

Technical Manual

MDT Switch Actuators
with current measurement

AMI/AMS



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2 Overview

2.1 Overview devices

The manual refers to the following devices, which are in our assortment of switch actuators. Actually we can offer you the following switch actuators (Order Code respectively printed in bold type):

- **AMS-0416.01** Switching actuator 4-fold, 4TE, 230V AC, 16 A, C-Load 100µF, standard design
 - 4 TE REG, 230VAC, 16A, C-Load 100uF, with current measurement
- **AMS-0816.01** Switching actuator 8-fold, 8TE, 230V AC, 16 A, C-Load 100µF, standard design
 - 8 TE REG, 230VAC, 16A, C-Load 100uF, with current measurement
- **AMI-0416.01** Switching actuator 4-fold, 4TE, 230V AC, 16 A, C-Load 200µF, industrial design
 - 4 TE REG, 230VAC, 16A, C-Load 200uF, with current measurement
- **AMI-0816.01** Switching actuator 8-fold, 8TE, 230V AC, 16 A, C-Load 200µF, industrial design
 - 8 TE REG, 230VAC, 16A, C-Load 200uF, with current measurement

2.2 Exemplary circuit diagrams

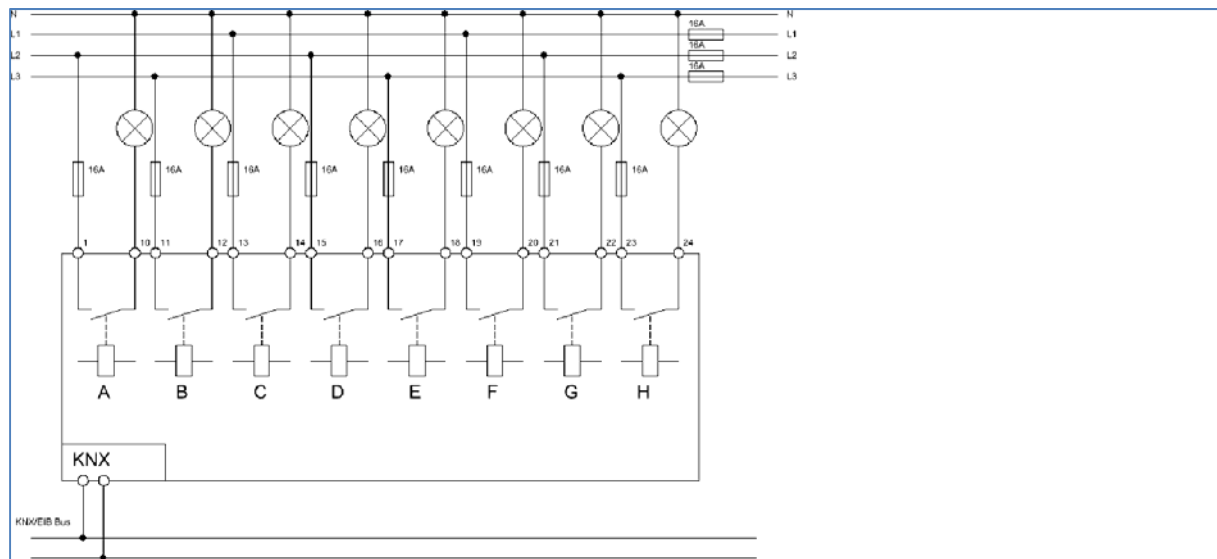


Illustration 1: Exemplary circuit diagram AMS-0816.01

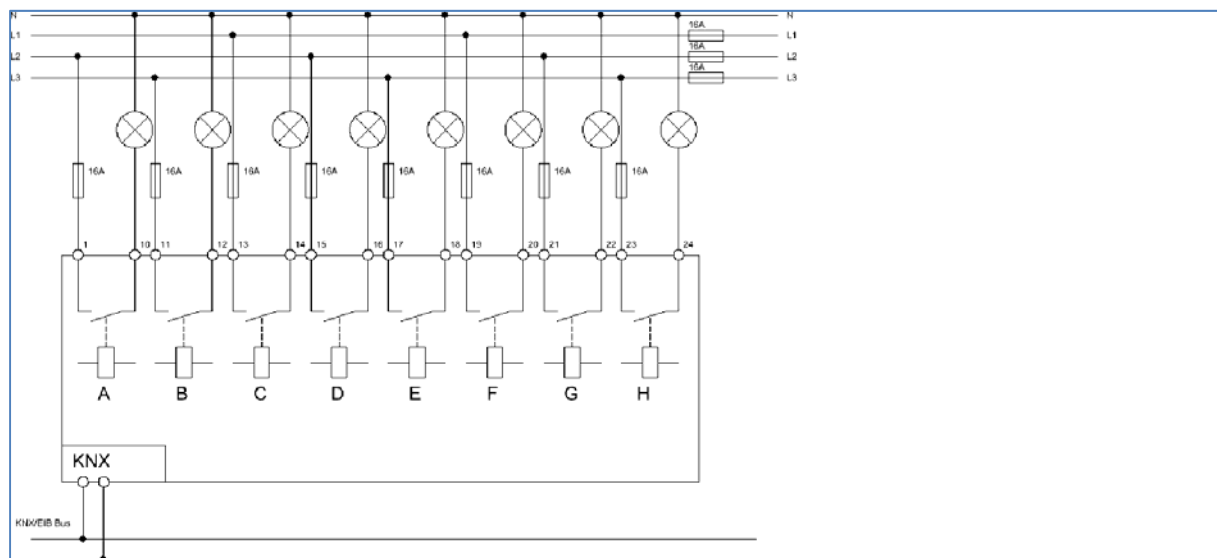


Illustration 2: Exemplary circuit diagram AMI-1216.01

2.3 Structure & Handling

The switch actuators (here: AKI 1216.01) contain of one status LED per channel. This LED indicates the state of the depending output. Furthermore every output can be switched manual, independent of the current parameterization. The lines AKS and AKI have buttons for every channel. In contrast the line of the AKK has only four buttons, independent to the number of channels. Two buttons are for choosing the channel, whereby the chosen channel is indicated by a flashing status LED. The buttons up and down are for switching the channel on and off. The programming button activates the programming function. An activated programming function is indicated by a lit programming LED.

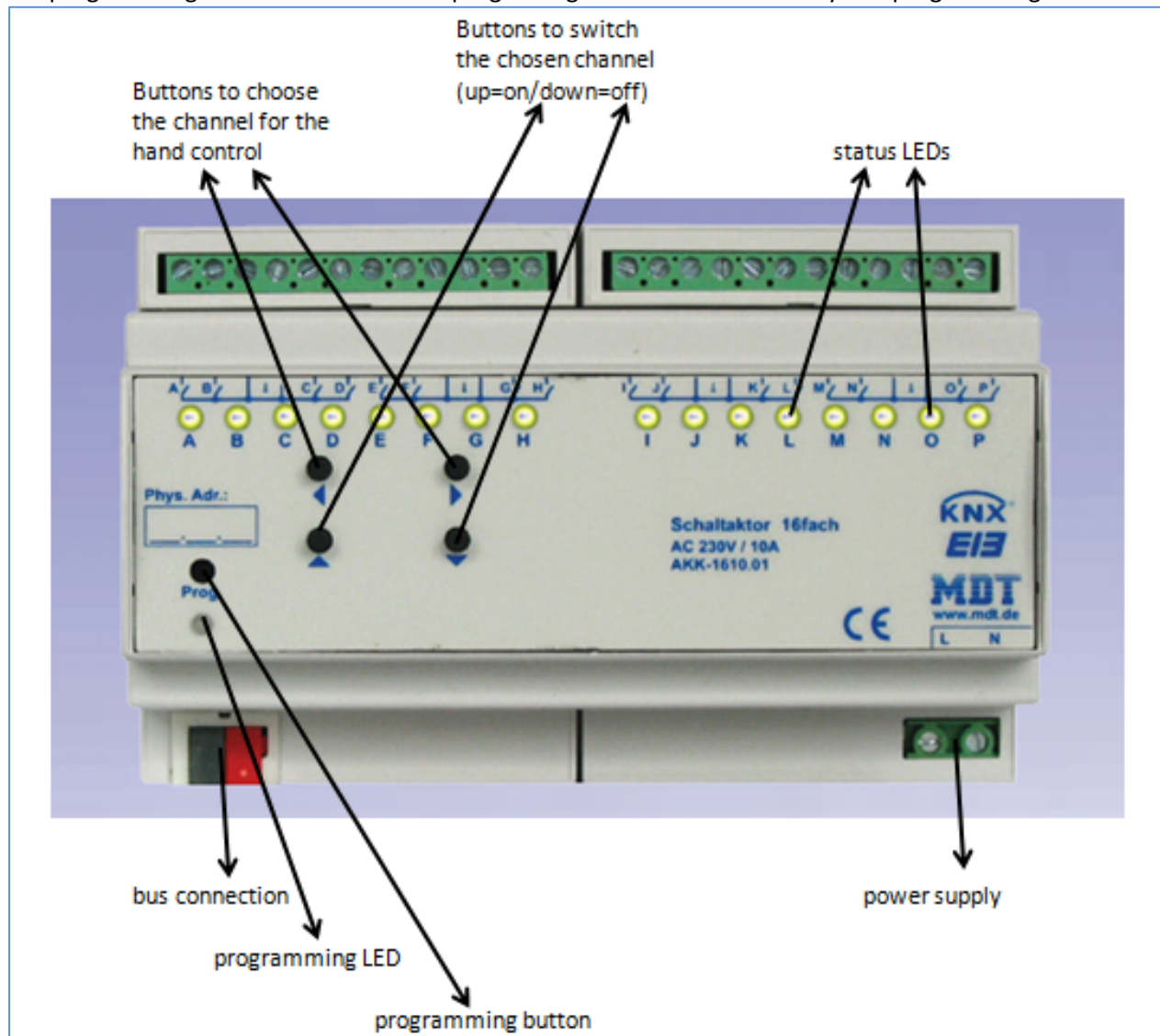


Illustration 3: Overview hardware module switch actuator (e.g. AKK-1610.01)

The lines AMS and AMI have bistable relays. At the bistable relays the current switching state also stays in case of a breakdown of the 230V auxiliary voltage and at an update of the parameterization.

