08/2014

Technical Manual

MDT Universal Actuator

AKU-0816.01
AKU-1616.01

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1 Content

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2 Overview

2.1 Overview devices

The manual refers to the following devices: (Order Code respectively printed in bold type):

- **AKU-0816.01** Universal Actuator 8-fold, 4TE MRDC, 230V AC, 16A
  - 4 Channels for shutter motors up to 600W, Manual control or 8 Channels for switching outputs for ohmic loads up to 2300W
  - any supposable mixed form of switching outputs and shutter output possible
- **AKU-1616.01** Universal Actuator 16-fold, 8TE MRDC, 230V AC, 16A
  - 8 Channels for shutter motors up to 600W, Manual control or 16 Channels for switching outputs for ohmic loads up to 2300W
  - any supposable mixed form of switching outputs and shutter output possible

2.2 Usage & possible applications

The universal actuator has its field of applications always if you ask flexibility. It can be parameterized as well as an adequate switching actuator as an adequate shutter actuator. Furthermore any supposable mixed forms of shutter and switching actuator are possible. So the universal actuator combines the advantages of the shutter actuator with the one of the switching actuator.
Parameterized as shutter actuator, as well shutter as blinds can be controlled. According to the hardware version up to 8 shutter or blinds can be controlled. Every channel can be adapted to every kind of blinds/shutters via the parameterization. The channels can drive manually via the up/down command and automatically via absolute position commands.
Further, there is the possibility of embedding the channel into automatic blocks and activate different scenes. At activation of the automatic function, absolute position can be approached via 1 Bit object. This function is e.g. very suitable for the start-up of sunblind positions, which are called via a brightness sensor. Additional weather alarms are parameterize able, which can call determined functions at the universal actuator.
Additional a manual control of the shutter/blinds can be switched on or off.
Parameterized as switching actuator, the settings switching output and staircase are available. At the configuration switch, all settings are available which are necessary for a comprehensive parameterization. As well On-/Off-delay, normally opened mode or normally closed mode, cyclic sending, central function, logical functions as scene function are adjustable. Additional the reset behavior and the blocking behavior can be set.
Via the staircase function an automatic switch off after a determined time can be adjusted.

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2.3 Exemplary Circuit diagrams

2.3.1 Shutter actuator

Parameterized as shutter actuator, the actuator is connected in the following way:

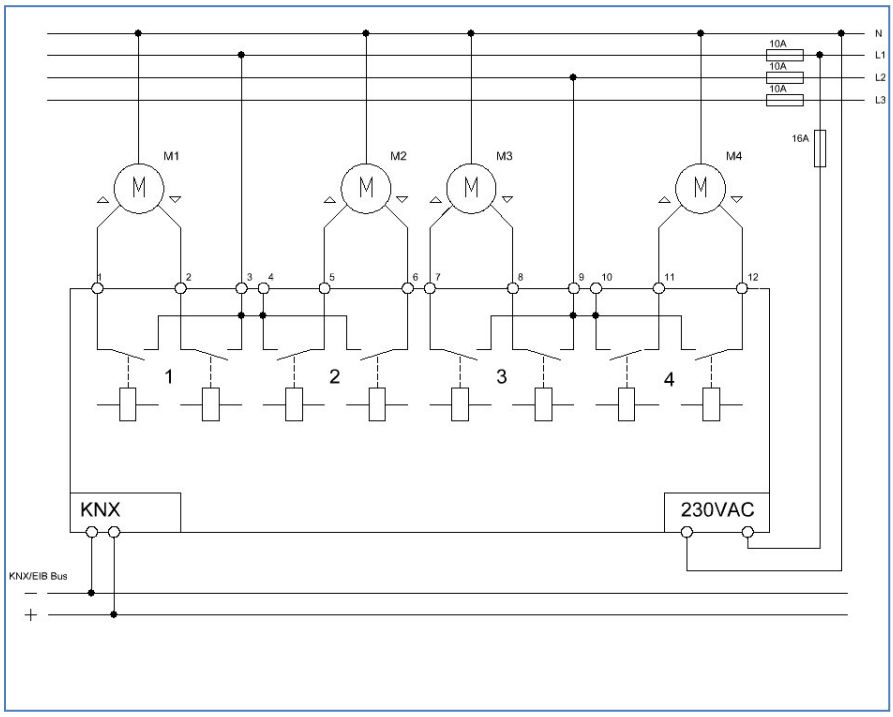

Illustration 1: Exemplary circuit diagram as 4-fold shutter actuator

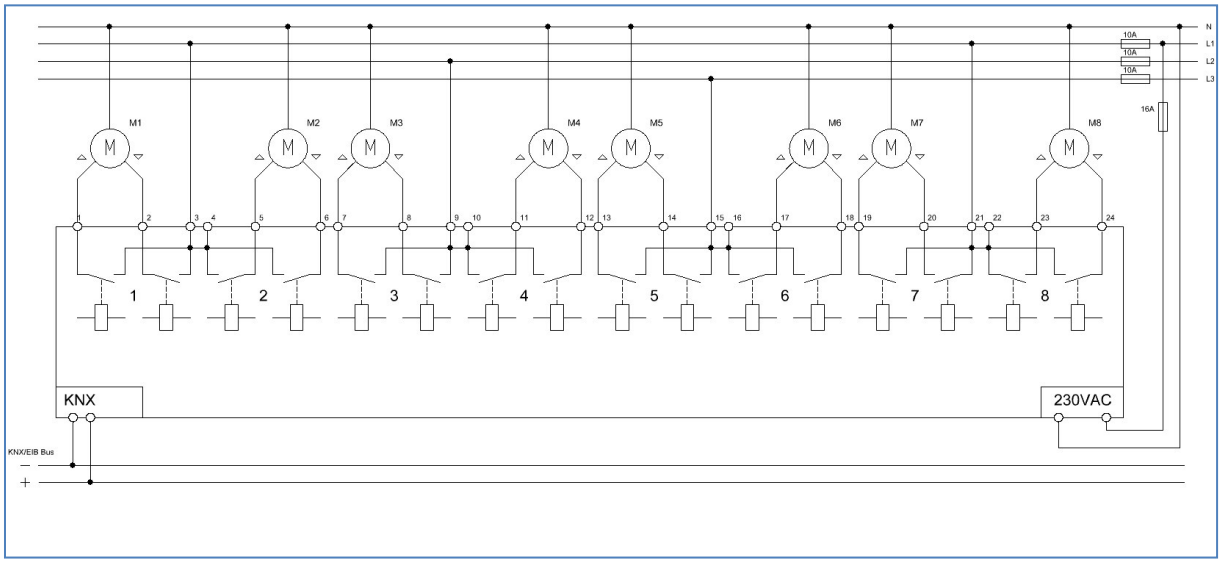

Illustration 2: Exemplary circuit diagram as 8-fold shutter actuator

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2.3.2 Switching actuator

Parameterized as switching actuator, the actuator is connected in the following way:

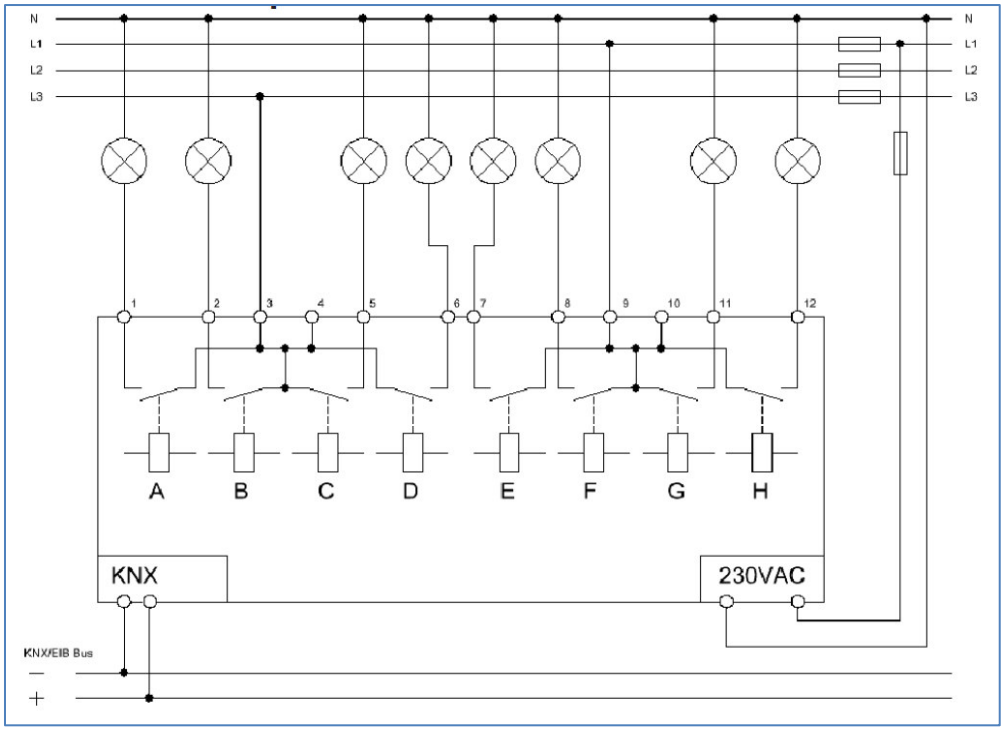

Illustration 3: Exemplary circuit diagram as 8-fold switching actuator

2.3.3 Mixed mode

Also arbitrary mixed modes are possible, e.g. in the following way:

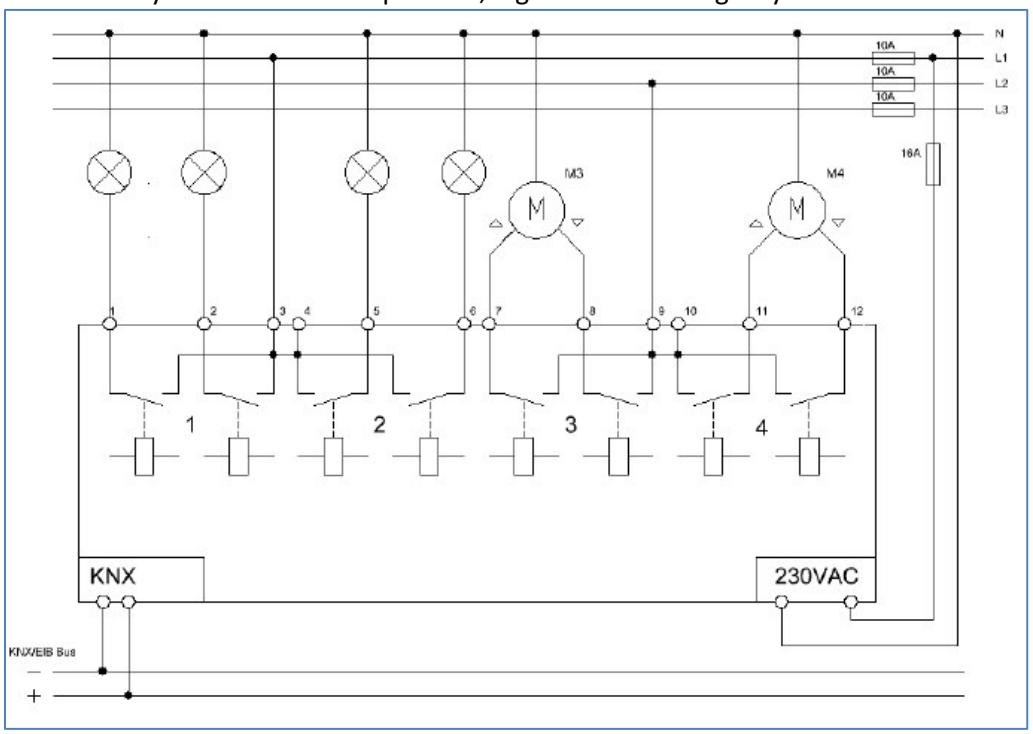

Illustration 4: Exemplary circuit diagram as switching and shutter actuator

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2.4 Structure & Handling

The universal actuator (MDRC) contains of a programming button as well as a programming-LED, which shows an activated programming button. The universal actuator works with 230V AC. Every channel of the MRDC device contains of a status-LEDs. Parameterized as shutter actuator, always two outputs form one channel. In this case, the left one switches the up-movement and the right one the down-movement. The status-LEDs show an active run-up or an active run-down command.
With the buttons left/right you can chose the channel and with the buttons up/down you can move the channel down or up.
The following illustration shows a 16-fold universal actuator:

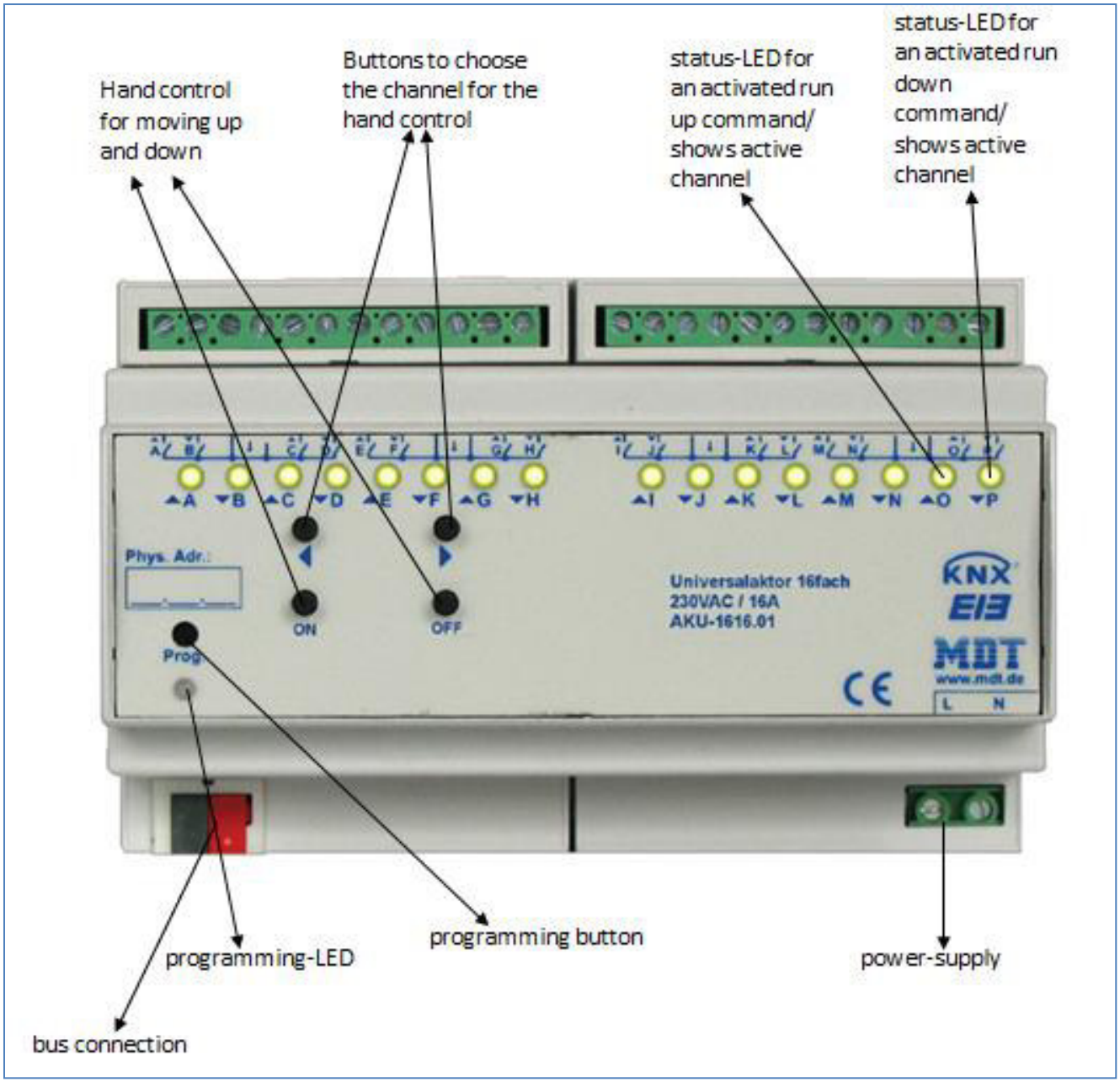

Illustration 5: Overview hardware module (AKU-1616.01)

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2.5 Functions

The functionality is the same for all channels. Depending on the hardware module the device contains of up to sixteen channels.
At the first step, every channel can be selected as not active, Switch/Staircase or as Shutter/Blinds.

- **not active**
  The channel becomes no more functions allocated. There are no more opportunities to parameterize the channel.

- **Shutter, Blinds**
  - Afterwards the pair of channels A/B to O/P or rather G/H can be divided into shutter or blinds.
  - In principle the functions for shutter and blinds are the same. But there is no movement for slats at the blind configuration.

  If a channel is selected as shutter/blinds, the user has different possibilities to parameterize the movement of a shutter or blinds. By different settings for the travel time, the actuator can be adapted to every kind of shutter/blinds. Furthermore you can adjust a pause at change of direction and a switch on delay or a switch off delay for the motor. Also you can restrict the driving area or move the shutter by giving absolutely driving commands. By using scene or automatic functions you can select more shutters with only one driving command. There are also preferences for weather alarms.

- **Switch, Staircase**
  - Every channel of the pair of channels can be selected individually as switch or staircase at the next step.

  If the channel is selected as switch, different switching actions can be parameterized. Additional actions, like logic functions and scene functions, can be parameterized.

  If the channel is selected as staircase, a staircase function, which causes an automatic cutout after an adjusted time, can be parameterized. Additional settings for the adjustment of the staircase function are available.

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2.5.1 Overview functions at the shutter/blinds mode

General settings	Channel selection	• not active • shutter • blinds
Shutter functions	moving times	• time for movement • different times for up and down* • step time for blinds • duration of blinds adjustment • pause at change direction • switch on and switch off delay motor • positions of blinds at end of driving
Blind functions	moving times	• time for movement • different times for up and down* • short time operation* • pause at change direction • switch on and switch off delay motor
Shutter & Blind functions	objects for absolute position	• active/not active • driving to reference • reaction after driving to reference
	Position start up via 1 Bit object	• move to 0-100% via 1 bit-object • conditions for driving adjustable • action for abolishment adjustable
	central objects	reaction of the central objects for every channel activatable/deactivatable
	scenes	for every channel activatable/deactivatable
	automatic functions	for every channel activatable/deactivatable
	alarm functions	for every channel activatable/deactivatable
scene functions		• every channel can react on up to eight scenes with absolute driving command • adjustable scene numbers
automatic functions		• 2 automatic blocks • correlation to automatic block for every channel adjustable • up to two automatic positions for every channel adjustable
alarm functions	order of alarms	adjustment of the alarm priority
	action of reset of alarms	• no action • drive to former position • drive to bottom/top
	wind alert/ rain alert/ frost alert	• active/not active • cycle time • reaction on alert
	Reaction of bus power down/up	• no action • drive to bottom • drive to top

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block functions	blocking	• separate activatable • action for activating & deactivating separate parameterize able
	blocking absolute position	• separate activatable
	Block universal mode	• separate activatable • free parameterize able • different block functions adjustable

Chart 1: Overview functions for shutter, blinds mode

2.5.2 Overview functions at the switch/staircase mode

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

Chart 2: Overview functions for switch, staircase mode

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2.6. Settings at the ETS-Software

Selection at the product database:

Manufacturer: MDT Technologies
Product family: Actuators
Product type: Universal actuator
Medium Type: Twisted Pair (TP)
Product name: addicted to the used type, e.g.: AKU-1616.01 universal actuator 16-fold, 8TE, 16A
Order number: addicted to the used type, e.g.: AKU-1616.01

2.7. 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)

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3 Communication Objects

3.1 Global communication objects

The global communication objects are standardly shown. They contain as well the communication objects, which are only valid for shutter/blinds, as the objects, which are only valid for switch/staircase.
The objects 0-4 are only valid for the configuration shutter/blinds and have no effect to the switch or staircase function.
The object 5 is only valid for the configuration switch/staircase and has no effect to the shutter or blinds function.

