

Specification Toolbox 2.0

# ABB i-bus KNX in Office Buildings Functional Specification – Advanced



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# 1. General Requirements

- The Intelligent Building Control System shall be designed and developed in accordance with the multi-vendor KNX standard and also in conformity to the following standards:
  - European Standard (CENELEC EN 50090 and CEN EN 13321-1)
  - International Standard (ISO/IEC 14543-3)
  - Chinese Standard (GB/T 20965)
  - US Standard (ANSI/ASHRAE 135)
- Systems which are single vendor based and run on proprietary protocols shall not be accepted. The system shall ensure that devices from different manufacturers are interoperable and compatible thus providing a future proof and flexible installation.
- The system should cover commercial control requirements of one or more applications, such as lighting, HVAC, shading, etc.
- The system shall be completely decentralized and programmable. Each device will have its own intelligence. The parameters are configured using PC or notebook computer located anywhere in the system topology. Systems using centralized controllers or processors will not be accepted. In case of power failure all the configuration and status information have to be stored and retained in a non-volatile storage. This data shall be pushed back to the device once electrical current is back. System with additional built-in or external battery that needs to be changed periodically for information storage shall not be accepted.
- The communication cable that links all the devices shall have data and power residing on the same medium. It shall also be possible to lay the cable along the power mains. Systems requiring different communication cables for signal transmission and control power between the devices are not acceptable.
- The bus connection terminal of all the devices should have 4 bus connection possibilities for looping or branching of bus cable. The bus cable shall be laid in the building in all possible configurations, i.e. linear, star or tree architecture similar to the power mains. Systems requiring fixed wiring configurations shall not be acceptable. It is thereby possible to disconnect the devices without interrupting the bus line. Systems requiring special tools for crimping, lagging or special installation connectors, e.g. RJ45 bus connections, shall not be acceptable.
- Online programming of any device of the system should be possible without affecting the other devices on the system as well as offline programming prior to dispatching of the material to site. In the event of failure of a device in one line, only the control functions controlled by that device shall be affected and all other devices shall continue to operate normally.
- Each device shall operate via the 21...30 V DC made available on the KNX bus line. The power supply unit should deliver a 640 mA/320 mA/160 mA version depending upon the bus network density.
- The system shall communicate through CSMA/CA with parity checks in order to avoid collision in the bus thereby increasing the system flexibility and bandwidth allocation. Systems which work on polling or master-slave configurations shall not be accepted.

### **1.1. System Description**

- The KNX Intelligent Building Control system shall be programmed to provide the following applications:
  - The control system will provide the aesthetic and energy management control of the lighting in each of the designated areas. This includes lighting control by manual operation and on the basis of predefined time schedules which shall be carried out by a dedicated KNX bus device. Furthermore, a presence-dependent operation of the lighting shall be available.
  - HVAC
  - Motorized shutter and blind control
  - Operation via predefined scenarios and time schedules
  - The system will be fully configurable and software-based. No centralized processors or memory storage devices shall be required. It shall be able to interface to BMS by mode of high level interface such as OPC server. The system shall provide the flexibility to ensure that it can be easily altered or added with new functions in the future without the need for reconfiguration or rewiring.

### **1.2. Bus System Control Devices**

- Dedicated integrated KNX controllers shall be provided in individual rooms for controlling lighting, HVAC, blinds, etc. The controllers shall have decentralized intelligence and shall be independent of any centralized controllers/software. For each application, such as lighting/blinds/HVAC control, dedicated controllers or channels need to be used.

### **1.3. Control Panel (Distribution Board)**

- There shall be a dedicated Control Panel for the control of one storey, for example. The control panel shall house the system devices and the related control equipment and protection devices depending on the number of circuits being controlled. This is to ensure that the power wiring between the control panel and the controlled loads is kept short.

### **1.4. General Controlling Concept**

- Manual operation shall be reduced to a minimum. All major functions like lighting, shading and HVAC control shall be operated automatically by the bus system. Nevertheless, local and manual operation shall be considered wherever a manual override of the automatic control is required. This shall be possible via a local operation with bus control elements. To allow a quick and comfortable operation according to several use cases, predefined lighting/blinds/HVAC scenes shall be planned to allow an efficient control for the staff. These shall be accessible via rockers of the bus control elements. Furthermore, to reduce energy consumption in low frequent times (e.g. at night), presence detectors shall be used to provide the full lighting level only if it is needed. Time-scheduled operation shall be considered as well, wherever applicable.
- A control of the building shall also be possible by centralized PC visualization software connectable to the bus (e.g. via LAN interface) allowing a comprehensive control of the building. It shall also feature a predefined time-based control for setting the lighting/blinds/HVAC system to predefined states dependent on the daytime. Furthermore, a local operation by the operator shall be possible by graphical display, e.g. showing the entire building based on floor plans or individual room plans (optional).

### **1.5. KNX Control Elements**

- KNX control elements shall be used to control various loads and scenes in the building. They shall include a bus coupler as part of the delivery, if applicable. The control elements shall be appropriately designed and located wherever necessary. All control elements shall be connected to the bus system. Optionally, there shall be also the possibility to connect conventional push-buttons to the bus system by means of appropriate binary inputs.

