KNX® Flash

ABB

Exclusion of liability:
Despite checking the contents of this document deviations cannot be completely excluded. We therefore cannot accept any liability for this.

Contents

INTELLIGENT BUILDING CONTROL – A DECISIVE FACTOR

The use of new materials and the application of renewable energies are considered as the most significant innovations in the construction and building technology sectors over the last few years. How does this equate with the core component of every building – the electrical installation? Particularly in this important sector there is an enormous potential for innovation. This potential can be fully realised with “smart home and intelligent building control” with significantly enhanced flexibility, safety, economic efficiency and comfort.

ABB i-BUS® KNX – THE STANDARDISED BUS SYSTEM

The ABB i-bus® interconnects all devices and systems in the electrical installation, e.g. heating and lighting, to form a networked system using a bus cable. In a conventional building installation – where each application is separately planned and implemented – networking is only possible involving high costs and a great deal of complex technical effort. Only networking will fully unlock efficient interaction of the individual systems and enable the realisation of the full potential of the building.

Important components of the bus system are:
Sensors that “feel”, detect states and accept commands, e.g. light switches or thermostats.
Actuators that “act” and carry out commands, e.g. shutter actuators, dimmers, switch actuators.
The bus, the “data line” that interconnects sensors and actuators with one another is used for device communication and supplying the units with power.

WHAT LINKS ABB AND KNX?

ABB has more than 100,000 employees in more than 100 countries and is a founder member of the KNX Association. The ABB i-bus® conforms to the international KNX standard and is thus one of the leading intelligent building control systems world-wide. With more than 25 years of experience, ABB is one of the leading companies in the sector of smart home and intelligent building control.

ABB i-BUS® KNX – A UNIVERSAL SYSTEM

In this system, all devices “communicate” with each other via a single bus line which is installed in addition to the mains supply network. This is how the following electrical functions are interconnected within the bus system for both domestic and commercial buildings.

LIGHTING CONTROL

- Switching/dimming
- Scenes/mood lighting
- Central/group switching
- Constant lighting control

SHUTTER CONTROL

- Control of the shutters
- Weather-dependent control
- Energy optimisation

CONTROL OF HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

- Individual room control
- Reduction during night time and absence
- Presence-dependent control

SECURITY SYSTEMS

- Intrusion
- Fire
- Technical alarms (gas/water)

REMOTE MAINTENANCE/ENERGY MANAGEMENT

- Remote maintenance/fault reporting
- Load management
- Facility management

VISUALISATION

- Control
- Operation
- Synoptics/displays

Advantages for customers offered by **KNX** *or*

why our customers should choose **KNX**

THE ADVANTAGES OF THE ABB i-BUS® KNX:

- It reduces the planning, installation and wiring expenses.
- It can be expanded virtually without any restrictions and constantly adapted during the entire service life of the installation, therefore it is a secure investment in the future.
- It enables the integration of new functions at any time.
- It realises intelligent automation, e.g. heating and lighting control during absence. This saves on energy costs and makes a significant contribution to environmental protection and our carbon footprint.
- It provides simple operation and monitoring – thus forming the long-term basis for lower running costs, efficient facility management and optimum building maintenance.
- It offers a great deal of individual comfort, thereby increasing the value of the building for tenants and purchasers.
- It increases safety and security for both people and building, thus protecting the investment

KNX
THE FUTURE OF BUS TECHNOLOGY!