3.2 Default settings of the global communication objects

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

Default settings									
Nr.	**Name**	**Object Function**	**Length**	**Priority**	**C**	**R**	**W**	**T**	**U**
0	all channels	Shutter up/down	1 Bit	Low	X		X		
1	all channels	Slat adjustment/ Stop	1 Bit	Low	X		X		
2	all channels	Stop	1 Bit	Low	X		X		
3	all channels	Absolute position	1 Byte	Low	X		X		
4	all channels	Absolute position of slats	1 Byte	Low	X		X		
5	Central functions	Switch On/Off	1 Bit	Low	X		X		

Chart 3: Default settings of the global communication objects

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.

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3.3 Default settings of the communication objects for shutter/blinds

The following chart shows the default settings of the communication objects, if the pair of channels is selected as shutter/blinds:

Default settings									
Nr.	**Name**	**Object Function**	**Length**	**Priority**	**C**	**R**	**W**	**T**	**U**
6	Channel A/B	Shutter up/down	1 Bit	Low	X		X		
6	Channel A/B	Blinds up/down	1 Bit	Low	X		X		
7	Channel A/B	Slat adjustment/Stop	1 Bit	Low	X		X		
7	Channel A/B	Short term operation	1 Bit	Low	X		X		
8	Channel A/B	Stop	1 Bit	Low	X		X		
9	Channel A/B	Scene	1 Byte	Low	X		X		
10	Channel A/B	Status current direction	1 Bit	Low	X	X		X	
10	Channel A/B	Status of movement	1 Bit	Low	X	X		X	
11	Channel A/B	Absolute position	1 Byte	Low	X		X		
12	Channel A/B	Absolute position of slats	1 Byte	Low	X		X		
13	Channel A/B	Status current position	1 Byte	Low	X	X		X	
14	Channel A/B	Status current position of slats	1 Byte	Low	X	X		X	
15	Channel A/B	Current position valid	1 Bit	Low	X	X		X	
16	Channel A/B	Start driving to reference	1 Bit	Low	X	X		X	
17	Channel A/B	Drive to position	1 Bit	Low	X		X		
18	Channel A/B	State upper position	1 Bit	Low	X	X		X	
19	Channel A/B	State lower position	1 Bit	Low	X	X		X	
20	Channel A/B	Block absolute position mode	1 Bit	Low	X		X		
21	Channel A/B	Block universal mode	1 Bit	Low	X		X		
22	Channel A/B	Wind alarm	1 Bit	Low	X		X		
23	Channel A/B	Rain alarm	1 Bit	Low	X		X		
24	Channel A/B	Frost alarm	1 Bit	Low	X		X		
25	Channel A/B	Block	1 Bit	Low	X		X		
+20	**next pair of channels**								
86/ 166	Automatic A	Automatic position 1	1 Bit	Low	X		X		
87/ 167	Automatic A	Automatic position 2	1 Bit	Low	X		X		
88/ 168	Automatic B	Automatic position 1	1 Bit	Low	X		X		
89 169	Automatic B	Automatic position 2	1 Bit	Low	X		X		

Chart 4: Default settings of the communication objects for shutter/blinds

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3.4 Default settings of the communication objects for switch/staircase

The following chart shows the default settings of the communication objects, if the pair of channels is selected as switch/staircase:

Default settings									
Nr.	**Name**	**Object Function**	**Length**	**Priority**	**C**	**R**	**W**	**T**	**U**
6	Channel A	Switch On/Off	1 Bit	Low	X		X		
7	Channel A	Staircase	1 Bit	Low	X		X		
8	Channel A	Block	1 Bit	Low	X		X		
9	Channel A	Scene	1 Byte	Low	X		X		
10	Channel A	State	1 Bit	Low	X	X		X	
11	Channel A	Logic 1	1 Bit	Low	X		X		
12	Channel A	Logic 2	1 Bit	Low	X		X		
+10	**next channel**								

Chart 5: Default settings of the communication objects for switch/staircase

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4 Reference ETS-Parameter – Shutter/Blinds

Attention:
After every transmission of a new parameterization you have to move the Shutter/Blinds once completely down and up, thereby the Shutter actuator knows his actual Reference values (see also 4.3.1 driving to Reference).

4.1 Channel selection

To operate the universal actuator as shutter actuator, at first the pair of channels, e.g. Channel A/B, must be selected as “Shutter, Blinds”. At the next step, the pair of channels can be selectd as shutter or blinds.

The following illustration shows the submenu channel selection:

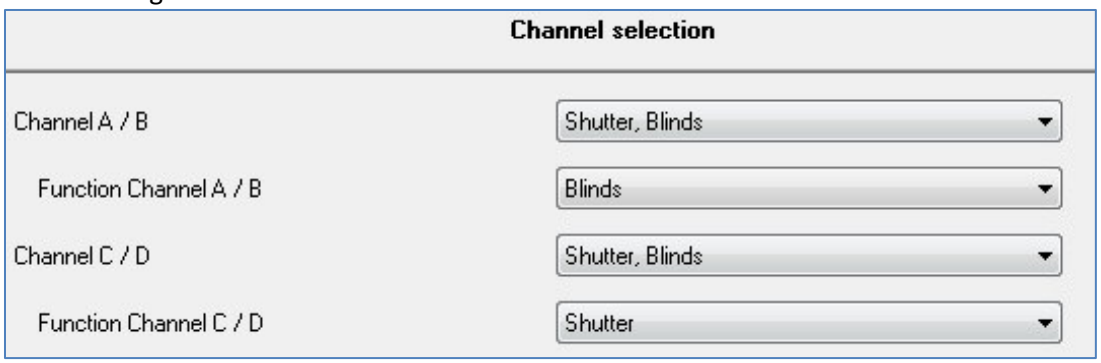

Illustration 6: Channel selection

The following chart shows the available settings for the channel selection:

ETS-text	Dynamic range **[default value]**	comment
Channel A/B – O/P	▪ **not active** ▪ Shutter, Blinds ▪ Switch, Staircase	Selection, if a pair of channels shall operate as switching actuator or as shutter actuator. Not active deactivates the pair of channels.
Channel A/B-O/P	▪ **Shutter** ▪ Blinds	At the shutter/blinds mode, theses settings are available.

Chart 6: Dynamic range channel selection

Each of the 4/8 available pair of channels can be allocated, whether it shall operate as shutter- or switch-actuator.
At this chapter 4, the operating mode as shutter actuator is descripted.

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4.1.1 Blinds

If a channel is selected as sblinds the user has a wide range of opportunities to parameterize the channel. These one are expounded at the following segments.
As soon as the channel is selected as shutters standardly three communications objects appear.
The following chart shows these objects:

Number	Name	Length	Usage
13	Blinds up/down	1 Bit	Movement of the shutter
14	Slats up/down/stop	1 Bit	Adjustment of the blinds/ Stopping of the shutter movement

Table 1: Communication objects blinds

The communication object “Blinds up/down” is used to move the blinds. Thereby is to consider that a logical “0” starts the up-movement and a logical “1” starts the down-movement. This configuration is standardly defined by KNX and controls an identical communication between KNX devices.
The communication object “Slats up/down/stop” is used to adjust the slats. By calling this object the current movement of the blinds is simultaneous stopped.

4.1.2 Shutter

There are also a wide range of opportunities to parameterize the channel at shutter function. The shutter function and the blind function are almost identical, but there are no options to parameterize or move the slats at the blind function.
As soon as the channel is selected as shutter appears standardly three communications objects.
The following chart shows these objects:

Number	Name	Length	Usage
13	Shutter up/down	1 Bit	Movement of the shutter
14	Short time operation	1 Bit	starts the short time operation
15	Stop	1 Bit	Stopping the shutter movement

Table 2: Communication objects shutter

The communication object “shutter up/down” is used to move the shutter. Thereby is to consider that a logical “0” starts the up-movement and a logical “1” starts the down-movement.
The communication object “Stop” is used to stop the current movement of the shutters. The object stop can be called by a logical “0” or “1”.

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4.2 Time for movement

By setting different times for movement the user is able to parameterize the Actuator individually for almost every shutter/blind. To be sure that the movement function works properly, you have to parameterize these times carefully. If the channel is selected as shutter there are additional settings for the moving time of the blinds.
You can see the screen for setting these times in the following illustration.