## 2. Office Building –Advanced Configuration

### 2.1. Lighting Control

- The bus-based lighting control solution shall allow the following control types:

#### 2.1.1. Switching of lighting

- Switchable lighting circuits shall be controlled via a switch actuator consisting of relays to switch several channels on/off. The switch actuator shall allow status feedback messages in order to monitor the response of the connected relay.

#### 2.1.2. Dimming of lighting

- Dimmable lighting circuits shall be controlled via appropriate actuators/gateways. There shall be three different dimming possibilities dependent on the used actuator which is connected to the bus system:
  - Universal dim actuators: Load is directly connected to the dimmer; incandescent lamps, low voltage halogen lamps (on conventional or electronic transformers) or 230 V halogen lamps can be operated. Outputs automatically recognize the connected load. Additionally, the operating mode can be selected manually.
  - 1...10 V switch/dim actuator: Dimming control is achieved via 1...10 V ballasts connected to the appropriate outputs of the switch/dim actuator. Switching on/off the light is done via floating contacts controlling the mains power supply of the 1...10 V ballast.
  - DALI Gateway: The dimming control system shall be based on DALI (Digital Addressable Lighting Interface) according to the technical standard IEC 62 386 in combination with KNX. To control DALI equipment, such as ballasts, transformers, LED converters, etc., a KNX/DALI Gateway shall be used. DALI allows the addressing of 64 ballasts which can be freely assigned to 16 DALI lighting control groups. The DALI control line can be installed together with the mains cable (e.g. by using a 5 wire standard cable). Functionalities achieved by DALI: light scenes, day light control, feedback regarding the connected DALI equipment (e.g. lamp or ballast failure), light scenes, etc.

#### 2.1.3. Daylight dependent Control

- A daylight-dependent control uses the available daylight to save operating and energy costs. To implement the control, an outside brightness sensor is mounted at the exterior of the building measuring the outside brightness value. The brightness sensor shall be a part of the weather system.
- After a certain outside brightness value is reached, lighting circuits shall be switched off as required by the operator, according to definable threshold values. In case of dimmable lighting circuits the lighting can be dimmed to a predefined lower brightness value in order to save energy.

#### 2.1.4. Time-Based and Occupancy-Dependent Control

- For further automation, the lighting shall be controlled via predefined time schedules according to the usage of the building. These shall be defined with a dedicated Radio Time Switch. Lighting circuits can be either switched off, or in case of dimmable circuits, set to a specified light value (e.g. 30 %) to allow a basic lighting.
- An occupancy-dependent control is a control form that uses motion or presence detectors. It detects the presence of persons in the building or in external areas and switches the corresponding lighting on or off. If dimmable lighting circuits are used, the light value can be reduced to a certain level (e.g. 30 %), if no presence is detected. Presence detection can be also combined with constant lighting control to further increase energy efficient lighting. For this control mode appropriate bus presence detectors shall be used.

## **2.2. HVAC Control**

- KNX shall be used for room-oriented temperature control or individual room temperature control. By detecting the actual temperature value and specifying a respective temperature setpoint with a control algorithm, the thermostat sends a control value to the actuator. This actuator controls a heating or cooling unit that changes the room temperature. The prerequisite is a water-based heating and cooling system. There shall be the possibility to operate 3 different types of HVAC systems:
  - Heating radiator control with electrothermal or electromotor valve drive
  - Blower/Fans
  - Fan coil unit (not part of this specification)
- The room temperature controller shall be fully integrated into the Intelligent Building Control system in order to simultaneously control the shutter/blind system. If a room is unoccupied, the blinds can be driven down in cooling operation to prevent heating of the room due to sun radiance. In heating operation (e.g. during wintertime) the blinds shall be driven up in order to support a cost-efficient heating of the room.
- The HVAC control system shall be interfaced to presence detectors, if applicable. Therefore, the presence detectors used for controlling lighting shall control the heating/cooling setpoint as well. If the room is not occupied, the setpoint value can be decreased (heating operation) in order to reduce the energy consumption.

## **2.3. Blind/Curtain/Shutter Control**

- Blind and curtain control shall be possible via the bus control elements. Motors are interfaced to the appropriate actuators. Furthermore, the integration into scenes shall be possible. The system shall also be capable of integrating values of the Weather Station in order to allow automatic control dependent on outside brightness level/sun position. Additionally, a reaction to wind alarms shall be integrated. Furthermore, an interaction with the room temperature controller shall be possible.

## **2.4. KNX Bus Control Elements**

- Bus control elements shall be used to control various building applications , such as lighting control including dimming, curtain and blind control, room temperature control. The local operation with bus control elements shall be only applicable if a manual override of the automatic control is required.

