KNX

Definitions and Design

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Life Is On Schneider Electric

Agenda

1	Introduction
2	Savings with KNX
3	Bus Devices
4	Heating and cooling control
5	Touchscreen
6	Installation
7	Communication and Topology

Introduction

What is KNX?

The three letters “KNX” stands for:

…….

However….

- KNX is a bus system
- KNX is a world standard
- KNX brings building functions together
- KNX offers flexibility, safety, comfort and cost efficiency

KNX is a world standard

- World means

  References all over the world: the world of home and building control "speaks" KNX. Several millions of successful KNX installations can be found not only all over Europe but also in the Far East, North and South America - a proof of just how attractive the KNX approach is. Over 370 KNX member companies worldwide offer more than 7.000 KNX certified product groups in their catalogues, from different application domains.

- Open Standard means

  KNX is approved as an International Standard (ISO/IEC 14543-3) as well as an European Standard (CENELEC EN 50090 and CEN EN 13321-1) and Chinese Standard (GB/T 20965). KNX is therefore future proof. KNX products made by different manufacturers can be combined – the KNX trademark logo guarantees their interworking and interoperability. KNX is therefore the world´s only open Standard for the control in both commercial and residential buildings.

KNX history

- **1984** - Increasing demands made on the **flexibility** and **convenience** of electrical installations, combined with the demand to **minimize energy requirements**, have led to first developments of building management systems.
- **1987** - The awareness that manufacturer specific and proprietary systems would hinder a broad market penetration guided the leading manufacturers in electrical installation techniques to the constitution of the **INSTABUS- research** and development organization.

  (Founding members: Merten, Berker, Gira, Jung and Siemens)
- **Target** => Creating a standard that **grants compatibility and interoperation** of devices and systems from different manufacturers through all crafts and building applications.
- **1990 -** Constitution of the **EIBA** (European Installation Bus Association) based in Brussels to **define technical guidelines**, certification and awarding of the EIB trademark, **preparing of European and international standards** (DIN VDE 0829 and EN 50090) and coordination of the EIBA-member activities.
- **1991 - First standardized products** have been offered to the market
- **1993** - Constitution of EIBA-country groups

KNX history

- **1999** - Members of the following associations have founded the **Konnex Association**:
  - **BatiBUS Club International (BCI)**
  - **European Installation Bus Association (EIBA)**
  - **European Home Systems Association (EHSA)**

Objective => Promoting the newly defined “one-single-standard” for field bus applications in homes and buildings. This standard, called **KNX**, is based on the well-established technology of EIB and enlarged with the configuration mechanisms and physical media from BatiBUS and EHS.

Today

KNX is the world's only open STANDARD for home and building control

- European standard – EN 50090
- International standard – ISO/IEC 14543

CENELEC CEN ISO IEC SAC ANSI

KNX association

KNX is a world wide open bus Technology

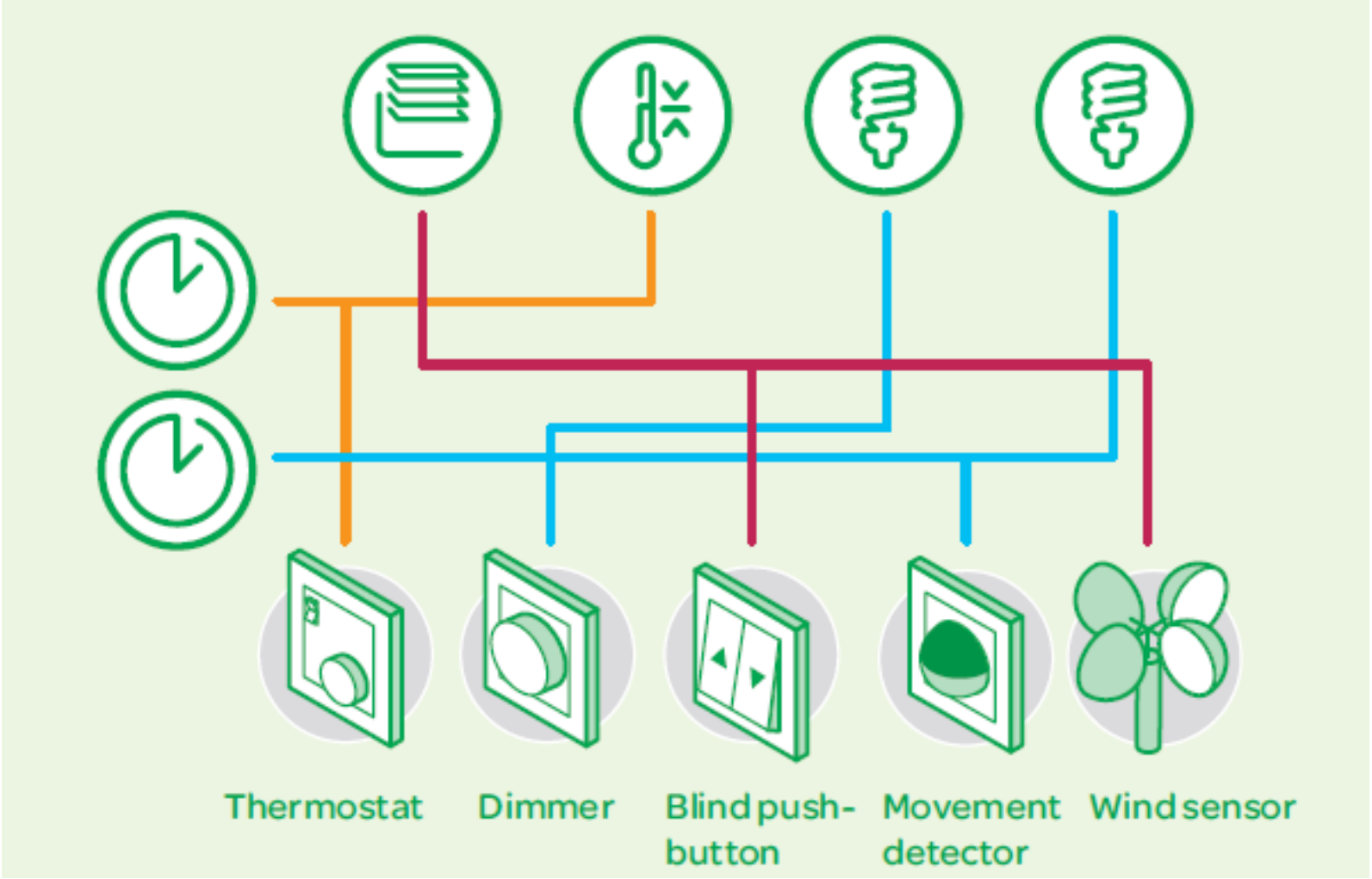
- More than 400 KNX members in 30 countries

- 50 KNX training centr

KNX association

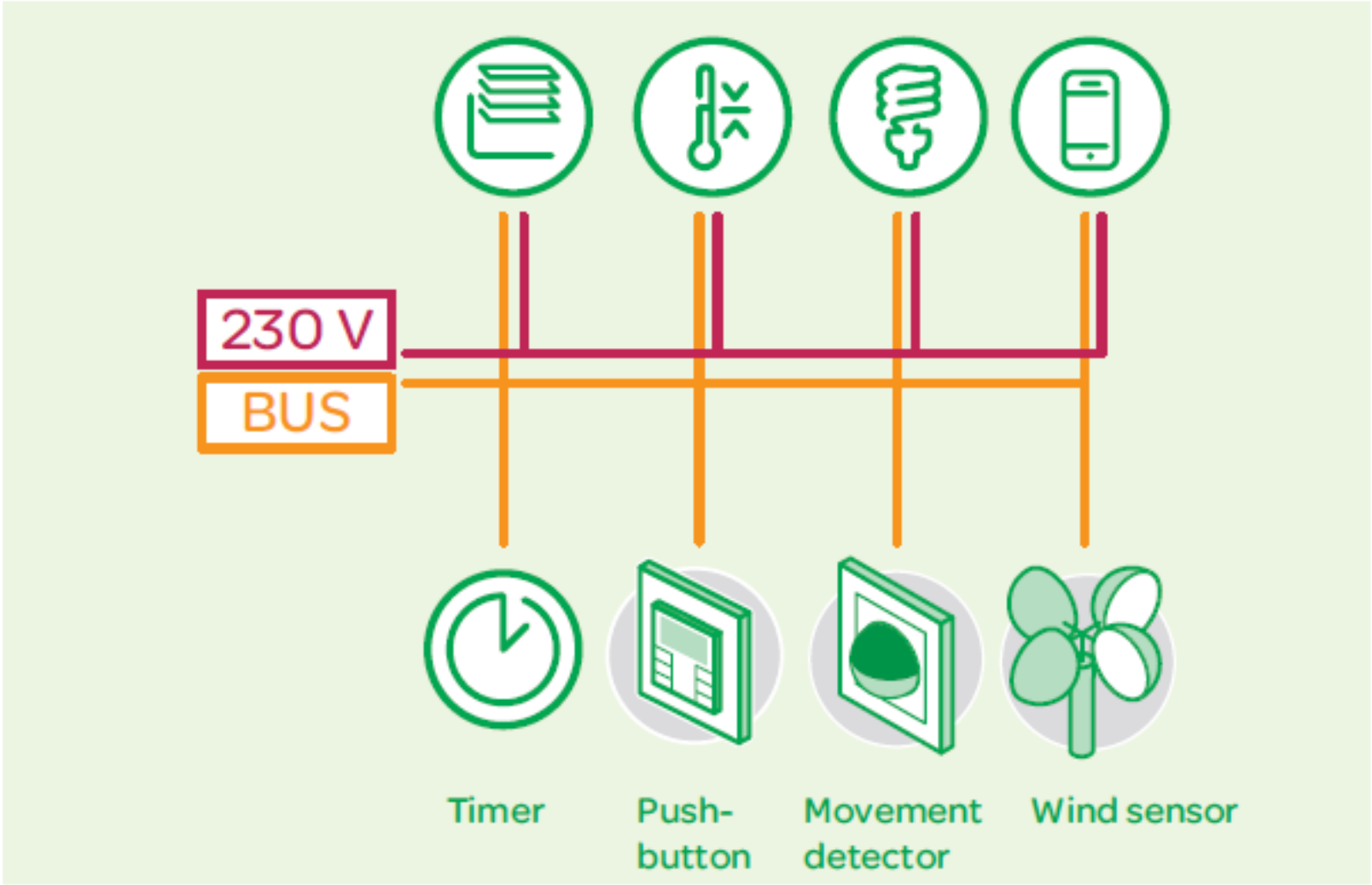
Conventional installation

- Every function is realized with one or more cables
- More functions = more cables
- Each function must be planned in detail before installation
- If a function should be changed, the physical installation has to be changed
- Each device is used for one function only
- Even low level interaction between different functions become complex and cost intensive



Bus installation

- Only one cable (the bus) for all information = less control cables
- Functions depends on programming
- Change of functions without touching the installation is possible
- Multiple use of single devices
- Complex interaction between different functions are easy



Schneider KNX

Introduction

Responsibility :

• DIN Rail Components :

Switching / Shutters / HVAC actuators etc…

•Switches, Motion / Presence detectors etc…

• Wiring Accessories :

