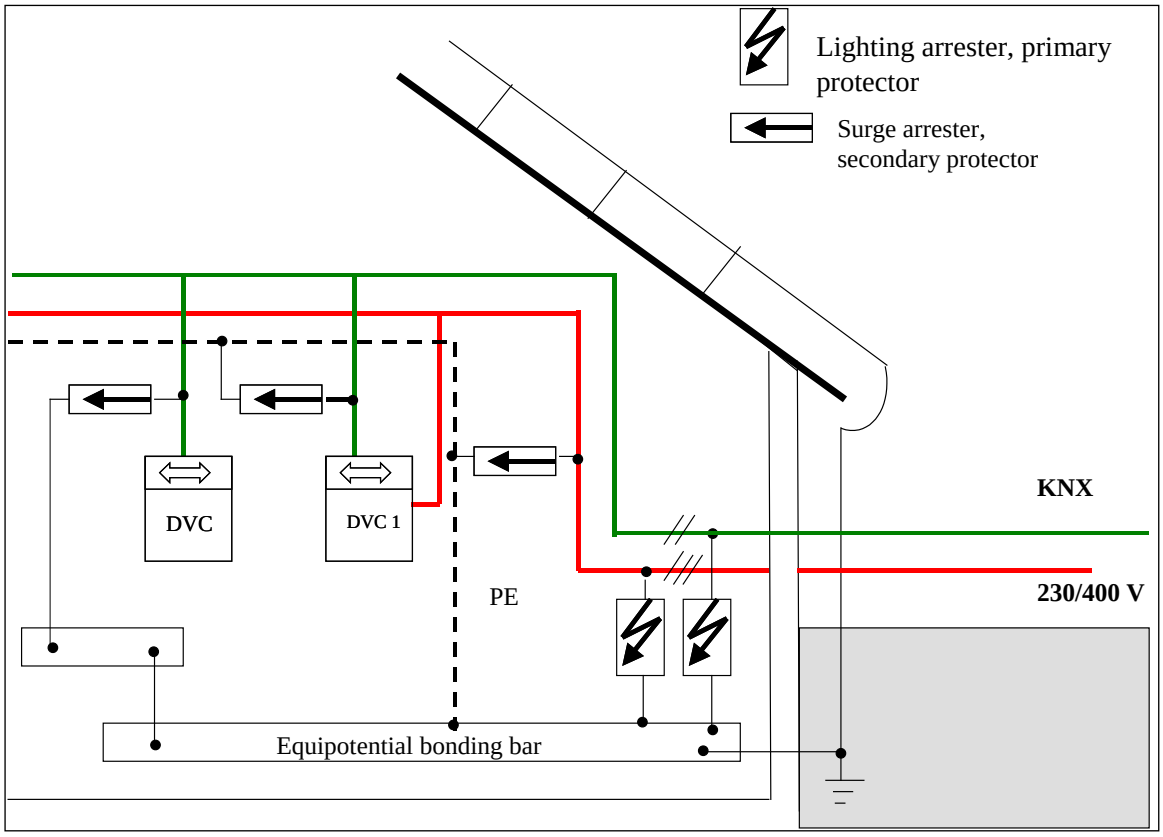

Figure 2 - Primary and secondary protection –bus connection with other building – KNX not installed in metal channels or pipes