Blinds:

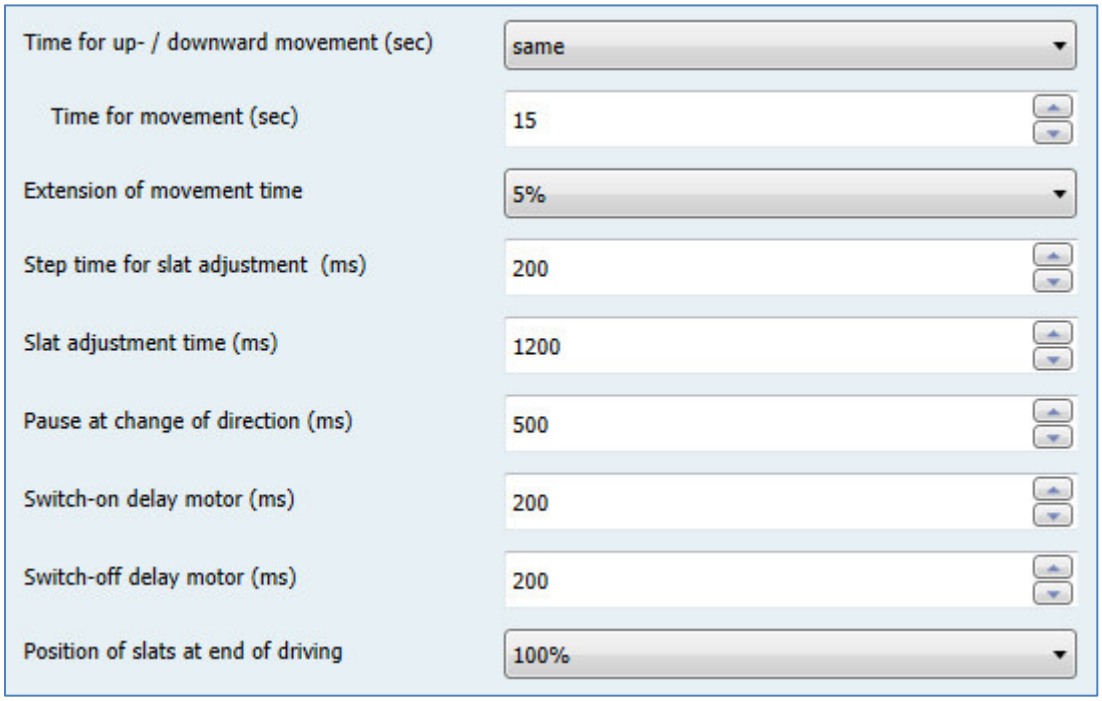

Figure 1: Time for movement - blinds

Shutter:

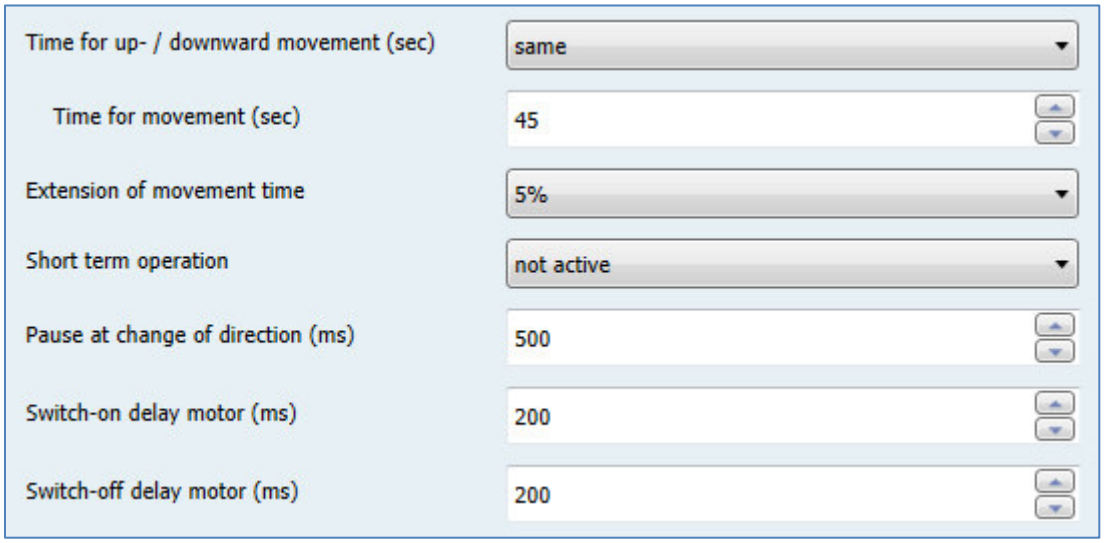

Figure 2: Time for movement - shutter

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In the following chart, you can see the setting range for the movement times:

ETS-text	Dynamic range **[default value]**	comment
Time for movement up/down	▪ **same** ▪ different	Adjustment, whether up-and down-movement should be different or not
Time for movement Time for movement up/down	1-10000sec **[45sec]**	sets the duration for an up-/down-movement
Extension of time for movement	no extension, 2%, 5%, **10%**, 15%, 20%	The extension of movement is for the definitely driving to the end stop and has no effects to the calculation of the absolute positions.
Step time for slats	50-1000ms [200ms]	**only at blinds** Duration for a step at the adjustment of blinds
Duration of slat adjustment	10-10000ms [1200ms]	**only at blinds** Duration for the whole adjustment of blinds (0-100%)
Pause at change of direction	1-1000ms [500ms]	sets the pause time between an up- and down movement
Switch-on delay motor	0-255ms [0ms]	switch-on delay for motors, which have not the whole power at the beginning
Switch-off delay motor	0-255ms [0ms]	switch-off delay for motors, which have time lag after set off
Position of slats at end of driving	0-100% [50%]	**only at blinds** sets the position of slats after driving the shutter
Short time operation	▪ **not active** ▪ active	**only at shutter** sets the short time operation on/off
Time for movement for short time operation	50-1000ms [200ms]	**only at shutter** adjusts the time for one short time operation

Table 3: Dynamic range time for movement

The functions are described in detail at the following segments.

4.2.1 Measure of the times for Movement

The individual times for the movement of shutter/blinds can normally determined very precise by using a stop watch.
If there are very short times for the movement, the measuring by using a watch will maybe cause problems. In this case it is advisable to adjust initially an approximated value, which should be a little bit shorter than the real time for movement. Afterwards you can test the adjusted time by triggering the shutters or blinds and control whether the final positions are achieved. If they are not achieved, you should set the time for movement gradually higher by using small steps until the final positions are achieved.

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4.2.2 Movement time

The movement time describes the time which the shutter actuator needs to drive the shutter/blinds from one final position to the other. When the adjusted time is over the channel is set off even when the final position was not achieved. So the shutter actuator triggers the down-movement/ up-movement for the adjusted time.
Because shutters and blinds have often different times for the up down movement, different times can be adjusted for the up and down movement (from hardware version 2.2).
The extension of time for movement (from hardware version 2.2) guarantees the definitely driving to the end stops. This function has no effects to the calculation of the absolute positions. So you should always adjust the precise time for the movement time and activate the extension for the guaranted driving to the end stops.
Check if the manufactory gives any data for the movement times.

4.2.3 Step time for slats

→only at blinds

You can adjust in which steps the slats shall be shifted with the setting “step time for slats”. The opening angle can adjust thereby in small steps to prevent e.g. a glare of the sun after a changing of the solar altitude or tighten sunblinds.
Additional, it is possible to adjust the step range in a way so that the slats drive from one final position to the other in a specific number of steps. For this way of slat-movement, you have to set the step time for blinds to a multiple of the “duration of slat adjustment”. Thereby the multiple of the duration time specifies the number of steps, which are required to drive the slats from one final position to the other.
For Example: Duration of slat adjustment: 3000ms
Step time for slats = 300ms
→Number of steps=10 → therefore the values 0%, 10%, …, 100% can be appointed

4.2.4 Duration of slat adjustment

→only at blinds

The duration of slat adjustment sets the interval, which is required to drive the slats from 0% to 100% or backwards. Therefore the shutter actuator triggers the slat adjustment.

Tip for the measurement from very small durations of slat adjustment

- Drive the slats in a final position (either 100% closed or 100% opened)
- Now send step commands until the other final position is achieved
- Multiply the number of steps with the adjusted time for the step time of slats
- Enter the result to the “duration of slat adjustment”

It is advisable to use the procedure, like under 4.2.1 described, by long slat adjustment times.

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4.2.5 Pause at change of direction

The pause at change of direction is for the protection of the shutter motor, if the shutter actuator receives simultaneously commands for the up- and down-movement. A direct shift from the one to the other direction can contract the duration of the motor significantly and even by some motors a total damage is caused.
If the shutter actuator receives during a running movement a command for a movement to the other direction, the shutter actuator will switch off the movement. Before the shutter actuator switches the movement to the other direction on, the actuator stops for the adjusted time for the pause at change of direction.
The pause at change of direction counts as well for the change of direction of the up-/down-movement as for the blind adjustment.

Too short adjusted pause at change of direction can cause damages of the motor!
Notice the manufacturer´s data at the datasheet of the drive absolutely.

4.2.6 Switch-on/Switch-off delay motor

Some motors can not bring the full power at the moment of switching it on, but first after some milliseconds. The time, which the motor needs to get the full power, can be balanced with the adjustment of the switch-on delay of the motor.
On the other hand there are motors, which run after it was switched off. This characteristic can be balanced by using the setting switch-off delay motor.

4.2.7 Position of slats at end of driving

→only at blinds

By using the adjustment “position of slats at end of driving“ can be adjusted in which position the slats shall be set after a down -movement. The shutter actuator drives automatically to this position after the end of a blind-movement, by using the object 13 “Blinds up/down”. The position of slats at end of driving can be set percentage in 1% steps, from 0% to 100%, whereby 0% full opened and 100% full closed correspond.
If the movement is stopped by sending a stop-command, this position will not be driven to, because the process is stopped.