2.4 Functions

All of the channels have identical functions (have a look at the functional overview). The numbers of channels depends to the hardware design, which can have 2, 4, 8, 12 or 16 channels. The identification is standardly in consecutive alphabetic order.

There are 3 different states for every channel possible:

- **not active**

The channel has no function. So there are no communication objects for this channel shown.

- **Switch**

If the channel is chosen as switch, there will be different parameterization options for configuring the switching process.

- **Staircase**

Now, the channel can become a staircase light function. This function causes an automatic switch off of the channel after an adjusted time.

2.4.1 Overview functions

Group of functions	Functions
Group addresses	number of objects/connections= dynamic (freely assignable of the user)
Reset behavior	behavior at bus power breakdown
	behavior at bus power up
	startup timeout
Relay mode	normally closed/ normally opened
Switch functions	switching
	central switching function
Time functions	on-delay
	off-delay
Staircase light functions	time for staircase
	pre-warning (with adjustable warning and pre-warning time)
	manual off
	retriggerable on/off
Superordinate functions	blocking function
	logic functions (AND/ OR)
Scenes	scene function for up to 8 scenes per channel
Status functions	feedback function
Current measurement	single current measurement of each channel
	warning and error messages adjustable
	total current measurement of the whole device
Operating hours counter	forward counter of the operating hours
	back counter to next service time

Chart 1: Overview functions

2.5. Settings at the ETS-Software

Selection at the product database:

Manufacturer: MDT Technologies

Product family: Actuator

Product type: Switch Actuators

Medium Type: Twisted Pair (TP)

Product name: addicted to the used type, e.g.: AMI-0816.01 switch actuator 8-fold, 8TE, 16A

Order number: addicted to the used type, e.g.: AKI-0816.01

2.6. Starting up

After wiring, the allocation of the physical address and the parameterization of every channel follow:

- (1) Connect the interface with the bus, e.g. MDT USB interface
- (2) Switching the power supply
- (3) Set bus power up
- (4) Press the programming button at the device (red programming LED lights)
- (5) Loading of the physical address out of the ETS-Software by using the interface (red LED goes out, as well this process was completed successful)
- (6) Loading of the application, with requested parameterization
- (7) If the device is enabled you can test the requested functions (also possible by using the ETS-Software)

3 Communication objects

3.1 Communication objects per channel

The communication objects per channel are displayed, when they are activated through the parameterization. There are 8 numbers reserved for every channel, even if not all of them are needed. So the first channel has the numbers from 0 to 7, the second from 8 to 15 and so on. The communication objects are needed for the connection to the group addresses and to program your project.

The following illustration shows the communication objects for the channels A and B. Channel A is selected as switch. Logic functions, blocking object and scenes are activated. Channel B is selected as staircase. Only the blocking function is activated:

Number	Name	Object Function	Description	Group Addresses	Leng...	C	R	W	T	U
0	Channel A	Switch On/Off			1 bit	C	-	W	-	-
2	Channel A	Block			1 bit	C	-	W	-	-
4	Channel A	Scene			1 Byte	C	-	W	-	-
5	Channel A	Status			1 bit	C	R	-	T	-
6	Channel A	Logic 1			1 bit	C	-	W	-	-
7	Channel A	Logic 2			1 bit	C	-	W	-	-
9	Channel B	Staircase			1 bit	C	-	W	-	-
10	Channel B	Block			1 bit	C	-	W	-	-
13	Channel B	Status			1 bit	C	R	-	T	-
96	Central Function	Switch On/Off			1 bit	C	-	W	-	-

Illustration 4: Communication objects per channel (Channel A –switch; Channel B –staircase)

The following communication objects can be shown for a channel selected as switch:

Nr.	Function	Usage	Data type	
0	Switch on/off	switches the channel on/off	DPT 1.001	In, Write
2	Block	blocks the channel	DPT 1.001	In, Write
4	Scene	calls activated scenes	DPT 18.001	In, Write
5	Status	feedback function	DPT 1.001	Out, Read
6	Logic 1	only shown at activated logic function	DPT 1.001	In, Write
7	Logic 2	only shown at activated logic function	DPT 1.001	In, Write
+8	next channel			

Chart 2: Communication objects "switch"

The following communication objects can be shown for a channel selected as staircase:

Nr.	Function	Usage	Data type	
1	Staircase	switches the staircase function on/off	DPT 1.001	In, Write
2	Block	blocks the channel	DPT 1.001	In, Write
5	Status	feedback function	DPT 1.001	Out, Read
+8	next channel			

Chart 3: Communication objects "staircase"

3.2 Central communication object

The central function is always shown also if it is not used in any of the channels. The communication object for the central function is at the bottom of the communication objects. It has always the first number after the communication objects for the channels. So at an 8-fold switch actuator, it has the number 64.

The communication object of the central function calls all channels, which have an activated central function.

The following communication object exists only once and is for channels:

Nr.	Function	Usage	Data type	
	Central function	number accords to the hardware design	DPT 1.001	In, Write

Chart 4: Central communication object

3.3 Communication Objects current measurement

The following communication objects are available for the current measurement and counting of the operating hours:

Nr.	Function	Usage	Data type	
8	Response operating hours	reports counted operating hours	DPT 7.007	Out, Read
8	Time to the next service	reports time to the next service	DPT 7.007	Out, Read
9	Reset operating hours	resets counter for the operating hours	DPT 1.001	In, Write
9	Reset service	resets the counter for the service time	DPT 1.001	In, Write
10	Service required	reports required maintenance	DPT 1.001	Out, Read
11	Current value	reports the actual current consumption of the channel	DPT 7.012/ DPT 9.021/ DPT 14.019/ DPT 9.024	Out, Read
12	Exceedance of load	reports an exceeded load	DPT 1.001	Out, Read
13	Lower deviation of load	reports an underranged load	DPT 1.001	Out, Read
14	Fault current	reports a fault current	DPT 1.001	Out, Read
14	Load faulty	reports a fault of the load	DPT 1.001	Out, Read
14	Fault current/Load faulty	reports a fault current and a fault of the load	DPT 1.001	Out, Read
+15	next channel			
76/148	Value of total current	reports the total current of all activated channels	DPT 9.021/ DPT 14.019/ DPT 9.024	Out, Read
77/149	Exceedance of total current	reports an exceeded load of all activated channels	DPT 1.001	Out, Read

Chart 5: Communication objects current measurement

The sizes as well as the type of the shown objects depends to the adjusted parameterization, have a look at the relevant explanations at section 4.

There are objects for the current measurement of the single channels as well as for the total current measurement of the actuator. It can be adjusted whether a channel shall be included to the total current measurement or not.

3.4 Default settings of the communication objects

The following chart shows the default settings of the communication objects:

Default settings									
Nr.	Name	Object Function	Length	Priority	C	R	W	T	U
0	Channel A	switch on/off	1 Bit	Low	X		X		
1	Channel A	Staircase	1 Bit	Low	X		X		
2	Channel A	Block	1 Bit	Low	X		X		
4	Channel A	Scene	1 Byte	Low	X		X		
5	Channel A	Status	1 Bit	Low	X	X		X	
6	Channel A	Logic 1	1 Bit	Low	X		X		
7	Channel A	Logic 2	1 Bit	Low	X		X		
8	Channel A	Response operating hours	2 Byte	Low	X	X		X	
8	Channel A	Time to the next service	2 Byte	Low	X	X		X	
9	Channel A	Reset operating hours	1 Bit	Low	X		X		
9	Channel A	Reset service	1 Bit	Low	X		X		
10	Channel A	Service required	1 Bit	Low	X	X		X	
11	Channel A	Current value	2 Byte	Low	X	X		X	
11	Channel A	Exceedance of load	4 Byte	Low	X	X		X	
12	Channel A	Lower deviation of load	1 Bit	Low	X	X		X	
13	Channel A	Fault current	1 Bit	Low	X	X		X	
14	Channel A	Load faulty	1 Bit	Low	X	X		X	
14	Channel A	Fault current/Load faulty	1 Bit	Low	X	X		X	
14	Channel A	Reset service	1 Bit	Low	X	X		X	
+8	next channel								
76/148	Central function	Value of total current		Low	X	X		X	
77/149	Central function	Exceedance of total current	1 Bit	Low	X	X		X	
78/150	Central function	switch on/off	1 Bit	Low	X		X		

Chart 6: Communication objects – default settings

You can see the default values for the communication objects from the upper chart. According to requirements the priority of the particular communication objects as well as the flags can be adjusted by the user. The flags allocates the function of the objects in the programming thereby stands C for communication, R for Read, W for write, T for transmit and U for update.

4 Reference ETS-Parameter

4.1 General Settings

The following parameter exists only once and affects to all channels:

General	
Startup timeout	1 s
Total current	activ

Illustration 5: General settings

The parameter startup timeout adjusts the time between an upload and the functional start of the device. The used hardware reacts only after expiration of the adjusted time. All input commands before the startup timeout expire.

The following chart shows the dynamic range of this parameter:

ETS-text	Dynamic range [default value]	comment
Startup timeout	1-60s [1s]	Time between an upload and the functional start of the device
Total current	<ul style="list-style-type: none"> ▪ active ▪ not active 	activates the total current measurement, have a look at chapter 4.6.2 total current

Chart 7: General settings

4.2 Channel selection

The following illustration shows the menu for selecting the channels:

Channel Preselection	
Channel A	Switch
Channel B	Staircase
Channel C	not activ
Channel D	not activ
Channel E	not activ
Channel F	not activ
Channel G	not activ
Channel H	not activ
Channel I	not activ
Channel J	not activ
Channel K	not activ
Channel L	not activ

Illustration 6: Channel selection

There are 3 possible states for every channel, which can be adjusted at the menu “channel preselection”. The following parameterization accords to the chosen state of a channel. But if you chose a channel as “not active”, there will be no further parameterization options available.

The chart shows the setting options for every channel:

ETS-text	Dynamic range [default value]	comment
Channel A-[O]	<ul style="list-style-type: none"> ▪ not active ▪ Switch ▪ Staircase 	Operating mode of the channels

Chart 8: Channel selection

4.3 Identical parameter

The following parameters, which are described at the headings 4.3.x, are as well available at channels selected as switch as at channels selected as staircase.

