ABB i-bus® KNX
I/O Actuators IO/S x.6.1.1
Product Manual

Power and productivity
for a better world™

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1 General

The I/O Actuators IO/S x.6.1.1 provide intelligent engineering technology for purpose-built and industrial buildings, and for small business enterprises.

Modern buildings require intelligent building engineering technology for safe and efficient operation. Many buildings world-wide already utilise the full potential of networked electrical installations.

Hotels, hospitals, senior citizen and student residential homes, assisted living accommodation and much, much more: The I/O Actuators cover new possibilities for buildings in the residential and purpose-built sectors.

The I/O Actuators have been developed for all rooms of this type. They cover all requirements of the electrical installation of this application and offer the following functions in compact form:

- Switching lighting
- Switching of loads

In addition to these basic functions, further automation functions can be implemented by a combination with a presence detector. The communication of the devices via the KNX bus also enables control functions as well as sending of emergency signals from the rooms to a control centre.

1.1 Using the product manual

This manual provides you with detailed technical information relating to the function, installation and programming of the ABB i-bus® KNX I/O Actuators.

This manual is subdivided into the following chapters:

Chapter 1	General
Chapter 2	Device technology
Chapter 3	Commissioning
Chapter 4	Planning and application
Chapter A	Appendix

1.1.1 Notes

Notes and safety instructions are represented as follows in this manual:

Note
Tips for usage and operation

Examples
Application examples, installation examples, programming examples

Important
These safety instructions are used as soon as there is danger of a malfunction without risk of damage or injury.

Caution
These safety instructions are used as soon as there is danger of a malfunction without risk of damage or injury.

Danger
These safety instructions are used if there is a danger for life and limb with inappropriate use.

Danger
These safety instructions are used if there is a danger to life with inappropriate use.

1.2 Product and functional overview

The I/O Actuators IO/S x.6.1.1 are used for purpose-built and industrial buildings, and for small business enterprises. The I/O Actuators are used to control the lighting circuits. The input signals are detected via binary inputs or directly via the sensors connected to the KNX.

Management systems can directly access the I/O Actuators via the ABB i-bus® and activate controls in the room.

The I/O Actuators are modular installation devices with a module width of 4 or 8 space units in Pro *M* design for installation in a distribution board. The connection to the ABB i-bus® is established using the front side bus connection terminal. The device can be operated, for example, during commissioning, by applying an auxiliary voltage to the bus terminals. The assignment of the physical addresses as well as the parameterization is carried out with Engineering Tool Software ETS.

The device features four or eight switching outputs for control of lighting circuits, e.g. such as

- Lighting in the room
- Bathroom and entrance lighting

Furthermore, four or eight floating binary inputs are available.

- Room lighting
- Bathroom lighting

The scanning voltage for the binary inputs is provided by the device. The binary inputs are divided into two or four groups of two inputs each.

Overview of the number and allocation of the inputs and outputs:

Inputs	IO/S 4.6.1.1	IO/S 8.6.1.1
Binary via contact scanning	4	8

Outputs	IO/S 4.6.1.1	IO/S 8.6.1.1
Switching contact 6 A, 250 V AC	4	8

2 Device technology

2.1 I/O Actuator IO/S 4.6.1.1, 4fold, MDRC

2CDC 071 038 S0012

IO/S 4.6.1.1

The IO/S 4.6.1.1 is a modular installation device (MDRC) in Pro*M* design. It is intended for installation in the distribution board on 35 mm mounting rails. The assignment of the physical addresses as well as the parameterization is carried out with the ETS and the current application.

The I/O Actuator is powered via the ABB i-bus® and does not require an additional auxiliary voltage supply.

The device is ready for operation after connecting the bus voltage.

2.1.1 Technical data

Supply	Bus voltage	21…32 V DC
	Current consumption, bus	Maximum 12 mA (Fan-in 1)
	Leakage loss, bus	Maximum 250 mW
	Leakage loss, device	Maximum 0.8 W *
* The maximum power consumption of the device results from the following specifications	Relay 6 A	0.8 W
Connections	KNX	Via bus connection terminals, 2-fold (red/black) 0.8 mm Ø, solid
	Circuits	Screw terminal with universal head (PZ 1) 0.2…4 mm² stranded, 2 x (0.2…2.5 mm²) 0.2…6 mm² single core, 2 x (0.2…4 mm²)
	Ferrules without/with plastic sleeves	without: 0.25…2.5 mm² with: 0.25…4 mm²
	TWIN ferrules	0.5…2.5 mm²
	Tightening torque	Maximum 0.6 Nm
Operating and display elements	Button/LED	For assignment of the physical address
Enclosure	IP 20	Compliant to EN 60 529
Safety class	II	Compliant to EN 61 140
Insulation category	Overvoltage category	III to EN 60 664-1
	Pollution degree	2 to EN 60 664-1
KNX safety extra low voltage	SELV 24 V DC	
Temperature range	Operation	-5 °C…+45 °C
	Transport	-25 °C…+70 °C
	Storage	-25 °C…+55 °C
Ambient conditions	Maximum air humidity	93 %, no condensation allowed
Design	Modular installation device (MDRC)	Modular installation device, Pro *M*
	Dimensions (H x W x D)	90 x 72 x 64.5 mm
	Mounting width in space units	4 modules at 18 mm
	Mounting depth	64.5 mm
Installation	On 35 mm mounting rail	Compliant to EN 60 715
Mounting position	as required	
Weight	0.17 kg	
Housing/colour	Plastic housing, grey	
Approvals	KNX to EN 50 090-1, -2	Certification
CE mark	In accordance with the EMC guideline and low voltage guideline	

Important
The maximum permissible current of a KNX line may not be exceeded. During planning and installation ensure that the KNX line is correctly dimensioned. The device features a maximum current consumption of 12 mA (Fan-In 1).

2.1.2 Binary inputs

Rated values	Number	4[1)]
	U_n scanning voltage	32 V, pulsed
	I_n scanning current	0.1 mA
	Scanning current In at switch on	Maximum 355 mA
	Permissible cable length	≤ 100 m one-way, at cross-section 1.5 mm² even when the core is routed in a multi-control cable

1) All binary inputs are internally connected to the same potential.

2.1.3 Rated current output 6 A

Rated values	Number	4 contacts
	U_n rated voltage	250/440 V AC (50/60 Hz)
	I_n rated current (per output)	6 A
Switching currents	AC3* operation (cos j = 0.45) To EN 60 947-4-1	6 A/230 V
	AC1* operation (cos j = 0.8) To EN 60 947-4-1	6 A/230 V
	Fluorescent lighting load to EN 60 669-1	6 A/250 V (35 mF)[2)]
	Minimum switching power	20 mA/5 V 10 mA/12 V 7 mA/24 V
	DC current switching capacity (resistive load)	6 A/24 V=
Service life	Mechanical durability	> 10^7
	Electronic service life To IEC 60 947-4-1	
	AC1* (240 V/cos j = 0.8)	> 10^5
	AC3* (240 V/cos j = 0.45)	> 1.5 x 10^4
	AC5a* (240 V/cos j = 0.45)	> 1.5 x 10^4
Switching times[1)]	Maximum relay position change per output and minute if only one relay is switched.	2,683

1) The specifications apply only after the bus voltage has been applied to the device for at least 10 seconds. Typical delay of the relay is approx. 20 ms.

2) The maximum inrush-current peak may not be exceeded, see chapter 2.1.4.

*** What do the terms AC1, AC3 and AC5a mean?**

In Intelligent Installation Systems, different switching capacity and performance specifications, which are dependent on the special application, have become established in industrial and residential systems. These performance specifications are rooted in the respective national and international standards. The tests are defined so that typical applications, e.g. motor loads (industrial) or fluorescent lamps (residential) are simulated.

The specifications AC1 and AC3 are switching performance specifications which have become established in the industrial field.

Typical application:

AC1 – Non-inductive or slightly inductive loads, resistive furnaces (relates to switching of ohmic/resistive loads)

AC3 – Squirrel-cage motors: Starting, switching off motors during running (relates to (inductive) motor load)

AC5a – Switching of electric discharge lamps

These switching performances are defined in the standard EN 60947-4-1 Contactors and motor-starters - Electromechanical contactors and motor-starters. The standard describes starters and/or contactors that previously were preferably used in industrial applications.

2.1.4 Output lamp load 6 A

Lamps	Incandescent lamp load	1200 W
Fluorescent lamps T5/T8	Uncorrected	800 W
	Parallel compensated	300 W
	DUO circuit	350 W
Low-voltage halogen lamps	Inductive transformer	800 W
	Electronic transformer	1000 W
	Halogen lamps 230 V	1000 W
Dulux lamp	Uncorrected	800 W
	Parallel compensated	800 W
Mercury-vapour lamp	Uncorrected	1000 W
	Parallel compensated	800 W
Switching capacity (switching contact)	Maximum peak inrush-current Ip (150 s)	200 A
	Maximum peak inrush-current Ip (250 ms)	160 A
	Maximum peak inrush-current Ip (600 ms)	100 A
Number of electronic ballasts (T5/T8, single element)[1)]	18 W (ABB EVG 1 x 18 CF)	10
	24 W (ABB EVG-T5 1 x 24 CY)	10
	36 W (ABB EVG 1 x 36 CF)	7
	58 W (ABB EVG 1 x 58 CF)	5
	80 W (Helvar EL 1 x 80 SC)	3

1) For multiple element lamps or other types, the number of electronic ballasts must be determined using the peak inrush current of the electronic ballasts.

Device type	Application	Max. number of Communication objects	Max. number of group addresses	Max. number of associations
IO/S 4.6.1.1	I/O Actuator, 4f/…*	255	255	255

* … = current version number of the application. **Please observe the software information on our homepage for this purpose.**

Note

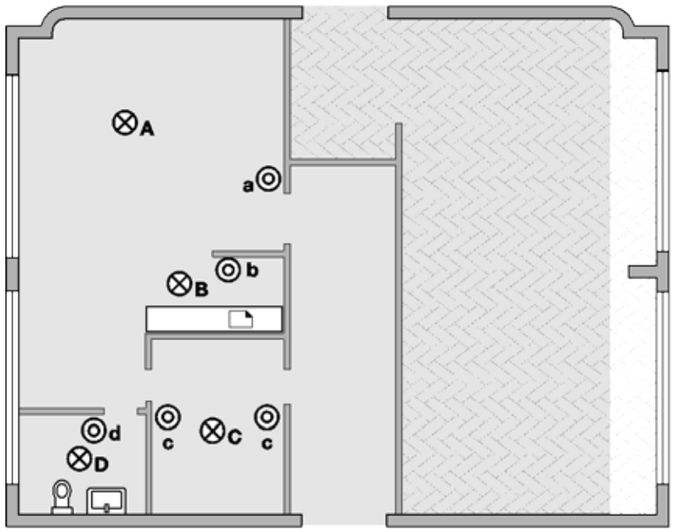
The ETS and the current version of the device application are required for programming.

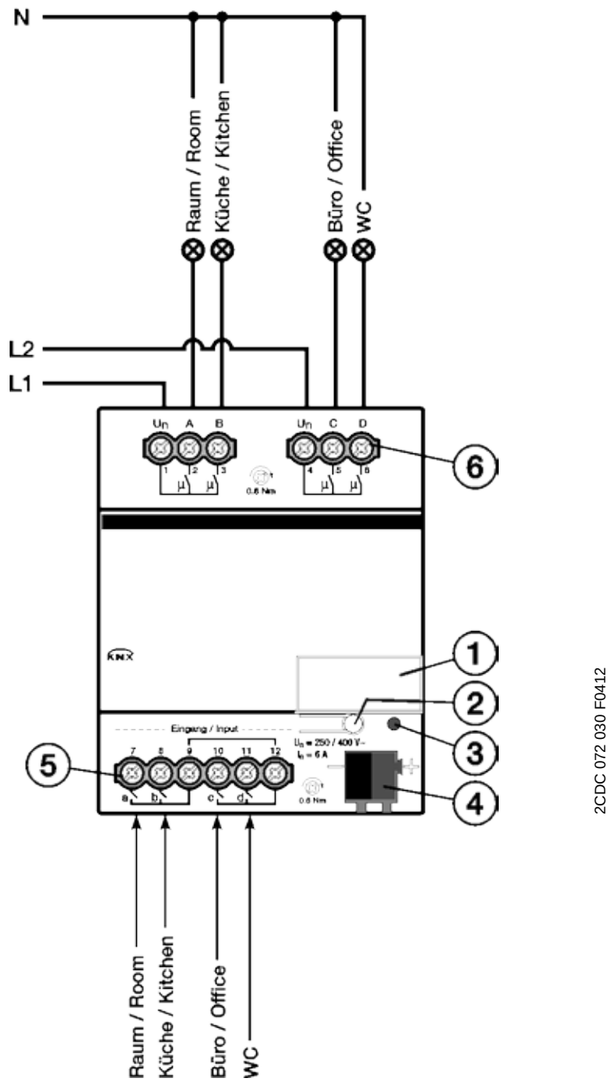
The current version of the application is available for download on the internet at *www.abb.com/knx*. After import in the ETS, it is available in the ETS under *ABB/Outputs/IO-Actuators*.

The device does not support the locking function of a KNX device in the ETS. If you inhibit access to all devices of the project with a *BCU code*, it has no effect on this device. Data can still be read and programmed.

2.1.5 Connection schematic

Example of a typical floor plan





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IO/S 4.6.1.1

1 Label carrier

2 Button *Programming*

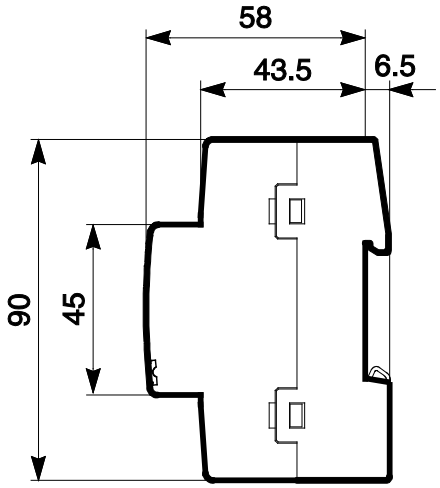
3 LED *Programming* (red)

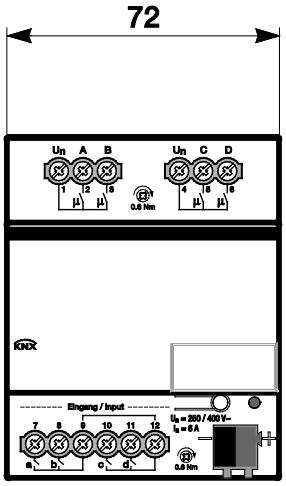
4 Bus connection terminal

5 Inputs (a, b, c, d)

6 Outputs, 2 contacts, 1 screw terminal for phase connection (A, B) and (C, D)

2.1.6 Dimension drawing





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2.2 I/O Actuator IO/S 8.6.1.1, 8fold, MDRC

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IO/S 8.6.1.1

The IO/S 8.6.1.1 is a modular installation device (MDRC) in Pro*M* design. It is intended for installation in the distribution board on 35 mm mounting rails. The assignment of the physical addresses as well as the parameterization is carried out with the ETS and the current application.

The I/O Actuator is powered via the ABB i-bus® and does not require an additional auxiliary voltage supply.

The device is ready for operation after connecting the bus voltage.

