Product Manual

ABB i-bus® EIB / KNX
Switch Actuators
SA/S

Intelligent Installation Systems

ABB

This manual describes the function of the Switch Actuators SA/S with its application programs Switch, xfyS/2.
(x = number of outputs, y = rated current, S = current detection).
The detached application program Switch, xfyS/1 is descript in the manual "Switch Actuators SA/S" (Publishing Number 2CDC 505 056 D0101).
The differences between the both applications are listed in the "Software Information" you can find in the SA/S Product Data on our ABB homepage www.abb.com/eib.

Details subject to change without notice.

Exclusion of liability:
Despite checking that the contents of this document and its adherence to 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.

Please inform us of any errors or suggested improvements.

Contents

Contents

1 General

This manual provides you with detailed technical information regarding the SA/S – Switch Actuator range including installation and programming details, and explains the use of the switch actuators using examples in actual applicatons. The SA/S Switch Actuator range consists of modular installation devices in Pro*M* design for installation in distribution boards on 35 mm mounting rails according to EN 60 715.

The switch actuators are used to control switched loads, such as
- Lighting
- Heating control
- Signalling equipment

and other loads via the ABB i-bus® EIB / KNX installation system.

The ability to use and operate the Engineering Tool Software ETS is assumed.

General

1.1 Product and functional overview

SA/S 4.6.1

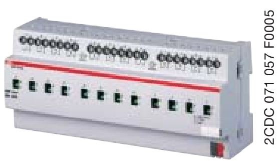
SA/S 8.6.1

SA/S 12.6.1

SA/S 2.16.5S, SA/S 2.16.1, SA/S 2.10.1, SA/S 2.20.1S

SA/S 4.16.5S, SA/S 4.16.1, SA/S 4.10.1, SA/S 4.20.1S

SA/S 8.16.5S, SA/S 8.16.1, SA/S 8.10.1, SA/S 8.20.1S



SA/S 12.16.5, SA/S 12.16.1, SA/S 12.10.1, SA/S 12.20.1

Fig. 1: Range

The ABB i-bus® EIB / KNX Switch Actuators SA/S are modular installation devices with 2 to 12 outputs and a module width of 2 to 12 module widths in Pro*M* design for installation in distribution boards. The connection to the ABB i-bus® is established using the front side Bus Connection Terminal. The SA/S Switch Actuators do not require an additional voltage supply. 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 the ETS3 is used a ".VD3" type file must be imported.

The switch actuators can switch from 2 to 12 independent electrical AC loads or three-phase loads via potential free contacts over the ABB i-bus® EIB / KNX. For selected types (SA/S x.x.x**S**) it is possible to monitor the load current on every output. The outputs for 10 A, 16 A and 20 A Switch Actuators can be switched ON or OFF manually. The switching states are displayed.

The switch actuators with the highest switching capacity (C-Load) are particularly suitable for switching loads with high inrush-current peaks such as is the case with fluorescent lighting with compensation capacitors or other fluorescent lamp loads (AX) to IEC 60669.

The following functions can be adjusted individually for each output within the same application program:
- Time functions, on/off delay
- Staircase lighting function with warning and adaptable staircase lighting time
- Scene control / presets via 8bit / 1bit commands
- Logic operation AND, OR, XOR, gate function
- Status response
- Forced operation and safety function
- Reaction to threshold functions
- Control of electrothermal valve drives
- Selection of preferred state after bus voltage failure and recovery
- Inversion of the outputs

In addition, the switch actuators with current detection on every output feature a load current detection function with a programmable reaction to two current threshold values. The current value can be sent via the EIB / KNX-bus.

The SA/S range consists of 18 types. The following type code overview should provide a fast and simple overview of the individual switch actuators.

----	SA/S 2.10.1	SA/S 2.16.1	SA/S 2.16.5	S /S 2.20.1S
SA/S 4.6.1	SA/S 4.10.1	SA/S 4.16.1	SA/S 4.16.5S	SA/S 4.20.1S
SA/S 8.6.1	SA/S 8.10.1	SA/S 8.16.1	SA/S 8.16.5S	SA/S 8.20.1S
SA/S 12.6.1	SA/S 12.10.1	SA/S 12.16.1	SA/S 12.16.5	SA/S 12.20.1
SA/S	– **S**witch **a**ctuator, (**S**chiene) rail mount			
SA/S x	– x = number of outputs (2, 4, 8 or 12)			
SA/S 8.y	– y = rated current in Ampere (6, 10, 16 or 20 A)			
SA/S 8.16.z	– z = 5 = C-Load (200 μF)			
SA/S 8.16.5S	– S = with current detection			

Table 1: SA/S – designation code overview

2 Technical properties

The technical properties of the ABB i-bus® Switch Actuators are explained in the following sections.

2.1 Technical data SA/S x.6.1

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Fig. 2: SA/S 12.6.1

The 6 A Switch Actuators are modular installation devices in pro*M* design for installation in the distribution board on 35 mm mounting rails.
The connection to the ABB i-bus® EIB / KNX is implemented via a Bus Connection Terminal.

The device does not require an additional power supply.

The actuators switch up to 12 independent electrical loads via potential free contacts. The outputs are connected using screw terminals in groups of 2 contacts. Each output is controlled separately via the EIB / KNX.

The device is suitable for switching ohmic, inductive and capacitive loads.

Power supply	– Operating voltage	21...30 V DC, made available by the bus		
	– Current consumption EIB / KNX	< 12 mA		
	– Power consumption EIB / KNX	Max. 250 mW		
Output nominal values	– SA/S - type	4.6.1	8.6.1	12.6.1
	– Number (potential free contacts 2 per group)	4	8	12
	– U_n rated voltage	250 / 440 V AC (50/60 Hz)		
	– I_n rated current (per output)	6 A	6 A	6 A
	– Power loss per device at max. load	1.5 W	2.0 W	2.5 W
Output switching currents	– AC3 operation (cosφ = 0.45) EN 60 947-4-1	6 A / 230 V		
	– AC1 operation (cosφ = 0.8) EN 60 947-4-1	6 A / 230 V		
	– Fluorescent lighting load to EN 60 669-1	6 A / 250 V (35 µF) [2)]		
	– Minimum switching performance	20 mA / 5 V 10 mA / 12 V 7 mA / 24 V		
	– DC current switching capacity (ohmic load)	6 A / 24 V DC		
Output life expectancy	– Mechanical endurance	$> 10^7$		
	– Electrical endurance to IEC 60 947-4-1		Operations (state change)	
	– AC1 (240 V/cosφ = 0.8)	$> 10^5$		
	– AC3 (240 V/cosφ = 0.45)	$> 1.5 \times 10^4$		
	– AC5a (240 V/cosφ = 0.45)	$> 1.5 \times 10^4$		
Output switching times [1)]		4.6.1	8.6.1	12.6.1
	– Max. number of relay position changes per output and minute, if all relays are switched simultaneously. The position changes should be distributed equally within the minute.	60	30	20
	– Max. number of relay position changes per output and minute only one relay is switched.	240	240	240
Connections	– EIB / KNX	Bus Connection Terminal, 0.8 mm Ø, single core		
	– Load current circuits (1 terminal per contact)	Screw terminal		
	– Phase (1 terminal for 2 contacts)	0.2... 2.5 mm^2 finely stranded 0.2...4 mm^2 single core		
	– Tightening torque	Max. 0.6 Nm		
EIB / KNX operating and display elements	– LED red and EIB / KNX push button	for assignment of the physical address		
Housing	– IP 20	to EN 60 529		
Safety class	– II	to EN 61 140		
Isolation category	– Overvoltage category	III to EN 60 664-1		
	– Pollution degree	2 to EN 60 664-1		

[1)] The specifications apply only after the bus voltage has been applied to the device for at least 10 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.

Table 2 – Part 1: 6 A Switch Actuator SA/S x.6.1, technical data

Technical properties

EIB / KNX voltage	– SELV 24 V DC (safety extra low voltage)			
Temperature range	– Operation – Storage – Transport	– 5 °C ... + 45 °C – 25 °C ... + 55 °C – 25 °C ... + 70 °C		
Environment conditions	– humidity	max. 93 %, without bedewing		
Design	– Modular DIN-Rail Component (MDRC) – SA/S - type – Dimensions (H x W x D) – Width W in mm – Mounting width (modules at 18 mm) – Mounting depth	Modular installation device, Pro*M* 4.6.1 90 x W x 64 36 2 64	 8.6.1 72 4 64	 12.6.1 108 6 64
Weight	– In kg	0.13	0.24	0.3
Installation	– On 35 mm mounting rail	EN 60 715		
Mounting position	– As required			
Housing, colour	– Plastic housing, grey			
Approvals	– EIB / KNX nach EN 50 090-2-2	Certification		
CE mark	– In accordance with the EMC guideline and low voltage guideline			

Table 2 – Part 2: 6 A Switch Actuator SA/S x.6.1, technical data

Lamp loads

Lamps	– Incandescent lamp load	1200 W
Fluorescent lamp T5 / T8	– Uncompensated luminaire – Parallel compensated – DUO circuit	800 W 300 W 350 W
Low-volt halogen lamps	– Inductive transformer – Electronic transformer – Halogen lamp 230 V	800 W 1000 W 1000 W
Dulux lamp	– Uncompensated luminaire – Parallel compensated	800 W 800 W
Mercury-vapour lamp	– Uncompensated luminaire – Parallel compensated	1000 W 800 W
Switching performance (switching contact)	– Max. peak inrush-current I_p (150 µs) – Max. peak inrush-current I_p (250 µs) – Max. peak inrush-current I_p (600 µs)	200 A 160 A 100 A
Number of electronic ballasts (T5/T8, single element) [1]	– 18 W (ABB EVG 1x58 CF) – 24 W (ABB EVG-T5 1x24 CY) – 36 W (ABB EVG 1x36 CF) – 58 W (ABB EVG 1x58 CF) – 80 W (Helvar EL 1x80 SC)	10 10 7 5 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. See section 2.7 for example

Table 3: Lamp load for SA/S x.6.1

Application programs

Type	Name	Max. number of communication objects	Max. number of group addresses	Max. number of associations
SA/S 4.6.1	Switch 4f 6A/2	64	254	254
SA/S 8.6.1	Switch 8f 6A/2	124	254	254
SA/S 12.6.1	Switch 12f 6A/2	184	254	254

Table 4: Application programs SA/S x.6.1

Note: The programming requires the EIB Software Tool ETS2 V1.3 or higher. If the ETS3 is used a ".VD3" type file must be imported.
The application program is located within the ETS2 / ETS3 in the category ABB/output/Binary output, x-fold/switch, xf6/2 (x = 4, 8 or 12, number of outputs).

2.1.1 Wiring diagram SA/S x.6.1

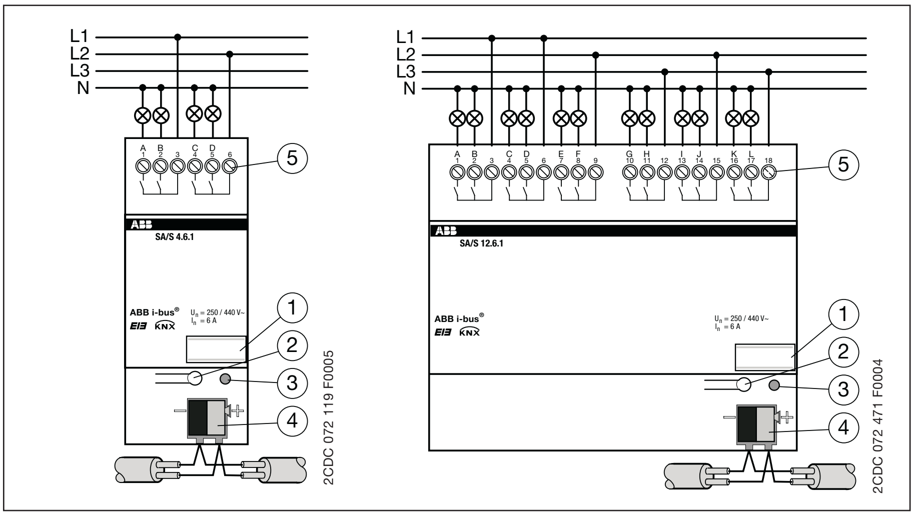
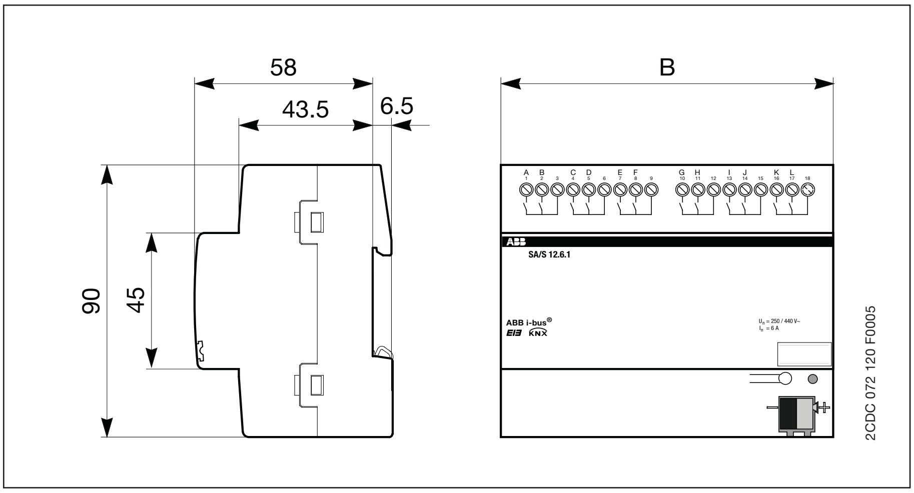


Fig. 3: Wiring diagram of the 6 A Switch Actuator SA/S x.6.1

1 Label carrier
2 Programming button
3 Programming LED
4 Bus Connection Terminal
5 Load current circuit
1 screw terminal per contact
1 screw terminal for every 2 contacts for the phase connection

Note: All-pole disconnection must be observed in order to avoid dangerous contact voltage which can develop via loads in other phases.

2.1.2 Dimension drawings SA/S x.6.1



	SA/S 4.6.1	SA/S 8.6.1	SA/S 12.6.1
B	36 mm 2 module widths	72 mm 4 module widths	108 mm 6 module widths

Fig. 4: Dimension drawings SA/S x.6.1

2.2 Technical data SA/S x.10.1

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Fig. 5 :SA/S 8.10.1

The 10 A Switch Actuators are modular installation devices in pro*M* design for installation in the distribution board on 35 mm mounting rails.
The connection to the ABB i-bus® EIB / KNX is implemented via a Bus Connection Terminal.

The device does not require an additional power supply.

The actuators switch up to 12 independent electrical loads via potential free contacts. The outputs are connected using screw terminals with combination drive head screws. Each output is controlled separately via the EIB / KNX.

The switch actuators can be manually operated via an operating element which simultaneously indicates the switch status. The actuators are particularly suitable for switching ohmic loads, inductive and capacitive loads as well as fluorescent lamp loads (AX) according to EN 60669.

Power supply	– Operating voltage	21...30 V DC, made available by the bus			
	– Current consumption EIB / KNX	< 12 mA			
	– Power consumption EIB / KNX	Max. 250 mW			
Output nominal values	– SA/S - type	2.10.1	4.10.1	8.10.1	12.10.1
	– Number of contacts (potential free)	2	4	8	12
	– U_n rated voltage	250 / 440 V AC (50/60 Hz)			
	– I_n rated current	10 AX	10 AX	10 AX	10 AX
	– Power loss per device at max. load	1.5 W	2.5 W	4.5 W	6.5 W
Output switching currents	– AC3 operation (cosφ = 0.45) EN 60 947-4-1	8 A / 230 V			
	– AC1 operation (cosφ = 0.8) EN 60 947-4-1	10 A / 230 V			
	– Fluorescent lighting load AX to EN 60669-1	10 AX / 250 V (140 µF) [2)]			
	– Minimum switching performance	100 mA / 12 V			
		100 mA / 24 V			
	– DC current switching capacity (ohmic load)	10 A / 24 V DC			
Output life expectancy	– Mechanical endurance	$> 3 \times 10^6$			
	– Electrical endurance to IEC 60 947-4-1			Operations (state change)	
	– AC1 (240 V/cosφ = 0.8)	$> 10^5$			
	– AC3 (240 V/cosφ = 0.45)	$> 3 \times 10^4$			
	– AC5a (240 V/cosφ = 0.45)	$> 3 \times 10^4$			
Output switching times [1)]		2.10.1	4.10.1	8.10.1	12.10.1
	– Max. number of relay position changes per output and minute, if all relays are switched simultaneously. The position changes should be distributed equally within the minute.	60	30	15	10
	– Max. number of relay position changes per output, and minute if only one relay is switched	120	120	120	120
Connections	– EIB / KNX	Bus Connection Terminal, 0.8 mm Ø, single core			
	– Load current circuits	Screw terminal with universal head (PZ 1)			
		0.2...4 mm² finely stranded, 2x (0.2 – 2.5 mm²)			
		0.2...6 mm² single core, 2x (0.2 – 4 mm²)			
	– cable shoe	contact pin minimum 10 mm			
	– Tightening torque	Max. 0.8 Nm			
Operating and display elements	– Red LED and EIB / KNX push button	for assignment of the physical address			
	– Contact position indication	Relay lever			
Housing	– IP 20	to EN 60 529			
Safety class	– II	to EN 61 140			
Isolation category	– Overvoltage category	III to EN 60 664-1			
	– Pollution degree	2 to EN 60 664-1			

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 6) may not be exceeded.

Table 5 – Part 1: 10 A Switch Actuator SA/S x.10.1, technical data

EIB / KNX voltage	– SELV 24 V DC (safety extra low voltage)				
Temperature range	– Operation – Storage – Transport	– 5 °C ... + 45 °C – 25 °C ... + 55 °C – 25 °C ... + 70 °C			
Environment conditions	– humidity	max. 93 %, without bedewing			
Design	– Modular DIN-Rail Component (MDRC)	Modular installation device, Pro*M*			
	– SA/S - type	2.10.1	4.10.1	8.10.1	12.10.1
	– Dimensions (H x W x D)	90 x W x 64			
	– Width W in mm	36	72	144	216
	– Mounting width (modules at 18 mm)	2	4	8	12
	– Mounting depth in mm	64	64	64	64
Weight	– In kg	0.15	0.25	0.46	0.65
Installation	– On 35 mm mounting rail	EN 60 715			
Mounting position	– As required				
Housing, colour	– Plastic housing, grey				
Approvals	– EIB / KNX nach EN 50 090-2-2	Certification			
CE mark	– In accordance with the EMC guideline and low voltage guideline				

Table 5 – Part 2: 10 A Switch Actuator SA/S x.10.1, technical data

Lamp loads

Lamps	– Incandescent lamp load	2330 W
Fluorescent lamp T5 / T8	– Uncompensated luminaire – Parallel compensated – DUO circuit	2300 W 1500 W 1500 W
Low-volt halogen lamps	– Inductive transformer – Electronic transformer – Halogen lamp 230 V	1200 W 1500 W 2300 W
Dulux lamp	– Uncompensated luminaire – Parallel compensated	1100 W 1100 W
Mercury-vapour lamp	– Uncompensated luminaire – Parallel compensated	2000 W 2000 W
Switching performance (switching contact)	– Max. peak inrush-current I_p (150 µs) – Max. peak inrush-current I_p (250 µs) – Max. peak inrush-current I_p (600 µs)	400 A 320 A 200 A
Number of electronic ballasts (T5/T8, single element) [1]	– 18 W (ABB EVG 1x58 CF) – 24 W (ABB EVG-T5 1x24 CY) – 36 W (ABB EVG 1x36 CF) – 58 W (ABB EVG 1x58 CF) – 80 W (Helvar EL 1x80 SC)	23 23 14 11 10

[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. See section 2.7 for example

Table 6: Lamp load for SA/S x.10.1

Application programs

Type	Name	Max. number of communication objects	Max. number of group addresses	Max. number of associations
SA/S 2.10.1S	Switch 2f 10A/2	24	254	254
SA/S 4.10.1S	Switch 4f 10A/2	64	254	254
SA/S 8.10.1S	Switch 8f 10A/2	124	254	254
SA/S 12.10.1	Switch 12f 10A/2	184	254	254

Table 7: Application programs SA/S x.10.1

Notes: The programming requires the EIB Software Tool ETS2 V1.3 or higher. If the ETS3 is used a ".VD3" type file must be imported.
The application program is located within the ETS2 / ETS3 in the category ABB/output/Binary output, x-fold/switch, xf10/2 (x = 2, 4, 8 or 12, number of outputs).

Technical properties

2.2.1 Wiring diagram SA/S x.10.1

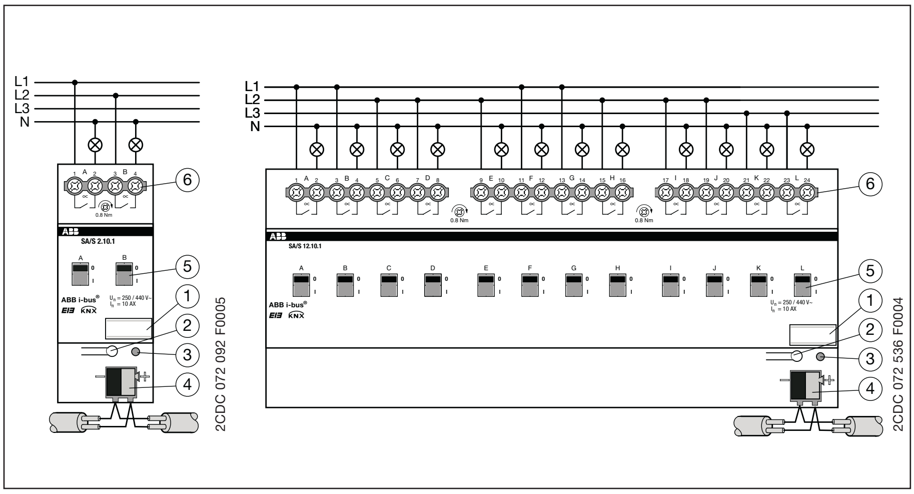
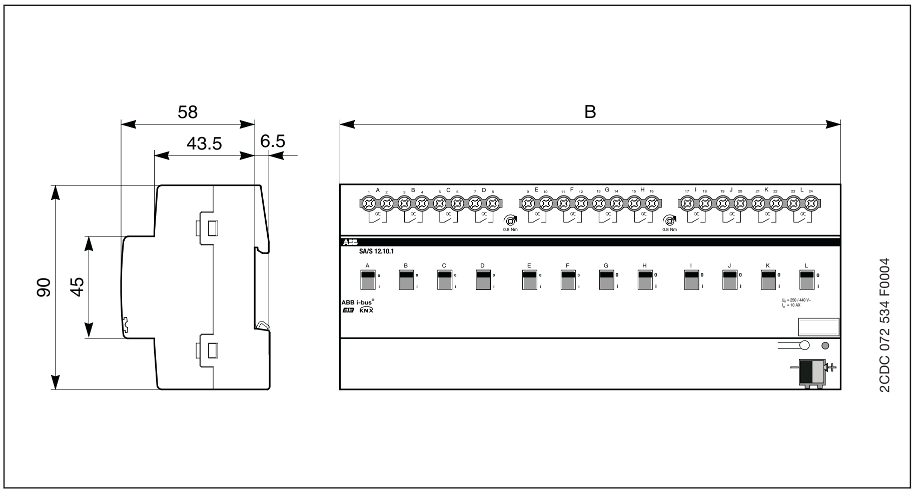


Fig. 6: Wiring diagram of the 10 AX Switch Actuator SA/S x.10.1

1 Label carrier
2 Programming button
3 Programming LED
4 Bus Connection Terminal
5 Contact position indication and manual operation
6 Load current circuits, per circuit 2 connection terminals

Note: All-pole disconnection must be observed in order to avoid dangerous contact voltage which can develop via loads in other phases.

2.2.2 Dimension drawings SA/S x.10.1



	SA/S 2.10.1	SA/S 4.10.1	SA/S 8.10.1	SA/S 12.10.1
B	36 mm 2 module widths	72 mm 4 module widths	144 mm 8 module widths	216 mm 12 module widths

Fig. 7: Dimension drawings SA/S x.10.1

2.3 Technical data SA/S x.16.1

The 16 A AC1 Switch Actuators are modular installation devices in pro*M* design for installation in the distribution board on 35 mm mounting rails. The connection to the ABB i-bus® EIB / KNX is implemented via Bus Connection Terminals.

The device does not require an additional power supply.

The actuators switch up to 8 independent electrical loads via potential free contacts. The outputs are connected using screw terminals with combination drive head screws. Each output is controlled separately via the EIB / KNX.

The switch actuators can be manually operated via an operating element which simultaneously indicates the switch status.

The actuators are particularly suitable for switching ohmic loads.

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Fig. 8 SA/S 8.16.1

Power supply	– Operating voltage	21...30 V DC, made available by the bus			
	– Current consumption EIB / KNX	< 12 mA			
	– Power consumption EIB / KNX	Max. 250 mW			
Output nominal values	– SA/S - type	2.16.1	4.16.1	8.16.1	12.16.1
	– Number of contacts (potential free)	2	4	8	12
	– U_n rated voltage	250 / 440 V AC (50/60 Hz)			
	– I_n rated current	16 A	16 A	16 A	16 A
	– Power loss per device at max. load	2.0 W	4.0 W	8.0 W	10 W
Output switching currents	– AC1 operation (cosφ = 0.8) EN 60 947-4-1	16 A / 230 V			
	– Fluorescent lighting load AX to EN 60669-1	16 A / 250 V (70 µF) 2)			
	– Minimum switching performance	100 mA / 12 V 100 mA / 24 V			
	– DC current switching capacity (ohmic load)	16 A / 24 V DC			
Output life expectancy	– Mechanical endurance	> 3 x 10^6		Operations (state change)	
	– Electrical endurance to IEC 60 947-4-1 – AC1 (240 V/cosφ = 0.8)	> 10^5			
Output switching times 1)	– Max. number of relay position changes per output and minute, if all relays are switched simultaneously. The position changes should be distributed equally within the minute.	2.16.1 60	4.16.1 30	8.16.1 15	12.16.1 10
	– Max. number of relay position changes per output, and minute if only one relay is switched	120	120	120	120
Connections	– EIB / KNX	Bus Connection Terminal, 0.8 mm Ø, single core			
	– Load current circuits	Screw terminal with universal head (PZ 1) 0.2...4 mm^2 finely stranded, 2x (0.2 – 2.5 mm^2) 0.2...6 mm^2 single core, 2x (0.2 – 4 mm^2)			
	– cable shoe	contact pin minimum 10 mm			
	– Tightening torque	Max. 0.8 Nm			
Operating and display elements	– Red LED and EIB / KNX push button	for assignment of the physical address			
	– Contact position indication	Relay lever			
Housing	– IP 20	to EN 60 529			
Safety class	– II	to EN 61 140			
Isolation category	– Overvoltage category	III to EN 60 664-1			
	– Pollution degree	2 to EN 60 664-1			

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 9) may not be exceeded.

Table 8 – Part 1: 16 A Switch Actuator SA/S x.16.1, technical data

EIB / KNX voltage	– SELV 24 V DC (safety extra low voltage)				
Temperature range	– Operation – Storage – Transport	– 5 °C ... + 45 °C – 25 °C ... + 55 °C – 25 °C ... + 70 °C			
Environment conditions	– humidity	max. 93 %, without bedewing			
Design	– Modular DIN-Rail Component (MDRC)	Modular installation device, Pro*M*			
	– SA/S - type	2.16.1	4.16.1	8.16.1	12.16.1
	– Dimensions (H x W x D)	90 x W x 64			
	– Width W in mm	36	72	144	216
	– Mounting width (modules at 18 mm)	2	4	8	12
	– Mounting depth in mm	64	64	64	64
Weight	– In kg	0.15	0.25	0.46	0.65
Installation	– On 35 mm mounting rail	EN 60 715			
Mounting position	– As required				
Housing, colour	– Plastic housing, grey				
Approvals	– EIB / KNX nach EN 50 090-2-2	Certification			
CE mark	– In accordance with the EMC guideline and low voltage guideline				

Table 8 – Part 2: 16 A Switch Actuator SA/S x.16.1, technical data

Lamp loads

Lamps	– Incandescent lamp load	2330 W
Fluorescent lamp T5 / T8	– Uncompensated luminaire – Parallel compensated – DUO circuit	2300 W 1500 W 1500 W
Low-volt halogen lamps	– Inductive transformer – Electronic transformer – Halogen lamp 230 V	1200 W 1500 W 2300 W
Dulux lamp	– Uncompensated luminaire – Parallel compensated	1100 W 1100 W
Mercury-vapour lamp	– Uncompensated luminaire – Parallel compensated	2000 W 2000 W
Switching performance (switching contact)	– Max. peak inrush-current I_p (150 µs) – Max. peak inrush-current I_p (250 µs) – Max. peak inrush-current I_p (600 µs)	400 A 320 A 200 A
Number of electronic ballasts (T5/T8, single element) [1]	– 18 W (ABB EVG 1x58 CF) – 24 W (ABB EVG-T5 1x24 CY) – 36 W (ABB EVG 1x36 CF) – 58 W (ABB EVG 1x58 CF) – 80 W (Helvar EL 1x80 SC)	23 23 14 11 10

[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. See section 2.7 for example

Table 9: Lamp load for SA/S x.16.1

Application programs

Type	Name	Max. number of communication objects	Max. number of group addresses	Max. number of associations
SA/S 2.16.1	Switch 2f 16A/2	34	254	254
SA/S 4.16.1	Switch 4f 16A/2	64	254	254
SA/S 8.16.1	Switch 8f 16A/2	124	254	254
SA/S 12.16.1	Switch 12f 16A/2	184	254	254

Table 10: Application programs SA/S x.16.1

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

The application program is located within the ETS2 / ETS3 in the category ABB/output/Binary output, x-fold/switch, xf16/2 (x = 2, 4, 8 or 12 number of outputs).

2.3.1 Wiring diagram SA/S x.16.1

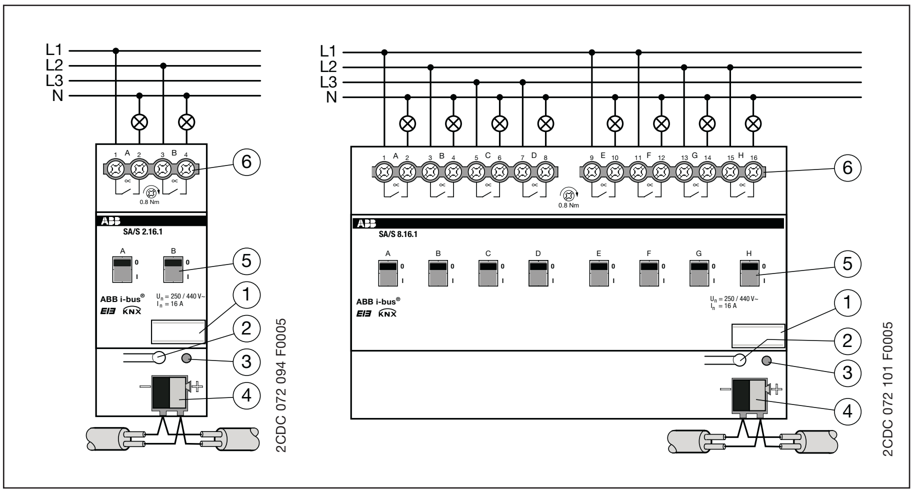
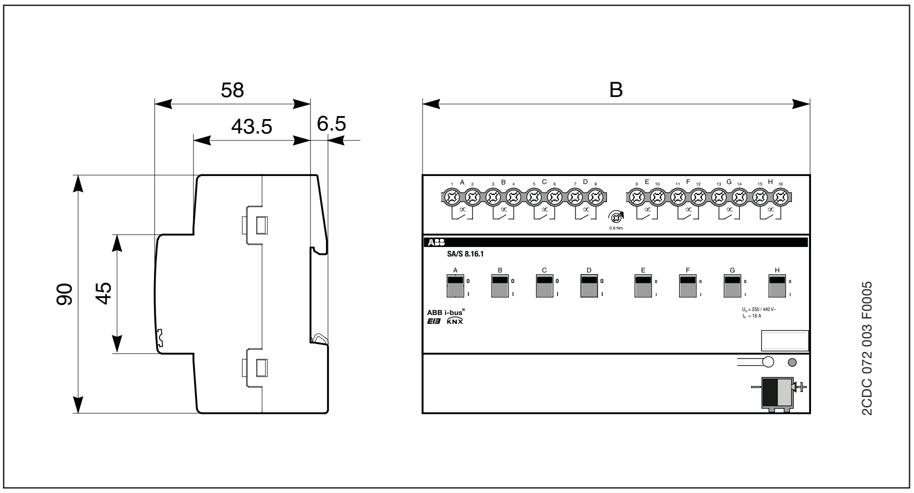


Fig. 9: Wiring diagram of the 16 A AC1 Switch Actuator SA/S x.16.1

1 Label carrier
2 Programming button
3 Programming LED
4 Bus Connection Terminal
5 Contact position indicatior and manual operation
6 Load current circuits, per circuit 2 connection terminals

Note: All-pole disconnection must be observed in order to avoid dangerous contact voltage which can develop via loads in other phases.