HOW TO PLAN IS SUCCESSFUL KNX-PROJECT:

1. Clarification of the requirements/cost estimation/approval for project development

2. Definition of the customer requirements/ determination of the functionality/structural outline of the system/project approval

3. Submission/project allocation

4. Implementation 1 = implementation planning/control planning
Implementation 2 = create programming fundamentals/material acquisition/installation/programming/commissioning

5. Acceptance/hand-over of the project/upkeep – maintenance

LIGHTING

- ❍ Operation from one or more positions
- ❍ Operation from one or more positions
- ❍ Central/group operation
- ❍ Dimming from one or more positions
- ❍ Staircase lighting
- ❍ On and off delay
- ❍ Time control
- ❍ Presence-dependent control
- ❍ Logical combination
- ❍ Daylight dependent control
- ❍ Constant lighting control
- ❍ (Light) scenes
- ❍ Status report
- ❍ Panic alarm
- ❍ Connection to DALI

SHADING/WINDOWS/ SKYLIGHTS/AWNING

- ❍ Operation from one/several positions
- ❍ Central/group operation
- ❍ Time control
- ❍ Movement to position
- ❍ Adjustment/movement of louvre positions
- ❍ Weather-dependent control (wind, rain, frost)
- ❍ Sun position dependent control (daylight reflection)
- ❍ Temperature dependent control
- ❍ Heating/cooling automatic
- ❍ Scene control
- ❍ State message
- ❍ Night cool down (window opening)
- ❍ Gutter heating control
- ❍ Control of heated areas

HEATING/VENTILATION/AIR CONDITIONING

- ❍ Individual room temperature control
- ❍ Time control
- ❍ Presence control
- ❍ Remote control (e.g. telephone)
- ❍ Boiler control/monitoring
- ❍ Window position monitoring
- ❍ Controlled ventilation
- ❍ Fault messages
- ❍ Parallel control of smoke and heat discharge systems

SAFETY FUNCTIONS

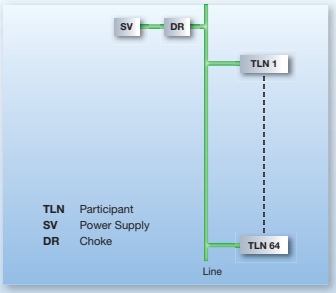
- ❍ Peripheral protection
- ❍ Internal surveillance
- ❍ External surveillance
- ❍ Smoke detection
- ❍ Water detection
- ❍ Gas detection
- ❍ Emergency call
- ❍ Internal alarm signal
- ❍ External alarm signal
- ❍ Presence simulation
- ❍ Triggering of in-house actions on alarm/arming
- ❍ Panic alarm
- ❍ Coupling of arming device with KNX
- ❍ Access control
- ❍ Connection to video monitoring

OPERATION/DISPLAY

- ❍ Intelligent KNX push buttons
- ❍ Design program
- ❍ Several operational functions from one location
- ❍ Status feedback via LED in push button
- ❍ Labelling of the functions on the push button
- ❍ Remote control via infrared
- ❍ Conventional push buttons via interface
- ❍ LCD display for visualisation and operation
- ❍ Conventional control panel
- ❍ Visualisation via PC
- ❍ Display and operation via internet/telephone/TV
- ❍ Room control via Intranet
- ❍ Voice control
- ❍ Combination with intercom system

DIFFERENT INTERDISCIPLINARY FUNCTIONS

- ❍ Detection/processing of (error) messages
- ❍ Control of watering (Garden)
- ❍ Control of water supply
- ❍ Switching of hot water circulation pumps
- ❍ Control of lavatory
- ❍ Control of water taps
- ❍ Voltage free of switching of installation
- ❍ Switching of electrical outlets/ circuits
- ❍ Monitoring of circuits
- ❍ Detection of power consumption values
- ❍ Load management
- ❍ Room occupancy display
- ❍ Interface to other systems (OPC server, IP gateway,...)
- ❍ Control of audio/video systems
- ❍ Connection of other systems via digital and analogue inputs and outputs
- ❍ Connection of power line and radio system via interfaces
- ❍ Solutions for special-needs and nursing homes
- ❍ Acquisition of operating hours
- ❍ Acquisition of weather data
- ❍ Central KNX timer



