ABB GPG Building Automation
Logic Controller ABA/S 1.2.1
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Agenda

- Logic Controller ABA/S 1.2.1
  - Introduction
  - Planning
  - Installation
  - Commissioning
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

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ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Introduction
What is a Logic Controller?

- A Logic Controller provides numerous functions like logic, timer, mathematical functions, PID controller and more as a superior intelligence to implement powerful solutions with sensors and actuators in KNX building automation.

Why do we need a Logic Controller?

- The functional requirements are growing continuously in intelligent buildings, not always feasible with the existing KNX devices, but can be covered by the Logic Controller efficiently.
What is the Logic Controller made for?

- With the huge number of individual functional blocks within the Logic Controller almost any kind of application in a KNX project can be empowered or even put into practice at all, e.g.
  - Lighting – with time and logic
  - HVAC – with controller
  - Security – with additional alarming
- Special functions like value comparison or mathematical functions needed multiple times in a project with demand for a economical implementation in terms of hardware, commissioning and maintenance
Is the Logic Controller needed in every project?

- KNX devices used in projects offer nowadays powerful applications with parameters for many functions
- Nevertheless it is often necessary to achieve functionality which requires additional intelligence
- Here the Logic Controller comes into play
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Introduction

Is the Logic Controller the only device for the functionality mentioned?

- There are a few KNX devices on the market with similar (not the same!) functions. For instance ABB’s components like presence detector or selected dimmers offer additional independent functions like logic. It is a case by case decision what to use.

- Compared with other components the Logic Controller offers
  - Graphical environment
  - More and all kind of functions
  - A dedicated product for the task

… so in many cases the right choice
Is it necessary to install the Logic Controller from the beginning of a project?

- As long as the functionality of the installed devices is sufficient no need to install it immediately.
- The Logic Controller needs bus connection and power supply only, so it is easy to install later.
- Often it is recommended to include a logic controller from the beginning to be quickly prepared for expected functional extensions.
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Device technology - Hardware

Logic Controller ABA/S 1.2.1
- Modular installation device (MDRC)
- Width: 4 MW
- Power supply:
  - 24 V DC or PoE (LAN connection)
- Bus connection terminal behind cover
- LAN connection
  - PoE (Power supply), WebUI, Download Application, Monitor
- LEDs (ON, LAN/Link, KNX telegram)
LED’s

- **ON**
  - Flashes slowly while the system is booting or Logic engine stopped
  - Lit up continuously when the system has been initialized permanently
  - Flashes rapidly when an error has occurred in the logic processing or the logic processing was stopped

- **LAN/LINK**
  - Lit up continuously when the auxiliary voltage is present and the router is connected to an IP network
  - Flashes with data traffic via LAN

- **Telegram**
  - When booting is complete, lit up continuously when the auxiliary voltage is present and the router is connected to KNX
  - Flashes with data traffic via KNX/TP
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Device technology - Software

- Application for ETS4 and ETS5 (not ETS3 any more !)
- Application fully integrated in ETS, no separate software required
- User friendly graphical environment in ETS

Optional: Accessing selected functions via Web UI, only web browser needed, covering partly typical i-bus tool functionality (Simulation and testing)
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Device technology - Software

- Integration in the i-bus® Tool
- Detection of connected Logic Controller with display of data
  - Device Name, Firmware
  - IP Data: IP address, MAC address
- Firmware update possible
- Operation and test via ETS Plug in and Web UI
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Device technology - Software

- **Functional Element**: Any type which is available
- **KNX IN/Outputs** → Group Objects
- **Group Addresses**: each address counts, also identical
- **Web UI**: Input and indication of values via Web browser

### Description | Maximum Number
--- | ---
Functional Elements | 3000
KNX In/Outputs | 500
Group Addresses | 2000
Web UI In/Outputs | 60
Standard group object to request and receive date and time from a time master, for synchronization of internal clock.