2.3.2 Dimension drawings SA/S x.16.1



	SA/S 2.16.1	SA/S 4.16.1	SA/S 8.16.1	SA/S 12.16.1
B	36 mm 2 module widths	72 mm 4 module widths	144 mm 8 module widths	216 mm 12 module widths

Fig. 10: Dimension drawings SA/S x.16.1

2.4 Technical data SA/S x.16.5S

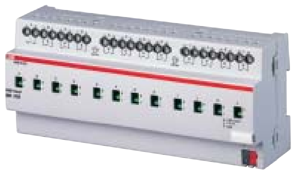


Fig. 11: SA/S 12.16.5

The 16 A Switch Actuators are modular installation devices in pro*M* design for installation in the distribution board on 35 mm mounting rails. The connection to the ABB i-bus® EIB / KNX is implemented via a Bus Connection Terminal.

The 2-, 4- and 8-fold switch actuators feature a load current detection on every output. A separate external voltage supply for the actuator is not required.

The actuators switch up to 12 independent electrical loads via potential free contacts. The outputs are connected using screw terminals with combination drive head screws. Each output is controlled and monitored separately via the EIB / KNX.

The switch actuators can be manually operated via an operating element which simultaneously indicates the switch status.

The actuators are particularly suitable for switching loads with high peak inrush currents such as fluorescent lighting with compensation capacitors or fluorescent lamp loads (AX) according to EN 60669.

Power supply	– Operating voltage – Current consumption EIB / KNX – Power consumption EIB / KNX	21...30 V DC, made available by the bus < 12 mA Max. 250 mW			
Output nominal values	– SA/S - type	2.16.5S	4.16.5S	8.16.5S	12.16.5
	– Current detection	yes	yes	yes	no
	– Number of contacts (potential free)	2	4	8	12
	– U_n rated voltage	250 / 440 V AC (50/60 Hz)			
	– I_n rated current	16 AX, C-Load			
	– Power loss per device at max. load	2.0 W	4.0 W	8.0 W	12.0 W
Output switching currents	– AC3 operation (cosφ = 0.45) EN 60 947-4-1 – AC1 operation (cosφ = 0.8) EN 60 947-4-1 – Fluorescent lighting load AX to EN 60669-1 – Minimum switching performance – DC current switching capacity (ohmic load)	16 A / 230 V 16 A / 230 V 16 AX / 250 V (200 µF) [2)] 100 mA / 12 V 100 mA / 24 V 16 A / 24 V DC			
Output life expectancy	– Mechanical endurance – Electrical endurance to IEC 60 947-4-1 – AC1 (240 V/cosφ = 0.8) – AC3 (240 V/cosφ = 0.45) – AC5a (240 V/cosφ = 0.45)	$> 10^6$ $> 10^5$ $> 3 \times 10^4$ $> 3 \times 10^4$		Operations (state change)	
Current detection (load current) SA/S 2.16.5S, SA/S 4.16.5S, SA/S 8.16.5S	– Detection range (sine r.m.s. value) – Accuracy – Frequency – Resolution 2-Byte – Detection speed limited by low-pass filter with τ	0.1 A ... 16 A +/- 8 % of current value (sine) and +/- 100 mA 50/60 Hz 1 mA (DTP 7.012) 100 ms			
Output switching times [1)]		2.16.5S	4.16.5S	8.16.5S	12.16.5
	– Max. number of relay position changes per output and minute, if all relays are switched simultaneously. The position changes should be distributed equally within the minute.	30	15	7	5
	– Max. number of relay position changes per output, and minute if only one relay is switched	60	60	60	60

[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 12) may not be exceeded.

Table 11 – Part 1: 16 A, AC3, C-Load Switch Actuator SA/S x.16.5S, technical data

Connections	– EIB / KNX	Bus Connection Terminal, 0.8 mm Ø, single core
	– Load current circuits	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)
	– cable shoe	contact pin minimum 10 mm
	– Tightening torque	Max. 0.8 Nm
Operating and display elements	– Red LED and EIB / KNX push button	for assignment of the physical address
	– Contact position indication	Relay lever
Housing	– IP 20	to EN 60 529
Safety class	– II	to EN 61 140
Isolation category	– Overvoltage category	III to EN 60 664-1
	– Pollution degree	2 to EN 60 664-1
EIB / KNX voltage	– SELV 24 V DC (safety extra low voltage)	
Temperature range	– Operation	– 5 °C ... + 45 °C
	– Storage	– 25 °C ... + 55 °C
	– Transport	– 25 °C ... + 70 °C
Environment conditions	– humidity	max. 93 %, without bedewing
Design	– Modular DIN-Rail Component (MDRC)	Modular installation device, Pro*M*
	– SA/S - type	2.16.5S 4.16.5S 8.16.5S 12.16.5
	– Dimensions (H x W x D)	90 x W x 64
	– Width W in mm	36 72 144 216
	– Mounting width (modules at 18 mm)	2 4 8 12
	– Mounting depth in mm	64 64 64 64
Weight	– In kg	0.2 0.34 0.64 0.8
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 11 – Part 2: 16 A, AC3, C-Load Switch Actuator SA/S x.16.5S, technical data

Lamp loads

Lamps	– Incandescent lamp load	3680 W
Fluorescent lamps T5 / T8	– Uncompensated luminaire	3680 W
	– Parallel compensated	2500 W
	– DUO circuit	3680 W
Low-volt halogen lamps	– Inductive transformer	2000 W
	– Electronic transformer	2500 W
	– Halogen lamp 230 V	3680 W
Dulux lamp	– Uncompensated luminaire	3680 W
	– Parallel compensated	3000 W
Mercury-vapour lamp	– Uncompensated luminaire	3680 W
	– Parallel compensated	3680 W
Switching performance (switching contact)	– Max. peak inrush-current I_p (150µs)	600 A
	– Max. peak inrush-current I_p (250µs)	480 A
	– Max. peak inrush-current I_p (600µs)	300 A
Number of electronic ballasts (T5/T8, single element) [1)]	– 18 W (ABB EVG 1x58 CF)	26[2)]
	– 24 W (ABB EVG-T5 1x24 CY)	26[2)]
	– 36 W (ABB EVG 1x36 CF)	22
	– 58 W ABB EVG 1x58 CF)	12[2)]
	– 80 W (Helvar EL 1x80 SC)	10[2)]

[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. See section 2.7 for example

[2)] Limited by protection with a B16 miniature circuit breaker

Table 12: Lamp Load for SA/S x.16.5S

Type	Name	Max. number of communication objects	Max. number of group addresses	Max. number of associations
SA/S 2.16.5S	Switch 2f 16CS/2	42	254	254
SA/S 4.16.5S	Switch 4f 16CS/2	80	254	254
SA/S 8.16.5S	Switch 8f 16CS/2	160	254	254
SA/S 12.16.5	Switch 12 f16C/2	220	254	254

Table 13: Application programs SA/S x.16.5S

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

The application program is located within the ETS2 / ETS3 in the category ABB/output/Binary output, x-fold/switch, xf16S/2 (x = 2, 4, 8 or 12, number of outputs, S = current detection).

2.4.1 Wiring diagram SA/S x.16.5S

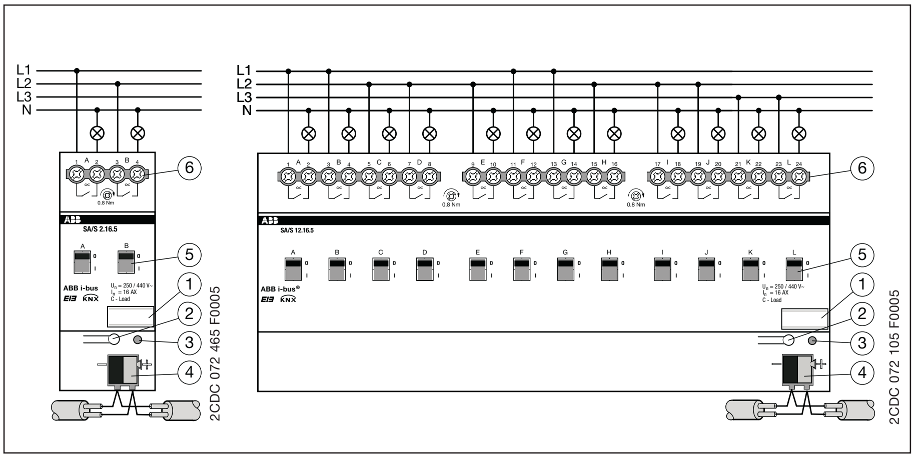
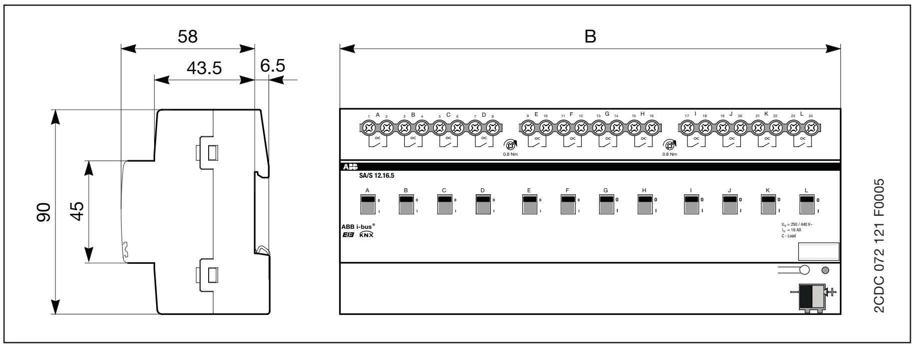


Fig. 12: Wiring diagram of the 16 A, C-Load Switch Actuators SA/S x.16.5S

1 Label carrier
2 Programming button
3 Programming LED
4 Bus Connection Terminal
5 Contact position indicatior and manual operation
6 Load current circuits, per circuit 2 connection terminals

Note: All-pole disconnection must be observed in order to avoid dangerous contact voltage which can develop via loads in other phases.

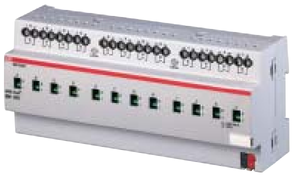
2.4.2 Dimension drawings SA/S x.16.5S



	SA/S 2.16.5S	SA/S 4.16.5S	SA/S 8.16.5S	SA/S 12.16.5
B	36 mm 2 module widths	72 mm 4 module widths	144 mm 8 module widths	216 mm 12 module widths

Fig. 13: Dimension drawings SA/S x.16.5S

2.5 Technical data SA/S x.20.1S



2CDC 071 068 F0005

Fig. 14: SA/S 12.20.1

The 20 AX Switch Actuators are modular installation devices in pro*M* design for installation in the distribution board on 35 mm mounting rails.
The connection to the ABB i-bus® EIB / KNX is implemented via a screwless Bus Connection Terminal.

The 2-, 4- and 8-fold switch actuators feature a load current detection on every output. A separate external voltage supply for the actuator is not required.

The actuator switches up to 12 independent electrical loads via potential free contacts. The outputs are connected using screw terminals with combination drive head screws. Each output is controlled and monitored separately via the EIB / KNX.

The switch actuators can be manually operated via an operating element which simultaneously indicates the switch status.

The actuators are particularly suitable for switching loads with high peak inrush currents such as fluorescent lighting with compensation capacitors or fluorescent lamp loads (AX) according to EN 60669.

Power supply	– Operating voltage	21...30 V DC, made available by the bus			
	– Current consumption EIB / KNX	< 12 mA			
	– Power consumption EIB / KNX	Max. 250 mW			
Output nominal values	– SA/S - type	2.20.1S	4.20.1S	8.20.1S	12.20.1
	– Current detection	yes	yes	yes	no
	– Number of contacts (potential free)	2	4	8	12
	– U_n rated voltage	250 / 440 V AC (50/60 Hz)			
	– I_n rated current	20 AX			
	– Power loss per device at max. load	3.0 W	5.5 W	11.0 W	16.0 W
Output switching currents	– AC3 operation (cosφ = 0.45) EN 60 947-4-1	16 A / 230 V			
	– AC1 operation (cosφ = 0.8) EN 60 947-4-1	20 A / 230 V			
	– Fluorescent lighting load AX to EN 60669-1	20 AX / 250 V (140 μF) [2]			
	– Minimum switching performance	100 mA / 12 V 100 mA / 24 V			
	– DC current switching capacity (ohmic load)	20 A / 24 V DC			
Output life expectancy	– Mechanical endurance	$> 10^6$		Operations (state change)	
	– Electrical endurance to IEC 60 947-4-1				
	– AC1 (240 V/cosφ = 0.8)	$> 10^5$			
	– AC3 (240 V/cosφ = 0.45)	$> 3 \times 10^4$			
	– AC5a (240 V/cosφ = 0.45)	$> 3 \times 10^4$			
Current detection (load current) SA/S 2.16.5S, SA/S 4.16.5S, SA/S 8.16.5S	– Detection range (sine r.m.s. value)	0.1 A ... 20 A			
	– Accuracy	+/- 8 % of current value (sine) and +/- 100 mA			
	– Frequency	50/60 Hz			
	– 2-Byte	1 mA (DTP 7.012)			
	– Detection speed limited by low-pass filter with τ	100 ms			
Output switching times [1]		2.20.1S	4.20.1S	8.20.1S	12.20.1
	– Max. number of relay position changes per output and minute, if all relays are switched simultaneously. The position changes should be distributed equally within the minute.	30	15	7	5
	– Max. number of relay position changes per output, and minute if only one relay is switched	60	60	60	60

[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 15) may not be exceeded

Table 14 – Part 1: 20 AX Switch Actuator SA/S x.20.1S, technical data

Connections	– EIB / KNX	Bus Connection Terminal, 0.8 mm Ø, single core
	– Load current circuits	Screw terminal with universal head (PZ 1) 0.2...4 mm² finely stranded, 2 x (0.2 – 2.5 mm²) 0.2...6 mm² single core, 2 x (0.2 – 4 mm²)
	– cable shoe	contact pin minimum 10 mm
	– Tightening torque	Max. 0.8 Nm
Operating and display elements	– Red LED and EIB / KNX push button	for assignment of the physical address
	– Contact position indication	Relay lever
Housing	– IP 20	to EN 60 529
Safety class	– II	to EN 61 140
Isolation category	– Overvoltage category	III to EN 60 664-1
	– Pollution degree	2 to EN 60 664-1
EIB / KNX voltage	– SELV 24 V DC (safety extra low voltage)	
Temperature range	– Operation	– 5 °C... + 45 °C
	– Storage	– 25 °C... + 55 °C
	– Transport	– 25 °C... + 70 °C
Environment conditions	– humidity	max. 93 %, without bedewing
Design	– Modular DIN-Rail Component (MDRC)	Modular installation device, Pro*M*
	– SA/S - type	2.20.1S 4.20.1S 8.20.1S 12.20.1
	– Dimensions (H x W x D)	90 x W x 64
	– Width W in mm	36 72 144 216
	– Mounting width (modules at 18 mm)	2 4 8 12
	– Mounting depth in mm	64 64 64 64
Weight	– In kg	0.2 0.34 0.64 0.8
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 14 – Part 2: 20 AX Switch Actuator SA/S x.20.1S, technical data

Lamp loads

Lamps	– Incandescent lamp load	3680 W
Fluorescent lamps T5 / T8	– Uncompensated luminaire	3680 W
	– Parallel compensated	2500 W
	– DUO circuit	3680 W
Low-volt halogen lamps	– Inductive transformer	2000 W
	– Electronic transformer	2000 W
	– Halogen lamp 230 V	3680 W
Dulux lamp	– Uncompensated luminaire	3680 W
	– Parallel compensated	3000 W
Mercury-vapour lamp	– Uncompensated luminaire	3680 W
	– Parallel compensated	3680 W
Switching performance (switching contact)	– Max. peak inrush-current I_p (150µs)	600 A
	– Max. peak inrush-current I_p (250µs)	480 A
	– Max. peak inrush-current I_p (600µs)	300 A
Number of electronic ballasts (T5/T8, single element) [1)]	– 18 W (ABB EVG 1x58 CF)	26[2)]
	– 24 W (ABB EVG-T5 1x24 CY)	26[2)]
	– 36 W (ABB EVG 1x36 CF)	22
	– 58 W ABB EVG 1x58 CF)	12[2)]
	– 80 W (Helvar EL 1x80 SC)	10[2)]

[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. See section 2.7 for example

[2)] Limited by protection with a B20 miniature circuit breaker

Table 15: Lamp load for SA/S x.20.1S

Application programs

Type	Name	Max. number of communication objects	Max. number of group addresses	Max. number of associations
SA/S 2.20.1S	Switch 2f 20S/2	42	254	254
SA/S 4.20.1S	Switch 4f 20S/2	80	254	254
SA/S 8.20.1S	Switch 8f 20S/2	160	254	254
SA/S 12.20.1	Switch 12f 20A/2	220	254	254

Table 16: Application programs SA/S x.20.1S

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

The application program is located within the ETS2 / ETS3 in the category ABB/output/Binary output, x-fold/switch, xf20S/2 (x = 2, 4, 8 or 12, number of outputs, S = current detection).

2.5.1 Wiring diagram SA/S x.20.1S

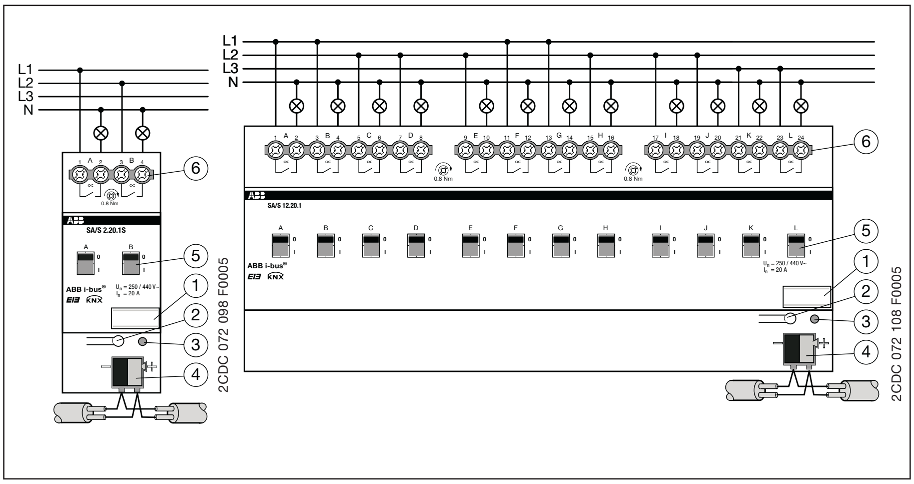
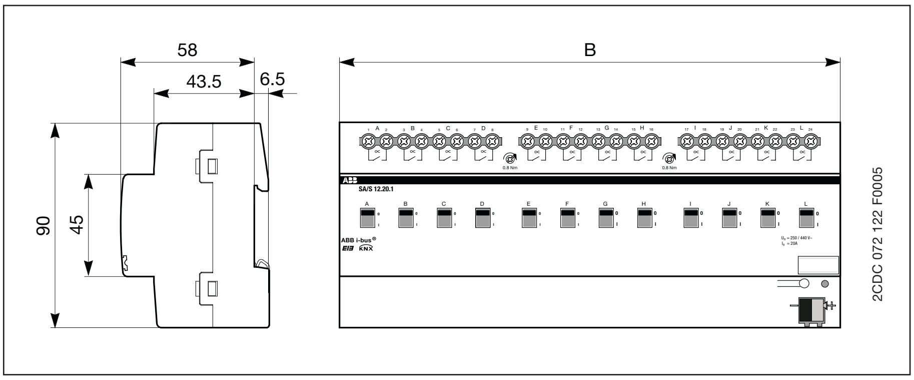


Fig. 15: Wiring diagram of the 20 AX Switch Actuator SA/S x.20.1S

1 Label carrier
2 Programming button
3 Programming LED
4 Bus Connection Terminal
5 Contact position indication and manual operation
6 Load current circuits, per circuit 2 connection terminals

Note: All-pole disconnection must be observed in order to avoid dangerous contact voltage which can develop via loads in other phases.

2.5.2 Dimension drawings SA/S x.20.1S



	SA/S 2.20.1S	SA/S 4.20.1S	SA/S 8.20.1S	SA/S 12.20.1
B	36 mm 2 module widths	72 mm 4 module widths	144 mm 8 module widths	216 mm 12 module widths

Fig. 16: Dimension diagrams SA/S x.20.1S

Technical properties

2.6 Overview of switching performance

The following table provides an overview of the switching performance, lamp loads or the number of lamps which can be connected to a output.

	SA/S 4.6.1 SA/S 8.6.1 SA/S 12.6.1	**SA/S 2.10.1 SA/S 4.10.1 SA/S 8.10.1 SA/S 12.10.1**	**SA/S 2.16.1 SA/S 4.16.1 SA/S 8.16.1 SA/S 12.16.1**	**SA/S 2.16.5S SA/S 4.16.5S SA/S 8.16.5S SA/S 12.16.5**	**SA/S 2.20.1S SA/S 4.20.1S SA/S 8.20.1S SA/S 12.20.1**
I_n nominal current / A	6 A	10 AX	16 A	16 AX C-Load	20 AX
U_n rated voltage / V	250/440 V AC	250/440 V AC	250/440 V AC	250/440 V AC	250/440 V AC
AC1-operation (cosφ = 0.8) EN 60947-4-1	6 A	10 A	16 A	16 A	20 A
AC3-operation (cosφ = 0.45) EN 60947-4-1	6 A	8 A	8 A	16 A	16 A
Fluorescent lighting load AX EN 60669-1	6 A (35 µF)[3]	10 AX (140 µF)[3]	16 A (70 µF)[3]	16 AX (200 µF)[3]	20 AX (140 µF)[3]
Minimum switching performance	10 mA/12 V	100 mA/12 V	100 mA/12 V	100 mA/12 V	100 mA/12 V
DC current switching capacity (ohmic load)	7 A/24 V DC	10 A/24 V DC	16 A/24 V DC	16 A/24 V DC	20 A/24 V DC
Mechanical endurance	10^7	$3x10^6$	$3x10^6$	10^6	10^6
Electrical endurance [4] to DIN IEC 60947-4-1 Rated current AC1 (240 V/0.8) Rated current AC3 (240 V/0.45) Rated current AC5a (240 V/0.45)	 100.000 15.000 15.000	 100.000 30.000 30.000	 100.000 30.000 30.000	 100.000 30.000 30.000	 100.000 30.000 30.000
Incandescent lamp load	1200 W	2500 W	2500 W	3680 W	3680 W
Fluorescent lamp T5 / T8 Uncompensated luminaire Parallel compensated DUO circuit	 800 W 300 W 350 W	 2500 W 1500 W 1500 W	 2500 W 1500 W 1500 W	 3680 W 2500 W 3680 W	 3680 W 2500 W 3680 W
Low-volt halogen lamps Inductive transformer electronic transformer	 800 W 1000 W	 1200 W 1500 W	 1200 W 1500 W	 2000 W 2500 W	 2000 W 2500 W
Halogen lamp 230 V	1000 W	2500 W	2500 W	3680 W	3680 W
Dulux lamp Uncompensated luminaire Parallel compensated	 800 W 800 W	 1100W 1100W	 1100W 1100W	 3680 W 3000 W	 3680 W 3000 W
Mercury-vapour lamp Uncompensated luminaire Parallel compensated	 1000 W 800 W	 2000 W 2000 W	 2000 W 2000 W	 3680 W 3000 W	 3680 W 3000 W
Sodium-vapour lamp Uncompensated luminaire Parallel compensated	 1000 W 800 W	 2000 W 2000 W	 2000 W 2000 W	 3680 W 3000 W	 3680 W 3000 W
Max. peak inrush-current I_p (150 µs)	200 A	400 A	400 A	600 A	600 A
Max. peak inrush-current I_p (250 µs)	160 A	320 A	320 A	480 A	480 A
Max. peak inrush-current I_p (600 µs)	100 A	200 A	200 A	300 A	300 A
Number of electronic ballasts (T5/T8, single element)[2]					
18 W (ABB EVG 1x58 CF)	10	23	23	26[1]	26[1]
24 W (ABB EVG-T5 1x24 CY)	10	23	23	26[1]	26[1]
36 W (ABB EVG 1x36 CF)	7	14	14	22	22
58 W (ABB EVG 1x58 CF)	5	11	11	12[1]	12[1]
80 W (Helvar EL 1x80 SC)	3	10	10	12[1]	12[1]

[1] Limited by protection with a B16 (B20 for 20 A device) miniature circuit breaker

[2] For multiple element lamps or other types the number of electronic ballasts must be determined using the peak inrush current of the electronic ballasts.

[3] The maximum peak inrush-current peak may not be exceeded

[4] Operations (state change)

Table 17: SA/S - switching performance overview

2.7 Electronic ballast calculation

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 switched on consecutively, with the electronic ballast all fluorescent lamps switch on practically simultaneously. If switch on occurs at the mains voltage peak, the buffer capacitor of the electronic ballast cause a high but very short current pulse. If multiple electronic ballasts are used in the same circuit, simultaneous charging of the capacitors can allow very high system inrush currents to flow.

This peak inrush current I_p is to be considered when designing the switch contacts as well as by the selection of the respective circuit protection.
In the following the effects of the electronic ballast peak inrush current and the associated limitation of the number of electronic ballasts in the switch 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 connectible electronic ballasts on every output can only relate to a defined type of electronic ballast.

For a different type this value can only be assumed to be an estimation.

In order to properly estimate the number of electronic ballasts, 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.

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

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

The relays of the switch actuators have the following maximum starting values:

	SA/S 4.6.1 **SA/S 8.6.1** **SA/S 12.6.1**	**SA/S 2.10.1** **SA/S 4.10.1** **SA/S 8.10.1** **SA/S 12.10.1**	**SA/S 2.16.1** **SA/S 4.16.1** **SA/S 8.16.1** **SA/S 12.16.1**	**SA/S 2.16.5S** **SA/S 4.16.5S** **SA/S 8.16.5S** **SA/S 12.16.5**	**SA/S 2.20.1S** **SA/S 4.20.1S** **SA/S 8.20.1S** **SA/S 12.20.1**
Max. peak inrush-current I_p (150 µs)	200 A	400 A	400 A	600 A	600 A
Max. peak inrush-current I_p (250 µs)	160 A	320 A	320 A	480 A	480 A
Max. peak inrush-current I_p (600 µs)	100 A	200 A	200 A	300 A	300 A

Table 18: Peak inrush currents

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

Example: ABB EVG 1x58 CF

Peak inrush current I_p = 33.9 A (147.1 µs)

For the SA/S 4.16.5S Switch Actuator this results in:

Maximum number of electronic ballast on every output
= 600 A/34 A = 17 electronic ballast

This number has been limited to 12 electronic ballasts in conjunction with a B16 miniature circuit breaker. If more electronic ballasts are connected the miniature circuit breaker may trip during switch on.

For the SA/S 4.6.1S Switch Actuator this results in:

Maximum number of electronic ballast on every output = 200 A / 34 A = 5 electronic ballasts

2.8 AC1, AC3, AX, C-Load specifications

Depending on the special area of application, differing switching capacities and performance specifications have set the tone in the industrial field and the domestic (building engineering) field. These performance specifications are defined in the respective national and international standards. The tests are defined to accommodate typical applications, e.g. motor loads (industrial) or fluorescent lamps (buildings).

The AC1 and AC3 specifications are switching capacities which have become the accepted standard in the industrial field.

AC1 – relates to the switching of ohmic loads (cos ϕ = 0.8)
AC3 – relates to a (inductive) motor load (cos ϕ = 0.45)

These switching capacities are defined in the standard EN 60947-4-1 “Contactors and motor-starters; Electromechanical contactors and motor-starters”. This standard describes motor starters and/or contactors which were previously used primarily in industrial applications.

The designation AX has established itself in the field of building engineering.

AX – relates to (capacitive) fluorescent lamp loads Switchable capacitive loads (200 µF, 140 µF, 70 µF or 35 µF) are referred to in conjunction with fluorescent lamp loads.

This switching capacity refers to the standard EN 60669 “Switches for household and similar fixed electrical installations”, which deals primarily with applications in building engineering. For 6 A devices a test with 70 µF is demanded and for devices exceeding 6 A, a test with 140 µF is demanded. The switching capacity specifications AC and AX are not directly comparable. However, the following switching capacity quality can still be determined:

The lowest switching capacity corresponds with the specification
AC1 – mainly for ohmic loads

The following switching capacity should be rated higher
AX – fluorescent lamp loads (According to the standard: 70 µF (6 A), 140 µF (10 A, 16 A).

The highest switching capacity is designated by
– AC3 – motor loads
– C-Load – fluorescent lamp loads (200µF)

Both specifications are almost equivalent. This means that a device which has fulfilled the test for AC3 to IEC 60947 will most probably fulfil the tests according to EN 60669 with 200 µF.

Finally, the following can be stated:

- Users or customers who are primarily involved withindustrial applications will refer to AC3 switching capacities.
- Users who are involved with building or lighting technology will more often than not refer to an AX switching capacity or C-Load (200 µF loads).

The switching capacity differences must be considered with type selection.

2.9 Current detection specifications

The switch actuators with current detection are recognisable by an “S” at the end of the type designation (e.g. SA/S 2.16.5**S**).

These are switch actuators with integrated load current recognition. Each output features its own current detection with evaluation electronics which can be parameterised separately. For individual parameterisation refer to section 3.4.1.8.

The current recognition detects sinusoidal load currents with a frequency range from 45 Hz to 60 Hz. The measured load currents are available as r.m.s. values. Non-sinusoidal currents (e.g. phase angle varied) can cause a measurement error depending on the curve type. If a DC current is superimposed, the output value may drop to 0 A. Phase angle varied currents are generated for example, by a current rectifier.

Only currents exceeding 100 mA can be displayed for technical reasons. Interference is suppressed by a low-pass filter and the display values are stabilised. The filter has a time constant τ of about 100 ms. Thus, a current change can only be detected after 100 ms at the earliest and can be sent on the bus if required.

The following technical data applies for the current detection:

Detection range:	0.1 A – 20 A
Accuracy:	+/– 8 % of the current value plus +/– 100 mA.
Time constant:	100 ms
Load current $I_{load\ AC}$:	0...20 A, sinusoidal
$I_{load\ DC}$:	not detected
Frequency range:	45...65 Hz
Ambient temperature:	– 5 °C...+ 40 °C

Example:

Detected current value	Max. Inaccuracy
300 mA	+/– 124 mA
2 A	+/– 0.26 A
16 A	+/– 1.38 A
20 A	+/– 1.70 A

Table 19 Current detection inaccuracy

For every channel the determined current values can be represented via a 2-Byte-value output object. The currents are represented as a counter value (DTP 7.012) with a resolution of 1 mA per digit.

It is possible to parameterise two threshold values for every channel. A 1bit telegram is sent on the bus if the threshold value goes above or falls below the current threshold value. Thus, malfunction of equipment can be detected and displayed. A significant enough current change to be registered will only be generated for fluorescent lighting with a minimum rating P_{min} = 40 W.

Technical properties

For example for dimensioning a malfunction display:

A circuit with 4 x 40 W incandescent lamps should be operated and malfunction of a lamp should be displayed. The threshold value should be defined for a current which corresponds to the rated current of 3.5 lamps!

$I_{threshold} = I_{typ}$ x (n-0.5)/n = P_{rated}/U_{rated} x (n-0.5)/n

n = number of connected devices
I_{typ} = typical current
P_{rated} = total power of the connected devices
U_n = rated Voltage

It results in:
I_{typ} = 4 x 40 W / 230 V = 0.696 A
$I_{threshold} = I_{typ}$ x (n-0.5)/n = 0.696 A x 3.5/4 = 0.609 A

Fault examination:

A 40 W incandescent lamp has an operating current of 174 mA at 230 V. Four lamps have an operating current of 696 mA. The maximum measuring error is 156 mA (8 % x 696 mA+/–100 mA). This error is less than the operating current of a 40 W incandescent lamp. Thus, when operation four 40 W incandescent lamps the malfunction of a lamp can be detected.