2.2.1 Technical data

Supply	Bus voltage	21…32 V DC
	Current consumption, bus	Maximum 12 mA (Fan-in 1)
	Leakage loss, bus	Maximum 250 mW
	Leakage loss, device	Maximum 1.68 W *
* The maximum power consumption of the device results from the following specifications	Relay 6 A	1.6 W
Connections	KNX	Via bus connection terminals, 2-fold (red/black) 0.8 mm Ø, solid
	Circuits	Screw terminal with universal head (PZ 1) 0.2…4 mm² stranded, 2 x (0.2…2.5 mm²) 0.2…6 mm² single core, 2 x (0.2…4 mm²)
	Ferrules without/with plastic sleeves	without: 0.25…2.5 mm² with: 0.25…4 mm²
	TWIN ferrules	0.5…2.5 mm²
	Tightening torque	Maximum 0.6 Nm
Operating and display elements	Button/LED	For assignment of the physical address
Enclosure	IP 20	Compliant to EN 60 529
Safety class	II	Compliant to EN 61 140
Insulation category	Overvoltage category	III to EN 60 664-1
	Pollution degree	2 to EN 60 664-1
KNX safety extra low voltage	SELV 24 V DC	
Temperature range	Operation	-5 °C…+45 °C
	Transport	-25 °C…+70 °C
	Storage	-25 °C…+55 °C
Ambient conditions	Maximum air humidity	93 %, no condensation allowed
Design	Modular installation device (MDRC)	Modular installation device, Pro *M*
	Dimensions (H x W x D)	90 x 144 x 64.5 mm
	Mounting width in space units	8 modules at 18 mm
	Mounting depth	64.5 mm
Installation	On 35 mm mounting rail	Compliant to EN 60 715
Mounting position	as required	
Weight	0.3 kg	
Housing/colour	Plastic housing, grey	
Approvals	KNX to EN 50 090-1, -2	Certification
CE mark	In accordance with the EMC guideline and low voltage guideline	

Important
The maximum permissible current of a KNX line may not be exceeded. During planning and installation ensure that the KNX line is correctly dimensioned. The device features a maximum current consumption of 12 mA (Fan-In 1).

2.2.2 Binary inputs

Rated values	Number	8[1)]
	U_n scanning voltage	32 V, pulsed
	I_n scanning current	0.1 mA
	Scanning current In at switch on	Maximum 355 mA
	Permissible cable length	≤ 100 m one-way, at cross-section 1.5 mm² even when the core is routed in a multi-control cable

1) All binary inputs are internally connected to the same potential.

2.2.3 Rated current output 6 A

Rated values	Number	8 contacts
	U_n rated voltage	250/440 V AC (50/60 Hz)
	I_n rated current (per output)	6 A
Switching currents	AC3* operation (cos j = 0.45) To EN 60 947-4-1	6 A/230 V
	AC1* operation (cos j = 0.8) To EN 60 947-4-1	6 A/230 V
	Fluorescent lighting load to EN 60 669-1	6 A/250 V (35 mF)[2)]
	Minimum switching power	20 mA/5 V 10 mA/12 V 7 mA/24 V
	DC current switching capacity (resistive load)	6 A/24 V=
Service life	Mechanical durability	> 10^7
	Electronic service life To IEC 60 947-4-1	
	AC1* (240 V/cos j = 0.8)	> 10^5
	AC3* (240 V/cos j = 0.45)	> 1.5 x 10^4
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Switching times[1)]	Maximum relay position change per output and minute if only one relay is switched.	2,683

1) The specifications apply only after the bus voltage has been applied to the device for at least 10 seconds. Typical delay of the relay is approx. 20 ms.

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	24 W (ABB EVG-T5 1 x 24 CY)	10
	36 W (ABB EVG 1 x 36 CF)	7
	58 W (ABB EVG 1 x 58 CF)	5
	80 W (Helvar EL 1 x 80 SC)	3

1) For multiple element lamps or other types, the number of electronic ballasts must be determined using the peak inrush current of the electronic ballasts.

Device type	Application	Max. number of Communication objects	Max. number of group addresses	Max. number of associations
IO/S 8.6.1.1	I/O Actuator, 8f/…*	255	255	255

* … = current version number of the application. **Please observe the software information on our homepage for this purpose.**

Note

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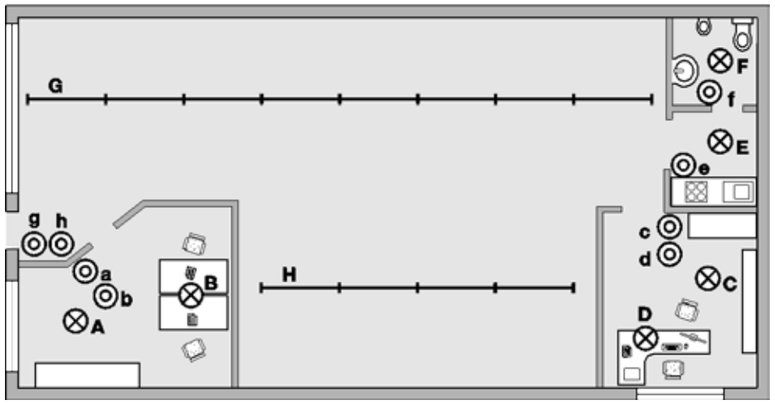
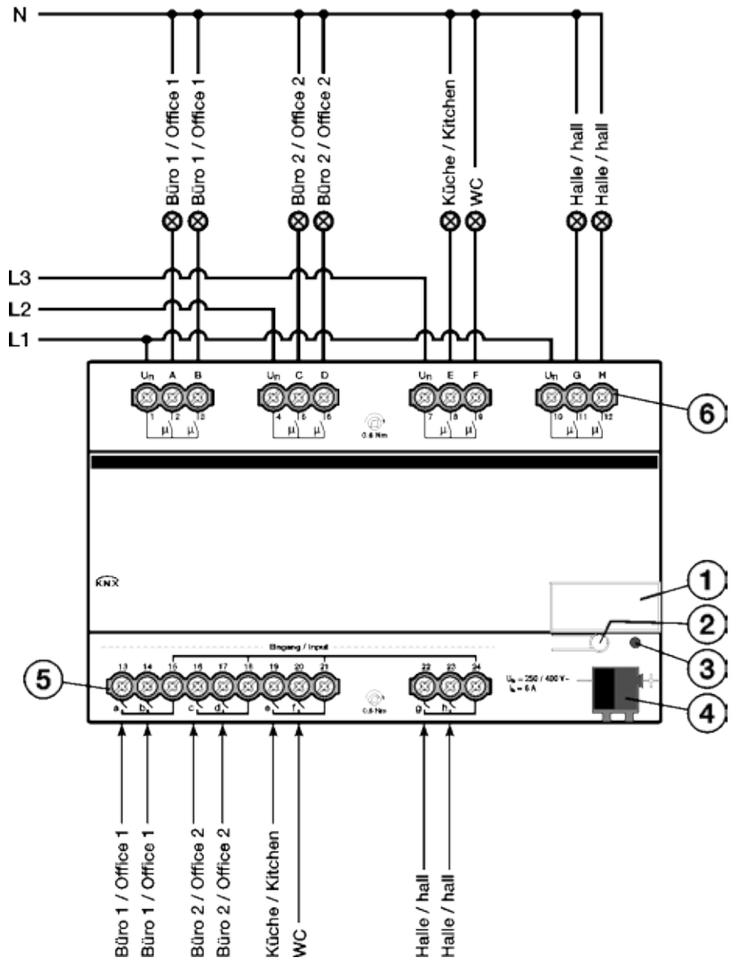
The device does not support the locking function of a KNX device in the ETS. If you inhibit access to all devices of the project with a *BCU code*, it has no effect on this device. Data can still be read and programmed.

2.2.5 **Connection schematic**

Example of a typical floor plan





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IO/S 8.6.1.1

1 Label carrier

2 Button *Programming*

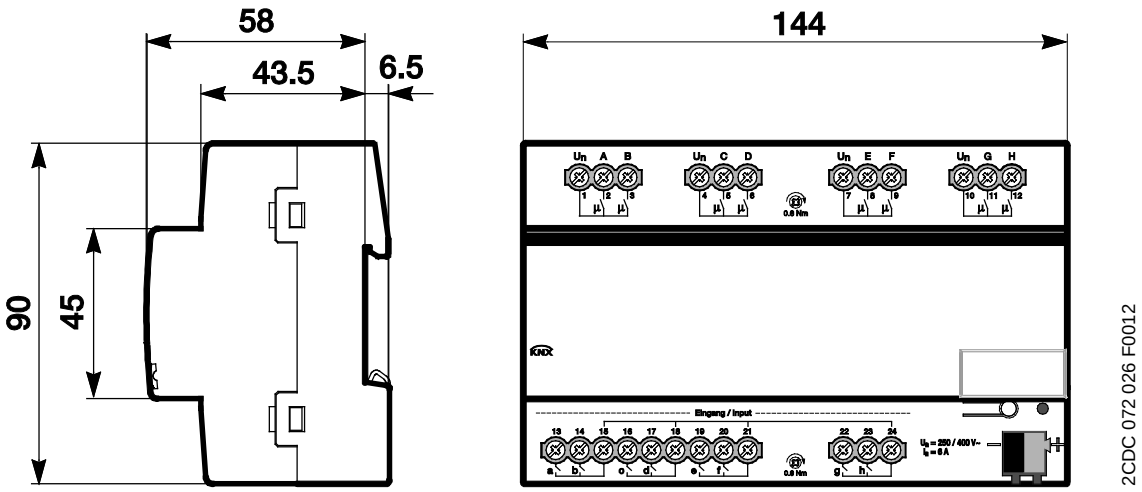
3 LED *Programming* (red)

4 Bus connection terminal

5 Inputs (a, b, c, d, e, f, g, h)

6 Outputs, 2 contacts, 1 screw terminal for phase connection (A, B), (C, D), (E, F) and (G, H)

2.2.6 Dimension drawing



2.3 Assembly and installation

The device is a modular installation device for quick installation in the distribution board on 35 mm mounting rails to EN 60 715.

The mounting position can be selected as required.

The electrical connection is implemented using screw terminals. The connection to the bus is implemented using the supplied bus connection terminal. The terminal assignment is located on the housing.

The device is ready for operation after connection to the bus voltage.

Accessibility of the devices for the purpose of operation, testing, visual inspection, maintenance and repair must be provided compliant to VDE 0100-520.

Commissioning requirements

In order to commission the device, a PC with ETS (from ETS3 or higher) as well as an interface to the ABB i-bus®, e.g. via a KNX interface, is required.

The device is ready for operation after connection to the bus voltage supply. No additional auxiliary voltage is required.

Important
The maximum permissible current of a KNX line may not be exceeded. During planning and installation ensure that the KNX line is correctly dimensioned. The device features a maximum current consumption of 12 mA (Fan-In 1).

The installation and commissioning may only be carried out by electrical specialists. The appropriate norms, guidelines, regulations and specifications for your country should be observed when planning and setting up electrical installations and security systems for intrusion and fire detection.

Protect the device from damp, dirt and damage during transport, storage and operation.

Only operate the device within the specified technical data limits!

The device should only be operated in an enclosed housing (distribution board)!

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

Danger

In order to avoid dangerous touch voltages, which originate through feedback from differing phase conductors, all-pole disconnection must be observed when extending or modifying the electrical connections.

Supplied state

The device is supplied with the physical address 15.15.255. The application is pre-installed. It is therefore only necessary to load group addresses and parameters during commissioning.

However, the complete application can be reloaded if required. A longer downtime may result if the application is changed or after a discharge.

Assignment of the physical address

The assignment and programming of the physical address is carried out in the ETS.

The device features a button for assignment of the physical device address. The red LED lights up, after the button has been pushed. It switches off, as soon as the ETS has assigned the physical address or the button has been pressed again.

Download response

Depending on the PC, which is used, the progress bar for the download may take up to one and a half minutes, before it appears, due to the complexity of the device.

Cleaning

If devices become dirty, they can be cleaned using a dry cloth or a cloth dampened with a soapy solution. Corrosive agents or solutions should never be used.

Maintenance

The device is maintenance-free. No repairs should be carried out by unauthorised personnel if damage occurs, e.g. during transport and/or storage.

3 Commissioning

The parameterization of the I/O Actuators is implemented with the application program I/O Actuator and the Engineering Tool Software ETS. Using the application, a comprehensive and flexible range of functions are available to the device. The standard settings allow simple commissioning. The functions can be extended if required.

3.1 Overview

The following functions are available:

Lighting	To supply four or eight lighting circuits in the area.
Binary input	Four or eight binary inputs are available, e.g. Light ON/OFF switching in the room. The binary inputs are divided into two or four groups of two inputs each.

The I/O Actuator features relays in each output which are mechanically independent of the other outputs. Switching noises cannot be avoided due to the mechanical nature of the design.

The device is installed primarily in the distribution board together with the circuit-breakers and RCCBs.

3.1.1 Functions of the inputs

The following table provides an overview of the functions possible with the inputs of the device and the application I/O Actuator:

Functions of the inputs	a…d…h
Switch sensor	**n**
Value / forced operation	**n**

n = Function is supported

3.1.2 Functions of the outputs

The following table provides an overview of the functions possible with the outputs of the device and the application I/O Actuator:

Functions of the outputs	A…D…H
Normally closed contact/Normally open contact	**n**
Staircase lighting	**n**

n = Function is supported

3.1.3 Copying and exchanging parameter settings

Parameterization of devices can take a lot of time depending on the complexity of the application and the number of device inputs/outputs. To keep the commissioning work to the minimum possible, using the function *Copy/exchange channels*, parameter settings of an output can be copied or exchanged with freely selectable outputs. Optionally, the group addresses can be retained, copied or deleted in the target input/output.

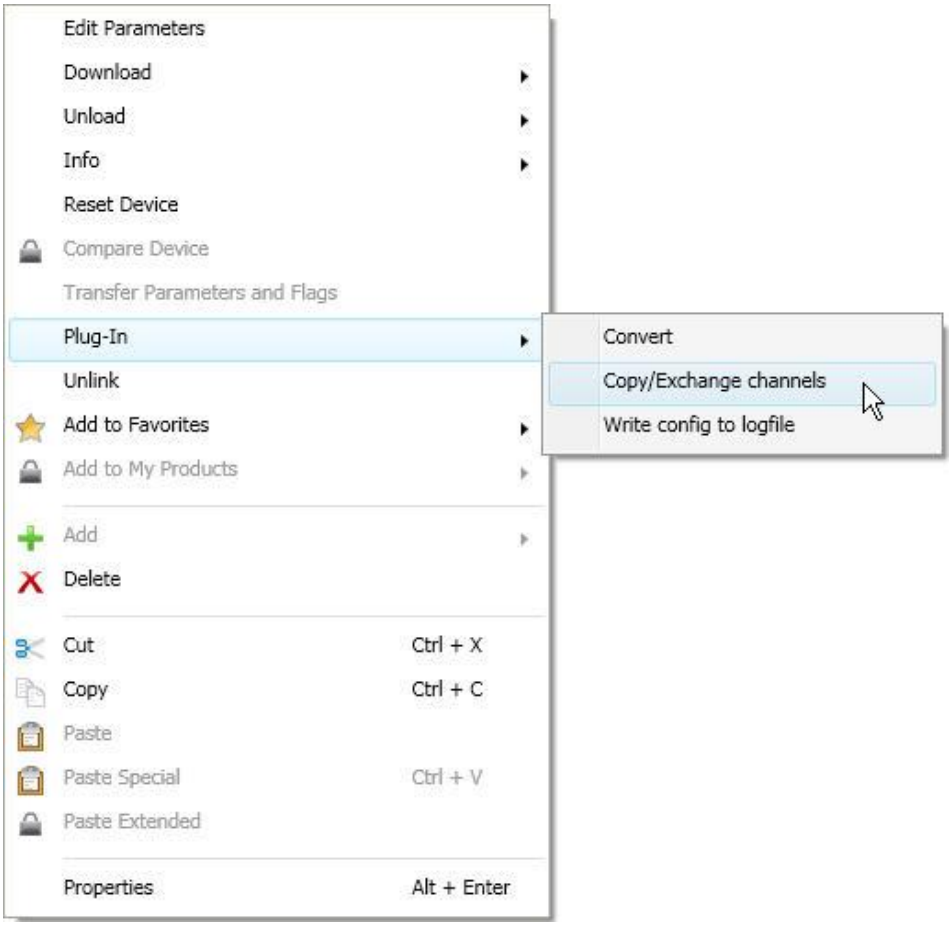
Note
When the term channels is used in the ETS, inputs and/or outputs are meant. In order to ensure that the ETS language generally applies for as many ABB i-bus® devices as possible, the word channels is used here.