## 3. Control Devices – System Components

### 3.1. KNX Power Supply with Enhanced Diagnostics (320 mA/640 mA)

- Produces and monitors the KNX system voltage
- With diagnostic function via KNX or ABB i-bus® Tool
- The voltage output is short-circuit- and overload-proof. The LEDs indicate the bus current consumption and the status of the line or device.
- Diagnostic functions via KNX: Bus voltage  $U_N$ , bus current  $I$ , bus current  $I > \text{rated current } I_N$ , overload  $I > I_{\text{max}}$ , trigger bus reset
- Supply voltage:  $U_s$  85...265 V AC, 50/60 Hz
- KNX voltage output: 1 line with integrated choke
  - Rated voltage:  $U_N$  30 V DC  $\pm 1\%$ , SELV
- Power consumption:
  - $< 30$  W (320 mA)
  - $< 55$  W (640 mA)
- Nominal power loss:
  - $< 2.5$  W (320 mA)
  - $< 4$  W (640 mA)
- Output voltage: 30 V DC  $\pm 1\%$ , SELV
- Nominal current: 320 mA/640 mA, short-circuit-proof
- Sustained short-circuit current:
  - $< 0.8$  A (320 mA)
  - $< 1.4$  A (640 mA)
- Mains failure back-up time: 200 ms
- Rated current:  $I_N$  320 mA or 640 mA
- Connection:
  - Bus connection: Bus connection terminal
  - Supply connection: Screw terminals
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 4 modules at 18 mm
- Manufacturer: ABB
- Product type (dependent on current): SV/S 30.320.2.1, SV/S 30.640.5.1

### 3.2. Line Coupler

- The Line Coupler electrically isolates lines/areas from one another. With an activated filter table, it only allows data telegrams which are intended for bus devices on other lines. The device can be parameterized as a line or area coupler as well as a line repeater using ETS software. With ETS version 4.1.2 or higher, the entire group address range (main group 0...13 and 14...31) can be filtered.
- Operating and display elements:
  - LED, green: ON
  - LED, yellow: Main line
  - LED, yellow: Line
- Connection:
  - Main line: Bus connection terminal
  - Line: Bus connection terminal
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 2 modules at 18 mm
- Manufacturer: ABB
- Product type: LK/S 4.2



### 3.3. IP Interface

- The IP Interface IPS/S 2.1 connects the KNX bus with the Ethernet network. The device uses the KNXnet/IP protocol for communication (Tunneling). KNX devices can be programmed via the LAN using ETS. It can serve as an interface for a visualization as well. The IP address can be fixed or can be received from a DHCP server. The power supply range is from 10 to 30 V DC. The device is very helpful in security/safety applications since it connects the security terminal/security sensors to the IP network, and therefore, in case of emergency or any security problem, text messages/indications are received in those devices connected to the IP network.
- Power Supply: Voltage range 10...30 V DC
- Display elements:
  - LED red and button: Assignment of the physical address
  - LED green: Operating mode display
  - LED yellow: Network connection indicator and KNX telegram traffic indicator
- Connection:
  - Operating voltage plug-in terminal
  - RJ45 socket
  - Bus connection terminal
- Interfaces:
  - LAN interface
  - KNX interface
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 2 modules at 18 mm
- Manufacturer: ABB
- Product type: IPS/S 2.1

### 3.4. IP Interface Advanced

- The IP Interface connects the KNX bus with the Ethernet network. The device uses the KNXnet/IP protocol for communication (Tunneling).
- Auxiliary voltage: 12 ... 30 V DC (+10% / -15%) or PoE (IEEE 802.3 af class 1)
- Relocated RJ45 socket for better radius of bend
- KNX devices can be programmed via the LAN using ETS
- Visualizations can send and receive telegrams via the tunneling servers
- The IP address can be fix or can be received from a DHCP server
- 5 tunneling servers available
- Supports bus monitor and group monitor
- Diagnosis and commissioning tool available (incl. firmware update)
- Power dissipation: Max. 1,8 W
- Display elements:
  - LED green: Operating mode display
  - LED yellow: LAN/LINK
  - LED yellow: KNX telegram
- Housing: Halogen free
- Connections:
  - LAN: Plug-in terminal, RJ45 socket
  - KNX: Bus connection terminal
- Interfaces:
  - 1 x KNX
  - 1 x LAN
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Mounting position: As required
- Width: 2 modules at 18 mm
- Manufacturer: ABB
- Product type: IPS/S 3.1.1

## 4. Control Devices – Switching and Dimming

### 4.1. Switch Actuator 16/20 AX

- Uses potential-free contacts to independently switch 2, 4, 8 or 12 electrical loads via KNX
- Manual operation and display of the switching status. No separate voltage supply necessary. Especially suitable for switching from loads with high surge current, such as lighting with compensatory capacitor or fluorescent lighting loads according to IEC/EN 60 669.
- With only one application program the following functions for each output can be set separately:
  - Current recognition, current value sending and reaction to current threshold values
  - Time functions, on/off delay
  - Staircase lighting function with preliminary warning and changeable staircase lighting time
  - Recall scenes/presets over 8-bit/1-bit commands
  - Logic functions AND, OR, XOR
  - Status response
  - Forced control and safety function
  - Reaction to threshold values
  - Control of electrothermal valve drives (continuous controller)
  - Selection of default position on bus voltage failure and recovery
  - Inversion of outputs
  - Parameterization of single outputs can be exchanged or copied
- Outputs: 2-12 potential-free floating contacts
- Rated current: 16/20 AX - C-Load (50/60 Hz)
- Switching capacity:
  - According to IEC/EN 60 947-4-1:  
16/20 A/AC1 (16 A actuator); 16 A/AC3 (on 230/400 V AC, 16 A actuator)
  - According to IEC/EN 60 669:  
16/20 AX (16 A actuator), max. capacitive load 200  $\mu$ F
- Operation: Actuating levers for displaying the switch position and manual operation
- Connection:
  - Load side: Screw terminals with combination head screws for lines, 0.2...6.0 mm<sup>2</sup> unifilar
  - KNX: Screwless bus connector
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 1 module at 18 mm per output channel
- Manufacturer: ABB
- Product type (dependent on number of channels): SA/S 2.16.5.1, SA/S 4.16.5.1, SA/S 8.16.5.1, SA/S 12.16.5.1

