Product Manual

ABB i-bus® EIB / KNX Switch/Dim Actuators SD/S

Intelligent Installation Systems

This manual describes the function of the Switch/Dim Actuators SD/S x.16.1 with its application programs *"Switch Dim xf 1-10V/1.1"* (x = 2, 4 and 8). Subject to changes and errors excepted.

Exclusion of liability:
Despite checking that the contents of this document match the hardware and software, deviations cannot be completely excluded. We therefore cannot accept any liability for this. Any necessary corrections will be inserted in new versions of the manual.
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ABB i-bus® EIB / KNX   **SD/S Switch/Dim Actuators, MDRC**

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ABB i-bus® EIB / KNX   **General**

1   General

This manual provides you with detailed technical information relating to the ABB i-bus® Switch/Dim Actuators SD/S x.16.1 with mounting and programming and explains the use of actuators using examples. The Switch/Dim Actuator range consists of EIB / KNX modular installation devices in ProM design. The three Switch/Dim Actuators feature 2, 4 or 8 outputs, which have a 1-10 V control output and a 16 A load relay. The outputs can be parameterised independently of each other and can implement different functions such as dimming, switching, scene retrieval, staircase lighting, slave operation, etc.

The Switch/Dim Actuators provide the link between devices with the 1-10 V interface and the higher-level intelligent installation systems and the ABB i-bus®.

The main reasons for using dimmable lighting components are

- Reduction of the operating costs

- Saving energy

- Improved lighting ensuring comfort and convenience

Of the many 1-10 V control devices available on the market the most common are

- Electrical ballasts

- Dimmers

- Transformers

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ABB i-bus® EIB / KNX   **General**

1.1   Product and functional overview

SD/S 8.16.1

SD/S 4.16.1

SD/S 2.16.1

Fig. 1:   SD/S - Range

The 2-, 4- and 8-fold ABB i-bus® Switch/Dim Actuators are EIB / KNX are modular installation devices in Pro*M* design. They control 2-, 4- and 8-output dimmable electronic ballast devices or transformers with 1-10 V interfaces. A floating contact for switching the electronic ballast devices on and off is provided for each output. Furthermore, there is an additional manual, auxiliary voltage-dependent operation of the switching relay which simultaneously serves for indication of the contact position. Switching and dimming is implemented independently of the output via the ABB i-bus®. Several ballast devices can be connected to a single output.

The number of connectable electronic ballast devices is limited by switching and control power. If the switching on and off function via the SD/S is not used, the number of ballast devices subject to control is only limited by the load capacity of the 1-10 V control voltage.

The devices are powered via the EIB / KNX and do not require an additional power supply. The control voltage of the 1-10 V devices is generated by the ballast devices. The Switch/Dim Actuator acts against this control voltage and reduces it. This is used to set the required dimming value. Switching off is implemented via the integrated switching relay in the Switch/Dim Actuator.

The assignment of the physical addresses as well as the parameterisation is carried out with Engineering Tool Software ETS (from Version ETS2 V1.3) with a VD2 file. If ETS3 is used, a ".VD3" type file must be imported.

The SD/S range consists of 3 types. The following designation code overview should provide a fast and simple overview of the individual Switch/Dim Actuators.

SD/S 2.16.1	
SD/S 4.16.1	
SD/S 8.16.1	
SD/S	- **Switch/Dim Actuators**, **rail mounted**
SD/S x	- x = number of outputs (2, 4 or 8)
SD/S 8.y	- y = rated current in amps (16 A)
SD/S 8.16.z	- z = version

Table 1   SD/S - designation code overview

ABB i-bus® EIB / KNX   **General**

1.2   Properties of the 1-10 V
         interface

Dimmable ballast's with 1-10 V control interface have long been established on the market and offer a simple, reliable and attractively priced solution for implementing controlled lighting environments, mood illumination and energy saving lighting installations.

Properties of the 1-10 V lighting systems

- Control of the ballast's is implemented via an interference resistant DC voltage signal of 10 V where:
  i) 10 V = maximum brightness (open control line) and,
  ii) 1 V = minimum brightness (control line fully loaded).

- The 10 V DC control voltage is supplied from the ballast's. The maximum supply current is dependent on the ballast type and manufacturer and lies typically between 0.5 mA and 4 mA per ballast.

- The control voltage is potentially isolated from the mains supply voltage, however it is not classified as SELV (**S**afety **E**xtra-**L**ow **V**oltage).

- Ballast devices connected to different phases can be dimmed with the same control voltage, i.e., control line.

Due to the typical characteristics of the 1-10 V system, the following points must be observed:

- The polarity of the control lines and of the control voltage must be observed.

- The control voltage is potentially isolated from the mains supply voltage, however as the voltage is not SELV, in the event of a fault, mains voltages can be present.

- The control voltage can be limited to a maximum or minimum value via the control device, e.g., the Switch / Dimm Acutators SD/S. This allows the implementation of two useful features:
  i) setting a minimum value allows trouble-free ignition of lamps at low light levels
  ii) limiting the upper value can save significant energy in normal operation and can extend the useful service life of the fluorescent tubes or allow for future compensation due to ageing of the luminaries.

- Testing the correct function of a ballast can be easily done without the need for additional software or testing devices:
  i) The ballast is turned on with an open circuit contol line. The luminary should ignite at full intensity
  ii) Short-circuiting the control line, e.g., with a wire jumper (observe second point!). The lamp should now dimm down to the minimum brightness.

- The 1-10 V control voltage is purely used for dimming the ballast's. The devices remain under mains voltage, even at minimum brightness. Isolation of the ballasts is carried out via the switch contact in the control device.

- The maximum loading of the control device must observed:
  i) loading of the 1-10 V control line
  ii) maximum switching capacity of the output circuit, including consideration of in-rush currents.

If you want to implement more flexible applications with your lighting and, for example, addressable lighting components are required, ballast devices with **DALI** (digital addressable lighting interface) interfaces should be used. In order to integrate these components in the intelligent installation systems and the ABB i-bus®, EIB / KNX DALI gateways are available from the ABB product range. More detailed information with the corresponding product manuals and technical data can be found on our homepage www.abb.com/eib under Downloads in the Illumination section.

ABB i-bus® EIB / KNX   **Device technology**
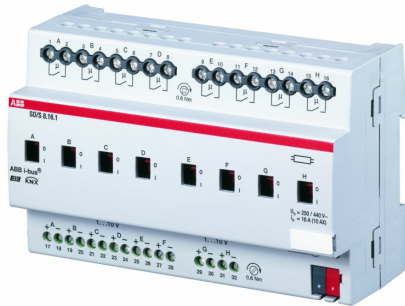
2 Device technology

Fig. 2: SD/S 8.16.1

The ABB i-bus® Switch/Dim Actuators allow the comfortable and energy efficient control of dimmable electronic ballast's or transformers with 1-10 V control interfaces. The Swtich/Dim Actuators with a rated switching current of 16 A are EIB / KNX modular installation devices in Pro*M* design for installation in the distribution board on 35 mm DIN mounting rails. The connection to the ABB i-bus® is implemented via a bus connection terminal.

The SD/S family consists of devices with 2, 4 or 8 outputs for cost effective application in lighting control systems. Per output a potential free relay contact for switching the mains supply to the ballast.

The switching relays are particularly suitable for switching ohmic, inductive and capacitive loads, as well as fluorescent lamp loads (10 AX) according to EN 60 669. The switching relays with integrated status indicator allow a simple manual operation of the device without the need for the bus voltage or an auxiliary supply.

The devices are powered via the EIB / KNX and do not require an additional auxiliary power supply.

2.1 Technical data

Power supply:	- Operating voltage	21...30 V DC, made available by the bus		
	- Current consumption EIB / KNX	2.16.1	4.16.1	8.16.1
		8.5 mA	9 mA	9.5 mA maximum
	- Power consumption via EIB / KNX	Max. 250 mW		
Outputs control circuit:	- SD/S - type	2.16.1	4.16.1	8.16.1
	- Number of control outputs 1-10 V (passive)	2	4	8
	- Max. current per control output	100 mA	100 mA	100 mA
	- Max. number of ballast devices (2 mA/ballast)[3]	50	50	50
	- Max. cable length, with max. load (100 mA)	70 m with cable cross-section 0.8 mm^2 100 m with cable cross-section 1.5 mm^2		
Outputs load circuit rated values:	- SD/S - type	2.16.1	4.16.1	8.16.1
	- Number of load outputs (floating)	2	4	8
	- U_n rated voltage	250 / 440 V AC (50/60 Hz)		
	- I_n rated current	16 A - AC1 or 10 AX		
	- Power loss per device at max. load	2.6 W	5.2 W	10.4 W
Load circuit (relay) switching currents	- AC1 operation (cos = 0.8) IEC 60 947-4-1	16 A / 230 V		
	- Fluorescent lighting load AX acc. EN 60 669-1	10 AX / 250V (140 F)[2]		
	- Minimum switching performance	100 mA / 12 V 100 mA / 24 V		
	- DC current switching capacity (ohmic load) Lamp loads	10 A / 24 V= See table 3		
Load circuit (relay) service life	- mechanical endurance	> 3 x 10^6		
	- electrical endurance to IEC 60 947-4-1			
	- AC1 (240V/cos 0.8)	> 10^5		
	- AC5a (240V/ cos 0.45)	> 3 x 10^4		
Load circuit (relays) switching times[1]	- Max. relay position change per output and minute if all relays are switched simultaneously object. The position changes should be distributed over a minute.	2.16.1 60	4.16.1 30	8.16.1 15
	- Max. relay position change per output and minute if only one relay is switched	120	120	120

[1] The specifications apply only after the bus voltage has been applied to the device for at least 30 seconds. The typical elementary delay of the relay is approx. 20 ms.
[2] The maximum inrush-current peak (see table 3) may not be exceeded
[3] The control current of 1-10 V devices determine the number of connectable ballast devices. Typical devices are between 0.4…4 mA.

Table 2 - Part 1:   Switch/Dim Actuators SD/S x.16.1, technical data

ABB i-bus® EIB / KNX   **Device technology**

Connections: ABB i-bus®	- EIB / KNX	Bus connection terminal, 0.8 mm Ø, single core
Connections: control circuit	- 2 terminals per control circuit	Screw terminal with slotted screw 0.2... 2.mm^2 finely stranded 0.2... 4 mm^2 single core
	- Ferrule with/without plastic sleeve	0.25...2.5 / 0.25...4 mm^2
	- TWIN ferrules	0.5 - 2.5 mm^2 Contact pin length min. 8 mm
	- Tightening torque	Max. 0.6 Nm
Connections: load circuit	- 2 terminals per load circuit	Screw terminal with universal head (PZ 1) 0.2... 4 mm^2 finely stranded, 2 x (0.2 - 2.5 mm^2) 0.2... 6 mm^2 single core, 2 x (0.2 - 4 mm^2)
	- Ferrule with/without plastic sleeve	0.25…2.5 / 0.25…4 mm^2
	- TWIN ferrules	0.5 - 2.5 mm^2 Contact pin length min. 8 mm
	- Tightening torque	Max. 0.8 Nm
Operating and display elements	- Red LED and EIB / KNX pushbutton - Switch position display	for assignment of the physical address Relay operating element
Enclosure	- IP 20	to EN 60 529
Safety class	- II	to EN 61 140
Isolation category	- Overvoltage category - Pollution degree	III to EN 60 664-1 2 to EN 60 664-1
EIB / KNX safety extra low voltage	- SELV 24 V DC	
Temperature range	- Operation - Storage - Transport	-5° C ... + 45° C -25°C...+ 55°C -25°C...+ 70°C
Environmental conditions	- Humidity	Max. 93%, moisture condensation should be excluded
Design	- Modular installation device (MDRC) - SD/S - type - Dimensions (H x W x D) - Width W in mm - Mounting width (modules at 18 mm) - Mounting depth in mm	Modular installation device, Pro*M* 2.16.1 4.16.1 8.16.1 90 x W x 64.5 72 108 144 4 6 8 64,5 64,5 64,5
Weight	- in kg	0,18 0,28 0,46
Installation	- On 35 mm mounting rail	EN 60 715
Mounting position	- as required	
Housing, colour	- Plastic housing, grey	
Approvals	- EIB / KNX to EN 50 090-2-2	Certification
CE mark	- in accordance with the EMC guideline and low voltage guideline	

Table 2 - Part 2:   Switch/Dim Actuators SD/S x.16.1, technical data

Note: Connection of 230 mains voltage to one of the 1-10 V outputs leads to the destruction of the 1-10 V output.

Note: Control, load and EIB / KNX sides are electrically isolated. Individual switching outputs are floating outputs. When connecting the control line, it is important to consider that the control outputs each feature a common ground reference to one another.

Note: Several electronic ballast devices with 1-10 V interfaces can be controlled with a output of the Switch/Dim Actuators. The number of dimmable ballast devices per output is limited both by the switching capacity and the control power of the Switch/Dim Actuator. See section 4 for calculation example.

ABB i-bus® EIB / KNX   **Device technology**

Lamp loads, switching capacity for lamp circuit

Lamps	- Incandescent lamp load	2300 W
Fluorescent lamps T5 / T8	- Uncorrected luminaire - Parallel compensated - DUO circuit	2300 W 1500 W 1500 W
Low-voltage halogen lamps	- Inductive transformer - Electronic transformer	1200 W 1500 W
	- Halogen lamp 230V	2300 W
Dulux lamp	- Uncorrected luminaire - Parallel compensated	1100 W 1100 W
Mercury-vapour lamp	- Uncorrected luminaire - Parallel compensated	2000 W 2000 W
Switching capacity (switching contact)[1]	- Max. peak inrush current I_p (150 μs)	400 A
	- Max. peak inrush current I_p (250 μs)	320 A
	- Max. peak inrush current I_p (600 μs)	200 A
Number of electronic ballast devices (T5/T8, single element)[1]	- 18 W (ABB EVG 1x58 CF)	23
	- 24 W (ABB EVG-T5 1x24 CY)	23
	- 36 W (ABB EVG 1x36 CF)	14
	- 58 W (ABB EVG 1x58 CF)	11
	- 80W (Helvar EL 1x80 SC)	10

[1] For multiple element lamps or other types, the number of electronic ballast devices must be determined using the peak inrush current of the electronic ballast devices. See section 4 for example

Table 3: Lamp load for load current circuit SD/S x.16.1

Application programs

Application program	Number of communication objects	Max. number of group addresses	Max. number of associations
Switch Dim 2f 1-10V/1.1	40	254	255
Switch Dim 4f 1-10V/1.1	80	254	255
Switch Dim 8f 1-10V/1.1	160	254	255

Table 4: Application programs for SD/S x.16.1

Note: The programming requires EIB Software Tool ETS2 V1.3 or higher. If ETS3 is used, a ".VD3" file or higher must be imported.

         The application program is located in the ETS2 / ETS3 under
ABB / Lighting / Switching/Dimming Actuators 1-10 V / Switch Dim xf 1-10 V/1
(x = number of outputs 2, 4 or 8)

Note: The devices do not support the closing function of a project or the KNX devices in the ETS. If you inhibit access to all devices of the project with a "BA password" (ETS2) or "BCU code" (ETS3), it has no effect on this device. Data can still be read and programmed.

ABB i-bus® EIB / KNX   **Device technology**

2.2 Circuit diagram
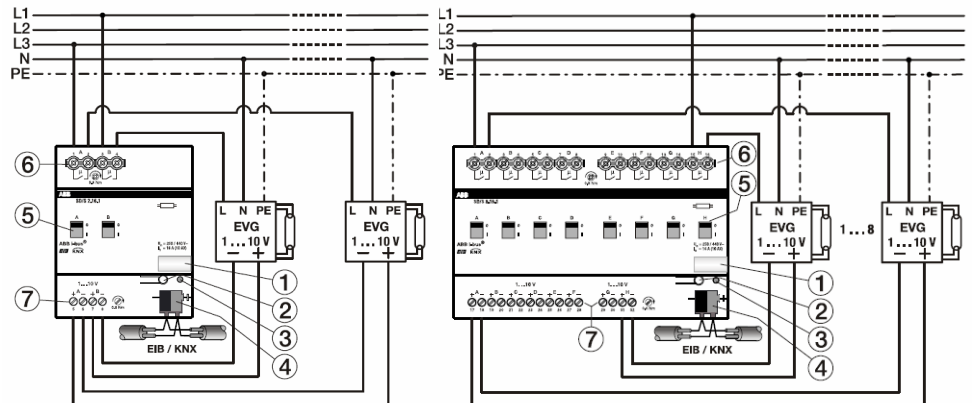
Fig. 3:   Connection schematic of the Switch/Dim Actuators SD/S x.16.1

1 Label carriers	4 Bus connection terminal
2 Programming button	5 Switch position display and manual operation
3 Programming LED	6 Load current circuits, for every 2 connection terminals
	7 Control circuits, with 2 terminals each

Note: All-pole disconnection must be observed in order to avoid dangerous touch voltages which originate from feedback from differing phase conductors.

Note: An open control line produces the maximum brightness. A short-circuited control line generates the minimum dimming value. The minimum dimming value is also set if the control cable polarity is reversed. In all 3 cases, dimming of the lighting is not possible.

2.3 Dimension drawing
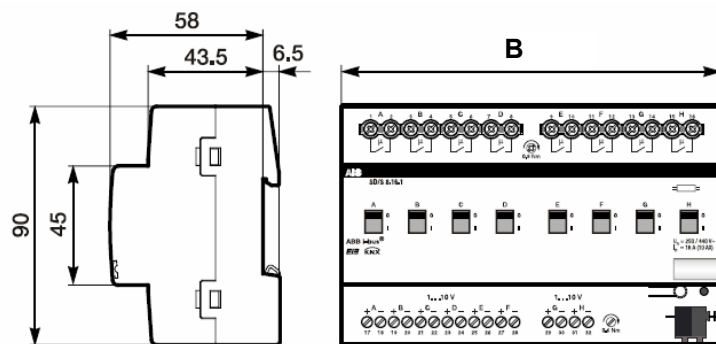
	SD/S 2.16.1	SD/S 4.16.1	SD/S 8.16.1	
B	72 mm 4 modules	108 mm 6 modules	144 mm 8 modules	

Fig. 4:   Dimension drawing SD/S x.16.1

ABB i-bus® EIB / KNX   **Device technology**

2.4   Assembly and installation

The ABB i-bus® Switch/Dim Actuators are suitable for installation in the distribution board or small enclosures for fast installation on 35 mm mounting rails to EN 60 715.

The mounting position can be selected as required and no auxiliary voltage is required. The device is supplied with power via the EIB / KNX.

⚠ Accessibility to the device for the purpose of operation, testing, visual inspection, maintenance and repair must be provided (compliant to DIN VDE 0100-520).

The voltage supply to the device must be switched off before installation work is performed.

The electrical connection is implemented using screw terminals. The connection to the EIB / KNX is established using a bus connection terminal. The terminal designation is located on the housing.

The devices should be protected from damp, dirt and damage during transport, storage and operation.

- The device should only be operated in a closed housing (e.g. distribution board)!
- The devices should not be operated outside the specified technical data.

2.5   Description of the inputs and outputs

The switching outputs of the Switch/Dim Actuators are isolated. Different phases of the 230 V operating voltage can be connected to neighbouring devices.

Control, load and EIB / KNX sides are electrically isolated. When connecting the control line, it is important to consider that the control outputs each feature a common ground reference to each another.

Connection of the 230 V mains voltage to one of the 1-10 V outputs can lead to the destruction of the 1-10 V end stages and the output.

2.6   Special operating states

The behaviour on bus voltage failure and recovery can be parameterised. The exact response after a download and bus reset is described in detail in chapter 4.

An open control line produces the maximum brightness. A short-circuited control line generates the minimum dimming value. The minimum dimming value is also set if the control cable polarity is reversed. In all 3 cases, dimming of the lighting is not possible.