With 6 x 40 watt lamps an operating current of 1.043 A and a measuring error 183 mA results. This error is larger than the malfunction of a 40 watt (174 mA) lamp. Thus with 6 x 40 watt lamps a lamp failure can no longer be reliably detected.

Voltage fluctuations and current changes on the operation device (e.g. through temperature influences) must be considered and can lead in certain circumstances to an incorrect display of measured values.

2.10 Installation

The ABB i-bus® Switch 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.

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

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.

2.11 Commissioning requirements

The parameterisation of the switch actuators is implemented using the application programs Switch xfyS/2 (x = 2, 4, 8 or 12 number of outputs, y = rated current, S = current detection) and the ETS (from version ETS2 V1.3). If the 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 general output device functions
– Definition of the operating mode (switch actuator or heating actuator)
– Parameterisation of the output behaviour
– Assignment of the communication objects to EIB / KNX groups

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.

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.

2.12 Manual operation

The 10 A, 16 A and 20 A switch actuators can be manually operated. The switch actuators can be switched ON or OFF with an operating element on the relay. The operating element simultaneously indicates the switch status.

The Switch 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 when a switch command which is received via the bus, the manually set position is not changed, as the actuator continues to assume that a manual operation has not occurred and that a contact change is unnecessary.

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

2.13 Delivery state

The SA/S – switch actuators are supplied with the physical address 15.15.255. The load connection terminals are open and the bus terminal is fitted.

The *Switch, xfyS/*2 application program is preloaded. Hence, only group addresses and parameters must be loaded during commissioning. The entire application can be reloaded as required. A longer downtime may result if the application program is changed or after a discharge.

2.14 Assignment of the physical EIB / KNX address

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

The actuator features a programming button located on the edge of the device for assignment of the EIB / KNX physical 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.

2.15 Maintenance and cleaning

The SA/S – switch 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.

3 Commissioning

All SA/S – Switch Actuators feature the same range of functions and user interface with the exception of the current detection function and number of outputs. It is thus possible depending on the application to freely define every output and to parameterise them accordingly.

This significantly simplifies the engineering and the programming of the ABB i-bus® EIB / KNX switch actuators.

The switch actuators with current detection are designated by an "S" at the end of the type designation (e.g. SA/S 2.16.5**S**).

Each Switch Actuator has its own application program with the same functions, whereby the devices feature additional parameters and objects for the current recognition.

The following table is intended to provide an overview of the functions with the switch actuators and their application programs:

	SA/S 4.6.1 8.6.1 12.6.1	**SA/S 2.10.1 4.10.1 8.10.1 12.10.1**	**SA/S 2.16.1 4.16.1 8.16.1 12.16.1**	**SA/S 2.16.5S 4.16.5S 8.16.5S 12.16.5**	**SA/S 2.20.1S 4.20.1S 8.20.1S 12.20.1**
Installation type	MDRC	MDRC	MDRC	MDRC	MDRC
Number of outputs	4/8/12	2/4/8/12	2/4/8/12	2/4/8/12	2/4/8/12
Module widths (space unit)	2/4/6	2/4/8/12	2/4/8/12	2/4/8/12	2/4/8/12
Manual Operation		■	■	■	■
Contact position indication		■	■	■	■
I_n nominal current / A	6 AX	10 AX	16 A	16 AX C-Load	20 A
Current detection	-	-	-	■[1]	■[1]
	no				
Switch function					
- ON delay	■	■	■	■	■
- OFF delay	■	■	■	■	■
- Staircase lighting function	■	■	■	■	■
- Prewarning	■	■	■	■	■
- Modifiable staircase lighting time	■	■	■	■	■
- Flashing	■	■	■	■	■
- Normally open/normally closed adjustable	■	■	■	■	■
- Threshold values	■	■	■	■	■
- Current detection					
- Threshold value monitoring				■[1]	■[1]
- Measured value detection				■[1]	■[1]
Scene function	■	■	■	■	■
Logical functions					
- Logic function AND	■	■	■	■	■
- Logic function OR	■	■	■	■	■
- Logic function XOR	■	■	■	■	■
- Gate function	■	■	■	■	■
Priority object / forced operation	■	■	■	■	■
Heating/Fan control					
- Switch on-off (2 point)	■	■	■	■	■
- Cyclical monitoring	■	■	■	■	■
- Automatic purge	■	■	■	■	■
2)					
Special functions					
- Preference with bus voltage failure	■	■	■	■	■
- Feedback status	■	■	■	■	■

[1] Current detection for 2, 4 and 8 channel devices, for each channel separately

[2] Separate sample Blower/Fan Coil Actuator LFA/S is in preparation

Table 20: Application overview

3.1 Overview

For the Switch Actuator SA/S x.y.zS the application program ***Switch xfyS***/2 *(x = number of outputs, y = rated current, S = current detection)* is to be used. Programming requires the ETS2 V 1.3 or higher. If the ETS3 is used a ".VD3" type file must be imported

Type	Name	Max. number of communication objects	Max. number of group addresses	Max. number of associations
SA/S 4.6.1	Switch 4f 6A/2	64	254	254
SA/S 8.6.1	Switch 8f 6A/2	124	254	254
SA/S 12.6.1	Switch 12f 6A/2	184	254	254
SA/S 2.10.1	Switch 2f 10A/2	34	254	254
SA/S 4.10.1	Switch 4f 10A/2	64	254	254
SA/S 8.10.1	Switch 8f 10A/2	124	254	254
SA/S 12.10.1	Switch 12f 10A/2	184	254	254
SA/S 2.16.1	Switch 2f 16A/2	34	254	254
SA/S 4.16.1	Switch 4f 16A/2	64	254	254
SA/S 8.16.1	Switch 8f 16A/2	124	254	254
SA/S 12.16.1	Switch 12f 16A/2	184	254	254
SA/S 2.16.5S	Switch 2f 16CS/2	40	254	254
SA/S 4.16.5S	Switch 4f 16CS/2	76	254	254
SA/S 8.16.5S	Switch 8f 16CS/2	148	254	254
SA/S 12.16.5	Switch 12f 16C/2	220	254	254
SA/S 2.20.1S	Switch 2f 20SA/2	40	254	254
SA/S 4.20.1S	Switch 4f 20SA/2	76	254	254
SA/S 8.20.1S	Switch 8f 20SA/2	148	254	254
SA/S 12.20.1	Switch 12f 20A/2	220	254	254

Table 21: Overview of the application programs and the number of communication objects

The function of the application programs differs in terms of the number of outputs. The same communication objects and parameters are available. The commissioning user only has to learn to handle a single application program.

For the variants featuring current detection there are additional communication objects and parameters available for this function.

In order to guarantee simple project design the application program has been dynamically structured, i.e. in the basic setting only a few communication objects are visible on every output and only a few parameter pages are visible. Parameter pages and functions are enabled by activation of the respective functions and the full functionality of the application program becomes visible.

⚠ All switch actuators are delivered with the application program installed. Hence, only group addresses and parameters must be loaded during commissioning. If necessary, the entire application program can be loaded.

Two operating modes (main functions) are available for every output:

1. **Switch actuator** (see section 3.4)
   This function is used for normal switching e.g. of lighting. The output is controlled directly via the object “Switch”. A large number of additional functions (timing, logical, safety functions, etc.) are possible. Application descriptions can be found in section 4.2.
2. **Heating actuator** (see section 3.5)
   In this function, the output is used to control heating valves e.g. in an individual room temperature control system. A room thermostat sends a control value which the output uses to control the valve (e.g. as 2-step control). Application descriptions can be found in section 4.3.

3.2 Parameter window "General"

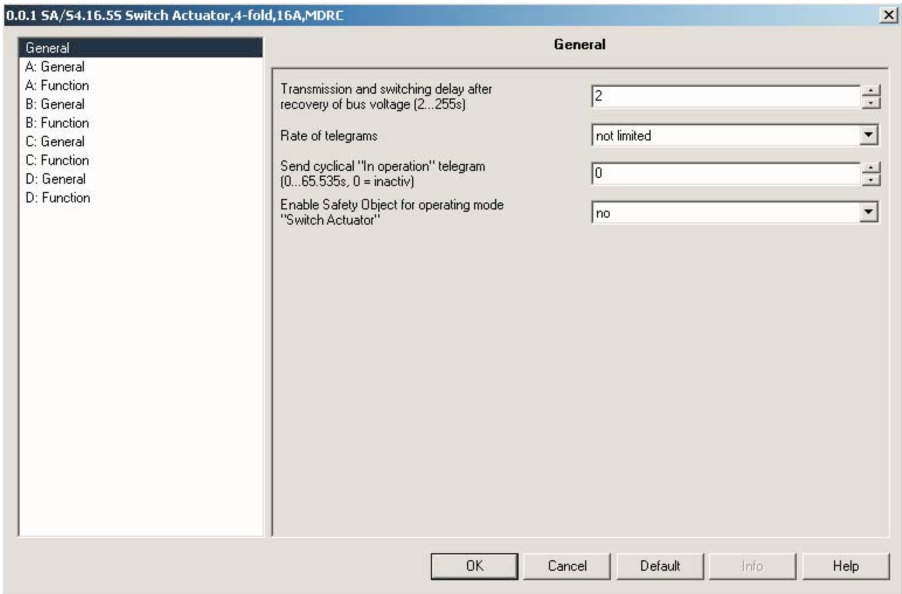


Fig. 17: "General" parameter window

In this parameter window general settings can be made which concern the Switch Actuator as a device with all its outputs.

Parameter "Transmission and switching delay after recovery of bus voltage (2...255s)"
The delay determines the time between the *bus voltage recovery* and the earliest time at which telegrams can be sent, and the earliest time at which the relays can switch. An initialisation time – reaction time of approx. 2 seconds until the processor is fully functional – is already included in the delay time.

If objects are read out via the bus during the delay time (e.g. from the visualisation), these requests are stored and if necessary answered after the time delay has timed out.

Options: **2**…255

If the delay time is long enough (see the switching times in the technical data in section 2) all contacts can switch simultaneously.

Note: The first switching action will only be initiated when enough energy is available to bring all outputs to the required position with a renewed 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 send delay is not influenced by this measure.

Parameter "Telegram rate"
A telegram limitation is determined with this parameter. The bus load can be influenced here.

Options: **no limitation**
1 telegram/second
2 telegrams/second
...
20 telegrams/second

Commissioning

The setting “1 telegram/second” means that a maximum of 1 telegram per second is sent by the switch actuator to the EIB / KNX. A maximum of 20 telegrams per second can be sentif the option “20 telegrams/second” is selected.

The telegrams are sent as quickly as possible at the start of the second. If the telegram limit is reached, sending the next telegram will be interrupted until the next second.

Parameter “Send cyclical ‚In operation‘ telegram (0...65.535s, 0 = inactive)”:
With the setting “0” the actuator does not send a monitoring telegram on the bus.

If a value not equal to “0” is selected, a telegram with the value “1” is sent cyclically with the delay interval on the bus via the communication object “In operation”.

Options: **0**...65.535, 0 = cyclical send inactive

The time interval of the send interval must be selected as long as possible in dependence on the application in order to keep the bus load as low as possible.

Parameter “Enable Safety Object for operating mode “Switch Actuator”
If “yes” is selected, parameters for 3 safety priorities are enabled.

Options: **no**
yes

The following parameter window results:

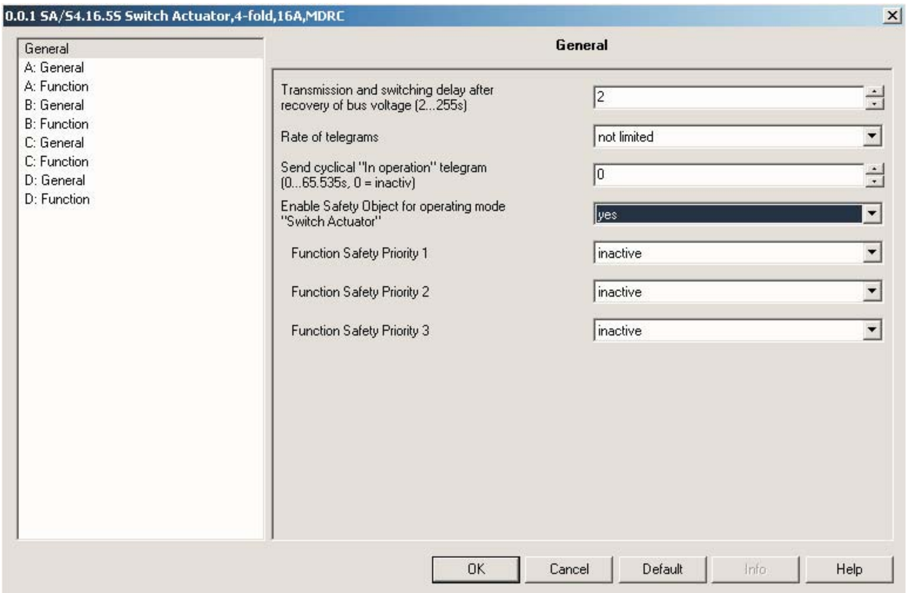


Fig. 18: Parameter window “General” - Safety Priorities

Parameter “Function Safety Priority x”, x = 1, 2, 3
Three safety priorities are available. For every priority, a trigger condition (safety disconnection) can be defined with this parameter. With every safety disconnection, 1 communication object “Safety Priority x” (x = 1, 2 or 3) will become visible. These objects relate to the entire device for the “Switch Actuator” mode of operation. However, every output can react differently to the receipt of a telegram. The reaction of the output is parameterised in the parameter window “X: Safety”.

Options: **inactive**
enable by Object value “0”
enable by Object value “1”

With the setting “enable by object value ‘0’” the activation of the safety is initiated when the object “Safety Priority x” receives a “0” telegram. With the setting “enable by object value ‘1’” activation is initiated on a “1” telegram. The switching state or every individual output can be parameterised in the parameter window “X: Safety”.

The option “inactive” has the effect that the safety priority is not used.

Parameter “Control period in seconds (0...65.535s, 0 = inactive)”
This parameter is only visible if the respective parameter “Enable function Safety Priority x” (x = 1, 2 or 3) is activated.

If no telegram from the object “Safety Priority x” is received within this time, the Safety Priority x triggers.

The triggering is prevented if a telegram with the non-trigger condition is received within the monitoring time by the object “Safety Priority x”. Determination of the trigger condition is implemented with the parameter “Function Safety Priority x”. After a non-trigger condition telegram is received, the time is reset and the monitoring sequence recommences from the start.

Options: **0**...65.535

If the value “0” is selected, no cyclical monitoring occurs. However, the “Safety Priority x” will still be triggered if a triggering telegram (refer to the “Function Safety Priority x”) is received.

The monitoring time in a Switch Actuator should be at least double so long as the cyclical send time of the sensor so that the alarm does not immediately occur if an individual signal is not received (e.g. due to a high bus load).

3.3 Parameter window “X: General”

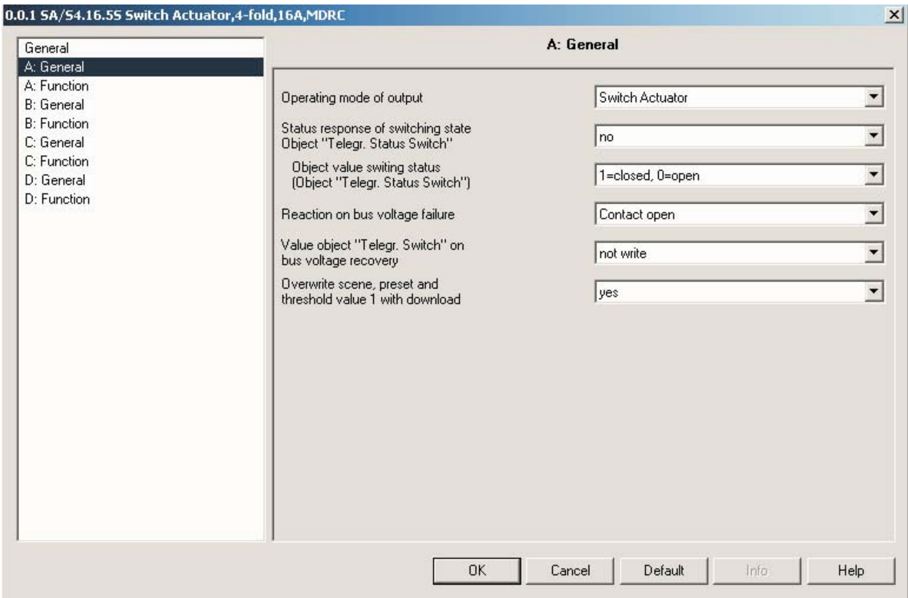


Fig. 19: Parameter window “X: General

This window is the first parameter window which relates to a determined output of the Switch Actuator.

In the following descriptions “Output X” or simply “X” represents an output on the Switch Actuator. The same parameter windows and communication objects are available for all other outputs.

In a parameter window designated with “X: ...”, parameter settings are made which apply to an individual window.

An operating mode and a range of functions must be selected for every output. Each function must be activated individually. Both operating modes as well as the various functions can be combined as desired in a switch actuator.

Parameter “Operating mode of output”
The function of the output X can be selected with this parameter.
Two operating modes are available.

Options:	**Switch Actuator**	*(see section 3.4)*
	Heating Actuator	*(see section 3.5)*

3.4 Operating mode "Switch Actuator"

The "Switch Actuator" mode is used for normal switching e.g. of lighting. The output is controlled via various logic, time and safety functions with the "Switch" object. A large number of additional functions are possible and are described in the following section.

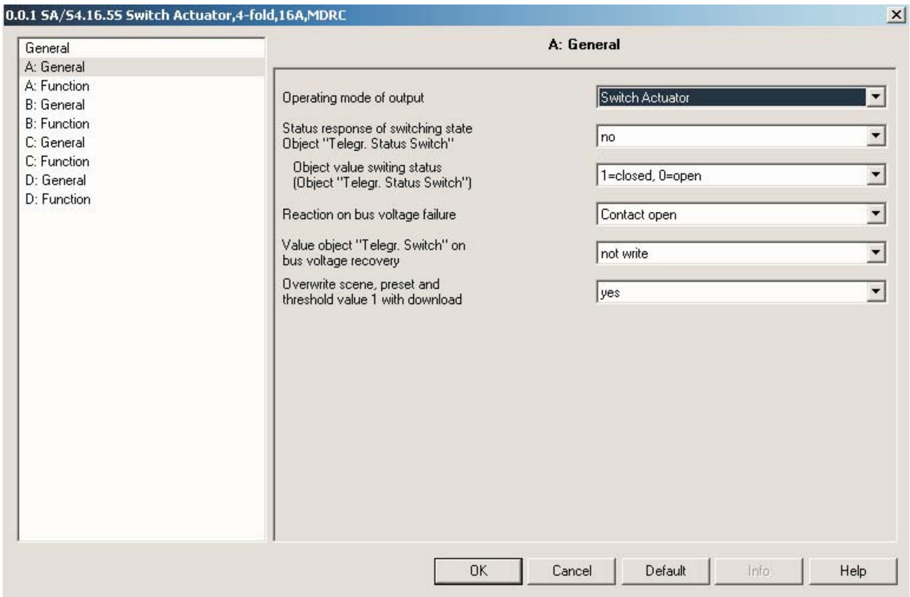


Fig. 20: Parameter window "X: General" - Switch Actuator

Parameter "Status response of switching state Object "Telegr. Status Switch""
With this parameter the object "Telegr. Status Switch" is released. It contains information concerning the current switch state / contact position.

Options: **no**
after a change
always

If "no" is set the object value will always be updated but not sent. The "always" setting has the effect that the contact position is updated and always sent, if a "switch option" is received, even if no switching or change in the object value has occurred. With the "after a change" setting the status telegram is only sent if the object value "Telegr. Status Switch" changes. The bus load can be greatly influenced here particularly with multichannel switch actuators.

The object value ("0" or "1") which is used at a contact position is possib-le with the "Object value contact position (Object "Telegr. Status Switch") parameter. This parameter appears if "after a change" or "always" have been selected.

The contact position can result from a series of priorities and logical func-tions (see the diagram in section 4.2.1).

Parameter "Object value contact position (Object "Telegr. Status Switch")"

Options: **"1" closed "0" open**
"0" close "1" open

With the setting ““1” close, “0” open” the value “1” is written with a closed contact, and the value “0” with an opened contact into the object “Telegr. Status Switch”. An inverted display is possible by the setting ““0” close, “1” open”.

Parameter “Reaction on bus voltage failure”
The output can adopt a defined state on bus voltage failure via this parameter. The following functions are available:

Options: **Contact unchanged**
Contact open
Contact closed

The general behaviour of the switch actuator during a bus voltage failure or ETS download is described in section 4.4.

Parameter “Value object “Telegr. Switch” on bus voltage recovery”
With this parameter the output can be influenced by the value of the “Switch” object on bus voltage recovery.

The “Switch” object can be written with either a “0” or “1” when the bus voltage recovers. The contact position is re-determined and set in dependence on the set device parameterisation (see the function chart in section 4.2.1). If “not write” is selected, the value “0” is written into the “Switch” object and remains so until the object is changed via the bus. The contact position is only re-evaluated at this time.

Options: **not write**
to write with 0
to write with 1

The Switch Actuator draws the energy for switching the contact from the bus. After the bus voltage has been applied, sufficient energy will only be available to switch all contacts simultaneously after 10 to 30 seconds, depending on the actuator type (refer to the technical data in section 2). 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 actuator 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.

Parameter “Overwrite scene, preset and threshold value 1 with download”
With this parameter you determine if the preset, scene values and theshold 1 are to be overwritten by the values in the ETS in the parameter windows for “X: Scene”, “X: Presets” or “X: Threshold”.

Options: **yes**
no

With the setting “yes” the values set in the parameter window “X: Scene” or “X: Presets” are transferred with a download in the switch actuator and the existing values are overwritten. Reprogramming to the scene or preset values remains possible at any time via the bus.

If the setting “no” is selected, the parameterised scene and preset values are not transferred to the switch actuator during a download. Thus, the values can only be changed or set via the bus.

More detailed information concerning storage of preset or scene values can be found in the description of the parameter windows “X: Scene” or “X: Presets”.

3.4.1 Parameter window for mode “Switch Actuator”

In the following parameter windows the parameterisation settings of the switch actuator function of an output are described.

3.4.1.1 Parameter window “X: Function” Switch Actuator

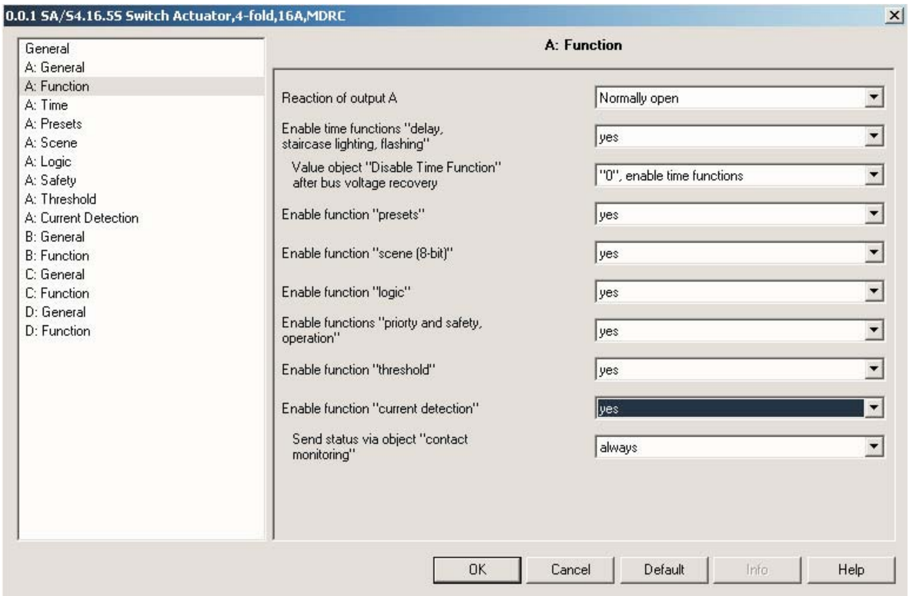


Fig. 21: Parameter window “X: Function” – switch actuator

Parameter “Reaction of output X”

It can be set in this parameter whether the output operates as a “Normally closed contact” or “Normally open contact”.

Options: **Normally open**
Normally closed contact

In the “Normally open” contact function, an ON “1” command leads to the closing of a contact while an OFF “0” contact causes the contact to be opened. When “Normally closed contact” is selected, the reverse process is carried out. An ON command (“1”) opens the contact and an OFF command (“0”) closes the contact.

Parameter “Enable time functions: “delay, staircase lighting, flashing”

This parameter enables the following time function:

On and off delay, staircase lighting and flashing

The Parameter window “X: Time” for output X is enabled. With the setting “no” the parameter window will remain blocked and invisible.

Options: **no**
yes

When the time function is activated, the communication object “Disable Time Function” is enabled. With this 1-Bit object the time functions On and off delay, staircase lighting and flashing can be enabled (“0”) or blocked (“1”) via the bus.

As long as the time function is blocked, the output can only be switched on and off without delay via the “Switch” object, whereby the function chart (section 4.2.1) with its priority sequence remains valid. After the time function is enabled, it can be activated by a new ON command.

If a time function is activated and the time function is then disabled with the “Disable Time Function” the switch position will remain as it is. A switch command via the “Switch” object effects non-delayed switching. Higher switch priorities such as, e.g. the safety functions are carried out.

The “Permanent ON” object is released with the release of the time function. The output is switched on via this object. It remains switched on until the “Permanent ON” object receives a telegram with the value “0”. The functions continue to operate in the background during the “Permanent ON” phase. The contact position at the end on the “Permanent ON” phase results from the functions which run in the background.

Parameter “Value object “Disable Time Function” after bus voltage recovery”
This parameter is visible if a time function is activated. You can use the

Options: **“0”, Enable time functions**
“1”, Disable time function

With selection “1”, i.e. “Disable time function” the time functions for the time, staircase lighting and flashing are disabled. They can only be enabled via the object “Disable Time Function”. With the setting “0”, i.e. “Disable time function” the time function is enabled and active after a bus voltage recovery.

If the “Disable Time Function” function is activated by the corresponding object during a sequence, the sequence stops and the current contact state is retained. This always ensures a safe state (light on) if the time function is blocked during the staircase lighting time countdown.

Parameter “Enable function presets”
This parameter enables the “Preset” function for output X.

Options: **no**
yes

Parameterisation is implemented in the parameter window “X: Preset” for the output X, which is enabled with the option “yes”. With the setting “no” the parameter window will remain blocked and invisible.

Parameter “Enable function scene (8-bit)”
The object “8-bit scene” is enabled via this parameter.

Options: **no**
yes

Parameterisation of the scene is implemented in the parameter window “X: Scene” for the output X, which is enabled with the option “yes”. With the setting “no” the parameter window will remain blocked and invisible.

Parameter “Enable function logic”
This parameter activates the “Logic”.

Options: **no**
yes

Parameterisation is implemented in the parameter window “X: Logic” for the output X, which is enabled with the option “yes”. The parameter window remains deactivated with the setting “no”.

Parameter “Enable functions priority and safety operation”
This parameter enables the safety function and the parameter window “X: Safety”. In this parameter window the “Safety priorities 1, 2, 3” and the “Forced operation” are programmed.

Options: **no**
yes

Parameterisation is implemented in the parameter window “X: Safety” for output X. The parameter window remains deactivated with the setting “no”.

Parameter “Enable function threshold”
This parameter activates the “Threshold function”.

Options: **no**
yes

Parameterisation is implemented in the parameter window “X: Threshold value” for the output X, which is enabled with the option “yes”. The parameter window remains deactivated with the setting “no”.

Parameter “Enable function Current Detection”

Options: **no**
yes

This parameter activates the “Current Detection” function. Parameterisation is implemented in the parameter window “X: Current Detection” of the output X. At the same time the communication object “contact monitoring” is released.

These parameters and functions are only visible on switch actuators with current detection. The Switch Actuators with integrated current detection are recognisable by an “S” at the end of the type designation (e.g. SA/S 2.16.5S).

With the “no” setting the parameter window for current detection remains deactivated.

Parameter “Status send contact monitoring object “Contact Monitoring””

Options: **no**
after a change
always

The transmission behaviour of the object value of the communication object “Contact monitoring” can be programmed with this parameter.

If “no” is set the object value will always be updated but not sent.
The “always” setting has the effect that the contact position is updated and sent if and only if the status change happened or the contact is switch off. If the contact is always opened no new status is send. No status is sent in case of the contact closing. A reset of the status is sent with the next opening of the contact. With the “after a change” setting a telegram is only sent if the “Contact monitoring” object value changes. The bus load can be greatly influenced here particularly with multichannel switch actuators.

A contact fault is indicated by the “Contact monitoring” object. A fault (object value “1”) is displayed if a current is detected (circa 100 mA) when the contact is open.

The contact change must be initiated by a switching operation via the EIB / KNX. Manual operation is not considered for the evaluation. The switch actuator can not differ between an broken wire and a manual switching.

3.4.1.2 Parameter window “X: Time”

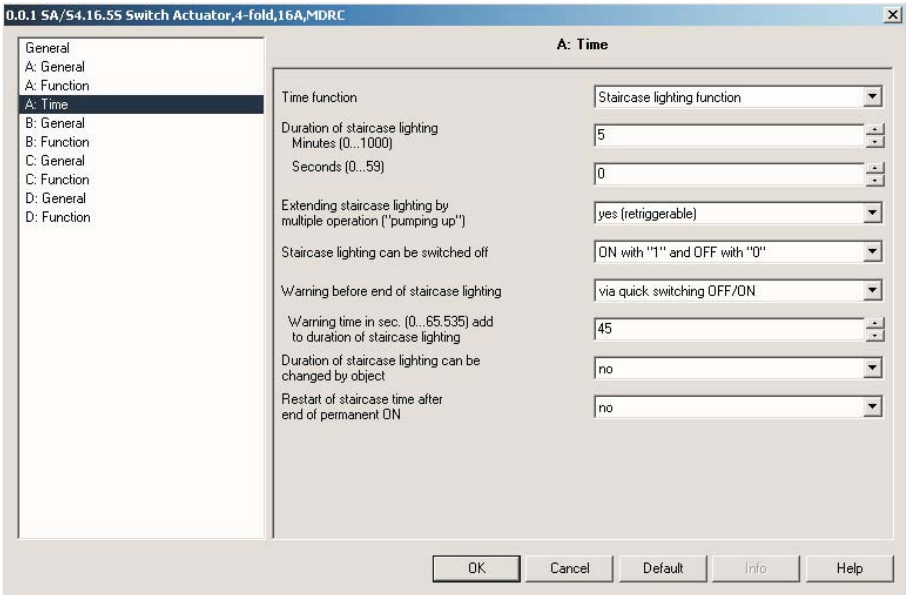


Fig. 22: Parameter window “X: Time” – Staircase lighting function

The time functions can be set here, such as duration of staircase lighting, on and off delay and flashing. The parameter window is enabled under “X: Function”.

Explanations about the time functions and sequences can be found in 4.2.2. Please observe the function chart in section 4.2.1, from which the switch and sequence priorities originate.

Parameter “Time function”
This parameter defines the type of the time function for an output.

Options: **Staircase lighting function**
ON/OFF delay
Flashing

Selection “Staircase lighting function”
The staircase lighting function is switched on via the switch on telegram of the communication object “Switch” of output X. The value of the switch object can be programmed. The staircase lighting time starts when it is switched on. It is switched off immediately when the staircase lighting time elapses if a warning time has not been set. If the warning time and the staircase lighting time are not equal to “0”, the staircase lighting time is extended by this time.

Note: “Switch on” means that a “normally open” contact is closed or a “normally closed” contact is opened.

Note: The staircase lighting function can be called by the object “Switch”, “Logical connection x” or a light scene call.

Note: The staircase lighting function can be disabled by a telegram to the object “Disable Time Function”. This function can be programmed in parameter window “X: Function” with an activated time function after a bus voltage failure.

Parameter "Duration of staircase lighting": Minutes (0...1.000), Seconds (0...59)"
The operating time defines how long the staircase lighting is switched on after an ON command. Two parameters for input in minutes and seconds are available:

Options: Minutes 0...**5**...1.000
Seconds **0**...59

If the warning time is not equal to "0", the staircase lighting time is extended by the warning time.

Parameter "Extending staircase lighting by multiple operation ("pumping up")"
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-fold time of 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.