## 4.2. Universal Dim Actuator

- KNX multichannel universal dimming actuator for controlling incandescent lamps, 230 V incandescent halogen lamps, low-voltage halogen lamps with conventional or electronic transformers, and dimmable energy-saving halogen lamps
- For dimmable retrofit LED lamps (LEDi)
- Parallel switching of channels for increasing the loads through wire bridges possible
- The outputs can be switched parallel in any combination
- Outputs automatically recognize the connected load
- In addition, the operating mode can be selected manually, with local operation.
- Status indication via LED
- The following applications are provided for the outputs:
  - Switching
  - Dimming
  - Value
  - Error message
  - Enable object
  - Light scene actuator
  - Sequence actuator
  - Staircase lighting
  - Delay
  - Preset
  - Cyclical telegram
  - Flashing
  - Logics (AND, OR, XOR, XNOR, NAND, NOR)
  - GATE
  - Min/max value transducers
  - Set value/hysteresis
  - PWM inverter
  - Priority
- Power supply: 230 V AC  $\pm$  10 %, 50/60 Hz
- Connection:
  - Outputs: Screw terminals, 0.2...6.0 mm<sup>2</sup>
  - Multiple-wire: 0.5...2.5 mm<sup>2</sup>
  - KNX: Bus connection terminal control element: Manual operation of ON brighter/Off darker and channel selection

- Display elements: Outputs status indication via LED
- Outputs: 4 or 6
- Rated power: Max. 210 W/VA, 315 W/VA, 600 W/VA per channel (dependent on used dim actuator type)
- Operating temperature range: -5° C to + 45° C
- Protection: Electronic short-circuit and overload protection
- Mounting: 35 mm mounting rail, IEC/EN 60715
- Width: 8 or 12 modules at 18 mm (dependent on rated power)
- Manufacturer: ABB
- Product type (dependent on number of channels and rated power):  
6197/12-101-500, 6197/13-101-500, 6197/14-101-500, 6197/15-101-500

### 4.3. Switch/Dim Actuator 16A

- Device for switching and dimming of 2/4/8 independent groups of luminaries with electronic ballasts, dimmers or transformers with 1...10 V control input. The dimming control per outputs carried out with two control wires. Maximum control load per channel is 100 mA. The Switch/Dim Actuator needs only KNX bus voltage for normal function. With 2/4/8 potential-free relays the supply voltage of the ballasts and consequently the luminaries can be switched on and off over KNX or manually without any auxiliary supply. Contact position is displayed.
- The following functions can be set separately for each channel:
  - Switching and dimming of lighting
  - Feedback of switching state and brightness value
  - Different adjustable dimming speeds for dimming and setting brightness
  - Adjustable upper and lower dimming limits
  - Recall and set of up to 18 light scenes (8-bit commands) per channel
  - 4 presets (1-bit commands) per channel
  - Integration in constant lighting control (“slave mode”)
  - Forced operation with higher priority
  - Staircase lighting function with adjustable staircase lighting time
  - Warning before switching off
  - Disable function to prevent unauthorized operation
  - Characteristic curve adjustment to adapt ballast brightness characteristic
- Outputs (channels):
  - 2/4/8, floating contacts for switching power supply of ballasts
  - 2/4/8, control channel 1...10 V passive
  - Nominal voltage: 230/440 V AC
  - Switching capacity:
    - 16 A/AC1 (ohmic load, IEC/EN 60 947)
    - 10 AX (fluorescent lighting load, IEC/EN 60 669)
  - Control current max.: 100 mA per channel
- Connection:
  - Outputs: Screw terminals
  - Bus connection: Bus connection terminal
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 4/6/8 modules at 18 mm
- Manufacturer: ABB
- Product type (dependent on number of channels): SD/S 2.16.1, SD/S 4.16.1, SD/S 8.16.1