2.7   Commissioning

The parameterisation of the Switch/Dim Actuators is implemented using the application programs *Switch Dim xf 1-10V/1* (x = 2, 4 or 8) and the ETS (from version ETS2V1.3). If ETS3 is used, a ".VD3" type file must be imported. The following work must be carried out:

- Assignment of the physical EIB / KNX device addresses
- Parameterisation of the inter-output device functions
- Parameterisation of the output behaviour
- Assignment of the communication objects to EIB / KNX groups

The Switch/Dim Actuators do not require an additional power supply. The connection to the EIB / KNX is sufficient to enable the actuator functions. You will require a PC or laptop for parameterisation with the ETS (from ETS2 V1.3) and a connection to the ABB i-bus® e.g. via RS232 or USB interface.

ABB i-bus® EIB / KNX   **Device technology**

⚠ The installation and commissioning may only be carried out by electrical specialists. The appropriate norms, guidelines, regulations and specifications should be observed when planning and setting up electrical installations.

2.8 Assignment of the physical EIB / KNX address

The assignment of the physical EIB / KNX device address of the Switch/Dim Actuators is carried out via the ETS and the programming button on the device.

The device features a programming button located on the edge of the device for assignment of the EIB / KNX physical device address. The red programming LED lights up after the button has been pushed. It switches off as soon as the ETS has assigned the physical address or the programming button is pressed again.

2.9 Manual operation

The Switch/Dim Actuators have a manual operating feature. The Switch Actuators can be switched ON or OFF with an operating element on the relay. The operating element simultaneously indicates the switching state.

⚠ The Switch/Dim Actuator does not feature electrical monitoring of the manual actuation and cannot therefore react to manual operation.

From a power engineering point of view, the relay is only actuated with a switching pulse if the known relay position has changed. This has the consequence that after a one-off manual operation, a repeated switching command is received via the bus and no contact changeover occurs, since the actuator assumes that no contact changeover has occurred and that the correct contact position is set.

An exception to this situation is after bus voltage failure and recovery. In both cases the relay position is recalculated dependent on the parameterisation and always set depending on the contact setting.

2.10 Delivered state

The Switch/Dim Actuators are supplied with the physical address 15.15.255. The load connection terminals and the relay are open and the bus terminal is fitted.

Please note that vibration during transport can change the relay settings. The contact position can be recognised at any time on the device via a visual inspection and can be changed if necessary by a manual operation.

The application program *Switch Dim xf 1-10V/1 (x = 2, 4 or 8)* is preloaded.

2.11 Maintenance and cleaning

The Switch/Dim Actuators are maintenance-free. No repairs should be carried out by unauthorised personnel if damage occurs (e.g. during transport or storage). The warranty expires if the device is opened.

If devices become dirty, they can be cleaned using a dry cloth. Should a dry cloth not remove the dirt, they can be cleaned using a slightly damp cloth and soap solution. Corrosive materials or solutions should never be used.

ABB i-bus® EIB / KNX   **Commissioning**

3   Commissioning

3.1   Overview

The application program *Switch Dim xf 1-10V/1* provides the device with a comprehensive and flexible range of functions. The standard settings allow simple commissioning. The functions can be extended if required.

The programming is implemented using the EIB Software Tool ETS2 V1.3 or higher. If ETS3 is used, a ".VD3" type file must be imported.

Each individual output of the three Switch/Dim Actuators features the same technical characteristics and software functions. It is thus possible, depending on the application, to freely define every output and to parameterise them accordingly.

The applications feature the same appearance and the same parameter window. This significantly simplifies the engineering and the programming of the ABB i-bus® Switch/Dim Actuators.

The following table provides an overview of the functions with the Switch/Dim Actuators and their application program:

	SD/S 2.16.1	SD/S 4.16.1	SD/S 8.16.1
Installation type	MDRC	MDRC	MDRC
Number of outputs	2	4	8
Module width (space unit)	4	6	8
Manual operation	■	■	■
Contact position display	■	■	■
I_n rated current	16 A	16 A	16 A
1-10 V control line	100 mA	100 mA	100 mA
Switch function			
- Brightness value when turned on	■	■	■
- Dimming speed for switching on and off	■	■	■
Dimming			
- Dimming speed can be changed via KNX	■	■	■
- Min. and max. dimming values	■	■	■
- Switching on / off via rel. dimming	■	■	■
Brightness value	■	■	■
- Dimming speed for transition brightness values	■	■	■
- Min. and max. value limits	■	■	■
- Set switching on and off via value	■	■	■
Presets (4 items)	■	■	■
Scenes (8-bit scene)	■	■	■
- Assignment of the output in up to 18 scenes	■	■	■
Forced operation			
- 2-bit coded forced operation	■	■	■
- Behaviour after voltage recovery	■	■	■
Block Activate output via 1-bit object	■	■	■
Special functions			
- 4-point characteristic adjustment	■	■	■
- Preference with bus voltage failure	■	■	■
- Status feedback	■	■	■
Additional functions			
- **Slave mode** e.g. for integration in the constant lighting control	■	■	■
- **Staircase lighting,**	■	■	■
Prewarning via dimming and / or KNX object	■	■	■

Table 5: Application overview

ABB i-bus® EIB / KNX   **Commissioning**

3.2   Parameters

This chapter describes the parameters of the Switch/Dim Actuators using the parameter windows. The parameter window is set up dynamically so that further parameter windows can be enabled depending on the parameterisation and function of the outputs.

In the following description, "Output X" represents all outputs of a Switch/Dim Actuator. It can be programmed commonly for all outputs or for each one individually.

> ⚠ Ensure that when changing from individual to common programming of the parameters that the implemented parameterisation and object assignment is not accepted.

The individual parameter windows and the parameter windows for all outputs only differ in the designation of their outputs. For this reason only parameter windows for common programming ("x:…") are described. The parameter windows for an output are identical.

The default values of the parameters are underlined, e.g. option yes/<u>no</u>.

Indented parameter descriptions indicate that this parameter is only visible if the main parameter is parameterised accordingly.

The illustrations of the parameter windows in this manual correspond to the ETS3 parameter windows. The application program is optimised for ETS3. Using the corresponding VD2 file, it is also possible to parameterise and configure Switch/Dim Actuators without problems using ETS2. In the ETS2 it is possible however that the parameter window is automatically split by the ETS interface if all parameters are used.

ABB i-bus® EIB / KNX   **Commissioning**

3.2.1 "General" parameter window
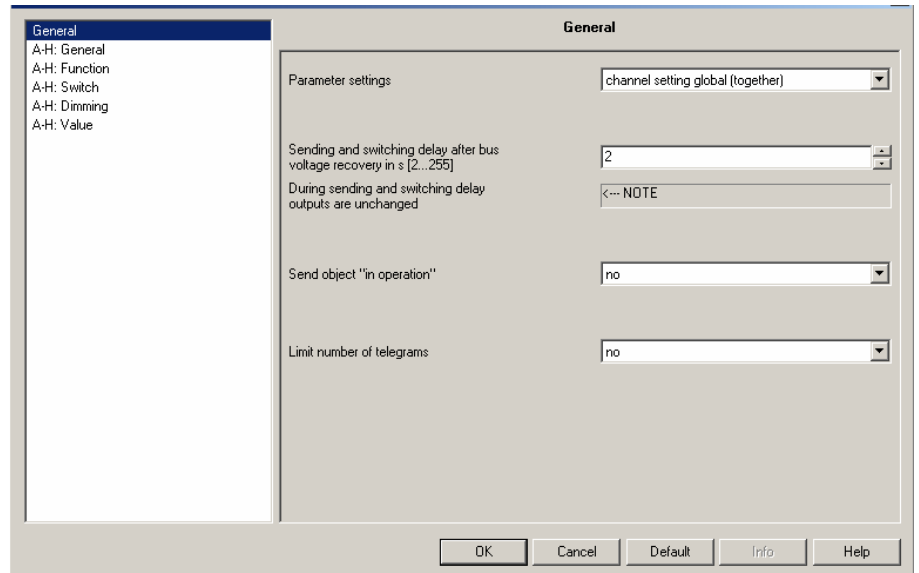
Fig. 5: "General" parameter window

Parameter settings

Options: channel setting global (together)
              channel setting individual

An individual setting can be undertaken separately for every output. Particularly in large EIB/KNX systems, it is frequently the case that all outputs are assigned with the same parameters. In this case, all settings only need to be made once in the device. These settings apply for all outputs.

channel setting global (together): The parameter window "A-X:" appears (for 2-fold X = B, for 4-fold X = D and for 8-fold devices X = H), which applies for all outputs in the same manner.

channel setting individual: All parameter windows for every individual output appear.

⚠ Ensure that when changing from individual to common programming of the parameters that the implemented parameterisation and object assignment is not accepted.

Sending and switching delay after bus voltage recovery in s [2...255]

Options: 2...255 s

Only telegrams are received during the sending and switching delay. The telegrams are not processed however and the outputs remain unchanged. No telegrams are sent on the bus.

After the sending and switching delay, the telegrams are sent and the state of the outputs is set to correspond to the parameterisation or the object values.

ABB i-bus® EIB / KNX   **Commissioning**

During the sending and switching delay, objects can be still be read via the bus, e.g. by a visualisation system. Sending and switching requirements are implemented after the sending and switching delay has been carried out.

The processor requires a starting time of about 2 seconds until it is ready to function. The initialisation time is included in the parameterised time.

The first switching action will only be initiated when sufficient energy is available to switch all contacts safely to the parameterised switching state on bus voltage failure. This can mean that the initial switching action will occur at a later time than intended by the parameterised switching delay. The sending delay is not influenced by this measure. The maximum switching operations per minute of the relay should be taken from the technical data in chapter 2.

Sent "in operation" object

Options: no
             send value "0" cyclically
             send value "1" cyclically

The object *In Operation* indicates the functional capability of the device on the bus and simultaneously indicates a faultless bus line. This cyclic telegram can be monitored by an external device. The following parameters are visible:

Sending cycle time in s [1...65535]

Options: 1...60...65.535

Here the time interval is set with the object *In Operation,* which depending on the parameterisation, cyclically sends a telegram with the value "1" or "0".

Limit number of telegrams

Options: no/yes

In order to limit the bus load caused by the device, it is possible to parameterise a limit on the number of telegrams.

With the selection *yes*, both parameters *Max. Number of sent telegrams within period* and *Period* are enabled.

Max. Number of sent telegrams within period

Options: 1...20...255

Period

Options: 50ms / 100ms / ... / 10s / ... / 30s / 1min

This parameter sets the number of telegrams which can be sent by the device within a period.

The telegrams are sent as quickly as possible at the start of a period. If the parameterised number of telegrams is reached, transmission is stopped and will only continue in the next period.

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3.2.2 Parameter window "X: General"
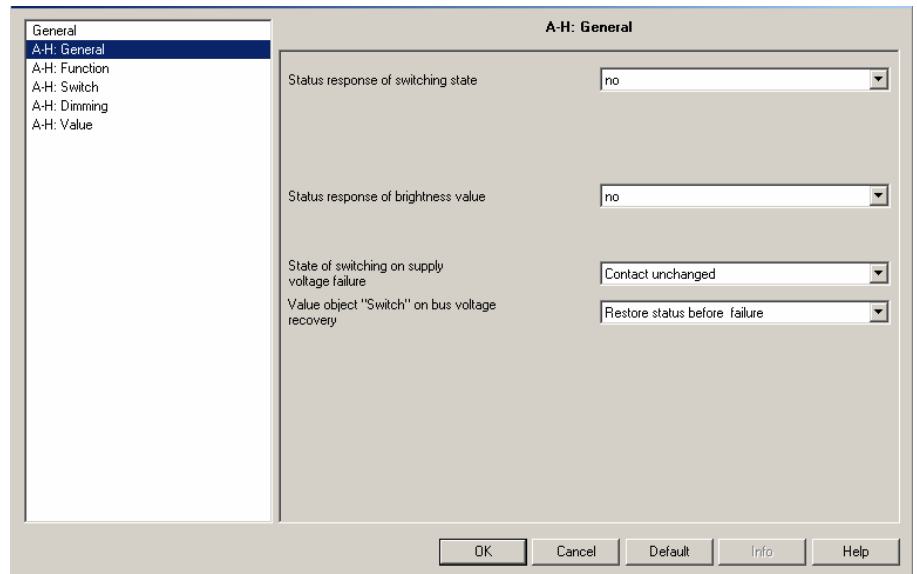
Fig. 6: Parameter window "A-H: General"

Status response of switching state

Options: <u>no</u>
yes: via object "Switch / Status"
yes: via separate object "Status switch"

Here you set if and when the current switching state of the lighting (ON / OFF) is sent on the bus.

With the setting *no,* the switching state is not actively sent on the bus.

With the setting *yes: via object Switch / Status*, the switching command is sent actively on the bus via the object *Switch / Status*.

With the setting *yes: via separate object*, an additional object *Status switch* is enabled with which the current switch status is sent on the bus.

Note: With a change of the parameterisation or after a subsequent switching of the status object, the assignment of the object *Switch* is lost and needs to be reprogrammed.

Note: Switching and response via the same object *Switch / Status* is useful because it simplifies the group address assignment. However, with improper programming unwanted switching actions can be triggered by the responses in a group. In a group with several Switch / Status objects, only one object should respond with the status.

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The options "yes:…" enable one or two further parameters:

Status response of switching state	yes: via separate object "Status switch" ▼
Send	only if value change ▼
inverted	no, 0 = OFF, 1 = ON ▼

Send

Options: only if value change / always

Here you set if the response is sent with *only if value change* of the object value or also with every value assignment of the object *Switch* (Option "*always*").

Status response "inverted"

Options: no: 0 = OFF, 1 = ON
                  yes: 0 = ON, 1 = OFF

This parameter is enabled if the option "yes: via separate object *Status switch"* has been selected beforehand.

With this parameter, the response of the switching state can be inverted. It is visible if the response occurs via the object *Status switch*.

With an inverted response, the object *Status switch* features the following values:

"0" lighting is switched on
"1" lighting is switched off

Status response of brightness value

Options: no
                  yes: via object *"Brightness value / Status"*
                  yes: via separate object *Status brightness value*

Here you set how the current status brightness value of the lighting is sent on the bus.

With the setting *no,* the brightness value is not actively sent on the bus.

With the setting *yes: via object Brightness value / Status,* the brightness value is sent on the bus via the object *Brightness value / Status*.

With the setting *yes: via separate object status brightness value,* an additional object *Status brightness value* is enabled which is used to send on the bus when the current brightness value changes.

The changed brightness value is sent at the end of the dimming process, i.e. when the end value is reached with switching, scene or preset recall. This can mean that during the dimming process the current brightness value is not displayed.

Note: With a change of the parameterisation or after a subsequent switching of the status object, the assignment of the object *Brightness value* is lost and needs to be reprogrammed.

Note: With an adjustment of the characteristic, the response sent from the lamp is again transformed via the characteristic curve. There is thus a correlation between brightness value and response. A more detailed description can be found in chapter 4.6.

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The options "yes:…" enable further parameters:

| Status response of brightness value | yes: via separate obj. "Status brightness value" ▾ |
| Send | only if value change ▾ |

Send

Options: only if value change / always

Here you set if the response is sent with *only if value change* of the object value or also with every value assignment of the object *Brightness value* (Option "*always*").

A value assignment is implemented via switching, dimming, setting the brightness value, scene, preset and staircase lighting recall.

State of switching on supply voltage failure

Options: Contact open
Contact closed
Contact unchanged

With this parameter, the load output can be set to a defined state after a bus voltage failure.

The 1-10 V control output assumes a high resistance state on bus voltage failure. Thus the lamps are controlled with a fixed brightness value of 100 %.

Value object "Switch" on bus voltage recovery

Options: Restore status before failure
write with "0"
write with "1"

With this parameter, the load output can be set to a defined state after bus voltage recovery.

With the setting *Restore status before failure*, the brightness is restored to the level before the bus voltage failed.

With both of the other parameter settings, the object *Switch* or *Switch / Status* can be written with a "0" or "1" as selected on bus voltage recovery. The contact position is redefined and set depending on the set device parameterisation.

If the staircase lighting function is activated, the staircase lighting can be triggered by a "1" switching command after bus voltage recovery.

Note: At bus voltage recovery the last brightness value is lost. With the setting *Switch on via last brightness value* in the parameter window *Switch*, the Switch/Dim Actuator always uses a 100 % brightness value or the maximum dimming value after bus voltage recovery and the first switching command. This applies until a new "last value" is detected.

If the slave mode after bus voltage recovery is parameterised as active in a parameter window, and the behaviour of the slave operation at switching on is simultaneously deactivated (also parameter window X: Slave), and if the output generates an ON command after bus voltage recovery with the parameters described here, the slave mode is immediately deactivated.

This means the parameter described here *Value object "Switch" on bus voltage recovery* has a higher priority than the parameter in the parameter window *X: Slave* "Slave mode after supply voltage recovery".

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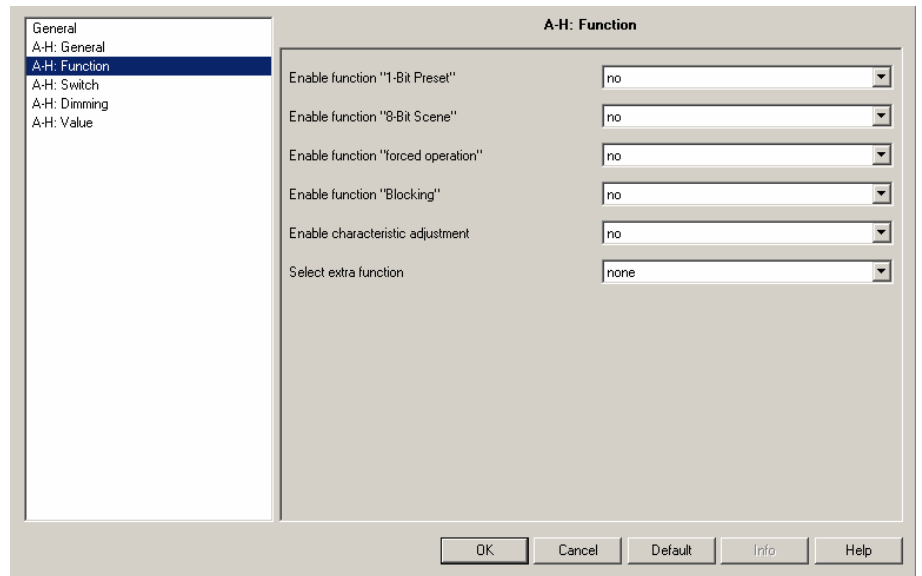
Fig. 7:   Parameter window "A-H: Function"

In this parameter window, additional functions of the output can be enabled.

Enable function "1-Bit Preset"

Options: no/yes

The "Preset" function can be enabled with this parameter. The function is used to recall or save brightness values via a 1-bit object.

If the preset function is enabled, a further parameter appears:
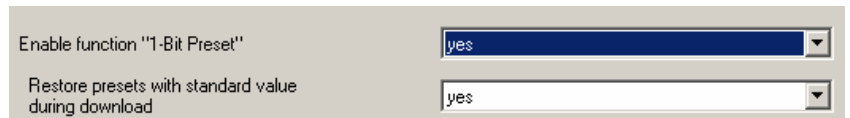
Restore presets with standard value during download

Options: no/yes

Here you set if the preset values are overwritten with the standard brightness values which are set via the parameters in the ETS.

This function is useful for example if the settings made by the user are to be reset and the lighting is to be set with a defined brightness value.

The special properties of the preset are defined in the parameter window "X: Preset".

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Enable function "8-Bit Scene"

Options: no/<u>yes</u>

The "Scene" function can be enabled with this parameter. The function is used to recall or save brightness values via a 1-byte object. Project-specific, manually set brightness values can be saved via the 1-byte object *8-Bit scene*.

If the 8-bit scene function is enabled, a further parameter appears:

Restore scene values with standard value

Options: no
             <u>via download</u>
             via object "Restore standard scene"
             via download or via object

Here you set if the scene values are overwritten with the standard brightness values which are set in the parameters. This function is useful for example if the scene settings of the user are to be undone.