Option to achieve IP address, automatically or fixed.
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Device technology – Software ETS

Open product specific parameter dialog
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Device technology – Software ETS

Menu and Functions
Worksheet
Simulation

Input
Function Element
Output

Comment

Properties (Parameter) of a Block

Help for selected element and online manual

In/Outputs, Function Elements positioned via drag and drop

Grid
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Features

- Graphical User Interface
  Transparent and user friendly

- Various function elements
  for all requirements

- Definition of composite function blocks
  own KnowHow, can be used multiple times

- Offline simulation and online monitoring
  safe commissioning and operation

- LAN and WebUser Interface
  Access by customer, fast download

- Buffering power voltage failure min 20 s
  safe operation
ABB i-bus® KNX Logic Controller ABA/S 1.2.1
Graphical User Interface
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

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Function Elements

- KNX I/O
  - 1 bit
  - 2 bit
  - 4 bit
  - 1 byte unsigned
  - 1 byte signed
  - 2 byte unsigned
  - 2 byte signed
  - 2 byte float
  - 4 byte unsigned
  - 4 byte signed
  - 4 byte float
  - Color
  - Date
  - Time
  - Date/Time

- Bit logic
  - AND
  - OR
  - XOR
  - NOT
  - ONE-HOT

- Comparison
  - Greater Than
  - Lower Than
  - Equal
  - Not Equal
  - Greater or Equal
  - Lower or Equal

- Select
  - Minimum/Maximum
  - Multiplexer, 2 to 1
  - Multiplexer, n-fold
  - Gate
  - Filter

- Internal Markers
  - Marker Input
  - Marker Output

- Mathematics
  - Addition
  - Multiplication
  - Subtraction
  - Division
  - Modulo

- Timers and Delay
  - Delay
  - Staircase Light
  - Calendar, simple
  - Calendar

- Conversion
  - Numeric Converter

- Flip Flops
  - RS-Flip Flop

- Counter
  - Up Counter

- Control
  - PID Controller

- Layout
  - ABC Comment
  - Rectangle
  - Line
  - Own function blocks
    - Splitter 1-byte to 8 bits
    - Splitter 2-byte in 1-byte
  - Imported
    - Fahr. to Cel.
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

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ABB i-bus® KNX Logic Controller ABA/S 1.2.1 Simulation
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

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ABB i-bus® KNX Logic Controller ABA/S 1.2.1

WebUI

- 60 In- or Outputs accessible via WebUI for operation or overwriting of values, e.g. change of a comparison value or change of parameter of a PID controller
- Please note: Not comparable with a visualisation
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Features

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  Transparent and user friendly
- Various function elements
  for all requirements
- Definition of composite function blocks
  own KnowHow, can be used multiple
- Offline simulation and online monitoring
  safe commissioning and operation
- LAN and WebUser Interface
  Access by customer, fast download
- Buffering supply voltage failure min. 20 s
  safe operation
Features

Logic Controller | Help

Persisting values

Power failure
If the power (24 V DC or PoE) fails, certain values are saved. The device has an internal power backup of about 20 to 60 seconds (depending on processing power).

As soon as the device detects a power failure, it saves the values and restores them when the power is back on.

If there is a brief drop in voltage where the power backup is sufficient to keep the device working, the saved information is discarded on voltage recovery.

To see which data are saved, please refer to the descriptions for the relevant Function Elements.

Bus voltage failure
If the bus voltage fails but the power is still on, all information is retained.

On bus voltage recovery, no telegrams are sent. The KNX inputs react as per their parameters.

ETS download
After an ETS download, all internal information is saved and restored. This also applies to internally calculated values (e.g. staircase lighting time and the integral value of the PID controller).

The KNX inputs react as per their parameters.

If an element was removed from the previous parameterization, its internal value is discarded.

If an element was added, its internal value will be set to the default (usually 0).

Unloading
Unloading the device via ETS removes all internal information and stops the application (Logic Controller).
Online Manual on ABB homepage and via link in ETS application
ABB i-bus® KNX Logic Controller ABA/S 1.2.1 Marketing Material

Further data and files on ABB homepage:

- Application Software ETS4 and ETS5
- Technical Data
- Installation and Operating Instructions
- Specification Text
- Product Manual (online)
- Presentation Slides
- CE Declaration of Conformity

... coming soon
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Market Introduction

- Market Launch: Week 46/2016

<table>
<thead>
<tr>
<th>Ident No.</th>
<th>Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2CDG 110 192 R0011</td>
<td>ABA/S 1.2.1 Logic Controller, MDRC</td>
<td>New</td>
</tr>
</tbody>
</table>

ABA/S 1.2.1 Logic Controller
Important: Logic Controller ABA/S 1.2.1 does not replace any existing device handling logic, time functions or other superior intelligent functions!
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Planning
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Planning