Options: no (not retriggerable)
yes (retriggerable)
up to max. 1x staircase lighting time
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

With the setting "no" a received switch ON telegram is simply ignored. The staircase lighting time continues without modification to completion. If a normal simple retrigger function is required "up to max. 1x staircase lighting time" must be set. In this case the staircase lighting time is reset by a renewed switch on telegram and starts to run again from the start.

Parameter "Staircase lighting can be switched off"
Here you can set which telegram value is used to switch on and prematurely switch off the staircase lighting.

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

With the option "ON with "0" or "1", switch OFF not possible" the staircase lighting function is switched on independently of the value of the incoming telegram. Premature switch off is not possible.

Parameter "Warning before end of staircase lighting"
The user can be warned before the staircase lighting time elapses that the lighting is about to switch off. If the warning time is not equal to "0", the staircase lighting time is extended by the warning time. The warning time is not modified by the "pumping" action. With the option "**no**", no warning is given, the staircase lighting switches off immediately after the staircase lighting time has elapsed. If the staircase lighting is switched off prematurely (e.g. by a switch command) there is no warning.

Options: no
via object
via quick switching OFF/ON
via object and switching ON/OFF

There are two types of warning:
– The object "Warning stairc. lighting" is set to "1" at the start of the warning time and remains so until the warning time has elapsed. The object can be used for example to switch a warning lamp.
– Switching the output (briefly OFF and ON again).

Both possibilities can be used individually or can be combined. The time duration between the OFF and ON sequence is about 1 second. This time is extended when more than x switching operations per minute and device are undertaken. Refer to the technical data in chapter 2.

If the warning time is not equal to "0", the staircase lighting time is extended by the warning time.

Parameter "Warning time in sec. (0...65.535) add to duration of staircase lighting"
This parameter is visible if a warning is programmed for the staircase lighting function time. The "warning time" must be entered in seconds. The staircase lighting time is extended by the warning time. The warning is triggered at the start of the warning time.

Options: 0...**45**...65.535

The warning time is not modified by the "pumping" action.

It is important to note that the Switch Actuator receives its switching energy exclusively via the EIB / KNX bus. Furthermore, the switch actuator collects enough energy before initial switching to bring all outputs to the required position with a bus voltage failure. Under these constraints, only a certain number of switching operations per minute are possible. Refer to the technical data in chapter 2.

Parameter “Duration of staircase lighting can be changed by object”
With the option “yes” a 2-Byte communication object “Duration of staircase lighting” can be enabled with which the staircase lighting time is modified via the bus. If “no” is selected, no modification of the staircase lighting time is possible via the bus. The value defines the staircase lighting time in seconds.

The staircase lightning function which has already commenced is completed. A change of the staircase lighting time is used the next time it is accessed.

Options: **no**
yes

Note: With a bus voltage failure, the staircase lighting time changed via the bus is lost and must be reset. Until a new value is set the staircase lighting time programmed via the ETS applies.

The behaviour of the staircase lighting function with a bus voltage failure is determined by the parameter “Reaction on bus voltage failure” on the parameter page “X: General”.

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

1. By the object “Disable Time Function”. (Programming is implemented on the parameter page “X: Function”). If the time function is blocked after bus voltage recovery the staircase lighting can normally only be switched ON and OFF via the object “Switch”.
2. If the light is switched ON or OFF with a bus voltage recovery depends on the programming of the “Switch” object on the parameter page “X: General”.

Parameter “Restart of staircase time after end of permanent ON”

Options: no
yes

With the “no” setting the lighting switches off when the permanent lighting on has ended. With the “yes” setting the lighting remains on and the staircase lighting time restarts. The function of continuously ON is controlled via the “Permanent ON” object value. If the 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 object “Permanent ON” receives the value “0”.

Permanent ON only switches ON and “masks” the other functions. This means that other functions (e.g. stairlight time , pumps, etc.) will continue to run in the background but will not have any effect. After Permanent ON has ended the switch state which would occur without permanent ON activates. The behaviour for the staircase lighting function after permanent ON is programmed in parameter window “X: Time”.

Selection "ON/OFF delay"

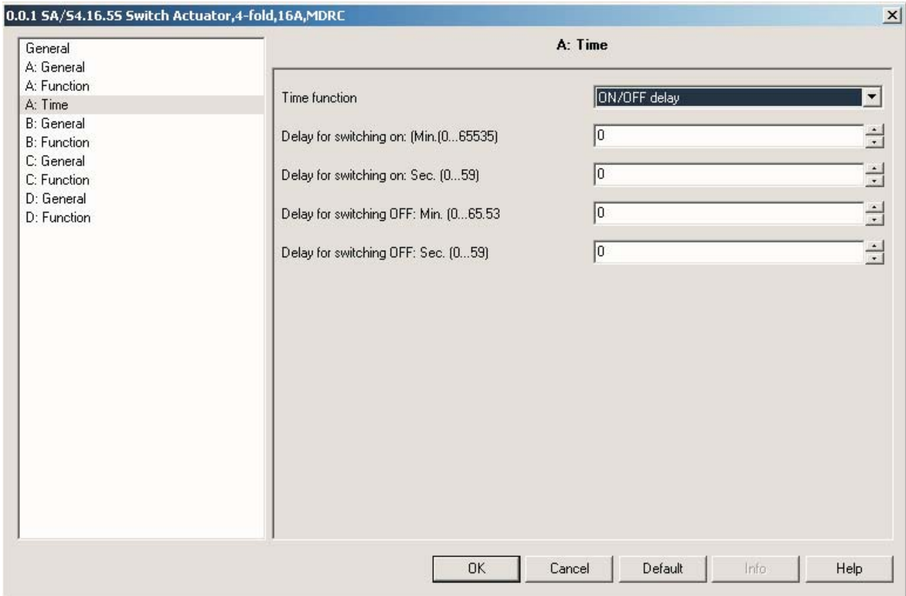


Fig. 23: Parameter window "X: Time" – "ON/OFF delay"

Timing diagrams and the effects of various ON and OFF telegrams in combination with the ON and OFF delay can be found in section 4.2.2.2.

Note: The delay function can be disabled by a telegram to the object "Disable Time Function". This function can be programmed in parameter window "X: Function" with an activated time function after a bus voltage failure.

Parameter "Delay for switching on: Min. (0...65.535)"
The time in minutes by which the switch on command is delayed is set here. The time can be entered with minutes and seconds (see the next parameter).

Options: **0**...65.535 minutes

Parameter "Delay for switching on: Sec. (0...59)"
The time in seconds by which the switch on command is delayed is set here. The time can be entered with minutes and seconds (see the previous parameter).

Options: **0**...59 seconds

Parameter "Delay for switching off: Min. (0...65.535)"
The time in seconds by which the switch off is delayed after the switch off command is set here. The time can be entered with minutes and seconds (see the next parameter).

Options: **0**...65.535 minutes

Parameter "Delay for switching off: Sec. (0...59)"
The time in seconds by which the switch off is delayed after the command is set here. The time can be entered with minutes and seconds (see the previous parameter).

Options: **0**...59 seconds

Selection “Flashing”

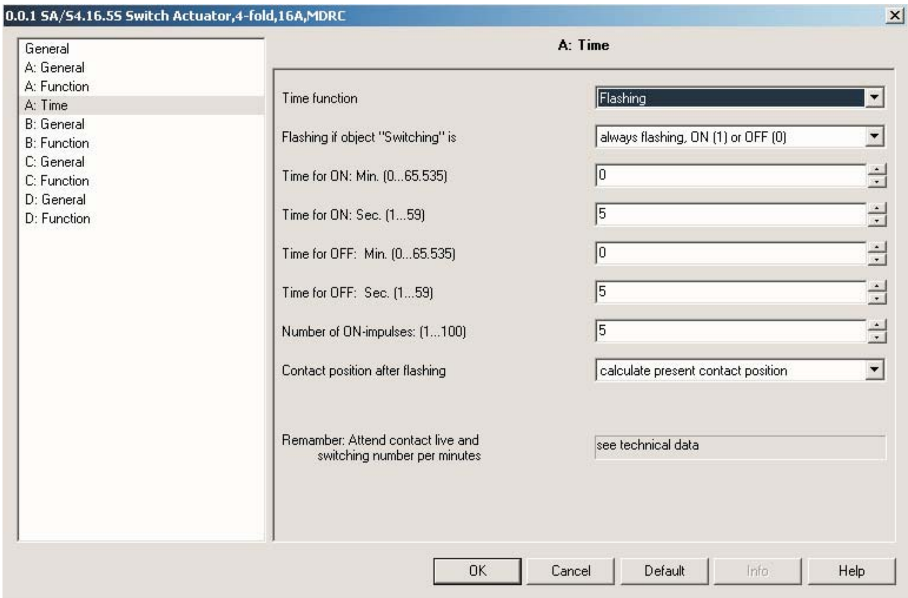


Fig. 24: Parameter window “X: Time” – Flashing

When the flashing function is activated, the output starts to flash as soon as the object “Switch” receives the corresponding value. The flashing rate can be set in the parameters for “Time for ON” or “Time for OFF”. At the start of the flash rate, the output is always switched ON by a normally open contact and OFF by a normally closed contact. On receipt of a new value at the object “Switch”, the flashing rate starts from the beginning.

The relay state after flashing can be programmed.

The flashing can be inverted whereby the output is operated as a “Normally closed contact”.

The object “Telegr. Status Switch”, indicates the current state of the relay during flashing.

It is possible to choose between 240 (6 A devices) and 60 (16 A / 20 A devices) contact position changes (ON or OFF) per minute and switch actuator (see technical data). If more switching operations are performed, extended pauses between two switching operations may be the result.

With the selection of the flash function the endurance of the switching contacts (see technical data) must be considered.

Note: The flashing can be disabled by a telegram to the object “Disable Time Function”. This function can be programmed in parameter window “X: Function” with an activated time function after a bus voltage failure.

Parameter "'Flashing if object "Switching" is"
This parameter sets which value (ON or OFF) of the object "Switch" causes the output to flash.

Options: ON (1)
OFF (0)
always flashing, ON (1) or OFF (0)

With the option ON (1) the flushing will start when a "1" telegram is received on the "switch" communication object. A telegram with the value "0" stops the flashing.
With the option "OFF (0)" the flashing will start when a telegram with the value "0" is received. A telegram with "1" stops the flashing.
The option "always flashing ON (1) or OFF (1)" both telegrams "0" and "1" on the "switch" object starts the flashing. In this case no manual end of the flashing is possible.

Parameter "Time for ON: Min. (0...65.535), Sec. (1...59)"
This parameter defines how long the output is switched on during a flashing rate. The smallest value is 1 second.

Options: **0**...65.535 minutes
1...**5**...59 seconds

It is important to note that only a limited number of switching operations per minute and actuator can be performed. With frequent switching a switching delay can occur. The same applies after bus voltage recovery. Refer to the technical data in chapter 2.

Parameter "Time for OFF: Min. (0...65.535), Sec. (1...59)"
This parameter defines how long the output is switched off during a flashing rate. The smallest value is 1 second.

Options: **0**...5...65.535 minutes
1...**5**...59 seconds

It is important to note that only a limited number of switching operations per minute and actuator can be performed. With frequent switching a switching delay can occur. The same applies after bus voltage recovery. Refer to the technical data in chapter 2.

Parameter "Number of ON-impulses (1...100)"
The number of flashing pulses can be limited with this parameter. This is necessary in order to preserve the contact life by frequent and excessive switching.

Options: 1...**5**...100

Parameter "Contact position after flashing"
With this parameter you can determine the state of the output after flashing has occurred.

Options: **ON**
OFF
calculate present contact position

The setting "calculate present contact position" has the effect that the output assumes the switching state which currently results from the device and object settings, e.g. by logic operations or parameter settings. Refer to the function chart in section 4.2.1.

3.4.1.3 Parameter window “X: Preset”

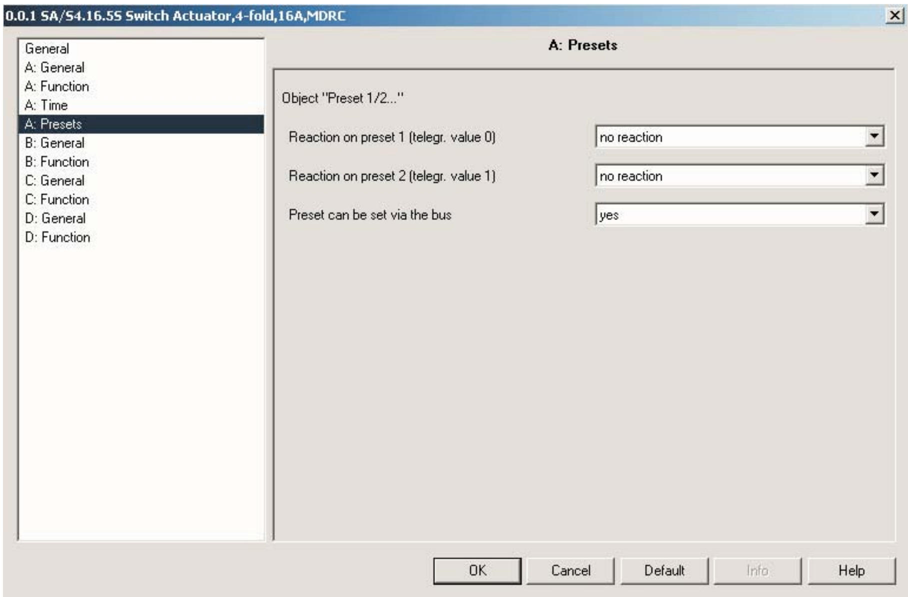


Fig. 25: Parameter window “X: Preset”

The preset function is enabled on the parameter page “X: Function Presets” to call a parameterised value, e.g. in order to implement lightscenes.
In addition, the output value that is currently set can be saved as a new preset value.

The Preset values can be set (stored) via the bus. In Parameter window “X: General” it can be set if the values set in the ETS are transferred with a download in the switch actuator. The values saved in the actuator are overwritten in this way.

Two objects are available for accessing and saving presets. There are two presets which are activated by the telegram value “0” (preset 1) or “1” (preset 2).

Parameter “Reaction on preset 1 (telegr. value 0)”
Here the contact position which is to be set if the object “Call preset 1/2” receives the telegram value “0” is set here.

Options: **no reaction**
ON
OFF
restore old value before preset 2
restore parameterized value of preset 2

The option “restore old value before preset 2” has the following effect:
The current state of the switching relay is stored when preset 2 is activated. This stored value is retained until preset 1 is again activated. The switch state is again stored if preset 2 is activated again.

Example: With preset 2, the lighting in a conference room is recalled for a presentation. When the presentation is finished, the lighting is restored via preset1 to the state it was in beforehand.

The option “restore parameterized value of preset 2” resets preset 2 to the parameterised value. This can be useful if the preset can be stored via the bus.

The option “no reaction” have the meaning that with the preset recall no switching will proceed. The preset command will ignore. Also the storage over the bus will ignore. This means no preset value will store over the bus command, the preset is still inactive.

Parameter “Reaction on preset2 (telegr. value 1)”
The contact position which is to be set if the object “Call preset 1/2” receives the telegram value 1” is set here.

Options: **no reaction**
ON
OFF

Parameter “Preset can be set via the bus”
The object “Set preset 1/2” is enabled via this parameter (parameter value “yes”). It is used to store the current contact position as a preset value. When the telegram value “0” is received the value for Preset 1 is saved. When the telegram value “1” is received, the value (the current contact position) for preset 2 is saved. When for the Preset “restore old value”, “restore parameterzized value 2” or “no reaction” is set, the value for Preset 1 is not saved. The new object value is ignored in this case.

Options: **yes**
no

With the parameter “Overwrite scene, preset and threshold value 1“ preset with download” in the parameter window “X: General” it is possible to protect and not overwrite the preset values set via the bus during a download.

If the bus voltage fails, the saved preset values are lost. They are overwritten by parameterised defined values.

3.4.1.4 Parameter window "X: Scene"

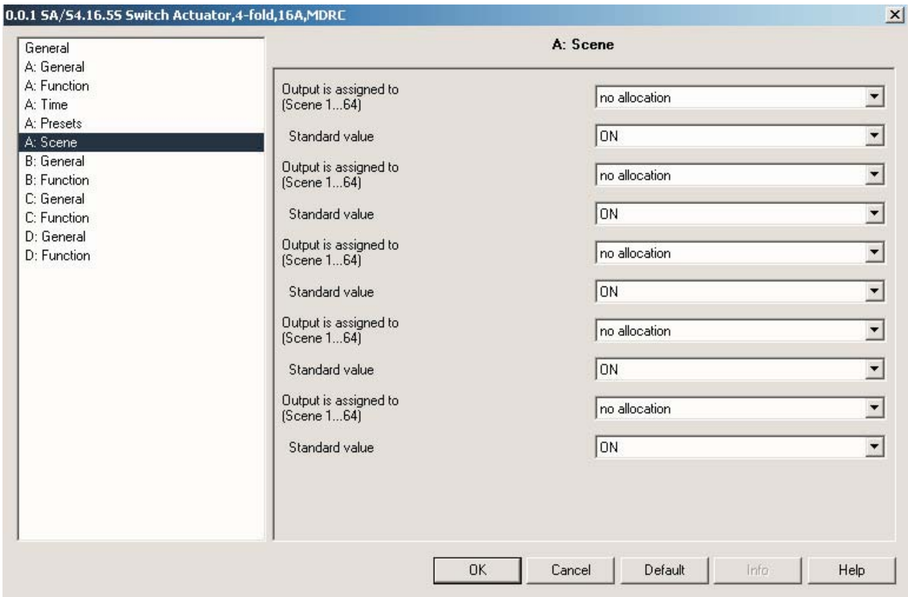


Fig. 26: Parameter window "X: Scene"

The scene function is enabled on the parameter page "X: Function"

The scene values can be set (stored) via the bus. In Parameter window "X: General" it can be set that the values set in the ETS are transferred with a download in the Switch Actuator. The values stored in the actuator are overwritten and lost in this manner.

Parameter "Output is assigned to (Scene 1...64)"
The output can be assigned to 64 different lightscenes via a group address. The output can be assigned to 5 lightscenes as a slave.

Options: **no allocation**
Scene 1
...
Scene 64

Parameter "Standard value"
Here you set which state the output adopts when the scene is called.

Options: **ON**
OFF

By storing a scene, the user has the possibility of modifying the value that is parameterised here. The stored scene values are lost if the bus voltage fails. The values programmed in the ETS are restored with a bus voltage recovery.

Note: When a scene is called
– the time functions are restarted
– the logic operations are re-evaluated

More detailed information about the coding of an 8 bit scene can be found in the object description and Appendix A2. The function of the 8 bit scene is explained in more detail in section 4.2.5.

3.4.1.5 Parameter window “X: Logic”

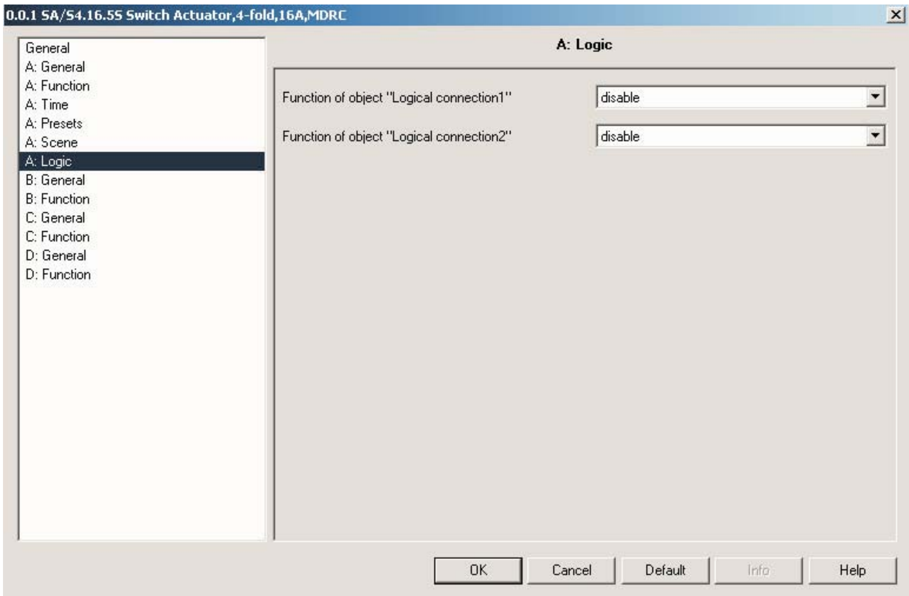


Fig. 27: Parameter window “X: Logic”

The logic function makes up to two logic objects available for each output, these objects are logically linked with the object “Switch”. The parameter window is enabled under “X: Function”.

The logic function is always recalculated on receipt of an object value. The object “Logical connection 1” is first evaluated together with the object “Switch”. The result is then linked with object “Logical connection 2”.

Explanations about the logic function can be found in section 4.2.3. Please note the function chart in section 4.2.1.

Parameter “Logical connection x” (x = 1, 2)
With this parameter the object “Logical connection 1” or “Logical connection 2” is enabled.

Options: **disable**
enable

Parameter “Function of object ‘Logical connection x’” (x = 1, 2)
The logic function of the object “Logical connection x” is defined here with the “Logical connection x”. All three standard operators are possible (AND, OR, XOR). The gate function is also available which can block switching commands. With the setting “inactive” of the parameters “Logical connection x” the logical function is switched off.

Options: **AND**
OR
XOR
Gate function

Explanations about the logic functions can be found in section 4.2.3.

Parameter "Result is inverted"
This parameter is visible if a logic function has been selected. The result of the logic can be inverted via the setting "yes". The setting "no" does not invert.

Options: **no**
yes

Parameter "Object value" Logical connection x" (x=1, 2) after bus voltage recovery"
This parameter is visible if a logic function has been selected. This parameter defines which value is assigned to the object "Logical connection x" after bus voltage recovery. The same object values "0" and "1" are available.

Options: **0**
1

Parameter "Gate disabled, if Logical connection x"
This parameter is visible if the function "Gate function" is been selected. It determines at which object "Logical connection x" value the gate is disabled. The following options are available to choose from:

Options: **0**
1

A gate disable has the effect that the telegrams received at the object "Switch" are ignored. As long as the gate function is activated, the value which was present when the gate function commenced remains on the output of the gate.

At the end of the gate function the current switching state is determined by the object values. Refer to the function chart in section 4.2.1. The gate function is deactivated with a bus voltage failure and will remain deactivated then the bus voltage recovers.

The same parameter programming exists for a second logic connection with the object value "Logical connection 2". See the function chart in section 4.2.3.

3.4.1.6 3Parameter window “X: Safety”

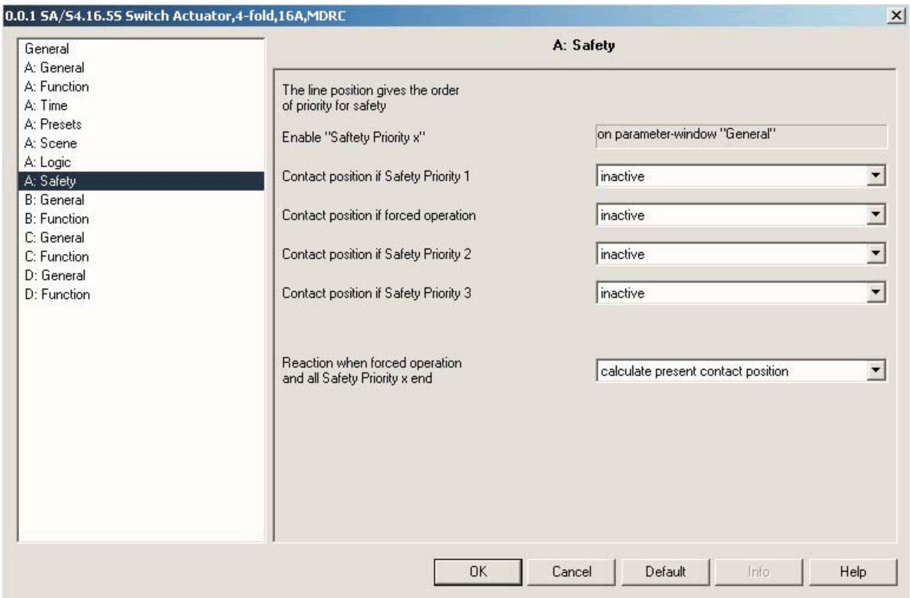


Fig. 28: Parameter window “X: Safety”

The parameter window is enabled under “X: Function”.

The forced operation (one 1-bit or 2-bit object on every output) or safety position (three independent 1-bit objects per switch actuator) sets the output to a defined state which cannot be modified while the forced operation is active. Only the reaction on bus voltage failure/recovery has a higher priority.

Enabling of the three safety priorities “Safety Priority x” (x=1, 2, 3) is implemented in the parameter window “General”. In this window the monitoring time and the telegram value to be monitored are set. If the device does not receive any telegrams the output is set to the safety position.
The safety position of the output can be determined on each output individually on a safety object. This definition is programmed in parameter window “X: Safety”, which will be described in the following.

In contrast to the three safety priorities, a forced operation object is available for every object. The forced operation can take be activated or deactivated via a 1-bit or 2-bit object. When using the 2-bit object, the output state is defined via the object value. The control of the actuation can be disabled via the object “Switch”.

When all the safety settings and the forced operations are completed, the switch state of the output can be programmed.

If multiple demands occur, the priority should be defined as follows.
This corresponds with the sequence on parameter page “X: Safety”,

- Safety Priority 1
- Forced Positioning
- Safety Priority 2
- Safety Priority 3

With the selection “inactive” the security priority or the forced operation and the respective communication object are not considered and bypassed in the priority rules.

Parameter "Contact position if Safety Priority x" (x=1,2,3)
The switch position of the output is determined via this parameter if the safety condition "Safety Priority x" (setting on parameter page "General") is fulfilled.

Options: unchanged
inactive
ON
OFF

The 1bit object "Safety Priority x" is used as a master for the safety position. The switch positions ON, OFF and unchanged are available. The option "inactive" has the consequence that the state of the object "Safety Priority x" has no effect on the output.

Parameter "Contact position if forced operation"
The forced operation relates to a 1bit or 2bit safety object "Forced operation" of output X, which is available for every output.

Options: **inactive**
unchanged via 1bit object
ON, via 1bit object
OFF, via 1bit object
switch position via 2bit Object

With the option "inactive" the object "forced operation" is invisible and the function forced operation is inactive. The options "unchanged via 1bit object", "on, via 1bit object" and "off, via 1bit object" relate to the 1bit safety object "forced operation" and determine the switching state of the output during the forced operation.

With the option "switch position via 2bit Object" a 2bit object "forced operation" is enabled. The telegram value which is sent via the 2bit object determines the switch position as follows:

Value	Bit 1	Bit 0	Access	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) or "1", the output of the switch actuator is switched off and remains / inhibited until forced operation is again deactivated. Actuation via another object is not possible as long as the forced operation is activated. The state of the output can be programmed at the end of forced operation.
3	1	1	forced ON	If the object "forced operation" receives a telegram with the value "3" (binary 11), the output of the Switch Actuator 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. The state of the output can be programmed at the end of forced operation.

Table 22: Overview of 2-Bit forced operation object

Parameter "Object value "Forced positioning" on bus voltage recovery"
This parameter is only visible if the forced operation is activated.

Depending on whether the forced operation object is a 1 or 2bit object, two different programming possibilities are available:

Options for 1bit: **disable**
enable

The selection "active" has the effect that the forced operation continues to be active after bus voltage recovery. The switch position of the output is defined by the programming "Contact position if forced operation".
With the selection "inactive" the forced operation is switched off and the output behaves as if it has been programmed with the parameter "Behaviour end of safety".

Options for 2bit: **"0" inactive**
"2" OFF
"3" ON

The selection "'2' OFF" has the consequence that the object "forced operation" is written with the value "2" and the output is switched OFF.
With the selection "'3' ON" with object "forced operation" is written with the value "3" and the output is switched ON.

With the selection "inactive" the forced operation is switched off and the output behaves as if it has been programmed with the parameter "Behaviour end of safety".

Parameter "Reaction when forced operation and all Safety Priority x end"
This parameter is only visible if the forced operation or a "Safety priority x" function is activated.

Options: **calculate present contact position**
ON
OFF
unchanged

The contact position of the relay at the end of the forced operation or safety position is defined here. The switch state can be programmed to OFF, ON, "according switch object" or "unchanged". With the setting "unchanged" the contact position which was set during forced operation will be retained. The contact position only changes after a new calculated switch position has been received. In contrast, the switch value setting "according switch object" is calculated immediately at the end of forced operation and implemented immediately, i.e. during the forced operation the actuator continues to operate normally in the background, but the output is not changed and set only after the end of safety.

3.4.1.7 Parameter window “X: Threshold”

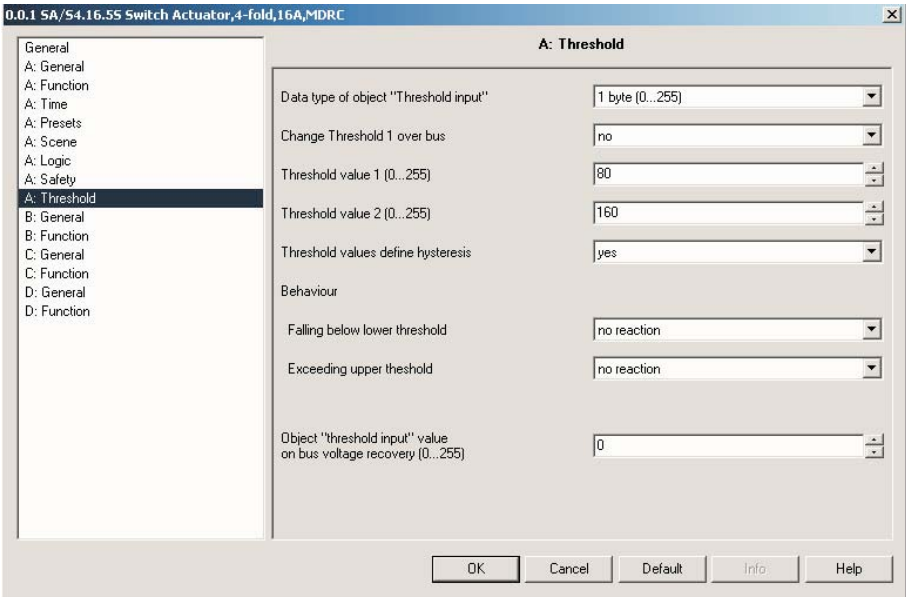


Fig. 29: Parameter window “X: Threshold”

The threshold function enables the evaluation of a 1byte or 2byte object “Threshold input”. As soon as the object value falls below or exceeds a threshold value, a switching operation can be triggered. Up to two independent threshold values are available in total. The parameter window is enabled under “X: Function”. The threshold 1 can set over bus.

Explanations about the threshold value function can be found in section 4.2.6.

If the threshold value function is activated the Switch Actuator can continue to receive telegrams (switch commands). The predefined contact position can be modified by the threshold value function, see the function chart in section 4.2.1. The threshold value function generates a switch command when a new threshold value telegram is received and when a simultaneous new switch condition exceeding or falling below the switching criteria exists.

Parameter “Data type of object, ‘Threshold input’”
The data type for the threshold value which can be received is determined by the object “Threshold input”.

Options: **1byte (0...255)**
2byte (0...65.635)

It is possible to select between a 1byte integer and 2byte counter value.

Parameter “Change Threshold 1 over bus”
This parameter determines if threshold value 1 can be changed via the bus.

Options: **no**
yes

If “yes” is selected the communications object “Change Threshold value 1” of output X also appears. This can be a 1byte or 2byte object depending on the programming of the threshold value input.

The threshold value 2 can only be programmed via the ETS in the parameter window “X: Threshold”.

With the “no” setting the threshold values 1 cannot be modified via the bus.

Parameter "Threshold value 1" and "Threshold value 2"
Two threshold values can be defined here. The value range is dependent on the data type.

Options: 0...**80**...255, **for 1byte object and threshold 1**
0...**160**...255, **for 1byte object and threshold 2**
Options: 0...**20.000**...65.535, **for 2byte object and threshold 1**
0...**40.000**...65.535, **for 2byte object and threshold 2**

Parameter "Threshold values define hysteresis"
This parameter defines whether the 1st and 2nd threshold values should be interpreted as hysteresis limits.

Options: no
yes

The hysteresis can reduce unwanted violations of the threshold value if the input value fluctuates around one of the threshold values. More detailed information can be found in section 4.2.6.

Parameter "falling below lower threshold" and
Parameter "Exceeding upper threshold"
These parameters are visible if the threshold values are interpreted as hysteresis limits by "yes" setting. They define the reaction of the output if the object value in dependence on the threshold value (object value). If the object value "Threshold input" exceeds the upper or lower threshold value.