The reset of the scene values is possible via ETS download or via the object *Restore standard scene*.

The special characteristics of the 8-bit scene are defined in the parameter window "X: Scene (x)". Every output of the Switch/Dim Actuator can be integrated in up to 18 scenes.

Enable function "forced operation"

Options: <u>no</u>/yes

The object "Forced operation" is enabled via this parameter.

Function of forced operation:

The active forced operation has an influence on the overall behaviour of the output. When the forced operation function is recalled, the parameterised brightness value in the ETS is set. The currently set brightness value is stored intermediately. A currently active dimming command is interrupted and the target brightness value is saved directly.

Brightness values received during active forced operation are not set but are processed in the background and saved. Switching commands are also saved in the background. Relative dimming commands and dimming ramps are ignored. The target brightness value is saved directly.

At the end of forced operation, the brightness value stored in the background is set.

Forced operation has a higher priority than blocking a output.

The forced operation is indicated in the second bit of the status byte (object *Status byte*).

The state of the forced operation (active / deactivated) after bus voltage recovery is parameterised in the parameter window "X: Function".

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Value	Bit 1	Bit 0	Status	Description
0	0	0	Free	If the object *Forced operation* receives a telegram with the value "0" (binary 00) or "1" (binary 01), the output is enabled and can be actuated via different objects.
1	0	1	Free	
2	1	0	Forced OFF	If the object *Forced operation* receives a telegram with the value "2" (binary 10), the output of the Switch/Dim Actuator is switched OFF and remains inhibited until forced operation is again deactivated. Actuation via another object is ignored as long as the forced operation is activated. Commands are run in the background and the end values are saved. After deactivation of forced operation, the brightness value which is continuously processed in the background is set.
3	1	1	Forced ON	If the object *Forced operation* receives a telegram with the value "3" (binary 11), the output of the outputs with the parameterised brightness value is switched on and remains inhibited until forced operation is again deactivated. Actuation via another object is not possible as long as the forced operation is activated. Commands are run in the background and the end values are saved. After deactivation of forced operation, the saved brightness value is set.

Table 6   Overview of 2-bit forced operation object

If the forced operation parameter is enabled, two further parameters appear:

Brightness while object value = 3 (forced operation = active, ON)

Options: <u>100%</u> (255) / 99% (252) / ... / 2% (5) / 1% (3) / 0% (off)

This parameter is visible if the function *Forced operation* has been activated. The brightness value used to control the output is set with this parameter, if the object *Forced operation* is set with the value "3" (= "forced operation = active, ON").

After forced operation is revoked, the normal state of the output is restored. During forced operation, the brightness value is calculated further; only "Rel. dimming" telegrams are ignored.

Setting force operation after bus voltage recovery

Options: <u>inactive (value 0)</u>
            switch off by force (value 2)
            switch on by force (value 3)

Here you switch on which value the object *Forced operation* is assigned on bus voltage recovery.

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Enable function "Blocking"

Options: no/yes

The *Block* object is enabled here. The function of the object can be blocked here, so that it cannot be changed via the bus.

The current brightness value of the output is frozen. All commands with the exception of forced operation and the reactions to bus voltage failure and recovery are ignored.

An activation of the blocked operation during dimming up and dimming down of the staircase lighting and switch or scene function is initially ignored. Only at the end of the dimming process is the output blocked and the brightness frozen. A block during the staircase lighting function on the other hand leads to an immediate blocking of the output and freezing of the brightness value. After unblocking, the staircase lighting function continues with dimming (prewarning).

Forced operation has a higher priority than blocking. With activated forced operation, the block function can be activated or deactivated, so that after forced operation the current blocked state which would result without activated forced operation is available.

Enable characteristic adjustment

Options: no/yes

If *yes* is entered in this parameter, the parameter window *Character adjustment* is enabled. In this the dimming characteristic (lighting dependent on the brightness value) can be changed.

The special characteristics of the character adjustment are defined in the parameter window "X: Charact. adj.".

Select extra function

Options: none
             Slave mode in lighting control
             Staircase lighting function

It is possible to select between two additional functions via this parameter.

For the staircase lighting function, the programmed dimming values in the parameter window "X: Dimming" apply. The brightness in slave mode on the other hand is limited by the value limits in the parameter window "X: Value".

Slave mode in lighting control is set, if in the device, for example, the constant lighting control is to be controlled by a lighting controller.

The special properties of the slave mode are defined in the parameter window "X: Slave".

Staircase lighting function is set if the light is to be switched off or slowly dimmed downwards after a defined time.

A warning before the staircase light switches off is possible via dimming and/or a 1-bit object, which can be used to trigger any required display or an acoustic signal.

The special characteristics of the staircase lighting function are defined in the parameter window "X: Staircase lighting function".

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3.2.4   Parameter window
       "X: Switch"

On this page, you determine how the device reacts to a switching command via the communication object *Switch* or *Switch / Status*.
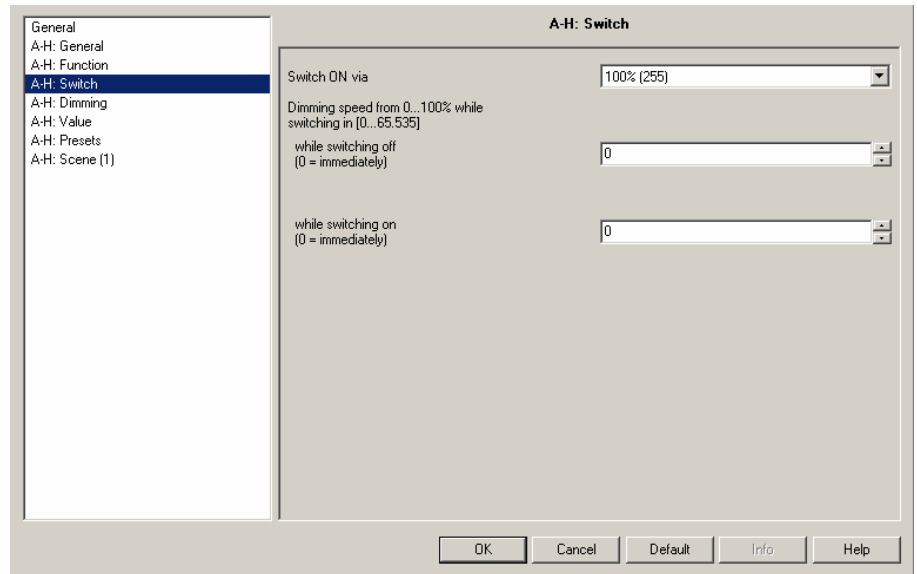
Fig. 8:   Parameter window "A-H: Switch"

Switch ON via

Options: last brightness value **/**

                100% (255) /

                99% (252) / ... / 2% (5) / 1% (3)

Here you set the brightness of the lighting which is applied when a *Switch* or *Switch / Status* object receives the telegram value "1".

When switching on with the *last brightness value,* the brightness level before the last switching off is restored, however with at least the brightness of the lower dimming value (see Parameter window "X: Dimming").

The last brightness value is the last constant brightness value. This can result from the setting of a brightness value using a switching or dimming command and through a scene, preset or staircase lighting function.

Note: At bus voltage recovery, the last brightness value is lost. The Switch/Dim Actuator will operate with 100% or the maximum dimming value until a new last value is detected.

Switch on with the last brightness value is ignored, if the slave mode is activated but interrupted (e.g. with corresponding parameterisation by a dimming command). If in this case the Switch/Dim Actuator receives a telegram with the value "1" at the object *Switch* or *Switch / Status*, the last brightness value is not set, but rather the last slave operation is activated and the brightness value from the object *Brightness value of slave* is set.

If the output is switched on and a new switch on command is received, the brightness value will remain unchanged if the last brightness value has been parameterised during switching on. The reason is that the current brightness value is assumed as the last constant brightness value by the Switch/Dim Actuator.

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Dimming speed from 0...100% while switching in s [0...65.535]

while switching off (0 = immediately)

Options: 0…65.535

while switching on (0 = immediately)

Options: 0 … 65.535

With this parameter, you set how fast the light can be switched on or off with a switching command. The set dimming speed relates to an unlimited dimming range of 0 % … 100 %.

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**3.2.5   Parameter window
"X: Dimming"**

With the object *Relative dimming*, the lighting is dimmed brighter or darker. In this parameter window, the parameters for dimming and switching the lighting are set.

A detailed description of the objects can be found in section 3.3.
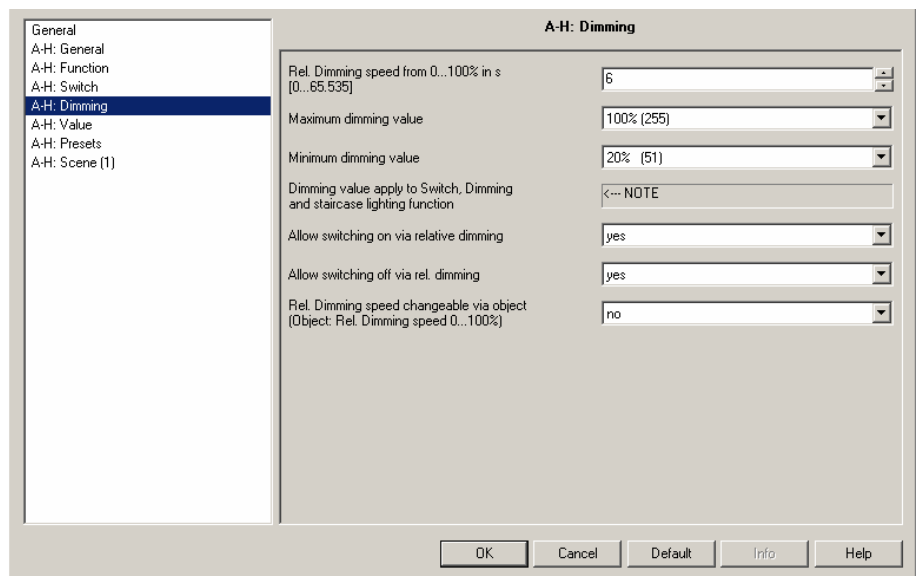
Fig. 9:   Parameter window "A-H: Dimming"

Rel. Dimming speed from 0...100% in s [0...65.535]

Options: 0 ...6… 65.535

A dimming ramp is defined by the dimming speed. The parameterised time is the time which the dimmer requires to toggle the brightness between 0% and 100%.

Note: The dimming speed refers to a full, unlimited dimming range, i.e. at a minimum or maximum dimming value the dimmer quickly reaches the maximum dimming value.

Maximum dimming value

Options: 100% / 99% / ... / 51% / 50%

Here the largest brightness value is set which can be controlled with the dimmer via relative dimming. In this way the service life of fluorescent lighting can be extended or energy can be conserved.

If the brightness value is above the upper dimming value (e.g. through recall of a preset or a scene), it is only possible to reduce the brightness.

The dimming values not only apply for dimming but also for the switching and staircase lighting function. During slave operation, when setting a brightness value and when recalling a scene or preset, the value limits which are parameterised in the parameter window "X: Value" apply.

The dimming value is independent of the value limit.

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Minimum dimming value

Options: 50% / 49% / ... / 20% / ... / 1% / 0,3%

Here the smallest brightness value is set which can be controlled with the dimmer via relative dimming. In this way for example, it is possible to prevent control of brightness ranges in which the fluorescent is already switched off.

The smallest minimum dimming value has a value of "0.3 %", thus switching off is always possible at the parameterised minimum dimming value.

The dimming values not only apply for dimming but also for the switching and staircase lighting function. During slave operation, when setting a brightness value and when recalling a scene or preset, the value limits which are parameterised in the parameter window "X: Value" apply.

The dimming value is independent of the value limit.

Should the function switch on or off via dimming be set, the output will be immediately turn off on reaching the lower dim threshold. When dimming up the output will turn on immediately at the minimum dim level.

Note: A value should be set here at which the fluorescent lighting can be operated. e.g. switching of some fluorescent lighting below about 10 % will cause flickering. This should be avoided.

Allow switching on via relative dimming

Options: no/yes

Here you can set if fluorescent lighting that has been switched off can be switched on "BRIGHTER" by a dimming telegram.

With the option "no", the output must be switched on before dimming.

Allow switching off via rel. dimming

Options: no/yes

Here you can set if fluorescent lighting that has been switched on can be switched off "DARKER" by a dimming telegram. With the parameter value *no*, the brightness value remains under the minimum dimming value.

**Rel. Dimming speed changeable via object
(Object: Rel. Dimming speed 0…100%)**

Options: no/yes

Here you parameterise if the dimming speed (0…100%) can be changed via the EIB/KNX. The other dimming speeds, e.g. for setting switching values are not changed.

With the option "yes", the object *Rel. Dimming speed 0…100%* appears. Using this object, the dimming speed for 0…100% can be modified via the bus. The 2-byte counter values (0…65.536) correspond to the time in seconds which is required to dim from 0 to 255 (0%…100%).

The dimming speed relates to the minimum dimming value. If the dimming values are parameterised, the dimming range is still executed with the same speed. This means however, that the execution time of the minimum dimming value to 100% is shorter than the set dimming speed.

The value is overwritten by a download. With a bus failure the time is lost and is overwritten by the value parameterised in ETS on bus voltage recovery.

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3.2.6 Parameter window "X: Value"

This function allows the definition of a brightness via the 1-byte object *Brightness value*.
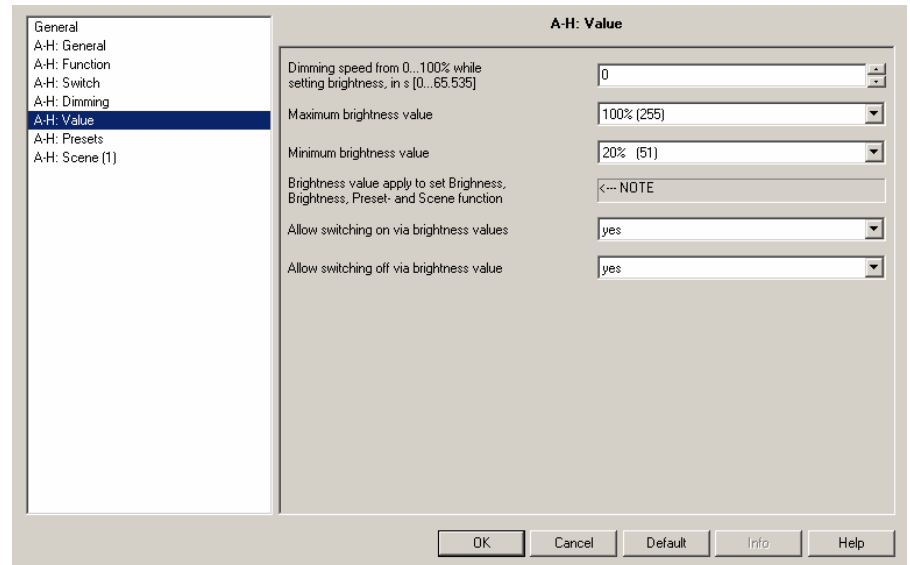
Fig. 10: Parameter window "A-H: Value"

Dimming speed from 0...100% while setting brightness, in s [0...65.535]

Options: 0...65.535

This parameter determines the speed with which the device dims to a new brightness value. The speed is set which is required to dim from 0...100%.

Maximum brightness value

Options: 100% / 99% / ... / 51% / 50%

Here the upper brightness value is set which can be controlled with the output via a brightness telegram. The value limit which is used to set a brightness value with the preset and scene function is considered. The limit in slave operation is also active here.

If a brightness value which is greater than the maximum brightness value is received, the output sets the maximum brightness value. This value is reported back on the bus.

The maximum value is independent of the dimming value parameterised in the parameter window "X: Dimming" and which applies for dimming, switching and the staircase lighting function.

The maximum value is independent of the dimming value parameterised in the parameter window "X: Dimming".

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Minimum brightness value

Options: 50% / 49% / ... / <u>20%</u> / ... / 1% / 0.3%

Here the lower brightness value is set which can be controlled with the output via a brightness telegram. If the dimmer receives a brightness value less than the minimum brightness value, the minimum brightness value is set.

The smallest minimum brightness value has a value of "0.3 %", thus switching off is always possible at the parameterised minimum dimming value.

The value limit which is used to set a brightness value with the preset and scene function is considered. The limit in slave operation is also active here.

If a brightness value is recalled, which is less than the minimum brightness value, the lower brightness value is set.

The maximum value is independent of the dimming value parameterised in the parameter window "X: Dimming".

Allow switching on via brightness values

Options: no/<u>yes</u>

Here you can set if fluorescent lighting that has been switched off can be switched on "BRIGHTER" by a brightness telegram exceeding "0".

Allow switching off via brightness value

Options: no/<u>yes</u>

If a brightness value of "0" is received, you can set here if the lighting switches off ("yes") or if it remains at the minimum dimming value.

If a brightness value is received during a dimming process, the dimming process is stopped and then a new brightness value is implemented.

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3.2.7

**Parameter window
"X: Presets"**

The presets are used to recall predefined brightness values via 1-bit telegrams.

Four presets are available per output. The presets with an even number (2 and 4) are addressed by a telegram with the value "1", the presets with an odd number (1 and 3) are addressed by a telegram with the value "0". Separate objects are available for recalling and for saving / setting a preset brightness value.

With the recall of presets, the maximum and minimum values as set in the parameter window "X: Value" apply. The maximum and minimum values are set with an overshoot or undershoot. At a brightness value of "0", switching off is always executed independently of the parameter "Allow switching off via brightness value" in the parameter window "X: Value".

A preset recall with enabled staircase lighting function has no effect on the output. A preset save command via object *Set preset 1 and 2* is implemented, i.e. at the time of the save command, the current brightness value of the outputs is saved as a new preset value.

The reaction to a preset recall with activated slave operation is parameterised in the parameter window "X: Slave". With the parameterisation "no reaction", a preset recall with activated slave operation is ignored. A preset save command is executed. The parameterisation "Slave mode can be deactivated" has the effect that the preset recall is implemented and the slave operation discontinued. If the preset command "Restore status before preset" is parameterised simultaneously, slave operation is reactivated. Otherwise slave operation is activated by the object *Activate slave mode*.

With the first recall of a preset, the current state is stored. At the same time it does not matter which of the 4 presets are recalled. Further preset recalls initiate a renewed save. This ensures that the state before the first preset can be re-established. A new preset value is again saved if the preset has been recalled beforehand with the function "Restore value before first preset call".
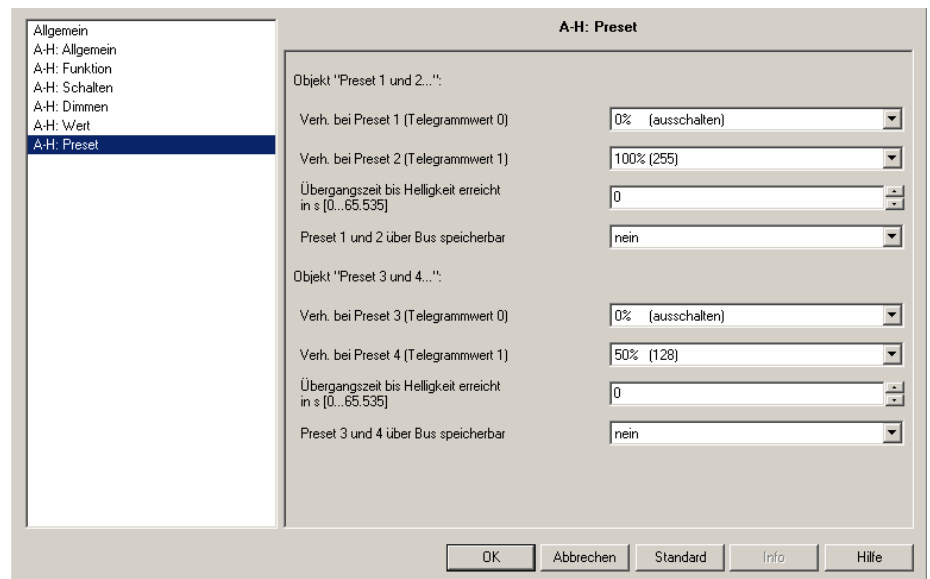
Fig. 11: Parameter window "A-H: Presets"

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The parameterisation undertaken in this parameter window "X: Preset" will only be transferred with a download to the Switch/Dim Actuator if in parameter window "X: Functions", the preset enable "Restore presets with standard value during download" has been set to "yes".