4.3.1 Relay operating mode

The following illustration shows the setting options for this parameter:

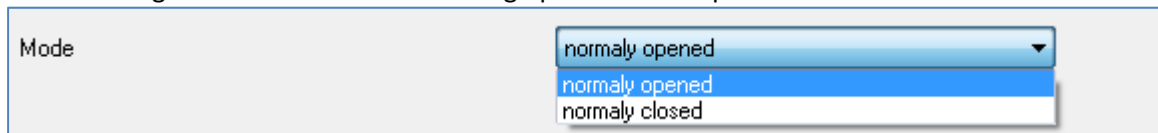


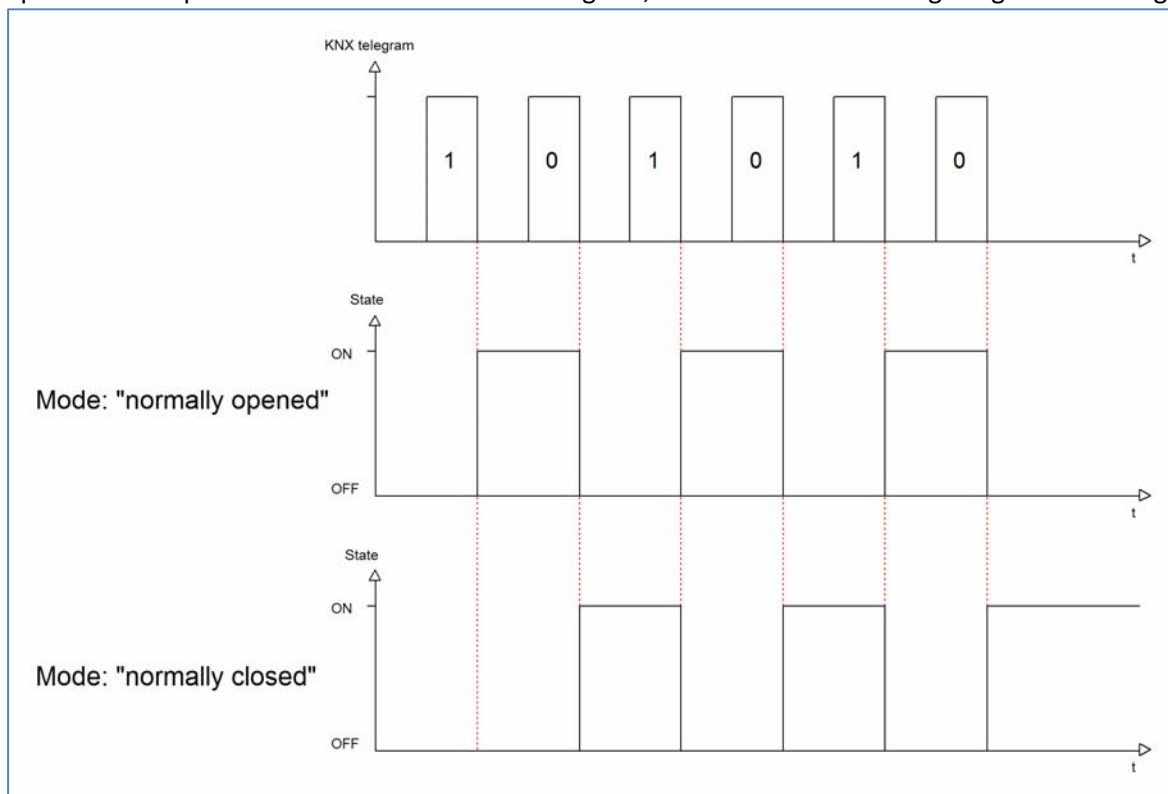
Illustration 7: Operating mode

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Mode	<ul style="list-style-type: none"> ▪ normally opened ▪ normally closed 	Relay operating mode of the channel

Chart 9: Operating mode

The following diagram shows the behavior of the relay operating mode normally closed and normally opened. The input for the channels is a KNX-telegram, which sends alternating 0-signals and 1-signals:



4.3.2 Central function

The following illustration shows the setting options at the ETS-Software:

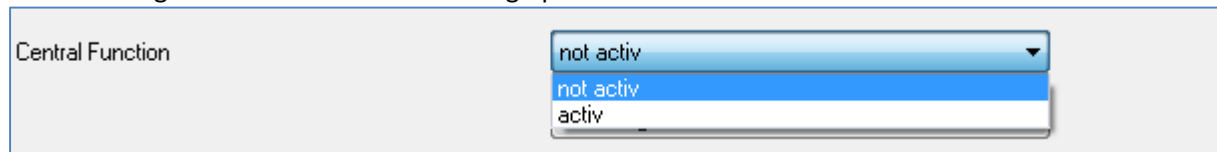


Illustration 8: Central function

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Central function	<ul style="list-style-type: none"> ▪ not active ▪ active 	switches the central function on/off for this channel

Chart 10: Central function

The central function can be switched on/off for every channel. For switching on this function, you have to choose the option "active". By calling the central communication object, all channels with an activated central function are switched on with their current parameterization. So switch-on delays or staircase functions are still kept.

The central function can make programming much more easier and your project can become more clear.

The following chart shows the associated communication object:

Number	Name	Length	Usage
	Central function	1 Bit	central switching of the channels number depends to the number of channels

Chart 11: Communication object central function

4.3.3 Behavior at block/unblock

The following illustration shows the setting options at the ETS-Software:

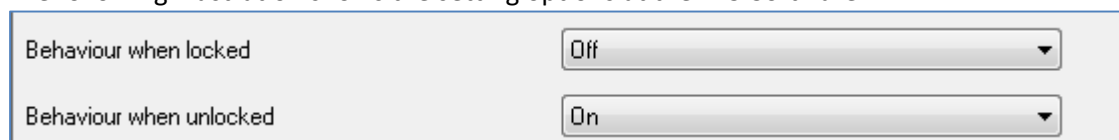


Illustration 9: Blocking function

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Behavior when locked Behavior when unlocked	<ul style="list-style-type: none"> ▪ On ▪ Off ▪ no change 	Behavior to a blocking/unblocking process

Chart 12: Behavior at block/unblock

The blocking function gets active, when the corresponding communication object becomes a logical "1". By sending a logical "0", the blocking function can be deactivated again.

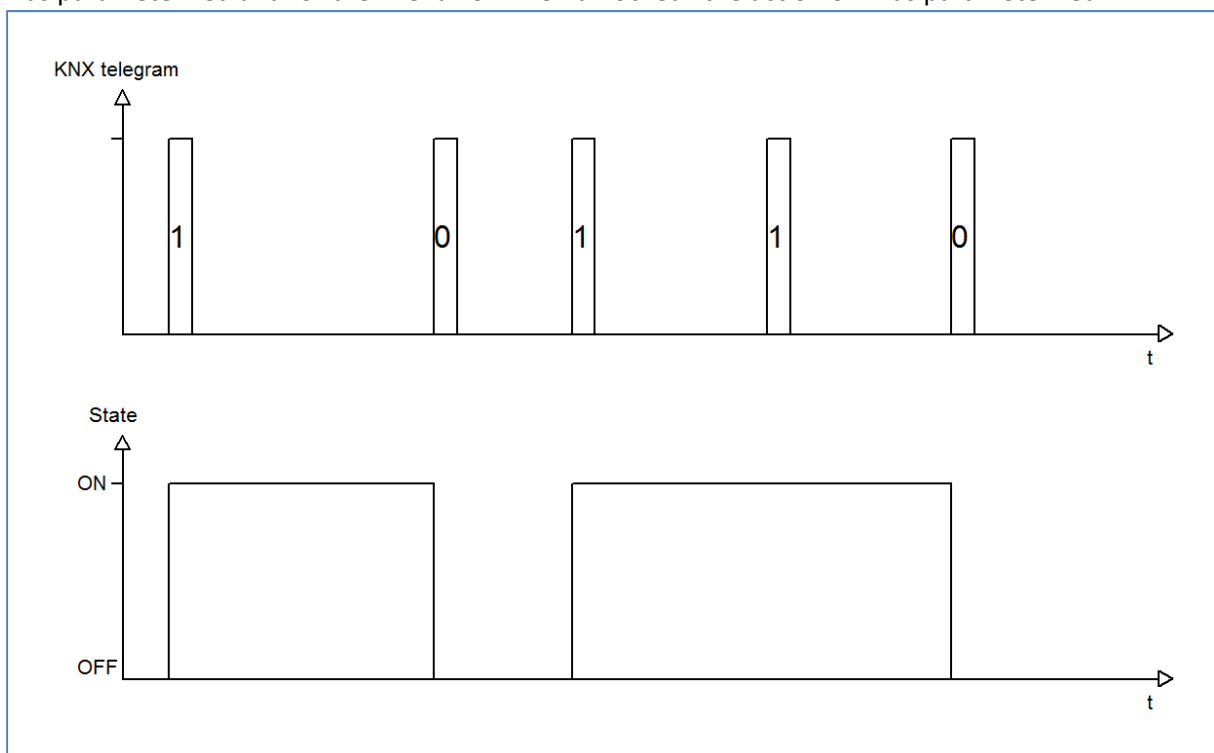
The parameter "Behavior when locked" defines an action for the output at activating the blocking process. There are the setting on, off and no change available. The same settings are also available for the "Behavior when unlocked". This action is called when the blocking function is deactivated again.

The following chart shows the corresponding communication object:

Number	Name	Length	Usage
2	Block	1 Bit	blocks the channel

Chart 13: Communication object blocking function

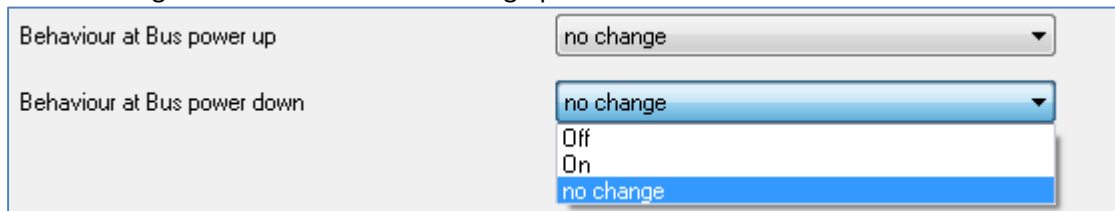
The following diagram describes the blocking process. For the "Behavior when locked", the action on was parameterized and for the "Behavior when unlocked" the action off was parameterized:



The KNX telegram shows which values are send to the blocking object. By sending a logical "1", the blocking function is activated and the channel is switched on. The blocking function is deactivated again by sending a logical "0". So the channel is switched off.