Schneider factory : merten GERMANY

Building functions

Generally handled by KNX

One system for many functions

KNX Comparison

- **Multi units**

Only one

- Lights
- HVAC
- Blinds
- Music

Benefits

bus system, standard, multi-trade

Flexibility

Planning, Installation, Adaptation, Use, Multi-vendor

Safety and security

Monitoring, Alarm, Fire load

Comfort

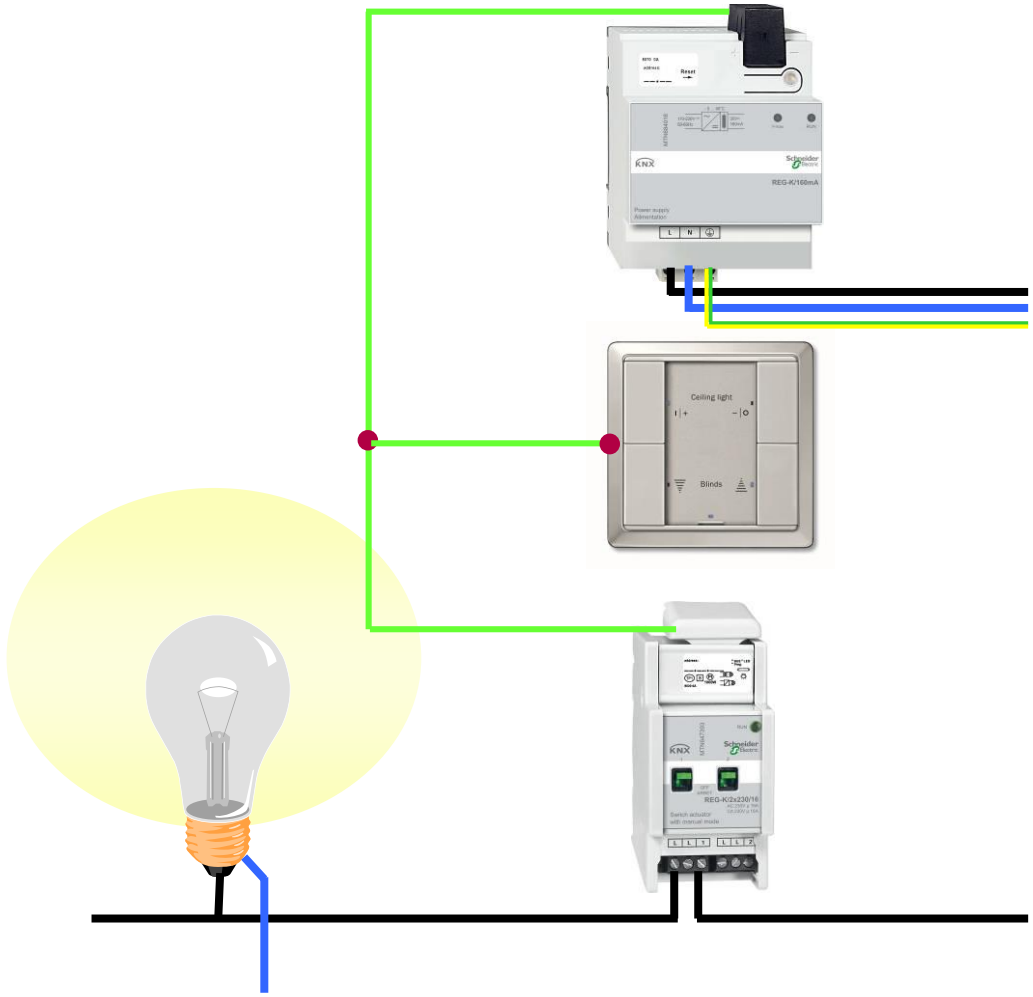
Easiness, Automatic, Scenes, Design

Cost efficiency

Energy efficiency, Adaptations, Maintenance, Multi-vendor

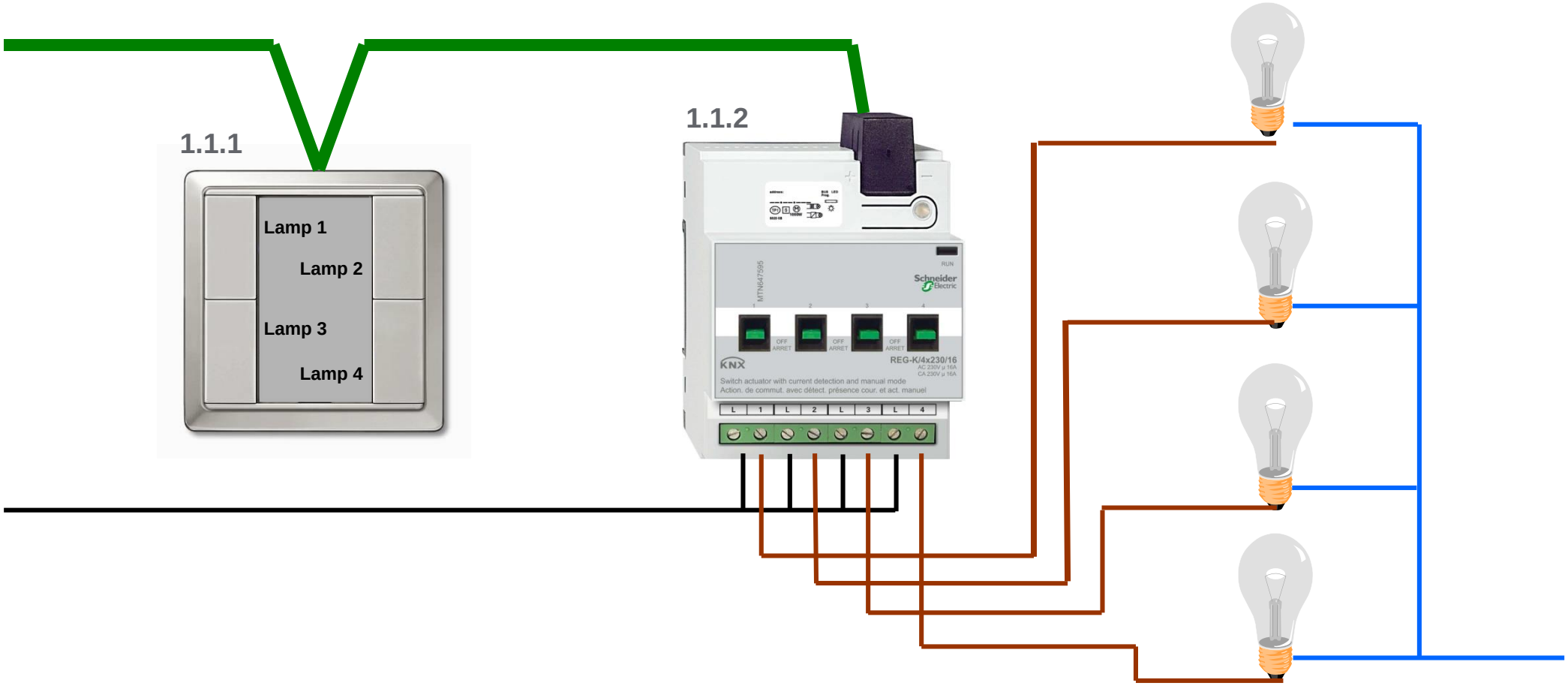
Which components does the KNX-system consist of?

- System components
  - Components to build the communicating network, e.g. power supply
- Sensors
  - Receives an external command
  - Transform it to KNX-information
  - Sends the information as telegram on the bus
- Actuators
  - Receives telegram from the bus
  - Processes the information
  - Execute the function