In the following section, the functions and the parameters for Preset 1 and 2 are written. Presets 3 and 4 feature the same functions and parameters.

Reaction on preset 1 (telegr. value 0)

Options: 100% / 99% / ... / 1% / 0% (switch off)
             restore value before first preset call
             reset to parameterised value before preset 2

Here you set how the output reacts with the recall of preset 1, which means that object *Call preset 1 and 2* receives a telegram with the value "0". A fixed brightness value can be recalled. The following functions can be selected as further selection options:

"restore value before first preset call" restores the state of the output which existed before the preset was first called. If for example, lighting control via slave operation was active, this is also reactivated and executed. The state is only saved with the first preset value recall. Further preset recalls initiate a renewed save. Only after a recall "*restore value before first preset call"* is a new brightness value stored which corresponds with the state before a preset is called.

"reset to parameterised value before preset 2" resets preset 2 to the parameterised value if it has been changed by the user. This can be advisable if preset 2 can be stored via the bus (see below).

Reaction on preset 2 (telegr. value 1)

Options: 100% / 99% / ... / 1% / 0%

Here you set which brightness is controlled with a recall of preset 2 (= object *Call preset 1 and 2* receives telegram value "1").

At the same time, the state of the output is saved with the first call of preset 2 and it is restored using the corresponding parameterisation of the value before preset 2.

Time to set new brightness value "Transition time" in s [0...65.535]

Options: 0...65.535

With this parameter you set the time in which a preset recall is dimmed to the new brightness value.

Preset 1 and 2 can be set via the bus

Options: no/yes

With this parameter, the object *Set preset 1 and 2* is enabled. It is used to store the currently set brightness value at the new preset value.

Telegram value "0" saves preset 1, whereas telegram value "1" saves preset 2.

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3.2.8 Parameter window "X: Scene (1)" to "X: Scene (6)"

This function permits the assignment of the output to up to 18 different lightscenes with the corresponding programmable brightness values. If a scene number is received via the object *8-bit scene*, the stored scene value (brightness value) is recalled. Alternatively the possibility exists to store the current brightness value as the new scene value.

With the recall of lightscenes, the maximum and minimum values as set in the parameter window "X: Value" apply. The maximum and minimum values are set with an overshoot or undershoot. At a brightness value of "0", switching off is always executed, independently of the parameter "Allow switching off via brightness value" in the parameter window "X: Value".

With the staircase lighting function enabled, a scene recall such as the saving of a scene has no effect.

The reaction of a scene recall with activated slave operation is programmable in the parameter window "X: Slave". With the parameterisation "no reaction", a scene recall and a scene store command are ignored with activated slave operation. The parameterisation "Slave mode can be deactivated" has the effect that the scene recall is executed just like a scene store command and the slave operation is interrupted. Note that slave operation has no effect but is active in the background and can be reactivated by an ON command telegram with the value "1" to the object *Switch*. For this reason the first bit of the status byte has the value "1". Also the slave mode can be activated via the object *Activate slave mode*.

The parameter window "X: Scene (1)" is enabled in parameter window "X: Function" if a scene function is parameterised. The further parameter pages for scenes 4 to 18 are each enabled in the previous parameter window "X: Scene (y)", y=1…5.

Note: With the common parameterisation of all outputs, they all feature the same scene parameters and thus switch the same brightness value on with a scene recall.
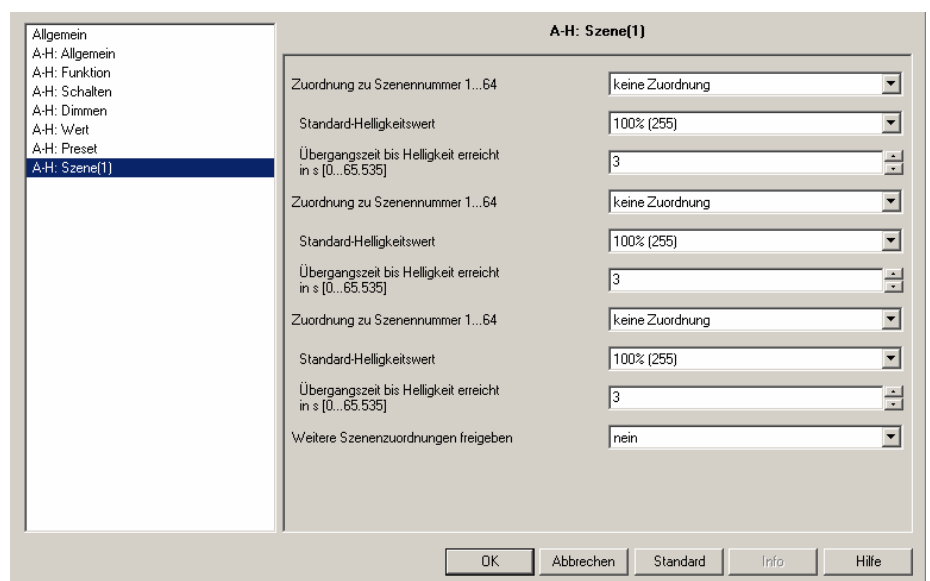
Fig. 12: Parameter window " A-H: Scene (1)"

ABB i-bus® EIB / KNX   **Commissioning**

The parameterisation undertaken in this parameter window "X: Scene (y)" will only be transferred with a download to the Switch/Dim Actuator if in parameter window "X: Functions" it is parameterised with the scene enable "Restore scene values with standard value during download".

Assignment to scene number 1...64

Options: no assignment
             Scene no. 1

             ...
             Scene no. 64

In this parameter, the output is assigned to a scene number (1...64). As soon as the device receives a telegram with this scene number at object *8-bit scene*, it will recall the corresponding scene.

Standard brightness value

Options: 100% / 99% / ... / 1% / 0%

Here the brightness is set which controls the output as standard with a scene recall.

The user can change the parameterised value here. This is implemented by "setting" a scene. Via the object *Restore standard scene* (Parameter window *"X: Function",* parameter *"Restore scene values with standard value")* the value can be reset to the parameterised value.

Time to set new brightness value "Transition time" in s [0...65.535]

Options: 0...3...65.535

The transition time which is required until the scene brightness value is reached is set here.

Enable more scene assignments

Options: no/yes

Using this parameter a further parameter window is opened in which the additional scene assignments can be implemented.

Note: With the execution of the scene, the defined value limits are considered in the parameter window "X: Value".

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3.2.9   Parameter window "X: Charact. adj."

The characteristic adjustment enables the adaptation of the dimming characteristic of the lamps (ballast devices) to the sensitivity of the eyes.
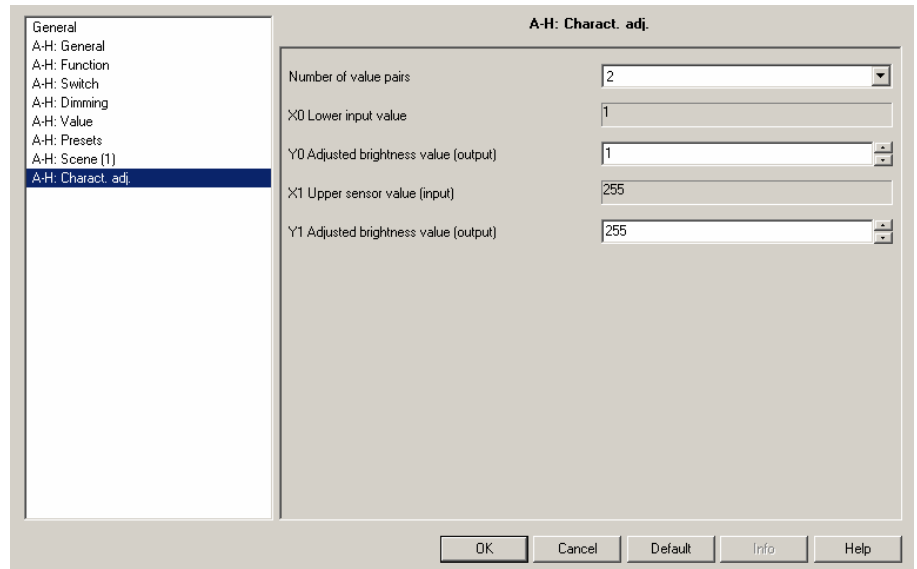
Fig. 13: Parameter window " A-H: Charact. adj."

Number of value pairs

Options: 2 / 3 / 4

Here the number of value pairs is set which are used in the characteristic curve. The curve (characteristic correction) results from a maximum of four value pairs. Between the value pairs, a linear interpolated curve (straight) is used.

Accordingly, additional parameters appear with which the individual X/Y values are to be entered to suit the parameterised number of value pairs.

Other parameters:

X… lower sensor value (input)

Options: 1…255

Y… Adjusted brightness value (output)

Options: 1…255

The limit and default values of the options are dependent on the number of value pairs.

In accordance with the number of value pairs, the X-value and the Y-value can be determined here. The X-value (input value) indicates the value defined by the EIB / KNX. The Y-value indicates the "true" brightness value used to control the lamps or the 1-10 V control device.

The first X-value is always defined with "1" and the last X-value with "255".

In the parameter window "X: Dimming" or "X: Value", parameterised dimming and brightness values are used before the transformation. Through the transformation a setting signal may result for the lamps which is less than or greater than the maximum or minimum brightness values.

The brightness value reported back by the status objects corresponds again for example, with the value defined in the control. A more detailed description and an example can be found in chapter 4.6.

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3.2.10 Parameter window "X: Slave"

In slave operation, the dimming actuator applies the brightness value which has been defined, for example, by a lighting controller via the object *Brightness value of slave*. Hereby a output of the Switch/Dim Actuator can be integrated into a constant lighting control.

A detailed description of the objects can be found in section 3.3.
The slave mode is described in detail in chapter 4.7.

The parameter window "X: Slave" is enabled with the parameter *Select extra function* (parameter window *Function*).

If the object *Switch* or *Brightness value* is mentioned in the following section, they also apply for the objects *Switch / Status* or *Brightness value / Status*.
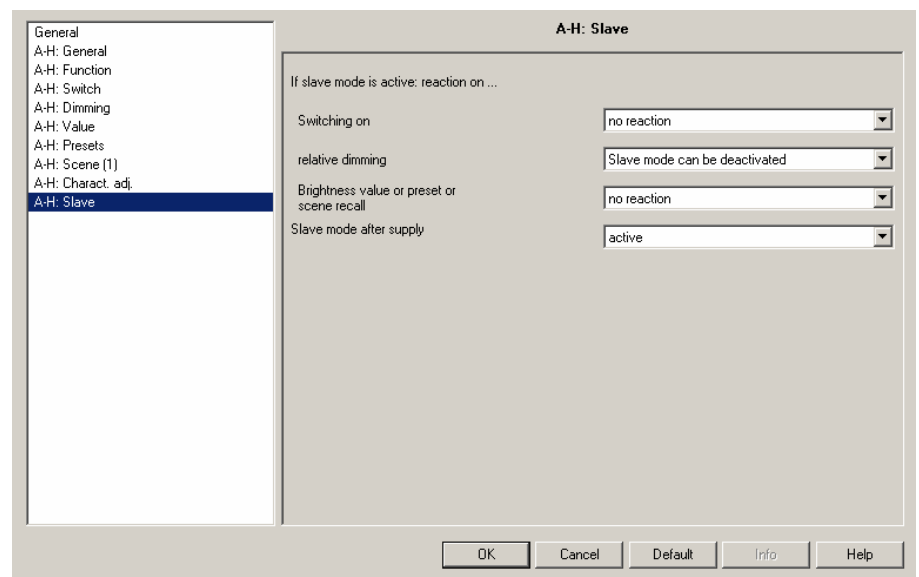
Fig. 14: Parameter window " A-H: Slave"

Using the following three parameters, you can set how an output reacts with "active slave operation".

If slave mode is active: reaction on …

Switching on

Options: no reaction
            Slave mode can be deactivated

If the slave mode is active, this parameter can be used to define the reaction to the switch on command (object value "Switch" = "1").

The option "*no reaction*" has the effect that switching on with active slave operation does not cause a reaction. The command is ignored.

The option "*Slave mode can be deactivated*" has the effect that with activated slave operation this ends with an ON command and the switching command is executed. The slave more is latent and waits until a renewed activation via the object *Activate slave mode ="1" or by a Switch On command via the object switch = "1".*

As the slave mode is only latent, the corresponding bit 0 in the status byte remains active and has the value "1".

Note: The behaviour on an OFF command cannot be parameterised.
An OFF command always ends the slave mode.

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Relative dimming

Options: no reaction
            <u>Slave mode can be deactivated</u>

If the slave mode is active, this parameter can be used to define the reaction to a dimming command (object "Relative dimming").

The option "*no reaction*" has the effect that with active slave operation a dimming command does not cause a reaction. The command is ignored.

The option "*Slave mode can be deactivated*" has the effect that with activated slave operation this ends with a dimming command and the dimming is executed. The slave more is latent and waits until a renewed activation via the object *Activate slave mode ="1" or by a Switch On command via the object switch = "1".*

Brightness value or preset or scene recall

Options: <u>no reaction</u>
            Slave mode can be deactivated

If the slave mode is activated, the reaction to a brightness value (object "Brightness value"), preset or scene recall can be defined with this parameter.

The option "*no reaction*" has the effect that with an active slave operation a brightness value or preset/scene recall does not have a reaction. The command is ignored.

The option "*Slave mode can be deactivated*" has the effect that with activated slave operation, it can be ended with a brightness command or preset/scene recall and the command is executed. The slave more is latent and waits until a renewed activation via the object *Activate slave mode*.

Slave mode after supply

Options: <u>active</u>
            inactive

In this parameter, you can set if the slave mode is *active* or *inactive* after the bus voltage recovers. If the slave function is *active*, the brightness value is recalled and set at the object *Brightness value of slave*.

Note: Parameterisation in window "X: General". In this window you can set that an ON command for the output is triggered after bus voltage recovery. If in the parameter window "X: Slave" described here, the slave mode is parameterised as active after a bus voltage recovery, and simultaneously the reaction of the slave mode during activation is parameterised as deactivated, the slave mode is immediately deactivated again by an ON command.

This means that the effect on the parameter *Value object "Switch" on bus voltage recovery* (page *X: General)* has a higher priority than the effect of the parameter "*Slave mode after supply voltage recovery*" described here.

With the setting *active*, the device initially sets the brightness before the bus voltage failure. Thereafter the device recalls the object value *Brightness value of slave* via the bus.

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3.2.11 Parameter window "X: Staircase light"

The parameter window is enabled in the parameter "Select extra function" (parameter window "X: Function"). A detailed description of the objects can be found in section 3.3. The staircase lighting function and its variation in time is described in detail in chapter 4.3.
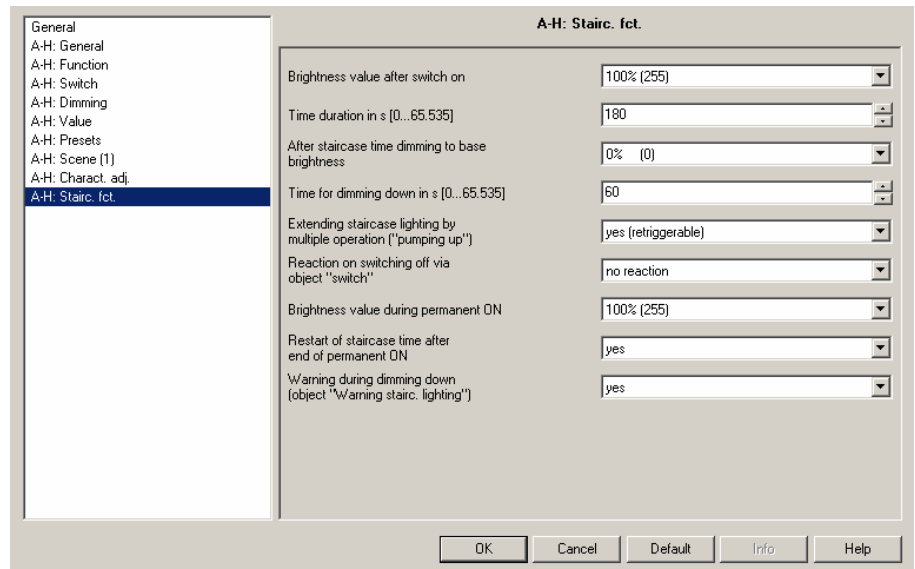
Fig. 15: Parameter window "A-H: Stairc. fct."

Brightness value after switch on

Options: 100% / 99% / ... / 1% / 0% (OFF)

Here the brightness of the lighting during the staircase lighting time can be set (0...100%). If the brightness value is less than the minimum dimming value, the minimum dimming value is set.

Time duration in s [0...65.535]

Here the time duration is set at which the staircase lighting is switched on with the staircase lighting brightness ("staircase lighting time t_{ON}")

After staircase time dimming to base brightness

Options: 100% / 99% / ... / 1% / 0% (OFF)

Here the base brightness is set which is permanently controlled (e.g. with night-time lighting). In normal mode, the brightness does not fall below this level.

Time for dimming down in s [0...65.535]

Here the speed is set which is used with the end of the staircase lighting time to dim down ("Dimming down time t_D").

The dimming time T_D relates to the minimum dimming value or the base brightness, depending on the value which is reached first. Using this logic, the light is always dimmed for the entire prewarning time T_D, in order to provide a sufficiently long warning before the staircase light is switched off.

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Parameter "Extending staircase lighting by multiple operation ("pumping up")

Options: no (not retriggerable)
            yes (retriggerable)
            up to max. 2x staircase lighting time
            up to max. 3x staircase lighting time
            up to max. 4x staircase lighting time
            up to max. 5x staircase lighting time

If a further ON telegram is received during the staircase lighting time, the remaining staircase lighting time can be extended by a further period. This is possible until the maximum time has been achieved. The maximum time can be programmed and it can be set to 1, 2, 3, 4 or 5 times the staircase lighting time. If a portion of the "pumped" time has already elapsed, it can again be pumped to the maximum value. The parameterised maximum time may not however be exceeded. The warning time is not modified by the pumping action.

With the setting "*no (not re-triggerable)*" the receipt of an ON telegram during the active staircase lighting time is ignored. The staircase lighting time continues without modification to completion. If a normal simple retrigger function is required, the option "yes (re-triggerable)" must be set. In this case the staircase lighting time is reset by a renewed ON telegram and starts to run again from the start.

Reaction on switching off via object "switch"

Options: no reaction
            switch on basis brightness
            dimming on basis brightness
            switch OFF

no reaction: Switch off telegrams are ignored.

switch on basis brightness: The lighting switches on basis brightness as has been parameterised in the parameter "After staircase lighting dimming to".

dimming on basis brightness: With switched on lighting the dimming phase is started with the corresponding dimming time and basis brightness.

switch OFF: The lighting is switched off.

If permanent ON is active the switch off telegram is ignored.

Brightness value during permanent ON

Options: 100% / 99% / ... / 1% / 0% (OFF)

Here you can set the brightness of the lighting which is to be retained during the continuous ON phase (object *continuous ON* has the value "1").

Note: Forced operation and blocking have a higher priority.

Restart of staircase time after end of permanent ON

Options: no, dimming immediately / yes

With the setting *no (dimming immediately),* the lighting switches off when the permanent lighting has ended. With the "yes" setting, the lighting remains on and the staircase lighting time restarts.