4.3.4 Behavior at bus power up/down

The following illustration shows the setting options at the ETS-Software:



Behaviour at Bus power up: no change

Behaviour at Bus power down: no change (selected from a list containing Off, On, and no change)

Illustration 10: Behavior at bus power up/down

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Behavior at bus power up/ Behavior at bus power down	<ul style="list-style-type: none"> ▪ On ▪ Off ▪ no change 	Adjustment, how the channel shall react in case of a bus power breakdown/return

Chart 14: Behavior at bus power up/down

Every channel can occupy a certain state as well in case of a bus power breakdown as in case of a bus power return. The channel can be switched off or on, but also stay in its current state by choosing the parameter “no change”.

To avoid problems in case of a bus power breakdown, you should adjust this parameter very conscientious. Because there is no controlling possible as long as the bus power is down.

4.4 Switching output

The following parameters, which are described at the headings 4.4.x, are only available at channels selected as switch.

4.4.1 Overview

By choosing a channel as switch, a sub menu, called Channel A Switching, appears for this channel at the left drop down menu.

The sub menu is shown at the following illustration:

Channel A Switching	
Mode	normally closed ▼
On Delay [s]	0 ▲ ▼
Off Delay [s]	0 ▲ ▼
Central Function	activ ▼
Behaviour when locked	Off ▼
Behaviour when unlocked	On ▼
Behaviour at Bus power up	no change ▼
Behaviour at Bus power down	no change ▼
Logical functions	with two Objects ▼
logic Operations	OR ▼
Szene	activ ▼

Illustration 11: Switching output

The chart shows the possible settings for switching outputs:

ETS-text	Dynamic range [default value]	comment
Mode	<ul style="list-style-type: none"> ▪ normally opened ▪ normally closed 	Operation mode of the channel
On-Delay	0...30000 sec [0=no delay]	Switch on delay of the channel in seconds
Off-Delay	0...30000 sec [0=no delay]]	Switch off delay of the channel in seconds
Central function	<ul style="list-style-type: none"> ▪ not active ▪ active 	Activates the central function for this channel
Behavior when locked	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for activating the blocking process
Behavior when unlocked	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for deactivating the blocking process
Behavior at bus power down	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for a bus power breakdown
Behavior at bus power up	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for a bus power return
Logic function	<ul style="list-style-type: none"> ▪ not active ▪ with one object ▪ with two objects 	Activation of the logic function with one or two objects
Logic operation	<ul style="list-style-type: none"> ▪ And ▪ Or 	Selection of the logic function only available, when the logic function was activated
Scene	<ul style="list-style-type: none"> ▪ not active ▪ active 	Activation of the scene function by activation this parameter a new sub menu appears (have a look at 4.4.4)

Chart 15: Switching output

4.4.2 On/Off delay

The following illustration shows the setting options at the ETS-Software:

On Delay [s]	<input type="text" value="0"/>	<input type="button" value="▲"/> <input type="button" value="▼"/>
Off Delay [s]	<input type="text" value="0"/>	<input type="button" value="▲"/> <input type="button" value="▼"/> [0..30000]

Illustration 12: On/Off delay

The on-delay causes a delayed switch of the channel. At sending an on-signal to the channel, first the adjusted on delay time expires and afterwards the channel will be switched on.

The off delay works on the same principle. At sending an off-signal, first the adjusted off delay time expires and afterwards the channel will be switched off.

Both functions work as well alone as combined. By adjusting "0 seconds" for a delay the function is switched off.

The following diagram describes the combination of on and off delay:



4.4.3 Logical functions

The following illustration shows the setting options at the ETS-Software:

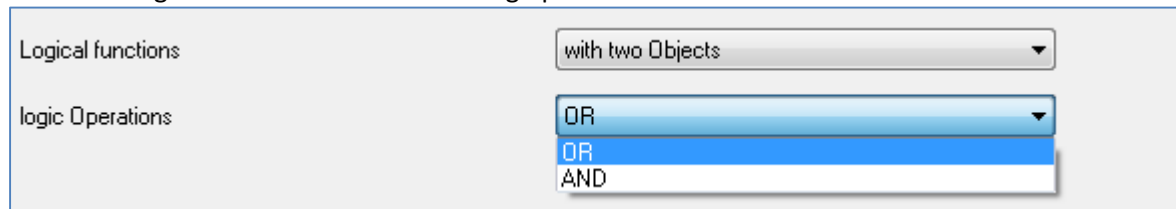


Illustration 13: Logical functions

The logic function can be activated with one or two objects. The objects are the inputs of the logic block. Furthermore you can choose between an AND-function and an OR-function.

When you have activated the logic function, the logic block has to be satisfied before switching the channel. As long as the logic function is not satisfied, the channel does not react to any signal.

The following chart shows the relevant communication objects:

Number	Name	Length	Usage
6	Logic 1	1 Bit	Logic object 1, is the first input for the logic block
7	Logic 2	1 Bit	Logic object 2, is the second input for the logic block

Chart 16: Communication objects logic

According to the chosen logic operation only one or both objects have to become a 1-signal.

The following chart shows the both logic operations with two objects:

AND-Connection							OR-Connection		
Logic 1	Logic 2	Channel switchable?					Logic 1	Logic 2	Channel switchable?
0	0	No					0	0	No
0	1	No					0	1	Yes
1	0	No					1	0	Yes
1	1	Yes					1	1	Yes

Chart 17: Logic operations

4.4.4 Scene function

When functions of different groups (e.g. light, heating and shutter) shall be changed simultaneously with only one keystroke, it is practical to use the scene function. By calling a scene, you can switch the lights to a specific value, drive the shutter to an absolute position, switch the heating to the day mode and switch the power supply of the sockets on. The telegrams of these functions can have as well different formats as different values with different meaning (e.g. "0" for switch the lights off and open the shutters). If there were no scene function, you would have to send a single telegram for every actuator to get the same function.

The scene function of the switch actuator enables you to connect the channels of the switch actuator to a scene control. For that, you have to assign the value to the appropriated space (scene A..H). It is possible to program up to 8 scenes per switching output. When you activate the scene function at the switching output, a new sub menu for the scenes appears at the left drop down menu. There are settings to activate single scenes, set values and scene numbers and switch the memory function on/off at this sub menu.

Scenes are activated by receiving their scene numbers at the communication object for the scenes. If the memory function of the scenes is activated, the current value of the channel will be saved at the called scene number.

The communication objects of the scenes have always the length of 1 byte.

The following illustration shows the setting options at the ETS-Software for activating the scene function:

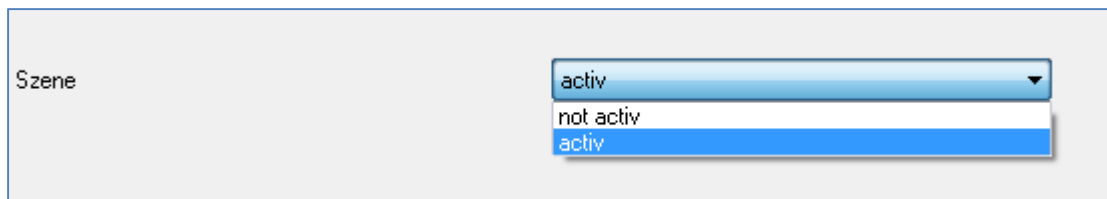


Illustration 14: Scene function

The following chart shows the relevant communication object:

Number	Name	Length	Usage
4	Scene	1 Byte	Call of the scene

Chart 18: Communication object scene

For calling a certain scene, you have to send the value for the scene to the communication object. The value of the scene number is always one number less than the adjusted scene number. For calling scene 1, you have to send a "0". So the scene numbers have the numbers from 1 to 64, but the values for the scenes only from 0 to 63.

If you want to call scenes by a binary input or another KNX device, you have to set the same number at the calling device as at the receiving device. The calling device, e.g. a binary input, sends automatically the right value for calling the scene.

There are up to 8 storage options for scenes at every channel.
These 8 storage options can get any of the possible 64 scene numbers.

Channel A, Scene	
Save scene	enabled
Scene A	Off
Scene Number A	1
Scene B	Off
Scene Number B	2
Scene C	Off
Scene Number C	3
Scene D	Off
Scene Number D	4
Scene E	Off
Scene Number E	5
Scene F	Off
Scene Number F	6
Scene G	Off
Scene Number G	7
Scene H	Off
Scene Number H	8

Illustration 15: Sub function scene

The chart shows the possible settings for scenes, which are identical for all channels. The settings are available at the sub menu for the scenes:

ETS-text	Dynamic range [default value]	comment
Save scene	<ul style="list-style-type: none"> ▪ disabled ▪ enabled 	Learning of scenarios; enable/disable memory function
Scene A	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene A
Scene number A	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number
Scene B	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene B
Scene number B	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number
Scene C	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene C
Scene number C	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number
Scene D	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene D
Scene number D	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number
Scene E	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene E
Scene number E	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number
Scene F	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene F
Scene number F	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number
Scene G	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene G
Scene number G	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number
Scene H	<ul style="list-style-type: none"> ▪ Off ▪ On 	Activation of the scene H
Scene number H	1-64 [1]	Scene number; Calling value = 1 less than the adjusted scene number

Chart 19: Parameter scene

For calling a scene or saving a new value for the scene, you have to send the accordingly code to the relevant communication object for the scene:

Scene	Retrieve		Save	
	Hex.	Dez.	Hex.	Dez.
1	0x00	0	0x80	128
2	0x01	1	0x81	129
3	0x02	2	0x82	130
4	0x03	3	0x83	131
5	0x04	4	0x84	132
6	0x05	5	0x85	133
7	0x06	6	0x86	134
8	0x07	7	0x87	135
9	0x08	8	0x88	136
10	0x09	9	0x89	137
11	0x0A	10	0x8A	138
12	0x0B	11	0x8B	139
13	0x0C	12	0x8C	140
14	0x0D	13	0x8D	141
15	0x0E	14	0x8E	142
16	0x0F	15	0x8F	143
17	0x10	16	0x90	144
18	0x11	17	0x91	145
19	0x12	18	0x92	146
20	0x13	19	0x93	147
21	0x14	20	0x94	148
22	0x15	21	0x95	149
23	0x16	22	0x96	150
24	0x17	23	0x97	151
25	0x18	24	0x98	152
26	0x19	25	0x99	153
27	0x1A	26	0x9A	154
28	0x1B	27	0x9B	155
29	0x1C	28	0x9C	156
30	0x1D	29	0x9D	157
31	0x1E	30	0x9E	158
32	0x1F	31	0x9F	159

Chart 20: Calling and saving scenes

4.4.4.1 Scene programming example

When the scene function is activated for one channel, a new sub menu for the scene of this channel appears. Up to 8 scenes can be adjusted at this sub menu. Every scene gets one scene number, which enables the calling of the scene. You can adjust one specific state for every scene. So you can switch the channel off, with the setting “Off” or switch the channel on with the setting “On”. When the scene is called, the adjusted parameterization of the channel is kept (e.g. on delay, off delay, ...). To note at the scene programming is that if you want to call 2 or more channels with the same scene number, you have to set the both communication objects for the scenes to the same group address. By sending the calling value, both scenes are called. Your programming can become much clearer if you divide your group addresses by scene numbers. If now one channel shall react to 8 scenes, you will have to connect the communication object for the scenes to 8 group addresses.

The following illustrations shall make the division clearly:

Maingroups

1 building one

0 Office

1 Scene A

2 Szene B

Object	Device	S	C	R	W	T	U	Product
4: Channel A - Scene	1.1.2 AKI-1216.01 Switch Actuator 12-f,...	S	C	-	W	-	-	AKI-1216.01 Switch Act...
12: Channel B - Scene	1.1.2 AKI-1216.01 Switch Actuator 12-f,...	S	C	-	W	-	-	AKI-1216.01 Switch Act...
28: Channel D - Scene	1.1.2 AKI-1216.01 Switch Actuator 12-f,...	S	C	-	W	-	-	AKI-1216.01 Switch Act...
36: Channel E - Scene	1.1.2 AKI-1216.01 Switch Actuator 12-f,...	S	C	-	W	-	-	AKI-1216.01 Switch Act...

Maingroups

1 building one

0 Office

1 Scene A

2 Szene B

Object	Device	S	C	R	W	T	U
4: Channel A - Scene	1.1.2 AKI-1216.01 Switch Actuator 12-f,...		C	-	W	-	-
20: Channel C - Scene	1.1.2 AKI-1216.01 Switch Actuator 12-f,...	S	C	-	W	-	-
28: Channel D - Scene	1.1.2 AKI-1216.01 Switch Actuator 12-f,...		C	-	W	-	-

Illustration 16: Programming of scenes

The channels A and D shall react to the call of scene A and scene B. So they are connected to both group addresses.

Furthermore you can save scenes at the according scene numbers. For that you have to activate the memory function at a channel of the switch actuator. Now you can call scenes by a binary input with a short keystroke and save scenes by a long keystroke. The adjusted value for the scene is overwritten by the current state of the actuator, when you save the scenes. At the next call of the scene, the scene will be called with the new value.

4.5 Staircase

The following parameters, which are described at the headings 4.5.x, are only available at channels selected as staircase.

4.5.1 Overview

By choosing a channel as staircase, a sub menu, called Channel A Staircase, appears for this channel at the left drop down menu.

The sub menu is shown at the following illustration:

Channel B Staircase	
Mode	normally closed
Time for Staircase [s]	120
Prewarning	activ
Warning Time [s]	1
Prewarning Time in [s]	10
Manual Switch off	not activ
Extend Staircase time	not activ
Central Function	not activ
Behaviour when locked	no change
Behaviour when unlocked	no change
Behaviour at Bus power up	no change
Behaviour at Bus power down	no change

Illustration 17: Staircase

The chart shows all possible settings for staircase outputs:

ETS-text	Dynamic range [default value]	comment
Mode	<ul style="list-style-type: none"> ▪ normally opened ▪ normally closed 	Operation mode of the channel
Time for staircase [s]	0...65535 sec [120 sec]	Duration of the switching process
Prewarning	<ul style="list-style-type: none"> ▪ not active ▪ active 	Activates the prewarning function
Warning time [s]	0...65535 sec [120 sec]	Duration of the warning; Only available when warning is activated
Prewarning time [s]	0...65535 sec [120 sec]	Adjustment, how long the light shall be switched on after the warning; Whole duration of the warning process is the sum of the 3 times: Staircase time, warning and prewarning Only available when warning is activated
Manual switching off	<ul style="list-style-type: none"> ▪ not active ▪ active 	Activation of the manual turn off of the staircase
Extend staircase time	<ul style="list-style-type: none"> ▪ not active ▪ active 	Activation of the extension of the staircase
Central function	<ul style="list-style-type: none"> ▪ not active ▪ active 	Activates the central function for this channel
Behavior when locked	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for activating the blocking process
Behavior when unlocked	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for deactivating the blocking process
Behavior at bus power down	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for a bus power breakdown
Behavior at bus power up	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ no change 	Action for a bus power return

Chart 21: Parameter staircase

4.5.2 Staircase time

The following illustration shows the setting options at the ETS-Software:

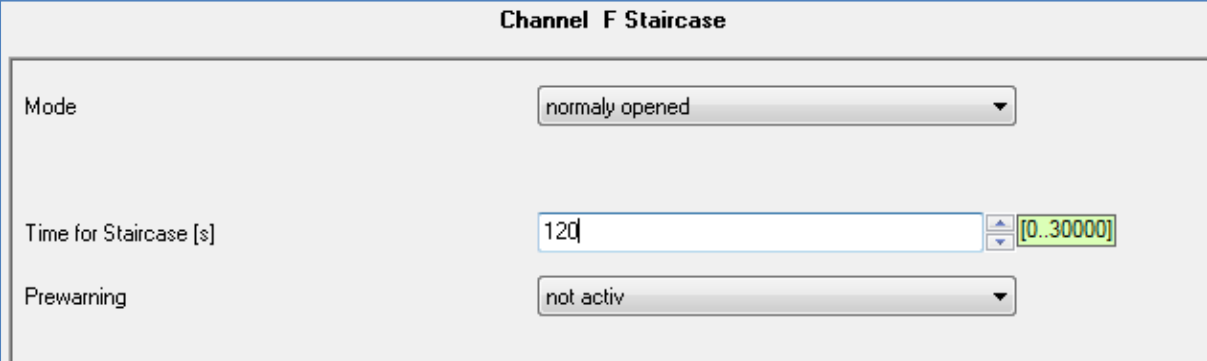


Illustration 18: Staircase time

The staircase function is activated by choosing a channel as staircase. This function enables an automatic turn off of the channel after an adjusted time, called “time for staircase”. The time for staircase can be parameterized freely. By sending an “on-signal” at the communication object, the channel is switched on and the time runs out. After the time is ran out, the channel is switched off automatically. There are a lot of further functions to adjust the staircase function. These functions are described at the following segments.

The following chart shows the relevant communication object:

Number	Name	Length	Usage
1	Staircase	1 Bit	Calling of the staircase function

Chart 22: Communication object staircase

4.5.3 Prewarning und Warning

The following illustration shows the setting options at the ETS-Software:

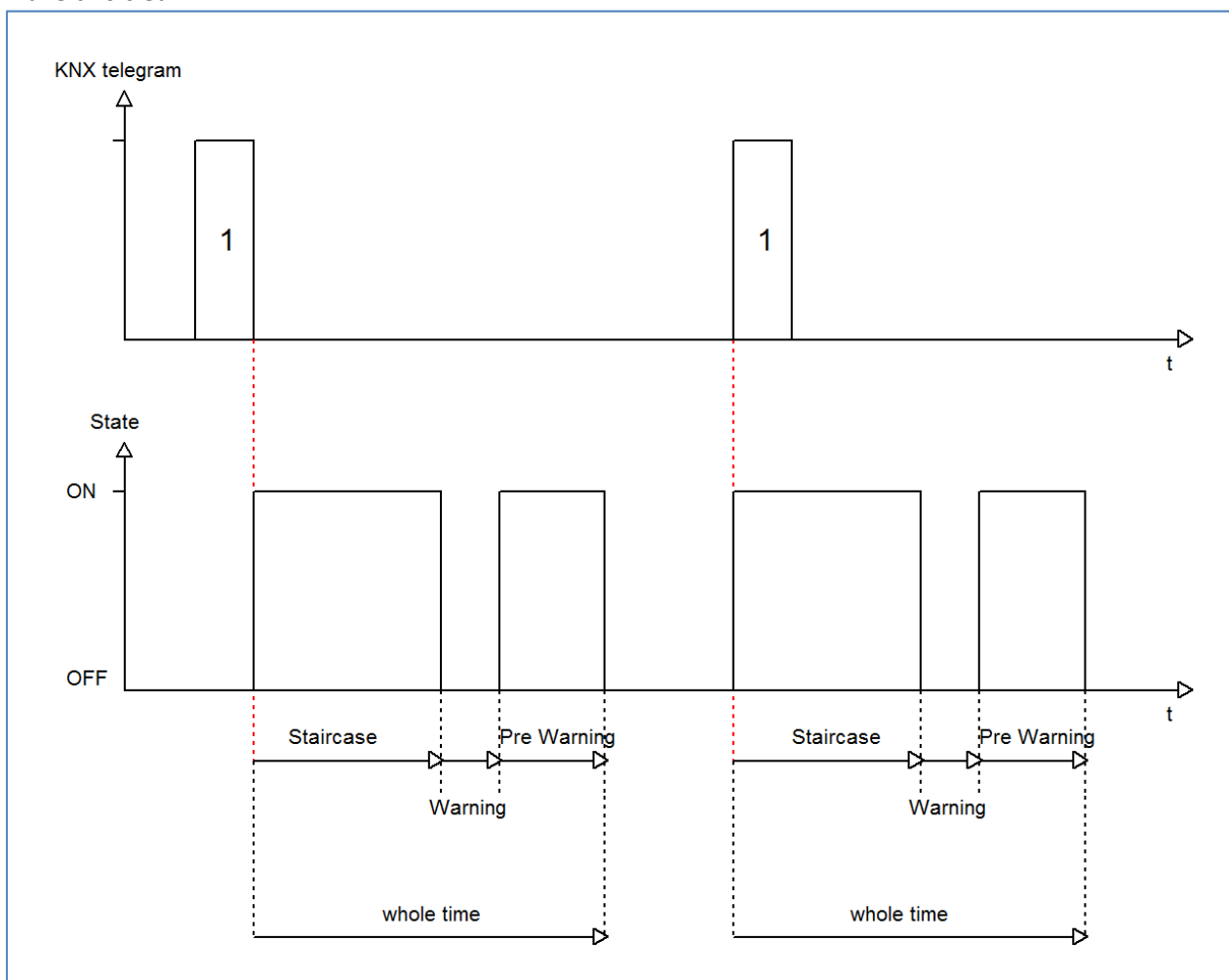
Prewarning	activ
Warning Time [s]	1 [0..30000]
Prewarning Time in [s]	10

Illustration 19: Warning timer & prewarning time

The warning function can be activated by adjusting the parameter “Prewarning” as active. Now, you can adjust warning time and prewarning time.