KNX *HIERARCHY*

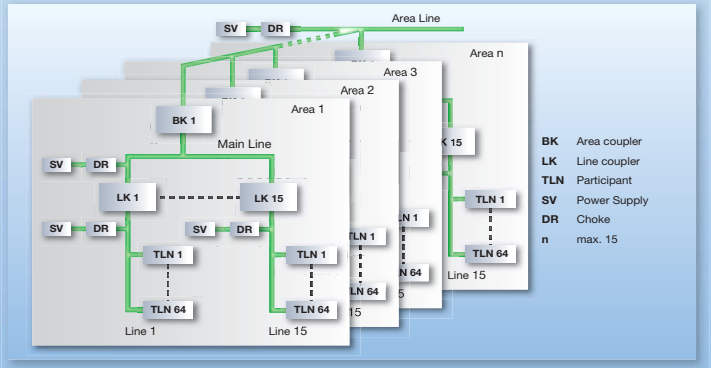
The KNX has a hierarchical structure. Using the smallest element – the bus line – up to 64 bus devices can be connected without a line repeater. The use of a line repeater allows up to 256 devices to be connected.

The bus can be implemented using a tree or star topology.
A defined sequence for the devices is not required.

KNX *TOPOLOGY*

Up to 15 lines can be joined to form an area via a so-called line-coupler. Up to 15 areas of this kind can be coupled to one another by an area coupler.

This arrangement enables a very clear and easily extendable system, which can include up to 14,400 components without the need for line repeaters. A system with a line repeaters can cover more than 60,000 devices

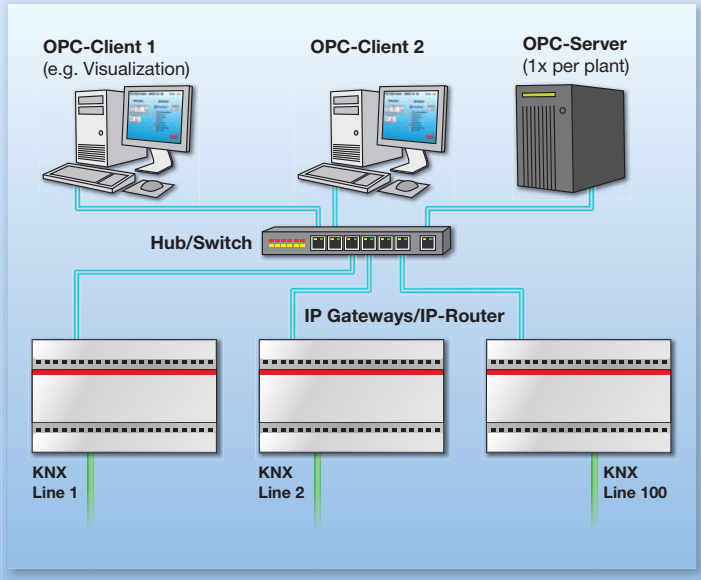


KNX *IP HIERARCHY*

IP networks have now become standard in larger buildings.

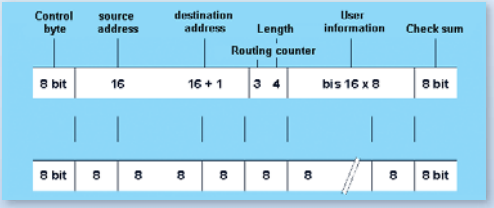
These networks can also be used to transmit KNX telegrams. A flat hierarchy can be established by the use of IP gateways and IP routers which feature similar functionalities as line and area couplers. 255 KNX lines can be compiled to an IP world. 255 IP worlds can also co-exist on a LAN or WAN.

Thus, even sections of the building which are further away can be integrated into the system.



TELEGRAM STRUCTURE

Devices communicate with one another using “telegrams” which are sent via the bus. A telegram consists of bus-specific information and the actual user information in which the event (e.g. pressing of a button) is communicated. The entire information is sent packaged as characters each 8 bit long.



TELEGRAM ACKNOWLEDGEMENT

After the telegram has been received by the devices, it will then send a receipt of acknowledgement.