Warning during dimming down (object "Warning stairc. lighting")

The user can be additionally warned during the dimming time by setting the object *Warning staircase lighting* to "1". Thus for example, a pushbutton LED can be controlled or a warning signal initiated which informs the user about the impending deactivation of the staircase lighting.

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3.3   Communication object

General device communication objects

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
0	In Operation	General	1 bit	C	R	-	T	-	

No.	Function	Object name	Data type	Flags
0	**In Operation**	**General**	**1 bit (EIS 1)** **DPT 1.002**	**C, R, T**

Object "In Operation": 1 bit (EIS 1): In order to regularly monitor the presence of the Switch/Dim Actuator on the EIB / KNX, a monitoring telegram can be sent cyclically on the EIB / KNX. The communication object is enabled, if the parameter "Send object "in operation" in the parameter window "General" is set to send. The send value of the telegram can be parameterised.

In Parameter window "X: General", it is possible to parameterise if a telegram with the value "1" or "0" is sent.

1...9	**Free**	**not assigned**		

Table 7   General communication objects

Communication objects per output

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
10	Switch	Output A	1 bit	C	-	W	T	-	
11	Status switch	Output A	1 bit	C	R	-	T	-	
12	Relative dimming	Output A	4 bit	C	-	W	-	-	
13	Brightness value	Output A	1 Byte	C	-	W	T	-	
14	Status brightness value	Output A	1 Byte	C	R	-	T	-	
15	Rel. Dimming speed 0...100%	Output A	2 Byte	C	R	W	-	U	
16	Forced operation	Output A	2 bit	C	-	W	-	-	

Or with the feedback via the objects Switch / Status and Brightness / Status.

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
10	Switch / Status	Output A	1 bit	C	R	W	T	-	
13	Brightness value / Status	Output A	1 Byte	C	R	W	T	-	

No.	Function	Object name	Data type	Flags
10 **40...** [1]	**Switch**	**Output A**	**1 bit (EIS 1)** **DPT 1.001**	**C, W, T**

Object "Switch": 1 bit (EIS 1): The object is always enabled in order to enable switching on and off without parameterisation.

This object is used for switching an output ON/OFF.

Telegram value   "0"   switch off command: relay opens
                        "1"   switch on command: relay closes

If the staircase lighting function is activated, the staircase light is switched on via this object. An inversion is not intended.

The relay only then receives a switch impulse, if a calculated contact change is required, i.e. a repeated switching command is carried out again. This behaviour should be considered particularly with a manual operation of the relay. This action is not recognised by the Switch/Dim Actuator and is therefore not considered in the contact calculation. For this reason a manually switched off contact can only be switched on via the bus if an OFF command has been received via the bus beforehand.

It is possible to parameterise that the switching state is fed back via the object *Switch* or *Switch / Status*. Generally the feedback uses a separate object *Status switch* for this purpose. In the parameter window "X: General", it is possible to parameterise if one or two objects for switching and feedback are available.

[1] For the SD/S outputs 2 to max. 8 the respective objects numbers apply.

Table 8   Communication objects output

ABB i-bus® EIB / KNX   **Commissioning**

No.	Function	Object name	Data type	Flags
10 **40…**[1]	**Switch/Status**	**Output A**	**1 bit (EIS 1)** **DPT 1.001**	**C, R, W, T**

Object "Switch/Status" 1 bit (EIS 1): This object is enabled if in parameter window "X: General" the feedback is parameterised via the object "Switch / Status".

This object has the same functions and characteristics as the object "Switch". The status is additionally fed back. If only a common object for switching and feedback is used, no inversion of the feedback is possible.

Telegram value   "0"   switch off command: relay opens
                  "1"   switch on command: relay closes

Note: If the object "Switch / Status" has more then one EIB/KNX group address, the address for the status response has to be set as a sending address (first address).

No.	Function	Object name	Data type	Flags
11 **41…**[1]	**Status switch**	**Output A**	**1 bit (EIS 1)** **DPT 1.001**	**C, R, T**

Object "Status switch": 1 bit (EIS 1): This object is visible provided that the parameter "Status response of switching state" on the parameter window "X: General" has the value "yes: via a separate object *Switch status*".

The object value directly indicates the current contact position of the switching relay. An inversion of the status value as when sending the status telegram can be programmed. The status can only be sent with "only if value changes" or "always, triggered by switch command". The parameterisation "always, triggered by switch command" means that the status is sent if a switching command is received via the object "Switch". Other switching actions, e.g. scene or preset recalls only trigger the sending of the status with a status change.

Manual switching will not be detected.

No.	Function	Object name	Data type	Flags
12 **42…**[1]	**Relative dimming**	**Output A**	**4 bit (EIS 2)** **DPT 3.007**	**C, R, W, U**

Object "Relative dimming": 4 bit (EIS 1): The object is always enabled in order to enable dimming without parameterisation.

The relative dimming telegram for the corresponding output is received via this object. It is a dimming command (BRIGHTER, DARKER, STOP). After a start command is received, the brightness is changed in the defined direction with the parameterised speed. If a stop command is received before the dimming process ends or the maximum or minimum dimming value is reached, the dimming process is interrupted and the received brightness value is retained.

Dimming values which are above or below the max. or min. dimming values will not be received, the parameterised max. or min. dimming value remain as they are with further dimming.

No.	Function	Object name	Data type	Flags
13 **43…**[1]	**Brightness value**	**Output A**	**1 byte (EIS 6)** **DPT 5.001**	**C, W, T**

Object "Brightness value" [EIS 6; 1-byte value]: The object is always enabled in order to enable a brightness value without parameterisation.

The defined brightness value for the corresponding output is received via this object. It can be set via parameters if the dimming speed to dim or jump to the brightness value is set.

Brightness values which are above or below the predefined max. or min. brightness values are not controlled. The respective value limit is set. Furthermore you can set which brightness value of the output (value = "x%") is switched on or off (value = 0 %).

Telegram value   "0" off, or min value limit
                     …
                     "255" = 100%

It is possible to parameterise that the status of the brightness value is fed back via the brightness setting object (*Brightness / Status*). Generally a separate object "Status brightness value" is used which can be enabled in the parameter window "X: General".

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 9   Communication objects output

ABB i-bus® EIB / KNX   **Commissioning**

No.	Function	Object name	Data type	Flags
13 **43…**[1]	**Brightness / Status**	**Output A**	**1 byte (EIS 6)** **DPT 5.001**	**C, R, W, T**

	Object "Brightness / Status" [EIS 6; 1-byte value]: This object is enabled if in parameter window "X: General", the feedback is parameterised via the object "Brightness / Status".
	
	This object has the same functions and characteristics as the object "Brightness value". The status is additionally fed back.
	
	Telegram value "0" off, or min value limit
	                …
	                "255" = 100%
	
	Note: If the object "Brightness / Status" has more then one EIB/KNX group address, the address for the status response has to be set as a sending address (first address).			

14 **44…**[1]	**Status brightness value**	**Output A**	**1 byte (EIS 6)** **DPT 5.001**	**C, R, T**
	Object "Status brightness value" [EIS 6; 1-byte value]: This object is visible provided that the parameter "Status response of brightness value" on the parameter window "X: General" has the value "yes: via the separate object "Status brightness value". The object is used to feedback the brightness value which is currently issued. The object value updates only at the completion of a switching or dimming process. It is possible to parameterise when a status telegram is sent. The status can only be sent with "only if value changes" or "always, triggered by brightness command". The parameterisation "always, triggered by brightness command" means that the status is sent if a brightness command is received via the object "Brightness value". Other brightness values set commands, e.g. the sending of the status is only triggered by scene or preset recalls in the event of a status change.			
15 **45...**[1]	**Rel. Dimming speed 0...100%**	**Output A**	**2 byte (EIS 10)** **DPT 7.005**	**C, R, W**
	Object "Rel. Dimming speed 0…100%" [EIS 10; 2-byte value]: This object is visible if in parameter window "X: Dimming" the parameter "Rel. Dimming speed changeable via object (Object: Rel. Dimming speed 0...100%)" is set to "yes". Via this object the dimming speed for relative dimming can be set. The dimming speed for switching, setting values or staircase lighting function will not be influenced. The value (counter value) is represented in seconds. After bus voltage recovery, the object value is set by the programmed value and the value set via the bus is overwritten and is lost.			

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 9   Communication objects output

ABB i-bus® EIB / KNX   **Commissioning**

No.	Function	Object name	Data type	Flags
16 46...[1]	**Forced operation**	**Output A**	**2 bit (EIS 8) DPT 2.001**	**C, W**
Object "Forced operation" [EIS 8; 2-bit value]: This object is visible if the forced operation function is enabled in parameter window "X: Function". This object serves for defining a parameterised brightness value with subsequent blocking of the operation. Output X can be forcibly operated via this object (e.g. by a higher-level control). The object value directly defines the forced position of the output: "0" or "1" The output is not priority controlled, a forced operation is removed "2" The output is forcibly switched OFF. The forced operation is active "3" The output is priority controlled with the parameterised brightness value switched on. The forced operation is active The brightness value of the output is calculated during forced operation, but is not however displayed. Dimming speeds are not considered with the calculation, i.e. in the background the immediate end values are stored. After the completion of forced operation, the brightness values calculated in the background are set. A dimming, scene or preset recall as with the staircase lighting function will not be reinitiated. After a download, the object *Forced operation* has the value "0". Forced operation is not activated. Forced operation has a higher priority than blocking a output. The state of the bus voltage can be parameterised.				

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 10   Communication objects for forced operation

ABB i-bus® EIB / KNX   **Commissioning**

Communication objects for the function "Preset"

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
17	Call preset 1 and 2	Output A	1 bit	C	-	W	-	-	
18	Set preset 1 and 2	Output A	1 bit	C	-	W	-	-	
19	Call preset 3 and 4	Output A	1 bit	C	-	W	-	-	
20	Set preset 3 and 4	Output A	1 bit	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
17, 19 **46, 49** …[1]	**Call preset 1 and 2** *AND* **Call preset 3 and 4**	**Output A**	**1 bit (EIS 1)** **DPT 1.022**	**C, W**
colspan	**Object "Call preset 1 and 2" [EIS 1; 1-bit value]:** A stored brightness value is accessed with this object. If the value "0" is sent to this object, the parameterised or saved switching state of "Preset 1" or "Preset 3" is recalled. Accordingly the value "1" has the effect that the parameterised brightness value of "Preset 2" or "Preset 4" is recalled. Telegram values: 0: Call preset 1 or preset 3 1: Call preset 2 or preset 4 The behaviour during slave operation or with activated staircase lighting function can be found in the parameter description of the slave operation or the staircase lighting function.			
18, 20 **48, 50** …[1]	**Set preset 1 and 2** *AND* **Set preset 3 and 4**	**Output A**	**1 bit (EIS 1)** **DPT 1.022**	**C, W**
	Object "Set preset 1 and 2" [EIS 1; 1-bit value]: Using this object it is possible to store the current brightness value as the new preset value. The object value "0" has the effect that the current switching state is saved as Preset 1 (or Preset 3). The value "1" saves the current brightness value as Preset 2 (or Preset 4). Telegram values: 0: Set preset 1 or Preset 3 1: Set preset 2 or preset 4			

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 11   Communication objects for presets

ABB i-bus® EIB / KNX   **Commissioning**

Communication objects for the function "8-bit scene"

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
21	8-bit-scene	Output A	1 Byte	C	-	W	-	-	
22	Restore standard scene	Output A	1 bit	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
21, 46, 71...[1]	**8-bit scene**	**Output X**	**1 byte Non EIS** DPT 18.001	**C, W**

Object "8-bit scene" [Non EIS; 1-byte value]: This object is visible if the 8-bit scene function is enabled in parameter window "X: Function".

Using this 8-bit communication object, a scene command can be sent using a coded telegram, which integrates the output of the Switch/Dim Actuator in an EIB/KNX scene. The telegram contains the number of the respective scene as well as the information if the scene is to be retrieved, or if the current brightness value is to be assigned to the scene.

Telegram format (1 byte):   M0SS SSSS
(MSB) (LSB)

M: 0 – scene is retrieved
1 – scene is stored (if allowed)
S: Number of the scene (1 ... 64: 00000000 ... 00111111)

EIB / KNX 1-byte telegram value		Meaning
Decimal	Hexadecimal	
01	00h	Retrieve scene 1
02	01h	Retrieve scene 2
00	02h	Retrieve scene 3
...	...	...
63	3Fh	Retrieve scene 64
129	80h	Store scene 1
130	81h	Store scene 2
128	82h	Store scene 3
...	...	...
191	AFh	Store scene 64

Other figures have no effect on the saving or retrieval of the scene function. See the appendix for the complete code table of the 8-bit scene telegram.

An example of an 8-bit scene is described in chapter 4 "Application and planning".

The behaviour during slave operation or with activated staircase lighting function can be found in the parameter description of the slave operation or the staircase lighting function.

No.	Function	Object name	Data type	Flags
22, 47, 72...[1]	**Restore standard scene**	**Output X**	**1 bit (EIS1)**: DPT 1.015	**C, W**

Object "Restore standard scene" [EIS 1; 1-bit value]: This object is visible if the object with the parameter "Restore scene values with standard value" has been enabled in parameter window "X: Function".

The standard brightness values of an 8-bit scene are defined in the parameter window "X: Scene (x)". These values can be modified by the user during operation.

A telegram with the value "1" which is received via this object resets all scene values to the standard values parameterised in the ETS.

Telegram values: 0:   No reaction
1:   Overwrite scene values with standard value

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 12   Communication objects for scene

ABB i-bus® EIB / KNX   **Commissioning**

Communication object for the "Blocking" function

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
23	Block	Output A	1 bit	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
23, 48, 73...[1]	**Block**	**Output X**	**1 bit (EIS1)**: DPT 1.003	**C, W**
Object "Block" [EIS 1; 1-bit value]: This object is visible if the blocking function is enabled in parameter window "X: Function". The object is used for blocking an output to prevent unwanted operation. The lighting remains unchanged when a block is removed. The blocking function has a lower priority than forced operation (see function flow chart in section 4). After bus voltage recovery or a download, the blocking is removed and must be reset if required. Telegram values: 0: Remove block 1: Block active				

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 13   Communication objects for blocking

Communication objects for the function "Slave operation"

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
24	Activate slave mode	Output A	1 bit	C	-	W	-	-	
25	Brightness value of slave	Output A	1 Byte	C	-	W	T	-	

No.	Function	Object name	Data type	Flags
24, 49, 74...[1]	**Activate slave mode**	**Output X**	**1 bit (EIS1)**: DPT 1.003	**C, W**
Object "Activate slave mode" [EIS 1; 1-bit value]: This object is visible if in parameter window "X: Function" the slave operation function is enabled in the additional function parameter. The object serves for activation / deactivation of the slave operation. With deactivation the device behaves like a "normal" Switch/Dim Actuator without slave function. The slave operation can be reactivated when this object receives the value "1". With activating the slave mode the brightness value will read from the object „slave brightness". The output will set to this brightness value. With an off command via the object „switch" the slave mode will be switched off always. By setting the T flag, the object is actively sent after bus voltage recovery. Telegram values: 0: Slave mode not activated 1: Activate slave mode				
25, 50, 75...[1]	**Brightness value of slave**	**Output X**	**1 byte (EIS6)**: DPT 5.001	**C, W, T**
Object "Brightness value of slave" [EIS 6; 1-byte value]: This object is visible if in parameter window "X: Function" the slave operation function is enabled in the additional function parameter. The Switch/Dim Actuator receives the brightness value via this object, e.g. from a higher-level light control (master). If the mode is deactivated or slave mode is latent, after an OFF command "0" to the object *Switch* or *Switch / Status* the telegrams to the object *Brightness value of slave* have no effect. In parameter window "X: Slave", it is possible to parameterise if the slave mode can be interrupted by a dimming command, a setting of a value or a scene or preset command. Brightness values which are above or below the predefined max. or min. brightness values are not set. In this case the value limits are set. Telegram value "0" = OFF output is switched off, slave mode remains inactive "255" = 100% If the slave mode is enabled via ETS for a output, this can be deactivated by a telegram with the value "0" or activated with the value "1" with the object *Activate slave mode*.				

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1) For the SD/S outputs 2 to max. 8 the respective object numbers apply.
Table 14   Communication objects for slave mode

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Communication objects for the function "Staircase lighting control"

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
24	Activate staircase function	Output A	1 bit	C	-	W	-	-	
25	Permanent ON	Output A	1 bit	C	-	W	-	-	
26	Duration of staircase lighting	Output A	2 Byte	C	R	W	-	-	
27	Warning staircase lighting	Output A	1 bit	C	-	-	T	-	

No.	Function	Object name	Data type	Flags
24, 49, 74...[1]	**Activate staircase function**	**Output X**	**1 bit (EIS1)**: DPT 1.003	**C, W**

Object "Activate staircase function" [EIS 1; 1-bit value]: This object is visible if in parameter window "X: Function" the staircase lighting function is enabled in the additional function parameter.

The staircase lighting function can be activated or deactivated via this object. With a deactivated staircase lighting time, the output of the device behaves like a "normal" Switch/Dim Actuator. The staircase lighting function is again activated if the value "1" is received via the object described here.

If the staircase lighting is switched off at the time when it is activated, the base brightness is set. If the light is switched on, the staircase lighting brightness is set and the staircase lighting time elapses.

After bus voltage recovery, the staircase lighting function is always activated. By setting the T flag, the object is actively sent after bus voltage recovery.

Telegram values: 0:   Staircase lighting function not activated
                  1:     Activate staircase lighting function

No.	Function	Object name	Data type	Flags
25, 50, 75...[1]	**Permanent ON**	**Output X**	**1 bit (EIS1)**: DPT 1.001	**C, W**

Object "Permanent ON" [EIS 1; 1-bit value]: This object is visible if in parameter window "X: Function" the staircase lighting function is enabled in the additional function parameter.

Serves as an active staircase lighting control for permanently switching on the lighting (also called "Service light").

After a bus voltage recovery or download, the object value is set to "0" and a permanent ON is not active.

Telegram values: 0:   Permanent light not active
                  1:     Permanent light active

No.	Function	Object name	Data type	Flags
26, 51, 76...[1]	**Duration of staircase lighting**	**Output X**	**2 byte (EIS 10)** DPT 7.005	**C, R, W**

Object "Duration of staircase lighting" [EIS 10; 2-byte value]: This object is visible if in parameter window "X: Function" the staircase lighting function is enabled in the additional function parameter.

Via this object the staircase lighting time can be set via the EIB/KNX. The time is defined in seconds. After bus voltage recovery, the object value is accepted by the programmed value in the ETS and the value set via the bus is lost.

No.	Function	Object name	Data type	Flags
27, 52, 77...[1]	**Warning staircase lighting**	**Output X**	**1 bit (EIS 1)** DPT 1.005	**C, T**

Object "Warning staircase lighting" [EIS 1; 1-bit value]: This object is visible if in parameter window "X: Function" the staircase lighting function is enabled in the additional function parameter.

The value of the object is used to provide a warning before the staircase lighting time elapses. The object has the value "1" during the warning.

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 15   Communication objects for staircase lighting

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Communication object for the diagnostics

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
34	Statusbyte	Output A	1 Byte	C	R	-	T	-	

No.	Function	Object name	Data type	Flags
34, 59, 84...[1]	**Status byte**	**Output X**	**1 byte Non EIS Non DPT**	C, R, T

Object "Status byte" [Non EIS; 1-byte value]: This object is always visible so that the status of the Switch / Dim actuator is always available.

This object is useful particularly if the device does not function as required. It indicates the possible causes:

Telegram values: Bit 0:   Additional function (staircase lighting or slave operation) is active

Bit 1:   Blocking function is active
Bit 2:   Forced operation is active

Bits not used can be defined with the value "0".

A detailed assignment of the object value to the device status is listed in the appendix. The object value is sent after a change, download and reset.