The warning function is for warning that the staircase time ran almost out and the lights are switched off soon. This warning happens through a short turn off the lights. The duration of the turn off is indicated by the warning time. A value of 1-3s is advisable for this parameter. When the warning time runs out, the lights will be switched on again for the adjusted prewarning time. Now you have the opportunities to extend the staircase time, when this parameter was activated, or leave the staircase. A dynamic programming is advisable for this time. So you can adapt this time to spatial conditions (next switch, length of the staircase, etc.).

The whole duration of the switching process is the sum of the 3 times. The following diagram shall make this clear:



4.5.4 Manual switch off

The following illustration shows the setting options at the ETS-Software:

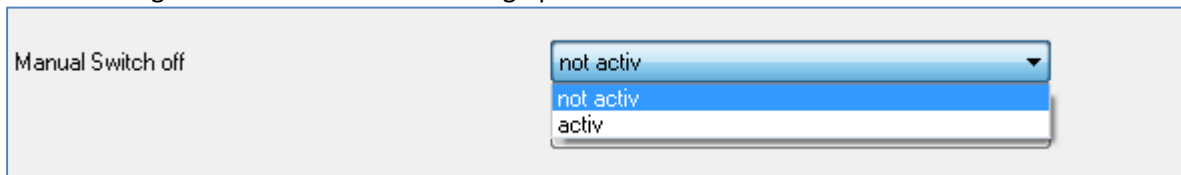


Illustration 20: Manual switch off

By activation this function, you can switch the channel off before the staircase time runs out. For switching off the channel, you have to send a logical "0" to the communication object for switching the staircase function (have a look at chart 20, page 27). When this function is not activated, the channel switches only off after the staircase time runs out.

4.5.5 Extend staircase time

The following illustration shows the setting options at the ETS-Software:

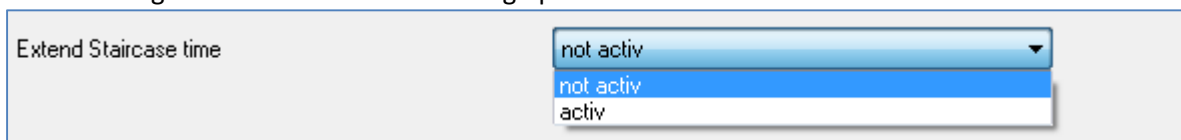
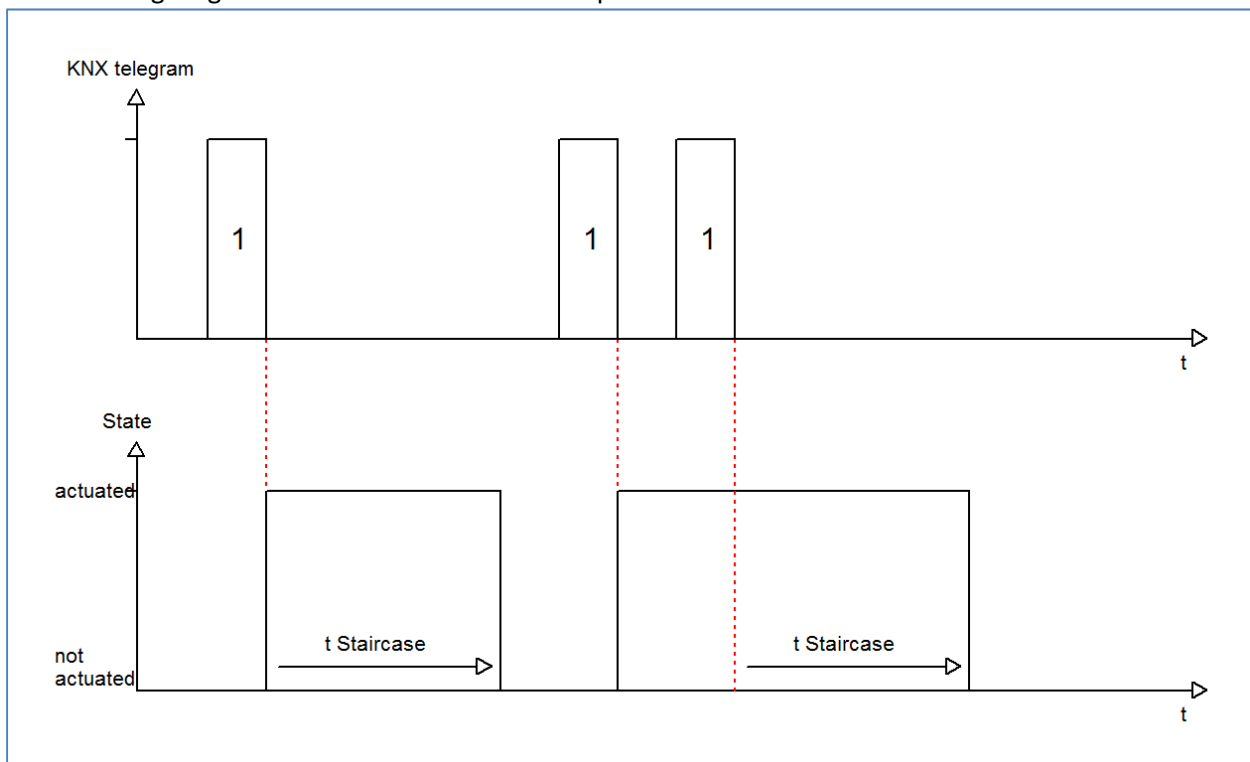


Illustration 21: Extend staircase time

By activating this function, the staircase time is retriggerable. That means, when the staircase time runs already out to 2/3, you can restart the time by sending a new on-signal to the communication object of the staircase function (have a look at chart 20, page 27).

The following diagram shows the behavior of this parameter:



4.6 Current measurement

The current measurement must be activated for every channel at the accordingly parameter:

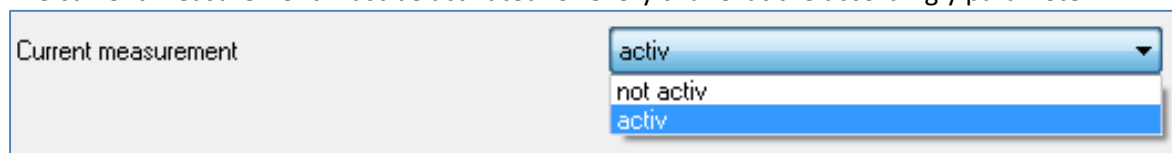


Illustration 22: Activation current measurement

If the current measurement is activated, a new submenu will appear. At his submenu, the current measurement can be parameterized for this channel.

4.6.1 General settings

The current measurement can be parameterized for the adjusted channel at the according submenu:

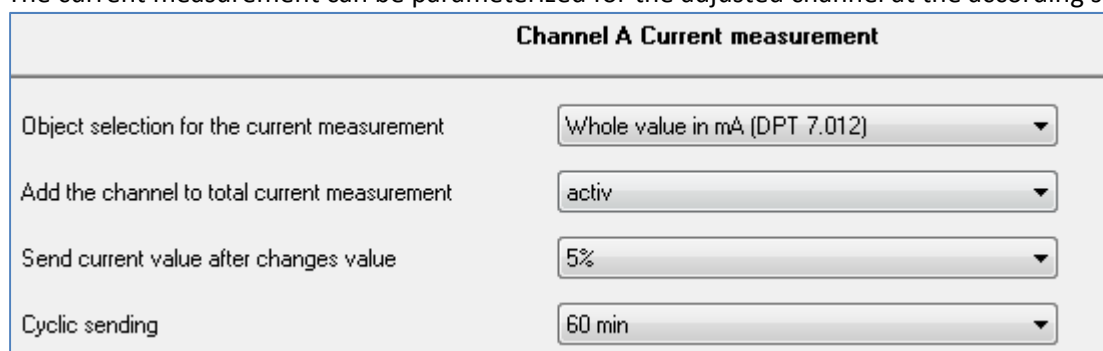


Illustration 23: General settings current measurement

The following general settings can be done for the current measurement:

ETS-text	Dynamic range [default value]	comment
Object selection for the current measurement	<ul style="list-style-type: none"> ▪ Whole value in mA ▪ Floating value in mA ▪ Value in A ▪ Value in kW 	Selection of the sending object for the current measurement
Add the channel to total current measurement	<ul style="list-style-type: none"> ▪ not active ▪ active 	adjusts, whether the channel hall be addicted to the total current measurement
Send actual value after changes value	not active, 1% - 75% [not active]	Activation and adjustment of the sending of the current value at determined changes
Cyclic sending	<ul style="list-style-type: none"> ▪ not active ▪ 15min ▪ 30min ▪ 60min ▪ 90min ▪ 120min 	Activation and adjustment of the sending of the current value at determined times

Chart 23: General settings current measurement

It can be adjusted for the current measurement of every channel, which object shall be shown. The accuracy of the current measurement as well as the size depends to the adjusted object.