The copy function for inputs/outputs is particularly useful with devices having the same parameter settings for several outputs, inputs or groups. For example, lighting in a room is frequently controlled in an identical manner. In this case, the parameter settings from input/output X can be copied to all other inputs/outputs or to a special input/output of the device. Thus the parameters for this input/output must not be set separately, which significantly shortens the commissioning time.

The exchange of parameter settings is useful, e.g. should the inputs/outputs be swapped when wiring the terminals. The parameter settings of the incorrectly wired inputs/outputs can be simply exchanged saving the requirement for time-consuming rewiring.

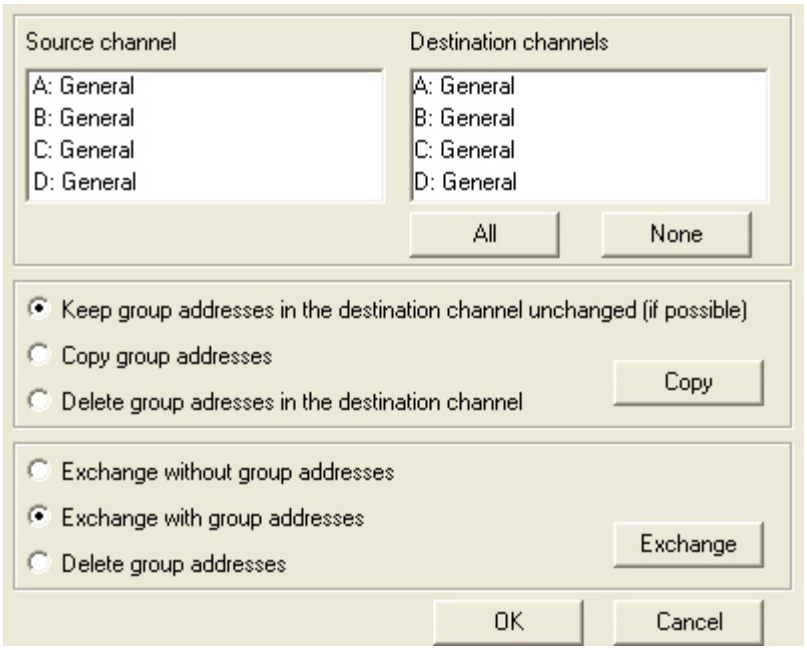
3.1.3.1 Procedure for copy and exchange

· Click with the right mouse button on the product, whose outputs you wish to copy or exchange, and select the context menu *Plug-in* > *Copy/exchange channels*.



Thereafter, undertake the required settings in the *Copy/exchange channels* dialog.

3.1.3.2 Dialog Copy/exchange channel



At the top left, you will see the Source channel selection window for marking the source channel. Beside is located the selection window for the target channel or channels for marking the target channel or channels.

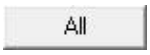
Source channel

With the selection of the source channel, you define which parameter settings should be copied or exchanged. Only one source channel can be selected at a time.

Target channels

With the selection of the target channel/channels, you define which channel/channels are to assume the parameter settings of the source channel.

- For the function Exchange, only one target output can be selected at a time.
- For the function Copy, different target channels can be selected simultaneously. For this purpose, press the Ctrl key and mark the required channels with the mouse cursor, e.g. channels B and C.



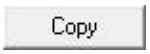
With this button, you select all available target channels, e.g. A…D.

Reset the selection of the target channel with this button.

Copy

The following options can be selected before copying the parameter settings:

- Leave the group addresses unchanged (if possible) in the target channel
- Copy group addresses
- Delete group addresses in the target channel



With this button, copy the settings of the source channel into the target channel or channels.

Exchange

The following options can be selected before exchanging the parameter settings:

- Retain group addresses
- Exchange group addresses
- Delete group addresses

With this button, exchange the settings of the source channel with the target channel.

Confirm your selection with this button, and the window closes.

Using this button, the window closes without accepting the changes.

3.2 Parameters

The parameterization of the I/O Actuator is implemented using the Engineering Tool Software ETS.

The application is available in the ETS at *ABB/Room automation/IO Actuator*.

The following chapter describes the parameters of the device using the parameter windows. The parameter window features a dynamic structure, so that further parameters may be enabled depending on the parameterization and the function of the outputs.

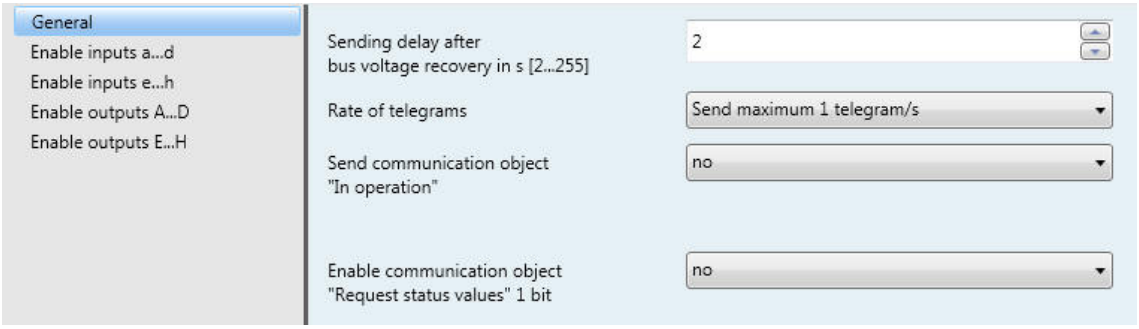
The default values of the parameters are underlined, e.g.:

Options: yes
no

Note
The device features several inputs/outputs. As the functions are identical for all inputs/outputs, they will only be explained using input/output A as an example.

3.2.1 Parameter window *General*

In this parameter window the higher-level parameters can be set.



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

Options: 2…255

Telegrams are only 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, telegrams are sent and the state of the outputs is set to correspond to the parameterization or the communication object values.

If communication objects are read during the sending and switching delay, e.g. by a visualisation system, these read requests are stored, and a response is sent, after the sending and switching delay has been completed.

An initialization time of about two seconds is included in the delay time. The initialisation time is the time that the processor requires to be ready to function.

How does the device behave with bus voltage recovery?

After bus voltage recovery, the device always waits for the send delay time to elapse before sending telegrams on the bus.

Rate of telegrams

Options: not limited
Send maximum 1 telegram/s
Send telegram every 0.1 s

- *Send maximum 1 telegram/s*: A maximum of one telegram per second is sent.
- *Send telegrams every 0.1 s*: A telegram is sent every 0.1 seconds.

This parameters limits the bus load of the device depending on its parameterization.

Send communication object "In operation"

Options: no
send value 0 cyclically
send value 1 cyclically

The communication object *In operation* indicates the presence of the device on the bus. This cyclic telegram can be monitored by an external device. If a telegram is not received, the device may be defective or the bus cable to the transmitting device may be interrupted.

- *no:* The communication object *In operation* is not enabled.
- *send value 0/1 cyclically*: The communication object *In operation* (No. 0) is sent cyclically on the KNX. The following parameter appears:

  Sending cycle time in s [1...65,535]

  Options: 1…60…65,535

  Here the time interval, at which the communication object *In operation* (No. 0) cyclically sends a telegram, is set.

Note
After bus voltage recovery, the communication object sends its value after the set sending and switching delay.

Enable communication object "Request status values" 1 bit

Options: no
yes

- *yes:* A 1 bit communication object *Request status values* is enabled.

Via this communication object, all status messages can be requested, provided that they have been parameterized with the option *after a change or request*.

With the option *yes*, the following parameters appear:

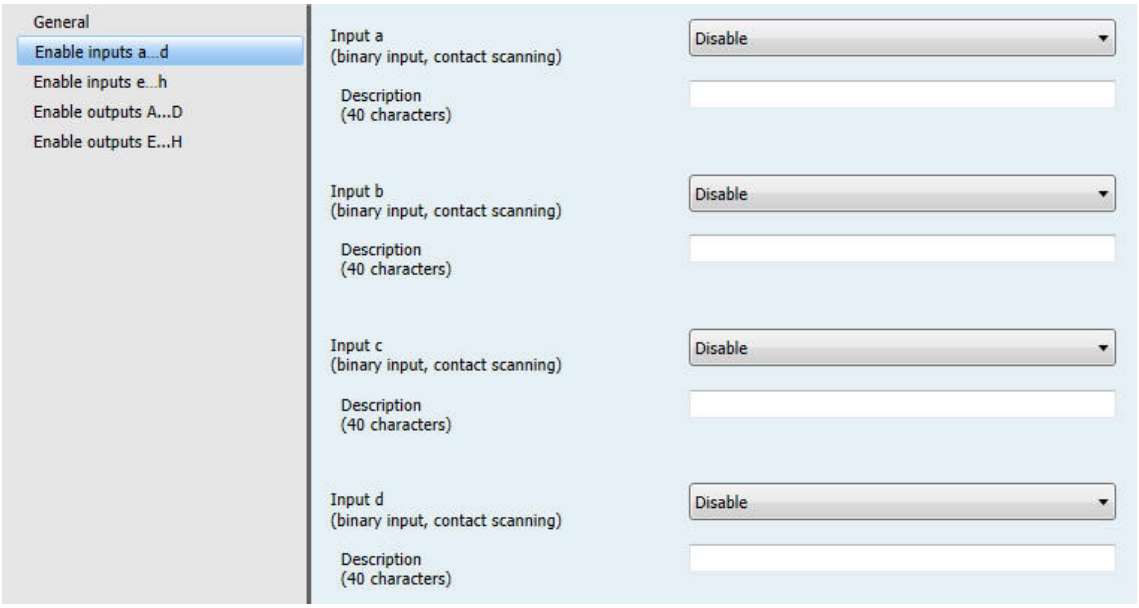
Request with object value

Options: 0
1
0 or 1

- *0:* Sending status messages is requested with the value 0.
- *1:* Sending status messages is requested with the value 1.
- *0 or 1:* Sending status messages is requested with the values 0 or 1.

3.2.2 Parameter window *Enable Inputs a…d...h*

In this parameter window, all the settings for enabling and description of the inputs a…h are undertaken.



Note
In the following, the setting possibilities of inputs a…f are explained using input a as an example. The setting possibilities are identical for all inputs.

Input a
(binary input, contact scanning)

Option: Disabled
Switch sensor
Value / forced operation

The operating mode of the input is set with this parameter. The respective parameter window *a: xxx* also becomes visible with the selection of an operating mode.

Description

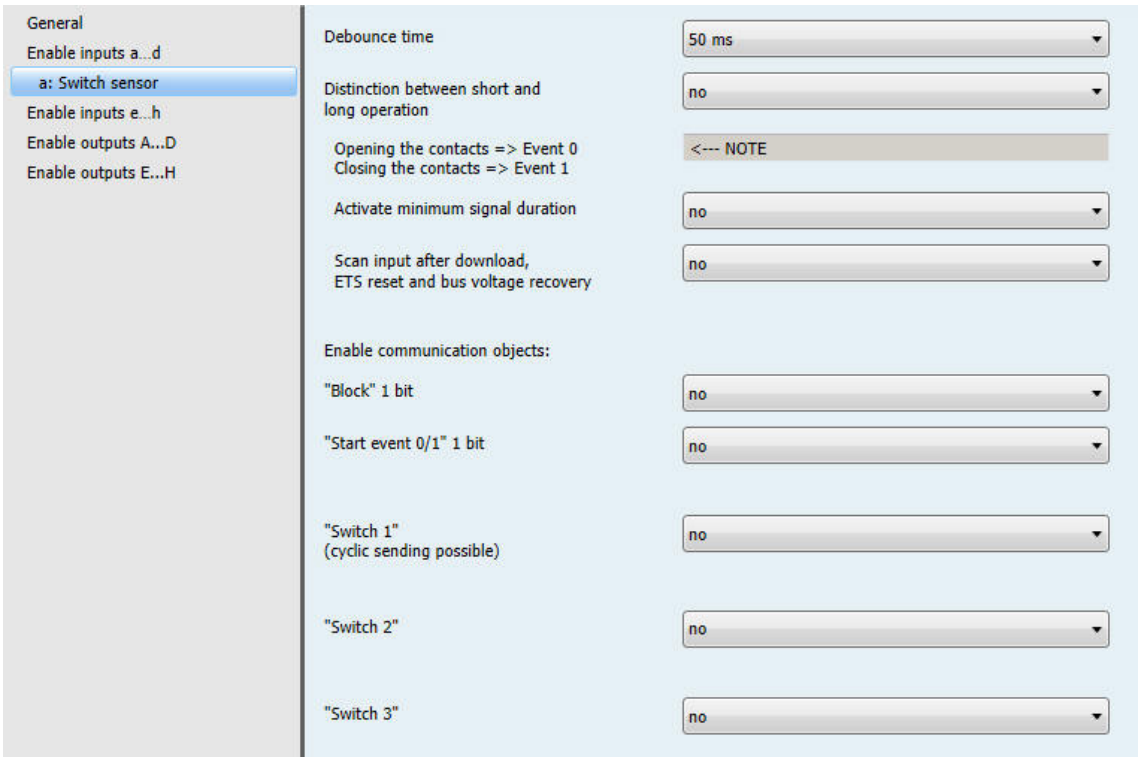
With this parameter, it is possible to enter a text of up to 40 characters in length for identification in the ETS.

Note
The text which is entered is used to provide help, in order to obtain an overview of the inputs when they are fully assigned and to indicate the function assigned to the input. The text is purely for informative purposes and has no further function.

3.2.2.1 Parameter window *a: Switch sensor*

This parameter window is visible if in Parameter window Enable Inputs a…d...h, page 29, in parameter *Input a (binary input, contact scanning)*, the option *Switch sensor* has been selected.

Note
The device features several inputs. However, as the functions for all inputs are identical, only the functions of input a will be described.



Debounce time

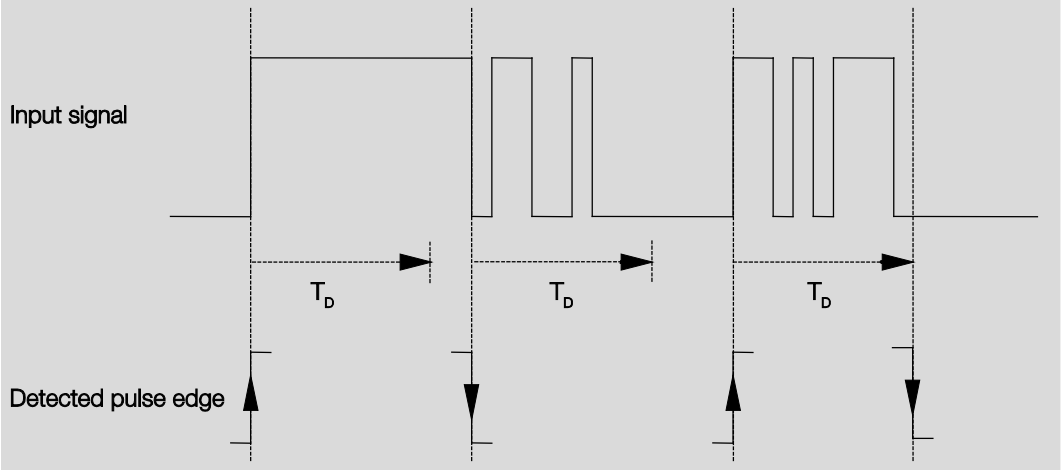
Options: 10/20/30/<u>50</u>/70/100/150 ms

Debouncing prevents unwanted multiple operations of the input, e.g. due to bouncing of the contact.