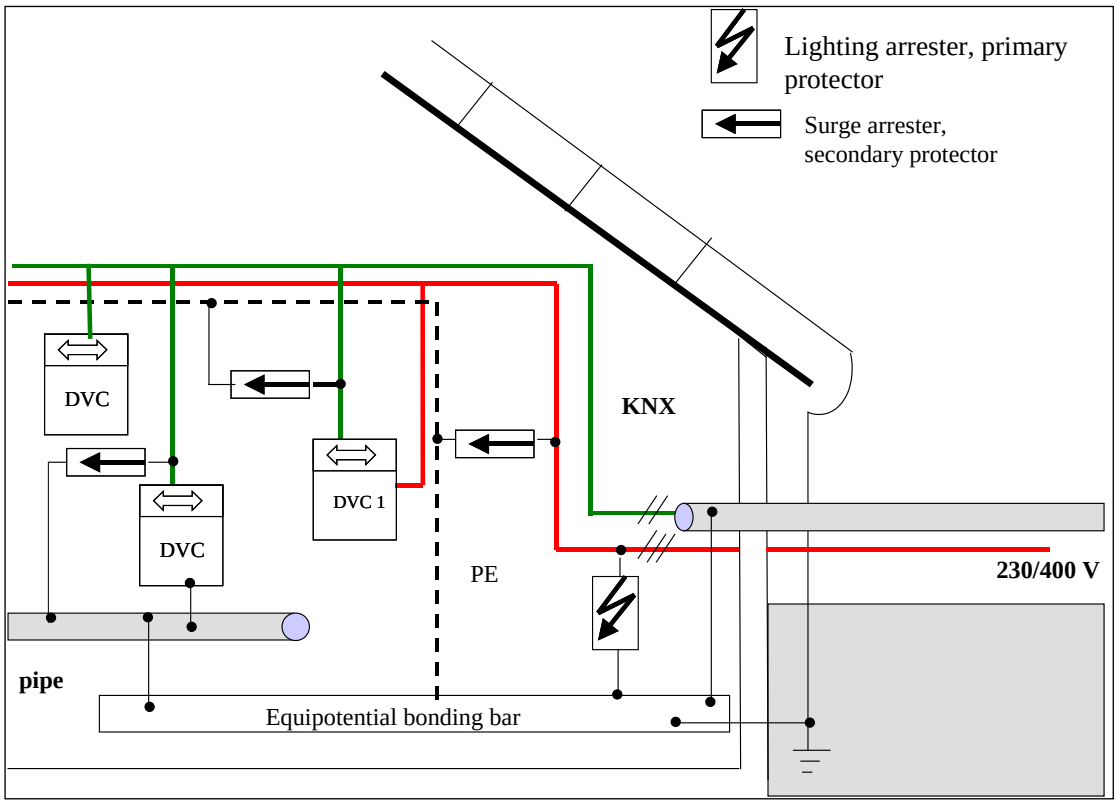

Figure 3 - Primary and secondary protection –bus connection with other building – KNX installed in metal channels or pipes