Three different sizes are distinct:

- **Whole value in mA**
sends the current value in mA, only whole values are sent
- **Floating value in mA**
sends the current value in mA; the value is sent as floating value, so included with decimals
- **Value in A**
sends the current value in A; the value is sent as floating value, so included with decimals

Additional a setting is available for the calculation of the electric power of the channel. For this setting, additional the used voltage multiplied with the active power factor must be entered:

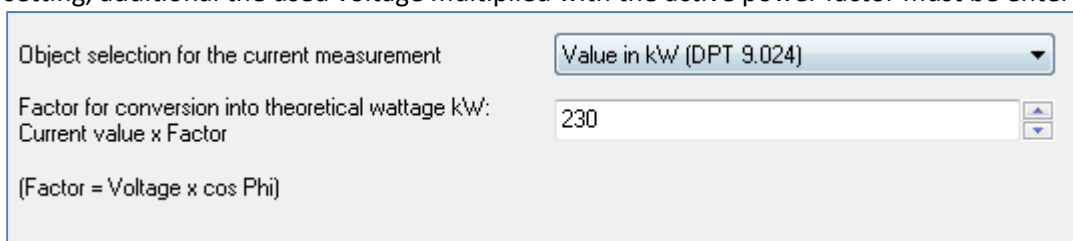


Illustration 24: Calculation of the theoretical power

The power of the channel is approximated calculated afterwards by a multiplication.

Furthermore can be set, whether the channel shall be integrated to the total current measurement of the actuator (have a look at 4.6.2 Total current measurement). Also the sending conditions of the channel can be adjusted. The channel can send its actual value as well as determined percentage change or in fixed time steps, independent of a change of the value. Both sending conditions can be combined, too.

The following chart shows the communication object for the current value:

Number	Name	Length	Usage
11	Current value	2/4 Byte	sends the actual current value of the channel

Chart 24: Communication object current measurement

4.6.2 Total current measurement

The total current measurement can be activated for the whole actuator once at the submenu "General" (have a look at 4.1 General). For every channel can be set, whether this channel shall be integrated to this measurement or not. The submenu for the parameterization of the total current measurement is constructed as follows:

Total current	
Object selection for the current measurement	Value in kW (DPT 9.024) ▼
Factor for conversion into theoretical wattage kW: Current value x Factor	230 ▲▼
(Factor = Voltage x cos Phi)	
Send current value after changes value	7% ▼
Cyclic send	30 min ▼
Monitoring exceedance of load	not activ ▼

Illustration 25: Total current

The following settings can be made for the total current measurement:

ETS-text	Dynamic range [default value]	comment
Object selection for the current measurement	<ul style="list-style-type: none"> ▪ Floating value in mA ▪ Value in A ▪ Value in kW 	Selection of the sending object for the current measurement
Send actual value after changes value	not active, 1% - 75% [not active]	Activation and adjustment of the sending of the current value at determined changes
Cyclic sending	<ul style="list-style-type: none"> ▪ not active ▪ 15min ▪ 30min ▪ 60min ▪ 90min ▪ 120min 	Activation and adjustment of the sending of the current value at determined times
Monitoring exceedance of load	<ul style="list-style-type: none"> ▪ not active ▪ active 	Activation of the observation of the exceedance of the load, have a look at 4.6.3 Monitoring exceedance/deviation of load

Chart 25: Total current

The object, which shall be shown for the total current measurement, can also be adjusted, but the setting “whole value in mA” is not available for the total current measurement. For a detailed explanation of the available settings have a look at chapter “4.6.1 General settings”.

The sending condition can be adjusted. So it is possible to send the value after an adjustable change or after an adjustable period of time. The cyclic sending is independent from a change of the measured current. Both sending conditions can also be combined.

Additional an observation of the total current can be activated. This is described in detail at the following chapter.

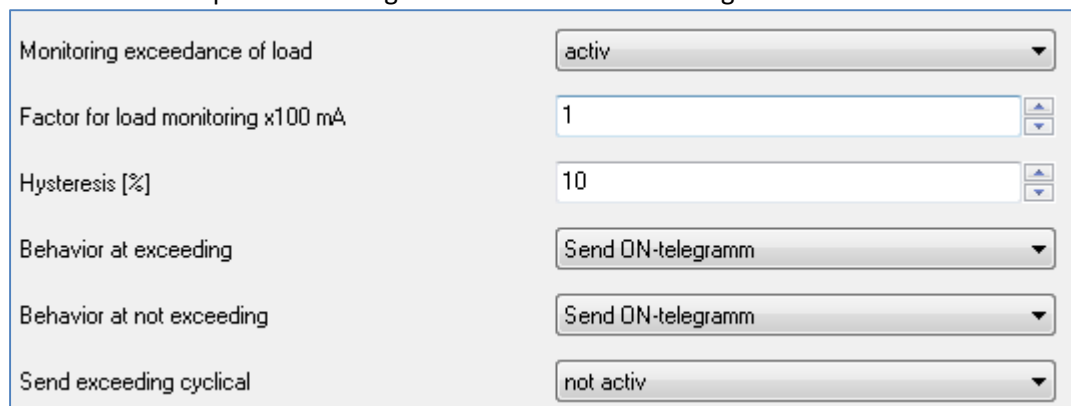
The communication object for the total current measurement is shown at the following chart:

Number	Name	Length	Usage
78/ 148	Value of total current	2/4 Byte	sends the actual current of the whole actuator
79/149	Exceedance of total current	1 Bit	reports an exceedance of the total current

Chart 26: Communication object total current

4.6.3 Monitoring exceedance/deviation of load

An observation of the load can be activated for every channel for an exceedance of a comparable worth as well as for a deviation of this worth. The total current measurement can only observe a exceedance. The possible settings are shown at the following illustration:



The screenshot shows a configuration window for 'Monitoring exceedance of load'. It contains six settings, each with a label and a control element:

- Monitoring exceedance of load:** A dropdown menu set to 'activ'.
- Factor for load monitoring x100 mA:** A numeric input field set to '1'.
- Hysteresis [%]:** A numeric input field set to '10'.
- Behavior at exceeding:** A dropdown menu set to 'Send ON-telegramm'.
- Behavior at not exceeding:** A dropdown menu set to 'Send ON-telegramm'.
- Send exceeding cyclical:** A dropdown menu set to 'not activ'.

Illustration 26: Monitoring exceedance/deviation of load

The available settings for a load monitoring are shown at the following chart:

ETS-text	Dynamic range [default value]	comment
Factor for load monitoring x100mA	1-200 [1]	adjusts the reference value for the monitoring of load
Hysteresis %	10-100 [10]	Adjustment of the hysteresis for avoiding to fast switching
Behavior at exceeding/deviating	<ul style="list-style-type: none"> ▪ Send no telegram ▪ Send On-telegram ▪ Send Off-telegram 	Adjustment of the behavior, when the measured value is out of the adjusted range
Behavior at not exceeding/deviating	<ul style="list-style-type: none"> ▪ Send no telegram ▪ Send On-telegram ▪ Send Off-telegram 	Adjustment of the behavior, when the measured value is in the adjusted range
Send exceeding/deviating cyclical	<ul style="list-style-type: none"> ▪ not active ▪ 15min ▪ 30min ▪ 60min ▪ 90min ▪ 120min 	Activation and adjustment of the time step for a cyclic sending

Chart 27: Monitoring exceedance/deviation of load

The reference value for the observation is set by the parameter “Factor for load monitoring”. The adjusted value is multiplied with 100mA, so the value can be adjusted in the range of 0,1A to 20A with 100mA steps. The hysteresis, which is indicated in % of the reference value, can avoid a too fast switching. At the monitoring exceedance of load, the hysteresis is subtracted from reference value. At the monitoring lower deviation of load, the hysteresis is added to the reference value. But the switch-on value is always the same as the reference value only the switch-off value is calculate by the upper way:

So, for a hysteresis of 10% and a reference value of 1A, the following switching points will result:

At the exceedance of load, a value is sent at exceedance of 1A, which only is reset when the value deviates above 0,9A.

At the deviation of load, a value is sent at deviating 1A, which only is reset when the value exceeds above 1,1A.

The sending conditions of the according communication object can also be adjusted. The telegram can send as well on-telegrams as off-telegram for the different cases. Additional the object can sent no telegram. Also, a cyclic sending can be activated.

The following chart shows the relevant communication objects:

Number	Name	Length	Usage
12	Exceedance of load	1 Bit	reports an exceedance of load
13	Lower deviation of load	1 Bit	reports an deviation of load

Chart 28: Communication objects load deviation/exceedance

4.6.4 Fault current/ Load failure

An error message can be activated for every channel for a fault current as for faulty load:

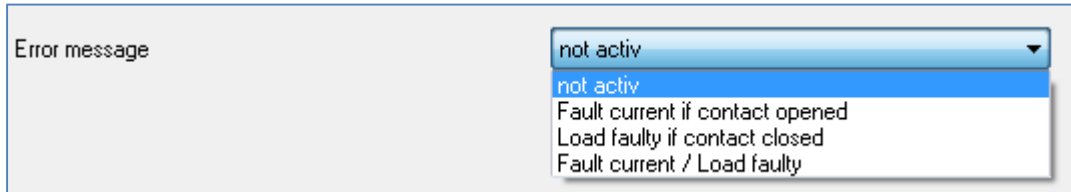


Illustration 27: Error message

The following settings are available for the error message:

ETS-text	Dynamic range [default value]	comment
Error message	<ul style="list-style-type: none"> ▪ not active ▪ Fault current is contact opened ▪ Load faulty if contact closed ▪ Fault current/Load faulty 	Adjustment of the type of the error message
Switching threshold	<ul style="list-style-type: none"> ▪ 20mA ▪ 50mA ▪ 100mA ▪ 200mA ▪ 500mA ▪ 1A ▪ 2A 	Adjustment of the reference value At the fault current, an exceeding is reported. At the Load faulty a deviation is reported

Chart 29: Fault current/Load faulty

By activating an error message, a fault current or/and a load failure can be shown. The fault current is calculated, when the channel has not been switched, so the contact is opened. The load failure is calculated, when the channel has been switched, so the contact is closed. If the error message is active, a 1-signal is sent by the communication object.