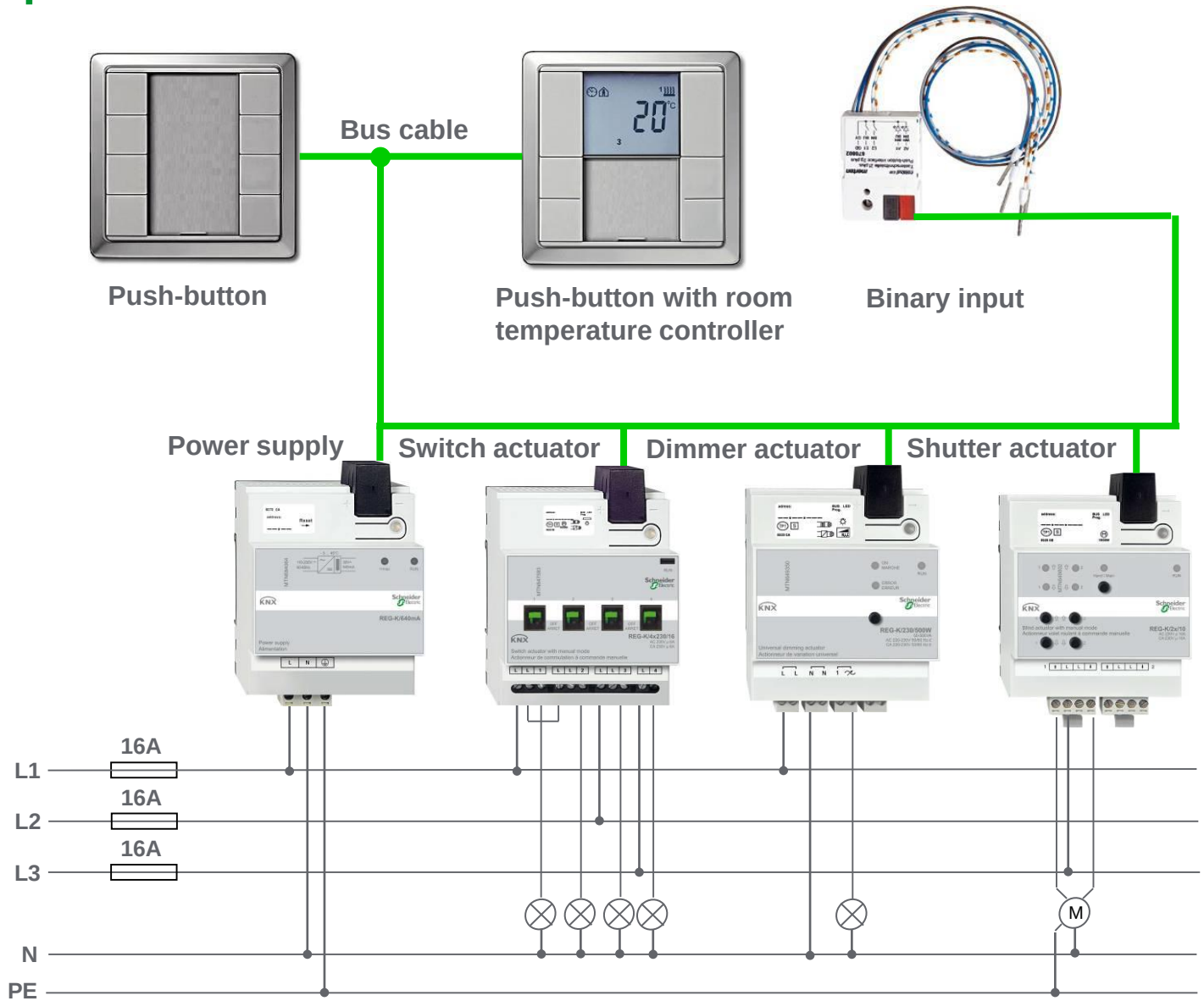


Practical example

Physical connections - cable



Example of connection within a bus line

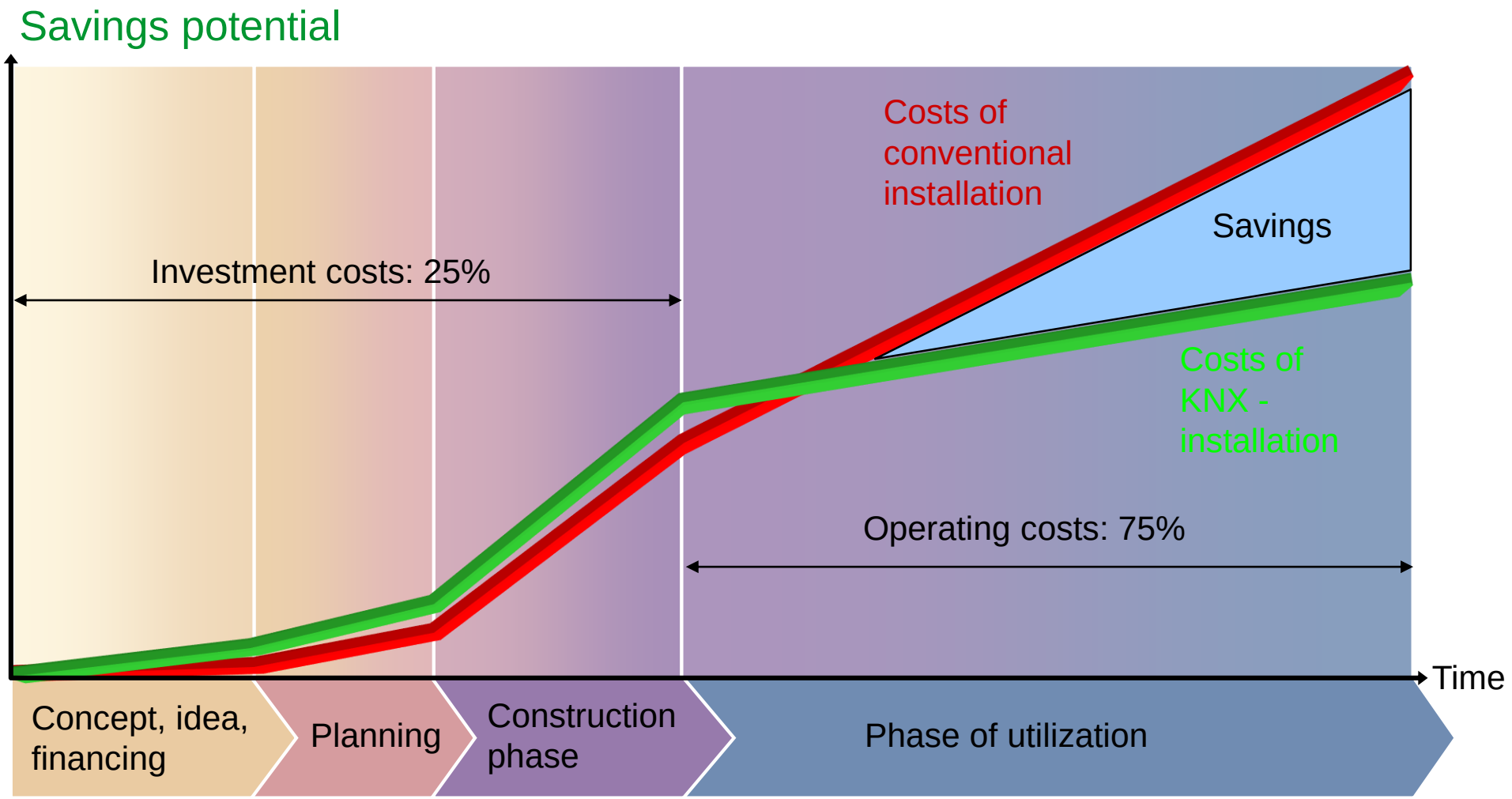


Topology within one bus line

- Free topology (mix of line, tree and star, but no loop)
- max. **64 bus devices**
- max. **1000 m bus cable**
- max. **350 m between** power supply and device

Savings with KNX

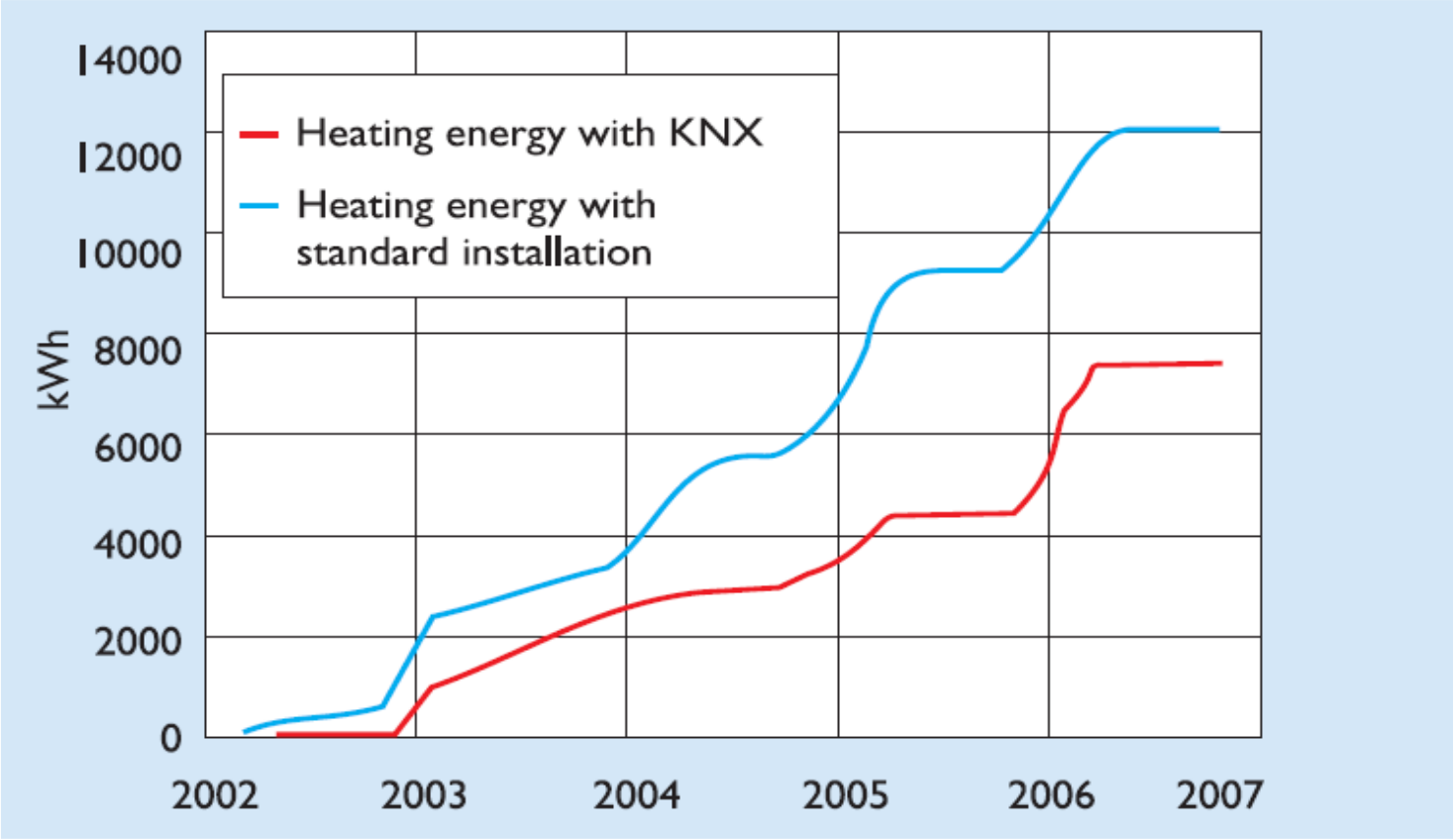
Installation saving



Energy savings with KNX

- Energy Efficiency
  - Closely connected with the KNX building system engineering is the comfort of controlling:
    - Shutters and blinds.
    - Lighting system.
    - Heating system and air-conditioning.

- Furthermore this comfort brings energy savings of up to **50%** as new researches documented
  (**Source:** *www.iia.hs-bremen.de/KNXEnergieeffizienz)*



Bus Devices

Power supplies

- For generating the bus voltage for a line with up to 64 bus devices.
- With integrated choke to decouple the power supply from the bus and a push-button to disconnect the power and reset the bus devices connected to the line.
- One PS needed for each line segment.
- Normally one use 640 mA, but other versions are also available.

640 mA

320 mA

160 mA

Backup for PS

- Used for backup of one line
- To be completed with a battery

Couplers

- Line coupler, backbone coupler and line repeater in one device
- The placement in the network decides the name of the device
- Two tasks:
  - Filter data traffic
  - Electrical divider between two PS

KNX/IP router

- Can replace couplers as both line and backbone coupler

Programming interface USB

- Used mostly for programming the KNX
- DIN rail mounting and flush mounting

Push-buttons

- Control the functions with push-buttons in excellent design of your choice

System M
4-gang

Artec
4-gang

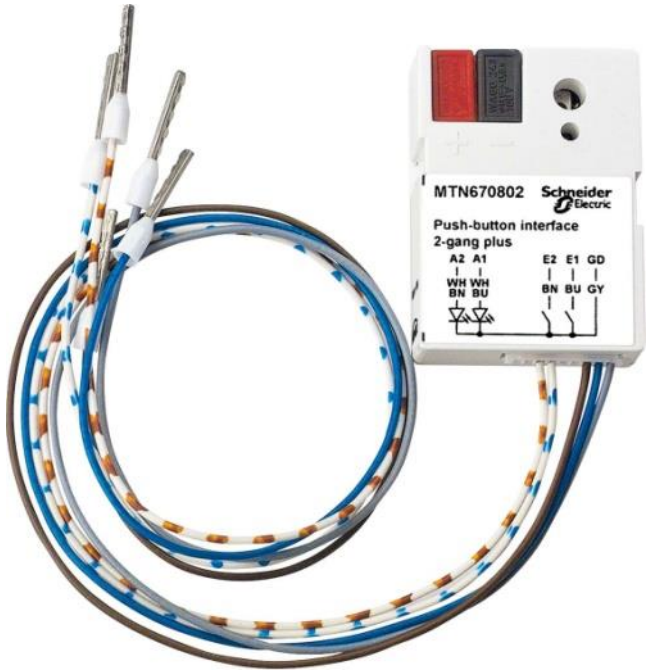
Unica
2-gang

Altira
2-gang

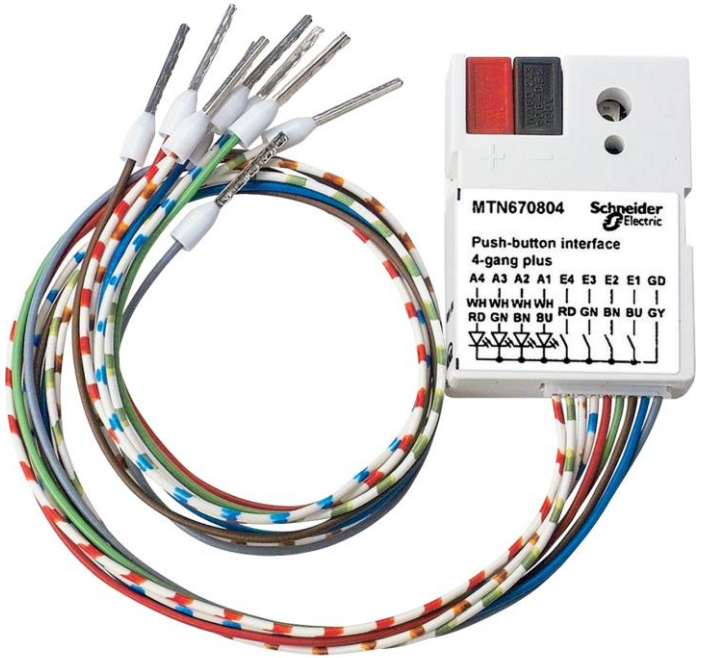
Push-button interfaces

Characteristics

- Generates an internal signal voltage for connecting two conventional push-buttons:
  - 2-gang / 4-gang plus



Push-button interface
2-gang plus



Push-button interface
4-gang plus

Binary Input
Characteristics

- For connecting four conventional push-buttons or floating contacts to the KNX:
  - 4 and 8 inputs for 10V, 24V and 240V.

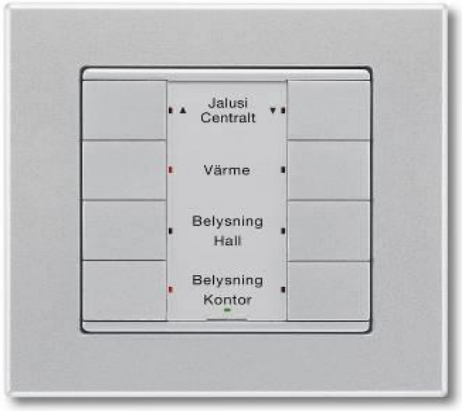
Binary Input
Inputs: 4

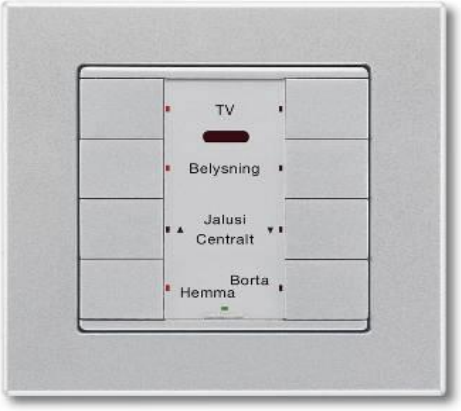
Binary Input
Inputs: 8

KNX Push-button plus

System M

- Push-buttons with integrated bus coupler (completed only with a frame)
  - 1-gang = 2 buttons / 2 LED’s
  - 2-gang = 4 buttons / 4 LED’s
  - 4-gang = 8 buttons / 8 LED’s
  - 4-gang+IR = 8 buttons / 8 LED’s / IR-receiver
- Red status LED’s, green operating LED
- Labelling
  - Labelling field for own printed labels
- 7 colours
  - Glossy: white, polar white, active white
  - Matt: white, polar white, anthracite, aluminium
- Installation
  - In wall boxes for flush and surface mounting





KNX Control and display devices

KNX Multitouch Pro

- Comfortable room controller for controlling up to 32 room functions and the room temperature.
- All functions are displayed on a touch screen and are called up using simple finger movements.
- The user chooses from 3 interface designs that can be freely assigned to the room
- functions. The room temperature control can be shown in 2 different designs.
- With room temperature control unit, display and connection for the remote sensor.
- The room temperature control unit can be used for heating and cooling with infinitely adjustable
- KNX valve drives or to trigger switch actuators and heating actuators.