D7	D6	D5	D4	D3	D2	D1	D0	Read direction of the data bit
N	N	0	0	B	B	0	0	Acknowledge message
1	1	0	0	0	0	0	0	BUSY still busy
0	0	0	0	1	1	0	0	NAK receipt not correct
1	1	0	0	1	1	0	0	ACK receipt correct

B = 00 BUSY N = 00 NAK

NAK

By acknowledging with NAK (receipt not correct) the telegram is repeated up to three times.

BUSY

By acknowledging with BUSY the transmitting device will wait for a short time and then resend the telegram.

END

If the sending device does not receive an acknowledgement, the telegram is repeated up to three times before the sent request is terminated.

DEFINITION OF THE DATA FORMATS/EIS TYPES

EIS is the designation for the “KNX Interworking Standard”. This standard defined by the KNX association stipulates the manufacturer-independent characteristics for the user information of the telegram.

This guarantees that all KNX certified devices are compatible to one another. A clear benefit of KNX technology

EIS TYPES

EIS	Description	Bit/Byte	Data point types
1	Switch	1 bit	On, off
2	Dimming	1 bit	On, off
2	Relative dimming	4 bit	0 = stop, 1…7 darker, 8 = stop, 9…15 brighter
2	Percentage value	1 byte	0 = off…255 maximum
3	Time	3 bytes	Weekday, hour, minute, second
4	Date	3 bytes	Day, month year
5	KNX floating point values	2 bytes	Temperature – 273…+ 670,760 °C, Temp. difference +/– 670,760 K, Temp. change +/– 670,760 K/h, Illumination intensity +/– 670,760 lux, Wind speed +/– 670,760 m/s, Air pressure +/– 670,760 Pa, Time difference +/– 670,760 s, Time difference +/– 670, 760 ms, Voltage +/– 670,760 mV, Current +/– 670,760 mA
6	Value	1 bytes	Percentage value 0 = 0 %…255 = 100 %, angle 0 = 0°…255 = 360°, unsigned value 0…255
7	Drive control	1 bit 1 bit	Up/down Stop/step
7	Status diagram	1 bit	Stopped, motion, step up, step down
8	Priority	1 bit	Switching EIS 1 Priority 0, 1 not forcibly operated, 2, 3 forcibly operated, switched off
9	KNX floating point values	4 bytes	Compliant to IEEE 754 (the value range is greater than 0…4,294,967,295)
10	Counter value 16 bit	2 bytes	Unsigned value 0…65,535, signed value – 32,768…+ 32,767
11	Counter value 32 bit	4 bytes	Unsigned value 0…4,294,967,295, signed value – 2,147,483,648…+ 2,147,483,647
12	Access control	4 bytes	3 bytes imply 2 characters 1 byte coded bit-by-bit
13	Characters	7 bit	ASCII characters
		8 bits	ISO 8859-1
14	Counter value 8 bit	1 byte	Unsigned value 0…255, signed value – 128…+ 127
15	Character string	14 byte	ASCII, up to 14 7 bit characters

CAUTION: The flags should only be modified in exceptional cases!

Flags are settings in the ETS. The behaviour of each communication object can be set on the bus by using flags.

COMMUNICATION FLAGS

E The communication object has a normal connection to the bus.

O Telegrams are acknowledged, but the communication object is not changed.

READ FLAG

E The object value can be read out via the bus.

O The object value cannot be read via the bus.

WRITE FLAG

E The object value can be modified via the bus.

O The object value cannot be modified via the bus.

TRANSMIT FLAG

E If (on the sensor) the object value is changed, a corresponding telegram is sent.

O The communication object only sends a response telegram with a read request.

UPDATE FLAG

E Value response telegrams are interpreted as write commands, the value of the communication object is updated. (always enabled in the BA – mask version 1.0 – 1.2)

O Value response telegrams are interpreted as write commands, the value of the communication object is not changed.