#### 4.4. DALI Gateway with Group Control

- The group-oriented KNX DALI Gateway (DALI = Digital Addressable Lighting Interface) is used for controlling DALI equipment (ballasts, transformers, LED converters, etc. using the DALI interface to IEC/EN 62 386/60 929) via KNX.
- Up to 64 DALI devices can be connected to a DALI output. The 64 DALI devices can be individually addressed and allocated as required in up to 16 lighting groups. Overlapping groups are possible. Control using KNX is implemented exclusively via 16 lighting groups. Furthermore, setting of 14 light scenes is possible which can be recalled or stored via 8-bit or 1-bit scene telegrams. The lighting group can be integrated into a lighting control using slave mode. Furthermore, a staircase lighting function and a sequencer mode are available for the programming of running lights and color effects without additional logic or timer modules.
- The 64 DALI devices of the DALI output can also be read or controlled together in broadcast mode. Information relating to a lamp and ballast fault is available individually for a lamp group or for a DALI device. Error messages can be inhibited on the KNX allowing the Gateway to operate together with emergency lighting systems, which disconnect the DALI from the Gateway during emergency lighting tests.
- Programming of the DG/S 1.16.1 is implemented with the Engineering Tool Software (ETS).
- Manual switching of all DALI devices with a test button on the device is possible.
- Additionally, the correct operating voltage of the Gateway and the fault state of the DALI devices are indicated via two status LEDs. The brightness value (0...100 %) of the ballast (power-on level) after ballast operating voltage recovery is programmable.
- The DALI address assignment is implemented automatically on the Gateway. It can however be suppressed by a parameter in the application program.
- Readdressing of the DALI device and the assignment of the 64 DALI devices into 16 lighting groups is implemented in an ETS independent software tool (ABB i-bus® Tool), so that for example, a facility manager without ETS knowledge is capable of exchanging and reassigning DALI devices, should maintenance be required. Furthermore, the fault states of the individual DALI devices and/or lighting groups are represented graphically with this tool.
- The DALI power source for the 64 DALI devices is integrated into the Gateway.
- Output DALI: Output for max. 64 DALI devices
- Operating voltage: 85...265 V AC, 45...65 Hz, 110...240 V DC
- Connection:
  - Outputs: Screw terminal
  - Bus connection: Bus connection terminal
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 4 modules at 18 mm
- Manufacturer: ABB
- Product type: DG/S 1.16.1

## 5. Control Devices – Curtain and Blind Control

### 5.1. Blind/Curtain/Shutter Control Actuator with Travel Detection and Manual Operation

- To control up to 2/4/8 independent blind and roller shutter drives or ventilation flaps (230 V AC)
  - Automatic travel detection via identification of end positions for each channel
  - Manual operation and displaying LEDs for each channel
  - Mutually mechanically interlocked outputs
  - Power supply only via KNX bus voltage
- Software functionality:
  - Copy and change channels
  - Time-delayed switching of drives
  - Sending and switching delay after bus voltage recovery
  - Request status values via object
  - Limited number of telegrams
  - Preferred position on bus voltage failure, recovery, programming and reset
  - Disable/enable manual operation, deactivation by time
  - Travel detection (automatically or triggered by object) or manual setting of travel times
  - Safety function (3 x wind alarm, rain alarm, frost alarm with cyclical monitoring, block and forced operation) and reaction on reset of safety function
  - Direct commands available for UP/DOWN, STOP/Slat Adjustment
  - Move to position height/slat 0...255
  - Move to/set preset position 1...4 and 8-bit scene
  - Dead times of blind/shutter adjustable
  - Tensioning function available (for awning and flap adjustment)
  - Limited travel range (adjustable for direct and/or automatic commands)
  - Change on direction and delay times for drives adjustable
  - Automatic sun protection (position height/slat at sun) and sun tracking
  - Heating/cooling automatic with overheat control
  - Status messages: Height/slat 0...255, upper/lower end position, operability, automatic, status information (2-byte, including motor error), controlling ventilation flaps, switch mode with staircase lighting function
- Outputs: 2/4/8 (2 relay outputs UP/DOWN for each channel)
- Power consumption: < 250 mW
- Operating voltage: 21...30 V DC
- U<sub>N</sub> rated voltage: Max. 230 V AC, 45...65 Hz
- I<sub>N</sub> rated current: Max. 6 A
- Operating and displaying elements: 2 LEDs and push-buttons for each channel
- Connection:
  - Outputs: Screw terminals (combination heads)
  - KNX: Screwless bus connection terminal
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 4 or 8 modules at 18 mm
- Manufacturer: ABB
- Product type (dependent on number of channels): JRA/S 2.230.5.1, JRA/S 4.230.5.1, JRA/S 8.230.5.1



## 5.2. KNX Weather System

- A weather system shall comprise of 2 units:
  - Weather Sensor: The Weather Sensor is used with the Weather Unit installed in KNX systems. The Weather Sensor allows the measurement of wind, brightness in three directions, rain incl. heating, temperatures, GPS-based date and time. The integrated power supply of the Weather Unit directly supplies power to the Weather Sensor.
  - Weather Unit: The Weather Sensor is connected to the Weather Unit. The Weather Unit collects and elaborates data from the Weather Sensor. The Weather Sensor provides data on wind speed, brightness in three directions, twilight, rain, temperature, as well as information about day/night, date and time. The Weather Sensor is directly supplied with power through the integrated power supply. A temperature sensor, type PT1000 is connectable.
- The Weather Unit and the Weather Sensor are synchronized. An additional heat transformer is not required.
- Blinds and sunblinds (awnings) can be retracted in the event of strong wind, or skylights and fanlights can be closed when it starts to rain.
- Functions of the application program:
  - The weather system is time-synchronized, with options for summer/winter schedules.
  - The Weather Sensor records wind velocity (0...24.0 m/s), rain and brightness in three directions (left, right and center), (0...999 Lux), twilight, temperatures (-30...+ 50 °C), date and time (GPS radio receiver). It only functions in combination with the Weather Unit.
  - Measured value for the unit: Adjustable as 1-bit values or 2-byte values depending on the type
  - Threshold: 2 per sensor, each with upper and lower limit
  - Logical functions: AND/OR, inversion, each with 4 inputs
  - Memory: 4 memories, 24 values per memory can be stored according to FiFo principle
- Weather Sensor:
  - Connection:
    - 1, 2 power supply: 2-pole, 1 plug-in terminals each for solid conductors 0.4 to 1.5 mm Ø, color: black
    - A, B data communication: 2-pole, 4 plug-in terminals each for solid conductors 0.6 to 0.8 mm Ø, color: white/yellow
  - Type of protection: IP 44, IEC/EN 60 529
  - Mounting: Wall mounted
  - Dimensions (H x W x D): 109 mm x 121 mm x 227 mm
  - Manufacturer: ABB
  - Product type: WES/A 3.1
- Weather Unit:
  - Power supply: 85...265 V AC, 50/60 Hz, 110...240 V DC
  - Output: Voltage supply, data communication
  - Input: Temperature sensor (PT1000)
  - Connection: Screw terminals
  - Tightening torque: Max. 0.6 Nm
  - KNX: Bus connection terminal
  - Type of protection: IP 20, IEC/EN 60 529
  - Mounting: 35 mm mounting rail, IEC/EN 60 715
  - Width: 4 modules at 18 mm
  - Manufacturer: ABB
  - Product type: WZ/S 1.3.1.2