Options: **unchanged**
OFF
ON

A reaction only occurs if the object value was previously smaller or larger than the lower or upper threshold value. More detailed information can be found in section 4.2.6.

Parameter "Object value < lower threshold"
Parameter "Lower thrsh. <= object <= upper thrsh."
Parameter "Object value > upper threshold"
These parameters are visible if the threshold values are interpreted as hysteresis limits by "no" setting. They define the reaction (ON, OFF, unchanged) dependent on the threshold value.

Options: **unchanged**
ON
OFF

Parameter "Object "threshold input" value on bus voltage recovery (0...255)" or (0...65.535)
The value of the object "Threshold input" after bus voltage recovery can be determined here.

Options: **0**...255 (1byte object)
0...65.535 (2byte object)

After a bus voltage recovery the threshold is calculation with the last known threshold. If no threshold is known before the factory side set threshold (lower than threshold) is used.

3.4.1.8 Parameter window “X: Current Detection”

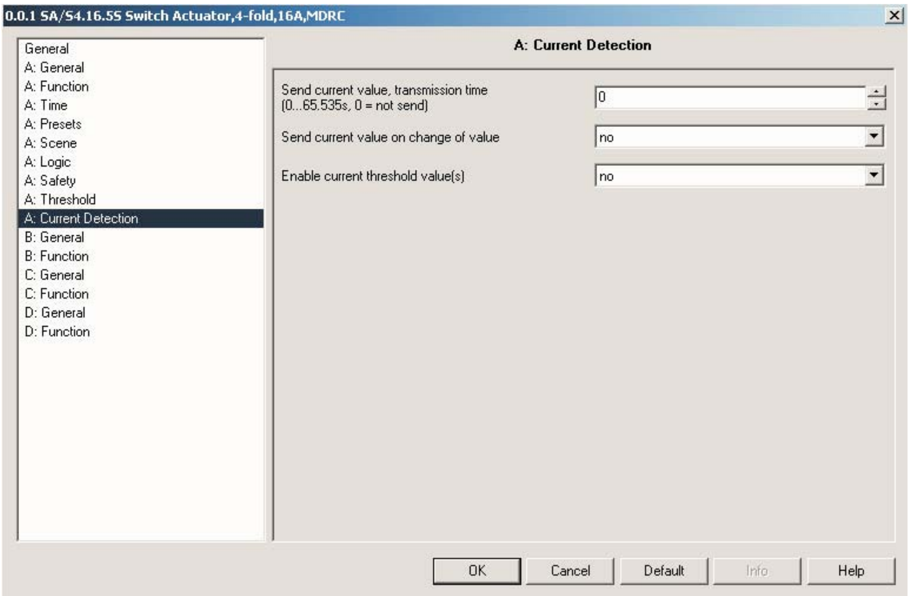


Fig. 30: Parameter window “X: Current detection”

This Parameter window “X: Current Detection” is visible if in parameter window X: Function” the parameter “Enable function Current Detection” has been set to “yes”. The current detection is visible in both modes: “Switch Actuator” and “Heating Actuator” if the actuator features a current recognition.

Via the parameter window “X: Current Detection” it is possible to define if and how the load current of the output is evaluated. The function current detection and the respective parameter window is visible with the switch actuators with current detection (SA/S x.y.z**S**). The communication object “Current Value” is always visible when the current detection is active. Technical details concerning current detection can be found in section 2.9. See section 4.1 for the application description.

With the “Current Value” communication object the detected current value can be sent on the EIB / KNX as an mA value. It is a 2-Byte counter value (EIS 10, DPT 7.012, 1 mA per digit). It is important to observe that the current detection range is designed for currents between 100 mA and 20 A.

Parameter “Send current value, transmission time (0...65.535s, 0 = not send)”
With this parameter it is possible to define if and at which intervals the up-to-date value of current is sent via the communication object “Current Value”. A “cycle time” must be entered in seconds.

Options: **0**
1...65.535

The option “0” has the effect that no cyclical current values are sent via the bus. The up-to-date values of current are continuously available in the communication object “Current Value” of the output X and can be read.

Parameter "Send current value on change of value"
With this parameter you can determine that the current value is sent on the bus via the communication object "Current Value" on output X, if the current value changes. A current value is only sent on the bus if a change in current exceeding the value set in this parameter occurs. The following current values are available:

Options: **no**, 50 mA, 100 mA, 200 mA, 500 mA, 1 A, 2 A, 5 A.

With the option "no" the function "Send current value on change" is deactivated.

The smaller the set current value, the more exactly the sent current value corresponds with the actual current value. If however the current value fluctuates greatly it may result in a high level of bus loading.

Details concerning the accuracy of the current values can be found in section 2.9.

If the function send current value cyclically is also activated, the change of the cycle time is set to zero and recommences when the count is also activated.

Note: If for example a current value change of 1 A has been selected, a current value is only sent if the load current exceeds 1 A assuming a reference value of 0 A. This means for example, that no current value is sent (displayed) if a current of 0.9 A flows. Or seen from another perspective, a current value can be displayed (sent), even though no current flows. Assuming a value of 1.5 A, the current is reduced to zero. A current value of 0.5 A is sent on the bus. As a current value change of 1 A does not occur to the current value zero, no new value is sent on the bus. The last sent and displayed value is 0.5 A.

This inaccuracy can be prevented if the "send current value cyclically" function has also been activated. Thus, the current value is always displayed after a certain interval.

Parameter "Enable threshold(s)"

Options: **no**
yes

With this parameter you can select if threshold values are used for detected currents. Up to two current threshold values are enabled in the following.

No current threshold is used with the "no" setting.

The setting "yes" initially enables a current threshold value with the corresponding programming option and communication object "Status Current-Threshold 1". The following parameter window appears.

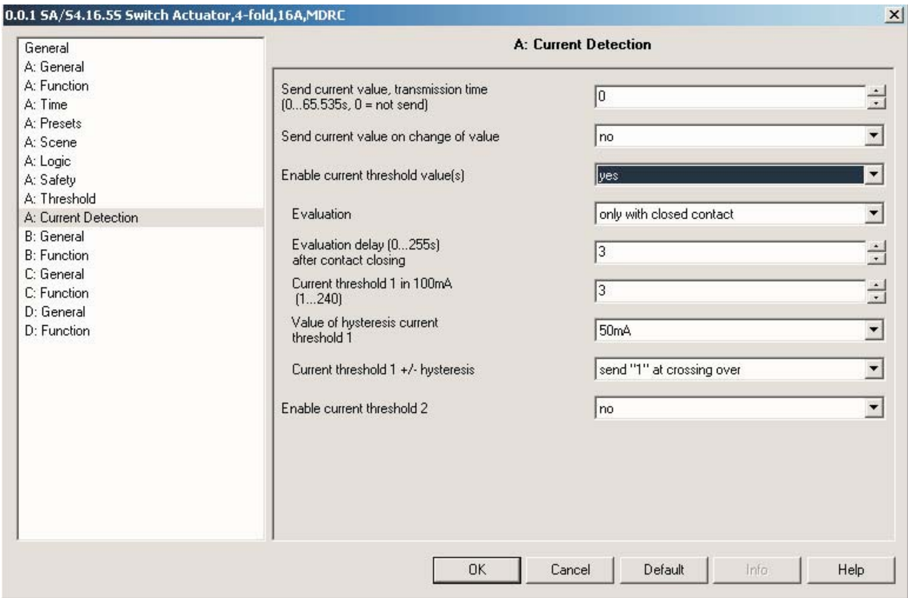


Fig. 31: Parameter windows “X Current Detection” – current threshold

Parameter “Evaluation”

This parameter is only visible if the Parameter “Enable threshold(s)” has been released with “yes”.

Options: always
only with closed contact
only with opened contact

With this parameter it is possible to define in which contact position the current threshold value is to be evaluated.

The “always” setting causes the current threshold to be evaluated at every contact position. This has the effect that a current threshold undershoot (as a fault) is signalled intentionally each time a contact is opened via the EIB / KNX (current flow interrupted).

The setting “only with closed contact” has the effect that the current threshold evaluation only takes place with a closed contact. This has the effect that with intentional switching and the associated interruption in the current flow, there will be no current threshold undershoot (fault) signalled. A prerequisite for correct evaluation is that the contact is closed via a switching action initiated via the EIB / KNX. Manual switching is not detected and the current threshold evaluation is not interrupted and is interpreted as a loss of power or the failure of a load. The evaluation occurs after the time delay set in the parameter “Evaluation delay (0…255 s) after closing of the contact” has timed out.

The setting “only with opened contact” has the effect that the current threshold evaluation only takes place with an opened contact. Accordingly, it is possible to immediately detect if a contact which has been switched off is switched back on again manually. The evaluation occurs approx. 1 second after the contact has been opened. The time is fixed and cannot be influenced.

Monitoring is not just undertaken once when a contact changes but rather is undertaken continuously (approx. 1 second).

Parameter “Evaluation delay (0…255 s) after closing of the contact”
This parameter is only visible if the Parameter “Enable threshold(s)” has been released with “yes”.

Options: 0...**3**..255

The parameter is entered in seconds. The option “0” has the effect that the current threshold values are evaluated immediately after the contact switches. This time ensures that transient starting currents or current spikes caused by the switching process do not lead to an unwanted current threshold value signal.

Parameter “Current threshold x, in 100 mA (0=inactive) (0...240)” (x=1, 2)
This parameter is only visible if at least one threshold value has been activated. It is possible to enter a threshold value in 100 mA steps with this parameter.

Options: 2...**3**...240 (threshold values 1)
2...**40**..240 (threshold values 2)

Parameter “Value of hysteresis threshold x” (x=1, 2)
Both of these parameters are visible if the respective threshold value is activated.

Options: 25 mA, **50 mA**, 100 mA, 200 mA, 500 mA, 1A, 2A, 5A

In order to avoid a continuous change of the threshold value state, the thresholds for the current recognition feature a hysteresis function. With this function a continuous current change about the threshold value is avoided and prevents continuous generation of the communication object “Status Current-Threshold x”. The set hysteresis threshold ensures that a current change is only registered as a current change, if the current value is greater than or less than the threshold value. Only then will a change of status be signalled. Refer to the diagram in section 4.1.1 for a better understanding of the concept.

Parameter “Current threshold x +/– hysteresis” (x = 1, 2)
With these parameters the object value of “Status Current-Threshold x” exceeding or falling below the threshold x can be programmed.

Options: no sending
send “0” at crossing over
send “1” at crossing over
send “1” at crossing lower
send “0” at crossing lower
send “0” at crossing over - “1” at crossing lower
send “1” at crossing over - “0” at crossing lower

With the option “send “1” at crossing over”, a “1” is sent via the object “Status Current-Threshold 1” when the threshold value 1 is exceeded.
If it falls below the value, the object value is set to “0”, but no telegram is sent. The option “send “0” at crossing over” has the effect that a “0” is sent when the threshold value is exceeded with exactly the same behaviour.

Parameter "Enable threshold 2"

Options: **no**
yes

No second current threshold is used with the "no" setting.

The setting "yes" initially enables a second current threshold value with the corresponding programming option and communication object "Status Current-Threshold 2". The same evaluation delay and evaluation attribute which applies for current threshold value 2 also applies for current threshold value 1. Otherwise the threshold values are independent of each other.

3.4.2 Communication objects operating mode "Switch Actuator"

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	-	
1	Safety Priority 1	General	1 bit	C	-	W	-	U	
2	Safety Priority 2	General	1 bit	C	-	W	-	U	
3	Safety Priority 3	General	1 bit	C	-	W	-	U	

<table>
<tr><th>No.</th><th>Function</th><th>Object name</th><th>Data type</th><th>Flags</th></tr>
<tr><td>0</td><td>In operation</td><td>General</td><td>1bit (EIS 1)
DPT 1.002</td><td>C, R, T</td></tr>
<tr><td colspan="5">In order to regularly verify the presence of the Switch Actuator EIB / KNX, a monitoring telegram can be sent cyclically on the bus. The communication object is always visible.

Telegram value "1" Status</td></tr>
<tr><td>1</td><td>Safety Priority 1</td><td>General</td><td>1bit (EIS 1)
DPT 1.005</td><td>C, W, U</td></tr>
<tr><td colspan="5">The Switch Actuator can receive a 1-Bit telegram via this communication object, which another EIB / KNX slave (e.g. diagnosis unit, wind sensor, etc.) sends cyclically. The communication capability of the bus or sensor (signalling device) can be monitored with the receipt of the telegram. If the Switch Actuator does not receive a telegram at the communication object "Safety Priority 1" (value can be programmed in the parameter window "General") within a determined period, a malfunction is assumed and a response as defined in parameter window "X: Safety" is triggered.

The output of the Switch Actuator assumes the safety state and does not distribute telegrams. Only after the communication object "Safety Priority 1" has received a "1" or "0" (depending on the programming) will the incoming telegrams be processed again and the contact position changed.

The monitoring time can be set in the parameter window "General" via the parameter "Control period in seconds".

The safety priority 1 can also be triggered if a telegram with the programmable trigger value (in the parameter window "General") has been received.</td></tr>
<tr><td>2</td><td>Safety Priority 2</td><td>General</td><td>1bit (EIS 1)
DPT 1.005</td><td>C, W, U</td></tr>
<tr><td colspan="5">This communication object has the same function as the "Safety Priority 1" objects described beforehand, but for a second safety priority.</td></tr>
<tr><td>3</td><td>Safety Priority 3</td><td>General</td><td>1bit (EIS 1)
DPT 1.005</td><td>C, W, U</td></tr>
<tr><td colspan="5">This communication object has the same function as the "Safety Priority 1" objects described beforehand, but for a third safety priority.</td></tr>
</table>

Table 23: General device communication objects

General communication objects on every output

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
10	Telegr. Switch	Output A	1 bit	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
10...[1)] 230	**Switch**	**Output X**	**1bit (EIS 1) DPT 1.001**	**C, W**
This object is used for switching an output ON/OFF. The device receives a switch command via the switch object. If the output is programmed as a “normally open” contact, the relay is closed with telegram value “1” and opened with telegram value “1” (and the inverse is true when programmed as a “normally closed” contact). Note: With logic operations or forced operations a change of the switch object does not automatically lead to a change of the contact position. Refer to the function chart in section 4.2.1				

1) For the SA/S outputs 2 to max. 12 the respective objects 30 to 230 apply.

Table 24: General communication objects on every output

Function: Delay, staircase lighting, flashing

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
11	Permanent ON	Output A	1 bit	C	-	W	-	-	
12	Disable Time Funktion	Output A	1 bit	C	-	W	-	-	
13	Duration of staircase lighting	Output A	2 Byte	C	R	W	-	-	
14	Telegr. warning stair lighting	Output A	1 bit	C	-	-	T	-	

<table>
<tr><th>No.</th><th>Function</th><th>name</th><th>Data type</th><th>Flags</th></tr>
<tr><td>11... [1)]
231</td><td>Permanent ON</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.001</td><td>C, W</td></tr>
<tr><td colspan="5">This object is visible if in parameter window “X: Function” the time function has been activated. If the 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 object “Permanent ON” has the value “0”. After the permanent ON state has been ended, the state of the communication object “Switch” is used in order to recalculate the contact position in dependence on the device settings
(see function chart section 4.2.1).

The “Permanent ON” only switch the relay ON and covers other functions. This functions like staircase lighting or time retrigger still running without tripping a visible action. After finishing Permanent ON the switch position will evaluate again as no Permanent ON was active.

The behaviour for the staircase lighting function after permanent ON is programmed in parameter window “X: Time”.

This object can be used for example to allow the caretaker or maintenance and cleaning personnel to initiate a permanent ON.</td></tr>
<tr><td>12... [1)]
232</td><td>Disable Time Function</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.003</td><td>C, W</td></tr>
<tr><td colspan="5">This object is visible if in parameter window “X: Function” the time function has been enabled. The time function (delay, staircase lighting and flashing) can be enabled or disabled via this object. After bus voltage recovery, the object value can be determined via the parameter “Value object “Disable Time Function” after bus voltage recovery” in the parameter window “X: Function”. See section 4.2.2 for an application example.

Telegram value “1” caused the time function to be disabled
Telegram value “0” caused the time function to be enabled
If the time function is blocked only a switch without delay is possible.
The contact position at the time of the inhibit remains and will only be changed with the next switch command.</td></tr>
<tr><td>13... [1)]
233</td><td>Duration of staircase lighting</td><td>Output X</td><td>2byte (EIS 10)
DPT 7.001)</td><td>C, R, W</td></tr>
<tr><td colspan="5">This object is visible if in parameter window “X: Time” the parameter “Duration of staircase lighting can be changed by object” is selected with “yes”.

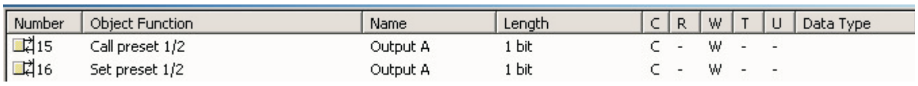
The staircase lighting time can be set via this object. The time is defined in seconds. After bus voltage recovery the object value is set by the programmed value and the value set via the bus is overwritten.</td></tr>
<tr><td>14... [1)]
244</td><td>Telegr. Warning stairc. lighting</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.005</td><td>C, T</td></tr>
<tr><td colspan="5">If in parameter window “X Time” the time function “Staircase lighting” is selected and via the parameter “Warning before end of staircase lighting” a warning via object is selected, this object will become visible. The object value is programmable and warns before the staircase lighting is switched off.

E.g. during the staircase lighting ON duration up to the start of the pre-warn time, a “0” can be sent to this object, and at the point of the pre-warning a “1” can be sent to this object. In this manner a warning can be switched on.</td></tr>
</table>

[1)] For the SA/S outputs 2 to max. 12 the respective objects 3x to 23x apply.

Table 25: Time function communication objects

Function: Preset



Number	Object Function	Name	Length	C	R	W	T	U	Data Type
15	Call preset 1/2	Output A	1 bit	C	-	W	-	-	
16	Set preset 1/2	Output A	1 bit	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
15... [1] **235**	**Call Preset 1/2**	**Output X**	**1bit (EIS 1) DPT 1.022**	**C, W**
A stored switch state is accessed with this object. If the value “0” is sent to this object, the programmed or stored switch state of “Preset1” is accessed. Accordingly, the value “1” has the effect that the programmed switch state of “Preset 2” is accessed. A retrieval of “Preset 1” can as a consequence with the respective programming, initiate that the state of the retrieval to “Preset 2” is restored, or the switch state is reset to the programmed value of Preset 2 (useful if Preset 2 can be stored).				
16... [1] **236**	**Set preset 1/2**	**Output X**	**1bit (EIS 1) DPT 1.022**	**C, W**
Using this object it is possible to store the current switch state as the new preset value. The object value “0” has the effect that the current switch state is stored as “Preset 1”. The value “1” saves the current switch state as the Preset 2 value. See section 4.2.4 for example.				

[1] For the SA/S outputs 2 to max. 12 the respective objects 3x to 23x apply.

Table 26: Preset function communication objects

Function: 8 bit scene

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
17	8-Bit-Scene	Output A	1 Byte	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
17...[1] 237	8bit scene	Output X	1byte Non EIS DPT 18.001	C, W

Via this 8 bit communication object a scene command can be sent via a coded telegram. The telegram contains the number of the respective scene as well as the information if the scene is to be recalled, or if the current switch state is to be assigned to the scene.
The communication object is only visible if the output X in the parameter window "X: Scene" is assigned to at least one 8bit scene.

Telegram format (1byte): MXSSSSSS
(MSB) (LSB)
M: 0 – scene is recalled
1 – scene is stored (if allowed)
X: not used
S: Number of the scene (1 ... 64: 00000000 ... 00111111)

EIB / KNX 1byte telegram value		Meaning
Decimal	Hexadecimal	
00 or 64 01 or 65 02 or 66 ... 63 or 127	00h or 40h 01h or 41h 02h or 42h ... 3Fh or 7Fh	Recall scene 1 Recall scene 2 Recall scene 3 ... Recall scene 64
128 or 192 129 or 193 130 or 194 ... 191 or 255	80h or B0h 81h or B1h 82h or B2h ... AFh or FFh	Store scene 1 Store scene 2 Store scene 3 ... Store scene 64

The exact code table for 8 bit scene telegrams can be seen in Appendix A2.

An example of an 8 bit scene is described in section "Application and planning" 4.2.5.

[1] For the SA/S outputs 2 to max. 12 the respective objects 37 to 237 apply.

Table 27: Communication objects 8 bit scene

Function: Logical connection

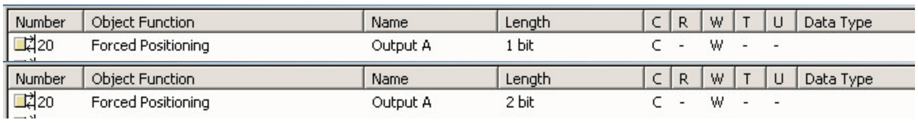
Number	Object Function	Name	Length	C	R	W	T	U	Data Type
18	Logical connection 1	Output A	1 bit	C	-	W	-	-	
19	Logical connection 2	Output A	1 bit	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
18...[1)] 238	**Logical connection 1**	**Output X**	**1bit (EIS 1) DPT 1.002**	**C, R**
The object is visible if the logic function in parameter window "X: Function" has been enabled. The output X can be assigned to the first of two logic objects. The logic operation is to be determined in the parameter window "X: Logic". First of all the switch object is linked with the object "Logical connection 1". The result is then linked with object "Logical connection 2". An example with function chart can be found in section 4.2.3.				
19...[1)] 239	**Logical connection 2**	**Output X**	**1bit (EIS 1) DPT 1.002**	**C, R**
Via this object the output X can be assigned to the second logic function. The logic operation is to be determined in the parameter window "X: Logic". First of all the switch object is linked with the object "Logical connection 1". The result is then linked with object "Logical connection 2". An example with function chart can be found in section 4.2.3.				

[1)] For the SA/S outputs 2 to max. 12 the respective objects 3x to 23x apply.

Table 28: Communication objects logical connection

Function: Safety, forced operation, cyclical monitoring



Number	Object Function	Name	Length	C	R	W	T	U	Data Type
20	Forced Positioning	Output A	1 bit	C	-	W	-	-	

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
20	Forced Positioning	Output A	2 bit	C	-	W	-	-	

<table>
<tr><th>No.</th><th>Function</th><th>Object name</th><th>Data type</th><th>Flags</th></tr>
<tr><td>20...[1)]
240</td><td>Forced operation</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.003</td><td>C, W</td></tr>
<tr><td colspan="5">This object is visible if in parameter window “X: Safety” the parameter “Contact position if forced operation” has been selected as a 1bit object.

If this object contains the value “1” the output is forcibly set to the programmed switch position which has been set in the parameter window “X: Safety”. The forced position of the contact remains until the forced position has ended. This is the case if a “0” is received via the “Forced operation” object.

It is important to note that the function “Security priority 1” and a bus failure have a higher priority on the switch state. See the function chart in section 4.2.1.</td></tr>
<tr><td>20...[1)]
240</td><td>Forced operation</td><td>Output X</td><td>2bit (EIS 8)
DPT 2.006</td><td>C, W</td></tr>
<tr><td colspan="5">This object is visible if in parameter window “X: Safety” the parameter “Contact position if forced operation” has been selected as a 2-Bit object.

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 contact:

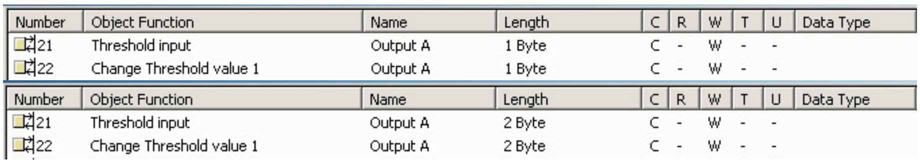
“0” or “1” — The output is not forcibly operated
“2” — The output is forcibly switched OFF
“3” — The output is forcibly switched ON

At the end of the forced operation it will first of all be verified if the 3 “Safety priority x” functions are active. If necessary, the contact position is set which results by the active safety priority. If no security priority is active, the contact position which is programmed in the parameter window “X: Safety” is set with the parameter “Reaction when forced operation and all Safety Priority x end”.</td></tr>
</table>

[1)] For the SA/S outputs 2 to max. 12 the respective objects 40 to 240 apply.

Table 29: Communication objects safety, forced operation, cyclical monitoring

Function: Threshold



Number	Object Function	Name	Length	C	R	W	T	U	Data Type
21	Threshold input	Output A	1 Byte	C	-	W	-	-	
22	Change Threshold value 1	Output A	1 Byte	C	-	W	-	-	

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
21	Threshold input	Output A	2 Byte	C	-	W	-	-	
22	Change Threshold value 1	Output A	2 Byte	C	-	W	-	-	

No.	Function	Object name	Data type	Flags
21...[1)] **241**	**Threshold input**	**Output X**	**1byte (EIS 6)** **2byte (EIS 5)** **DPT 5.010** **DPT 7.001**	**C, W**
This object is enabled if in parameter window “X: Function” the threshold function has been activated. Depending on the programming in the parameter window “X: Threshold” the object can be a 1byte (integer value) or 2byte object (floating comma value). If the object value exceeds one of the programmed thresholds in the parameter window “X: Threshold” a switching action can be implemented.				
22...[1)] **242**	**Change Threshold value 1**	**Output X**	**1byte (EIS 6)** **2byte (EIS 5)** **DPT 5.010** **DPT 7.001**	**C, W**
“Threshold 1” can be modified via the bus with the object “Change Threshold value 1”. This object is enabled if in parameter window “X: Threshold” the parameter “Change Threshold 1 over bus” is activated. Depending on threshold 1 the object “Change Threshold value 1” can be a 1byte or 2byte object.				
23 **24**	**Free**	**not assigned**		

[1)] For the SA/S outputs 2 to max. 12 the respective objects 4x to 24x apply.

Table 30: Time function communication threshold

Function: Current detection

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
25	Contact monitoring	Output A	1 bit	C	-	-	T	-	
26	Current Value	Output A	2 Byte	C	R	-	T	-	
27	Status Current-Threshold 1	Output A	1 bit	C	-	-	T	-	
28	Status Current-Threshold 2	Output A	1 bit	C	-	-	T	-	

25...[1)] 245	**Contact monitoring**	**Output X**	**1bit (EIS 1) DTP 1.002**	**C, R, T**
The contact state can be indicated in dependence on the switching action sent via the EIB / KNX with this object. The value “1” (contact fault) is assumed if the contact is opened via a switching action and a current is still detected (contact welded) or if the contact is closed manually and a current will detect. The evaluation if a current flows or does not flow is undertaken in the steady-state approximation of 2 seconds after the switching action. The current is safely detected if it is greater than 100 mA.				
26...[1)] 246	**Current Value**	**Output X**	**2byte (EIS 10) DPT 7.012**	**C, R, T**
The currently detected current value can be sent on the EIB / KNX with this object. This object is “Current Value” enabled if in parameter window “X: Function” the function “Current Detection” is activated. The Current Value is a 2-Byte counter value (EIS 10, DPT 7.012) 1 mA per digit. It is important to observe that the current detection range is designed for currents between 100 mA and 20 A. See section 2.9 for the current value accuracy.				
27...[1)] 247	**Status Current-Threshold 1**	**Output X**	**1bit (EIS 1) DTP 1.002**	**C, R, T**
A “1” (programmable) is sent via this object if the current value does not exceed the threshold1 plus the hysteresis threshold 1. If the threshold 1 minus the threshold 1 hysteresis is not exceeded, the object has the value “0” (programmable). Parameterisation is implemented in the parameter window “X: Current detection”. The exact function of the current threshold function is described in section 4.1.1.				
28...[1)] 248	**Status Current-Threshold 2**	**Output X**	**1bit (EIS 1) DTP 1.002**	**C, R, T**
A “1” (programmable) is sent via this object if the current value does not exceed the threshold 2 plus the hysteresis threshold 2. If the threshold 2 minus the threshold 2 hysteresis is not exceeded, the object has the value “0” (programmable). Parameterisation is implemented in the parameter window “X: Current detection”. The exact function of the current threshold function is described in section 4.1.1.				

[1)] For the SA/S outputs 2 to max. 12 the respective objects 4x to 24x apply.

Table 31: Time function communication current detection

Switch status

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
29	Telegr. Status Switch	Output A	1 bit	C	-	-	T	-	

29...[1)] 249	**Telegr. Status Switch**	**Output X**	**1bit (EIS 1) DPT 1.002**	**C, T**
This object is visible if the parameter “Status response of switching state Object “Telegr. Status Switch” in the parameter window “A: General” is assigned with the value “yes”. The object value directly indicates the current contact position of the switching relay. Via the parameter “Status response of switching state Object ‘Telegr. Status Switch’” in parameter window “X: General”, it is possible to set if the open relay contact is displayed with the value “0” or “1”.				

[1)] For the SA/S outputs 2 to max. 12 the respective objects 49 to 249 apply.

Table 32: Communication object switch status

3.5 Operating mode "Heating Actuator"

In the "Heating Actuator" operating mode the Switch Actuator is generally used to control an electro-thermal valve drive. Room temperature can be controlled in conjunction with a room thermostat or room thermometer which controls the Switch Actuator.

Various types of control are possible, e.g. PWM and 2-step control (1bit) or a continuous control (1byte).

Each individual output of the Switch Actuator can be controlled via a 1bit control value (2-step control, PWM control, pulse width modulation).
The switch objects of the outputs must be linked with the control value objects of the room thermostat/controller. It is important to ensure that the parameters of the room thermostats on "continuous 2-point control" or "switching on-off control" are set.

With so-called continuous control, a 1byte-value (0...255) is used as an input signal, which is converted to a programmable cycle time in the ON and OFF command of the switch relay.

At 0 % the valve is closed and at 100 % it is fully opened. Intermediate values are calculated using pulse width modulation (PWM), refer to 4.3.4.

When SA/S Switch Actuators are used in heating technology, it is important to observe the electrical and mechanical endurance (refer to the technical data in section 2) of the actuator. Due to small cycle times with continuous control, it is possible that a high number of switching operations are the result which can quickly mean that the contact life of the Switch Actuator is very quickly at an end.

Electromechanical switch actuators which include the SA/S Switch Actuator feature mechanical contacts. On the one hand electrical isolation is thus achieved and on the other hand a very high switching capacity. On the other hand this is associated with switching noises and mechanical wear, which means that the switch relay reaches the end of its life after a certain number of switching operations. Under these aspects, it can be useful to use an electronic switch actuator (e.g. ES/S 4.1.1) for heating control. These actuators do not feature electrical isolation and have a much lower switching capacity, but the have a higher mechanical endurance.

In the mode "Heating Actuator“ the current detection function is also available for the switch actuators SA/S x.x.xS, refer to capture 3.4.1.8.

3.5.1 Parameter window for operating mode "Heating Actuator"

Every output of an SA/S Switch Actuator can assume the function of a heating actuator. In the following sections the parameter windows will be described, which are available for setting the output as a heating actuator.

⚠ If an output has been selected as a heating actuator, it is particularly important to consider the endurance of the relay (see technical data section 2). This is essential if the output is used for a continuous controller.

3.5.1.1 Parameter window "General" – Heating Actuator

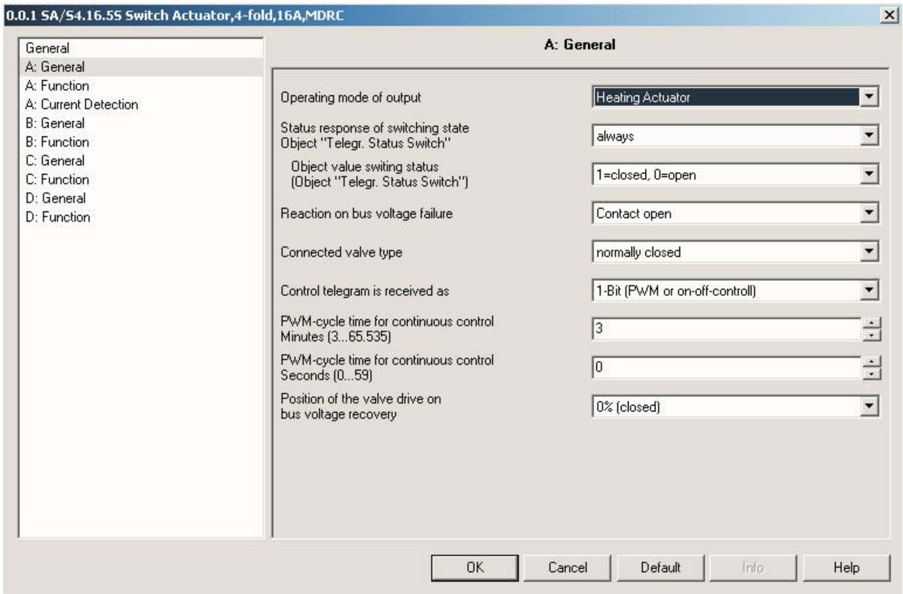


Fig. 32: Parameter window "X: General" - heating actuator

This parameter window appears if in parameter window "X: General" the operating mode "Heating Actuator" is selected. Alternatively, it is possible to select the "Switch Actuator" operating mode (see section 3.4).