KNX ARGUS 180, flush-mounted

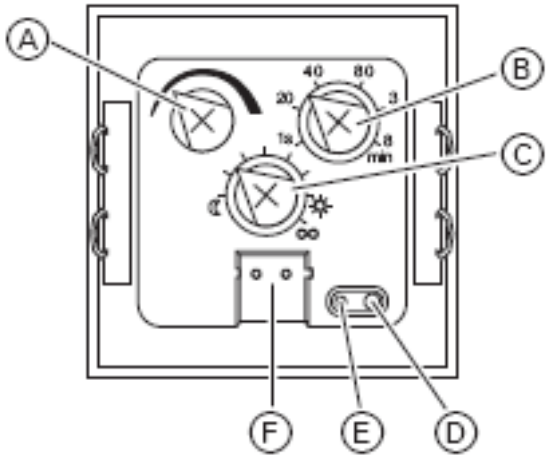
System M and Artec (Antique, Trancent)

Artec

System M

- With integrated bus coupling unit
- For wall mounting: height 1,1 m
- Area of detection: 180°
  - Range: radius 8 m

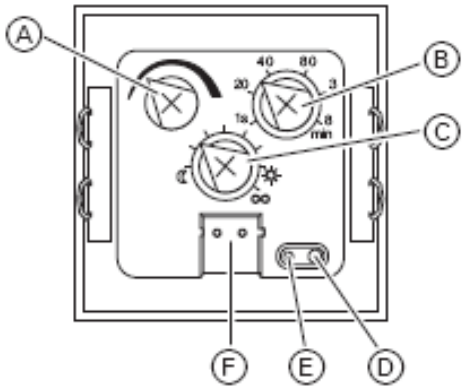
- Software / Settings
  - Light sensor: infinitely adjustable by ETS or potentiometer
  - Time: adjustable in steps from 1 s to 8 min or adjustable from 1 s to 255 hours (ETS)
  - Range: infinitely adjustable (ETS or potentiometer)



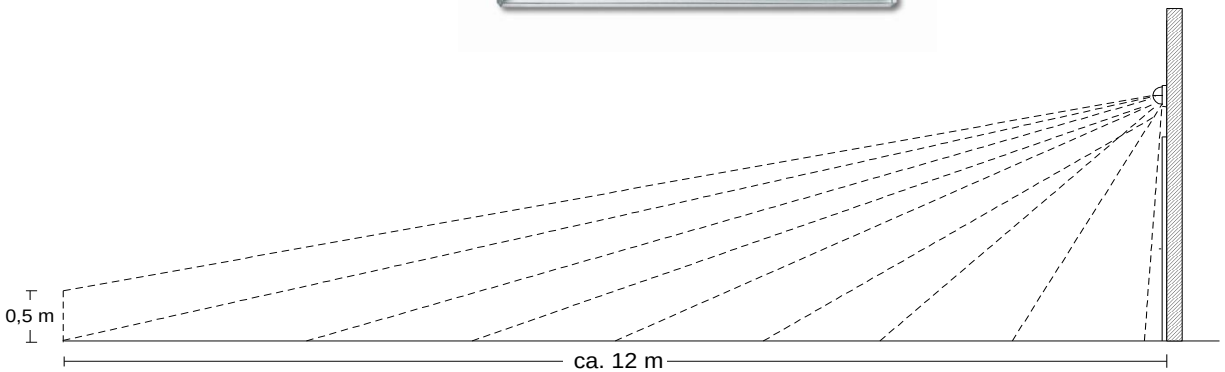
KNX ARGUS 180/2,2 m, flush-mounted

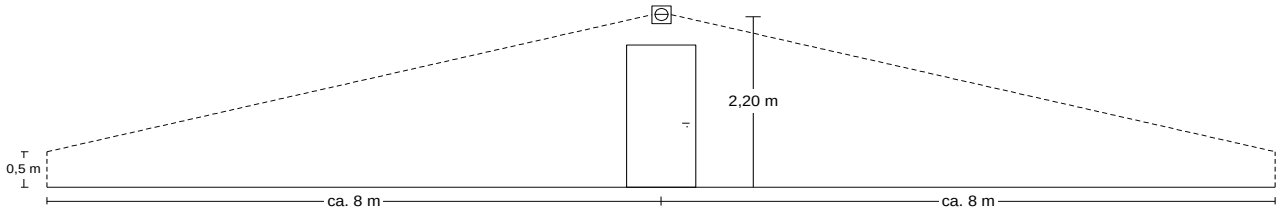
System M

- Notes
  - Set the brightness value after installing the covering segments
  - Good area of detection data



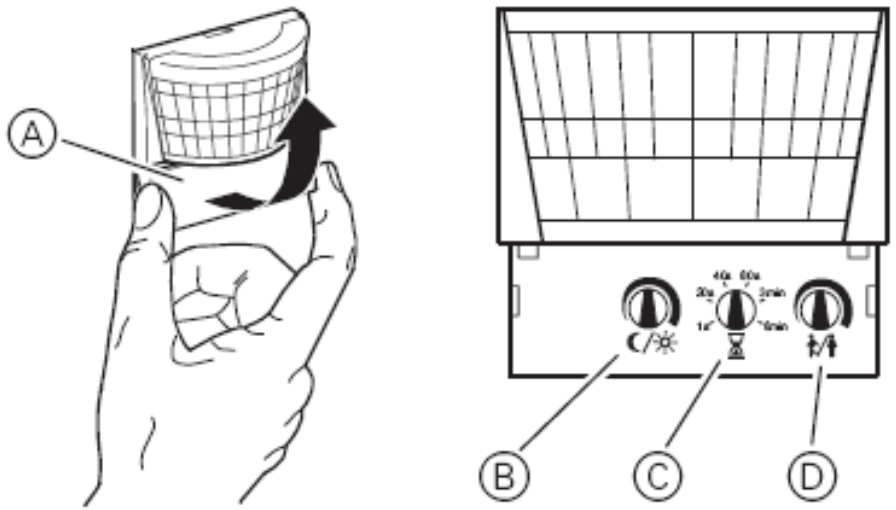
Ⓐ Setting the range
Ⓑ Setting the overshoot time
Ⓒ Setting detection brightness
Ⓓ Programming button
Ⓔ Programming LED
Ⓕ Bus connection