## 6. Control Devices – HVAC

### 6.1. Standard Room Thermostat with Display

- For single-room temperature control in heating and air-conditioning technology
- With illuminated display for showing the actual room temperature and external actual-value default
- Comfort, standby, night operation or frost/heat protection operation can be selected via KNX. The set values can be parameterized.
- Display of the operation statuses with symbols
- Display of the date and time is possible
- The controller is a constant room temperature controller for ventilator convectors (fan coils) in 2-pipe and 4-pipe systems and conventional heating or cooling systems.
- The fan stage can be switched manually or in automatic mode.
- Setpoint adjustment using upper switch cover is possible.
- Comfort/standby switchover using lower switch cover is possible.
- The control output can optionally emit a continuous (PI control) or switching position signal (2-point or PWM).
- Support of KNX functions through innovative LED-color concept (yellow = lighting, blue = blind, orange = RTC, magenta = scene and white = neutral/no function assigned) or standard illumination red/green
- Color and function of the LED can be changed via ETS.
- Removal protection is possible with screw-on installation.
- With a maximum of 10 logic channels (logic gate, time delay, sequences, etc.). The logic functions of the channel can be freely selected.
- For flush-mounted bus coupler
- The following functions are provided for the application module:
  - Inputs: Switching, Continuous, Heating, Cooling, Time, Date
  - Outputs: Fan control, Light scene actuator, Sequence actuator, Staircase lighting, Delay, Preset, Cyclical telegram, Flashing, Logics (AND, OR, XOR, XNOR, NAND, NOR), GATE, Min/max value transducers, Set value/hysteresis, PWM inverter, Priority
- Room thermostat:
  - Connection:
    - Power supply: 10-pole multi-point connector
  - Control element: Switch contacts left/right for selecting setpoint and mode of operation
  - Display elements: LCD showing operation modes
  - Type of protection: IP 20, IEC/EN 60 529
  - Temperature range: -5 °C to 45 °C
  - Dimensions (L x W x D): 63 mm x 63 mm
  - Manufacturer: ABB
  - Product type: 6128/28

- Bus coupler:
  - For combining the installation bus KNX and the different application modules
  - For installation in surface-mounted or flush-mounted boxes
  - Connection:
    - KNX line: Bus connection terminal
  - Rated voltage: 24 V
  - Outputs:
    - Rated current: 24 mA
  - Type of protection: IP 20, IEC/EN 60 529
  - Temperature range: -5 °C to 45 °C
  - Dimensions (L x W x D): 50 mm x 45 mm x 23 mm
  - Manufacturer: ABB
  - Product type: 6120/12

## 6.2. Multi-Function Room Thermostat with Display and Control Elements

- For single-room temperature control in heating and air-conditioning technology
- With illuminated display for showing the actual room temperature
- With external actual-value default
- Comfort, standby, night operation or frost/heat protection operation can be selected via KNX. The set values can be parameterized.
- Display of the operation statuses with symbols
- Display of the date and time is possible
- The controller is a constant room temperature controller for ventilator convectors (fan coils) in 2-pipe and 4-pipe systems and conventional heating or cooling systems.
- The fan stage can be switched manually or in automatic mode.
- Setpoint adjustment using upper switch cover is possible.
- Comfort/standby switchover using lower switch cover is possible.
- The control output can optionally emit a continuous (PI control) or switching position signal (2-point or PWM).
- For transmitting switching, push-button, dimming and blind commands to KNX actuator
- Support of KNX functions through innovative LED-color concept (yellow = lighting, blue = blind, orange = RTC, magenta = scene and white = neutral/no function assigned) or standard illumination red/green
- Color and function of the LEDs can be changed via ETS.
- Removal protection is possible with screw-on installation.
- With a maximum of 10 logic channels (logic gate, time delay, sequences, etc.). The logic functions of the channel can be freely selected.
- For flush-mounted bus coupler
- The following functions are provided for the application module:
  - Inputs: LED
  - Outputs: Switching, Dimming, Blinds, Value, Push-button, Light scene extension unit, Step switch, Short/long operation, RTC operating mode switchover, Push-button switching, Push-button dimming, Push-button blind, Push-button value sender, Push-button step-type switch, Push-button multiple functions (max. 5 channels), Push-button value sender, 2 objects, Light scene actuator, Sequence actuator, Staircase lighting, Delay, Preset, Cyclical telegram, Flashing, Logics (AND, OR, XOR, XNOR, NAND, NOR), GATE, Min/max value transducers, Set value/hysteresis, PWM inverter, Priority, Continuous, Heating, Cooling, Fan control