What is the debounce time?

If an edge is detected at an input, the input will react immediately to this edge, e.g. by sending a telegram. The debounce time T_D starts at the same time. When the pulse edges are detected at the input during the debounce time they are ignored.

Example: Debounce time of the input signal for a detected edge:



After detection of an edge on the input, further edges are ignored for the debounce time T_D.

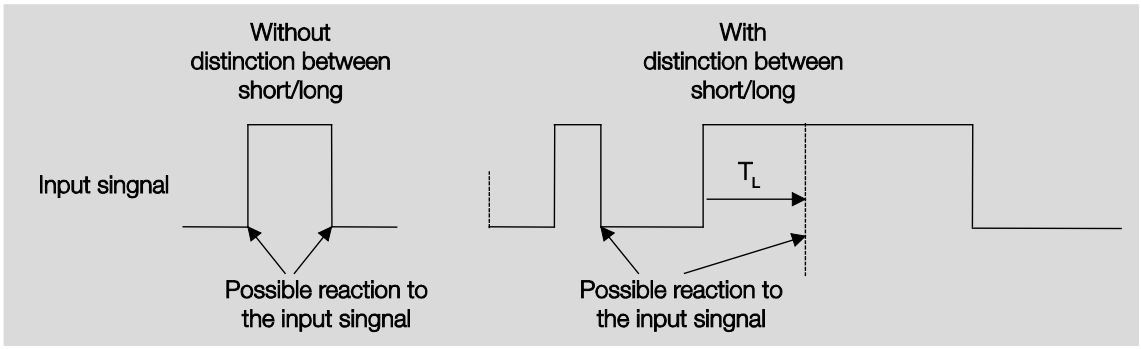
Distinction between short and long operation

Options: no
yes

Using this parameter, you set if the input differentiates between short and long operation.

- *yes*: After opening/closing of the contact, it must first of all be ascertained if a short or long operation has occurred here. Only thereafter will a possible reaction be triggered.

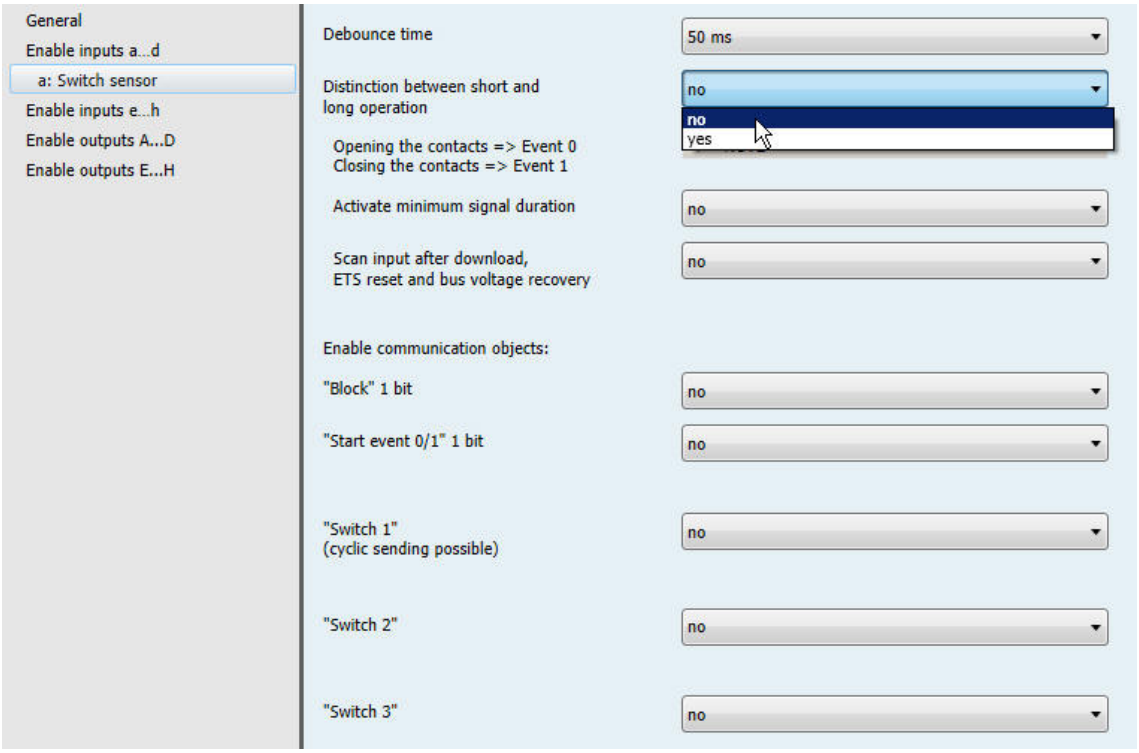
The following table shows the function in detail:



T_L is the time duration from where a long operation is detected.

3.2.2.1.1 Parameter *Distinction between short and long operation – no*

If the option *no* is selected with the parameter *Distinction between short and long operation*, the following parameters appears in Parameter window a: Switch sensor, page 30:



Opening the contacts => Event 0
Closing the contacts => Event 1

<−−− NOTE

Activate minimum signal duration

Options: no
yes

· *yes:* The following parameters appear:

On closing the contact
in value x 0.1 s [0…65,535]

Options: 1…10…65,535

On opening the contact
in value x 0.1 s [0…65,535]

Options: 1…10…65,535

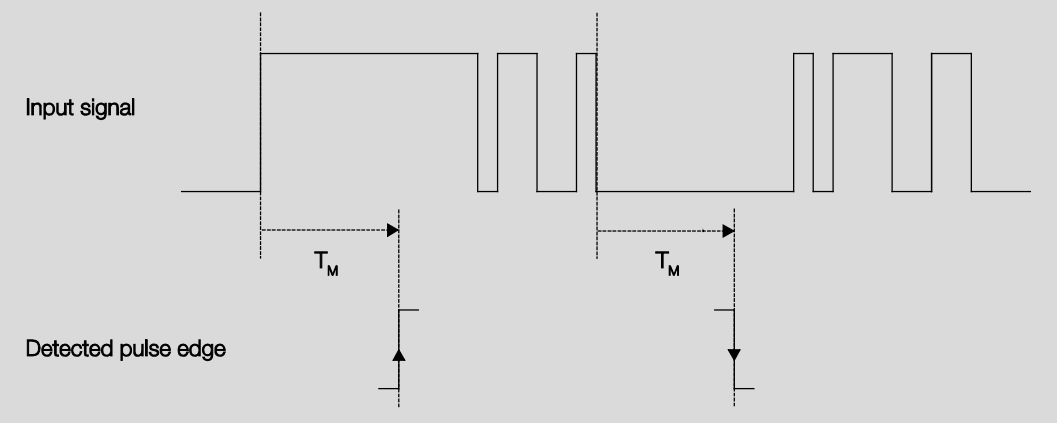
What is the minimum signal duration?

In contrast to the debounce time, a telegram is only sent after the minimum signal duration has elapsed.

The individual functions are:

If an edge is detected on the input, the minimum signal duration will commence. No telegram is sent on the bus at this time. The signal on the input is observed within the minimum signal duration. If a further edge appears at the input during the minimum signal duration, it will be interpreted as a new operation, and the minimum signal duration restarts. If no further edges occur after the start of the minimum signal duration, a telegram is sent on the bus, after the minimum signal duration has timed out.

Example: Minimum signal duration of the input signal for a detected edge:



In only two cases, no further edge changes occur within the minimum signal duration T_M after a change of edge. For this reason, only both of these are detected as valid.

Scan input after download,
ETS reset and bus voltage recovery

Options: no
yes

- *no*: The object value is not scanned after a download, bus reset and bus voltage recovery.
- *yes*: The object value is scanned after a download, bus reset and bus voltage recovery. The following parameter appears:

Inactive wait state after bus voltage recovery in s [0…30,000]

Options: 0…30,000

Here the waiting time after a bus voltage recovery is set. After the waiting time has elapsed the state on the input terminals is scanned. The input reacts as if the state on the input terminals has just changed.

Note
The inactive waiting time does not add to the actual, adjustable send delay time. This can be set separately.

Enable communication objects:

"Block" 1 bit

Options: no
yes

· *yes*: The 1 bit block communication object *Block* is enabled. This can be used to block the input.

Notes
If the input is disabled and the option *Cyclic sending* is set, the last state is still sent regardless of the block. The option *Block* still blocks the physical input, sending continues internally. Should the internal block with a binary input not be permitted in the Parameter window Enable Inputs a…d...h, page 29, this communication object has no effect on the respective binary input.

"Start event 0/1" 1 bit

Options: no
yes

· *yes:* The 1 bit communication object *Start event 0/1* is enabled. As a result, the same events, such as those of the push button/switch connected to the binary input, can also be triggered by the receipt of a telegram on the communication object *Start event 0/1*.

"Switch 1"
(cyclic sending possible)

Options: no
yes

· *yes:* The communication object *Switch 1* appears. The following parameters appear:

Reaction on event 0

Options: ON
OFF
<u>TOGGLE</u>
no reaction
terminate cyclic transmission

Reaction on event 1

Options: ON
OFF
TOGGLE
<u>no reaction</u>
terminate cyclic transmission

The behaviour of the communication object is determined here. If the option *yes* has been selected with the parameter *Distinction between short and long operation*, the reaction occurs with a short or long operation. With the option *no*, it occurs with each edge change.

Important
If the option *terminate cyclic sending* is set, it is important to note that this is only effective if the option *yes* has only been selected in the parameter *Cyclic sending*.

Internal connection

Options: <u>no</u>
Output A (6 A)
Output B (6 A)
Output C (6 A)
Output D (6 A)
Output E (6 A), only visible with IO/S 8.6.1.1
Output F (6 A), only visible with IO/S 8.6.1.1
Output G (6 A), only visible with IO/S 8.6.1.1
Output H (6 A), only visible with IO/S 8.6.1.1

With this parameter, a direct connection of the binary input with an output can be established. With this connection, no assignment of the group address is necessary.

- *Output x (6 A):* The communication object *Switch* of the output is updated together with the communication object *Switch 1* of the binary input.

Caution
If an internal connection with an output is selected, and at the same time the reaction to an event is parameterized with TOGGLE, the communication object *Switch 1* of the binary input is updated with the inverted value of the communication object *Status Switch* of the output. Ensure that the communication object *Status Switch* of the output is enabled. The settings *normally closed contact/normally open contact* and *Invert status* should be parameterized, so that a TOGGLE function is possible.

Cyclic sending

Options: no
Yes

What is cyclic sending?

Cyclic sending enables the communication object *Switch* to send automatically at a fixed interval. If cyclic sending is only carried out for a specific object value (ON or OFF), this condition refers to the value of the communication object. It is therefore possible in principle to start cyclic sending by sending a value to the communication object *Switch*. As this behaviour is unwanted, the flags *Write* and *Update* of the communication object are deleted in the preliminary setting, so that they cannot be changed via the bus. If this functionality is required irrespectively, these flags should be set accordingly. When the communication object *Switch* changes and after bus recovery (after the send delay time has elapsed), the communication object value is sent immediately on the bus, and the transmission cycle time restarts.

- *yes:* The following parameters appear:

Telegram repeated every …
in s [1...65,535]

Options: 1…60…65,535

The send cycle time describes the time used between two cyclically sent telegrams.

On object value

Options: 1
0
0 or 1

- *1:* The communication object value is sent cyclically with 1.
- *0:* The communication object value is sent cyclically with 0.
- *0 or 1:* The communication object values 0 and 1 are sent cyclically.

"Switch 2"

"Switch 3"

Options: no
Yes

- *yes:* The communication object *Switch 2/3* becomes visible. The following parameters appear:

  Reaction on event 0

  Options: ON
  OFF
  TOGGLE
  no reaction

  Reaction on event 1

  Options: ON
  OFF
  TOGGLE
  no reaction

  The behaviour of the communication object is determined here. If the option *yes* has been selected with the parameter *Distinction between short and long operation*, the reaction occurs with a short or long operation. With the option *no*, it occurs with each edge change.

  Internal connection

  Options: no
  Output A (6 A)
  Output B (6 A)
  Output C (6 A)
  Output D (6 A)
  Output E (6 A), only visible with IO/S 8.6.1.1
  Output F (6 A), only visible with IO/S 8.6.1.1
  Output G (6 A), only visible with IO/S 8.6.1.1
  Output H (6 A), only visible with IO/S 8.6.1.1

  With this parameter, a direct connection of the binary input with an output can be established. With this connection, no assignment of the group address is necessary.

  - *Output x (6 A):* The communication object *Switch* of the output is updated together with the communication object *Switch 2/3* of the binary input.

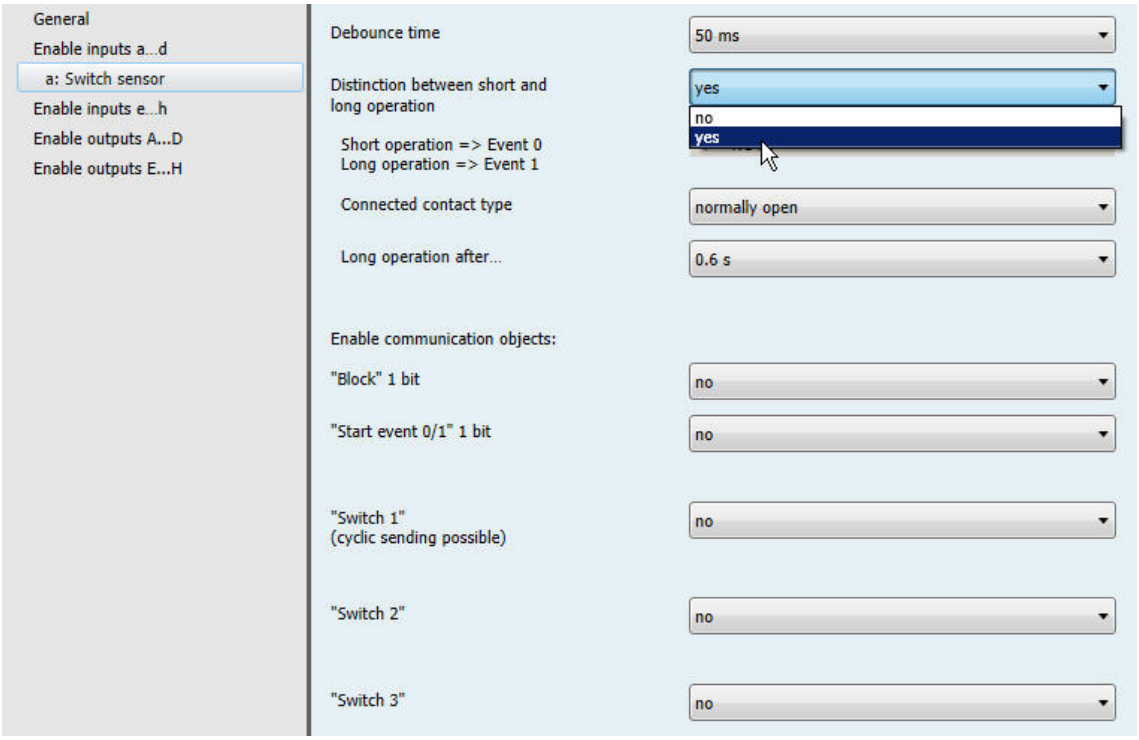
Caution

If an internal connection with an output is selected, and at the same time the reaction to an event is parameterized with TOGGLE, the communication object *Switch 2/3* of the binary input is updated with the inverted value of the communication object *Status switch* of the output.

Ensure that the communication object *Status Switch* of the output is enabled. The settings *normally closed contact/normally open contact* and *Invert status* should be parameterized, so that a TOGGLE function is possible.

3.2.2.1.2 Parameter *Distinction between short and long operation – yes*

If the option *yes* is selected with the parameter *Difference between long and short operation*, the following parameters are visible in Parameter window a: Switch sensor on page 30.