4.2.8 Short time operation

→only at shutter

The short time operation helps you to drive the shutter to a certain position, e.g. for sun protection. With small steps, the shutter can be driven to every possible position. It is often useful to set the short time operation as a multiple of the movement time. So the shutter can be driven from the bottom to the top, or the other way around, in a certain number of steps.

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4.3 Objects for absolute position/ Status objects

Through activating the objects for absolute position it is possible to drive to absolute positions for movement and blind positions.
The following illustration shows the possible settings:

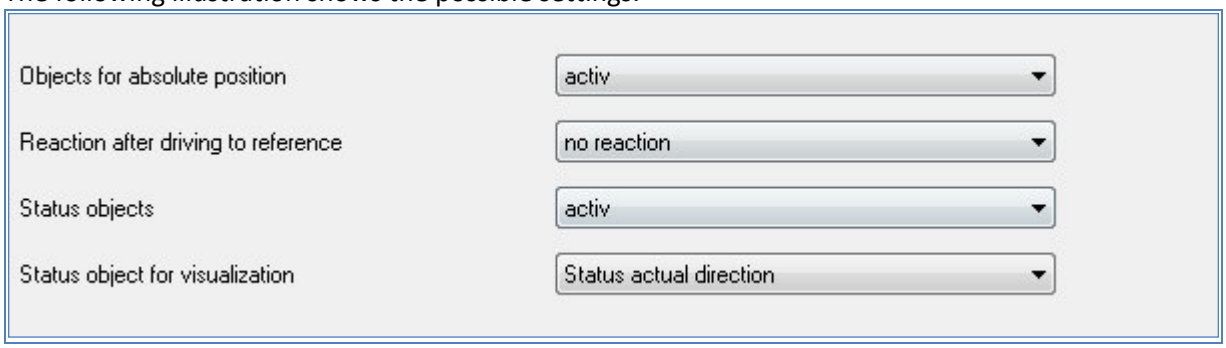

Illustration 9: objects absolute position

The following chart shows the setting range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Objects for absolute position	▪ **not active** ▪ active	activate/deactivate the objects for absolute position
Reaction after driving to reference	▪ no reaction ▪ **drive to former position**	gets only displayed if the objects are activated; sets the reaction after a driving to reference
Status objects	▪ **not active** ▪ active	enables the status objects
Status object for visualization	▪ **Status actual direction** ▪ Status of movement	adjusts the status object for the visualization

Chart 10: setting range absolute position

When the objects for the absolute position are activated, the following objects aredisplayed:

Number	**Name**	**Length**	**Usage**
10	Status actual direction	1 Bit	indicates the actual direction of the way of driving
10	Status of movement	1 Bit	indicates an active driving process
11	absolute position	1 Byte	utilized for driving the shutter/blinds to a specific value
12	absolute position of slats	1 Byte	for adjustment of the blinds to a specific value (only at blinds)
13	Status current position	1 Byte	indicates the actual shutter-/blinds position
14	Status current position of slats	1 Byte	indicates the actual position of the blinds (only at blinds)
15	Current position valid	1 Bit	indicates whether a driving to reference was already conducted

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16	start driving to reference	1 Bit	starts the driving to reference
18	state upper position	1 Bit	notify achievement of the upper end position
19	state lower position	1 Bit	notify achievement of the lower end position

Chart 11: communication objects absolute position

The usage/function of this communication objects are explained at the following segments.

4.3.1 Driving to reference

The shutter actuator calculates its actual positions from the appointed times for movement. The real times for movement can be corrupted trough outside influences after some time.
A driving to reference calculates the appointed time for movements anew and specifies in this way the shutter actuator new times for movement. Based on these new times for movement the shutter actuator can calculate the real position of the shutter/blinds more detailed.
The driving to reference is especially useful if someone works very often with commands for absolute positions. Therefore the shutter actuator can calculate the entered position more detailed and drive to this position more precise. Every drive to the lowest or highest position replaces a driving to reference. So the driving to reference should be done, when the shutter/blinds is only driven with absolute commands lower than 100% and more than 0%. In this case, a reference drive should be done regularly, e.g. one's a week.
The reference run is started through an 1-signal on its 1 bit communication object "start driving to reference". It is possible to adjust the reaction after the driving to reference by the parameter "reaction after driving to reference". The shutter actuator can drive to the position, which it had before the reference run, by the setting "drive to former position". Through the setting "no reaction" the shutter actuator lets the shutter/blinds at the position, which was reached after the end of the reference run.
After every transfer of a new parameterization you have to conduct a reference run. This can either manual occurred, that means the upper and lower position are approached ones, or by the object "start driving to reference". Now the reference run was conducted and the shutter actuator knows its actual state along the driving range.

4.3.2 Commands for absolute positions

By the objects for absolute positions you can specify a constant value to the shutter actuator, on which the shutter shall be driven. This value is indicated in percent and has a range from 0-100% with every 1% step between it. From the indicated percent value the shutter actuator calculates at the next step the real time for the movement of the shutter/blinds based on the appointed times for movement and the actual position.
The commands for the absolute position are transmitted to the 1 byte communication objects. There is an object for the absolute height positions of the driving way at shutter and blinds. Additional there is an object for the opening angle of the blinds at shutters, the object "absolute position of blinds".
At the percentage description corresponds 0% always fully opened and 100% full closed.

4.3.3 Status objects (current position/direction)

The status objects "Status current position" and "Status current position of blinds" conduce the visualization of the absolute position. Both objects indicate the actual state of the height and the opening angle of the blinds, respectively after end of driving. The objects can be used e.g. for Visualization.

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4.3.4 Report objects

The 1 bit objects „state lower position“ and „state upper position“ will conduct respectively an 1-signal, if the lower end position or the upper end position is achieved. The signal of the object changes from 1 to 0, when the end position is left. Both objects are useful for the observation of the shutter/blinds.

4.3.5 Status objects for Visualization

The 1 bit status object “Status of movement” shows, that a movement of these shutters/blinds is active right now. A running movement is indicated by a logical “1”.
The 1 bit object “Status current direction” conducts with a logical 0 a running up driving and with a logical 1 a running down driving. The state is respectively displayed, when a movement starts. The state exists intern as long as a new command for driving is sent. The 1 bit object “current Position valid” will conduct, if a reference run was started after a new programming. This object can be used through a visualization to indicate that there is still a reference run necessary.

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4.4 Drive to position via 1 Bit object

Via the parameter “Drive to position via 1 Bit object”, the startup of absolute positions via an 1 Bit command can be activated.
The following illustration shows the available settings:

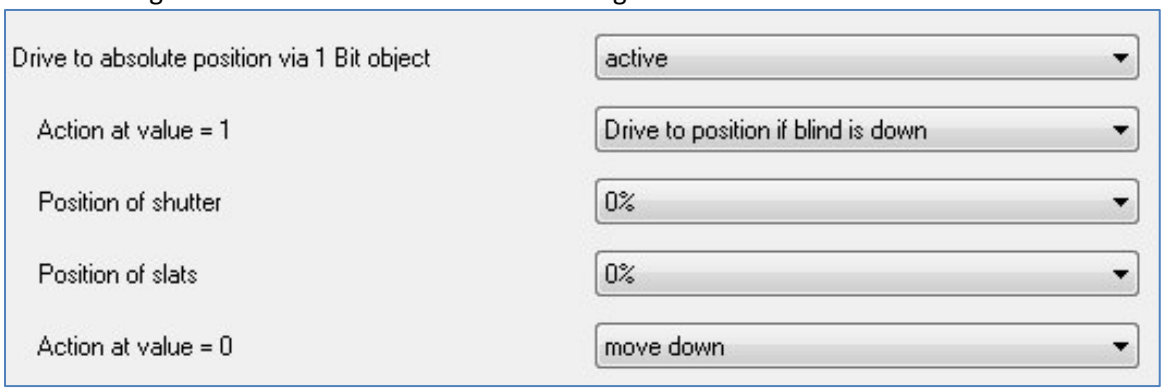

Illustration 10: Drive to position via 1 Bit object

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Function object number 24	**Position start up via 1Bit object**	selected function for object number 24
Action at value = 1	▪ **Drive to position** ▪ Drive to position if blind/shutter is up ▪ Drive to position if blind/shutter is down	Function for sending a logical 1
Position of blinds/shutter/slats	0-100% **[50%]**	Position, which shall be activated at sending a logical 1
Action at value = 0	▪ **no function** ▪ move up ▪ move down	Action at the deactivation of the position start up, via logical 0

Chart 12: Position start up via 1Bit object

The function position start up via 1 Bit object enables driving to absolute positions via 1 Bit object. On this, additional conditions can be parameterized when the channel shall drive to the adjusted functions. Compared to the automatic function, this function is only valid for one single channel. So this function can be parameterized individually for every channel.
The parameter “Action at value = 1” defines whether the position start up shall occur in every position or only at the end positions.
Furthermore, it can be selected via the “Action at value 0” what shall be happen at the deactivation of the position start up. The channel can drive to one of the both end positions or stay in its last position.
The “Action at value =0” will only be done, if the current position is still the same as the adjusted one. If the shutter/blinds are driven to another position before sending a logical 0, the channel will not drive.

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The field of application for this function are widespread. Two examples are given at the following segments:

- Moving up the blinds for air ventilation at opened/tilted window:
  As soon as the window contact detects an opened window, the blinds shall be moved up to the value 0f 90%. Of course this function shall only be administrated if the blinds are in the bottom end stop. So you choose at the parameter “Action at value = 0” the setting “Drive to position if position is down”. When the window is closed again, the blinds shall drive again to the bottom end position. So you choose at “Action at value = 0” the setting “move down”.
- The shading shall only drive if the blinds are up:
  If the blinds are stilled closed in a room, e.g. the bedroom, or already manually driven to certain shading position and shall not drive to the adjusted shading position, the position start up via 1 Bit object can fix this problem. The parameter “Action at value = 1” must be selected as “Drive to position if blinds are up”. The deactivation can be selected as “move up”. To note is, that this function will only be done if the blinds are not moved to another position before.