The bit 0 is always active if the staircase lighting function of the slave mode is activated. Both of these functions cannot be enabled simultaneously for a output of the Switch/Dim Actuator. If one of the functions is enabled via the ETS, it can be activated via the objects *Activate slave mode* or *Activate staircase function*. In both cases the bit 0 of the status will assume the value "1". Bit 0 also remains set when the slave mode is latent after an OFF command and telegram with the value "0" to the object *Switch* or *Switch / Status*. The same behaviour results with the corresponding parameterisation if the slave mode is interrupted by dimming, setting the brightness, scene or preset recall. The behaviour can be programmed in parameter window "X: Slave".

[1] For the SD/S outputs 2 to max. 8 the respective object numbers apply.

Table 16   Communication objects for status byte

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4   Planning and application

In this section you will find some tips and application examples for practical use of the device.

4.1   Number of connectable ballast devices

Several electronic ballast devices with 1-10 V interfaces can be controlled with a output of the Switch/Dim Actuators. The number of dimmable ballast devices per output is limited both by the switching capacity and the control power of the Switch/Dim Actuator.

Both sizes determine the number of connectable 1-10 V ballast devices.

If the switching on and off function is not used via the switching relay of the Switch/Dim Actuator (e.g. external contactor), the number of controllable ballast devices depends on the load capacity of the contactor contact and the 1-10 V DC control voltage.
If the switching and control function of a output of the Switch/Dim Actuator is used, the smaller number of ballast devices limits the maximum number of ballast devices which can be connected to a output.

Each output should be considered. An influence between the outputs is not to be considered.

4.1.1   Load current influence

The electronic ballast is a device for operating gas discharge lamps, e.g. fluorescent lamps. During normal operation, the electronic ballast converts the mains voltage to an optimum operating voltage for the gas discharge lamps. Furthermore, the electronic ballast enables the gas discharge lamps to ignite (start) via capacitor circuitry.
With the original choke/starter circuitry the lamps are switched on consecutively, with the electronic ballast all fluorescent lamps switch on practically simultaneously. If switching on occurs at the mains voltage peak, the buffer capacitor of the electronic ballast causes a high but very short current pulse. With the use of several ballast devices on the same circuit, the simultaneous charging of the capacitors may result in very large system inrush currents (inrush current peaks I_p).

This peak inrush current I_p is to be considered when designing the switch contacts as well as when selecting the respective circuit protection. In the following section, the effects of the electronic ballast peak inrush current and the associated limitation of the number of electronic ballast devices in the Switch/Dim Actuators are examined.

The inrush current of the electronic ballast depends not only on the wattage but also on the type, the number of elements (lamps) and on the manufacturer. For this reason the given maximum number of connectable electronic ballast devices per output can only relate to a defined type of electronic ballast. For a different type this value can only represent an estimation.

In order to properly estimate the number of electronic ballast devices, the peak inrush current I_p with the respective pulse width of the electronic ballast must be known. In the meantime, these values are stated by the manufacturer in the technical data or are available on request.

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Typical values for single element electronic ballast devices with T5/T8 lamps are:

Peak inrush current 15 A to 50 A with a pulse time of 120μs to 200μs.

The relay of the Switch/Dim Actuator features the following maximum switch on values:

	SD/S x.16.1
Max. peak inrush current I_p (150μs)	400 A
Max. peak inrush current I_p (250μs)	320 A
Max. peak inrush current I_p (600μs)	200 A

Table 17   Peak inrush currents

If these limit values are exceeded, the relay will be destroyed (e.g. the contacts will weld).

Example: ABB EVG 1x58 CF

Peak inrush current I_p = 33.9 A (147.1μs)

For the SD/S 4.16.1 Switch/Dim Actuator this means:

Maximum number of electronic ballast per output = 400 A / 34 A = 11 electronic ballast devices

4.1.2 Control current influence

The 1-10 V interface operates according to the current source principle. Hereby, the ballast is a voltage source which generates a constant current. The Switch/Dim Actuator (current sink) represents an electrical end stage, so that the voltage value corresponds to the required dimming setting. The output stage of the Switch/Dim Actuator has been designed so that it can counteract a maximum control current of 100 mA and generate a control voltage of 1 V on the ballast. The minimum brightness which the ballast can set is produced at this 1 V value.
If the number of ballast devices produces a current greater than 100 mA, the Switch/Dim Actuator is not longer in a position to reduce the voltage on the ballast to 1 V. In this case, the minimum dimming value of the ballast cannot be set. The same problems can occur if the control line is too long or if its cross-section is too small. In these cases the resistance and accordingly the voltage drop on the line is too large, so that the actual control voltage on the ballast does not correspond to the required voltage value.

The control current generated by the ballast depends on the type and manufacturer of the ballast. Typical currents are between 0.4 and 4 mA. If an average control current of 2 mA is assumed, 50 ballast devices can be connected to a Switch/Dim Actuator output.
Furthermore, the control cables and the cable cross-sections must be taken into consideration. If the cable is too long or too thin, the line voltage drop is too large in order to generate the minimum control voltage of 1 V on the ballast. This leads to the minimum dimming value not being adjustable. With a cable cross-section of 0.8 mm^2, a simple control line length of 70 m, or at 1.5 mm^2 a length of 100 m is possible with the Switch/Dim Actuators.

An open control line causes a voltage drop of 10 V on the ballast and affects the maximum brightness of 100 %.
A short-circuited control line allows the voltage to collapse and the minimum dimming value of the control device is set.

The polarity must be observed when the control line is connected. If the polarity is reversed, the ballast cannot be dimmed and the minimum dimming value is set.

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4.2   **Function chart**

The following illustration indicates the sequence in which the functions of the Switch/Dim Actuator operating mode are processed. Objects, which lead to the same box have the same priority and are processed in the sequence in which the telegrams are received.

Fig. 16:   Function chart

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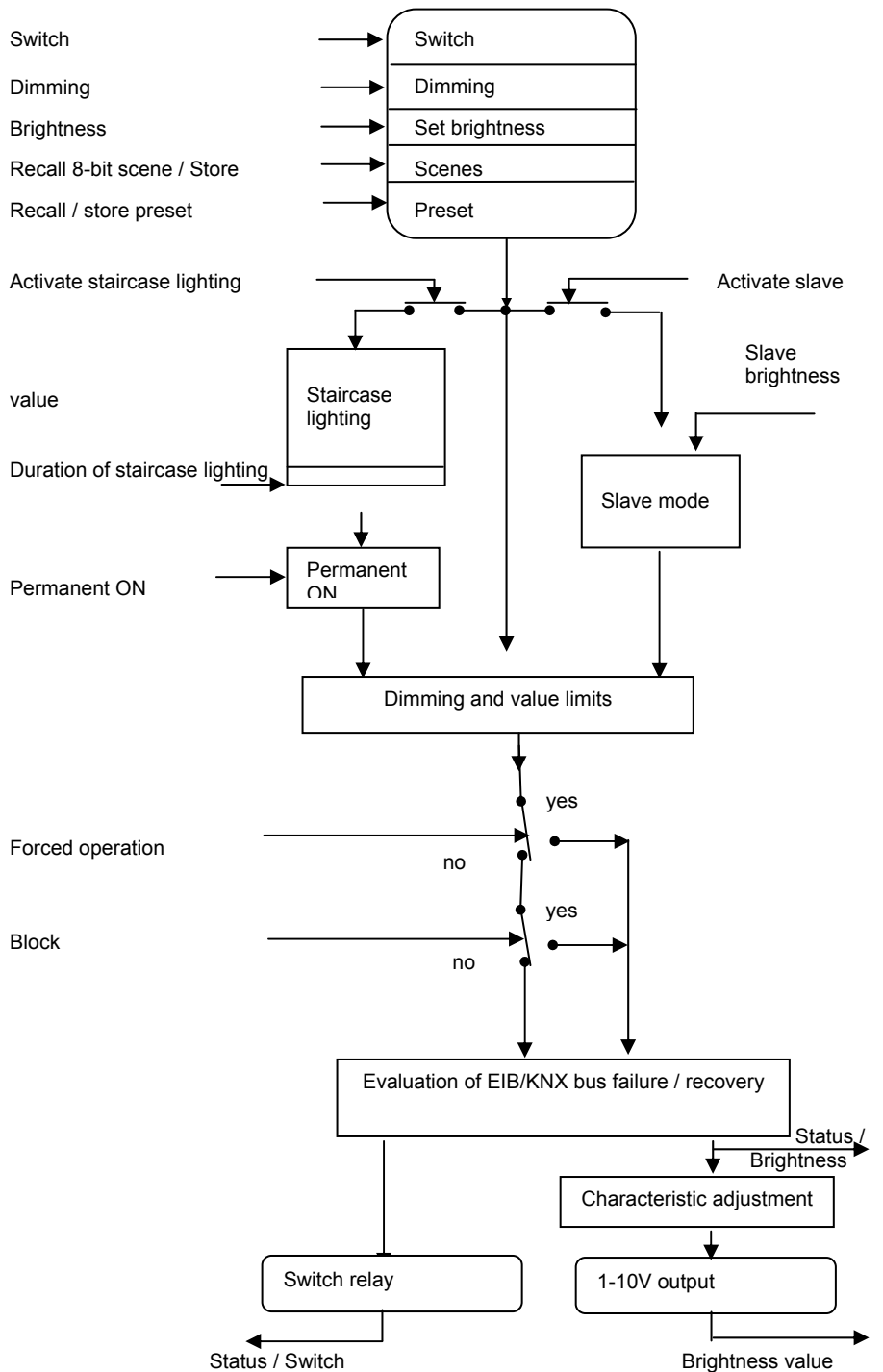
4.3   Staircase lighting time

With the active staircase lighting function, the other functions of the device are deactivated with the exception of forced operation and the blocking function.

When the telegram value "1" is received at the *Switch* object, the lighting is switched on. After the staircase lighting time t_{ON} has elapsed, the lighting dims in an adjustable dimming time t_D to a defined brightness value ("Base brightness"). If this value is zero, the lighting switches off after the minimum dimming value is reached. Then parameterised dimming values in the parameter window *X: Dimming* apply.

During an activated staircase lighting function, the preset and scene commands have no effect.

After bus voltage recovery, the staircase lighting function is activated. The lighting state remains unchanged: If the lighting was switched on, the starting brightness is set and the lighting is restarted. If the lighting was switched off, the brightness switches to the base brightness.

The dimming time T_D relates to the minimum dimming value or the base brightness, depending on the value which is reached first. Using this logic the light is always dimmed for the entire prewarning time T_D, in order to provide a sufficiently long warning before the staircase lighting is switched off.
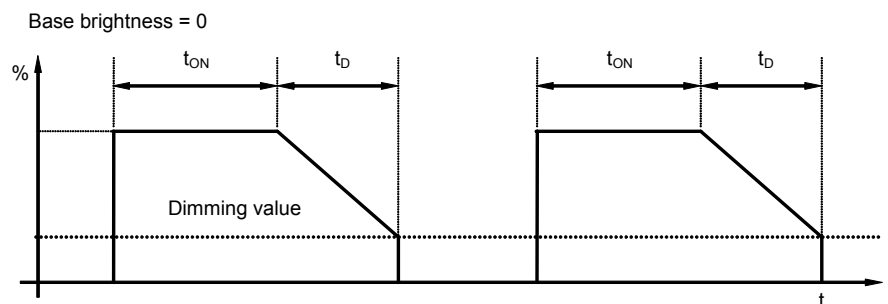
Base brightness = 0

Fig. 17: Brightness behaviour with base brightness = 0
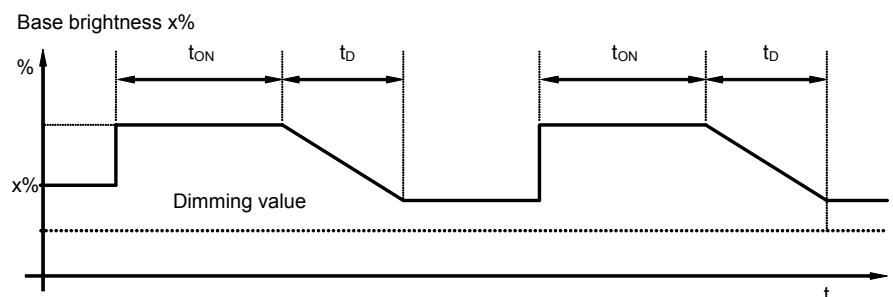
Base brightness x%

Fig. 18: Brightness behaviour with base brightness not equal to 0

A telegram with the value "0" which is received by the object *Activate staircase function* deactivates the staircase function. Thereafter the device operates like a "normal" dimming actuator, i.e. all other functions such as relative dimming, setting of a brightness value and the scene and preset functions can be fully used again. For renewed activation of the staircase function, a telegram with the value "1" must be received at the object.

With activated staircase lighting, the maximum and minimum dimming values, as defined in parameter window *X: Dimming* apply. The respective parameterised values are set with an overshoot or undershoot.

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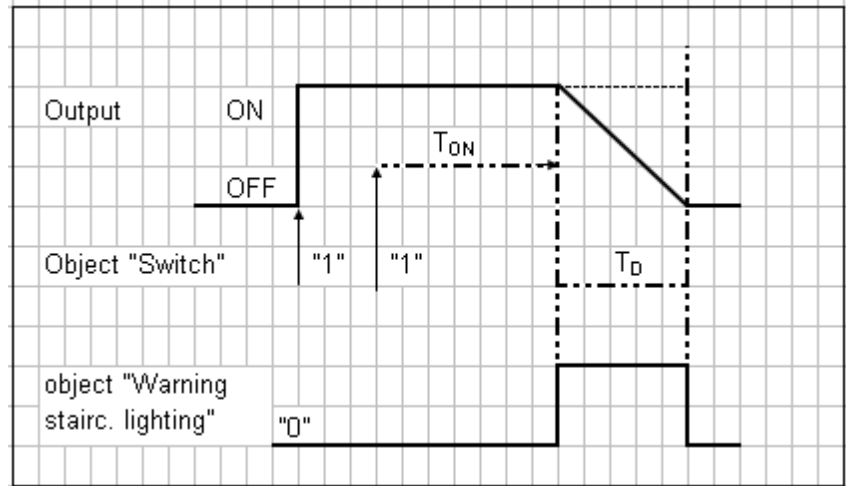
Retrigger:

Fig. 19:   Diagram for staircase lighting time

After the staircase lighting time T_{ON}, the output switches off automatically. With each "1" telegram, the time restarts ("retrigger function"), if the parameter "Extending staircase lighting by multiple operation ("pumping up")" in the parameter window "X: Staircase light" is set to "no, no pump up possible".

In this example, a dimming down process with the corresponding prewarning is parameterised. The prewarning is visualised by the dimming. At the same time the object *Warning staircase lighting* can be switched as a project-specific warning (e.g. optical or acoustic warning).

With **pumping**, the user can adapt the staircase lighting time to the current requirements by pressing the pushbutton several times in succession. The maximum duration of the staircase lighting time can be set in the parameters.
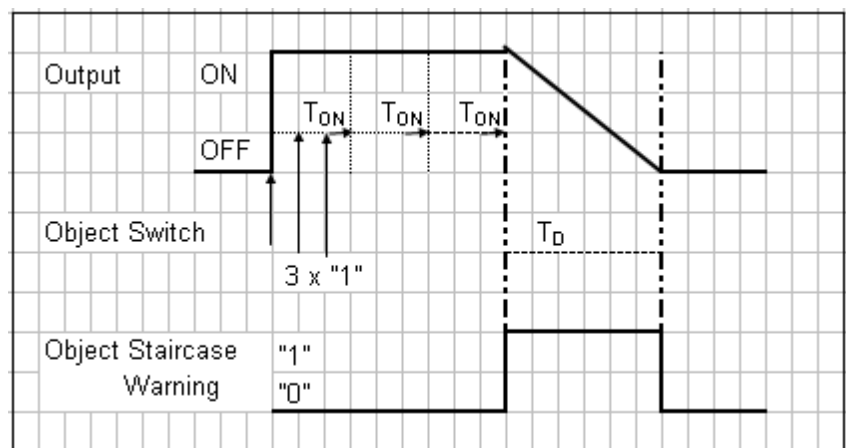
Fig. 20:   Diagram for staircase lighting time pumping

If the device receives a further ON command when the staircase lighting is switched on, the staircase lighting time is added to the remaining period. The dimming T_D (warning time) is not changed by "pumping" and is added to the extended (x times T_{ON}) staircase lighting time.

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4.4   Preset description

A parameterisable switching state can be retrieved with the help of presets. Lightscenes can therefore be implemented for example by a 1-bit object.

Retrieve preset
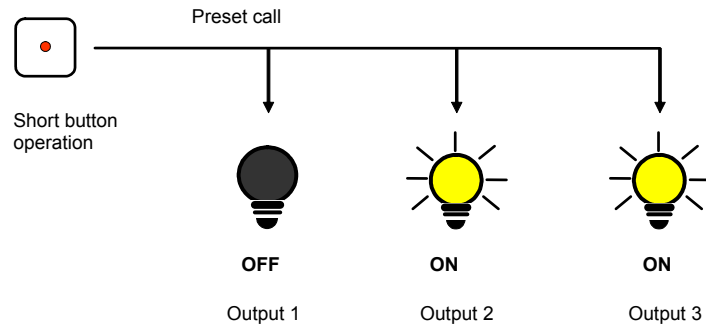
Fig. 21:   Controlling lightscenes via presets

Switching states ("preset values") can be retrieved via the object *Recall preset 1 and 2*. A maximum of 4 preset values are available for each output:

Action	Telegram
Recall preset 1	Object *Recall preset 1 and 2* = 0
Recall preset 2	Object *Recall preset 1 and 2* = 1

Table 18   Retrieved preset objects

Store preset
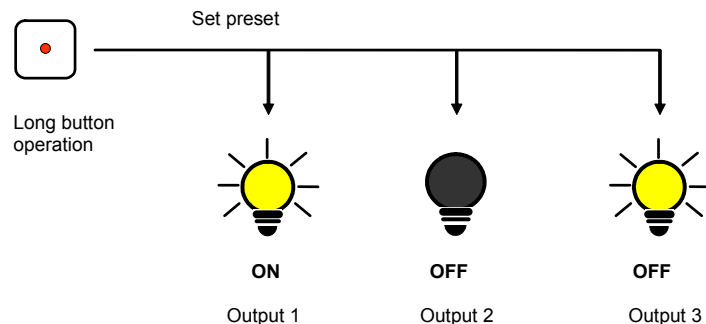
Fig. 22:   Storing the current output state as the new preset value

The current switching state is stored as a new preset value via the object *Set preset 1 and 2*. The user can thus adapt a lightscene for example. The presets are stored via the following values:

Action	Telegram
Save preset 1	Object *Set preset 1 and 2* = 0
Save preset 2	Object *Set preset 1 and 2* = 1

Table 19   Set preset objects

A similar process applies for preset 3 and 4 with the objects "*Set preset 3 and 4"* and *"Recall preset 3 and 4".*

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Special function: Restore state

A useful special function can also be assigned to preset 1, which is used to recreate the brightness values (states) which were present before retrieving the first preset recall. The recall can be implemented via Preset 2, 3 or 4. The following diagram clarifies this:

	Output 1	Output 2	Output 3
Old state	ON	OFF	ON
Recall preset 2	OFF	ON	ON
Restore value before first preset call	OFF	ON	OFF
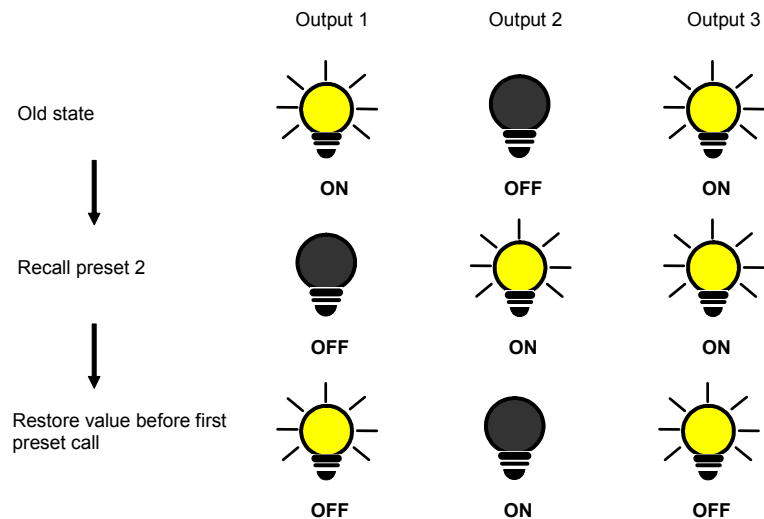
Fig. 23:   Restoring the old brightness state (example)

This function can be used for example after a presentation to restore the lighting to the state it was in beforehand.