Short operation => Event 0
Long operation => Event 1

<−−− NOTE

Connected contact type

Options: normally closed
<u>normally open</u>

- *normally closed:* The input is opened on actuation.
- *normally open:* The input is closed on actuation.

If a normally open contact is connected to the input, the option *normally open* should be selected; on a normally closed contact the option *normally closed* should be selected.

Long operation after…

Options: 0.3/0.4/0.5/<u>0.6</u>/0.8 s
1/1.2/1.5 s
2/3/4/5/6/7/8/9/10 s

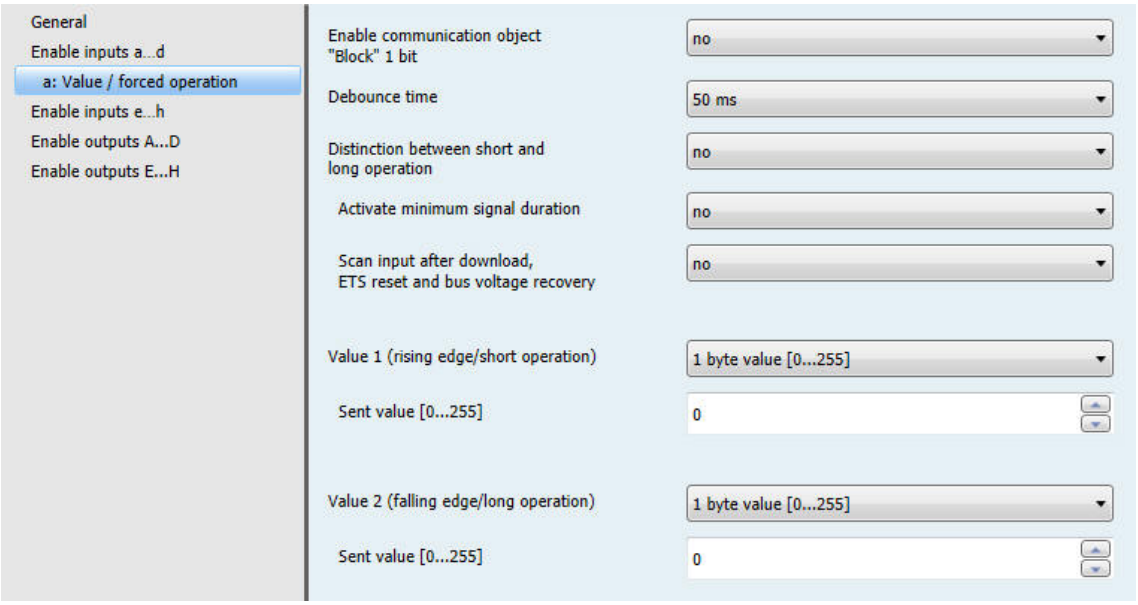
Here the time period T_L after which an operation is considered a “long” operation is defined.

Note
The remaining parameter descriptions can be found in Parameter Distinction between short and long operation – no, page 32.

3.2.2.2 Parameter window *a: Value/Forced operation*

This operating mode allows the sending of values of any data types.

This parameter window is visible if in Parameter window Enable Inputs a…d...h, page 29, in parameter *Input a (binary input, contact scanning),* the option *Value/Forced operation* has been selected.



Enable communication object "Block" 1 bit

Options: no
yes

- *yes*: The 1 bit block communication object *Block* is enabled. This can be used to block the input.

Note
If the input is disabled and the option *Cyclic sending* is set, the last state is still sent regardless of the block. The option *Block* still blocks the physical input, sending continues internally.

Debounce time

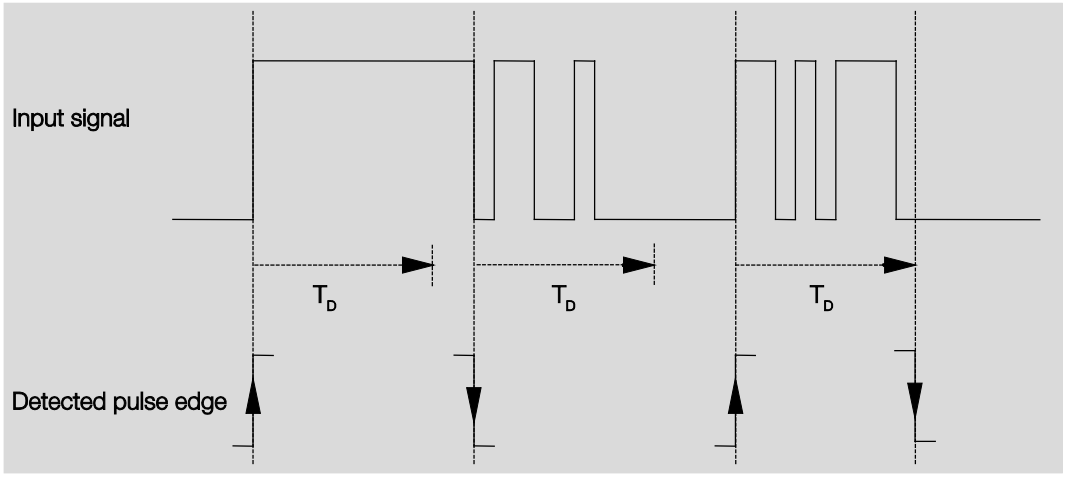
Options: 10/20/30/50/70/100/150 ms

Debouncing prevents unwanted multiple operations of the input, e.g. due to bouncing of the contact.

What is the debounce time?

If an edge is detected at an input, the input will react immediately to this edge, e.g. by sending a telegram. The debounce time T_D starts at the same time. When the pulse edges are detected at the input during the debounce time they are ignored.

The following example makes this clear:



After detection of an edge on the input, further edges are ignored for the debounce time T_D.

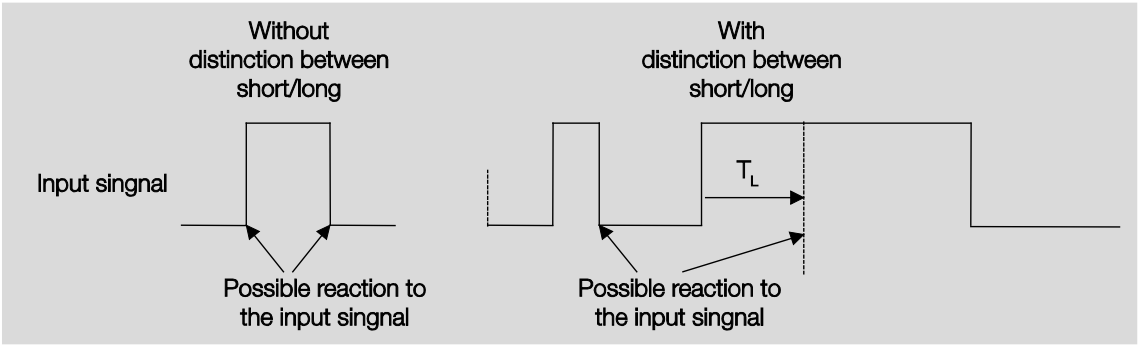
Distinction between short and long operation

Options: no
yes

Using this parameter, you set if the input differentiates between short and long operation. With the option *yes*, after opening/closing of the contact it must first of all be ascertained if a short or long operation has occurred here. Only thereafter will a possible reaction be triggered.

Note
With Distinction between short and long operation, two communication objects are visible for each input. One communication object only transmits during short operation, the other communication object only during a long operation.

The following table shows the function in detail:

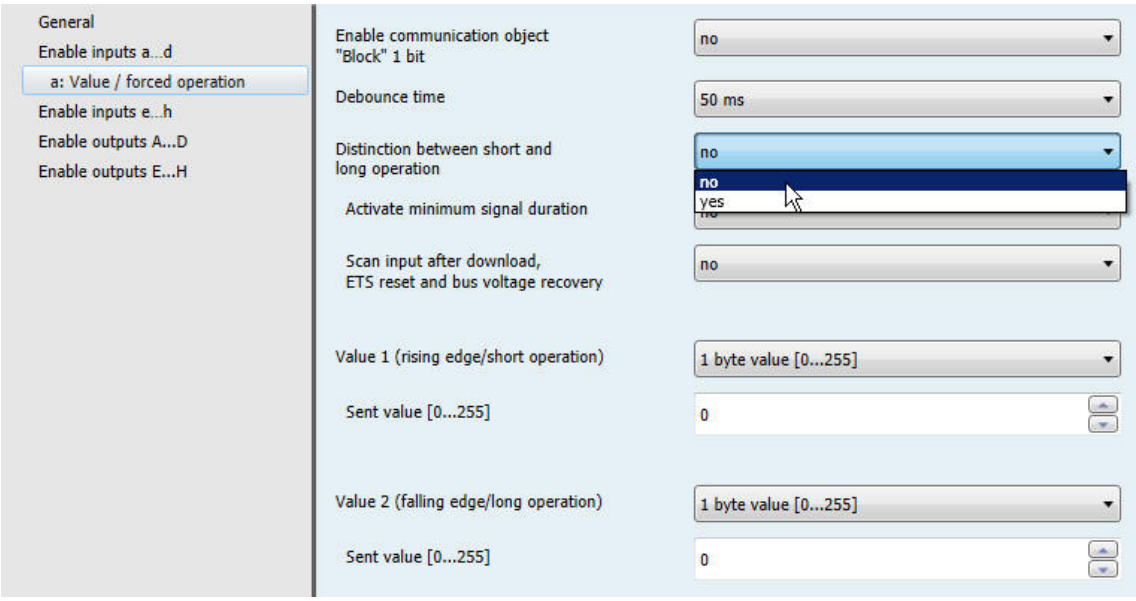


T_L is the time duration from where a long operation is detected.

If the option *no* is selected with the parameter *Distinction between short and long operation*, the following parameters appear:

3.2.2.2.1 Parameter *Distinction between short and long operation – no*

If the option *no* is selected with the parameter *Distinction between short and long operation*, the following parameters appears in Parameter window a: Value/Forced operation, page 39:



Activate minimum signal duration

Options: no
yes

- *yes:* The following parameters appear:

  for rising edge
  in value x 0.1 s [1…65,535]

  Options: 1…10…65,535

Note
A rising edge corresponds to a “normally opened contact function”.

  for falling edge
  in value x 0.1 s [1…65,535]

  Options: 1…10…65,535

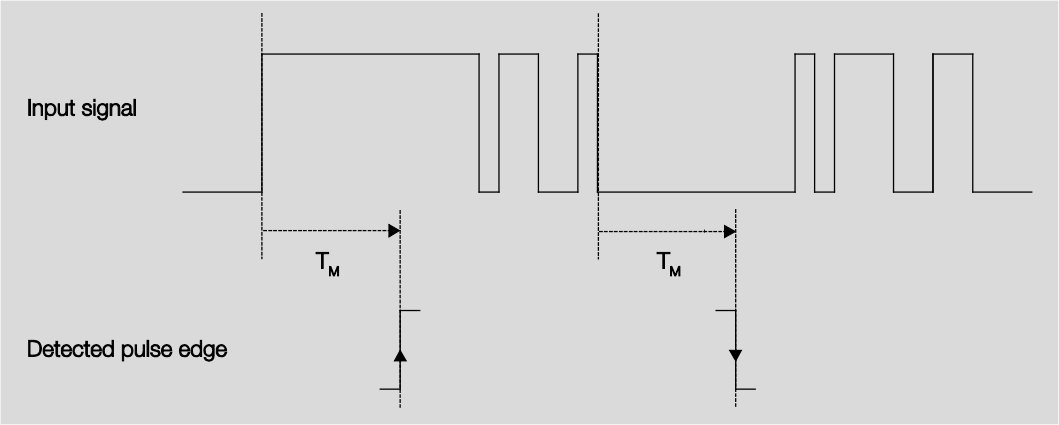
Note
A falling edge corresponds to a normally closed contact function.

What is the minimum signal duration?

In contrast to the debounce time, a telegram is only sent after the minimum signal duration has elapsed. The individual functions are:

If an edge is detected on the input, the minimum signal duration will commence. No telegram is sent on the bus at this time. The signal on the input is observed within the minimum signal duration. If a further edge appears at the input during the minimum signal duration, it will be interpreted as a new operation, and the minimum signal duration restarts. If no further edges occur after the start of the minimum signal duration, a telegram is sent on the bus, after the minimum signal duration has timed out.

Example: Minimum signal duration of the input signal for a detected edge:



In only two cases, no further edge changes occur within the minimum signal duration T_M after a change of edge. For this reason, only both of these are detected as valid.

Scan input after download, bus reset and bus voltage recovery

Options: no
yes

- *no:* The object value is not scanned after a download, bus reset and bus voltage recovery.
- *yes:* The object value is scanned after a download, bus reset and bus voltage recovery. The following parameter appears:

  Inactive wait state after bus voltage recovery in s [0…30,000]

  Options: 0…30,000

  Here the waiting time after a bus voltage recovery is set. After the waiting time has elapsed the state on the input terminals is scanned. The input reacts as if the state on the input terminals has just changed.

Note
The inactive waiting time does not add to the actual, adjustable send delay time. This can be set separately.

Value 1 (rising edge/short operation)

Options: do not send
1 bit value [0/1]
2 bit value [Forced operation]
1 byte value [-128…127]
1 byte value [0…255]
1 byte value [8 bit scene]
2 byte value [-32,768...32,767]
2 byte value [0...65,565]
2 byte value [floating point]
3 byte value [time of day, weekday]
4 byte value [-2147483648…2147483647]
4 byte value [0…4294967295]

This parameter serves for defining the data type which is sent when the contact is actuated.

Depending on the selection made in parameter *Value 1 (rising edge / short operation),* different parameters appear. All parameters are described in the following:

Sent value [X]

Options: ON/OFF/TOGGLE
0/1
-128…0…127
0…255
-32. 768…0…32. 767
0…65,535
-100…20…100
-2147483648…0…2147483647
0…4294967295

This parameter defines the value which is sent on operation. The value range is dependent on the set data type of the value X.

Sent value

Options: ON, activate forced position
OFF, activate forced operation
Disable forced operation

This parameter defines the value which is sent on operation.

In the following table, the Forced operation function is explained:

Bit 1	Bit 0	Access	Description
0	0	Free	The switch communication object of the actuator is enabled by the binary input. The assigned sensor can control the actuator via the switch object. The binary input does not control the actuator. Bit 0 of the value of the forced operation communication object is not evaluated. The forced operation communication object sends a telegram with the group addresses of the forced operation communication object and the status of the switch communication object with every state change of the switch communication object.
0	1	Free	
1	0	OFF	The switch communication object of the actuator is disabled by the binary input. The assigned sensor can not control the actuator via the switch communication object. The binary input controls the actuator via the forced operation communication object. The actuator is switched off. Bit 0 of the value of the forced operation communication object is evaluated.
1	1	ON	The switch communication object of the actuator is disabled by the binary input. The assigned sensor can not control the actuator via the switch communication object. The binary input controls the actuator via the forced operation communication object. The actuator is switched on.

8 bit scene

Options: 1…64

This parameter defines the scene number, which is sent on actuation.

Recall/store scene

Options: recall
Save

This parameter defines whether the scene is to be recalled or stored.

Hour [0...23]

Options: 0…23

Minute [0...59]

Options: 0…59

Seconds [0…59]

Options: 0…59

With these parameters, the hours, minutes and seconds are set which are to be send when actuated.