Parameter "Status response of switching state Object "Telegr. Status Switch""

With this parameter the object "Telegr. Status Switch" is released. It contains information concerning the current switch state / contact position.

Options: **no**
after a change
always

If "no" is set the object value will always be updated but not sent. The "always" setting has the effect that the contact position is updated and always sent, if a "switch option" is received, even if no switching or change in the object value has occurred. With the "after a change" setting the status telegram is only sent if the object value "Telegr. Status Switch" changes. The bus load can be greatly influenced here particularly with multichannel switch actuators.

The object value ("0" or "1") which is used at a contact position is possible with the "Object value contact position (Object "Telegr. Status Switch") parameter. This parameter appears if "after a change" or "always" have been selected.

The contact position can result from a series of priorities and logical functions (see the diagram in section 4.2.1).

Parameter "Object value contact position (Object "Telegr. Status Switch")"

Options: **"1" closed "0" open**
"0" close "1" open

With the setting ""1" close, "0" open" the value "1" is written with a closed contact, and the value "0" with an opened contact into the object "Telegr. Status Switch". An inverted display is possible by the setting ""0" close, "1" open".

The reaction of the valve is dependent on the position of the switch actuator relay and the valve type (normally open or normally closed).

Parameter "Reaction on bus voltage failure"

With this parameter you set how the contacts and how the valve drive is actuated should the bus voltage fail.

Options: **unchanged**
Contact closed
Contact open

Only the energy for the switching action is available when the bus voltage fails. If a normally closed valve is used a closed contact means an open valve (100 %) or a closed valve (0 %) with an open contact.

A normally opened valve has the opposite effect.

A middle position of the valve can not be set with bus voltage failure. The valve moves either to its closed (0 %) or open (100 %) end position with bus voltage failure.

Parameter "Connected valve type"

In this parameter you can set the valve type which is controlled by the switch actuator.

Options: **normally closed**
normally open

With "normally closed", opening of the valve is achieved by closing the relay. Accordingly, with "normally open" opening of the valve, it is achieved by opening the relay.

Parameter "Control telegram is received as"

The heating actuator can either be controlled via the 1-bit object "Switch" or the 1-byte object "Control value (PWM)".

Options: **1bit (PWM or on-off-control)**
1byte (continuous)

In 1bit control, the heating actuator functions in a similar way to a standard switch actuator: The room thermostat controls the heating actuator via standard switching commands. A 2-step control of the control value can be implemented in this way. The 1bit value can originate from a pulse width modulation (PWM) which a room thermostat has calculated.

Only during a malfunction when the control signal is not received by the room thermostat will the switch actuator undertake an autonomous PWM calculation. The switch actuator uses the programmable PWM cycle time for this purpose.

For 1byte control, a value of 0..255 (corresponds to 0 %..100 %) is preset by the room thermostat. This process is also known as “continuous-action control”. At 0 % the valve is closed and at 100 % it is fully opened. The heating actuator controls intermediate values via pulse width modulation (see section 4.3.4).

Parameter “Transmit status response Object ‚Telegr. Status heating‘”
This parameter is only visible with continuous control with a 1byte object value. For 2 step control the current control value means the same as the object “Telegr. Status Switch”.

With the parameter “Transmit status response” the object “Telegr. Status heating” is enabled. Via this object the current control value can be read as 1byte or 1bit-values.

Options: **no**
yes, 0 % = “0” otherwise “1” (1bit)
yes, 0 % = “0” otherwise “0” (1bit)
yes, continuous control value (1byte)

With the setting “no” the control value is written into the object “Telegr. Status heating”.

The programming “0 % = “0” otherwise “1” (1bit)” and “0 % = “1” otherwise “1” (1bit)” enable a 1bit “Telegr. Status heating”.

The setting “continuous control value (1byte)” enables a 1byte “Telegr. Status heating”. The current control value will be sent.

Parameter “PWM cycle time for continuous control minutes (3...65.535)”
The interpulse period of the pulse width modulation for 1byte control (continuous-action control) is set here. It corresponds to the cycle time t_{CYC} see section 4.3.4. The value is entered in minutes and seconds

Options: **0**...59 seconds
3...65.535 minutes

For 1bit control, the pulse width modulation is only used when controlling the actuator in fault mode, during forced operation and directly after bus voltage recovery.

The time has been limited to 3 minutes in order to suit the endurance of the switch relay. See section 4.3.5 to examine the endurance.

Parameter “Position of the valve drive on bus voltage failure”
This parameter sets how the valve drive is triggered on failure of the bus voltage, until the first or control command is received from the room thermostat. Until a signal is received from the controller, a pulse width modulation for continuous-action control is set here using the programmed PWM cycle time.

Options: **0 % (closed)**
10 % (26)
...
90 % (230)
100 % (open)

The values in brackets correspond to a 1byte-value.

The programmed value is used as the PWM cycle time.

3.5.1.2 Parameter window "X: Function" – Heating Actuator

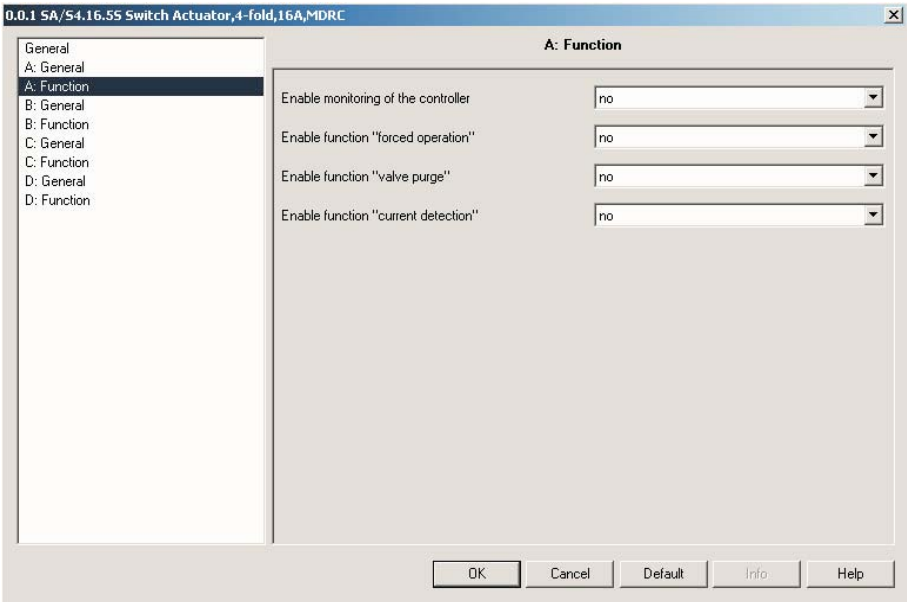


Fig. 33: Parameter window "X: Function" – Heating Actuator

Parameter "Enable monitoring of the controller"
The cyclic monitoring of the room thermostat can be enabled here.

Options: **no**
yes

The failure of the thermostat can thus be detected. The output switches to fault mode and moves to a defined position. The respective monitoring object "Telegr. RTR fault" must be enabled in the parameter window "X: monitoring".

Parameter "Enable function forced operation"
The forced operation of the output can be enabled here in order to move the outputs to a specific position e.g. for inspection purposes.

Options: **no**
yes

With "yes" the parameter window "Forced operation" and the object "Forced operation" are enabled.

Parameter "Enable function, valve purge'"
The cyclic valve purge can be enabled here to prevent deposits from forming in the valves.

Options: **no**
yes

With "yes" the parameter window "Purge" and the object "Trigger valve purge" and "Telegr. Status valve purge" are enabled.

Parameter "Enable function Current Detection"

Options: **no**
yes

This parameter activates the "Current Detection" function. Parameterisation is implemented in the parameter window "X: Current Detection" of the output X. At the same time the communication object "contact monitoring" is released.

These parameters and functions are only visible on switch actuators with current detection. The Switch Actuators with integrated current detection are recognisable by an "S" at the end of the type designation (e.g. SA/S 2.16.5S).

With the "no" setting the parameter window for current detection remains deactivated.

Parameter "Status send contact monitoring object "Contact Monitoring""

Options: **no**
after a change
always

The transmission behaviour of the object value of the communication object "Contact monitoring" can be programmed with this parameter.

If "no" is set the object value will always be updated but not sent.
The „always" setting has the effect that the contact position is updated and sent if and only if the status change happened or the contact is switch off. If the contact is always opened no new status is send. No status is sent in case of the contact closing. A reset of the status is sent with the next opening of the contact.

With the "after a change" setting a telegram is only sent if the "Contact monitoring" object value changes. The bus load can be greatly influenced here particularly with multichannel switch actuators.

A contact fault is indicated by the "Contact monitoring" object. A fault (object value "1") is displayed if a current is detected (circa 100 mA) when the contact is open.

⚠ The contact change must be initiated by a switching operation via the EIB / KNX. Manual operation is not considered for the evaluation. The switch actuator can not differ between an broken wire and a manual switching.

3.5.1.3 Parameter window “Monitoring”

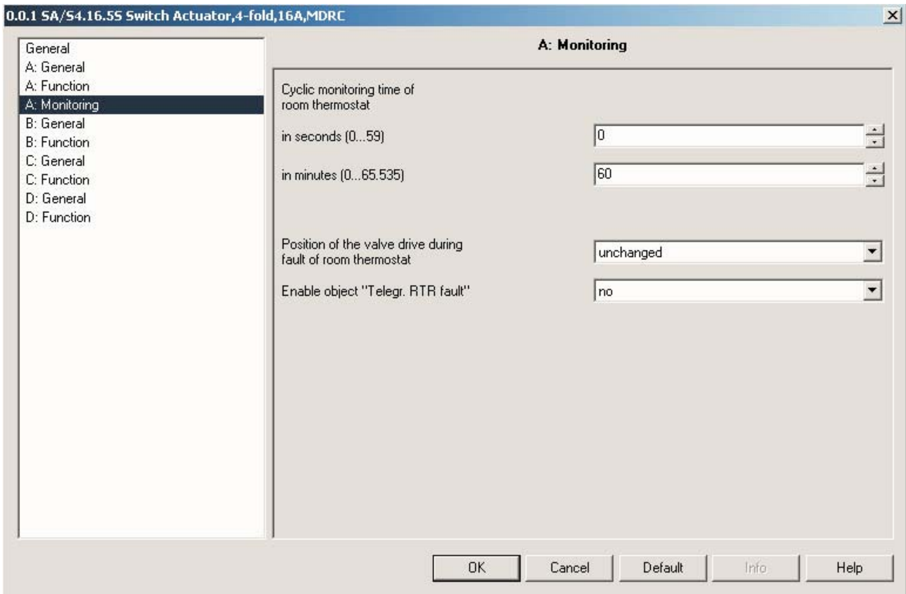


Fig. 34: Parameter window “X: Monitoring”

This parameter window is visible if the function monitoring of the room thermostat is enabled be entering “yes” in the parameter window “X: Function”.

Parameter “Cyclic monitoring time of room thermostat”
The telegrams of the room thermostat are transferred to the electronic actuator at specific intervals. If one or more of the subsequent telegrams is omitted, this can indicate a communications fault or a defect in the room thermostat. If there are no telegrams to the objects “Switch” or “Control value (PWM)” during the period defined in this parameter, the actuator switches to fault mode and triggers a safety position. The fault mode is ended as soon as a telegram is received as a control value.

Options: **0**...59 seconds
0...**60**...65.535 minutes

Note: If this parameter window is visible, the room thermostat must send the control value cyclically, otherwise no function is possible. The monitoring time should be greater than the cycle time for sending (recommended: factor 2).

Parameter “Position of the valve drive during fault of room thermostat”
The safety position which is triggered by the actuator in fault mode is defined here.

Options: **unchanged**
0 % (closed)
10 % (26)
...
90 % (230)
100 % (open)

The values in brackets correspond to a 1byte-value.

The switch cycle time t_{CYC} of the control is defined in the parameter “PWM cycle time for continuous control” in the parameter window “X: General”.

Parameter "Enable object "Telegr. RTR fault"
In this parameter the object "Enable object "Telegr. RTR fault" can be enabled.

Options: **no**
yes

It has the object value "1" during a malfunction. If there is no malfunction, the object value is "0".

3.5.1.4 Parameter window “Forced operation”

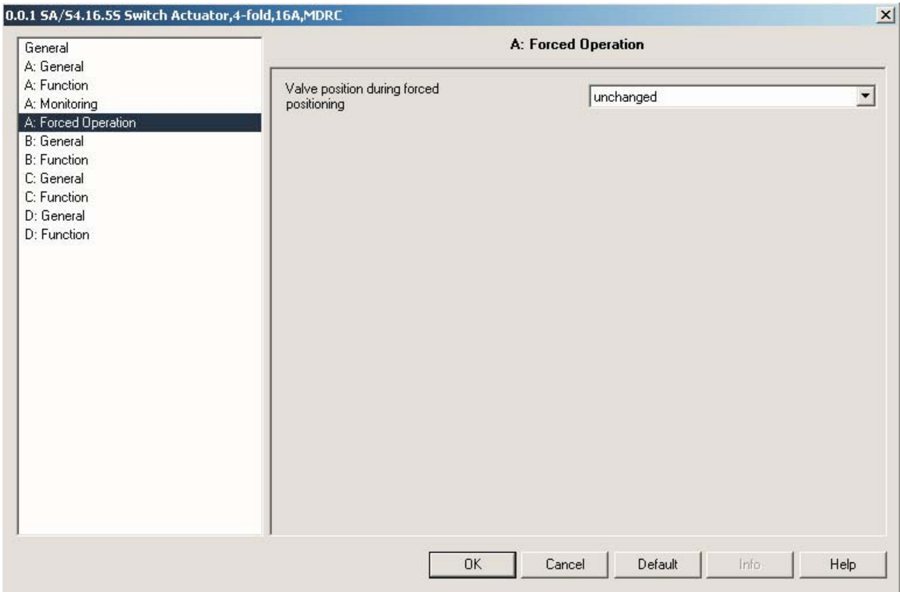


Fig. 35: Parameter window “X: Forced operation

During a forced operation, the actuator triggers a freely adjustable forced position. This has the highest priority i.e. it is not modified by a valve purge or safety position. The forced operation can be activated via the object “Forced Positioning” = “1” and deactivated via “Forced Positioning” = “0”.

Parameter “Valve position during forced positioning”
The valve position triggered by the actuator during the forced operation is defined in this parameter.

Options: **unchanged**
0 % (closed)
10 % (26)
...
90 % (230)
100 % (open)

The values in brackets correspond to a 1byte-value.

The switch cycle time t_{CYC} of the control is defined in the parameter “PWM cycle time for continuous control” in the parameter window “X: General”.

At the end of forced operation the switch actuator returns to its normal method of operation and calculates its next valve value from the incoming values of “Switch” or “Control value (PWM)”.

3.5.1.5 Parameter window "Valve Purge"

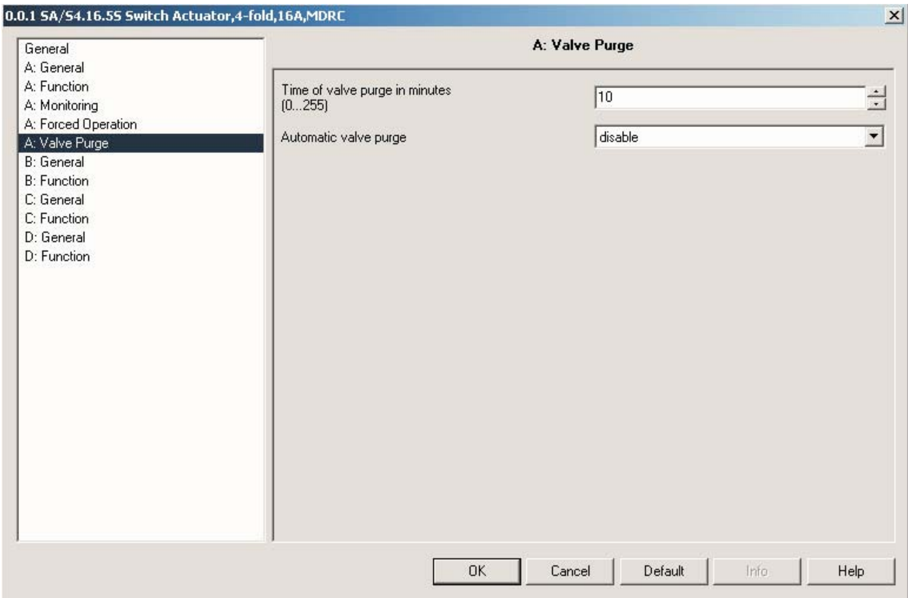


Fig. 36: Parameter window "X: Valve Purge"

Regular purging of a heating valve can prevent deposits from forming in the valve area and restricting the valve function. This is particularly important at times when the valve position does not change very much. The valve is opened to the maximum during a valve purge. It can be triggered via the object "Trigger valve purge" and/or automatically at adjustable intervals.

Parameter "Time of valve purge in minutes (0...255)"
The duration of a valve purge is set here in minutes.

Options: 0...**10**...255

Parameter "Automatic valve purge"
The valve is automatically purged at adjustable intervals with this parameter:

Options: **disable**
one times per day
one times per week
one times per month

A purge can be initiated by the object "Trigger valve purge".

The timer for automatic purging starts to operate if the parameter is loaded into the actuator. With a renewed download, the timer will reset again and the time runs from the beginning.

With a valve purge the time is reset too. This happens with an automatic valve purge or with a manual trigger of the valve purge by the object "trigger valve purge". A functional switching of the actuator do not influence the valve purge time.

3.5.1.6 Parameter window "Current Detection"

This parameter window is visible if the function current detection is enabled. See parameter window "x: Function".

The current detection has the same options and functions as describe in the switch actuator mode. See section 3.4.1.8.

3.5.2 Communication objects “Heating Actuator”

The “General device communication objects” are the same objects with the same function as occur in the “Switch Actuator” operating mode.

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	-	
1	Safety Priority 1	General	1 bit	C	-	W	-	U	
2	Safety Priority 2	General	1 bit	C	-	W	-	U	
3	Safety Priority 3	General	1 bit	C	-	W	-	U	

No.	Function	Object name	Object name	Flags
0	**In operation**	**General**	**1bit (EIS 1) DPT 1.002**	**C, R, T**
In order to regularly verify the presence of the Switch Actuator EIB / KNX, a monitoring telegram can be sent cyclically on the bus. The communication object is always visible. Telegram value “1” Status				
1	**Safety Priority 1**	**General**	**1bit (EIS 1) DPT 1.005**	**C, W, U**
The Switch Actuator can receive a 1bit telegram via this communication object, which another EIB / KNX slave (e.g. diagnosis unit, wind sensor, etc.) sends cyclically. The communication capability of the bus or sensor (signalling device) can be monitored with the receipt of the telegram. If the Switch Actuator does not receive a telegram at the communication object “Safety Priority 1” (value can be programmed in the parameter window “General”) within a determined period, a malfunction is assumed and a response as defined in parameter window “X: Safety” is triggered. The output of the Switch Actuator assumes the safety state and does not distribute telegrams. Only after the communication object “Safety Priority 1” has received a “1” or “0” (depending on the programming) will the incoming telegrams be processed again and the contact position changed. The monitoring time can be set in the parameter window “General” via the parameter “Control period in seconds”. The safety priority 1 can also be triggered if a telegram with the programmable trigger value (in the parameter window “General”) has been received.				
2	**Safety Priority 2**	**General**	**1bit (EIS 1) DPT 1.005**	**C, W, U**
This communication object has the same function as the “Safety Priority 1” objects described beforehand, but for a second safety priority.				
3	**Safety Priority 3**	**General**	**1bit (EIS 1) DPT 1.005**	**C, W, U**
This communication object has the same function as the “Safety Priority 1” objects described beforehand, but for a third safety priority.				
4...9	**Free**	**not assigned**		

Table 33: Communication objects “General” per device

Communication objects on every output

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
10	Telegr. switch	Output A	1 bit	C	-	W	-	-	
11	Trigger valve purge	Output A	1 bit	C	-	W	-	-	
12	Telegr. Status valve purge	Output A	1 bit	C	-	-	T	-	

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
10	Control value (PWM)	Output A	1 Byte	C	-	W	-	-	
11	Trigger valve purge	Output A	1 bit	C	-	W	-	-	
12	Telegr. Status valve purge	Output A	1 bit	C	-	-	T	-	

<table>
<tr><th>No.</th><th>Function</th><th>Object name</th><th>Data type</th><th>Flags</th></tr>
<tr><td>10...[1)]
230</td><td>Telegr. Switch</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.001</td><td>C, W</td></tr>
<tr><td colspan="5">Object “Switch”: 1bit (EIS1): This object is visible if the control of the “Heating Actuator” is implemented via a 1bit object. The output is controlled directly depending on if the valve is a “normally open” or “normally closed” type.
Telegram value: “0” valve closes
“1” valve opens</td></tr>
<tr><td>10... [1)]
230</td><td>Control value (PWM)</td><td>Output X</td><td>1byte (EIS 6)
DPT 5.010</td><td>C, W</td></tr>
<tr><td colspan="5">Object “Control value (PWM)”: 1byte (EIS6): This object is visible if the actuation of the heating actuator occurs via a 1byte object, e.g. within continuous control. The object value [0…255] is determined by the variable mark-to-space of the valve. At object value “0” the valve is closed and at object value “255” it is fully opened.
Telegram value “0” Valve closed
“255” Valve fully opened</td></tr>
<tr><td>11... [1)]
231</td><td>Trigger valve purge</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.001</td><td>C, W</td></tr>
<tr><td colspan="5">Object “Trigger valve purge”: 1bit (EIS1): If the value “1” is received the valve is opened for the duration of the valve purge. If the value “0” is received the valve purge ends. This object is visible if the purge function is enabled in the parameters.
Telegram value “1” start valve purge
“0” end valve purge</td></tr>
<tr><td>12... [1)]
232</td><td>Telegr. Status valve purge</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.002</td><td>C, T</td></tr>
<tr><td colspan="5">Object “Telegr. Status valve purge”: 1bit (EIS1): This object indicates if the valve purge is active or inactive.
Telegram value “0” valve purge is inactive
“1” valve purge is active</td></tr>
</table>

[1)] For the SA/S outputs 2 to max. 12 the respective objects 3x to 13x apply.

Table 34: Communication objects “General” on every output

Function monitoring controller

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
13	Telegr. RTR fault	Output A	1 bit	C	-	-	T	-	

No.	Function	Object name	Object name	Flags
13... 1) 233	**Telegr. RTR fault**	**Output X**	**1bit (EIS 1) DPT 1.005**	**C, T**
Object "Telegr. RTR fault": 1bit (EIS1): This object indicates a possible fault in the room thermostat (RTR). The object "Switch" or "Control value (PWM)" can be cyclically monitored. If the object value is not received for a programmable time, the device assumes that the room thermostat has failed and signals a fault. Telegram value "0" no fault "1" fault				

1) For the SA/S outputs 2 to max. 12 the respective objects 33 to 233 apply.

Table 35: Communication object monitoring controller

Function forced operation

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
14	Forced operation	Output A	1 bit	C	-	W	-	-	

No.	Function	Object name	Object name	Flags
14... 1) 234	**Forced operation**	**Output X**	**1bit (EIS 1) DPT 1.003**	**C, W**
Object "Forced operation": 1bit (EIS1): This object sets the output in a defined state and blocks it. If the value "1" is received, forced operation is activated and the output triggers the programmed valve position. If the value "0" is received forced operation ends. The object is enabled with the parameters. Telegram value "0" forced operation ended "1" start forced operation				

1) For the SA/S outputs 2 to max. 12 the respective objects 34 to 234 apply.

Table 36: Communication object monitoring controller

Status objects

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
15	Telegr. Status heating	Output A	1 Byte	C	-	-	T	-	

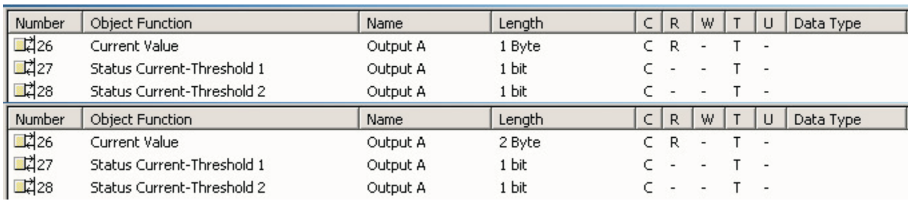
Number	Object Function	Name	Length	C	R	W	T	U	Data Type
15	Telegr. Status heating	Output A	1 bit	C	-	-	T	-	

<table>
<tr><th>No.</th><th>Function</th><th>Object name</th><th>Object name</th><th>Flags</th></tr>
<tr><td>15... [1]
235</td><td>Telegr. Status heating</td><td>Output X</td><td>1byte (EIS 6)
DPT 5.010</td><td>C, W</td></tr>
<tr><td colspan="5">Object “Telegr. Status heating” 1byte (EIS6): This object is visible if “1byte (continuous)” has been selected as parameter “Control telegram is received as” in parameter window “X: General”. It signals the current control value of the output. The object value is sent with changes.
Telegram value 1byte control value</td></tr>
<tr><td>15... [1]
235</td><td>Telegr. Status heating</td><td>Output X</td><td>1bit (EIS 1)
DPT 1.002</td><td>C, T</td></tr>
<tr><td colspan="5">Object “Telegr. Status heating” 1bit (EIS1): This object is visible if the function “heating actuator” and in parameter window “X: General” the parameter “1byte (continuous)” are selected and the monitoring of the control value is parameterise as 1-bit value. In this case the object value will monitor the digital control value of the output. The object value is sent with change.
The setting “0% = ‘0’ else ‘1’ (1bit)” monitore the
Telegram value “0” if control value is 0%
“1” if control value is not 0%
The setting “0% = ‘1’ else ‘0’ (1bit)” monitore the
Telegram value “0” if control value not 0%
“1” if control value is 0%</td></tr>
<tr><td>16... [1]
25
up to
236...
245</td><td>free</td><td>not assigned</td><td></td><td></td></tr>
</table>

[1] For the SA/S outputs 2 to max. 12 the respective objects 3x to 23x apply.

Table 37: Time function communication status

Current detection objects



Number	Object Function	Name	Length	C	R	W	T	U	Data Type
26	Current Value	Output A	1 Byte	C	R	-	T	-	
27	Status Current-Threshold 1	Output A	1 bit	C	-	-	T	-	
28	Status Current-Threshold 2	Output A	1 bit	C	-	-	T	-	

Number	Object Function	Name	Length	C	R	W	T	U	Data Type
26	Current Value	Output A	2 Byte	C	R	-	T	-	
27	Status Current-Threshold 1	Output A	1 bit	C	-	-	T	-	
28	Status Current-Threshold 2	Output A	1 bit	C	-	-	T	-	

<table>
<tr><td>25...[1)]
245</td><td>Contact monitoring</td><td>Output X</td><td>1bit (EIS 1)
DTP 1.002</td><td>C, R, T</td></tr>
<tr><td colspan="5">The contact state can be indicated in dependence on the switching action sent via the EIB / KNX with this object.

The value “1” (contact fault) is assumed if the contact is opened via a switching action and a current is still detected (contact welded) or if the contact is closed manually and a current will detect.

The evaluation if a current flows or does not flow is undertaken in the steady-state approximation of 2 seconds after the switching action. The current is safely detected if it is greater than 100 mA.</td></tr>
<tr><td>26...[1)]
246</td><td>Current Value</td><td>Output X</td><td>2byte (EIS 10)
DPT 7.012</td><td>C, R, T</td></tr>
<tr><td colspan="5">The currently detected current value can be sent on the EIB / KNX with this object.
This object is “Current Value” enabled if in parameter window “X: Function” the function “Current Detection” is activated.

The Current Value is a 2-Byte counter value (EIS 10, DPT 7.012) 1 mA per digit. It is important to observe that the current detection range is designed for currents between 100 mA and 20 A.

See section 2.9 for the current value accuracy.</td></tr>
<tr><td>27...[1)]
247</td><td>Status Current-Threshold 1</td><td>Output X</td><td>1bit (EIS 1)
DTP 1.002</td><td>C, R, T</td></tr>
<tr><td colspan="5">A “1” (programmable) is sent via this object if the current value does not exceed the threshold1 plus the hysteresis threshold 1. If the threshold 1 minus the threshold 1 hysteresis is not exceeded, the object has the value “0” (programmable). Parameterisation is implemented in the parameter window “X: Current detection”.

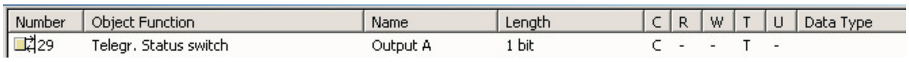
The exact function of the current threshold function is described in section 4.1.1.</td></tr>
<tr><td>28...[1)]
248</td><td>Status Current-Threshold 2</td><td>Output X</td><td>1bit (EIS 1)
DTP 1.002</td><td>C, R, T</td></tr>
<tr><td colspan="5">A “1” (programmable) is sent via this object if the current value does not exceed the threshold 2 plus the hysteresis threshold 2. If the threshold 2 minus the threshold 2 hysteresis is not exceeded, the object has the value “0” (programmable). Parameterisation is implemented in the parameter window “X: Current detection”.

The exact function of the current threshold function is described in section 4.1.1.</td></tr>
</table>

[1)] For the SA/S outputs 2 to max. 12 the respective objects 3x to 23x and 4x to 24x apply.

Continuation Table 37: Time function communication status

Status switch object



Number	Object Function	Name	Length	C	R	W	T	U	Data Type
29	Telegr. Status switch	Output A	1 bit	C	-	-	T	-	

No.	Function	Object name	Object name	Flags
29... [1)] 249	**Telegr. Status Switch**	**Output X**	**1bit (EIS 1) DPT 1.002**	**C, T**
Object "Telegr. Status switch": 1bit (EIS1): This object is visible if the feedback is enabled in the parameter settings. It registers the status of the contact position of the output. The object value is sent with changes. Telegram value "0" is in the parameter window "X: Current Detection", "1" programmable, if an open or closed contact is represented by a "1" or "0". The value of the object "Telegr. Status Switch" always defines the current contact position. The specification relates to the relay of the switch actuator and not to the valve positions. The reaction of the valve is dependent on the position of the switch actuator relay and the valve type (normally open or normally closed).				

[1)] For the SA/S outputs 2 to max. 12 the respective objects 39 to 239 and 49 to 249 apply.

Continuation Table 37: Time function communication status

4 Planning and application

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

4.1 Current detection

The current detection function can open many new fields of application for the switch actuators. The following listing is simply a short excerpt of possible applications.

- Load current detection (from 100 mA)
- Detection of a malfunction of important equipment
- Preventative detection of malfunctions by continuous current monitoring
- Recording of actual operating hours
- Signalling of maintenance or service work
- Detection of open circuits
- Recording of switching operations per time interval
- Energy and load management
- Monitoring and signalling

In the following some application examples are described in more detail for the current detection.

4.1.1 Threshold function

The current detection function features two independent thresholds.
The detected current value will fluctuate by about 25 mA due to the necessary analogue/digital conversion of the detected load current. In order to avoid a continuous change of the threshold value state, the thresholds for the current recognition always feature a hysteresis function. The width of the hysteresis band is determined by the programmable “Hysteresis thresholds”.
The following illustration with its hysteresis thresholds should simplify comprehension of the threshold value function:

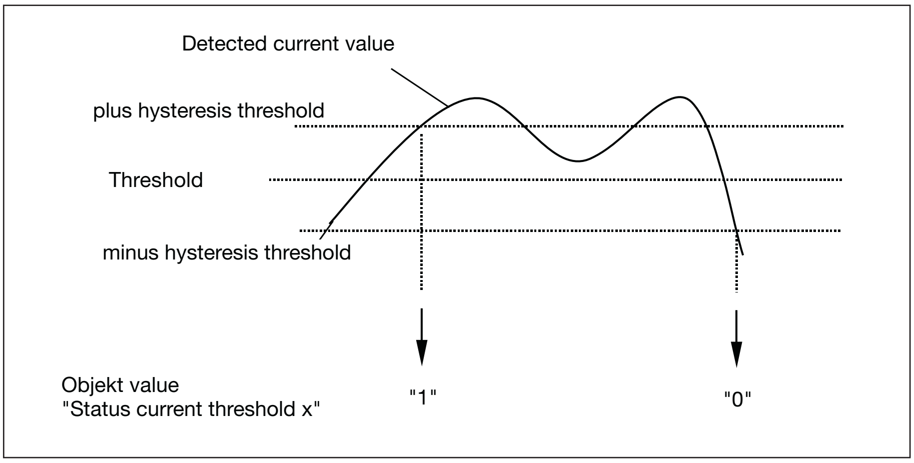


Fig. 37: Current threshold

If the value exceeds the upper (plus) hysteresis threshold or falls below the lower (minus) hysteresis threshold, the object value “Status Current-Threshold x” is modified and sent to the bus. This object value can be programmed in parameter window “X: Current detection”. In the example shown, the setting “send “1” at crossing over – “0” at crossing lower” has been set.