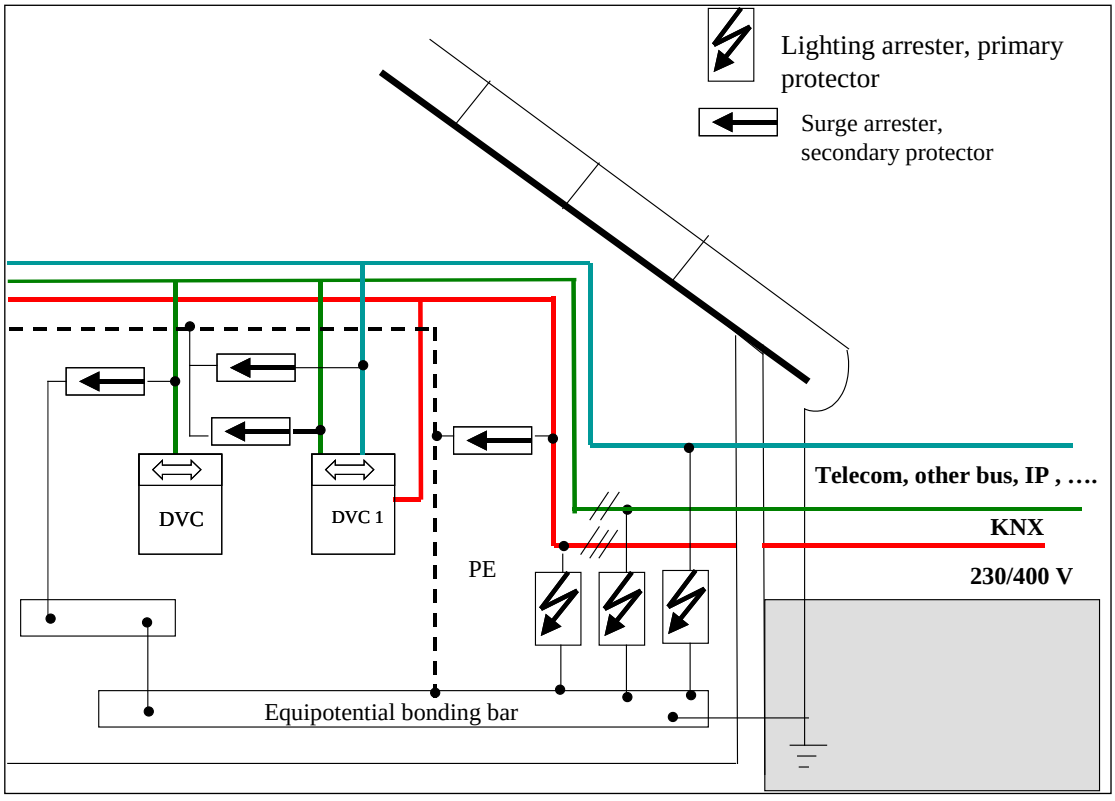

Figure 4 - Primary and secondary protection – bus device with connection to mains and other data network (telephone, external sensor, other bus, IP, etc.)

10 Installation in special Locations

Equipment that is used in locations other than indoors shall comply with the requirements (under further consideration) listed in Table 2.

Table 2 – Requirements for locations other than indoors

	Location	Requirements
1	Humid and wet locations, outdoor Installation	1. Equipment not suitable for use in these locations shall be protected by enclosures or similar.
		2. The IP protection class shall comply with the product standard.
		3. Enclosures, boxes, etc., shall have a drain for condensed water.
		4. Cables shall be sheathed and shall be suitable for use in this environment. The TP1 cable screen shall be omitted or connected to the equipotential bonding.
2	Installation of TP1 bus cable in bathrooms	Standardised KNX TP1 cable may be used in bathrooms under the following conditions: The installation may be carried out in zones 1 to 3 as TP1 is based on SELV according to IEC 61140 As - The TP1 cabling network is an extended network in close vicinity to mains. - The screen of the TP1 standard cable is normally not connected to ground nor to PE. - The use of screened cables is not excluded in IEC 60364-7-701 - The installation of the TP1 cable shall comply with one of the following requirements, in order to avoid carrying of hazardous voltages. 1. The screen of the TP1 standard cable shall be connected to the equipotential bonding or 2. An unscreened but sheathed cable stub shall be used in Zones 1, 2 or 3. This is in line with e.g. IEC 364-7-701. This measure should only be used if 1. is not feasible.
3	Installation in furniture	1. Wall boxes for installations in hollow walls shall only be used if marked with "H".
		2. The devices for mounting in wall boxes shall not be fixed with claws.
		3. Equipment (in particular lamps) which can cause overheating or fire shall be installed with the adequate protection.
		4. Cables shall be sheathed and shall be suitable for use in this environment.
4	Class Rooms etc.	SELV circuits are recommended.
5	Locations exposed to fire hazards	under consideration
6	Hospitals and medical use	under consideration
7	Communal facilities	under consideration
8	Agricultural premises	under consideration

11 Instruction Sheet

If an instruction sheet is required to maintain electrical safety (and proper functioning) after mounting and installation, this is part of the device. The instruction sheet shall be established in the language where the device is sold and in one of the three official KNX languages (English, French, German or). The instruction sheet shall inform on (where applicable):

1. Manufacturers' identification.
2. Product name.
3. Additional equipment and tools for installation etc.
4. Intended use, restrictions, and risks.
5. Installation guidelines for reaching required safety, steps of working, safety measures during the work.
6. Persons permitted to do the work.