With the first recall of a preset, the current state of the output is stored. If a preset was already active, the saved state will not be overwritten. This ensures that the state before the first preset recall can be re-established. If the preset is recalled more frequently, the state of the first recall applies.

After the command "Restore value before first preset call" has been recalled, the new state will be stored with the next preset recall in order to recall it again at a later time.

A similar process applies for preset 3 and 4 with the objects "*Set preset 3 and 4*" and *"Recall preset 3 and 4"*.

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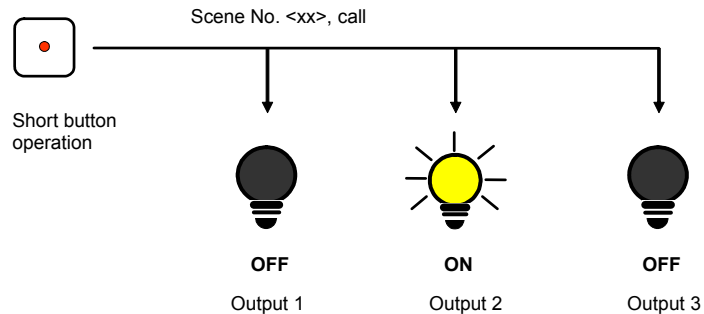
4.5 8-bit scene

Fig. 24:   Retrieve scene, 8-bit scene

With the 8-bit scene, e.g. a pushbutton or a visualisation with an 8-bit telegram, the system receives an instruction to set / recall a scene. The information (brightness value and transition time) is not stored in the pushbutton, but rather in the Switch/Dim Actuator and the other ABB i-bus® devices in the system. All scene devices (e.g. a output of the Switch/Dim Actuator) are addressed by the same group address. It is sufficient to send a single telegram to recall the scene with all outputs involved.

The 8-bit telegram value contains the scene number which must match the scene number in the parameters of the Switch/Dim Actuator.

Up to 64 different scenes are managed via a single group address. The 8-bit scene telegram contains the retrieval and storing functions of a scene.

In the following, the 8-bit scene function is described which controls multiple EIB / KNX devices.

With the 8-bit scene, it is possible to retrieve one of 64 scenes or to connect multiple EIB / KNX devices in an 8-bit scene, e.g. shutter, switch actuator and DALI gateways or Switch/Dim Actuators. The scene can be retrieved or stored using a single 1-byte telegram. The precondition is that all operating devices or outputs are parameterised with the same scene number.

Each EIB / KNX device involved receives the 8-bit scene telegram and independently controls the scene values. For example, the outputs are switched on or off via the Switch/Dim Actuator, the shutter actuator moves the shutters to a defined position or the DALI gateway dims its output to the pre-programmed brightness values.

Up to 64 different scenes can be managed via a single EIB / KNX group address. An 8-bit scene telegram contains the following information (see the code table in the appendix).

    – Number of the scene (1…64)
    – Retrieve scene/store scene

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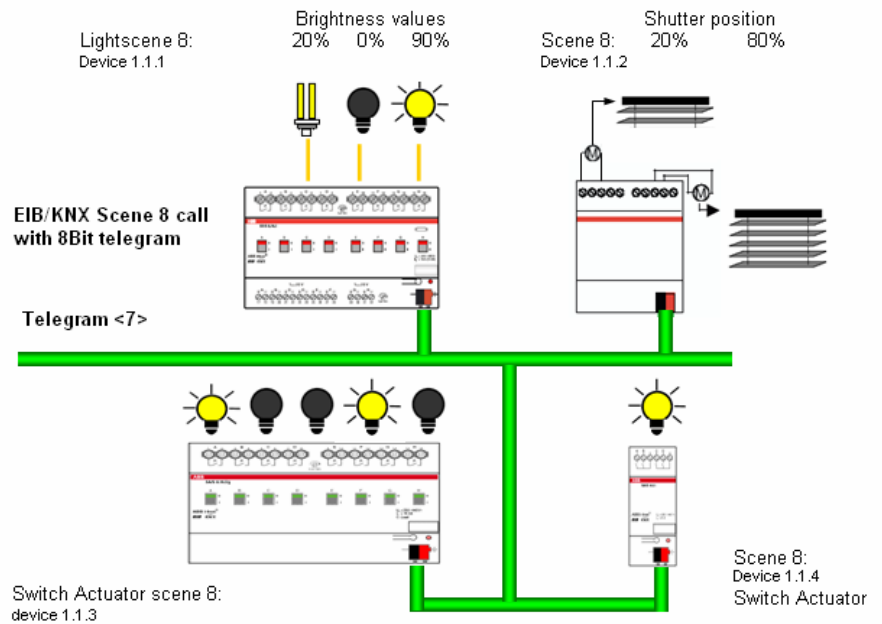
Fig. 25:   Example of 8-bit scene: Retrieve scene no. 8

Example: An EIB / KNX 8-bit scene (no. 8) comprises a single lamp, which is connected via a Switch/Dim Actuator and two switch actuators. Furthermore, two shutters are integrated into the scene via a shutter actuator. The scene can be retrieved via a single EIB / KNX telegram. The prerequisite for this is that all devices have programmed scene 8 accordingly in the devices. After a telegram has been received, the slave switches on its scene number 8. The shutter actuators move the shutters to the corresponding position; the lighting assumes the predefined brightness values and switching states defined by the scene.

Advantage: The 8-bit scene offers some advantages compared to conventional scene programming via several EIB/KNX groups. On the one hand, only a single telegram which is received by all participants in the scene and implemented accordingly, is sent on the bus to retrieve a scene. On the other hand, the target position of the shutter, the contact position of the switch actuator outputs and the brightness of the Switch/Dim Actuators are stored in the participating devices and do not need to be sent via the EIB / KNX each time they are to be retrieved.

The scene numbering 1 to 64 is retrieved via the EIB / KNX with a telegram number 0 to 63. See the code table in the appendix for the respective scene coding.

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4.6   Characteristic adjustment
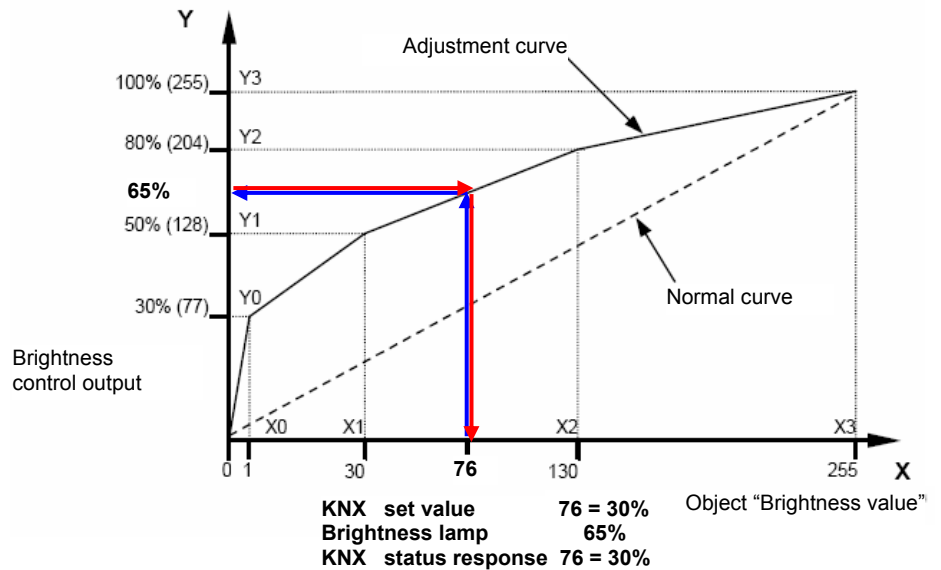
Fig. 26:   Example for a characteristic adjustment

Sometimes it is necessary to adjust the dimming characteristic of a light to the sensitivity of the human eye. This can be undertaken with a characteristic adjustment. Normally the object value 0...255 is assigned with the proportional brightness value 0 %...100 % (see "normal curve"). This curve can be converted by 4 value pairs to an adjustment curve. A linear interpolation of the characteristic is undertaken between the value pairs.

If the lights should be brighter in the lower range, the brightness can be increased or reduced with the object value "1". In the example above (see figure) the brightness for value "1" in the first value pair has therefore been defined at 30 %. The other value pairs in the example have been defined so that they result in a flatter curve in the upper range. With relative dimming, a flatter dimming ramp is thus achieved.

In extreme cases the brightness characteristic can even be inverted.

X = 1 -> Y = 255 (100 %) and X = 255 -> Y = 1 (0.3 %)

In this case, the maximum control value 255 sets the minimum brightness value of 0.3 % and the minimum control value sets the maximum brightness value of 100 %.

The feedback brightness values received via object *Status brightness value* or *Brightness / Status* also take the curve into consideration, i.e. a control variable of 76 (30 %) is transformed to a brightness of 65 % to control the lighting. The lighting feeds back 65 %. This value is transformed once again to 76 (30 %) and provided as a brightness value in the EIB/KNX. In this way the constant lighting control of a lighting controller can be operated without any difficulties, as the control value and the feedback directly correspond and a correct control factor can be calculated.

Note: In the parameter window "X: Dimming" or "X: Value", parameterised dimming or brightness values are used before the transformation. Through the transformation a setting signal may result for the lamps which is less than or greater than the maximum or minimum brightness values.

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4.7   Slave mode

The reaction to the ON telegram with the object *Switch* can be parameterised. If the slave operation is activated, the dim actuator strictly adheres to the brightness value, which is predefined by the object *Brightness value of slave*. Brightness values at the object *Brightness value* are ignored. A telegram with the value "0" at the object *Activate slave mode* deactivates slave mode and a telegram with the value "1" activates the slave mode again. The activation or deactivation is also displayed in the first bit of the status byte.

An OFF telegram ("0") at the object *Switch* has the effect that the slave mode is deactivated for some time. In this case the slave mode is in a latent state and waits in the background for renewed activation. A renewed activation can be implemented by an ON command, a telegram with the value "1" to the object *Switch* or via the object *Activate slave mode*. As in the "latent state", the slave mode continues to be active in the background and is waiting for activation, the first bit in the status byte will always indicate the activated slave mode with the value "1".

The same behaviour results when in the parameter window "X: Slave" it is programmed that a dimming command, switching command, value command, preset or scene recall interrupts slave operation. During this interruption the slave mode is also latent and can be reactivated by an ON command, a telegram with the value "1" to the object *Switch* or via the object *Activate slave mode*.

The parameterisation "no reaction" has the effect that no dimming, switching or value command can be executed. A preset or scene recall and storing of a scene also has no effect. However, a new brightness value can be stored via the object *Set preset*.

The parameterised value limits in the *Value* parameter window also apply for the slave operation. The undershoot and overshoot of these limits are set using the parameterised minimum or maximum brightness value. If the master sends the brightness value "0", the lighting is switched off.

The behaviour of the slave mode after bus voltage recovery can be parameterised.

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4.8 Behaviour on bus voltage failure, recovery and download

Reaction on bus voltage failure

The switching behaviour (relay position) can be parameterised. The control output assumes a high resistance state, which means that the ballast devices assume the maximum brightness (100 %).

Reaction on bus voltage recovery

The behaviour of the device after bus voltage recovery can be parameterised on a output-by-output basis (see parameter page *X: General*).

The individual functions behave as follows:

After bus voltage recovery, the **staircase lighting function** is always activated. If permanent ON was activated it will be cancelled. Via the parameter *Value object "Switch" on bus voltage recovery*, it is also possible to define if the light switches on or off (provided that this is allowed in the parameters).

If the base brightness was set before bus failure, it will be set again.
If the staircase lighting was deactivated before bus failure, the staircase lighting will be reactivated.

If the **blocking function** was active, the blocking of the device is cancelled at bus voltage recovery.

Reaction of download or ETS recovery

The brightness value remains unchanged during and directly after the download or ETS reset. The function (e.g. staircase lighting, forced operation, blocking) of the device also remains unchanged.

If another or no additional function was parameterised before reset/download, the following applies:

The **Staircase lighting function** is active and the object *Activate staircase function* is written with the value "1".
If the base brightness was set for the staircase lighting before download, it will be set again.
If the staircase lighting was not active before download, it will remain deactivated after the download.
If the staircase lighting was dimming before download, it will be set to base brightness after download.

The special behaviour is described in the following table.

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Behaviour of the Switch/Dim actuator after a download, ETS bus reset voltage failure and recovery

Behaviour with:	Bus voltage failure (BF)	Bus voltage recovery (BW)	Download	ETS bus reset "Reset device"
Switch behaviour (relay position)	Programmable ("X: General)	Object value "Switch" is parameterised (X: General)	State as before the download	State as before the reset
1-10 V output	Assumes high resistance, ballast devices go to 100 %	Dependent on parameterisation "Switch object after bus recovery." Unchanged: Brightness before bus failure Value "1": Brightness = 100% Value "0": Off, or min brightness	Control output and thus the brightness value remain unchanged.	Control output and thus the brightness value remain unchanged.
Block	No function, see relay position	Blocking is removed	Blocking is removed	Blocking is removed
Forced operation	No function, see relay position	Programmable ("X: Function).	Will be deactivated, brightness as was before forced operation	Will be deactivated, brightness as before forced operation
Scenes	No function, see relay position	Inactive, via bus saved scene values remain available	Inactive, scene values are overwritten depending on the parameterisation (X: Function)	Inactive. Values stored via bus still available for recall
Presets	No function, see relay position	Preset is written with the parameterised standard value in the ETS	Preset is written with the parameterised standard value in the ETS	Inactive
Object "Status switch" "Status brightness"	No function, no data is sent	Will be updated and depending on parameterisation (X: General) will be sent	Will be updated and depending on parameterisation (X: General) will be sent	Will be updated and depending on parameterisation (X: General) will be sent
Rel. Dimming speed 0…100%, set via bus	Dimming speed is lost. no function	The dimming speed set via the bus is lost and is replaced by the ETS programmed time.	The dimming speed set via the bus is lost and is replaced by the ETS programmed time.	The dimming speed set via the bus is lost and is replaced by the ETS programmed time.
Staircase lighting function	No function, see relay position	Staircase light function active, reaction dependent on "Switch" object	State as before the download	State as before ETS bus reset
Permanent ON	No function, see relay position	Inactive	Inactive	Inactive, brightness is retained
Slave operation	No function, see relay position	Is programmable (X: Slave)	State as before download, slave brightness object will be read	State as before reset, slave brightness object will be read
Status byte	No function	Values are updated and sent	Values are updated and sent	Values are updated and sent
Last brightness value	The last brightness value is saved.	As long as the last value is unknown, switches on with 100 % or maximum value	Last brightness value is still known.	Last brightness value is still known.

Table 20 Behaviour of Switch / Dim actuators on bus voltage failure, recovery and download

ABB i-bus® EIB / KNX   **Commissioning**

4.9   Interdependence of the functions

The functions have a dependence on one another:

The highest priority is forced operation, which is triggered with the 2-bit object *Forced operation*. The output is blocked with forced operation. At the same time the value of the object *Forced operation* of the output is switched on (object value "3" or "11") or off (object value "2" or "10") with a parameterised brightness value. The slave operation such as staircase lighting continues to run in the background during forced operation. The brightness is not influenced by this measure. During active forced operation the blocking of the outputs can be triggered or removed. At the end of forced operation the blocking is checked and implemented if necessary.

The second highest priority is the "Blocking" function. With this function the output is blocked via the 1-bit object *Block* (value "1"), i.e. no switching, dimming or value commands are carried out. The brightness value is frozen at its present level after completion of a dimming, scene or preset transition. The staircase lighting function and the slave mode are interrupted. If the output receives a telegram with the value "0" via the object *Block*, the output is re-enabled and the brightness value that was active before blocking is set again. The staircase lighting continues in the background until dimming. The dimming is implemented again after the end of blocking. Slave mode is again implemented.

The permanent ON function has a lower priority than the forced operation and blocking function. After the end of forced operation or blocking the permanent ON function is no longer active. Permanent ON interrupts the staircase lighting function and the timer runs in the background until the start of dimming. You can parameterise if the staircase lighting function is restarted after the end of permanent ON or if it remains in a standby state.

The additional functions of slave mode and staircase lighting have equal priority and cannot be activated simultaneously. A output can either be operated with staircase lighting or slave mode.

The parameterised behaviour on bus voltage failure or recovery acts directly on the switching contacts and thus has the highest priority.

A graphic representation with the active principles of the priorities is described in chapter 4.2 in a flow chart.

ABB i-bus® EIB / KNX   **Appendix**

5   Appendix

5.1   Table of the status bytes

Object value		Forced operation is active	Blocking function is active	Staircase lighting function or slave function is active
dec	hex			
0	00			
1	01			■
2	02		■	
3	03		■	■
4	04	■		
5	05	■		■
6	06	■	■	
7	07	■	■	■

"■" = applies

Table 21   Meaning of the status byte

Forced operation is active means that the output is forcibly switched on or off via the forced operation (*Forced operation* object).

Blocking is active means that the output is blocked for all operation via the blocking function (*Block* object).

Staircase lighting function or slave function is active means that one of these additional functions is active and therefore certain operating functions are inhibited.

5.2   Code table for 8-bit scene telegram

The following table indicates the telegram code for an 8-bit scene in hex and binary code for the first 64 scenes. When retrieving or storing a scene, an 8-bit value must normally be sent.