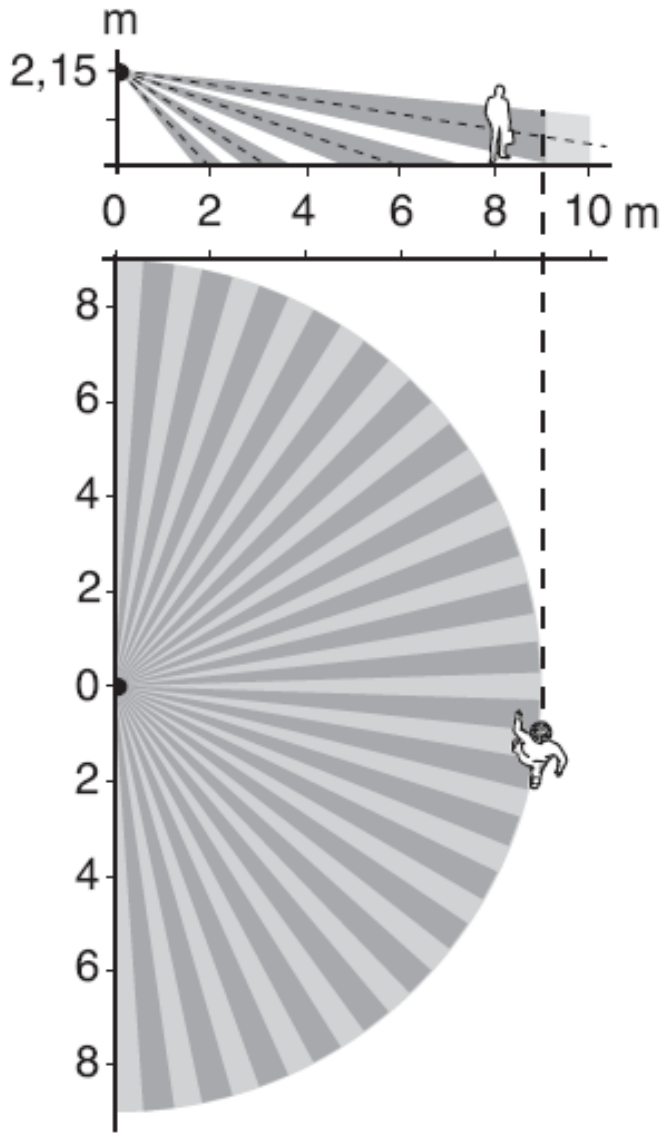




KNX Movement detector 180, flush-mounted

Unica, Altira





Ⓐ Cover

Ⓑ Setting the detection brightness

Ⓒ Setting the overshoot time

Ⓓ Setting the range

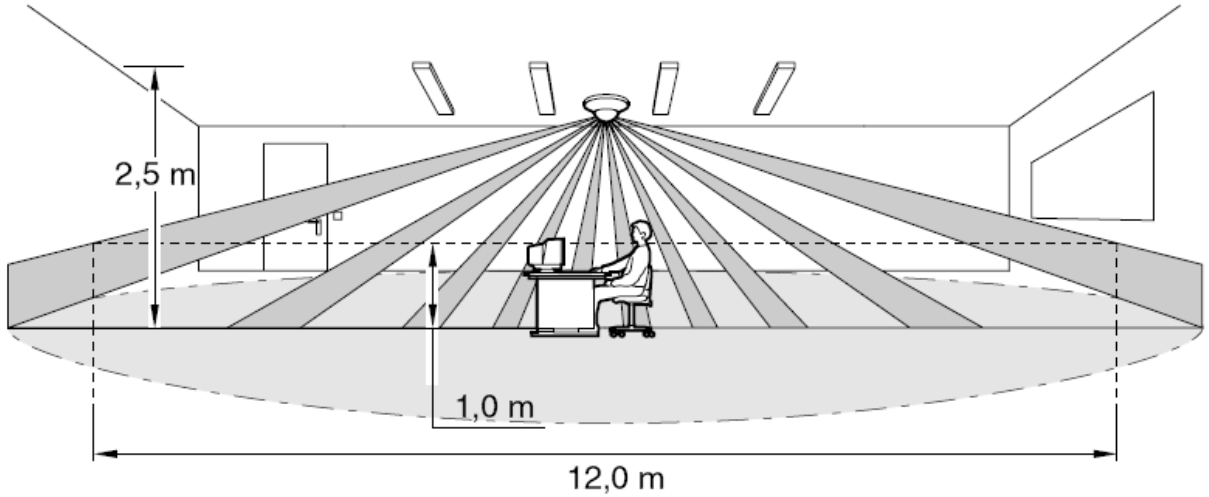
KNX ARGUS Presence detectors

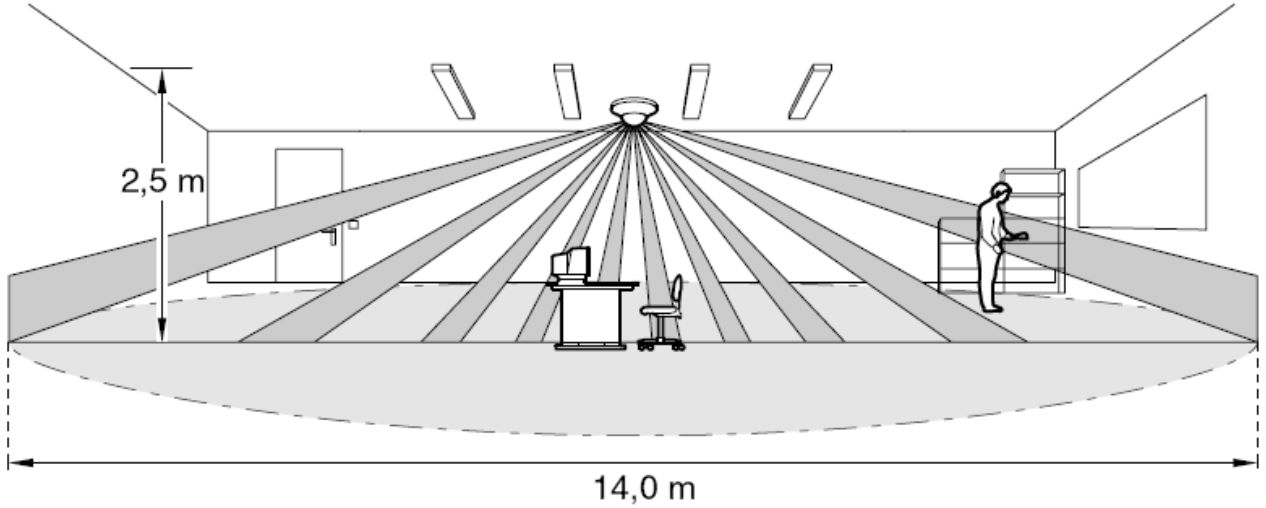
- ARGUS Presence Basic
  - Polar white MTN630719
  - Aluminium MTN630760
- ARGUS Presence
  - Polar white: MTN630819
  - Aluminium : MTN630860
- ARGUS Presence 180/2.20m (System M only)
  - Polar white: MTN630419
  - Active white: MTN630425
  - Anthracite: MTN630614
  - Aluminium: MTN630660
- ARGUS Presence with light control & IR-receiver
  - Polar white: 630919
  - Aluminium: 630960

KNX ARGUS Presence detectors

Hardware – ceiling mounted

- Angle of detection : 360°
- Number of movement sensors : 4 (separately adjustable for 6308xx and 6309xx)
- Max range (mounting height 2,50) : radius 7 m
- Light sensor : threshold value 10-2000 Lux via ETS
- IR-channels (6309xx): 10 for KNX-telegram and 10 for configuration

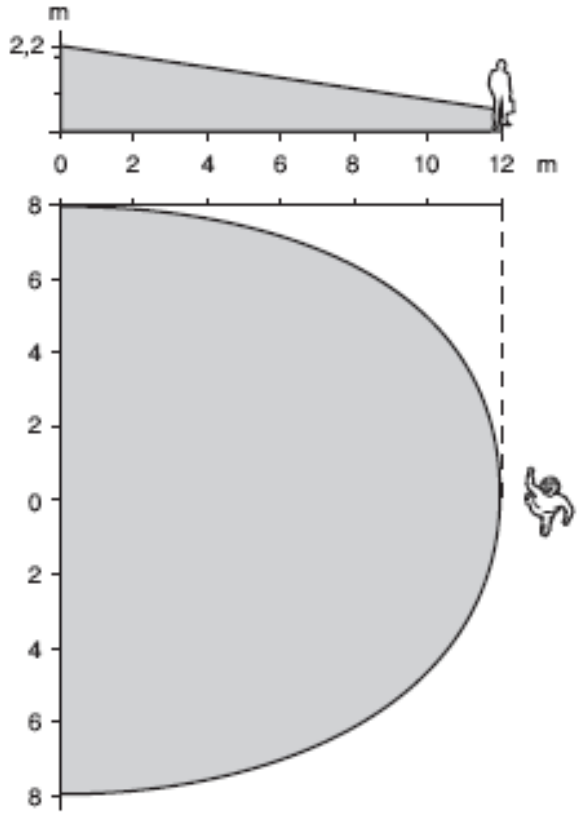


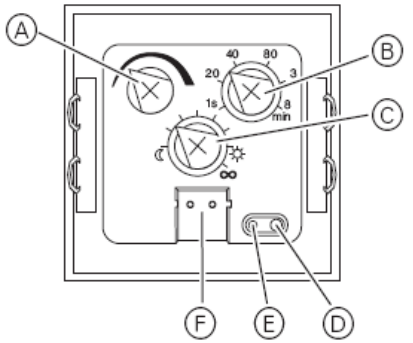


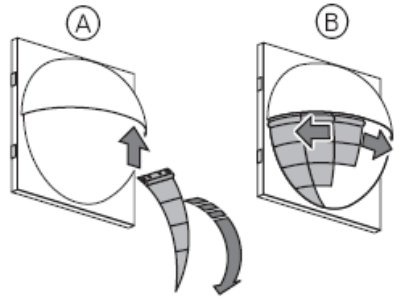
KNX ARGUS Presence detectors

Hardware – wall mounted

- Angle of detection: 180°
- Number of movement sensors: 2 (separately adjustable)
- Max range (mounting height 2,2 m): 8 m right/left, 12 m to the front
- Light sensor: threshold value 10-2000 Lux
  via ETS, or via potentiometer
- Time: 1 to 255 hours via ETS, or in steps from 1 s to 8 min via potentiometer
- Range: 10%-100% via ETS or via potentiometer
- *Note: Set the brightness value after installing the covering segments*







Switch actuators

- Switching of lights, outlets etc.
- 6, 10 and 16 amps.
- All with manual control in front.
- 16A also in version with current detection.

Channels: 2

Channels: 4

Channels: 24

Channels: 8

Channels: 12

230V dimmers

- Universal dimmer
- Detects automatically the load at first connection
- Manual control in front
- 1, 2 and 4 channels
- 4 channel version can be connected to different phases

Channels: 1

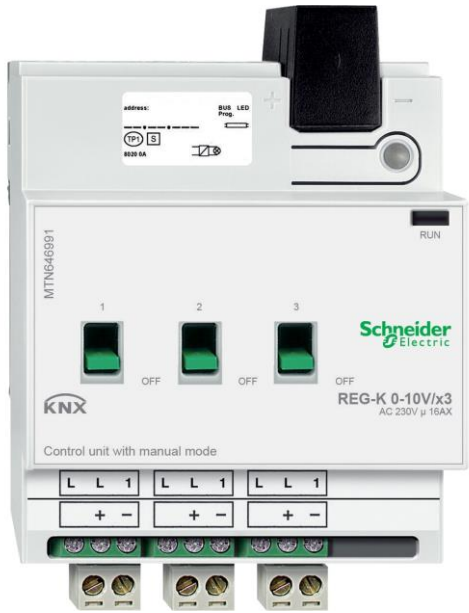
Channels: 2

Channels: 4

1-10V dimming

- For lamps with 1-10V ballast
- Available in 1 and 3 channels
- Up to 50 lamps pr channel
- 16A relay to cut off power at switch OFF

Channels: 1



Channels: 3

KNX-DALI Gateway

- Switching and dimming of 64 DALI ballasts in 16 grupper
- 16 scenes
- Can control all 64 ballasts individually
- Integrated web server
- Connection of PDA, PC or LAN via RJ45

Heating and cooling control

RTR with push buttons

- Room Temperature Regulator
- Heating and cooling and fancoil
- 4 or 8 freely programable buttons
- Scene module
- System M and Artec

Room temperature control unit for properties

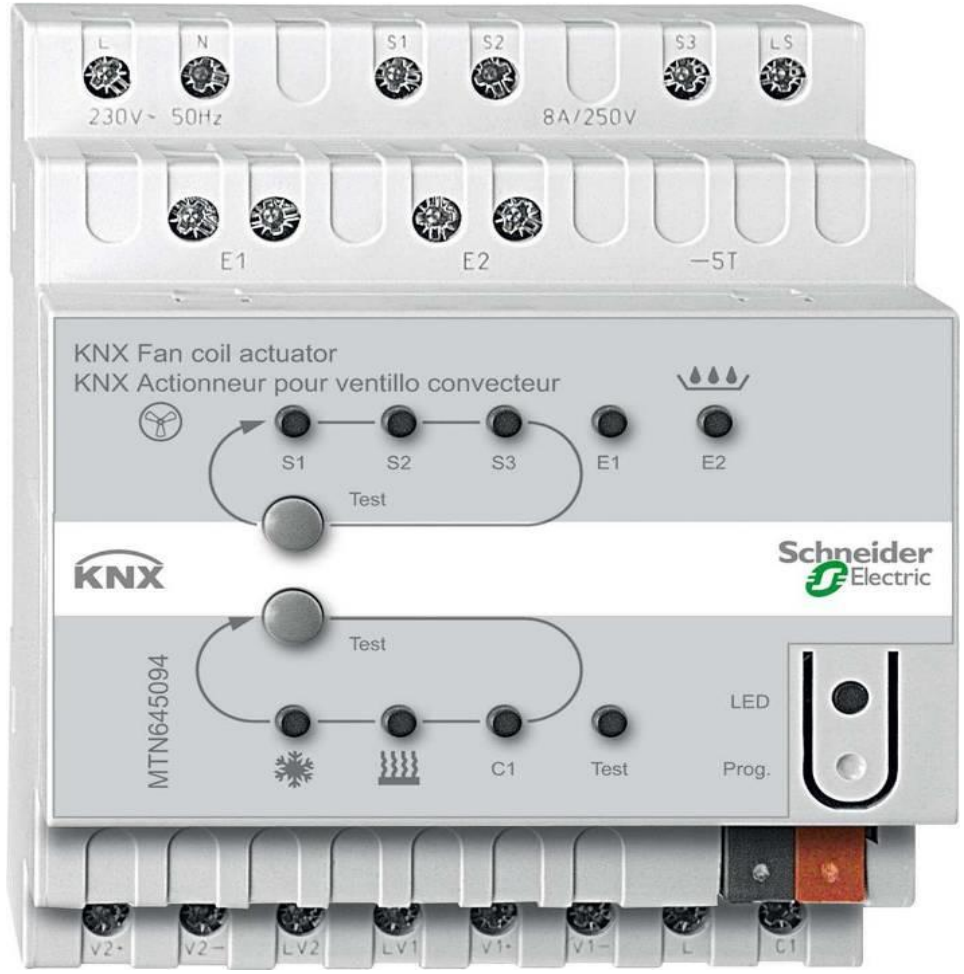
System M

- Functions
  - Room temperature controller.
  - Same functionality as the one with display but no indication or buttons.
- Integrated bus coupler (mono-block)
- Only available in System M

Fan coil actuator REG-K

Overview

- Actuator for controlling a fan coil unit with a heating / cooling valve, up to 3 fan speeds
- 2- or 4-pipe systems can be used
- 2- or 3-point valve drives can be used
- Can be controlled by the multi-function push-button with RTC
- 2 inputs: for window contact or drip tray monitoring
- Auxiliary switch output 16 A for additional functions
- Test mode to check the system during commissioning or trouble shooting



Weather stations

- Measuring
  - Wind
  - Temperature
  - Rain
  - Light level
- Used for controlling blinds and outdoor lighting

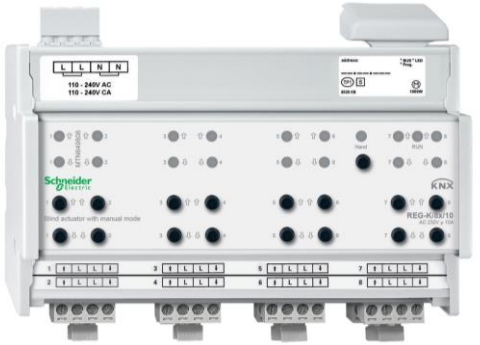
Blind actuators

- 2, 4 and 8 channels, also combi devices with up to 12 channels
- Manual control in front
- Advanced setup with weather station
- 10A relays
- Locking functions
- Good possibilities to adjust the running time