- The applicable standards, directives, regulations and specifications of the local country have to be observed when planning and setting up electrical installations

- KNX International Standard
  - ISO/IEC 14543 and EN 50090

- PoE (IEEE 802.3 af class 1)
From the installation point of view the Logic Controller is easy to plan

- No classical in/outputs to be observed
- Power supply 24 V DC or PoE
- Space in DB (4MW)

Technical data (extract)

- **Auxiliary voltage (required)**: 24 V DC (-15% / +20%) or PoE (IEEE 802.3 af class 1) 3.0 W max.
- **Power loss Current consumption**
  - 60 mA typical
  - 120 mA peak current
- **Current consumption KNX Connection terminals** < 10 mA
- **Auxiliary voltage** Screw terminals
  - 0.2...2.5 mm² fine stranded,
  - 0.2...4 mm² single core
- **Tightening torque** Max. 0.6 Nm
- **KNX connection** Bus connection terminal
- **LAN connection** 10/100 BaseT, IEEE 802.3 via RJ45 plug
- **Temperature range in operation \( T_{op} \)** - 5 °C ... + 45 °C
- **Storage** - 25 °C ... + 55 °C
- **Transport** - 25 °C ... + 70 °C
- **Atmospheric pressure** Atmosphere up to 2,000 m
- **Maximum air humidity** 95%, no condensation allowed
- **Protection degree** IP 20 according to DIN EN 60 529
- **Protection class** II according to DIN EN 51 140
- **Overvoltage category** III according to DIN EN 60 664-1
- **Pollution degree** 2 according to DIN EN 60 664-1
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Software

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<td>2000</td>
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<tr>
<td>Web UI In/Outputs</td>
<td>60</td>
</tr>
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</table>

- Is a ABA/S necessary or possible to use other solutions like ABL/S 2.1?
- Planning concerning software and capacity
  - Which functions?
  - Directly available or to be created?
  - How many?
- Often one device is sufficient due to the big number of functions per device
- In case of known comprehensive functionality (quantity) more than one ABA/S might be required
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Software

- Decentralized installation to reduce bus traffic can be considered
- Practically the number of In/Outputs could be the limit (500 KNX IO’s)
- In case of expected but in the planning phase not yet known functionality a Logic Controller should be budgeted already
- Please note: Commissioning can take some time, to be considered (Costs and time)

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ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Software

- **Summary for Planner:**

  The Logic Controller ABA/S 1.2.1 is with its extraordinary capability for almost every functional requirement the right choice.

  Simple installation, clear and user friendly commissioning with graphical environment in the ETS, a dedicated hardware for the task it was made for with direct connection to KNX TP in the line ensures a successful implementation and a well running solution.
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Installation
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Installation

- Warning! Hazardous voltage! Installation by person with electro technical expertise only
- The appropriate standards, directives, regulations and specifications must be observed when planning and setting up electrical installations
- The device must not be operated outside the specified technical data
- A detailed description of Installation and commissioning can be found in the technical documentation and Installation and Operating Instructions of the device
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Installation

- The device is suitable for installation in distribution units or small housings on a 35 mm mounting rail according to EN60715 (any position)
- Accessibility of the device for the purpose of operation, testing, visual inspection, maintenance and repair must be ensured
- Power supply 24 V DC via screw terminals
- The connection to the KNX is implemented using the supplied bus connection terminal
- The connection to the IP network is established using an RJ 45 plug
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Installation

- Thanks to the new way to snap KNX devices from ABB on the rail in a distribution board especially dismounting is very simple without screwdriver and thus user friendly

- Snap onto mounting rail

- Remove from mounting rail
### ABB i-bus® KNX Logic Controller ABA/S 1.2.1

#### Connections

**Connection diagram**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LED ON</td>
</tr>
<tr>
<td>2</td>
<td>LED LAN / LINK</td>
</tr>
<tr>
<td>3</td>
<td>LED Telegram</td>
</tr>
<tr>
<td>4</td>
<td>Label carrier</td>
</tr>
<tr>
<td>5</td>
<td>Programming LED</td>
</tr>
<tr>
<td>6</td>
<td>Programming button</td>
</tr>
<tr>
<td>7</td>
<td>Bus connection terminal</td>
</tr>
<tr>
<td>8</td>
<td>Cover for bus connection terminal</td>
</tr>
<tr>
<td>9</td>
<td>Supply 24 V DC</td>
</tr>
<tr>
<td>10</td>
<td>LAN Connection</td>
</tr>
</tbody>
</table>