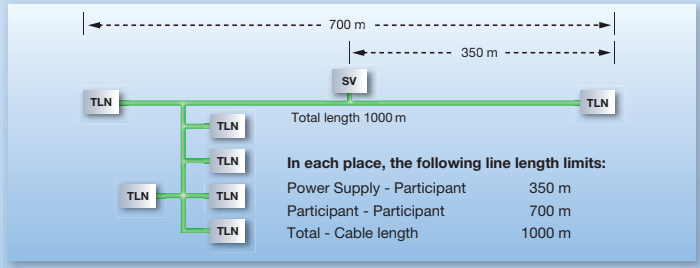
(E) = flag set/(O) = flag not set

THE 6 STAGES FOR CORRECT KNX INSTALLATION

1. Check for compliance of allowable line lengths.
2. Visual inspection for marking of bus cable ends.
3. Check for incorrect cable connections.
4. Measure the isolation resistance of the bus lines.
5. Polarity test of all bus nodes.
6. Measure the voltage on the bus cable ends (mind. 21 V).

ADDITIONS TO THE POINTS ABOVE

1. The maximum permissible bus line lengths are defined by the voltage drops and the capacitances of the bus cables, and thus the telegram transmission times. The measurement of the loop impedance of the bus line concerned can prove to be useful..



KNX *RESTRICTIONS:*

- Permissible cable length in a line is **max. 1000 m**
- Distance between voltage supply – bus device is **max. 350 m**
- Distance between two voltage supplies incl. choke is **max. 200 m**
- Distance between two devices is **max. 700 m**

2. The ends of the bus cables should be labelled with “KNX” or “bus” clearly identifying them as the installation bus. Furthermore, details of the area and line will assist in the location of specific bus lines.

3. Different lines may only be connected using a (line) coupler. Inadmissible connections between the individual lines can be verified by switching off the power supply on the lines to be checked. If the power LED continues to light on the line coupler, an inadmissible connection has been made.

4. The insulation resistance of the bus cable should be measured with DC 250 V (DIN VDE 0100 part 610). The insulation resistance should be at least 250 kOhms. Measurement is performed from the conductor to PE, and not conductor to conductor.

   CAUTION: Overvoltage surge protection connectors should be removed before testing in order to avoid influencing the measurement or avoid damaging the surge protectors.

5. The polarity test should be performed on all bus devices. For this purpose switch to programming mode on the bus device with the programming button. The bus device is correctly connected if the LED lights up. By renewed pressing of the programming button the bus device is switched over to operating mode and the programming LED switches off.

6. The bus voltage should be checked with a voltmeter at the end of every bus cable after all bus devices have been installed. It must be at least 21 V.

BEFORE WE COMMENCE WITH COMMISSIONING, THE:

- RS 232/USB interface must be programmed locally to suit the line. Failure to do so will mean the line couplers cannot be correctly programmed.
- Program the line couplers, possibly, setting the parameters then to route all telegrams unfiltered.
- ETS diagnostics ensures that no bus device is in programming mode. (programming button pressed, programming LED lights up.)

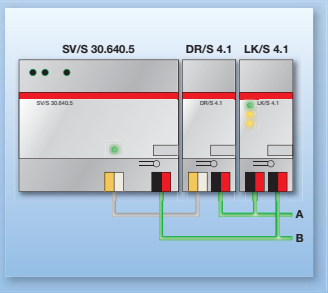
COMMISSIONING OF THE BUS DEVICES:

- Initially all of the bus devices will be physically addressed.
- If all devices are physically programmed, we can commence loading the applications. (In order to save time, the applications should be loaded during a break, e.g. lunch.
- The following points should be checked if communication problems occur:
  - The RS 232/USB interface is not physically programmed.
  - A device with an address corresponding to line x is located in another line.
  - Two different lines are interconnected with each other.
  - The line couplers are not programmed.

CAUTION: Line couplers must always be programmed at the start of commissioning. If they are not programmed, they interfere with the bus communication.

VOLTAGE SUPPLY

Should the power consumption be low, a power supply can be used for two lines (e.g. line and main line). To connect the second output of the power supply to the second line an additional choke is required. If only two lines are needed in the object, one line coupler is sufficient for both lines. A coupler is needed for each line with more than two lines.