Channels: 12

Channels: 2

Channels: 4



Channels: 8

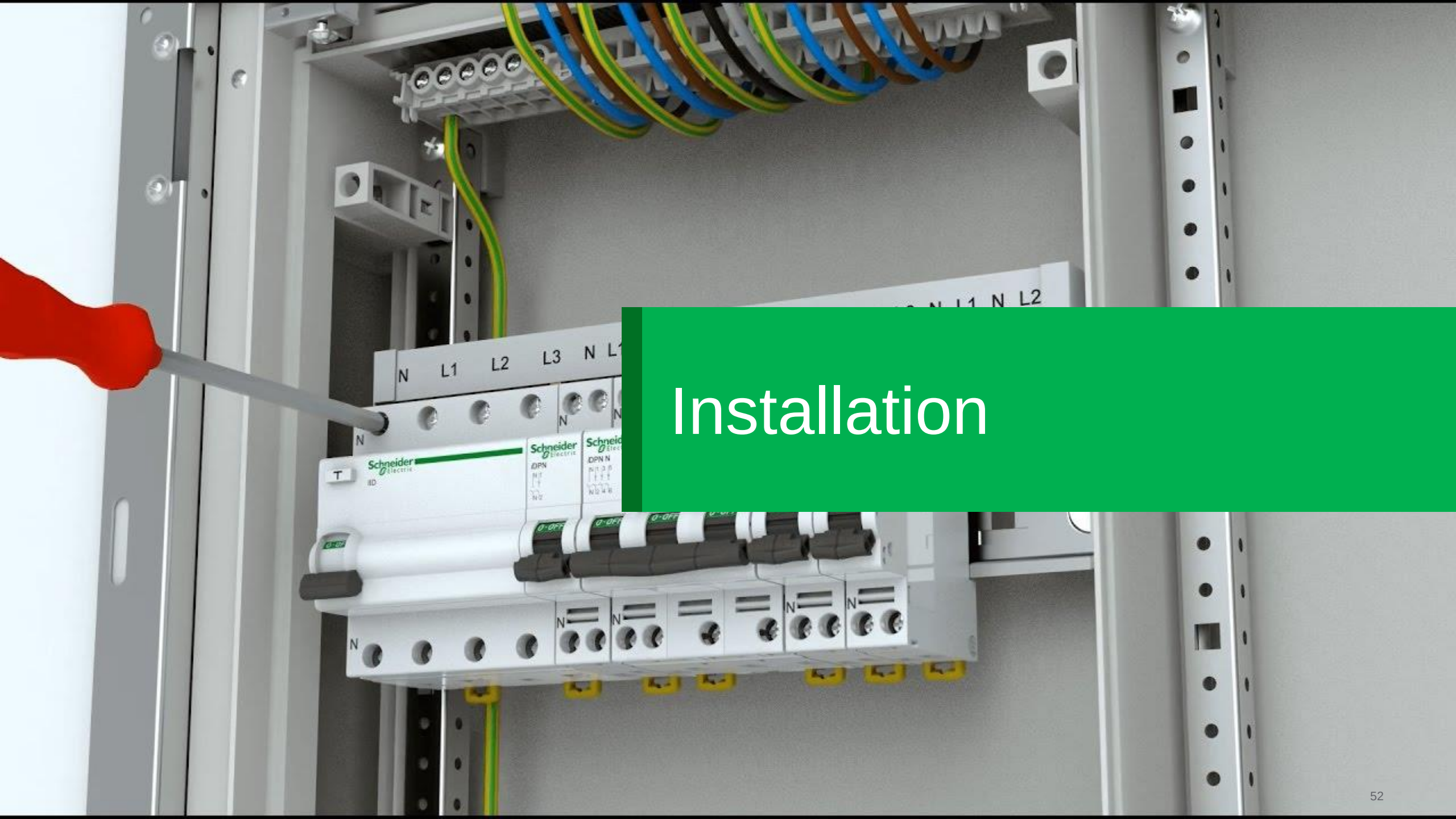
INSPINIA
02 January
Sunday
07:48
2°
Windy
MAP
DASHBOARD
SMARTHOME
ROOM 1
ROOM 2
ROOM 3
ROOM 4
ROOM 5
INTERCOM
SECURITY
CONCIERGE
CAMERAS
SETTINGS
ROOM 1
Default
ON
Default
ON - OFF
Default
ON - OFF
Default
STOP
Default
0°C
25
Touchscreen

10” Touch panel

- Freely programmable interface
- Separate software, not inside ETS
- Communication via TP or IP

7” Touch panel

- Lights, blinds or temperature can be controlled from one central point in the house
- Simulate presence function that the house looks occupied even when no one is at home
- A nice improvement of your existing installation



Installation

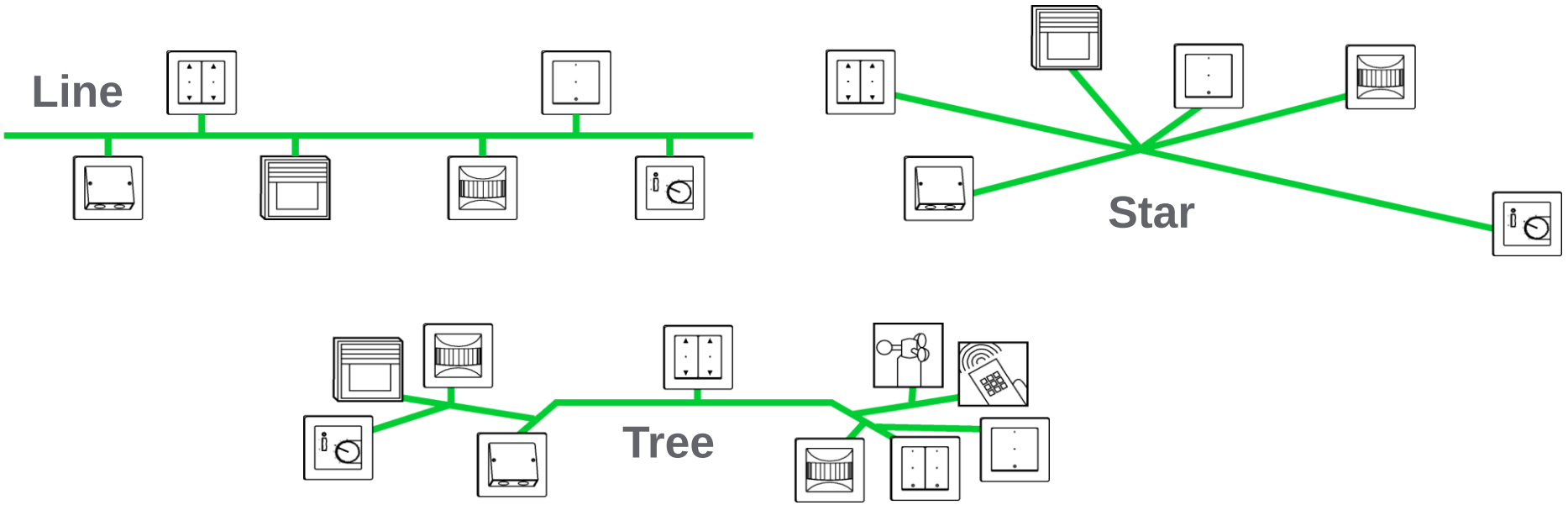
Bus cable

- Data transfer and power supply via 2 twisted wires (red/black)
- Spare pair (yellow/white)
- Installation together with 230/400 V permitted
- Schneider Electric strongly recommends using an KNX/EIB-certified bus cable.

Bus cable installation (twisted pair, TP)

Free topology

- The topologies line, star and tree can be combined
- Rings have to be avoided
- KNX does not require terminating resistors



Bus cable installation

- It is allowed to install the bus cable in the same pipe as power cables / min 19 mm pipes
- Bus and power cable cores may be present in the same installation box if the safety separation of the bus and power cable cores in the installation box is guaranteed by the installation.

E.g. boxes with fixed terminals or partition wall

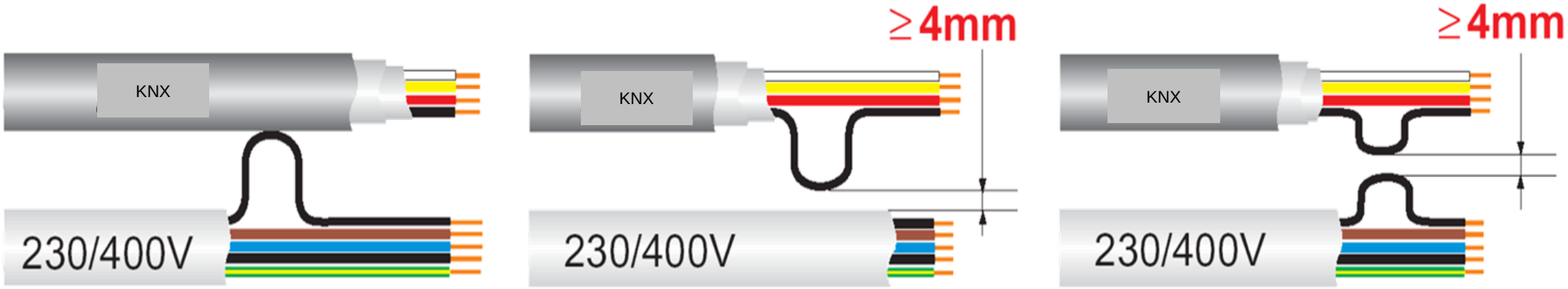
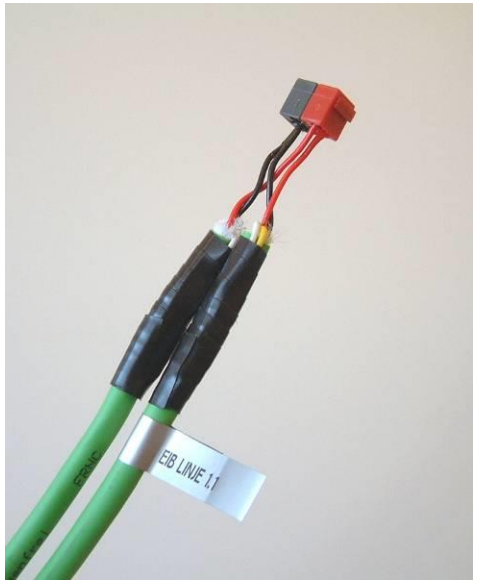


Fig. 2: Distance between KNX cable and mains

Bus connection terminal/ Spare pair branch terminal

- Supplied with almost all bus devices
- 4 plug-in terminals per wire
- Can be used for branch off in a conjunction box