Via the setting switching threshold, the sensitivity of the error message can be adjusted. At the fault current, the communication object sends a 1-signal when the switching threshold is exceeded. At the load faulty, the communication object sends a 1-signal when the current is smaller then the adjusted switching threshold.

The following chart shows the relevant communication objects, which changes depending to the actual setting:

Number	Name	Length	Usage
14	Load faulty	1 Bit	reports a load failure
14	Fault current	1 Bit	reports a fault current
14	Fault current/Load faulty	1 Bit	reports a fault current and a load failure

Chart 30: Communication object Fault current/Load faulty

4.7 Operating hours

The operating hours counter can count the activity of a channel. There is as well a reverse counter to the next service as a forward counter, with the setting operating hours counter, available.

4.7.1 Operating hours counter

The following illustration shows the available settings for the operating hours counter:

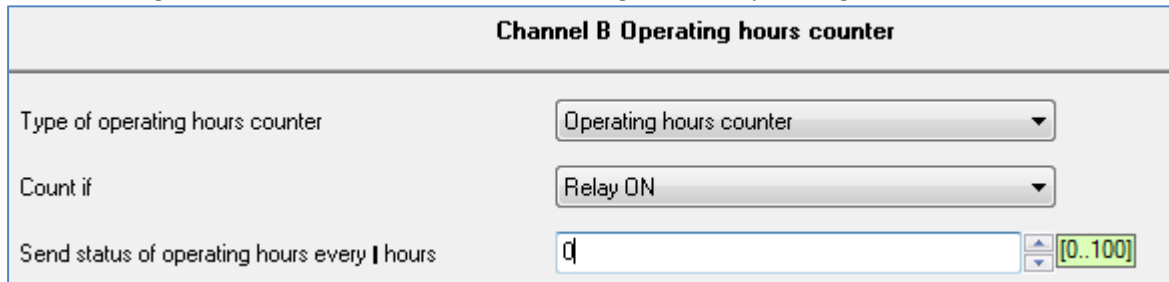


Illustration 28: Operating hours counter

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Type of operating hours counter	Operating hours counter	Chosen operating mode: Operating hours counter
Count if	<ul style="list-style-type: none"> ▪ Relay ON ▪ Current >20mA ▪ Current >50mA ▪ Current >100mA ▪ Current >200mA ▪ Current >500mA ▪ Current >1A ▪ Current >2A ▪ Current >5A 	Adjustment of the counting condition
Send status of operating hours every ... hours	0-100 [0h]	Adjustment when a message shall be sent

Chart 31: Operating hours counter

The operating hours counter can count the operating hours at which the channel is active. These can be count as well when the channel is switched on as when a determined current value is exceeded. Furthermore can be adjusted when the communication object "Response operating hours" shall send a value. This function can be deactivated by the setting 0h. So the object is switched passive and sends no value, but can be requested. Via the object "Reset operating hours" the operating hours are set back to 0h.

The following chart shows the relevant communication objects for this parameter:

Number	Name	Length	Usage
8	Response operating hours	2 Byte	sends the number of counted operating hours
9	Reset operating hours	1 Bit	sets the operating hours back to 0h

Chart 32: Communication object operating hours counter

4.7.2 Reverse counter

The following illustration shows the settings for the reverse counter to the next service:

Channel B Operating hours counter	
Type of operating hours counter	Reverse counter
Count if	Relay ON
Send status of service hours every I [h]	0 [0..100]
Send signal of service at I x10h intervals	0

Illustration 29: Reverse counter to next service

The following chart shows the dynamic range of this parameter:

ETS-text	Dynamic range [default value]	comment
Type of operating hours counter	Reverse counter	Chosen operating mode: Reverse counter
Count if	<ul style="list-style-type: none"> Relay ON Current >20mA Current >50mA Current >100mA Current >200mA Current >500mA Current >1A Current >2A Current >5A 	Adjustment of the counting condition
Send status of service hours every ... [h]	0-100 [0h]	Adjustment when a message shall be sent
Send signal of service at ...x10h intervals	0-250 [0h]	Adjustment when a service is required

Chart 33: Reverse counter to next service

The reverse counter to the next service can count the operating hours in which the channel is active. These can be counted back as well when the channel is switched on as when a determined current value is exceeded.

The value when a service is required can be adjusted with the setting "Send signal of service at". When this service time runs out, the dependent communication object "Service required" sends a service requirement. The setting 0h deactivates this function and so also the one described below. Via the setting "Send status of service hours every ... h" can be adjusted in which steps the object "Time to next service" sends a message with the remaining operating hours before the next service. The setting 0h deactivates this function.

The following chart shows the relevant communication objects for this parameter:

Number	Name	Length	Usage
8	Time to the next service	2 Byte	sends the remaining time to the next service
9	Reset service	1 Bit	resets service time back to the adjusted value
10	Service required	1 Bit	reports that a service is required

Chart 34: Communication object reverse counter to next service

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6 Attachment

6.1 Statutory requirements

The above-described devices must not be used with devices, which serve directly or indirectly the purpose of human, health- or lifesaving. Further the devices must not be used if their usage can occur danger for humans, animals or material assets.

Do not let the packaging lying around careless, plastic foil/ -bags etc. can be a dangerous toy for kids.

6.2 Routine disposal

Do not throw the waste equipment in the household rubbish. The device contains electrical devices, which must be disposed as electronic scrap. The casing contains of recyclable synthetic material.

6.3 Assemblage



Risk for life of electrical power!

All activities on the device should only be done by an electrical specialist. The county specific regulations and the applicable EIB-directives have to be observed.

MDT Switch Actuator 4/8/12-fold with current measurement, MDRC

Version		
AMS-0416.01	Switch Actuator 4-fold	4SU MDRC, 230VAC, 16A, C-Load 100uF, current measurement
AMI-0416.01	Switch Actuator 4-fold	4SU MDRC, 230VAC, 16A, C-Load 200uF, current measurement
AMS-0816.01	Switch Actuator 8-fold	8SU MDRC, 230VAC, 16A, C-Load 100uF, current measurement
AMI-0816.01	Switch Actuator 8-fold	8SU MDRC, 230VAC, 16A, C-Load 200uF, current measurement
AMS-1216.01	Switch Actuator 12-fold	12SU MDRC, 230VAC, 16A, C-Load 100uF, current measurement
AMI-1216.01	Switch Actuator 12-fold	12SU MDRC, 230VAC, 16A, C-Load 200uF, current measurement

The MDT Switch Actuator receives KNX/EIB telegrams and switches up to 12 independent electrical loads. Each output uses a bistable relay and can be operated manually via a push button. A green LED indicates the switching status of each channel.

The outputs are parameterized individually via ETS3/4. The device provides extensive functions like logical operation, status response, block functions, central function, delay functions and staircase lighting function. Additionally the device provides several time and scene control.

The MDT Switch Actuator offers current measurement for each channel and measurement of the total current. In dependence on the parameterization the measured data can be transmit in different data formats (mA/A/kW) onto the KNX bus. Additionally the device provides an hour/service interval meter.

If the mains voltage fails, all outputs hold their current position. After bus voltage failure or recovery the relay position is selected in dependence on the parameterization.

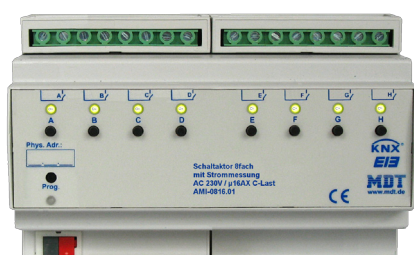
The MDT Switch Actuator is a modular installation device for fixed installation in dry rooms. It fits on DIN 35mm rails in power distribution boards or closed compact boxes. The MDT Switch Actuator has a separate power supply terminals for each channel.

For project design and commissioning of the MDT Switch Actuator it is recommended to use the ETS3f/ETS4 or later. Please download the application software at www.mdt.de/Downloads.html

AMS/AMI-04xx.01



AMS/AMI-08xx.01



- Production in Germany, certified according to ISO 9001
- Modern design
- Fully compatible to all KNX/EIB devices
- Push Button and LED indicator for each channel
- NO and NC contact operation
- Time functions (switch-on/switch-off delay, staircase light function)
- Status response (active/passive) for each channel
- Logical linking of binary data
- 8 scenes per channel
- Hour meter
- Central switching functions and block functions
- Programmable behaviour in case of bus voltage failure or return
- Each contact has an own supply phase
- **Integrated current measurement (current, kWh, limit value)**
- Power supply via KNX bus
- Modular installation device for DIN 35mm rails
- Integrated bus coupling unit
- 3 years warranty

Technical Data	AMS-0416.01 AMS-0816.01 AMS-1216.01			AMI-0416.01 AMI-0816.01 AMI-1216.01		
Number of outputs	4	8	12	4	8	12
Current measurement range	20mA - 16A			20mA - 16A		
Output switching ratings						
Ohmic load	16A			16A		
Capacitive load	max. 100µF at 16A			max. 200µF at 16A		
Voltage	230VAC			230VAC		
Maximum inrush current	400A/150µs 200A/600µs			600A/150µs 300A/600µs		
Maximum load						
Incandescent lamps	2700W			3680W		
Halogen lamps 230V	2500W			3680W		
Halogen lamps, electronic transformer*	1000W			2000W		
Fluorescent lamps, not compensated	1800W			3680W		
Fluorescent lamps, parallel comp.	1000W			2500W		
Max. number of electronic transformers	14			28		
Output life expectancy (mechanical)	1.000.000			1.000.000		
Max. fuse per channel	16A			16A		
Permitted wire gauge						
Screw terminal	0,5 - 4,0mm ² solid core 0,5 - 2,5mm ² finely stranded			0,5 - 4,0mm ² solid core 0,5 - 2,5mm ² finely stranded		
KNX busconnection terminal	0,8mm Ø, solid core			0,8mm Ø, solid core		
Power supply	via KNX bus			via KNX bus		
Power consumption	<0,3W	<0,4W	<0,4W	<0,3W	<0,4W	<0,4W
Operation temperature range	0 to + 45°C			0 to + 45°C		
Enclosure	IP 20			IP 20		
Dimensions MDRC (Space Units)	4/8/12SU			4/8/12SU		

* low voltage halogen lamps with electronic transformer

Exemplary circuit diagram AMS/AMI-0816.01