The following chart shows the relevant communication object:

Number	Name	Length	Usage
17	Drive to position	1 Bit	drives to the adjusted position; is shown when the function “Drive to position via 1 Bit object” is active

Chart 13: Drive to position via 1Bit object

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4.5 Central objects

The parameter “central objects“ defines for every channel if he shall react to the central objects or not.

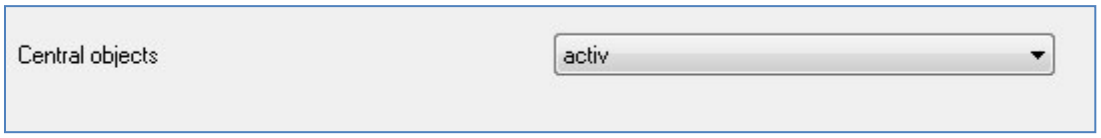

Figure 3: Central objects

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
central objects	▪ **not active** ▪ active	activates/deactivates the reaction to central objects for this channel

Table 4: Dynamic range central objects

The central communication objects are displayed durable also the function “central objects” is deactivated in every channel. Central objects are accounted as “all channels” and at the top of the list for the communication objects.

Number	Name	Length	Usage
0	Shutter up/down	1 Bit	Driving function for all channels
1	Blinds up/down/stop	1 Bit	Adjustment of blinds/stopping blind adjustment for every channel, which is defined as shutter
2	Stop	1 Bit	stop function for every channel
3	absolute Position	1 Byte	absolute command for height at every channel
4	absolute position of slats	1 Byte	absolute command for opening angle of blinds at every channel, which is defined as shutter

Table 5: Central communication objects

Activating the central objects in selected channels enables the triggering of several channels to the same time with only one command.
The object 0 “shutter up/down” is the central driving object and controls as well channels selected as shutter as channels selected as blinds in which the parameter was activated.
The object 1 “slats up/down/stop” controls only channels selected as blinds in which the central function was activated. It drives the slats and stops a running up- or down- movement.
Object number 2, called “stop”, is the central stop function for every channel. Also object 3 “absolute position” is for shutter- and blind-channels with activated central function. By this object, you can give the actuator absolute commands for the height of the shutter/blinds.
The object 4 “absolute position of slats” controls only channels selected as blinds. It controls the opening angle of the slats by an absolute position command.

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4.6 Scenes

If functions of different crafts (e.g. light, shutter, heater) shall be controlled with only one keystroke or command, it will be useful to use the scene-function. By calling this scene, you are able to set the lights in a room to specific value or dim them, drive the shutter to a specific value and rotate the blinds, the control of the heater can be set to day operation and switch on the power supply of the sockets. The telegrams of this function can have different formats as well as different values with various meaning (e.g. “0” for lights off and open shutters). Without the scene function you have to send every actor a separate signal to get the same setting.
By using the scene function of the shutter actor you can integrate the channels to a scene control. In order to do this you have to allocate the respective memory (scene (A-H) a value. There are up to 8 scenes for every channel possible. If the scene function is activated for this channel the according scene menu is shown. At this menu the single scenes can be activated and values, scene numbers and the memory function on/off can be set.
Scenes get activated by reception of their scene number at the according scene object. If the memory function is activated at the scene, the saving will follow with the actual values of the channels. The communication objects have always the size of 1 Byte.

The following illustration shows the possible settings at the ETS-Software to activate the scenes:

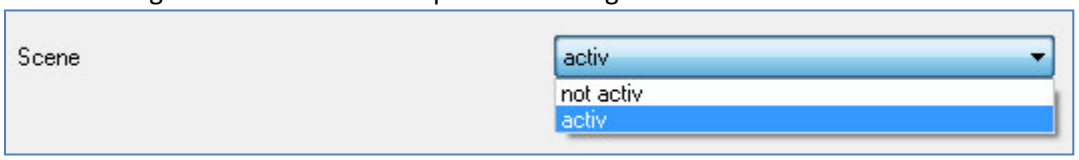

Illustration 12: scene function

Number	Name	Length	Usage
10	Scene	1 Byte	Call of the respectively scene

Chart 16: communication object scene

To call a specific scene, you have to send the value of the respectively scene to the communication object for the scene function. The value, to call the scene, is thereby always one number less than the adjusted scene number. If you for example want to call scene number 1, you have to send a 0. Consequently the scene number can have the values from 1 to 64, but the values to call a scene only from 0 to 63.
If you activate the call of a scene at a binary input, you have to set the same scene numbers at your binary input and at your shutter actor. The binary input sends automatically the right value to call the scene.

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4.6.1 Subitem scene

Every channel has 8 opportunities to save scenes. This 8 memory cells have the names A-H. Every of the 8 scenes can get one of the possible 64 scene numbers. The following illustration shows the setting options at the sub item scene (channel X: scene) for the scenes A-D and a channel, which was selected as shutter (scenes E-H are the same as the first four):

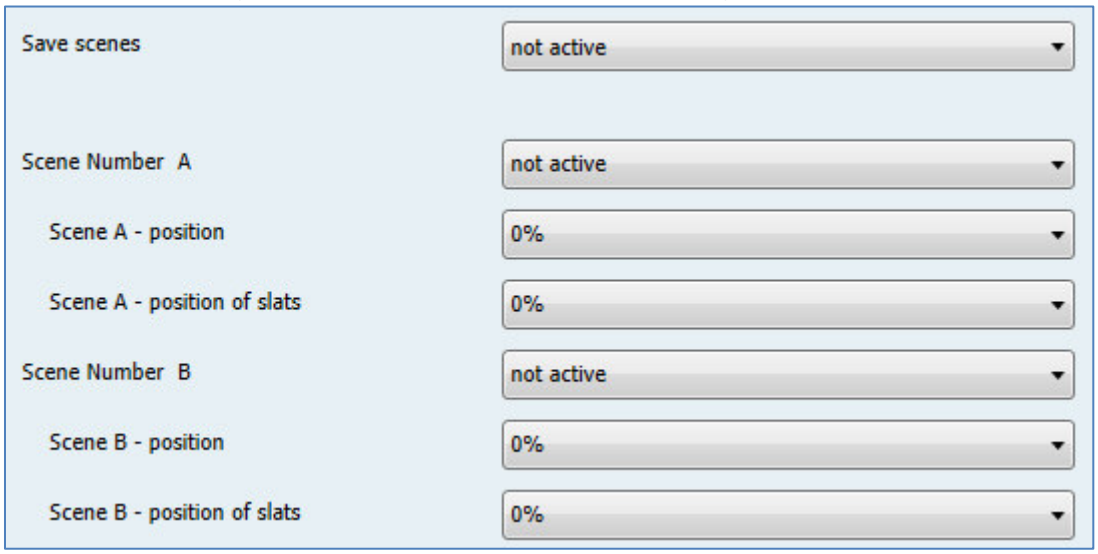

Figure 4: Subitem scene

The subitem for blinds is almost the same like the one for a shutter channel, but the setting options.

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The following chart shows the dynamic range for the scenes:

ETS-text	Dynamic range **[default value]**	comment
Save scenes	▪ **not active** ▪ active	activates/deactivates the memory function for scenes
Scene A - position	0-100% [0%]	Adjustment for absolute positions when calling the scenes
Scene A – position of slats	0-100% [0%]	Adjustment for absolute blind positions when calling the scene (only at channels, which are chosen as blindsr)
Scene number A	1-64 [1]	Scene number; pick-up value = one number less than the scene number (default values increase by every alphabetic increment, B=2; C=3,…)

Chart 17: dynamic range scenes

If a scene is activated in a channel, a subitem scene for this channel will appear. At this subitem the channel can be allocated a reaction for the call of this scene. This reaction contains a command for an absolute height (0-100%) for this channel or additional an absolute position of blinds at a shutter channel (see also Chart 17). Every channel can react to eight different scenes. By sending the according pick-up value for the scene, the scene is called and assumes its parameterized conditions. During this process the channel regards also its individual parameterization. If the channel shall for example drive to 0% by calling the scene and still drives down at 70%, the pause at change of direction will be observed before the channel starts driving up to 0%.
You have to observe at the programming, that if two or more channels shall refer to the same scene numbers, the communication objects are hosted in the same group address. By sending the pick-up value for the scene, all channels with the according scene number respond. It is useful to divide your group addresses after scenes to make the programming more clearly. That means if a channel shall react to eight different scenes, the communication object is also integrated in eight different group addresses.

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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 18: Calling and saving scenes

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4.7 Automatic function

You can activate an automatic function for every channel. Through the automatic function, you can call up to 4 different conditions. The automatic function is divided into two different blocks (A and B). It is also possible to call several moves to the same time through the automatic function, for example drive the blinds as well as the shutter and change the opening angle of the blinds.
The following Illustration shows the activation of the automatic function for a channel:

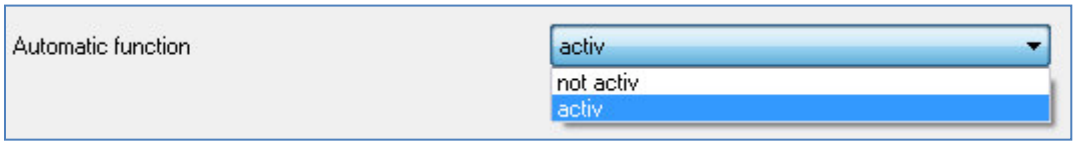

Illustration 14: automatic function

If the automatic function is activated for a channel, at the left drop down menu a new subitem (channel X: Automatic) will appear to parameterize the automatic function for this channel.