Communication and Topology

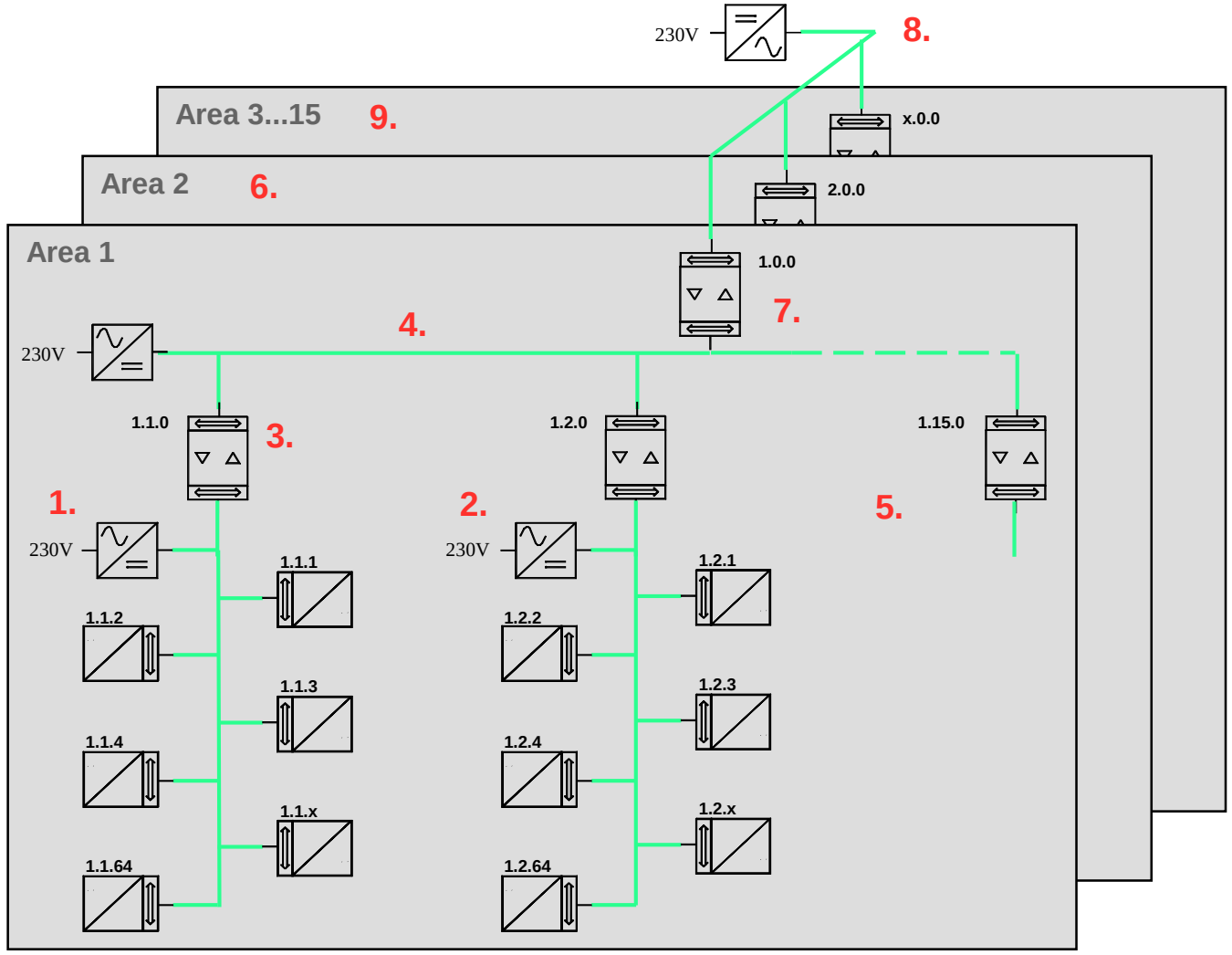
Bus access and data exchange

- KNX is a decentralized and event-controlled bus system, i.e. no central unit
- All connected bus devices can exchange data between each other, packed into telegrams and sent over the bus (serial transmission of “1” and “0”), e.g. from a sensor (the command output) to one or more actuators (the command receiver).
- Transmission rate: 9600 bit/s
- Average transmission time for sending and confirmation of a telegram is approx. 25 ms

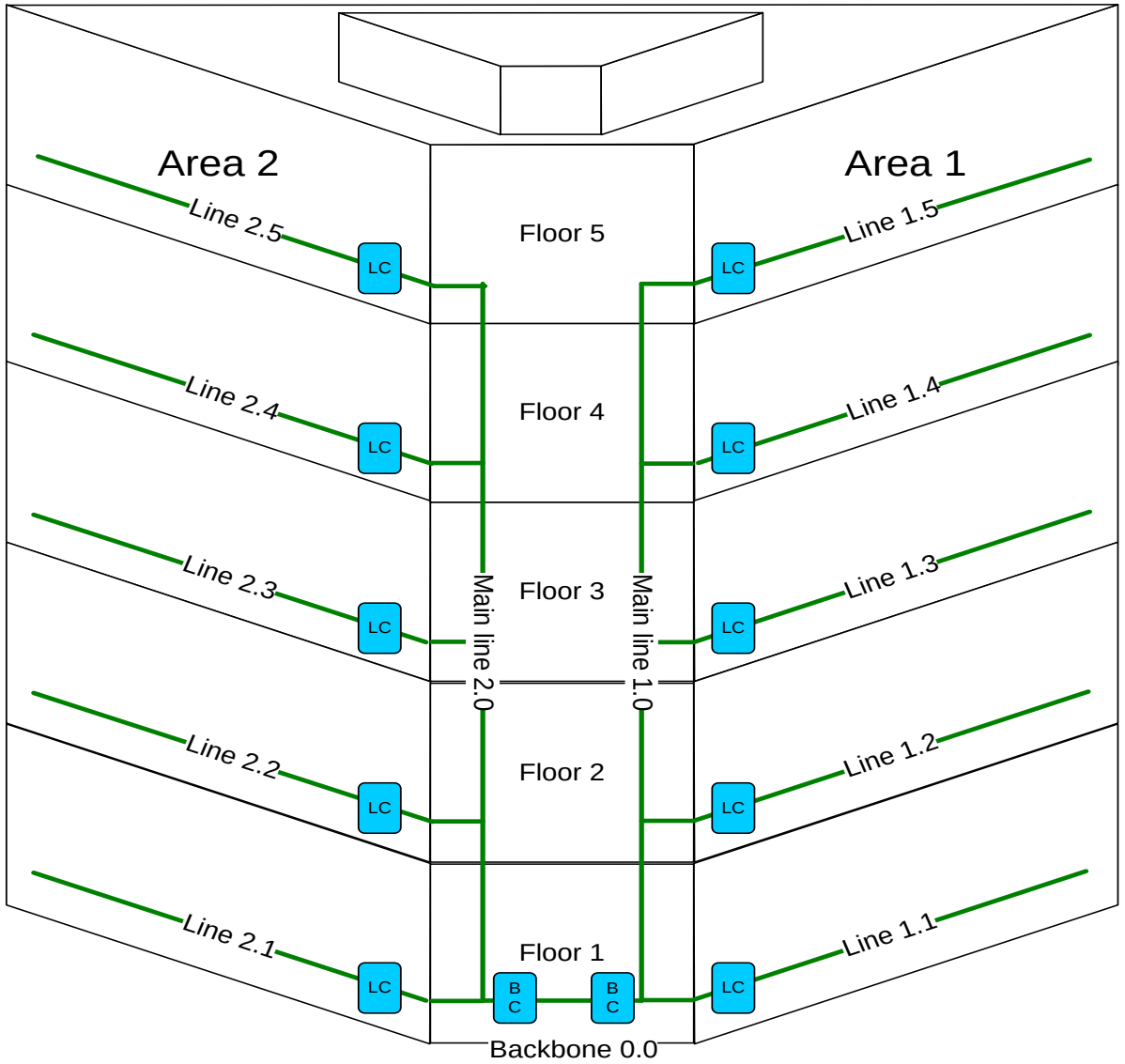
KNX topology

Twisted pair only

1. 1 Line = up to 64 devices
2. > 64 devices => New Line
3. Connect 2 Lines = Line couplers
4. Main line of the Area
5. 1 Area = up to 15 Lines
6. > 15 Lines => New Area
7. Connect 2 Areas = Area couplers
8. Area Line (Backbone)
9. Up to 15 Areas



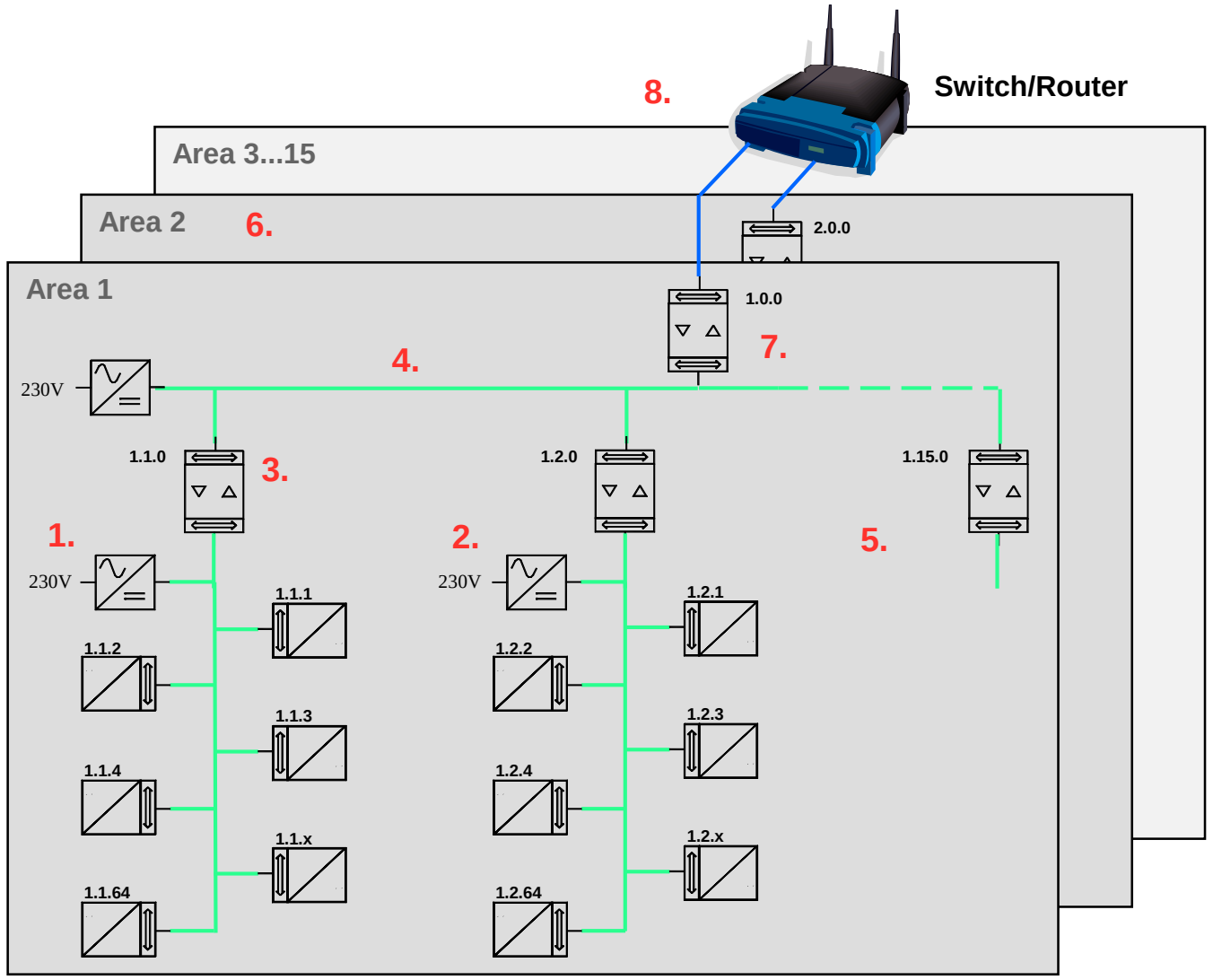
Topology - Structure in building



KNX topology

Twisted pair and Ethernet backbone

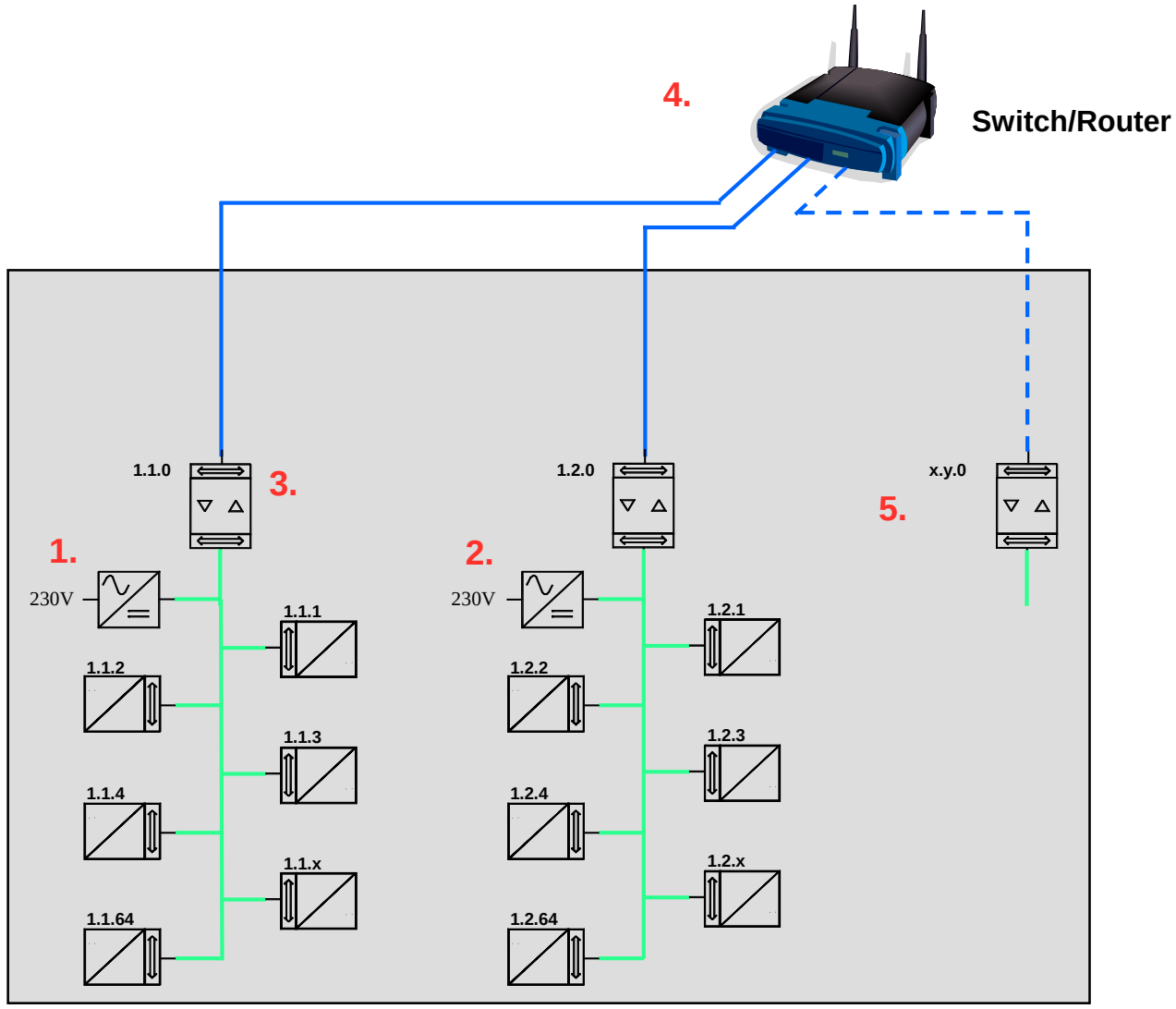
1. 1 Line = up to 64 devices
2. > 64 devices => New Line
3. Connect 2 Lines = Line couplers
4. Main line of the Area
5. 1 Area = up to 15 Lines
6. > 15 Lines => New Area
7. Connect 2 Areas = KNX/IP router Replaces Area Couplers
8. Area Line (Ethernet backbone)
9. Up to 15 Areas