- Room thermostat:
  - Connection:
    - Power supply: 10-pole multi-point connector
  - Control element: Switch contacts left/right, also for selecting setpoint and mode of operation
  - Display elements: LCD showing operation mode, temperature, time and date
  - Type of protection: IP 20, IEC/EN 60 529
  - Temperature range: -5 °C to 45 °C
  - Dimensions (L x W x D): 63 mm x 63 mm
  - Manufacturer: ABB
  - Product type: 6128/28
- Bus coupler:
  - For combining the installation bus KNX and the different application modules
  - For installation in surface-mounted or flush-mounted boxes
  - Connection:
    - KNX line: Bus connection terminal
  - Rated voltage: 24 V
  - Outputs:
    - Rated current: 24 mA
  - Type of protection: IP 20, IEC/EN 60 529
  - Temperature range: -5 °C to 45 °C
  - Dimensions (L x W x D): 50 mm x 45 mm x 23 mm
  - Manufacturer: ABB
  - Product type: 6120/12

### 6.3. Valve Drive Actuator

- To control thermoelectric valve drives (24...230 V AC) in heating/cooling systems via 6/12 independent semiconductor outputs
- General device functions:
  - Supply via bus voltage
  - Protection against overload and short-circuit
  - Manual operating keys and displaying LEDs for each channel
  - Block/enable manual operation, deactivation after time and status
  - Copy and exchange channels
  - Cyclical monitoring of the device
  - Sending and switching delay after bus voltage recovery
  - Request status values
  - Limited number of telegrams
- Software functionality for each channel:
  - Reaction on bus voltage recovery
  - Status message overload/short-circuit
  - Selection of valve drive (normally closed/normally open)
  - Control of outputs: Switching (1-bit) or continuous (1-byte, pulse width modulation)
  - Status message control value (1-bit or-1 byte)
  - Cyclic monitoring of control value (room temperature controller)
  - Preferred position and status message at controller fault
  - Security functions: Blocking and forced operation
  - Valve purge: Activation via object, adjustable duration, cyclic purge and status
  - Characteristic curve correction
  - Status byte
- Outputs: 6/12 semiconductor outputs
- Power consumption KNX: < 250 mW
- Operating voltage: 21...30 V DC via KNX
- $U_N$  rated voltage: Max. 24...230 V AC, 45...65 Hz
- $I_N$  rated current: Max. 160 mA
- Operating and displaying elements:
  - LED and push-button (ON/OFF) for each channel
  - LED overload/short-circuit and push-button reset
- Connection:
  - Outputs: Screw terminals with combination head screws
  - KNX: Screwless bus connection terminal
- Type of protection IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60715
- Width: 4 or 8 modules at 18 mm
- Manufacturer: ABB
- Product type (dependent on number of channels): VAA/S 6.230.2.1, VAA/S 12.230.2.1

#### **6.4. Thermoelectric Valve Drive**

- The thermoelectric valve drive is used to open and close valves in heating, cooling and air conditioning systems.
- The snap-on mounting on valves or in heating circuit distributors will be established by valve adapters.
- Version normally closed (NC)
- Voltage supply: 230 V AC, 50/60 Hz
- Type of protection: IP 54, IEC/EN 60 529
- Protection class: II
- Mounting: Snap-on mounting in all installation positions
- Connection cable: Pluggable, 2 x 0.75 mm<sup>2</sup>, 1m
- Display elements: Function display
- Housing: White, RAL 9003
- Dimensions: 60 mm x 44 mm x 49 mm
- Manufacturer: ABB
- Product type: TSA/K 230.2