Weekday [1 = Mo, 2..6, 7 = Su]

Options:
0 = no day
1 = Monday
2 = Tuesday
3 = Wednesday
4 = Thursday
5 = Friday
6 = Saturday
7 = Sunday

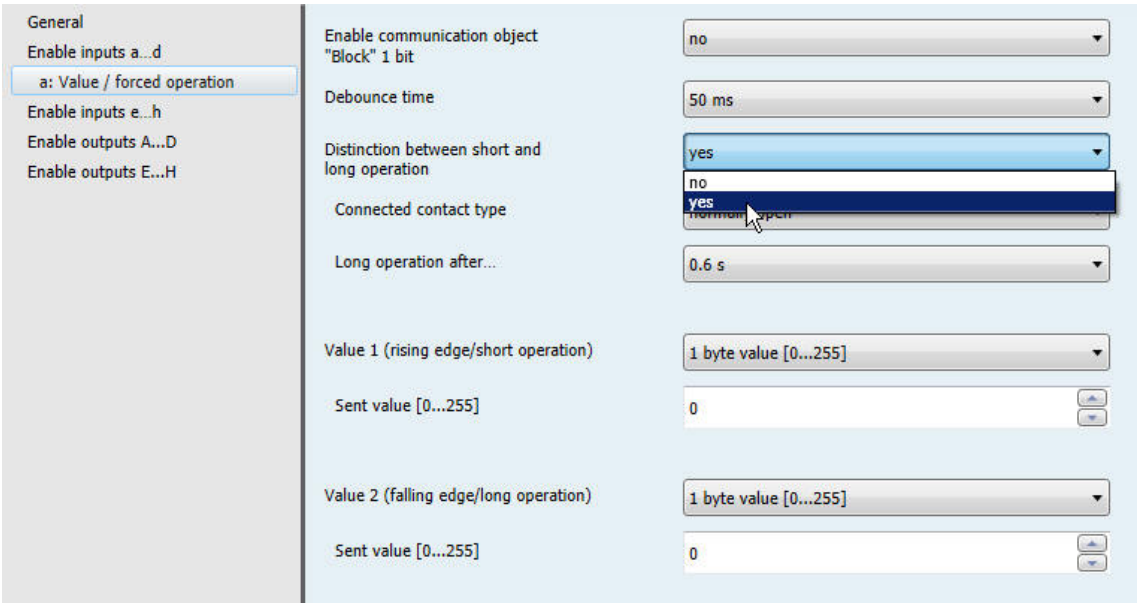
Using these parameters, the weekdays sent on actuation are set.

Value 2 (falling edge/long operation)

Note
The parameter descriptions of the parameter *Value 2 (with a rising edge and with short operation)* correspond with those of parameters *Value 1 (with a rising edge and with short operation)*.

3.2.2.2.2 Parameter *Distinction between short and long operation – yes*

If the option *yes* is selected with the parameter *Distinction between short and long operation*, the following parameters appear:



Connected contact type

Option: normally open
normally closed

- *normally open:* The input is closed on actuation.
- *normally closed:* The input is opened on actuation.

Long operation after…

Options: 0.3/0.4/0.5/0.6/0.8 s
1/1.2/1.5 s
2/3/4/5/6/7/8/9/10 s

Here the time period T_L after which an operation is considered a “long” operation is defined.

Note
The remaining parameter descriptions can be found in Parameter Distinction between short and long operation – no, page 41.

3.2.3 Parameter window *Enable Inputs g…l*

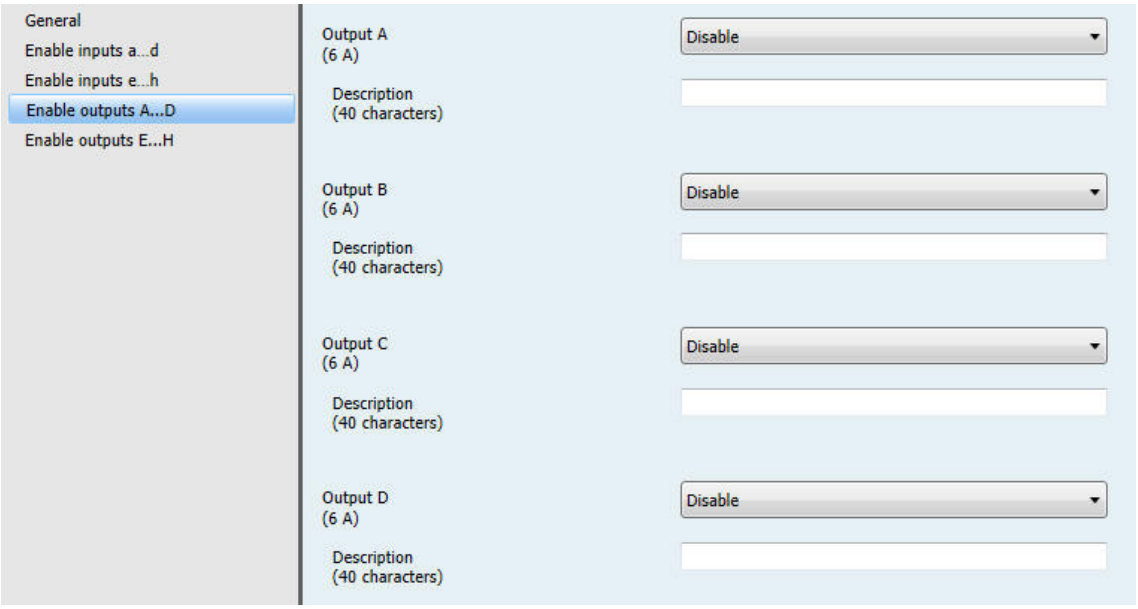
The inputs g...l do not differ from input a.

The descriptions of the parameter setting options and the adjustable communication objects for the inputs g…l can be found in the descriptions at Parameter window Enable Inputs a…d...h, page 29 and Parameter window a: Switch sensor page 30.

3.2.4 Parameter window *Enable Outputs A…D...H*

In this parameter window, Outputs A…H are enabled.

Note
In the following, the setting possibilities of outputs A…H are explained using output A (6 A) as an example. The setting possibilities for outputs A…H are identical.



Output A...H
(6 A)

Options: Disabled
Enabled

- *Disabled:* The Output A (6 A) is blocked/invisible, no communication objects are visible.
- *Enabled:* The parameter window *A: Output (6 A)* appears. Dependent communication objects become visible.

Description
(40 characters)

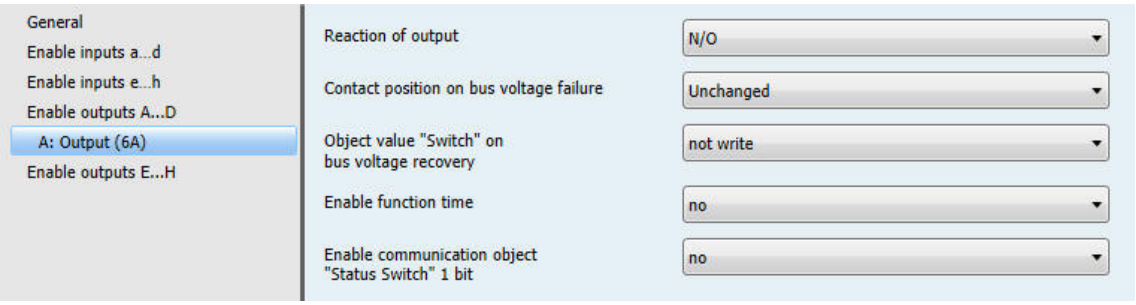
With this parameter, it is possible to enter a text of up to 40 characters in length for identification in the ETS.

Note
The text which is entered is used to provide help, in order to obtain an overview of the inputs when they are fully assigned and to indicate the function assigned to the input. The text is purely for informative purposes and has no further function.

3.2.4.1 Parameter window *A: Output (6 A)*

In this parameter window, all settings for the output A (6 A) are undertaken. The explanations also apply for the Outputs B…H (6 A).

This parameter window is visible if in Parameter window Enable Outputs A…D...H…, page 47, the *Output A (6 A)* has been enabled.



Reaction of output

Options: N/O
N/C

It can be set in this parameter whether the output operates as a *normally closed contact* or *normally open contact*.

- *N/O:* An ON telegram (1) closes the contact, and an OFF telegram (0) opens the contact.
- *N/C:* An ON telegram (1) opens the contact, and an OFF telegram (0) closes the contact.

Contact position on bus voltage failure

Options: normally closed
normally open
unchanged

The output can adopt a defined state on bus voltage failure (BVF) using this parameter.

- *normally closed:* The contact is opened with bus voltage failure.
- normally open: The contact is closed with bus voltage failure.
- *unchanged:* No change of the contact position.

Note
The reaction on bus voltage failure, recovery and download is to be monitored.

Object value "Switch" on bus voltage recovery

Options: not write
write with 0
write with 1

With this parameter, the output can be influenced by the value of the communication object *Switch* on bus voltage recovery.

The communication object *Switch* can be written with either a 0 or 1 when the bus voltage recovers. The contact position is redefined and set in dependence on the set device parameterization.

- *not write:* The communication object assumes the value 0. This value remains as it is until modified via the bus. The contact position is only re-evaluated and set at this time.

Note
The reaction on bus voltage failure, recovery and download is to be monitored. The I/O Actuator draws the energy for switching the contact from the bus. After bus voltage is applied, sufficient energy is only available after about ten seconds in order to switch all contacts simultaneously. Depending on the set transmission and switching delay after recovery of bus voltage set in the parameter window *General*, the individual outputs will only assume the desired contact position after this time. If a shorter time is set, the IO/S will only switch the first contact when sufficient energy is stored in the actuator, in order to ensure that enough energy is available to immediately bring all outputs safely to the required position with a renewed bus voltage failure.

Enable function time

Options: no
yes

- *no:* The parameter window remains disabled and invisible.
- *yes:* The parameter window - *Time* appears.

After the function *Time* has been enabled, the parameter window - *Time* is enabled. Further settings are undertaken there.

Note
A more exact description of the function can be found at Communication objects Output A (6 A), page 62, No. 136.

Enable communication object "Status Switch" 1 bit

Options: no
yes

Caution

If an internal connection with an output is selected, and at the same time the reaction to an event is parameterized with TOGGLE, the communication object *Switch 1* of the binary input is updated with the inverted value of the communication object *Status Switch* of the output.

Ensure that the communication object *Status Switch* of the output is enabled. The settings *normally closed contact/normally open contact* and *Invert status* should be parameterized, so that a TOGGLE function is possible.

- *yes:* The following parameters appear:

  Send object value

  Options: no, update only
  after a change
  on request
  after a change or on request

  - *no, update only:* The status is updated but not sent.
  - *after a change:* The status is sent after a change.
  - *after request:* The status is sent after a request.
  - *after a change or request:* The status is sent after a change or a request.

  Object value of contact position

  Options: 1 = closed, 0 = open
  0 = closed, 1 = opened

  With this parameter, the communication object value of the switch status (*Status switch*) is defined.

  - *1 = closed, 0 = open:* A closed contact is represented by communication object value 1 and an open contact is represented by the value 0.
  - *0 = closed, 1 = open:* A closed contact is represented by communication object value 0 and an open contact is represented by the value 1.

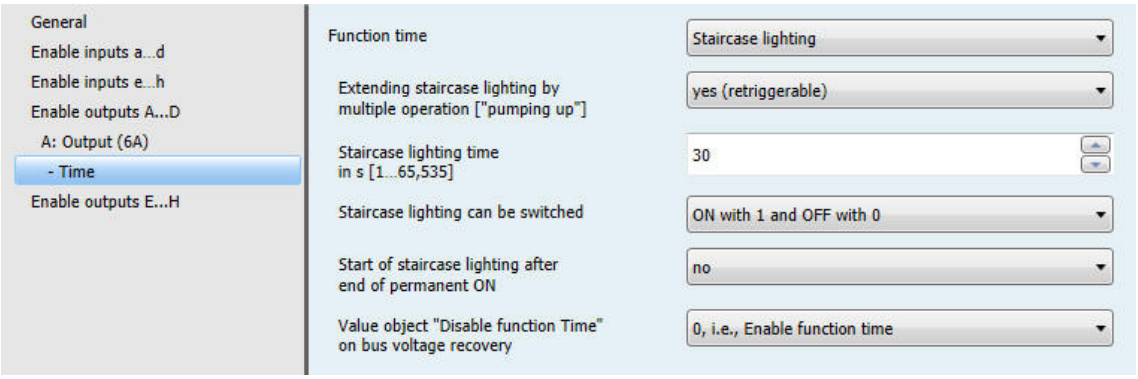
  Note

  The contact position and thus the switch status can result from a series of priorities and links.

3.2.4.1.1 Parameter window *A: Output (6 A) - Time*

In this parameter window, all settings for the function *Time* are undertaken: *Staircase lighting*.

This parameter is visible if in parameter window Parameter window A: Output (6 A), page 48, the parameter *Enable function time* has been enabled.



Explanations concerning the time functions and the timing sequences can be found in Planning and application, page 65. Please observe the Function diagram, page 66, from which the switching and timing priorities originate.

Observe contact life span and switching cycles per minute

Note
For the contact life and switching operations per minute, see Technical data, page 7.

Function Time

Options: Staircase lighting

- *Staircase lighting:* The value, with which the staircase lighting is switched on and off, can be parameterized. The staircase lighting time is started when the function is activated. It is switched off immediately after the staircase lighting time has been completed.

The following parameter appears with the selection *Staircase lighting*:

Staircase lighting time in s [1…65,535]

Options: 1…30…65,535

The staircase lighting defines how long the contact is closed – provided that the contact is programmed as a normally open contact – and how long the light remains on after an ON telegram. The input is made in seconds.

Extending staircase lighting by multiple operation ["pumping up"]

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

If a further ON telegram is received during the staircase lighting time sequence, the remaining staircase lighting time can be extended by a further period. This is possible by repeated operation of the button (“Pumping up“) until the maximum programmed number of retriggering operations is reached. The maximum time can be set to 1, 2, 3, 4 or 5-fold time of the staircase lighting time.

The staircase lighting time is extended by “Pumping up” to the maximum time. If some of the time has already timed out, the staircase lighting time can again be extended to the maximum time by “pumping up”. The parameterized maximum time may not however be exceeded.

- *no:* The receipt of an ON telegram is ignored. The staircase lighting time continues without modification to completion.
- *yes (retriggerable):* The staircase lighting time is reset each time by a renewed ON telegram and starts to count again. This process can be repeated as often as desired using this selection.
- *up to max. 2/3/4/5 x staircase lighting time:* The staircase lighting time is extended by the 2/3/4/5-fold staircase lighting time with renewed ON telegrams.

Staircase lighting can be switched

Options: ON with 1 and OFF with 0
ON with 1 no action with 0
ON with 0 or 1, switch OFF not possible

This parameter defines the telegram value used for switching the staircase lighting on and off prematurely.

- *ON with 0 or 1, switch OFF not possible:* The function *Staircase lighting* is switched on independently of the value of the incoming telegram. Premature switch off is not possible.

Restart of staircase lighting after end of permanent ON

Options: no
yes

- *no:* The lighting switches off if *Permanent ON* is ended.
- *yes:* The lighting remains on and the staircase lighting time restarts.

The function of continuously ON is controlled via the communication object *Permanent ON*. If the communication object receives a telegram with the value 1, the output is switched ON regardless of the value of the communication object *Switch* and remains switched on until the communication object *Permanent ON* has the value 0.

Value object "Disable function Time" on bus voltage recovery

Options: unchanged
1, i.e., Disable function time
0, i.e., Enable function time

This parameter defines how the parameter function *Time* should behave after bus voltage recovery. With a telegram to the communication object *Disable function time*, the function *Time* can be disabled.

- *unchanged:* The function *Time* can continue unchanged.

Note
The status of the function *Time* is stored with bus voltage failure and continues unchanged after bus voltage recovery.

- *1, i.e., disable function time:* The function *Time* is disabled by a telegram with the value 1.

Note
They can only be enabled via the communication object *Disable function time*.

- *0, i.e., enable function time:* The function *Time* is enabled by a telegram with the value 0.

Note
If the staircase lighting is disabled when the function *Time* is operational, the light will stay at ON until it is switched to OFF manually.

