Specification Toolbox 2.0

ABB i-bus KNX in Office Buildings
Functional Specification – Basic

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Table of Contents

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, 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.
   – Motorized shutter and blind control
   – Operation via predefined scenarios and time schedules
   – Movement-dependent control in designated areas
   – 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, blinds, etc. The controllers shall have decentralized intelligence and shall be independent of any centralized controllers/software. For each application, such as lighting/blinds 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 and shading 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 conventional switches/push-buttons interfaced via binary inputs to the KNX bus or via use of KNX coupling units. To allow a quick and comfortable operation according to several use cases, predefined lighting/blinds scenes shall be planned to allow an efficient control for the staff. These shall be accessible via the appropriate switches/push-buttons. 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.

1.5. Control Elements

– Conventional switches/push-buttons shall be used to control various loads and scenes in the building. The conventional switches/push-buttons shall be interfaced to the KNX system by means of KNX universal interfaces which can be directly mounted in standard back boxes. The KNX universal interfaces feature binary inputs with contact scanning to monitor and transmit the state of the switch. The switches/push-buttons shall be appropriately designed and located, wherever necessary.

– Alternatively, switches with integrated bus couplers shall be used to cover the same functions.

2. Office Building – Basic 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.

−   Specialized switch actuators with current detection shall be used to monitor the electrical state of a connected lighting load. By means of current threshold values, alarm messages shall be triggered if a certain current value is exceeded or undercut (optional).

2.1.2. 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. A dedicated KNX radio time switch shall execute this with the possibility to change time schedules directly on the device without programming tools. The time can be obtained via a connectable GPS sensor or a DCF signal receiver. If a BMS (Building Management System)/visualization software is used, the time program can be realized on software basis.

−   An occupancy-dependent control is a control form that uses motion or presence detectors. It detects the movement of persons in the building or in external areas and switches the corresponding lighting. If dimmable lighting circuits are used, the light value can be reduced to a certain level (e.g. 30%), if no movement is detected (optional). The presence detector shall have a KNX interface in order to connect it to the KNX bus directly. The KNX bus then transmits the appropriate signals to switch actuator channels carrying out the command.

2.2.   Blind/Curtain/Shutter Control

−   Curtain and blind control shall be possible via local operation with switches/push-buttons. 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 a KNX weather system in order to react on a wind alarm, for example. Furthermore, the outside brightness value provided by the weather system's brightness sensor can be used to realize basic automated shading functionality.

2.3.   Operation via Switches/Push-buttons

−   Conventional switches/push-buttons with floating contacts shall be integrated in the bus system via binary inputs with contact scanning by means of universal interfaces which can be directly mounted in back boxes. The binary input shall be configurable in terms of sending various types of commands, e.g. switching, dimming and values in order to fit several applications.

−   Alternatively, direct KNX coupling units shall be installed. The coupling units shall be configurable to send various types of commands, e.g. switching, dimming, and values in order to be pairable with several applications.

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 > rated current I_N, overload I > I_{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 +1/-2 V, 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 +1/-2 V, 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

4. Control Devices – Switching

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 µF

– 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 mm² 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

5. Control Devices – Curtain and Blind Control

5.1. Blind/Curtain/Shutter Control Actuator with Manual Operation

– To control up to 2, 4 or 8 independent blind and roller shutter drives or curtains and ventilation flaps (230 V AC) with manual operation and displaying LEDs for each channel. Mutually, mechanically interlocked outputs are available, and power supply is provided only via bus voltage.

– Functions of the application program:

  – Duplicating and changing channel functions
  – Time-delayed switching of drives for specific applications
  – Sending and switching delay after bus voltage recovery
  – Request status values via object and limited number of telegrams
  – Preferred position on bus voltage failure recovery, programming and reset
  – Disable/enable manual operation, deactivation by time
  – 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 for UP/DOWN, STOP/Slat Adjustment are available
  – 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 for awnings and slot positioning for roller shutters, for example
  – 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)
  – Controlling ventilation flaps, switch mode with staircase lighting function

– Outputs: 2, 4 or 8 parallel relay outputs UP/DOWN

– Power consumption: < 250 mW

– Operating voltage: 21…30 V DC via KNX

– U_N rated voltage: Max. 230 V AC, 45…65 Hz

– I_N rated current: Max. 6 A

– Operating and displaying elements: 2 LEDs and push-buttons for each channel

– Connection

  – Outputs: Screw terminals with combination head screws
  – Bus: 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 2.230.2.1, JRA/S 4.230.2.1, JRA/S 8.230.2.1