4.7.1 Subitem automatic function

The following illustration shows the setting options for an automatic function at the subitem channel X: automatic:

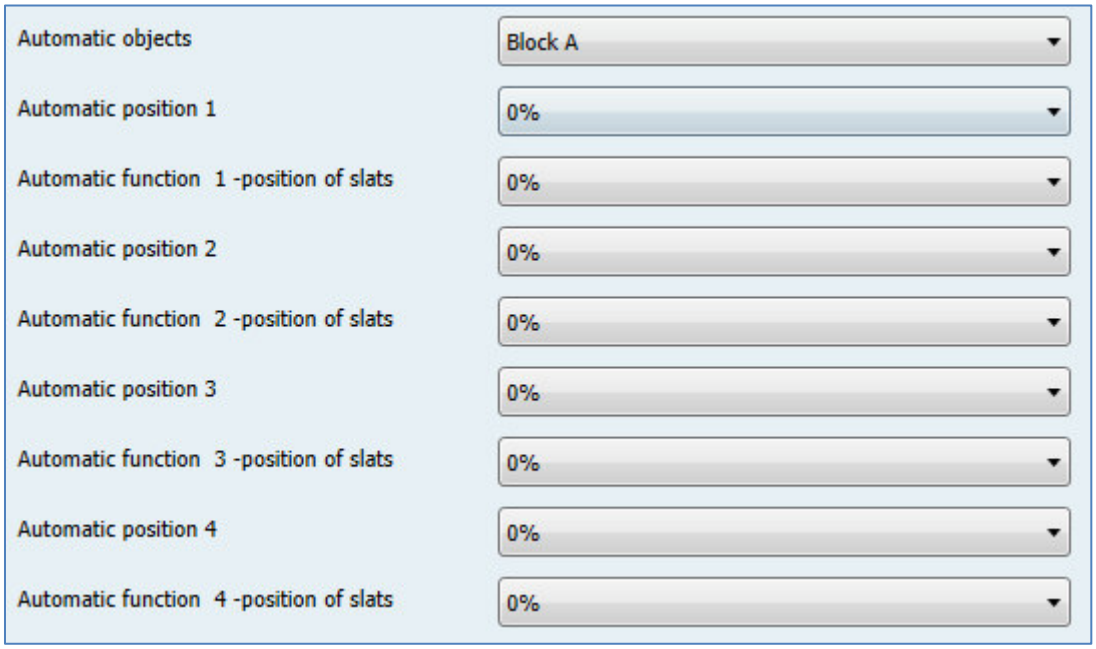

Illustration 15: subitem automatic function

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The following chart shows the dynamic range for the first automatic function. There are 2 different automatic functions for every channel. The dynamic range of the automatic function 2 is the same as the first.

ETS-text	Dynamic range **[default value]**	comment
Automatic objects	▪ **Block A** ▪ Block B	setting to which automatic block this channel shall refer
Automatic function 1(-2) – Position	0-100% [0%]	height position for the first automatic function
Automatic function 1(-2) – position of slats	0-100% [0%]	position of blinds for the first automatic function(only at blinds)

Chart 19: dynamic range automatic function

At the subitem for the automatic function, you can depose values for 4 different automatic calls. The values are absolute values, which the channel accepts at the call of the according automatic function. Additional you can determine for every channel to which automatic block the channel shall refer. Here are the blocks A and B disposal. The activation of the blocks is descripted below.

Additional an option for the automatic function can be parameterized:

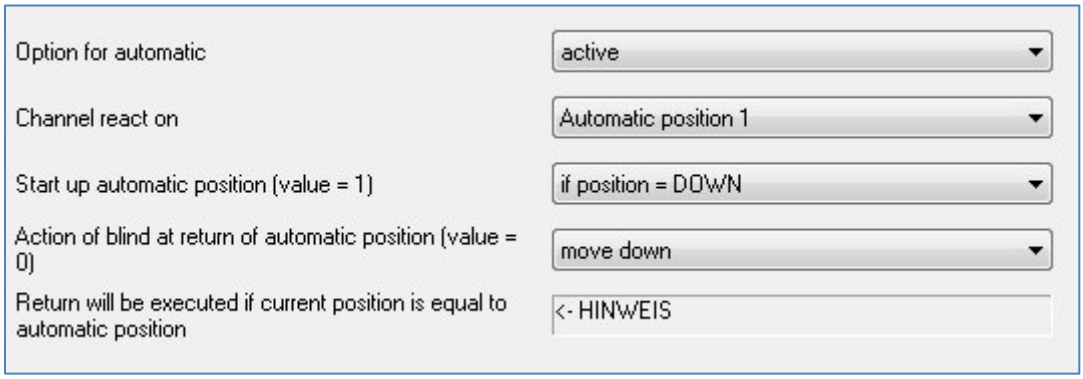

Illustration 16: Option for automatic

At the “option for automatic” the area of validity of the automatic function for one channel can be restricted. So e.g. the channel B can react only to one certain position or perform the call of an automatic function only if the shutter/blinds are in an end position.
Furthermore a moving command can be parameterized for the deactivation of the automatic function. But this moving command is only performed if the channel is still in the called position. For proofing this, an internal alignment between the current position and the called position is done before moving the channel. So it is ensured that the action at return of the automatic function is only performed if the shutter/blinds are not driven manually to any certain value.

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The following settings are available for the automatic position:

ETS-text	Dynamic range **[default value]**	comment
Option for automatic	▪ **not active** ▪ active	Activation of the automatic option
Channel react on	▪ **Automatic position 1-2** ▪ Automatic position 1 ▪ Automatic position 2	Adjustment which automatic positions shall be performed of the channel
Startup automatic position (value = 1)	▪ **ever** ▪ if position = UP ▪ if position = DOWN	Adjustment if the automatic position shall only be performed in an end position
Action at reset of automatic position (value=1)	▪ **not active** ▪ move up ▪ move down	Adjustment, which action the channel shall perform at the reset of the automatic function

Chart 20: Option for automatic

Individual shading and air ventilation projects can be realized by the option for the automatic function. Examples are described at chapter 4.4.2.

4.7.2 Automatic blocks

To call appointed values by the automatic function, you have to activate the appointed automatic blocks at the subitem for the automatic function. The blocks A and B can be activated or deactivated separately.
The following illustration shows the setting options for the automatic blocks:

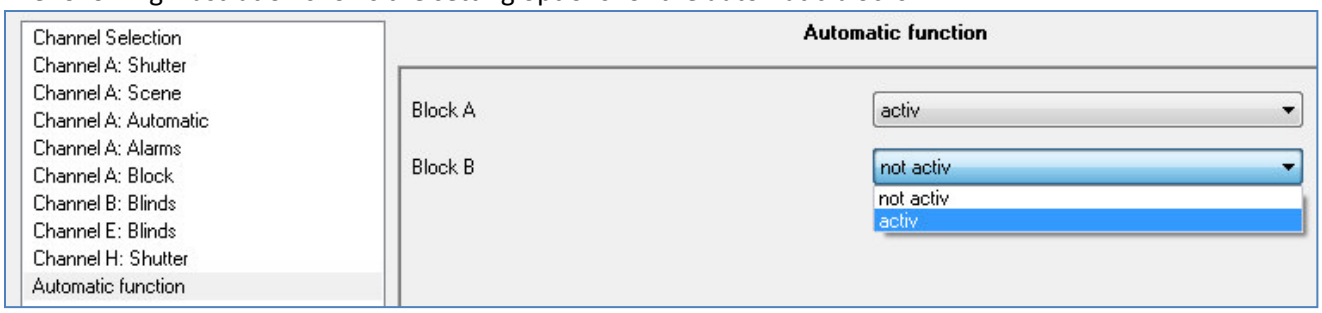

Illustration 17: automatic blocks

If an automatic block gets activated, the according communication objects appear. There are four communication objects for every block, respectively one for every automatic function.

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The communication objects are shown at the following chart:

Number	Name	Length	Usage	Number
86/166	automatic A	automatic position 1	1 Bit	Call of the first automatic position at block A
87/167	automatic A	automatic position 2	1 Bit	Call of the second automatic position at block A
88/168	automatic B	automatic position 1	1 Bit	Call of the first automatic position at block B
89/169	automatic B	automatic position 2	1 Bit	Call of the second automatic position at block B

Chart 21: communication objects automatic function

The communication objects, with the size of 1 Bit, can be allocated arbitrary to the group addresses. By calling one of the communication objects, the deposited values for the automatic function are called. It is possible to move all channels of one shutter actuator to their parameterized values with only one command, but also to move only one channel. This happens in according to the parameterization, which was made for the individual channel at the subitem automatic function (have a look at 4.7.1). To move more channels to the same time to a specific value, you have to choose the same blocks for these channels and set the same values for this automatic positions.