4.1.2 Display operating states

A switch actuator with current detection is predestined for displaying and recording operating states of electrical loads.

The operating state is detected indirectly via the load current. If the load current exceeds both thresholds, an ON telegram is sent via the bus, if the value drops below both thresholds an OFF telegram is issued. This ON/OFF telegram can be received for example by a Universal Concentrator and displayed on the display panel.

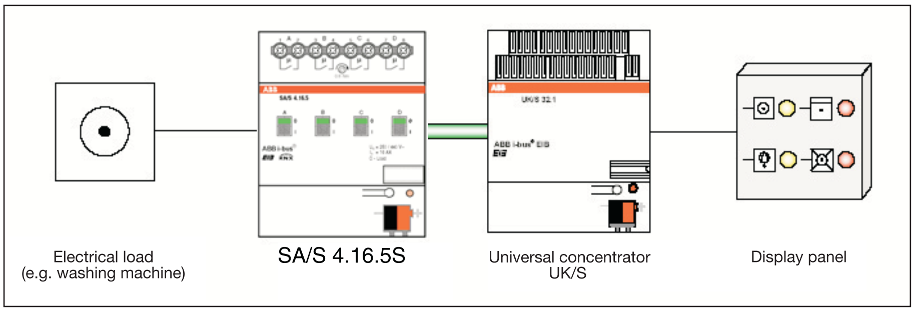


Fig. 38: Display operating states

4.1.3 Logging operating hours

With the help of current detection in the switch actuator and a separate meter or counter element, it is possible to record, signal and display the actual electrical operating hours of electrical loads. This function can be used in facility management or for preventative maintenance and service planning. Filter exchange in air-conditioning systems or the exchange of lamp elements can be optimised and planned in advance.

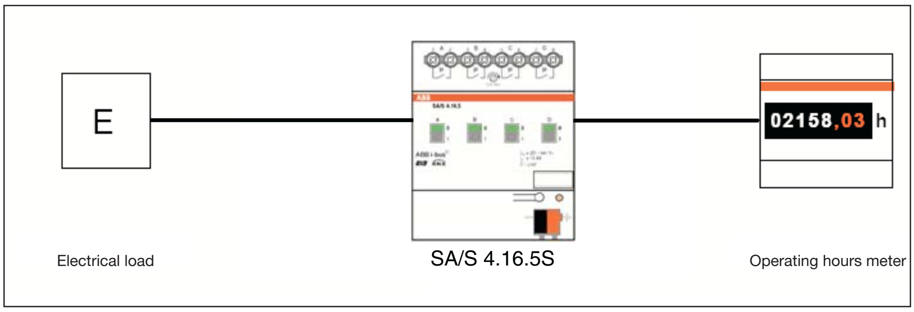


Fig. 39: Operating hours detection

4.1.4 Trend analysis

Trend analysis is used to monitor the states of electrical systems over long periods and to receive early warnings of possible defects. The system operator can use this information for planning and carrying out his inspections and to undertake a repair when indicated before the system fails. If for example, the fault current value changes, telegrams are sent on the bus. These telegrams can be evaluated on a PC and can be displayed as a diagram using visualisation software. Thus, changes which occur over an extended period are easily recognisable. If the trend analysis is combined with protocolling, a defective device can be quickly and easily identified.

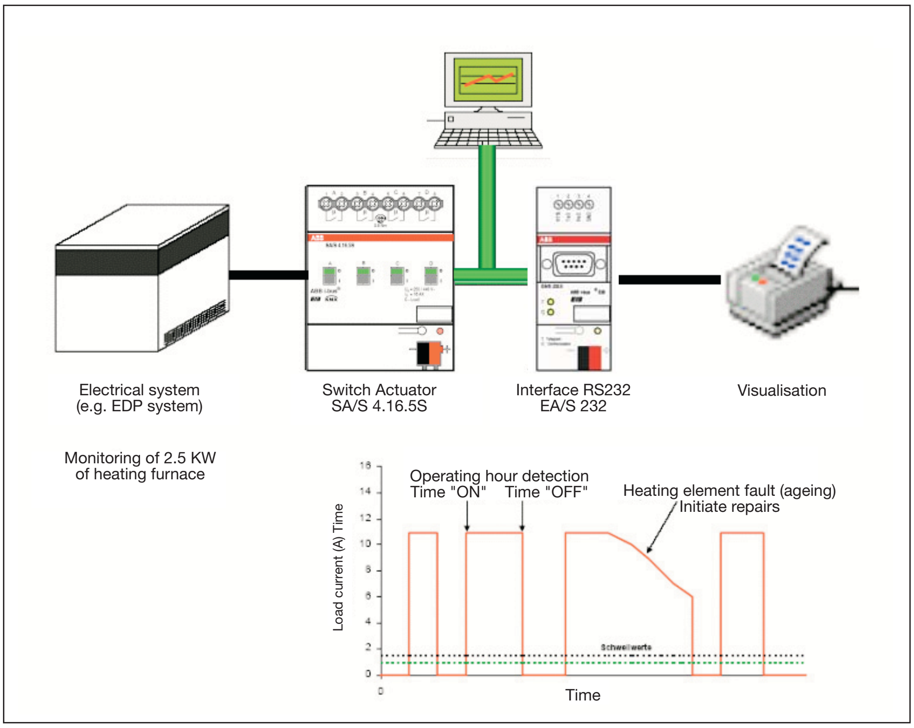


Fig. 40: Trend analysis

4.1.5 Current readout

The switch actuators with current recognition are not current measurement devices. The recognised current with its tolerances (see technical data section 2) can be displayed.

Via the EIB, this current value can be sent to a complex maintenance centre or a simple LCD display (e.g. LD/W, Panels). There are no obstacles to further processing or display. Hereby, real-time monitoring or facility management of the installation is possible.

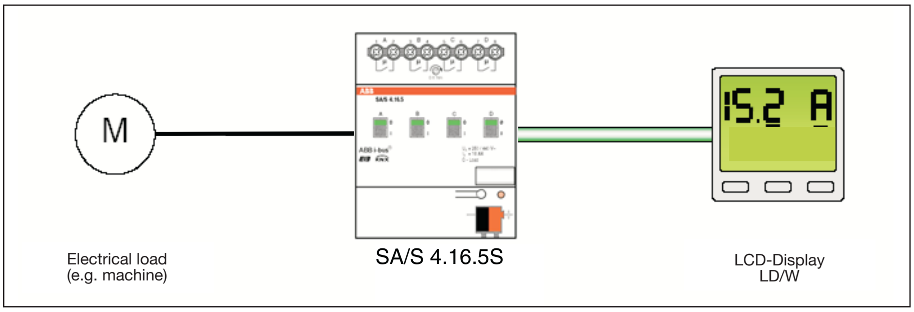


Fig. 41: Current display

4.2 Operating mode "Switch Actuator"

The following illustration indicates the sequence in which the functions of the "Switch 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.

4.2.1 Function chart

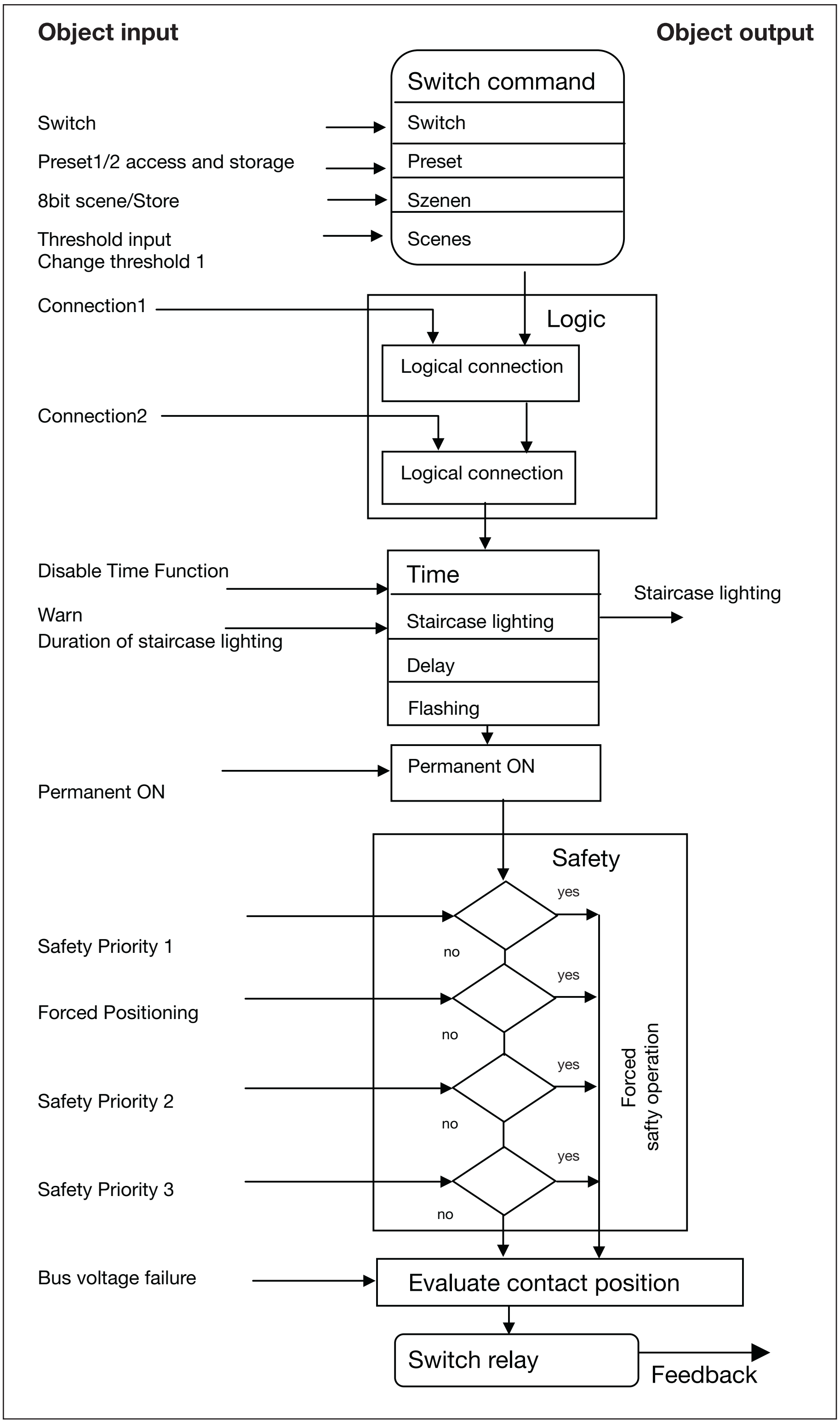


Fig. 42: Function chart switch actuator mode

Example: If a telegram is received via the switch object, it is connected with both logic objects if they are activated. The result serves as the input signal for the time function. If this has not been disabled, the respective trigger signal is generated (e.g. delay, flashing, etc.). Before the switch command reaches the relay, the safety priorities and forced operation are verified and will be implemented if necessary. Finally, the switching action is only dependent on the bus voltage state. The relay is switched if a switching state allows it.

4.2.2 Time functions

The time function can be enabled via the bus (1bit communication object "Disable Time Function") with "0" and disabled via "1". With this function the staircase lighting function, the time delay or flashing can be disabled. The switch actuator operates without a delay as long as the time function is disabled.

With this function, e.g. it is possible to switch between the staircase lighting function (night mode) and the normal ON / OFF switching function (day mode).

A further application is the deactivation of ON and OFF switch delays.

4.2.2.1 Staircase lighting function

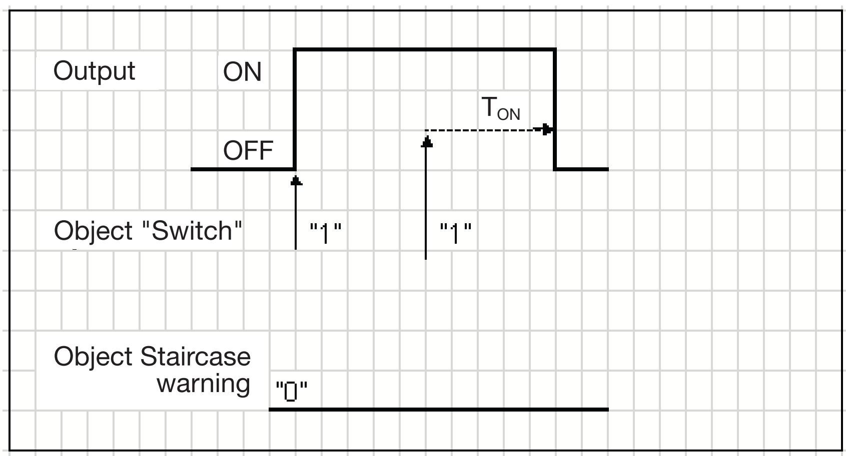


Fig. 43: Diagram staircase lighting time

After the staircase lighting time TON the output switches off automatically. With every "1" telegram the time will restart ("Retrigger function"). This behaviour is the basic with the staircase function, when no warning function is activated.

Planning and application

A **warning function** enables the user to be warned in good time before the staircase lighting time elapses. The warning can be carried out by switching the output on/off briefly or by sending an object.

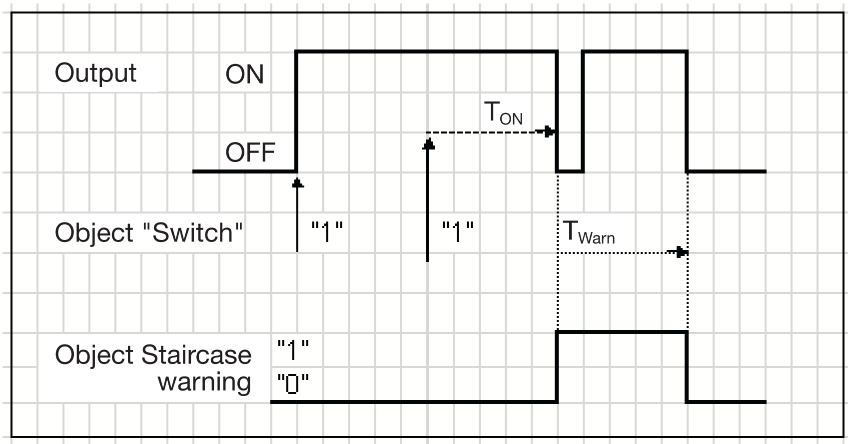


Fig. 44: Diagram staircase lighting time warning function

The warning time T_{WARN} extends the ON phase. At the start of the warning time the output can be briefly switched on and off and/or the object “Staircase warning” can be written with a “1”. The output is switched off briefly for the period “T_{WARN}” after the staircase lighting time “T_{ON}” elapses and the object “Warning stairc. lighting” is sent. As a result, for example, half of the lighting is switched off and a LED is switched on as a warning.

The entire staircase lighting time in which the staircase lighting is on is thus the time period T_{ON} plus T_{WARN}.

With **pumping**, the user can adapt the staircase lighting time to the current requirements by pressing the push button several times in succession. The maximum duration of the staircase lighting time can be set in the parameters.

Soll die Schrift ersetzt werden, analog der anderen Abbildungen? Schrift ist dort Helvetica.

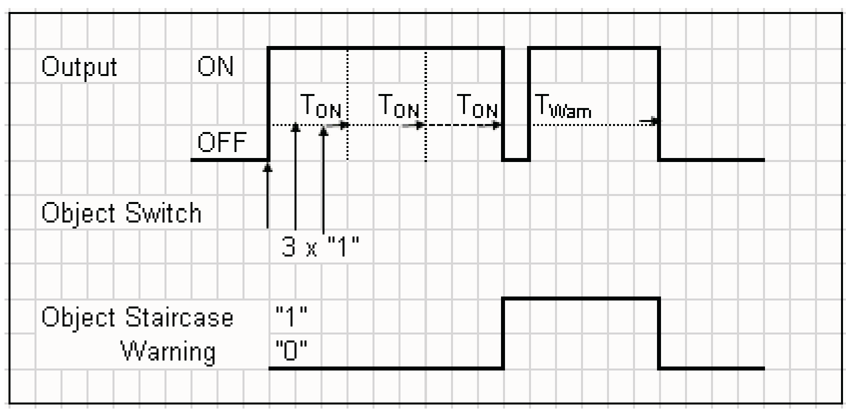


Fig. 45: Diagram staircase lighting time pumping

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 warning time does not change due to “Pumping” and is added to the extended (x-fold T_{ON}) ON time.

Application: Lighting control in staircases
Monitoring of telegrams

4.2.2.2 ON/OFF delay

The ON/OFF delay causes the output to be switched on or off with a delay.

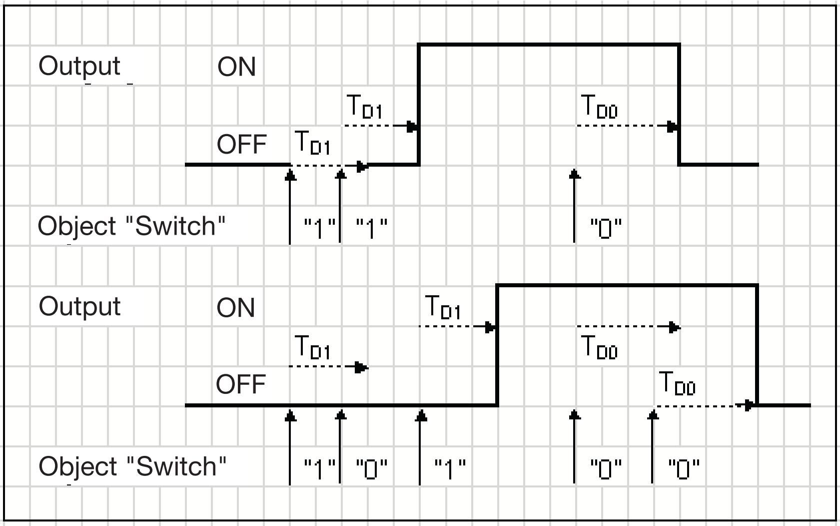


Fig. 46: Diagram ON/OFF delay time

After a switching command, the delay period T_{D1} or T_{D0} starts, after which the output initiates the switch command.

If a renewed ON telegram “1” is received during the switch on delay, the ON delay time restarts. The same applies to the OFF delay. If a renewed OFF telegram “0” is received during the switch off delay, the OFF delay time restarts.

Note: If the device receives an OFF command during the ON delay period T_{D1}, the ON command is rejected.

4.2.2.3 Flashing

The output can flash by switching on and off periodically.

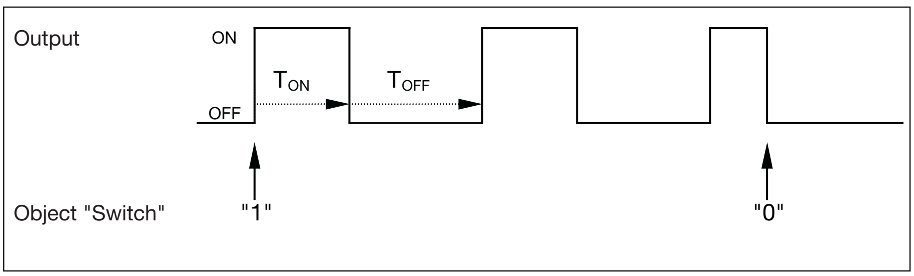


Fig. 47: Flashing diagram

The ON time (T_{ON}) and OFF time (T_{OFF}) during flashing can be parameterised.

Note: The contact life of the SA/S contacts is limited and should be taken from the technical data in section 2. It could be useful to limit the switching operations with the parameter “Number of ON-impulses”.
Furthermore, due to the limited switching energy in the switch actuator, it is possible that a delay can occur in the switching sequence.
The possible switching operations per minute refer capture 2.

4.2.3 Logical connection

With the “Logic” function, it is possible to link the switching of the output with certain conditions. Two logic objects are available:

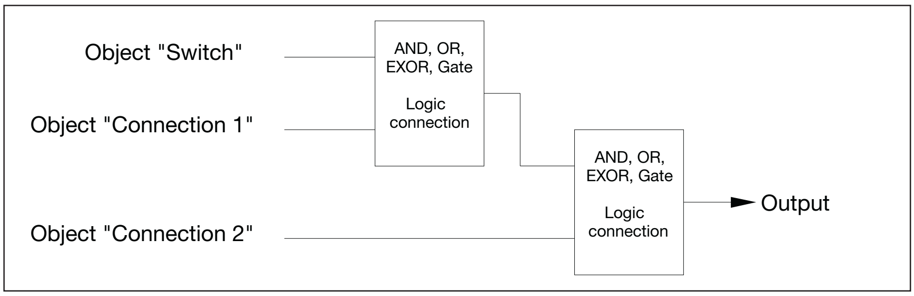


Fig. 48: Logic function chart

First, the object “Switch” is evaluated together with the object “Logical connection 1”. The result is linked with the object “Logical connection 2”.

The following logic functions are possible:

	Object values			
Logical function	**Switch**	**Connection**	**Result**	**Explanation**
AND	0 0 1 1	0 1 0 1	0 0 0 1	The result is 1 if both input values are 1.
OR	0 0 0 1	0 1 1 1	0 1 0 1	The result is 1 if one of both input values is 1.
XOR	0 0 1 1	0 1 0 1	0 1 1 0	The result is 1 if both input values have a different value.
Gate function	0 0 1 1	0 1 0 1	0 0 0 1	The object “Switch” is only let through if the gate is open. Otherwise the receipt of the object “Switch” is ignored. *Example and assumptions: See below*

Table 40: Logic functions AND, OR, XOR, Gate

The logic function is recalculated each time an object value is received.
Example gate function:

– The gate function is parameterised so that it is disabled if the object “Logical connection x” is a “0”.
– The output of the logic operation is “0”
– Object “Logical connection 1” receives “0”, i.e. gate disabled
– Object “Switch” receives “0”, “1”, “0”, “1”. Output of the logic operation always remains “0”
– Object “Logical connection x” receives “1”, i.e. gate enabled
– Output of logic operation is recalculated.

Note: If telegrams are received when object “Switch” is disabled, they are not stored.

4.2.4 Presets

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

Call preset

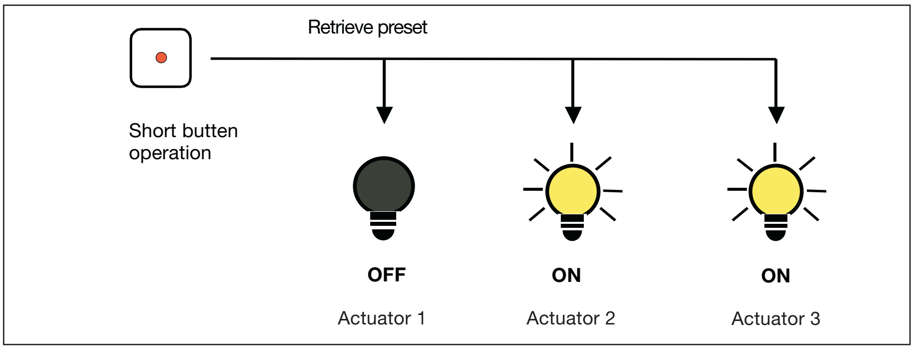


Fig. 49: Controlling light scenes via presets

Switch states ("preset values") can be recalled via the object "Recall Preset 1/2". A maximum of 2 preset values are available for each output:

Action	Telegram
Recall Preset1	Object "Recall Preset 1/2" = 0
Recall Preset2	Object "Recall Preset 1/2" = 1

Table 41: Recalled Preset objects

Store preset

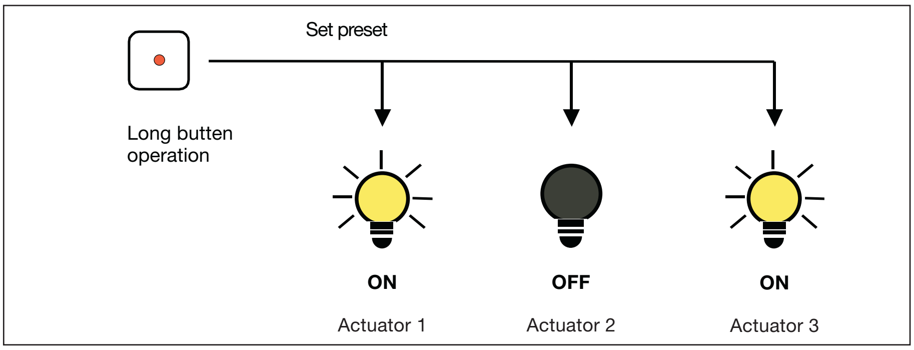


Fig. 50: Storing the current output state as the new preset value

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

Action	Telegram
Store Preset1	Object "Set Preset 1/2" = 0
Store Preset2	Object "Set Preset 1/2" = 1

Table 42: Set Preset objects

Special function: Restore state
A useful special function can also be assigned to preset1, which is used to recreate the brightness level (states) which was present before retrieving preset2. The following diagram clarifies this:

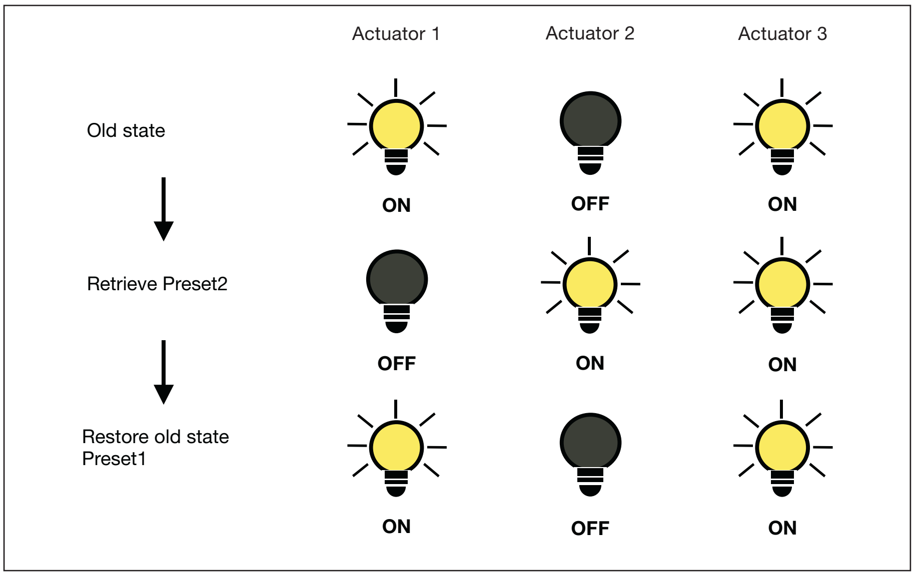


Fig. 51: Restoring the old brightness state (example)

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

4.2.5 8-bit scene

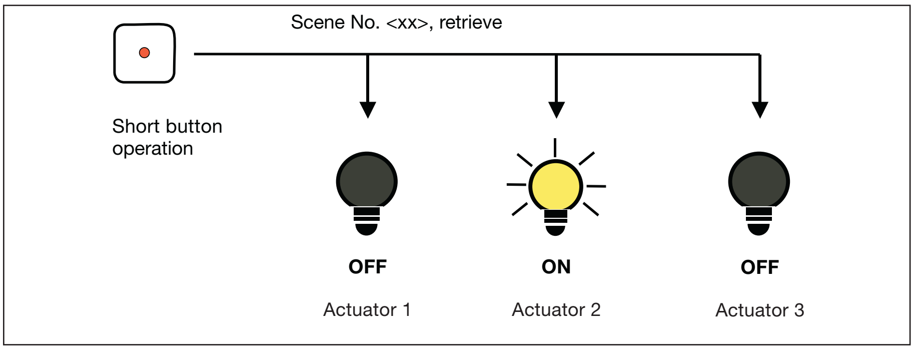


Fig. 52: Recall scene, 8-bit scene

In the 8-bit scene, the push button gives the actuator the instruction to recall a scene. The scene is not stored in the push button but in the actuator. All the actuators are addressed via the same group address. A single telegram is sufficient to recall the scene.

A scene number is sent in the telegram value which must match the scene number in the parameters of the actuator.

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

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

With the 8-bit scene, is possible to recall one of 64 scenes or to connect multiple EIB / KNX devices in an 8bit scene, e.g. shutter, switch actuator and DALI gateway. The scene can be recalled or stored using a single telegram. However, all devices must be programmed using the same scene number for this purpose.

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 actuator, the shutters 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 Appendix A2).

– Number of the scene (1…65)
– Recalled scene/store scene

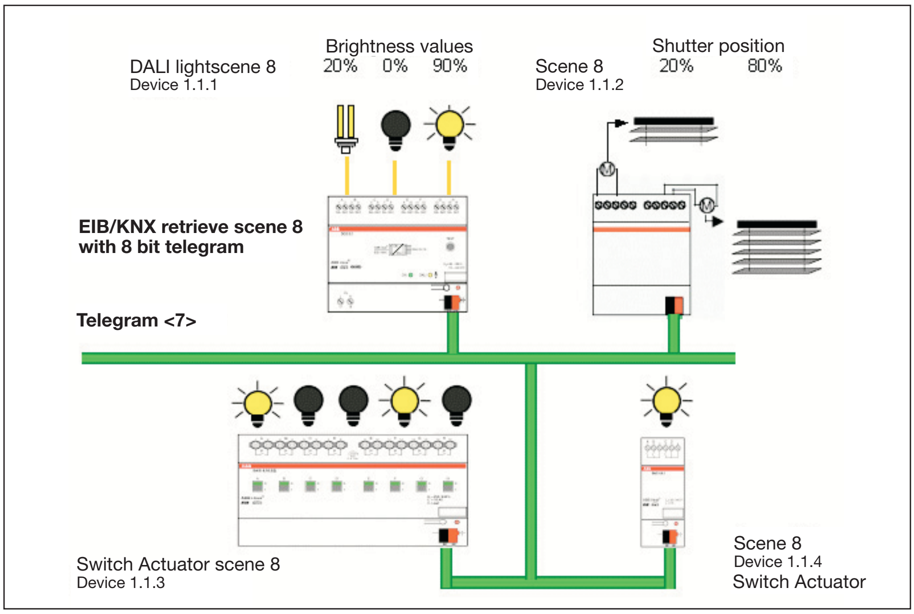


Fig. 53: 8bit scene example: Recall scene No. 8

Example: An EIB / KNX 8bit scene (No. 8) comprises of a single lamp, which is connected to a DALI gateway via two switch actuators. Furthermore, two shutters are integrated into the scene via a shutter actuator. The scene can be recalled 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 actuator moves the shutters to the respective position.

Advantage: The 8bit scene offers a few advantages in comparison to conventional scene programming. 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 recall 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 DALI slaves are stored in the participating devices and do not need to be sent via the EIB each time it is to be recall.

⚠ The scene numbering 1 to 65 is recall via the EIB / KNX with a telegram number 0 to 64. See the code table in Appendix A2 for the respective scene coding

4.2.6 Threshold function

The threshold function monitors a 1-byte or 2-byte value. As soon as this value exceeds or falls below a threshold value, the output can be switched. The threshold values can be interpreted as hysteresis values:

Threshold values are hysteresis values

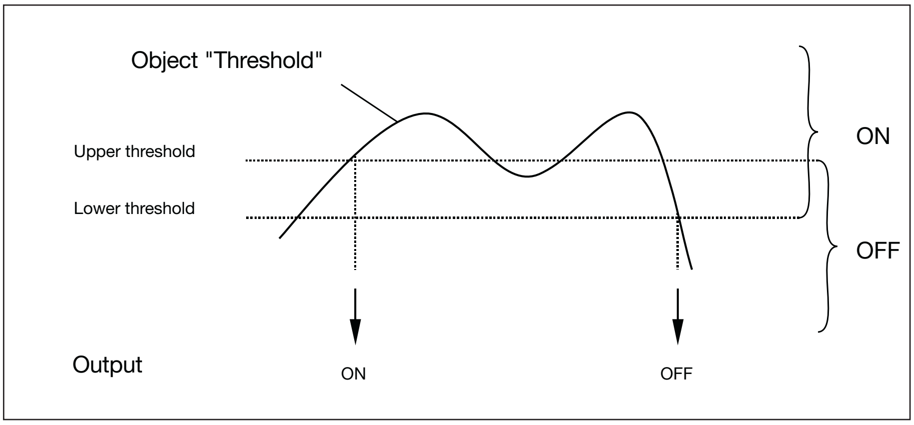


Fig. 54: Threshold values are hysteresis values

When the value exceeds the upper threshold or falls below the lower threshold, the output is switched.