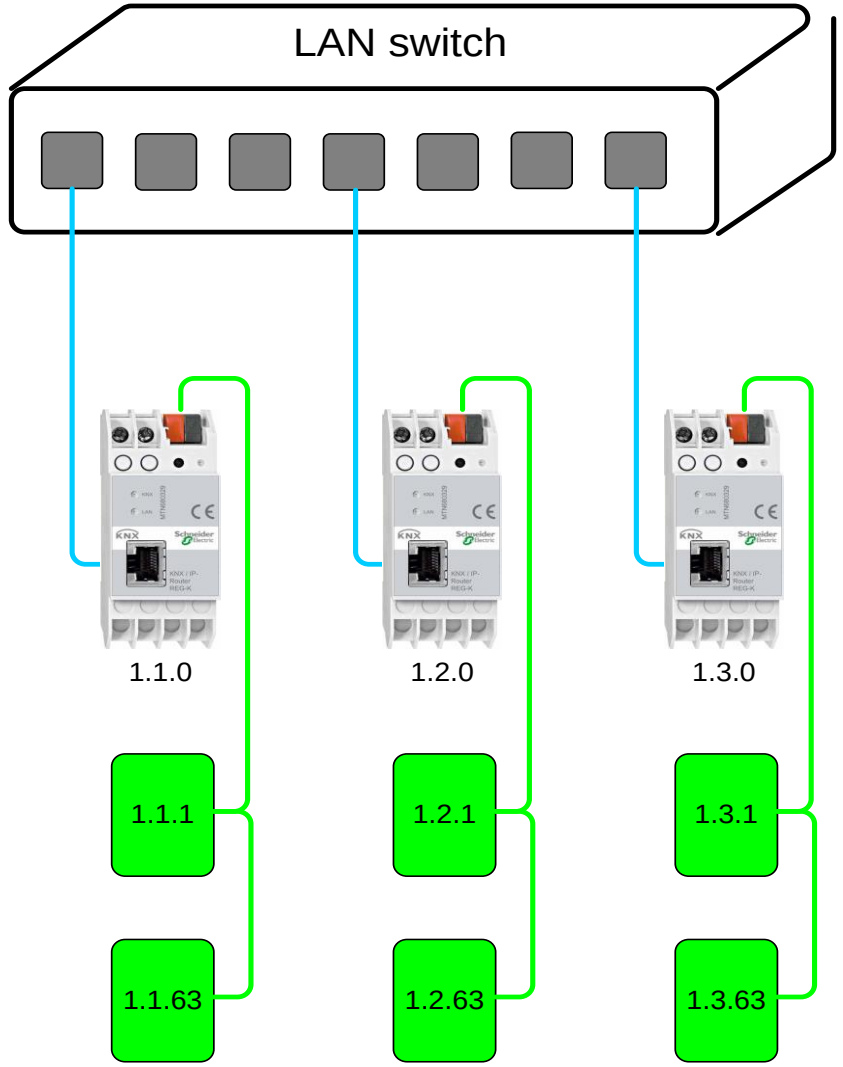
KNX topology

Twisted pair and Ethernet backbone

1. 1 Line = up to 64 devices
2. > 64 devices => New Line
3. Connect 2 Lines = KNX/IP router
   Replaces Line Couplers
4. Backbone (Ethernet)
   No Area Couplers needed
5. Addressing x.y.0 (x, y: 1..15) =
   up to 225 lines

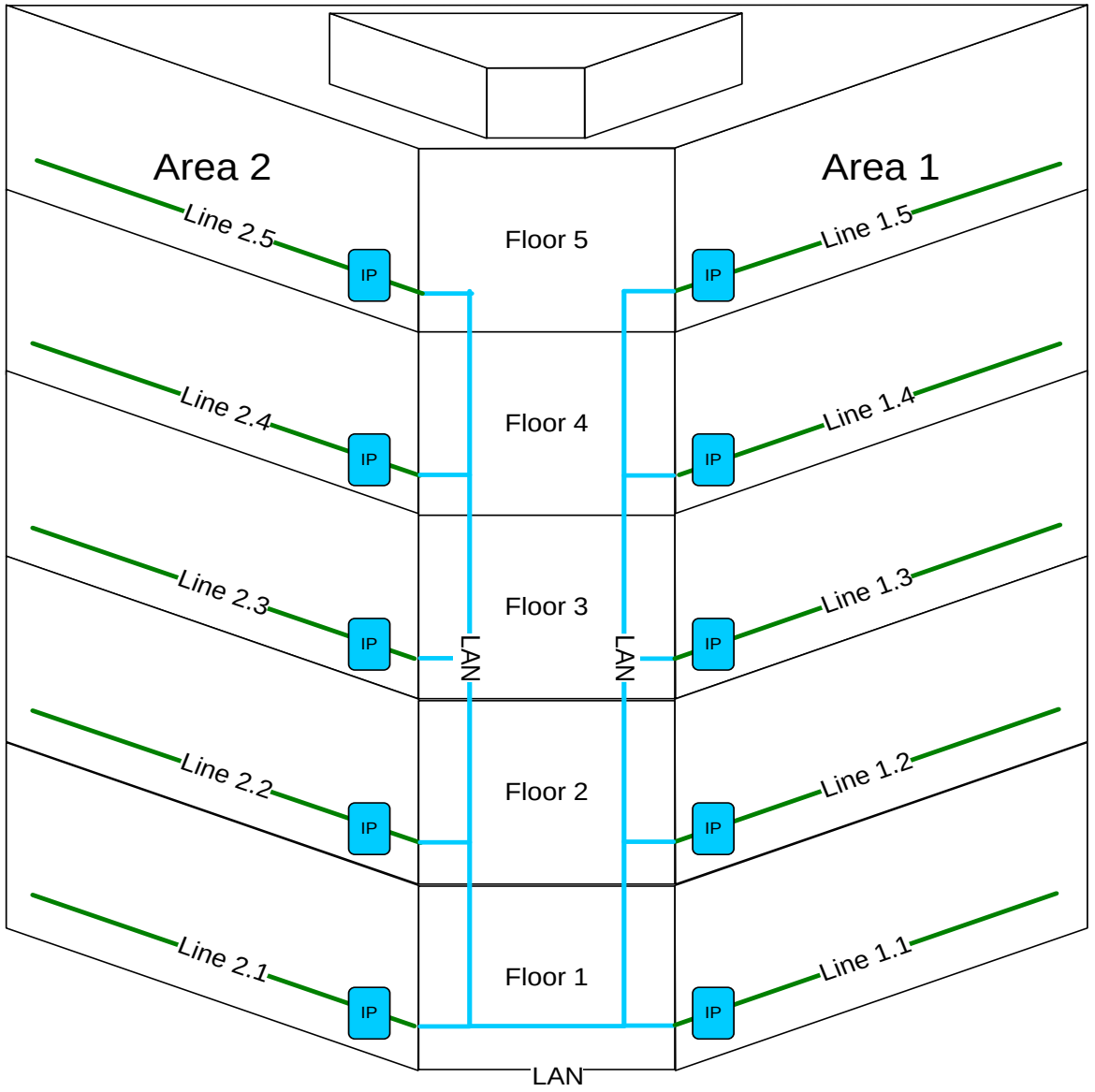


Coupling lines via the LAN network



KNXnet/IP Routing (multicast address)

Line coupler replaced by IP Router



Practical example
Group address, 3-level

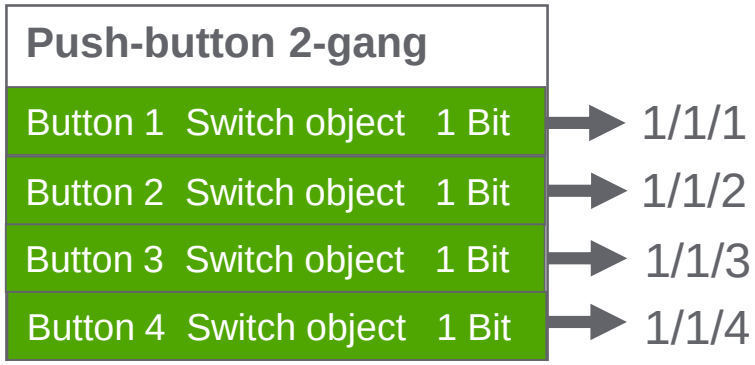
- Group addresses are generated in order to determine the connections between the communications objects = the name of a telegram
- The group address allocates the functions to be executed
- It is divided into a main group, a middle group and a subgroup.

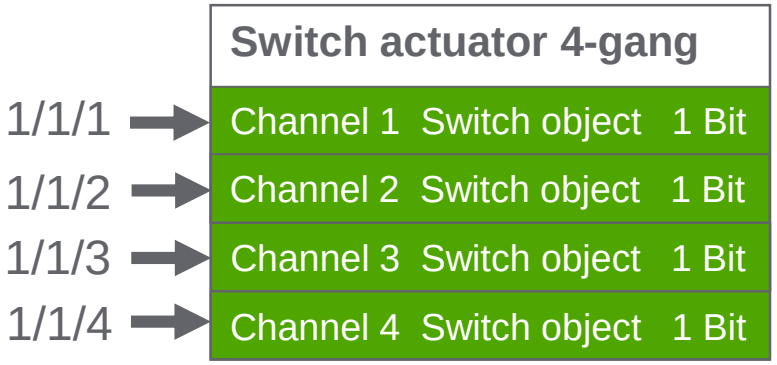
Example:

Main group	/	Middle group	/	Sub group
Level	/	Function type	/	Function
1st floor	/	Lighting	/	Lamp group 1 On/Off
1	/	1	/	1

Practical example

Logical connections - software inside the products





Command sender

- When Button 1 is pressed a telegram with group address 1/1/1 will be sent on the bus via the Switch object
- The function and thereby the value in the telegram is pre-defined in the parameters, e.g. toggle-function = the actual object value is inverted and sent on the bus, i.e. every press sends alternately ON- and OFF-telegrams
- The telegram will be received by all the sensors and actuators on the bus

Command receivers

- When telegram 1/1/1 comes to the actuator it will be evaluated and control the relay of Channel 1. If the value is 1 (ON) the relay will close and if the value is 0 (OFF) the relay will open.
- The actuator sends an acknowledge telegram
- Other actuators and sensors which does not have the group address 1/1/1 assigned will not evaluate and acknowledge the telegram

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