---

24 V DC
### LED Function Description

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>System has been initialized permanently</td>
</tr>
<tr>
<td></td>
<td>Flashing slowly</td>
<td>System is booting</td>
</tr>
<tr>
<td></td>
<td>Flashing quickly</td>
<td>Error has occurred in the logic processing or the logic processing was stopped</td>
</tr>
<tr>
<td>LAN / LINK</td>
<td>ON</td>
<td>Auxiliary voltage is present and device is connected to an IP network</td>
</tr>
<tr>
<td></td>
<td>Flashing</td>
<td>Data traffic via LAN</td>
</tr>
<tr>
<td>Telegram</td>
<td>ON</td>
<td>Booting complete, auxiliary voltage present and device is connected to KNX</td>
</tr>
<tr>
<td></td>
<td>Flashing</td>
<td>Data traffic via KNX/TP</td>
</tr>
<tr>
<td>Programming button</td>
<td>Press</td>
<td>Assignment of the individual address</td>
</tr>
<tr>
<td>Programming LED (red)</td>
<td>ON</td>
<td>The LED comes on when the Programming button is pressed, in order to assign a individual address</td>
</tr>
</tbody>
</table>
ABB i-bus® KNX Logic Controller ABA/S 1.2.1
Installation steps

- De-energize the electrical plant and prevent unintentional reclosing of the electrical plant
- Snap device onto mounting rail
- Connect the cables for
  - Operating voltage (if no supply via LAN with PoE)
  - KNX
  - LAN connection (if necessary → power supply via PoE, Web UI, i-bus® tool, Online monitoring, Application download)
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Installation steps

- Switch on operating voltage and KNX
  → Start up of the device

- Start up process runs and finally (after < 1 min) all LED’s are on or flash in case of traffic (KNX or IP). See slide ‘Installation – Display/Operating elements’

→ Logic Controller is ready for operation and commissioning with i-bus tool and ETS
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Testing and troubleshooting

Test KNX
(Condition: supply voltage / PoE OK)

- Press “Programming button”
  → Programming LED lights red
  KNX is OK, press again to switch off the LED
  → Programming LED does not light: KNX failure

Check weather KNX is available (e.g. using a digital meter and measure the bus voltage between the red and black core, 21-30 V DC)

Test supply voltage 24 V DC

- Use a digital meter and measure the voltage between terminal 1 and 2
Test IP Network

- LED LAN/LINK
  - ON (yellow), network connected, no traffic
  - Flash (yellow), network connected, IP traffic
  - OFF, no network connected
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ABB i-bus® KNX Logic Controller ABA/S 1.2.1
Commissioning
- For Firmware update or if IP data (e.g. IP address for Web UI access) is needed

- PC with i-bus® tool has to be linked via IP connection of ABA/S

- After Start of i-bus® tool click on ‘Connect’ and ‘IP devices’

- All supported ABB IP devices will be displayed
By selecting on the left side ‘ABA/S’ only this device will be shown with

- Name, Firmware (Status and version)
- IP Data: IP address, MAC address

Button ‘Detailed data’ gives more related information
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i-bus® Tool

- Firmware update: In case of new firmware version an update is feasible with i-bus® Tool
- Update Information and option to download in i-bus® Tool
- The firmware update can be triggered → update → Start update
- For firmware update Logic Controller has to be linked via LAN connection

Note: In case of firmware update i-bus tool has to be started as administrator
Inputs/Outputs are available as:

- KNX in/outputs
- WebUI in/outputs
- Function block in/outputs

- 1 bit, 2 bit, 4 bit,
  - 1 byte, 2 byte and 4 byte,
  - 3 byte (Date, Time, Color)
  - 8 byte (Date and Time)
Inputs

- Elements with Icon (colored) represent an input.

- Telegram with the assigned group address will be received and processed according to further connected functional elements.

- Inputs can be parametrized with additional status output, confirming that the incoming telegram has been received. An impulse value 1 (200ms) → 0 will be sent.