How does the staircase lighting behave with bus voltage failure?

The behaviour at bus voltage failure is determined by the parameter *Reaction on bus voltage failure* in the parameter window *A: Output (6 A)*.

How does the staircase lighting behave with bus voltage recovery?

The behaviour at bus voltage recovery is defined by two conditions.

1. By the communication object *Disable function time*. If the staircase lighting is blocked after bus voltage recovery, the staircase lighting can only be switched on or off via the communication object *Switch*.
2. By the parameterization of the communication object *Switch*. Whether the light is switched on or off with bus voltage recovery depends on the programming of the communication object *Switch*.

3.2.5 Parameter window *Enable Outputs E…H*

The parameter setting options and the adjustable communication objects for the outputs E...H do not differ from the descriptions at Parameter window Enable Outputs A…D...H, page 47.

3.2.6 Commissioning without bus voltage

How is the device switched on and put into operation?

The device can be made operational by applying an auxiliary voltage from the mobile power supply (NTI).

3.3 Communication objects

Note
As standard, the write flag (with the exception of 1 bit communication objects) is deleted with the communication object values. Thus the communication object value cannot be changed via the bus. If this function is required, the Write flag must be set in the ETS. The communication object value is overwritten with the parameterized value after bus voltage recovery.

3.3.1 Short overview of the communication objects, using the example of IO/S 8.6.1.1

CO No.	Function	Name	Data Point Type (DPT)	Length	Flags				
					C	R	S	T	R
0	In operation	System	1.002	1 bit	x			x	
1	Request status values	General	1.017	1 bit	x		x		
2…9	Not assigned								
10	Block	Input a: Switch sensor	1.003	1 bit	x		x		
		Input a: Value/forced operation	1.003	1 bit	x		x		
11	Switch 1	Input a: Switch sensor	1.001	1 bit	x		x	x	
	Value 1, unsigned	Input a: Value/forced operation	8.001	2 byte	x			x	
	Value 1, floating point	Input a: Value/forced operation	9.001	2 byte	x			x	
	Value 1, forced operation	Input a: Value/forced operation	2.001	2 bit	x			x	
	Value 1, signed	Input a: Value/forced operation	13.001	4 byte	x			x	
	Value 1, signed	Input a: Value/forced operation	6.010	1 byte	x			x	
	Value 1, unsigned	Input a: Value/forced operation	5.010	1 byte	x			x	
	Value 1, scene number	Input a: Value/forced operation	18.001	1 byte	x			x	
	Value 1	Input a: Value/forced operation	1.001	1 bit	x			x	
	Value 1, time, weekday	Input a: Value/forced operation	10.001	3 byte	x			x	
	Value 1, signed	Input a: Value/forced operation	7.001	2 byte	x			x	
	Value 1, unsigned	Input a: Value/forced operation	12.001	4 byte	x		x	x	
12	Switch 2	Input a: Switch sensor	1.001	1 bit	x		x	x	
	Value 2, unsigned	Input a: Value/forced operation	8.001	2 byte	x			x	
	Value 2, floating point	Input a: Value/forced operation	9.001	2 byte	x			x	
	Value 2, forced operation	Input a: Value/forced operation	2.001	2 bit	x			x	
	Value 2, signed	Input a: Value/forced operation	13.001	4 byte	x			x	
	Value 2, signed	Input a: Value/forced operation	6.010	1 byte	x			x	
	Value 2, unsigned	Input a: Value/forced operation	5.010	1 byte	x			x	
	Value 2, scene number	Input a: Value/forced operation	18.001	1 byte	x			x	
	Value 2	Input a: Value/forced operation	1.001	1 bit	x			x	
	Value 2, time, weekday	Input a: Value/forced operation	10.001	3 byte	x			x	
	Value 2, signed	Input a: Value/forced operation	7.001	2 byte	x			x	
	Value 2, unsigned	Input a: Value/forced operation	12.001	4 byte	x			x	
13	Switch 3	Input a: Switch sensor	1.001	1 bit	x		x	x	
14	Start event 0/1	Input a: Switch sensor	1.001	1 bit	x		x		
15…49	the same CO as Input a	Input b…h							

CO No.	Function	Name	Data Point Type (DPT)	Length	Flags				
					C	R	S	T	R
50	Switch	Output A (6 A)	1.001	1 bit	x		x	x	
51	Permanent ON	Output A (6 A)	1.003	1 bit	x		x		
52	Disable function Time	Output A (6 A)	1.003	1 bit	x		x		
53	Status switch	Output A (6 A)	1.001	1 bit	x	x		x	
54…81	the same CO as Ouput A (6 A)	Output B…H (6 A)							

3.3.2 Communication objects *General*

No.	Function	Object name	Data type	Flags
0	**In operation**	**System**	**1 bit** **DPT 1.002**	**C, T**
The communication object is enabled if in parameter window General the parameter Send communication object "In operation" has been selected with option yes. In order to regularly monitor the presence of the device on the KNX, an in operation monitoring telegram can be sent cyclically on the bus. As long as the communication object is activated, it sends a programmable in operation telegram. Telegram value 1 = system in operation with option *send value 1 cyclically* 0 = system in operation with option send value 0 cyclically				
1	**Request status values**	**General**	**1 bit** **DPT 1.017**	**C, W**
The communication object is enabled if in parameter window General the parameter Enable communication object "Request status values" 1 bit has been selected with option yes. If a telegram with the value x (x = 0; 1; 0 or 1) is received in the communication object, all status objects are sent on the bus, as long as these have not been programmed with the option *after a change* or *after request or after a change or request*. The following function results for the option x = 1: Telegram value: 1 = All status messages are sent. 0 = nothing happens.				

3.3.3 Communication objects *Inputs a…d...h*

The communication objects of all Inputs do not differentiate from one another and are explained using *Input a*.

The descriptions of the parameter setting options of *Inputs a…h* are described in Parameter window Enable Inputs a…d...h, page 29.

The communication objects *Input a* have the nos. 10…14.

The communication objects *Input b* have the nos. 15…19.

The communication objects *Input c* have the nos. 20…24.

The communication objects *Input d* have the nos. 25…29.

The communication objects *Input e* have the nos. 30…34.

The communication objects *Input f* have the nos. 35…39.

The communication objects *Input g* have the nos. 40…44.

The communication objects *Input h* have the nos. 45…49.

3.3.3.1 Communication objects *Switch sensor*

No.	Function	Object name	Data type	Flags
10	**Block**	**Input a: Switch sensor**	**1 bit** **DPT 1.003**	**C, W**

This communication object is enabled if in parameter window *a: Switch sensor*, the parameter *Enable communication object "Block" 1 bit* has been selected with option *yes*.

Using the communication object *Block*, the input can be blocked or enabled. With activated communication object *Block* the inputs are blocked.

Note

When the input is blocked there is fundamentally no reaction to a signal change on the input, but:

– Waiting for a long button operation or a minimum signal duration is suspended.

– Parameterised *Cyclic sending* is not interrupted.

– The description of the communication object *Switch x* is still possible.

If the input state changed during the blocked phase, this leads to immediate sending of the new communication object value after enabling. If the input state remains the same during the blocking phase, the communication object value is not sent.

Telegram value 0 = enable input a
1 = block input a

11	**Switch 1**	**Input a: Switch sensor**	**1 bit** **DPT 1.001**	**C, W, T**

This communication object is enabled if in the parameter window *Enable inputs a…f* the parameter *Input a (binary input, contact scanning)* has been selected with the option *Switch sensor*.

In accordance with the parameter setting, this communication object can be switched by actuation of the input to *ON, OFF or TOGGLE* or can be set to *no reaction*. With toggle the previous value, e.g. 1, is toggled directly to the value 0. The communication object can be sent cyclically, e.g. for lifesign monitoring of the sensor.

Note

The communication object can be written to externally. Thus cyclic sending is interrupted or may not be possible depending on the parameter setting.

No further communication objects are visible with the setting.

Telegram value: 0 = OFF
1 = ON

12	**Switch 2**			

See communication object 11.

13	**Switch 3**			

See communication object 11.

14	**Start event 0/1**	**Input a: Switch sensor**	**1 bit** **DPT 1.001**	**C, W**

This communication object is enabled if in parameter window *a: Switch sensor*, the parameter *Enable communication object "Start event 0/1" 1 bit* has been selected with option *yes*.

The 1 bit communication object *Start event 0/1* is enabled. As a result, the same events except those of the push button/switch connected to the binary input can also be triggered by the receipt of a telegram on the communication object *Event 0/1 started*.

Telegram value: 0 = start event 0
1 = start event 1

3.3.3.2 Communication objects *Value/forced operation*

No.	Function	Object name	Data type	Flags
10	**Block**	**Input a:** **Value / forced operation**	**1 bit** **DPT 1.003**	**C, W**

This communication object is enabled if in parameter window *a: Value/Forced operation,* the parameter *Enable communication object "Block" 1 bit* has been selected with option *yes*.

Using the communication object *Block*, the input can be blocked or enabled. With activated communication object *Block* the inputs are blocked.

Note

When the input is blocked there is fundamentally no reaction to a signal change, but:

– Waiting for a long button operation or a minimum signal duration is suspended.

– The parameter setting *8 bit scene* is ended with saving.

– Communication objects continue to be updated and sent if necessary.

When enabling an input, a change of the signal states (as opposed to before the block) leads to immediate processing, e.g.:

– The minimum actuation or detection of a long/short button push starts.

– Communication objects send their current value if necessary.

Telegram value 0 = enable input a
1 = block input a

No.	Function	Object name	Data type	Flags
11	**Value 1**	**Input a:** **Value / forced operation**	**DPT variable**	**C, T**

This communication object is enabled if in the parameter window *Enable inputs a…f,* the parameter *Input a (binary input, contact scanning)* has been selected with the option *Value/forced operation*.

This communication object sends a value on the bus with short operation when opening or closing of the contact. The value and data type can be freely set in the parameters.

1 bit value [0/1]	EIS 1	DPT 1.001 switch telegram
2 bit value [0…3]	EIS 8	DPT 2.001 forced operation
1 byte value [-128…127]	EIS 14	DPT 6.010 value
1 byte value [0…255]	EIS 6	DPT 5.010 value
1 byte value [8 bit scene]	EIS 6	DPT 18.001 control scene
2 byte value [-32,768...32,767]	EIS 10	DPT 7.001 value
2 byte value [0...65,535]	EIS 10	DPT 8.001 value
2 byte value [floating point]	EIS 5	DPT 9.001 temperature
3 byte value [time of day, weekday]	EIS 3	DPT 10.001 time of day, weekday
4 byte value [0…4294967295]	EIS 11	DPT 12.001 value
4 byte value [-2147483648…2147483647]	EIS 11	DPT 13.001 value

No.	Function	Object name	Data type	Flags
12	**Value 2**			

See communication object 11.

No.	Function	Object name	Data type	Flags
13…14				

Not assigned

3.3.4 Communication objects *Outputs*

The communication objects of all outputs do not differentiate from one another and are explained using *Output A (6 A).*

The descriptions of the parameter setting options of *Outputs A…D...H (6 A)* are described in Parameter window Enable Outputs A…D...H, page 47.

The following list applies to IO/S 8.6.1.1:

The communication objects *Output A (6 A)* have the nos. 50...53.

The communication objects *Output B (6 A)* have the nos. 54...57.

The communication objects *Output C (6 A)* have the nos. 58...61.

The communication objects *Output D (6 A)* have the nos. 62...65.

The communication objects *Output E (6 A)* have the nos. 66...69.

The communication objects *Output F (6 A)* have the nos. 70...73.

The communication objects *Output G (6 A)* have the nos. 74...77.

The communication objects *Output H (6 A)* have the nos. 78...81.

3.3.4.1 Communication objects *Output A (6 A)*

No.	Function	Object name	Data type	Flags
50	**Switch**	**Output A (6 A)**	**1 bit** **DPT 1.001**	**C, W, T**

This communication object is enabled if in the parameter window *Enable Outputs A...D* the parameter *Output A (6 A)* has been enabled.

This communication object is used for switching of the output ON/OFF. The device receives a switch telegram via a switch communication object.

N/O:

Telegram value 1 = switch ON
0 = switch OFF

N/C:

Telegram value 1 = switch OFF
0 = switch ON

Note

With logical connections or forced operations, a modification of the communication object *Switch* does not necessarily lead to a change of the contact position.

For further information see: Function diagram, page 66.

No.	Function	Object name	Data type	Flags
51	**Permanent ON**	**Output A (6 A)**	**1 bit** **DPT 1.003**	**C, W**

This communication object is enabled if in parameter window *A: Output (6 A)*, the parameter *Enable function Time* has been selected with the option *yes*.

The output can be forcibly switched on with this communication object.

If the communication object is assigned with the value 1, the output is switched on irrespective of the value of the object *Switch* and remains switched on until the communication object *Permanent ON* has the value 0. After ending the permanent ON state, the state of the communication object *Switch* is used.

Permanent ON only switches ON and “masks” the other functions. This means that the other functions, e.g. staircase lighting, continue to run in the background but do not initiate a switching action. After the end of permanent ON, the switching state, which would result without the permanent ON function, becomes active. For the function *Staircase lighting,* the response after permanent ON is parameterized in Parameter window A: Output (6 A) - Time, page 51.

This communication object can be used, for example, to allow the service or maintenance and cleaning personnel to initiate a permanent ON. The device receives a switch telegram via the switch object.

Permanent ON becomes inactive after a download or bus voltage recovery.

Telegram value 1 = activates permanent ON mode
0 = deactivates permanent ON mode

No.	Function	Object name	Data type	Flags
52	**Disable function Time**	**Output A (6 A)**	**1 bit** **DPT 1.003**	**C, W**
This communication object is enabled if in parameter window *A: Output (6 A)*, the parameter *Enable function Time* has been selected with the option *yes*. After bus voltage recovery, in parameter window - *Time* the communication object value with the parameter *Object value "Disable function Time"* can be determined. With the blocked function *Time*, the output can only be switched ON or OFF, the function *Staircase lighting* is not triggered. Telegram value 1 = staircase lighting disabled 0 = staircase lighting enabled The contact position at the time of disabling and enabling is retained and will only be changed with the next switch telegram to the communication object *Switch*.				
53	**Status switch**	**Output A (6 A)**	**1 bit** **DPT 1.001**	**C, R, T**
This communication object is enabled if in the parameter window *A: Output (6 A)*, the parameter *Enable communication object "Switch status" 1 bit* has been selected with *yes*. You can parameterize whether the communication object value *no, update only, after a change* or *after a change or request* is sent on the bus. The communication object value directly indicates the current contact position of the switching relay. The status value can be inverted. Telegram value 1 = relay ON or OFF depending on the parameterization 0 = Relay OFF or ON depending on the parameterization				

4 Planning and application

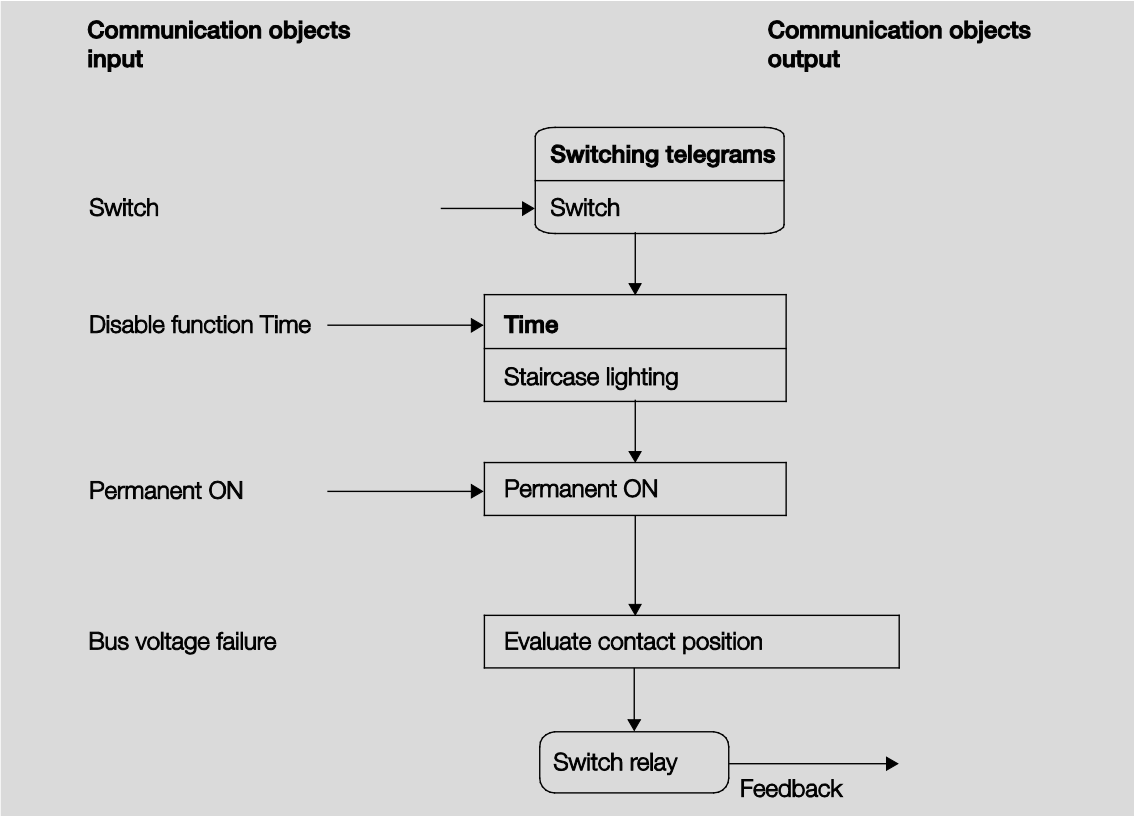
In this section you will find some tips and application examples for practical use of the device.