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 – Operation

6.1. KNX Push-Button Coupling Unit

− For transmitting switching, push-button, value, dimming and blind commands to a KNX actuator

− For the connection of conventional 1- or 2-fold switch rockers

− For installation in surface-mounted or flush-mounted boxes

− With middle position and update interface

− The following functions are provided for the application module:
  − 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

− Connections: KNX line: Bus connection terminal

− Rated voltage: 24 V, ± 5 V

− Inputs: 2/4

− Polling voltage: 24 V, is provided by the device

− Type of protection: IP 20, IEC/EN 60 529

− Temperature range: -25 °C to 45 °C

− Dimensions (L x W x D): 53 mm x 45 mm x 28 mm

− Manufacturer: ABB

− Product types: 6108/01 (1-/2-fold), 6108/02 (2-/4-fold)

6.2. Universal Interface

- The device has 2/4/12 channels that can be parameterized as inputs or outputs. It is possible to connect conventional push-buttons, floating contacts or LEDs. The scanning voltage for the contacts and the supply voltage for the LEDs are provided by the device. Series resistors for external LEDs are integrated into the device. The Universal Interface is a flush-mounted device and a low cost solution designed in such a way to fit inside conventional electrical back boxes.

- The following functions can be set for each channel separately:

    - Switching and dimming of lighting
    - Operation of blinds and roller shutters
    - Sending of arbitrary values, e.g. temperature values
    - Control and storing of light scenes
    - Triggering an electronic relay for control of electrothermal valve drive for heating valves
    - Control/flashing of an LED for feedback of an operation
    - Operation of different loads by multiple push-button actions
    - Operation of several loads in a fixed switching sequence
    - Reading out of technical contacts (e.g. relays)

- Input:

    - Scanning voltage: 20 V DC
    - Input current: 0.5 mA

- Output:

    - Output voltage: 3.3 V DC
    - Output current: Max. 2 mA, limited by series resistor

- Connection:

    - Inputs/Outputs:

        - 4 cables approx. 30 cm long (for 2-fold)
        - 6 cables approx. 30 cm long (for 4-fold)
        - 18 cables approx. 30 cm long (for 12-fold)
        - Each cable can be extended to a maximum of 10 m

    - Bus connection:

        - Bus connection terminal

- Type of protection: IP 20, IEC/EN 60 529

- Mounting: Flush-mounted, combined wall and joint box, 60 mm

- Manufacturer: ABB

- Product type (dependent on number of channels): US/U 2.2, US/U 4.2, US/U 12.2

6.3. 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 independet 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

6.4. Binary Input with Wide Range Input

–   The binary input has a wide input range of 10….230 V AC/DC. It serves as interfaces for operation of bus systems via conventional buttons/switches/230 V presence detectors or for coupling of binary signals (signal contacts). The device features a push-button for manual operation for each input. Input states can be simulated during manual operation, so that the conventional push-buttons, switches or floating contacts do not need to be connected for commissioning purpose. The device is suitable for reading out all types of binary input signals. Each binary input of a device can receive input values and assume one of the functions. The device can be parameterized flexibly to fit the requirements of conventional switches.

–   The binary inputs are used for many sensory applications, such as

   –   Switching
   –   Dimming
   –   Operation of shutters and blinds
   –   Sending of arbitrary values
   –   Control and saving of light scenes
   –   Operation of several loads in a defined switching sequence
   –   Operation of different consumers by repeated actuation
   –   Operation of several loads in a defined switching sequence
   –   Counting from impulses and actuations
   –   Reading of floating contacts

–   Power Supply: Bus voltage 21…32 V AC

–   Inputs : 4 or 8

–   Connections

   –   KNX Via bus connection terminals
   –   Inputs Via slotted head screw terminals

–   Type of protection: IP 20, IEC/EN 60 529

–   Mounting: 35 mm mounting rail, IEC/EN 60 715

–   Width:

   –   4-fold: 2 modules at 18 mm
   –   8-fold: 4 modules at 18 mm

–   Manufacturer: ABB

–   Product type (dependent on number of channels): BE/S 4.230.2.1, BE/S 8.230.2.1

6.5.   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

Further information and local contacts:

www.abb.com/knx

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