- Inputs should be named!
Outputs

- Elements with Icon (colored) represent an output
- Telegram with the assigned group address will be sent out resulting in any function in the KNX installation
- Outputs should be named!
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Outputs

- Sending Behavior
  - Sending on change:
    Telegram value has to be different compared with the former status to be sent
  - Send always:
    After each cycle/calculation output sends a telegram, even if no change of the former value occurred

- Output telegrams can be sent cyclically, e.g. monitoring of telegram for safety reasons
Worksheet is the area to place and connect In/Outputs and functional elements.

Worksheets can be named.

Many Worksheets can be created.

Grid for more precise positioning of the elements.

Slider to zoom the worksheet between 20% and 150%.

Search button to find an element or comment with red border of the found element.
Connection of marker allow to link pins of different elements when no connection is possible any more

- Within the same worksheet if due to optical reasons (overview) a direct connection is not useful
- Connection between elements in different worksheets
Pins of binary signals can be inverted by double click on it

- '0' → '1'  '1' → '0'

Inverted Pin shown as empty circle
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Color of Pin’s

- 15 different data types are available to be processed in the Logic Controller ABA/S 1.2.1
- Each datatype has its own color
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Color of Pin’s and Lines

- Even the connecting lines have this color for better distinction
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Direct link In-/Output

- Direct connection of In-/outputs is possible, e.g. as telegram multiplier or light groups
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PID Controller

- The Logic Controller offers PID Controller for control functions in a building

- Options:
  - P-Controller (Proportional)
  - PI (Proportional Integral)
  - PD (Proportional Derivative)
  - PID (Proportional Integral Derivative)

- Input S: Set point
- Input A: Actual value
- Input R: Reset Integral time
- Output O: Control value
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**PID Controller**

- The coefficient and times are either adjusted via parameters or changeable via group objects
  - **PC:** Proportional Coefficient
  - **IT:** Integral Time
  - **DT:** Derivative Time

- All value inputs and output 1 byte or higher
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PID Controller

- Parameter Limit output (control value) between 0 and 255 to limit the control value
- E.g. to avoid an oscillating system (Upper limit)
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Time and Calendar

- ABA/S offers comprehensive Time and Calendar functions
  - Simple Calendar (CALENDAR_S) to trigger daily events at a certain time or the whole day
  - Calendar (CALENDAR) to trigger events at any time and day
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Check

- The check function allows to monitor the number of used elements, group objects and the amount of data already downloaded to the Logic Controller ABA/S 1.2.1.
Group Addresses to be assigned the classical way in the ETS (not in Plug In like ABL/S 2.1)

Group addresses will be shown in the Input/Output blocks
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Monitoring and Simulation

- **Monitor**
  - Online monitoring of status of logic
  - Telegrams from other KNX devices to be received
  - IP connection required

- **Simulation**
  - Offline simulation
  - Inputs of logic to be triggered

→ LIVE DEMONSTRATION
ABB i-bus® KNX Logic Controller ABA/S 1.2.1
Example: 2-step control Cooling, dynamic Setpoint, variable Hysteresis
Example: 2-step control Cooling, dynamic Setpoint, variable Hysteresis

- Room temperature above setpoint + hysteresis → Cooling ON
- Room temperature below setpoint – hysteresis → Cooling OFF
- Room temperature within hysteresis zone → no reaction
- Outputs to be programmed with sending behavior ‘Send always’
ABB i-bus® KNX Logic Controller ABA/S 1.2.1

Example: Conversion Fahrenheit → Celsius

Transformation to Function block

Example: 68 degr. Fahrenheit = 20 degr. Celsius
Example: Limitation of Value

As long as the KNX IN value is bigger than the limit the limit value will be sent out, otherwise the original KNX in value.
ABB i-bus® KNX Logic Controller ABA/S 1.2.1
Example: 16 bit to 2 x 8 bit

Transformation to Function block
ABB i-bus® KNX Logic Controller ABA/S 1.2.1
Example: Flashlight
Next Webinar

- **Wednesday 14th of December 2016**
  - Morning 09:00 am Europe Time (Berlin, UTC + 1h)
  - Afternoon 03:00 pm Europe Time (Berlin, UTC + 1h)
- **ABB-free@home® wireless**
  - 64 wireless and 64 wired devices in one system
  - The new System Access Point supports both media wireless and cabled in the one system
  - The best radio connection thanks to meshed network

*Topic is subject to change*
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