4.1 Output

In this chapter, the function charts and the application explanations for the outputs are explained.

4.1.1 Function diagram

The following illustration indicates the sequence, in which the functions are processed. Communication objects, which lead to the same box, have the same priority and are processed in the sequence, in which the telegrams are received.



Note
If a telegram is received via the communication object *Switch*, the result serves as the input signal for the function *Time*. If this is not blocked, a corresponding switch signal is generated. Subsequently, the switching action is only dependent on the state of the bus voltage. The relay is switched if a switching action allows it.

4.1.2 Function *Time*

The function *Time* can be enabled (value 0) and disabled (value 1) via the bus (1 bit communication object *Disable function Time*). The output operates without a delay as long as the function *Time* is disabled.

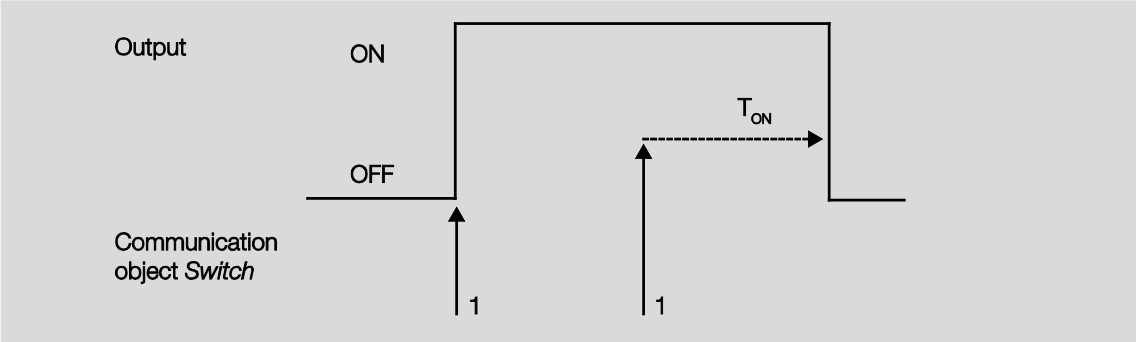
The following function can be realized using the function *Time*:

- Staircase lighting

You can switch, for example, between functions, e.g. function *Staircase lighting* (night time operation) and normal ON/OFF switch function (daytime operation).

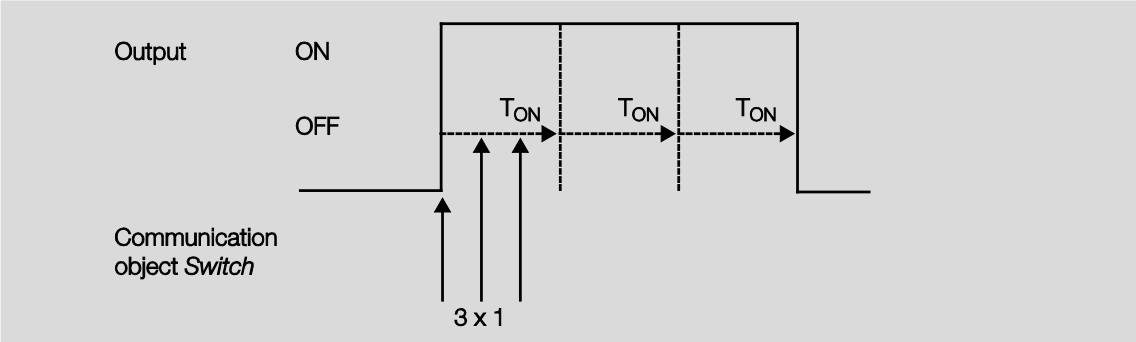
4.1.2.1 Staircase lighting

After the staircase lighting time T_{ON} the output switches off automatically. For every telegram with the value 1, the time restarts, except if the parameter *Extending staircase lighting by multiple operation ("pumping up")* on Parameter window A: Output (6 A) - Time, page 51, is set to *no (not retriggerable)*.



The response is the fundamental response of the staircase lighting function.

Via “pumping up” – actuation of the push button several times in succession – the user can adapt the staircase lighting to current needs. The maximum duration of the staircase lighting time can be set in the parameters.



If the device receives a further ON telegram when the staircase lighting is switched on, the staircase lighting time is added to the remaining period.

4.2 Behaviour with …

4.2.1 Bus voltage recovery

General

- At bus voltage recovery, the communication object values can be parameterized; if not they are set to the value 0.
- Timers are out of operation and should be restarted.
- Status communication objects are sent as long as the option *after a change* has been set.
- The contact position is not known with 100 % certainty after bus voltage recovery. It is assumed that the contact position has not changed during the bus failure. Only after a new switch event is the contact position known to the I/O Actuator.
- The send delay is only active at bus voltage recovery!

Switch contact output

- The communication object value *Staircase lighting time* remains unchanged as before bus voltage failure.
- The communication object value *Disable function time* is independent of the selected option.
- The communication object value *Permanent ON* remains unchanged as before bus voltage failure.
- The switch contact output switches as follows:
  - After the set communication object value *Switch* with bus voltage recovery.
  - If the parameter *Object value "Switch" at bus voltage recovery* is not parameterized, the behaviour at bus voltage failure is decisive.
  - If none of the two above options are selected, the last position is retained as with bus voltage failure.

Note
If a staircase lighting time was active at bus voltage failure, it will restart.

Inputs

- The inactive waiting time is only active at bus voltage recovery.

4.2.2 Reset via Bus

What is an ETS reset?

Generally an ETS reset is defined as a reset of the device via the ETS. The ETS reset is initiated in the ETS3 under the menu item *Commissioning* with the function *Reset device*. This stops the application and it is restarted.

Note
For all resets after delivery including the first download, the response will comply with that of a reset via the bus. A send and switch delay is not executed. All states are reset.

Switch contact output

- The communication object value *Staircase lighting time* receives its parameterized value.
- The communication object value *Disable function time* is 0, i.e., function *Time* is not blocked.
- The object value *Permanent ON* is 0, i.e., permanent on is not active.
- The switch contact output goes to the safely opened state.

4.2.3 Download (DL)

Note
After a download with a change, the application complies in behaviour to a reset of the device in the ETS.

Switch contact output

The communication object value *Staircase lighting time* remains unchanged.

The communication object value *Disable function time* remains unchanged.

Exception: The communication object value is set to 0 if there is no assignment to the communication object.

Note
Otherwise, the block for the function *Time* is removed, if the communication object *Disable function time* is not available. The switch contact output will otherwise use the new parameters.

The communication object value *Permanent ON* remains unchanged.

The switch contact output remains unchanged.

4.2.4 Reaction on bus voltage failure

After the contact positions have set with bus voltage recovery, the device remains functional until the bus voltage recovers.

Only the energy for a non-delayed switching action for each output is available should the bus voltage fail.

A Appendix

A.1 Scope of delivery

The I/O Actuators are supplied together with the following components. The delivered items should be checked according to the following list.

IO/S 4.6.1.1:

- 1 pc. 4.6.1.1, I/O Actuator, MDRC
- 1 pc. Installation and operating instructions
- 1 pc. Bus connection terminal (red/black)

IO/S 8.6.1.1:

- 1 pc. 8.6.1.1, I/O Actuator, MDRC
- 1 pc. Installation and operating instructions
- 1 pc. Bus connection terminal (red/black)

A.2 Code table scene (8 bit)

Bit No.		7	6	5	4	3	2	1	0		
8 bit value	Hexadecimal	Recall	Not defined	Scene number	Scene number	Scene number	Scene number	Scene number	Scene number	Scene number	Recall (R)
0	00									1	R
1	01								n	2	R
2	02							n		3	R
3	03							n	n	4	R
4	04						n			5	R
5	05						n		n	6	R
6	06						n	n		7	R
7	07						n	n	n	8	R
8	08					n				9	R
9	09					n			n	10	R
10	0A					n		n		11	R
11	0B					n		n	n	12	R
12	0C					n	n			13	R
13	0D					n	n		n	14	R
14	0E					n	n	n		15	R
15	0F					n	n	n	n	16	R
16	10				n					17	R
17	11				n				n	18	R
18	12				n			n		19	R
19	13				n			n	n	20	R
20	14				n		n			21	R
21	15				n		n		n	22	R
22	16				n		n	n		23	R
23	17				n		n	n	n	24	R
24	18				n	n				25	R
25	19				n	n			n	26	R
26	1A				n	n		n		27	R
27	1B				n	n		n	n	28	R
28	1C				n	n	n			29	R
29	1D				n	n	n		n	30	R
30	1E				n	n	n	n		31	R
31	1F				n	n	n	n	n	32	R
32	20			n						33	R
33	21			n					n	34	R
34	22			n				n		35	R
35	23			n				n	n	36	R
36	24			n			n			37	R
37	25			n			n		n	38	R
38	26			n			n	n		39	R
39	27			n			n	n	n	40	R
40	28			n		n				41	R
41	29			n		n			n	42	R
42	2A			n		n		n		43	R
43	2B			n		n		n	n	44	R
44	2C			n		n	n			45	R
45	2D			n		n	n		n	46	R
46	2E			n		n	n	n		47	R
47	2F			n		n	n	n	n	48	R
48	30			n	n					49	R
49	31			n	n				n	50	R
50	32			n	n			n		51	R
51	33			n	n			n	n	52	R
52	34			n	n		n			53	R
53	35			n	n		n		n	54	R
54	36			n	n		n	n		55	R
55	37			n	n		n	n	n	56	R
56	38			n	n	n				57	R
57	39			n	n	n			n	58	R
58	3 A			n	n	n		n		59	R
59	3B			n	n	n		n	n	60	R
60	3C			n	n	n	n			61	R
61	3D			n	n	n	n		n	62	R
62	3E			n	n	n	n	n		63	R
63	3F			n	n	n	n	n	n	64	R

Bit No.		7	6	5	4	3	2	1	0		
8 bit value	Hexadecimal	Save	Not defined	Scene number	Scene number	Scene number	Scene number	Scene number	Scene number	Scene number	Save (S)
128	80	n								1	S
129	81	n							n	2	S
130	82	n						n		3	S
131	83	n						n	n	4	S
132	84	n					n			5	S
133	85	n					n		n	6	S
134	86	n					n	n		7	S
135	87	n					n	n	n	8	S
136	88	n				n				9	S
137	89	n				n			n	10	S
138	8A	n				n		n		11	S
139	8B	n				n		n	n	12	S
140	8C	n				n	n			13	S
141	8D	n				n	n		n	14	S
142	8E	n				n	n	n		15	S
143	8F	n				n	n	n	n	16	S
144	90	n			n					17	S
145	91	n			n				n	18	S
146	92	n			n			n		19	S
147	93	n			n			n	n	20	S
148	94	n			n		n			21	S
149	95	n			n		n		n	22	S
150	96	n			n		n	n		23	S
151	97	n			n		n	n	n	24	S
152	98	n			n	n				25	S
153	99	n			n	n			n	26	S
154	9A	n			n	n		n		27	S
155	9B	n			n	n		n	n	28	S
156	9C	n			n	n	n			29	S
157	9D	n			n	n	n		n	30	S
158	9E	n			n	n	n	n		31	S
159	9F	n			n	n	n	n	n	32	S
160	A0	n		n						33	S
161	A1	n		n					n	34	S
162	A2	n		n				n		35	S
163	A3	n		n				n	n	36	S
164	A4	n		n			n			37	S
165	A5	n		n			n		n	38	S
166	A6	n		n			n	n		39	S
167	A7	n		n			n	n	n	40	S
168	A8	n		n		n				41	S
169	A9	n		n		n			n	42	S
170	AA	n		n		n		n		43	S
171	DOW	n		n		n		n	n	44	S
172	AC	n		n		n	n			45	S
173	AD	n		n		n	n		n	46	S
174	AE	n		n		n	n	n		47	S
175	AF	n		n		n	n	n	n	48	S
176	B0	n		n	n					49	S
177	B1	n		n	n				n	50	S
178	B2	n		n	n			n		51	S
179	B3	n		n	n			n	n	52	S
180	B4	n		n	n		n			53	S
181	B5	n		n	n		n		n	54	S
182	B6	n		n	n		n	n		55	S
183	B7	n		n	n		n	n	n	56	S
184	B8	n		n	n	n				57	S
185	B9	n		n	n	n			n	58	S
186	BA	n		n	n	n		n		59	S
187	BB	n		n	n	n		n	n	60	S
188	BC	n		n	n	n	n			61	S
189	BD	n		n	n	n	n		n	62	S
190	BE	n		n	n	n	n	n		63	S
191	BF	n		n	n	n	n	n	n	64	S

empty = value 0
n = value 1, applicable

Note
All combinations not listed or indicated are invalid.

A.3 Input 4 bit dimming telegram

The following table describes the 4 bit dim telegram:

Dec.	Hex.	Binary	Dim telegram
0	0	0000	STOP
1	1	0001	100 % DARKER
2	2	0010	50 % DARKER
3	3	0011	25 % DARKER
4	4	0100	12.5 % DARKER
5	5	0101	6.25 % DARKER
6	6	0110	3.13 % DARKER
7	7	0111	1.56 % DARKER
8	8	1000	STOP
9	9	1001	100 % BRIGHTER
10	R	1010	50 % BRIGHTER
11	B	1011	25 % BRIGHTER
12	C	1100	12.5 % BRIGHTER
13	D	1101	6.25 % BRIGHTER
14	E	1110	3.13 % HELLER
15	F	1111	1.56 % BRIGHTER

A.4 Ordering information

Short description	Description	Order No.	bbn 40 16779 EAN	Price group	Weight 1 pc. [kg]	Pack unit [pc.]
IO/S 4.6.1.1	I/O Actuator, 4fold, MDRC	2CDG 110 168 R0011	881074	P2	0.17	1
IO/S 8.6.1.1	I/O Actuator, 8fold, MDRC	2CDG 110 169 R0011	881081	P2	0.3	1

Notes

Notes

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