Note: If the object “Threshold value” receives a value which does not exceed or fall below any of the threshold values when compared to the old value, no switching operations are triggered.

Note: The switch actuator can continue to receive telegrams during the threshold function which can trigger a switching action. The switch object, the scenes, preset and threshold function have the same priority and are processed in the sequence in which they are received.

Threshold values are not hysteresis values

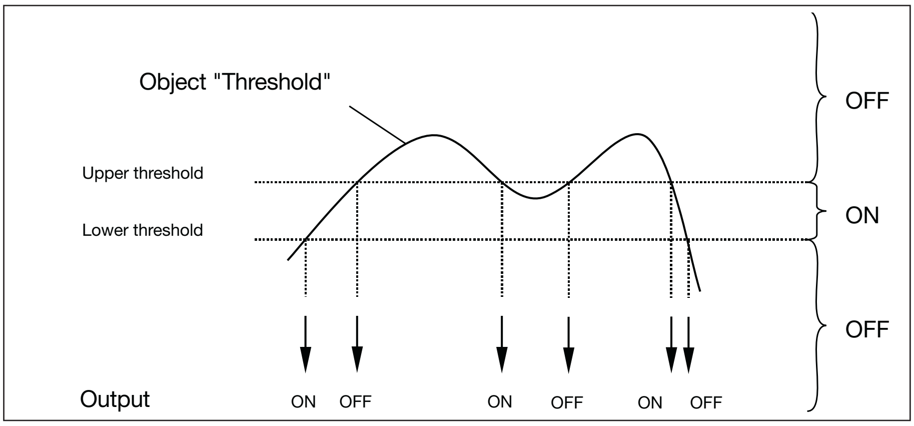


Fig. 55: Threshold values are not hysteresis values

The output is switched if the value exceeds the upper hysteresis threshold or falls below the lower hysteresis threshold.

Note: If the object “Threshold value” receives a value which does not exceed or fall below any of the threshold values when compared to the old value, no switching operations are triggered.

4.3 Operating mode "Heating Actuator"

The following illustration indicates the sequence in which the functions of the "heating actuator" operating mode are processed.

4.3.1 Function chart

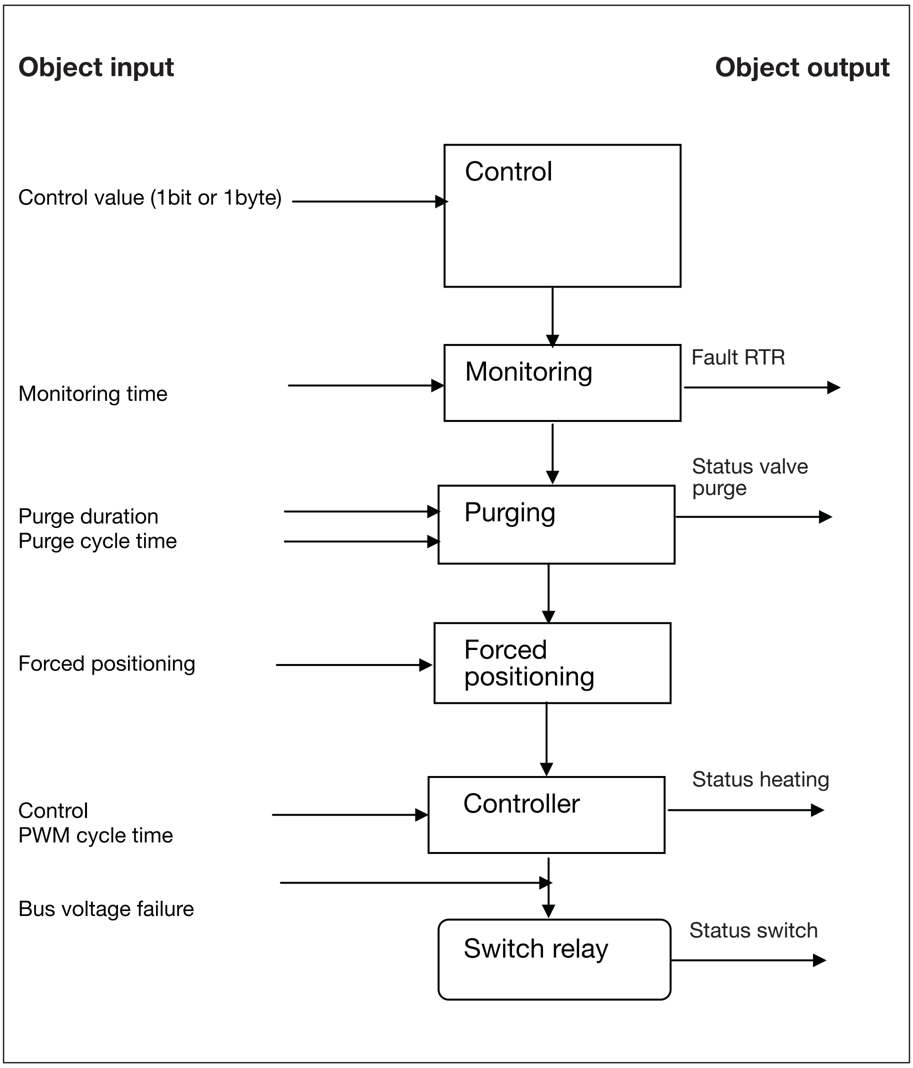


Fig. 56: Function chart – heating actuator

4.3.2 2 step control

2 step control is the simplest form of control. A control value is not calculated here. The room thermostat sends a “1” via the object “Switch” if a certain temperature is exceeded and a “0” if the value drops below a certain temperature. These switch values are implemented by the actuator.

The room thermostat hysteresis limits can be used to stabilise control. Use of these limits does not affect the method of operation of the switch actuator.

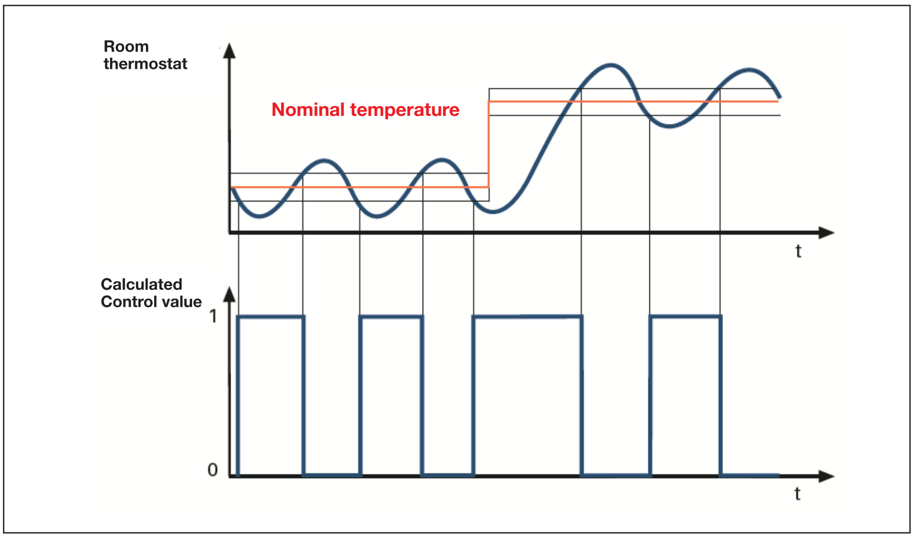


Fig. 57: Diagram 2 step control

A room thermostat can use the control algorithm of a PWM control. As the room thermostat sends ON and OFF commands to the actuator, the actuator operates like a 2 step control.

4.3.3 PWM control

If the switch actuator receives an 1byte value as an input signal, the switch actuator can use this value together with the programmed cycle time of the received value and control an output via a PWM.

With PWM control, the value calculated in the control algorithm (0...100 %) is converted to a PWM. The conversion is always based on a constant cycle time. If the switch actuator for example, receives a control value of 20 %, then for a cycle time of 15 minutes a "1" will be sent for 3 minutes (20 % of 15 minutes) and a "0" will be sent for 12 minutes.

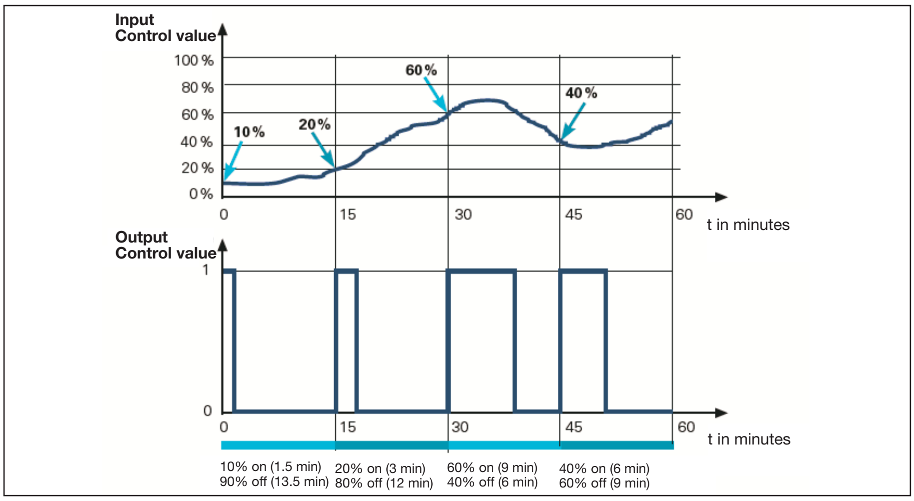


Fig. 58: PWM control diagram

4.3.4 PWM calculation

With pulse width modulation the control is implemented by a variable mark-space ratio. The following diagram clarifies this:

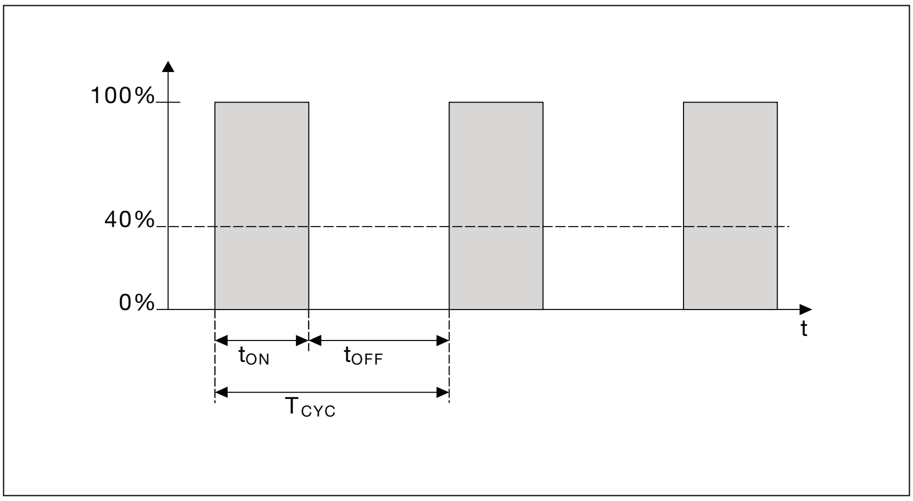


Fig. 59: PWM calculation diagram

During the time t_{ON} the valve is controlled with OPEN, during the time t_{OFF} with CLOSE. If $t_{ON} = 0.4 \times t_{CYC}$ the valve switches on for about 40 %. t_{CYC} is the so-called PWM cycle time for continuous control.

Pulse width modulation leads to frequent switching of the outputs. Consider the limited number of switching operations with normal switch actuators! The use of electronic switch actuators should be the preferred method.

4.3.5 Lifetime examination of a PWM control

Assume that a PWM cycle time of 15 minutes has been selected, this means that 4 switching operations (switching on/of) occurs each hour. 96 in a day and 3000 in a month. This amounts to 36000 switching operations a year. With a relay life of 10^5 switching operations, this means a Switch Actuator life of less than 3 years.

If however, the cycle time is set to just 3 minutes, this results in about 150000 switching operations annually, which normally means the Switch Actuator life would be less than a year.

This observation assumes an AC1 (practically ohmic load) switch loading at rated current. If the maximum number of switching operations for a purely mechanical relay loading are assumed, the life of the Switch Actuator is extended. This has an inherent risk, as the contact materials will wear prematurely and cannot safely guarantee conduction of current.

In the following, conventional cycle times for control of various heating and air-condition systems are listed:

Heating system	Control method	Cycle time
Heating water Supply temperature 45 °C – 70 °C	PWM	15 minutes
Heating water Supply temperature < 45 °C	2 step PWM	– 15 minutes
Underfloor/wall heating	PWM	20 – 30 minutes
Electrical underfloor heating	PWM	20 – 30 minutes
Electrical fan heating	2 step	–
Electrical convection heating	PWM 2 step	10 – 15 minutes –

Table 43: Cycle times

4.4 Behaviour during bus voltage failure, recovery and download

Reaction on bus voltage failure
The reaction of every individual output with bus voltage failure can be programmed in the parameter window “X: General” with the parameter “Reaction on bus voltage failure”. This programming acts directly on the relays and has the highest priority in the entire Switch Actuator, see function chart in sections 4.2.1 and 4.3.1.

Before the first switching action is possible after bus voltage recovery, the actuator will first store enough energy 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.

With the programming “Contact unchanged” the relay contact position will not be changed if the bus voltage fails. That means if the staircase lighting is on, it will stay on until the bus voltage recovers and a renewed switching action is received.

After the contact positions are set with bus voltage recovery, the switch actuator remains functional until the bus voltage recovers.

Reaction on bus voltage recovery
The Switch Actuator draws the energy for switching the contact from the bus. After the bus voltage has been applied, sufficient energy will only be available to switch **all** contacts simultaneously after 10 to 30 seconds, depending on the actuator type (refer to the technical data in section 2). Depending on the time “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 actuator 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 bus voltage failure

The switch actuator commences to operate after about 1 to 2 seconds independently of the programmed “Transmission and switching delay after recovery of bus voltage”, i.e. the objects are set according to the programming, e.g. the timer for time delay is started. A switching action or sending of a telegram is only possible however after the “Transmission and switching delay after recovery of bus voltage”.

Download:
The actuator is not functional during download. No telegrams are received, sent and no switching actions are executed. The primary objective is to ensure that a download has no effect on the current operation. It is thus possible to undertake a download during normal operation.

In parameter window “X: General” with the parameter “Overwrite scene and preset with download”, it is possible to select if the actuator should overwrite scenes and preset values with the programmed values, or retain them during a download.

In the following table the behaviour of the switch actuator after bus voltage recovery, download and ETS bus reset are listed:

Behaviour with:	Bus voltage recovery (BW)	Download	ETS-Bus-Reset
Object values	Generally the values of the object can be programmed. (see functions below) If not the object is written with the value “0”	Remain as they were. Overwriting scene and preset values can be programmed (X: General”)	Remain as they were, even the scene and preset values
Timer	Are not operational	Remains as the are, out of operation	As with download
Contact position	Initially unknown. Modified by receipt of the latest event in dependence on the function chart (section 4.2.1). Execution after the send delay time has timed out (“General”)	Unchanged. Only after an event is received. Exception is change of the forced operation and safety priority. These changes are immediately verified and executed if required	As with download
Switch actuator			
Switch object	Programmable (“X: General”)	Unchanged. Evaluation only after an event has been received.	As with download
Time function	Can be programmed if enabled (“X: Function”), timer out of operation	Unchanged, timer out of operation	As with download
Staircase lighting	It can be programmed in the parameter window “X: Function” if the time function is disabled or not disabled after bus voltage recovery. Otherwise unchanged. Change only after a new event has been received. The staircase lighting time changed via the bus is lost and is replaced by the ETS programmed time.	Unchanged. Change only after an event has been received. E.g. the staircase lighting remains on until it is started again or switched off	As with download
Delays	Unchanged. Change only after an event has been received.	Unchanged. Change only after an event has been received.	As with download
Flashing	Unchanged. Change only after an event has been received.	Unchanged. Change only after an event has been received.	As with download
Permanent ON	Programmable (“X: Time”)	Unchanged	As with download
Preset / scenes	The preset and scene values in the actuator will be restored.	Overwriting scene and preset values can be programmed (X: General)	The preset and scene values in the actuator will be restored.
Logic (Object connection)	Programmable (“X: Logic”) Will only be evaluated after the next event.	Will only be evaluated after the next event	As with download
Threshold (Object threshold input)	Programmable (“X: Threshold”) Will only be evaluated after the next event.	Will only be evaluated after the next event	As with download
Safety priorities	Inactive, object values are set to inactive	Object values remain. Monitoring time will be restarted	As with download
Forced Positioning	Programmable (“X: Safety”)	Object values remain. Monitoring time will be restarted	As with download
Current detection	The current value will be recalculated. The threshold status will be calculated from it	The current value will be recalculated. The threshold status will be calculated from it	As with download
Heating actuator			
Valve operation	Position programmable (“X: General”)	Calculation will be continued	As with download
Function	Unchanged	Will be accepted, if changed	Unchanged
Monitoring (Object “RTR fault”)	Monitoring time will be restarted. Object value is “0”	Monitoring time will be restarted. Object value unchanged	As with download
Behaviour forced operation	OFF	Unchanged	As with download
Valve Purge	Monitoring time restarts	Monitoring time restarts	As with download

Table 44: Behaviour with bus voltage failure, recovery and download

Appendix

A.1 Scope of delivery

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

– 1 pc. SA/S x.y.zS[1], MDRC
– 1 pc. Installation and operating instructions
– 1 pc. Bus Connection Terminal (red/black)

[1] Note: x = number of outputs (2, 4, 8 or 12)
y = rated current in Ampere (6 A, 10 A, 16 A, or 20 A)
z = 5 = C-Load (200 µF),
S = current detection code letter

A.2 Code table 8-bit scene telegram

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

Bit No.		7	6	5	4	3	2	1	0		
8bit value	Hexadecimal	Recall/ storing	Not defined	Scene number						Scene number	Recall (A)/ Store (S)
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	A
65	41	0	1	0	0	0	0	0	1	2	A
66	42	0	1	0	0	0	0	1	0	3	A
67	43	0	1	0	0	0	0	1	1	4	A
68	44	0	1	0	0	0	1	0	0	5	A
69	45	0	1	0	0	0	1	0	1	6	A
70	46	0	1	0	0	0	1	1	0	7	A
71	47	0	1	0	0	0	1	1	1	8	A
72	48	0	1	0	0	1	0	0	0	9	A
73	49	0	1	0	0	1	0	0	1	10	A
74	4A	0	1	0	0	1	0	1	0	11	A
75	4B	0	1	0	0	1	0	1	1	12	A
76	4C	0	1	0	0	1	1	0	0	13	A
77	4D	0	1	0	0	1	1	0	1	14	A
78	4E	0	1	0	0	1	1	1	0	15	A
79	4F	0	1	0	0	1	1	1	1	16	A
80	50	0	1	0	1	0	0	0	0	17	A
81	51	0	1	0	1	0	0	0	1	18	A
82	52	0	1	0	1	0	0	1	0	19	A
83	53	0	1	0	1	0	0	1	1	20	A
84	54	0	1	0	1	0	1	0	0	21	A
85	55	0	1	0	1	0	1	0	1	22	A
86	56	0	1	0	1	0	1	1	0	23	A
87	57	0	1	0	1	0	1	1	1	24	A
88	58	0	1	0	1	1	0	0	0	25	A
89	59	0	1	0	1	1	0	0	1	26	A
90	5A	0	1	0	1	1	0	1	0	27	A
91	5B	0	1	0	1	1	0	1	1	28	A
92	5C	0	1	0	1	1	1	0	0	29	A
93	5D	0	1	0	1	1	1	0	1	30	A
94	5E	0	1	0	1	1	1	1	0	31	A
95	5F	0	1	0	1	1	1	1	1	32	A
96	60	0	1	1	0	0	0	0	0	33	A
97	61	0	1	1	0	0	0	0	1	34	A
98	62	0	1	1	0	0	0	1	0	35	A
99	63	0	1	1	0	0	0	1	1	36	A
100	64	0	1	1	0	0	1	0	0	37	A
101	65	0	1	1	0	0	1	0	1	38	A
102	66	0	1	1	0	0	1	1	0	39	A
103	67	0	1	1	0	0	1	1	1	40	A
104	68	0	1	1	0	1	0	0	0	41	A
105	69	0	1	1	0	1	0	0	1	42	A
106	6A	0	1	1	0	1	0	1	0	43	A
107	6B	0	1	1	0	1	0	1	1	44	A
108	6C	0	1	1	0	1	1	0	0	45	A
109	6D	0	1	1	0	1	1	0	1	46	A
110	6E	0	1	1	0	1	1	1	0	47	A
111	6F	0	1	1	0	1	1	1	1	48	A
112	70	0	1	1	1	0	0	0	0	49	A
113	71	0	1	1	1	0	0	0	1	50	A
114	72	0	1	1	1	0	0	1	0	51	A
115	73	0	1	1	1	0	0	1	1	52	A
116	74	0	1	1	1	0	1	0	0	53	A
117	75	0	1	1	1	0	1	0	1	54	A
118	76	0	1	1	1	0	1	1	0	55	A
119	77	0	1	1	1	0	1	1	1	56	A
120	78	0	1	1	1	1	0	0	0	57	A
121	79	0	1	1	1	1	0	0	1	58	A
122	7A	0	1	1	1	1	0	1	0	59	A
123	7B	0	1	1	1	1	0	1	1	60	A
124	7C	0	1	1	1	1	1	0	0	61	A
125	7D	0	1	1	1	1	1	0	1	62	A
126	7E	0	1	1	1	1	1	1	0	63	A
127	7F	0	1	1	1	1	1	1	1	64	A
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	AB	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	S
193	C1	1	1	0	0	0	0	0	1	2	S
194	C2	1	1	0	0	0	0	1	0	3	S
195	C3	1	1	0	0	0	0	1	1	4	S
196	C4	1	1	0	0	0	1	0	0	5	S
197	C5	1	1	0	0	0	1	0	1	6	S
198	C6	1	1	0	0	0	1	1	0	7	S
199	C7	1	1	0	0	0	1	1	1	8	S
200	C8	1	1	0	0	1	0	0	0	9	S
201	C9	1	1	0	0	1	0	0	1	10	S
202	CA	1	1	0	0	1	0	1	0	11	S
203	CB	1	1	0	0	1	0	1	1	12	S
204	CC	1	1	0	0	1	1	0	0	13	S
205	CD	1	1	0	0	1	1	0	1	14	S
206	CE	1	1	0	0	1	1	1	0	15	S
207	CF	1	1	0	0	1	1	1	1	16	S
208	D0	1	1	0	1	0	0	0	0	17	S
209	D1	1	1	0	1	0	0	0	1	18	S
210	D2	1	1	0	1	0	0	1	0	19	S
211	D3	1	1	0	1	0	0	1	1	20	S
212	D4	1	1	0	1	0	1	0	0	21	S
213	D5	1	1	0	1	0	1	0	1	22	S
214	D6	1	1	0	1	0	1	1	0	23	S
215	D7	1	1	0	1	0	1	1	1	24	S
216	D8	1	1	0	1	1	0	0	0	25	S
217	D9	1	1	0	1	1	0	0	1	26	S
218	DA	1	1	0	1	1	0	1	0	27	S
219	DB	1	1	0	1	1	0	1	1	28	S
220	DC	1	1	0	1	1	1	0	0	29	S
221	DD	1	1	0	1	1	1	0	1	30	S
222	DE	1	1	0	1	1	1	1	0	31	S
223	DF	1	1	0	1	1	1	1	1	32	S
224	E0	1	1	1	0	0	0	0	0	33	S
225	E1	1	1	1	0	0	0	0	1	34	S
226	E2	1	1	1	0	0	0	1	0	35	S
227	E3	1	1	1	0	0	0	1	1	36	S
228	E4	1	1	1	0	0	1	0	0	37	S
229	E5	1	1	1	0	0	1	0	1	38	S
230	E6	1	1	1	0	0	1	1	0	39	S
231	E7	1	1	1	0	0	1	1	1	40	S
232	E8	1	1	1	0	1	0	0	0	41	S
233	E9	1	1	1	0	1	0	0	1	42	S
234	EA	1	1	1	0	1	0	1	0	43	S
235	EB	1	1	1	0	1	0	1	1	44	S
236	EC	1	1	1	0	1	1	0	0	45	S
237	ED	1	1	1	0	1	1	0	1	46	S
238	EE	1	1	1	0	1	1	1	0	47	S
239	EF	1	1	1	0	1	1	1	1	48	S
240	F0	1	1	1	1	0	0	0	0	49	S
241	F1	1	1	1	1	0	0	0	1	50	S
242	F2	1	1	1	1	0	0	1	0	51	S
243	F3	1	1	1	1	0	0	1	1	52	S
244	F4	1	1	1	1	0	1	0	0	53	S
245	F5	1	1	1	1	0	1	0	1	54	S
246	F6	1	1	1	1	0	1	1	0	55	S
247	F7	1	1	1	1	0	1	1	1	56	S
248	F8	1	1	1	1	1	0	0	0	57	S
249	F9	1	1	1	1	1	0	0	1	58	S
250	FA	1	1	1	1	1	0	1	0	59	S
251	FB	1	1	1	1	1	0	1	1	60	S
252	FC	1	1	1	1	1	1	0	0	61	S
253	FD	1	1	1	1	1	1	0	1	62	S
254	FE	1	1	1	1	1	1	1	0	63	S
255	FF	1	1	1	1	1	1	1	1	64	S

Table 45: Code table 8bit scene

A.3 Ordering information


2CDC 071 017 F0005

SA/S 4.6.1


2CDC 071 018 F0005

SA/S 8.6.1


2CDC 071 019 F0005

SA/S 12.6.1


2CDC 071 063 F0005

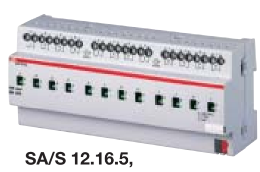
SA/S 2.16.5S, SA/S 2.16.1, SA/S 2.10.1, SA/S 2.20.1S


2CDC 071 064 F0005

SA/S 4.16.5S, SA/S 4.16.1, SA/S 4.10.1, SA/S 4.20.1S


2CDC 071 065 F0005

SA/S 8.16.5S, SA/S 8.16.1, SA/S 8.10.1, SA/S 8.20.1S


2CDC 071 057 F0005

SA/S 12.16.5, SA/S 12.10.1, SA/S 12.20.1

Switch Actuators, 6 A, MDRC

Switches with potential free contacts 4, 8 and 12 independent electrical loads in 2, 4 or 6 groups with 2 contacts each via ABB i-bus®. The 6 A–AC3 series is suitable for switching ohmic, inductive and capacitive loads.

Type	Version	MB **	Order Code	bbn 40 16779 EAN	Price group	Unit weight 1 pc. [kg]	Pack unit [Pc.]
SA/S 4.6.1	4-fold	2	2CDG 110 036 R0011	**64384 9**	26	0.13	1
SA/S 8.6.1	8-fold	4	2CDG 110 037 R0011	**64424 2**	26	0.24	1
SA/S 12.6.1	12-fold	6	2CDG 110 038 R0011	**64423 5**	26	0.30	1

Switch Actuators, 10 AX, MDRC

Switches with potential free contacts 2, 4, 8 and 12 independent electrical loads via ABB i-bus®. Manual contact operation possible for each output. The switching state of the contact is displayed. The 10 AX–AC1 series is particularly suitable for switching ohmic loads, inductive and capacitive loads as well as fluorescent lamp loads (AX) to EN 60669.

Type	Version	MB **	Order Code	bbn 40 16779 EAN	Price group	Unit weight 1 pc. [kg]	Pack unit [Pc.]
SA/S 2.10.1	2-fold	2	2CDG 110 039 R0011	**64422 8**	26	0.15	1
SA/S 4.10.1	4-fold	4	2CDG 110 040 R0011	**64421 1**	26	0.25	1
SA/S 8.10.1	8-fold	8	2CDG 110 041 R0011	**64420 4**	26	0.46	1
SA/S 12.10.1	12-fold	12	2CDG 110 042 R0011	**64419 8**	26	0.65	1

Switch Actuators, 16 A, MDRC

Switches with potential free contacts, 2, 4, 8 and 12 independent electrical loads via ABB i-bus®. Manual contact operation possible for each output. The switching state of the contact is displayed. The 16 A–AC1 series is suitable for switching ohmic, inductive and capacitive loads.

Type	Version	MB **	Order Code	bbn 40 16779 EAN	Price group	Unit weight 1 pc. [kg]	Pack unit [Pc.]
SA/S 2.16.1	2-fold	2	2CDG 110 062 R0011	**64877 6**	26	0.15	1
SA/S 4.16.1	4-fold	4	2CDG 110 063 R0011	**64876 9**	26	0.25	1
SA/S 8.16.1	8-fold	8	2CDG 110 064 R0011	**64875 2**	26	0.46	1
SA/S 12.16.1*	12-fold	12	2CDG 110 082 R0011	**65928 4**	26	0.65	1

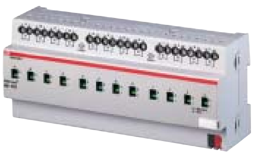
Switch Actuators, 16 AX, C-Load, MDRC

Switches with potential free contacts 2, 4, 8 and 12 independent electrical loads via ABB i-bus®. The actuators SA/S 2.16.5S, SA/S 4.16.5S and SA/S 8.16.5S feature a circuit for current detection for each output. Manual contact operation possible for each output. The switching state of the contact is displayed. The 16 AX–AC3, C-Load series are particularly suitable for switching loads with high peak inrush currents such as fluorescent lighting with compensation capacitors or fluorescent lamp loads (AX) to EN 60669.

Type	Version	MB **	Order Code	bbn 40 16779 EAN	Price group	Unit weight 1 pc. [kg]	Pack unit [Pc.]
SA/S 2.16.5S	with Current Detection, 2-fold	2	2CDG 110 043 R0011	**64418 1**	26	0.20	1
SA/S 4.16.5S	with Current Detection, 4-fold	4	2CDG 110 044 R0011	**64383 2**	26	0.34	1
SA/S 8.16.5S	with Current Detection, 8-fold	8	2CDG 110 045 R0011	**64417 4**	26	0,6	1
SA/S 12.16.5	12-fold	12	2CDG 110 046 R0011	**64416 7**	26	0.80	1

* available I/2007

A.3 Ordering information



SA/S 12.20.1

Type	Version	MB **	Order Code	bbn 40 16779 EAN	Price group	Unit weight 1 pc. [kg]	Pack unit [Pc.]

Switch Actuators, 20 AX, MDRC

Switches with potential free contacts 2, 4, 8 and 12 independent electrical loads via ABB i-bus®. The actuators SA/S 2.20.1S, SA/S 4.20.1S and SA/S 8.20.1S feature a circuit for current detection for each output. Manual contact operation possible for each output. The switching state of the contact is displayed. The 20AX-AC1 series is particularly suitable for switching ohmic loads, inductive and capacitive loads such as fluorescent lighting with compensation capacitors as well as fluorescent lamp loads (AX) to EN 60669.

Type	Version	MB **	Order Code	bbn 40 16779 EAN	Price group	Unit weight 1 pc. [kg]	Pack unit [Pc.]
SA/S 2.20.1S	with Current Detection, 2-fold	2	2CDG 110 047 R0011	**64415 0**	26	0.2	1
SA/S 4.20.1S	with Current Detection, 4-fold	4	2CDG 110 048 R0011	**64414 3**	26	0.34	1
SA/S 8.20.1S	with Current Detection, 8-fold	8	2CDG 110 049 R0011	**64413 6**	26	0.6	1
SA/S 12.20.1	12-fold	12	2CDG 110 050 R0011	**64412 9**	26	0.8	1

Table 46: Ordering details of the SA/S – Switch Actuator

A.4 Notes

Notes

Notes

The information in this leaflet is subject to change without further notice.

Pub. No. 2CDC 505 056 D0203
replace 2CDC 505 056 D0202

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