ABB i-bus® EIB / KNX **Appendix**

8-bit value	Hexadecimal	7	6	5	4	3	2	1	0	Scene number	Retrieve (A) / Store (S) / No reaction (-)
		Recall/ storing	not defined	Scene number							
0	00	0	0	0	0	0	0	0	0	1	A
1	01	0	0	0	0	0	0	0	1	2	A
2	02	0	0	0	0	0	0	1	0	3	A
3	03	0	0	0	0	0	0	1	1	4	A
4	04	0	0	0	0	0	1	0	0	5	A
5	05	0	0	0	0	0	1	0	1	6	A
6	06	0	0	0	0	0	1	1	0	7	A
7	07	0	0	0	0	0	1	1	1	8	A
8	08	0	0	0	0	1	0	0	0	9	A
9	09	0	0	0	0	1	0	0	1	10	A
10	0A	0	0	0	0	1	0	1	0	11	A
11	0B	0	0	0	0	1	0	1	1	12	A
12	0C	0	0	0	0	1	1	0	0	13	A
13	0D	0	0	0	0	1	1	0	1	14	A
14	0E	0	0	0	0	1	1	1	0	15	A
15	0F	0	0	0	0	1	1	1	1	16	A
16	10	0	0	0	1	0	0	0	0	17	A
17	11	0	0	0	1	0	0	0	1	18	A
18	12	0	0	0	1	0	0	1	0	19	A
19	13	0	0	0	1	0	0	1	1	20	A
20	14	0	0	0	1	0	1	0	0	21	A
21	15	0	0	0	1	0	1	0	1	22	A
22	16	0	0	0	1	0	1	1	0	23	A
23	17	0	0	0	1	0	1	1	1	24	A
24	18	0	0	0	1	1	0	0	0	25	A
25	19	0	0	0	1	1	0	0	1	26	A
26	1A	0	0	0	1	1	0	1	0	27	A
27	1B	0	0	0	1	1	0	1	1	28	A
28	1C	0	0	0	1	1	1	0	0	29	A
29	1D	0	0	0	1	1	1	0	1	30	A
30	1E	0	0	0	1	1	1	1	0	31	A
31	1F	0	0	0	1	1	1	1	1	32	A
32	20	0	0	1	0	0	0	0	0	33	A
33	21	0	0	1	0	0	0	0	1	34	A
34	22	0	0	1	0	0	0	1	0	35	A
35	23	0	0	1	0	0	0	1	1	36	A
36	24	0	0	1	0	0	1	0	0	37	A
37	25	0	0	1	0	0	1	0	1	38	A
38	26	0	0	1	0	0	1	1	0	39	A
39	27	0	0	1	0	0	1	1	1	40	A
40	28	0	0	1	0	1	0	0	0	41	A
41	29	0	0	1	0	1	0	0	1	42	A
42	2A	0	0	1	0	1	0	1	0	43	A
43	2B	0	0	1	0	1	0	1	1	44	A
44	2C	0	0	1	0	1	1	0	0	45	A
45	2D	0	0	1	0	1	1	0	1	46	A
46	2E	0	0	1	0	1	1	1	0	47	A
47	2F	0	0	1	0	1	1	1	1	48	A
48	30	0	0	1	1	0	0	0	0	49	A
49	31	0	0	1	1	0	0	0	1	50	A
50	32	0	0	1	1	0	0	1	0	51	A
51	33	0	0	1	1	0	0	1	1	52	A
52	34	0	0	1	1	0	1	0	0	53	A
53	35	0	0	1	1	0	1	0	1	54	A
54	36	0	0	1	1	0	1	1	0	55	A
55	37	0	0	1	1	0	1	1	1	56	A
56	38	0	0	1	1	1	0	0	0	57	A
57	39	0	0	1	1	1	0	0	1	58	A
58	3A	0	0	1	1	1	0	1	0	59	A
59	3B	0	0	1	1	1	0	1	1	60	A
60	3C	0	0	1	1	1	1	0	0	61	A
61	3D	0	0	1	1	1	1	0	1	62	A
62	3E	0	0	1	1	1	1	1	0	63	A
63	3F	0	0	1	1	1	1	1	1	64	A
64	40	0	1	0	0	0	0	0	0	1	-
65	41	0	1	0	0	0	0	0	1	2	-
66	42	0	1	0	0	0	0	1	0	3	-
67	43	0	1	0	0	0	0	1	1	4	-
68	44	0	1	0	0	0	1	0	0	5	-
69	45	0	1	0	0	0	1	0	1	6	-
70	46	0	1	0	0	0	1	1	0	7	-
71	47	0	1	0	0	0	1	1	1	8	-
72	48	0	1	0	0	1	0	0	0	9	-
73	49	0	1	0	0	1	0	0	1	10	-
74	4A	0	1	0	0	1	0	1	0	11	-
75	4B	0	1	0	0	1	0	1	1	12	-
76	4C	0	1	0	0	1	1	0	0	13	-
77	4D	0	1	0	0	1	1	0	1	14	-
78	4E	0	1	0	0	1	1	1	0	15	-
79	4F	0	1	0	0	1	1	1	1	16	-
80	50	0	1	0	1	0	0	0	0	17	-
81	51	0	1	0	1	0	0	0	1	18	-
82	52	0	1	0	1	0	0	1	0	19	-
83	53	0	1	0	1	0	0	1	1	20	-
84	54	0	1	0	1	0	1	0	0	21	-
85	55	0	1	0	1	0	1	0	1	22	-
86	56	0	1	0	1	0	1	1	0	23	-
87	57	0	1	0	1	0	1	1	1	24	-
88	58	0	1	0	1	1	0	0	0	25	-
89	59	0	1	0	1	1	0	0	1	26	-
90	5A	0	1	0	1	1	0	1	0	27	-
91	5B	0	1	0	1	1	0	1	1	28	-
92	5C	0	1	0	1	1	1	0	0	29	-
93	5D	0	1	0	1	1	1	0	1	30	-
94	5E	0	1	0	1	1	1	1	0	31	-
95	5F	0	1	0	1	1	1	1	1	32	-
96	60	0	1	1	0	0	0	0	0	33	-
97	61	0	1	1	0	0	0	0	1	34	-
98	62	0	1	1	0	0	0	1	0	35	-
99	63	0	1	1	0	0	0	1	1	36	-
100	64	0	1	1	0	0	1	0	0	37	-
101	65	0	1	1	0	0	1	0	1	38	-
102	66	0	1	1	0	0	1	1	0	39	-
103	67	0	1	1	0	0	1	1	1	40	-
104	68	0	1	1	0	1	0	0	0	41	-
105	69	0	1	1	0	1	0	0	1	42	-
106	6A	0	1	1	0	1	0	1	0	43	-
107	6B	0	1	1	0	1	0	1	1	44	-
108	6C	0	1	1	0	1	1	0	0	45	-
109	6D	0	1	1	0	1	1	0	1	46	-
110	6E	0	1	1	0	1	1	1	0	47	-
111	6F	0	1	1	0	1	1	1	1	48	-
112	70	0	1	1	1	0	0	0	0	49	-
113	71	0	1	1	1	0	0	0	1	50	-
114	72	0	1	1	1	0	0	1	0	51	-
115	73	0	1	1	1	0	0	1	1	52	-
116	74	0	1	1	1	0	1	0	0	53	-
117	75	0	1	1	1	0	1	0	1	54	-
118	76	0	1	1	1	0	1	1	0	55	-
119	77	0	1	1	1	0	1	1	1	56	-
120	78	0	1	1	1	1	0	0	0	57	-
121	79	0	1	1	1	1	0	0	1	58	-
122	7A	0	1	1	1	1	0	1	0	59	-
123	7B	0	1	1	1	1	0	1	1	60	-
124	7C	0	1	1	1	1	1	0	0	61	-
125	7D	0	1	1	1	1	1	0	1	62	-
126	7E	0	1	1	1	1	1	1	0	63	-
127	7F	0	1	1	1	1	1	1	1	64	-
128	80	1	0	0	0	0	0	0	0	1	S
129	81	1	0	0	0	0	0	0	1	2	S
130	82	1	0	0	0	0	0	1	0	3	S
131	83	1	0	0	0	0	0	1	1	4	S
132	84	1	0	0	0	0	1	0	0	5	S
133	85	1	0	0	0	0	1	0	1	6	S
134	86	1	0	0	0	0	1	1	0	7	S
135	87	1	0	0	0	0	1	1	1	8	S
136	88	1	0	0	0	1	0	0	0	9	S
137	89	1	0	0	0	1	0	0	1	10	S
138	8A	1	0	0	0	1	0	1	0	11	S
139	8B	1	0	0	0	1	0	1	1	12	S
140	8C	1	0	0	0	1	1	0	0	13	S
141	8D	1	0	0	0	1	1	0	1	14	S
142	8E	1	0	0	0	1	1	1	0	15	S
143	8F	1	0	0	0	1	1	1	1	16	S
144	90	1	0	0	1	0	0	0	0	17	S
145	91	1	0	0	1	0	0	0	1	18	S
146	92	1	0	0	1	0	0	1	0	19	S
147	93	1	0	0	1	0	0	1	1	20	S
148	94	1	0	0	1	0	1	0	0	21	S
149	95	1	0	0	1	0	1	0	1	22	S
150	96	1	0	0	1	0	1	1	0	23	S
151	97	1	0	0	1	0	1	1	1	24	S
152	98	1	0	0	1	1	0	0	0	25	S
153	99	1	0	0	1	1	0	0	1	26	S
154	9A	1	0	0	1	1	0	1	0	27	S
155	9B	1	0	0	1	1	0	1	1	28	S
156	9C	1	0	0	1	1	1	0	0	29	S
157	9D	1	0	0	1	1	1	0	1	30	S
158	9E	1	0	0	1	1	1	1	0	31	S
159	9F	1	0	0	1	1	1	1	1	32	S
160	A0	1	0	1	0	0	0	0	0	33	S
161	A1	1	0	1	0	0	0	0	1	34	S
162	A2	1	0	1	0	0	0	1	0	35	S
163	A3	1	0	1	0	0	0	1	1	36	S
164	A4	1	0	1	0	0	1	0	0	37	S
165	A5	1	0	1	0	0	1	0	1	38	S
166	A6	1	0	1	0	0	1	1	0	39	S
167	A7	1	0	1	0	0	1	1	1	40	S
168	A8	1	0	1	0	1	0	0	0	41	S
169	A9	1	0	1	0	1	0	0	1	42	S
170	AA	1	0	1	0	1	0	1	0	43	S
171	DOWN	1	0	1	0	1	0	1	1	44	S
172	AC	1	0	1	0	1	1	0	0	45	S
173	AD	1	0	1	0	1	1	0	1	46	S
174	AE	1	0	1	0	1	1	1	0	47	S
175	AF	1	0	1	0	1	1	1	1	48	S
176	B0	1	0	1	1	0	0	0	0	49	S
177	B1	1	0	1	1	0	0	0	1	50	S
178	B2	1	0	1	1	0	0	1	0	51	S
179	B3	1	0	1	1	0	0	1	1	52	S
180	B4	1	0	1	1	0	1	0	0	53	S
181	B5	1	0	1	1	0	1	0	1	54	S
182	B6	1	0	1	1	0	1	1	0	55	S
183	B7	1	0	1	1	0	1	1	1	56	S
184	B8	1	0	1	1	1	0	0	0	57	S
185	B9	1	0	1	1	1	0	0	1	58	S
186	BA	1	0	1	1	1	0	1	0	59	S
187	BB	1	0	1	1	1	0	1	1	60	S
188	BC	1	0	1	1	1	1	0	0	61	S
189	BD	1	0	1	1	1	1	0	1	62	S
190	BE	1	0	1	1	1	1	1	0	63	S
191	BF	1	0	1	1	1	1	1	1	64	S
192	C0	1	1	0	0	0	0	0	0	1	-
193	C1	1	1	0	0	0	0	0	1	2	-
194	C2	1	1	0	0	0	0	1	0	3	-
195	C3	1	1	0	0	0	0	1	1	4	-
196	C4	1	1	0	0	0	1	0	0	5	-
197	C5	1	1	0	0	0	1	0	1	6	-
198	C6	1	1	0	0	0	1	1	0	7	-
199	C7	1	1	0	0	0	1	1	1	8	-
200	C8	1	1	0	0	1	0	0	0	9	-
201	C9	1	1	0	0	1	0	0	1	10	-
202	CA	1	1	0	0	1	0	1	0	11	-
203	CB	1	1	0	0	1	0	1	1	12	-
204	CC	1	1	0	0	1	1	0	0	13	-
205	CD	1	1	0	0	1	1	0	1	14	-
206	CE	1	1	0	0	1	1	1	0	15	-
207	CF	1	1	0	0	1	1	1	1	16	-
208	D0	1	1	0	1	0	0	0	0	17	-
209	D1	1	1	0	1	0	0	0	1	18	-
210	D2	1	1	0	1	0	0	1	0	19	-
211	D3	1	1	0	1	0	0	1	1	20	-
212	D4	1	1	0	1	0	1	0	0	21	-
213	D5	1	1	0	1	0	1	0	1	22	-
214	D6	1	1	0	1	0	1	1	0	23	-
215	D7	1	1	0	1	0	1	1	1	24	-
216	D8	1	1	0	1	1	0	0	0	25	-
217	D9	1	1	0	1	1	0	0	1	26	-
218	DA	1	1	0	1	1	0	1	0	27	-
219	DB	1	1	0	1	1	0	1	1	28	-
220	DC	1	1	0	1	1	1	0	0	29	-
221	DD	1	1	0	1	1	1	0	1	30	-
222	DE	1	1	0	1	1	1	1	0	31	-
223	DF	1	1	0	1	1	1	1	1	32	-
224	E0	1	1	1	0	0	0	0	0	33	-
225	E1	1	1	1	0	0	0	0	1	34	-
226	E2	1	1	1	0	0	0	1	0	35	-
227	E3	1	1	1	0	0	0	1	1	36	-
228	E4	1	1	1	0	0	1	0	0	37	-
229	E5	1	1	1	0	0	1	0	1	38	-
230	E6	1	1	1	0	0	1	1	0	39	-
231	E7	1	1	1	0	0	1	1	1	40	-
232	E8	1	1	1	0	1	0	0	0	41	-
233	E9	1	1	1	0	1	0	0	1	42	-
234	EA	1	1	1	0	1	0	1	0	43	-
235	EB	1	1	1	0	1	0	1	1	44	-
236	EC	1	1	1	0	1	1	0	0	45	-
237	ED	1	1	1	0	1	1	0	1	46	-
238	EE	1	1	1	0	1	1	1	0	47	-
239	EF	1	1	1	0	1	1	1	1	48	-
240	F0	1	1	1	1	0	0	0	0	49	-
241	F1	1	1	1	1	0	0	0	1	50	-
242	F2	1	1	1	1	0	0	1	0	51	-
243	F3	1	1	1	1	0	0	1	1	52	-
244	F4	1	1	1	1	0	1	0	0	53	-
245	F5	1	1	1	1	0	1	0	1	54	-
246	F6	1	1	1	1	0	1	1	0	55	-
247	F7	1	1	1	1	0	1	1	1	56	-
248	F8	1	1	1	1	1	0	0	0	57	-
249	F9	1	1	1	1	1	0	0	1	58	-
250	FA	1	1	1	1	1	0	1	0	59	-
251	FB	1	1	1	1	1	0	1	1	60	-
252	FC	1	1	1	1	1	1	0	0	61	-
253	FD	1	1	1	1	1	1	0	1	62	-
254	FE	1	1	1	1	1	1	1	0	63	-
255	FF	1	1	1	1	1	1	1	1	64	-

Table 22   Code table for 8-bit scene

ABB i-bus® EIB / KNX   **Appendix**

5.3 Conversion of old application programmes

With the aid of the conversion it is possible from ETS3 to accept the parameters and group addresses from previous application programs.

Procedure:

1. Import the current VD3 file into the ETS3 and append a product with the current application program into the project.

2. Click with the right mouse button on the product and select "Convert".
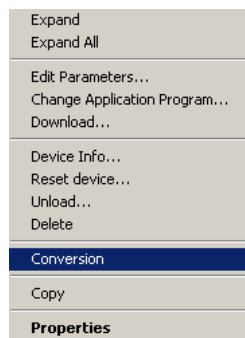
3. Then follow the instructions

The following application programs can be converted:

Application program	Conversion is possible completely
Switch Dim 2f 1-10V/1.0 & 1.0a	Switch Dim 2f 1-10V/1.1
Switch Dim 4f 1-10V/1.0 & 1.0a	Switch Dim 4f 1-10V/1.1
Switch Dim 8f 1-10V/1.0 & 1.0a	Switch Dim 8f 1-10V/1.1

Note: Please note that the standard values can be set after conversion of newly added parameters.

4. Then change the existing physical address and delete the old device.

ABB i-bus® EIB / KNX   **Appendix**

5.4 Scope of delivery

The ABB i-bus® EIB / KNX Switch/Dim Actuator SD/S is supplied with the following components. Please check the items received using the following list.

– 1 pc. SD/S x.16.1[1), MDRC
– 1 pc. installation and operating instructions
– 1 pc. bus connection terminal (red/black)

[1) Note: x = number of outputs (2, 4 or 8)

5.5 Ordering information

Switch /Dim Actuators, 1-10 V, 2-, 4-, 8-fold, 16 A, MDRC

Switches the floating contacts of 2, 4 and 8 independent load circuits with ballast devices which can be dimmed via independent 1-10 V control inputs. The switching state of the contact is displayed. The switching capacity is 16 A at AC1.
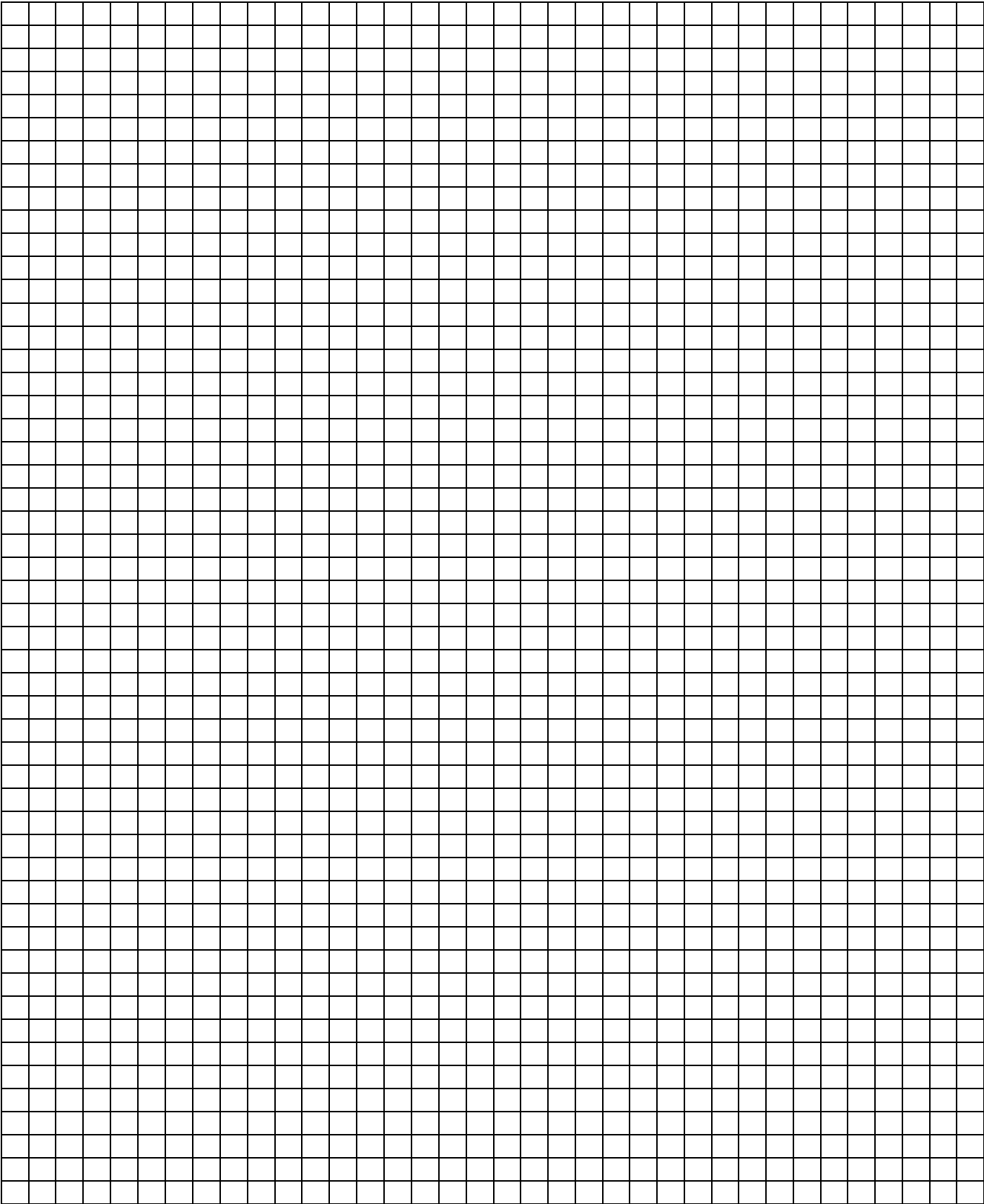
	Ordering details Short designation	Order no.	bbn 40 16779 EAN	Price 1 pc. [EURO]	Price group	Unit weight 1 pc. [kg]	Pack unit [Pcs]
	SD/S 2.16.1	2CDG 110 079 R0011	65996 3	-	26	0.180	1
	SD/S 4.16.1	2CDG 110 080 R0011	65937 6	-	26	0.280	1
	SD/S 8.16.1	2CDG 110 081 R0011	65918 5	-	26	0.460	1

Table 23 Ordering details for Switch/Dim Actuators

ABB i-bus® EIB / KNX   **Appendix**

A.1   Notes

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