## 6.5. Blower Actuator 6 A

- The Blower Actuator switches one or two 1- to 3-speed fan/s, controlled via KNX, by means of floating contacts.
  - Switching of one/two multi-level resistive, inductive or capacitive loads
  - Contacts of the fan connection with common foot point
  - Second fan connection alternatively as 3 switching outputs (2-fold version only)
  - One/two additional floating switching output
  - Speed switching or changeover switching can be parameterized
  - Direct selection of fan speed
  - Increase and decrease fan speed
  - Control fan speed via up to 2 control values
  - Control value selection by switchover or maximum selection
  - Threshold value with hysteresis for fan speeds
  - Forced operation
  - Limitation
  - Selection of fan speed on bus voltage failure
  - Selection of fan speed on bus voltage recovery
  - Start-up behavior can be parameterized
  - Switchover pause between fan speeds can be parameterized
  - Fan run-on can be individually parameterized for every speed
  - Control value monitoring can be parameterized
  - Switching output can be parameterized as N/O contact or N/C contact
  - Switching output with staircase lighting function
  - Status feedback
  - Reaction of outputs on bus voltage failure can be parameterized
  - Reaction of outputs on bus voltage recovery can be parameterized
  - Sending delay after bus voltage recovery
  - "In Operation" object (cyclic alive signal)
- Outputs:
  - 1-fold device: 4 (3+1)
  - 2-fold device: 8 (2 x 3 + 2 x 1)
  - Rated current per output: 6 AX (250/440 V AC)
  - Max. power consumption of device: 1.5 W (1-fold), 2 W (2-fold)
  - Switching capacity:
    - To IEC/EN 60 947-4-1: 6 A/AC3
    - To IEC/EN 60 669: 6 AX
    - Max. capacitive load: 140  $\mu$ F
    - Max. peak inrush current (150  $\mu$ s): 400 A
- Connection:
  - Screw terminals with universal head screw
  - KNX: Screwless bus connection terminal
- Load circuit: For 0.2...6.0 mm<sup>2</sup> cables
- Type of protection: IP 20, IEC/EN 60 529
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Width: 4 or 6 modules at 18 mm
- Manufacturer: ABB
- Product type (dependent on number of channels): FCL/S 1.6.1.1, FCL/S 2.6.1.1



## 7. Control Devices – Operation

### 7.1. Standard Control Element with Bus Coupler

- For transmitting switching, push-button, dimming and blind commands to KNX actuator
- LED colors for status or orientation light are programmable via ETS.
- Removal protection is possible with screw-on installation
- With individual labelling area
- Bus coupler in delivery included (bundle)
- The following functions are provided for the application module:
  - Inputs: LED
  - Outputs: Switching, Dimming, Blinds, Value, Push-button, Light scene extension unit, Value sender, 2 objects
- Connections:
  - Power supply: 10-pole multi-point connector
- Control element: Rocker switch left/right
- Display elements: Two LED per rocker via separate communication object for status (Red/Green/OFF) or orientation light
- Type of protection: IP 20, IEC/EN 60 529
- Temperature range: -5 °C to 45 °C
- Dimensions (L x W x D): 63 mm x 63 mm
- Manufacturer: ABB
- Product type (dependent on number of rockers): 6125/01, 6126/01, 6127/01

## 7.2. Presence Detector

- With integrated bus coupler
- Targeted for connection and disconnection of light bands depending on the room brightness
- Applicable as presence or movement detector
- Control also possible depending on movement
- Constant light switch with up to 2 independent channels
- Constant light switch with max. 2 outputs for brightness-dependent switching of two light bands in the room
- Detector operation with 2 power off stages
- Detector operation with integrated monitoring function
- Configurable as master or slave
- Configurable operating modes: Automatic, automatic activation or deactivation
- Activation text can be changed using an external communication object
- Switch-off delay can be changed using an external communication object
- Ceiling mounting in false ceilings with spring clamps or in solid ceilings in surface-mounting boxes 6131/29-xxx(-500)
- 4 PIR sensors, integrated brightness sensor
- The device can be updated through the bus
- The presence detector is not suited for alarm indications in VdS-compliant alarm systems.
- Detection range (for mounting height 2.5 m, 3 m and 4 m): circular
  - Seated persons Ø: Max. 5 m (8 m), max. 6.5 m (10 m), and max. 9 m (14 m)
  - Walking persons Ø: Max. 6.5 m (10 m), max. 8 m (12 m), and max. 10.5 m (16 m)
- Visible height: 16 mm (23 mm)
- Inputs: External brightness sensor, external movement
- Outputs: Movement detector, constant light switch
- Power supply: Via KNX  
KNX line: Bus connection terminal
- Type of protection: IP 20, IEC/EN 60 529
- Temperature range: -5 °C to 45 °C
- Brightness limit value: 1...1,000 Lux
- Dimensions (L x W x D): 80 mm x 80 mm x 45 mm (91 mm x 91 mm x 45 mm)
- Mounting depth: 29 mm (22 mm)
- Mounting height: 2...4 m
- Manufacturer: ABB
- Product type: 6131/20, 6131/30

### 7.3. Radio Time Switch

- The Radio Time Switch sends current time and date on the bus. The time can be optionally received via a DCF or GPS antenna. Furthermore, the device can be used to easily adjust the time programs.
- Functions:
  - 800 memory locations
  - Astronomical function with automatic calculation of sunrise and sunset times
  - Operation on the device with display backlight
  - Programming of the time programs on a PC
  - Transfer of time programs via memory card or via the KNX bus
  - Automatic summer/winter time changeover
  - Holiday and random programs
  - Protection against unauthorized access (PIN)
  - 8 years power reserve (lithium backup battery)
- Number of channels: 8
- Supply voltage: 110...240 V AC, 50/60 Hz
- Connection: Screw-less terminals
- Mounting: 35 mm mounting rail, IEC/EN 60 715
- Manufacturer: ABB
- Product type: FW/S 8.2.1

**Note:**

The information in this Document contains best practice solutions to prescribe KNX installations in a specific application segment, but is of an exemplary nature only. The information may not represent the exact functional requirements with regard to specific local electrical installation requirements. Please note the Document also does not include the specification of legally required primary electrical protection devices i.e., circuit breakers, earth fault devices, etc., as these are highly dependent on national installation regulations.

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