Shutter actuator / Load type	SA/S 4.6.1 8.6.1 12.6.1	SA/S 2.10.1 4.10.1 8.10.1 12.10.1	SA/S 2.16.1 4.16.1 8.16.1 12.16.1	SA/S 2.16.5S 4.16.5S 8.16.5S 12.16.5	SA/S 2.20.1S 4.20.1S 8.20.1S 12.20.1
Outputs	4/8/12	2/4/8/12	2/4/8/12	2/4/8/12	2/4/8/12
Installation type	REG	REG	REG	REG	REG
Module width (space unit)	2/4/6	2/4/8/12	2/4/8	2/4/8/12	2/4/8/12
Manual operation		■	■	■	■
I_n Rated current/A	6 A	10 AX	16 A	16 AX C-Last	20 AX
Current detection	–	–	–	■[1)]	■[1)]
Switching capacity					
Switching capacity to AC1	6A	10 A	16 A	16 A	20 A
DIN EN 60947–4–1 AC3	6 A	8 A	8 A	16 A	16 A
Switching capacity to DIN EN60669	6 A (35 µF)	10 AX (140 µF)	16 A (70 µF)	16 AX (200 µF)	20 AX (140 µF)
Mechanical contact endurance	10^7	$3x10^6$	$3x10^6$	10^6	10^6
Electrical endurance IEC 60947-4-1					
Rated current AC1 (240V/cos φ = 0.8)	100.000	100.000	100.000	100.000	100.000
Rated current AC3 (240V/cos φ = 0.45)	30.000	30.000	30.000	30.000	30.000
Rated current AC5a (240V/cos φ = 0.45)	30.000	30.000	30.000	30.000	30.000
Incandescent lamp load	1200 W	2300 W	2500 W	3680 W	3680 W
Fluorescent lamps T5/T8					
Uncompensated	800 W	2300 W	2500 W	3680 W	3680 W
Parallel compensated	300 W	1500 W	1500 W	2500 W	2500 W
DUO circuit	350 W	1500 W	1500 W	3680 W	3680 W
Low-volt halogen lamps					
Inductive transformer	800 W	1200 W	1200 W	2000 W	2000 W
Electronic transformer	1000 W	1500 W	1500 W	2500 W	2500 W
Halogen lamp 230 V	1000 W	2300 W	2500 W	3680 W	3680 W

Shutter actuator / Load type	SA/S 4.6.1 8.6.1 12.6.1	SA/S 2.10.1 4.10.1 8.10.1 12.10.1	SA/S 2.16.1 4.16.1 8.16.1 12.16.1	SA/S 2.16.5S 4.16.5S 8.16.5S 12.16.5	SA/S 2.20.1S 4.20.1S 8.20.1S 12.20.1
Dulux lamp					
Uncorrected	800 W	1100 W	1100 W	3680 W	3680 W
Parallel compensated	800 W	1100 W	1100 W	3000 W	3000 W
Mercury-vapour lamp					
Uncompensated	1000 W	2000 W	2000 W	3680 W	3680 W
Parallel compensated	800 W	2000 W	2000 W	3680 W	3680 W
Max. peak inrush-current IP (150 µs)	200 A	400 A	400 A	600 A	600 A
Number of electronic ballast's (T5/T8, single element)					
18 W (e.g. ABB EVG 1x18 CF)	10	23	23	26[2)]	26[2)]
24 W (e.g. ABB EVG-T5 1x24 C)	10	23	23	26[2)]	26[2)]
36 W (e.g. ABB EVG 1x36 CF)	7	14	14	22	22
58 W (e.g. ABB EVG 1x58 CF)	5	11	11	12[2)]	12[2)]
80 W (e.g. HELVA EL 1x80 SC)	3	10	10	12[2)]	12[2)]

The technical details in this publication are subject to change without notice.

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Your KNX-Partner