4.8 Alert functions/ superior functions

The shutter actuator can react to specific weather situations and introduce several reactions for this channel to protect the shutters/blinds by using the alarm function. Additional reactions on a bus power breakdown or a bus power return can be defined. The alarm functions can be activated or deactivated for every several channel.
The signals for the alarms can be recovered of a KNX weather station. Now the shutter actuator is able to evaluate these signals and assemble them according to the parameterization.
The following Illustration shows the activation of the alert functions for a channel:

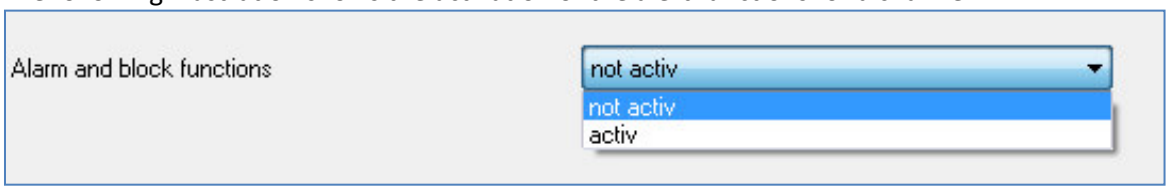

Illustration 18: Alert functions

If the alert function is activated for a channel, at the left drop-down menu appears a subitem (channel X: Alarms), in which the following parameterization can ensue.

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If the alert function is activated, you can make the following parameterization at the appeared subitem.
The following illustration shows the drop-down menu for the alert function:

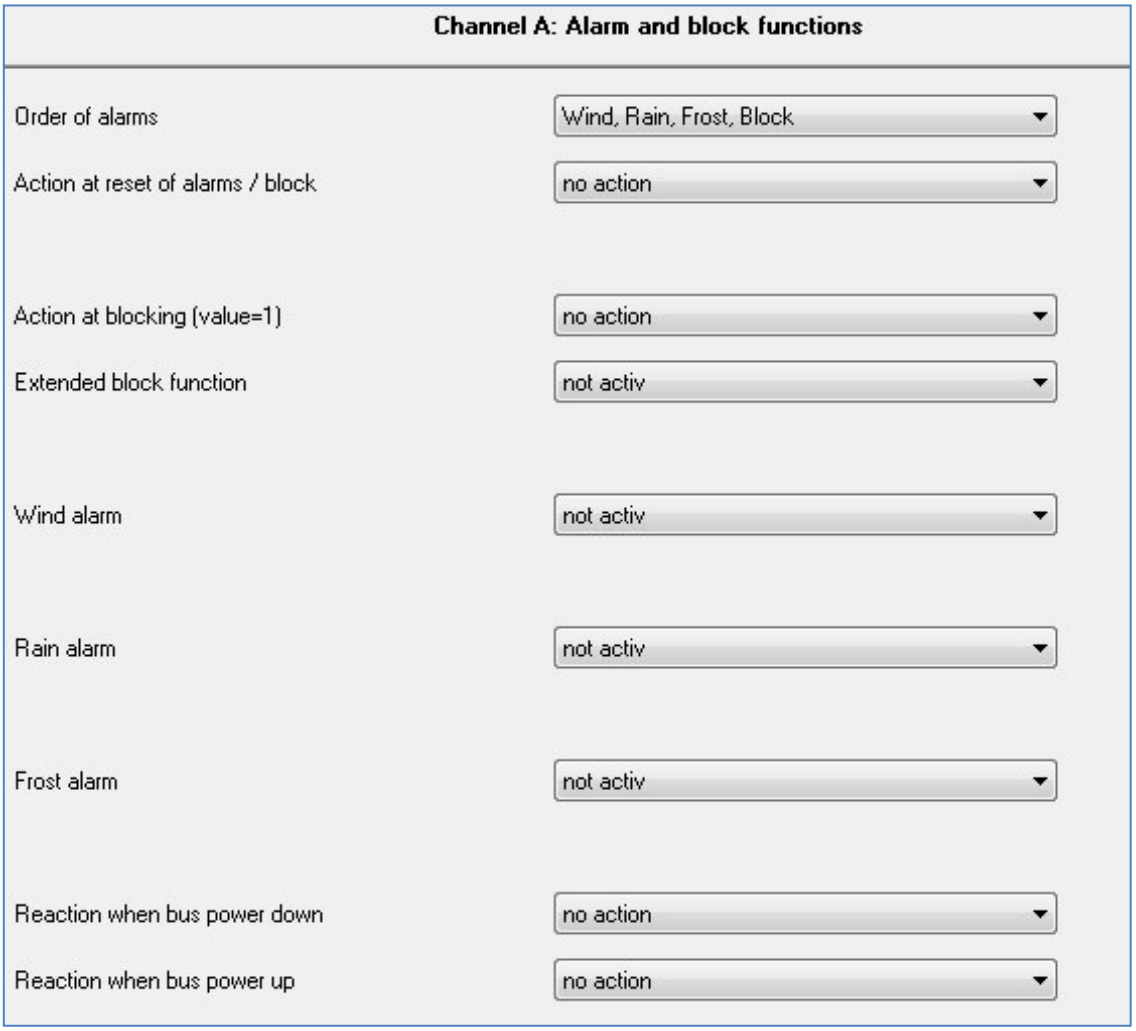

Illustration 19: subitem alert function

The several parameters of the alert function, as well as the setting options, are descripted in detail at the following segments.

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4.8.1 Order of alarms

The parameter “order of alarms” describes the priority of the several alarms.
The following chart shows the setting options for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Order of alarms	▪ **Wind, Rain, Frost, Block** ▪ Wind, Rain, Block, Frost ▪ Wind, Block, Rain, Frost ▪ Block, Rain, Wind, Frost	sets the priority of the alarms

Chart 22: Order of alarms

If there are two or more alarms activate to the same time, the shutter actuator will evaluate the alarms according to the appointed order of alarms. The shutter actuator implements only the function of the alarm with the highest priority. The function for the alarm with the lower priority does not implement, as far the alarm with the higher priority is active. When the alarm with the higher priority is deactivated and the alarm with the lower priority is still active, the function for the alarm with the lower priority is activated afterwards.

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4.8.2 Alarm types

Three different types of alarms can be activated (wind alarm, rain alarm, frost alarm), which can be set individually afterwards.
The following chart shows the dynamic range of the three types of alarms:

ETS-text	Dynamic range **[default value]**	comment
Wind alarm	▪ **not active** ▪ active	Activation of the wind alarm
Cycle time (only when wind alarm is activated)	*0-120 min [30min]*	*periodic observation of the wind alarm setting 0 deactivates the periodic observation*
Action (only when wind alarm is activated)	▪ **no action** ▪ drive to top ▪ drive to bottom	*Action when wind alarm gets active*
Rain alarm	▪ **not active** ▪ active	Activation of the wind alarm
Cycle time (only when rain alarm is activated)	*0-120 min [30min]*	*periodic observation of the rain alarm setting 0 deactivates the periodic observation*
Action (only when rain alarm is activated)	▪ **no action** ▪ drive to top ▪ drive to bottom	*Action when rain alarm gets active*
Frost alarm	▪ **not active** ▪ active	Activation of the wind alarm
Cycle time (only when frost alarm is activated)	*0-120 min [30min]*	*periodic observation of the frost alarm setting 0 deactivates the periodic observation*
Action (only when frost alarm is activated)	▪ **no action** ▪ drive to top ▪ drive to bottom	*Action when frost alarm gets active*

Chart 23: alarm types

If an alarm is activated the according communication object appears. If the according communication object receives an “1-signal”, the alarm function will be activated. By sending a “0-signal”, the alarm gets deactivated.
The following chart shows the according communication objects:

Number	Name	Length	Usage
22	Wind alarm	1 Bit	Activation/deactivation of the wind alarm
23	Rain alarm	1 Bit	Activation/deactivation of the rain alarm
24	Frost alarm	1 Bit	Activation/deactivation of the frost alarm

Chart 24: communication objects alarms

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The function of the alarms is identical for every of the three alarm types. For every of the three alarms a periodic observation can be activated (have a look at 4.8.3). Furthermore an action for the release of each alarm can be set. Here, the user has 3 opportunities: On the one hand the shutter actuator can drive the channel to the top or to the bottom, when the alarm is activated. On the other hand the shutter actuator can react with the setting “no action”. At this setting, the channel stays in its actual position. A movement of this channel is not possible as long as the alarm is activated. Also after the reset of the alarms, the shutter actuator can perform predetermined functions. These are descripted at 4.8.5.
Please note, that the communication objects of the alarms shall always be connected to group addresses; otherwise there is no opportunity to receipt the alarms. If an alarm is activated because of its periodic observation, which is not connected to a group address, you will only be able to receipt it by using the ETS-Software!

4.8.3 Periodic observation

The periodic observation of the alarm function can be activated for every of the three alarms separately. The dynamic range extends from 0 to 120min, whereby the setting 0 min sets the periodic observation off.
The communication object for the respectively alarm must get a signal during the parameterized time, otherwise the alarm causes automatically. There are settings at KNX weather stations, in which clearances the periodic sending shall follow. The time for the periodic sending shall be always set less than the observation time to avoid an unwittingly cause of the alarm.
You can get sure that a weather sensor works properly, by using the periodic observation. If a signal is absent, because of a failure of the weather station or a wire break, the shutter actuator will trigger the alarm after the expiration of the observation time.
The following illustration shows the setting options for the periodic observation:

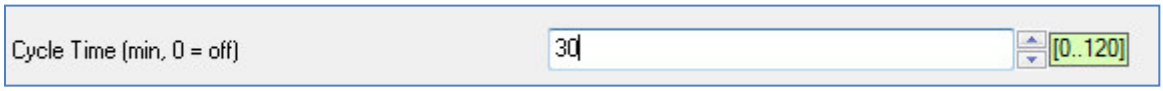

Illustration 20: periodic observation

4.8.4 Normal blocking

The following chart shows the dynamic range for the activation of the blocking object:

ETS-text	Dynamic range **[default value]**	comment
Action at blocking (Value=1)	▪ **no action** ▪ Drive to top ▪ Drive to bottom	Adjustment for the activation of the blocking object of the channel

Chart 25: Action at blocking

The shutter actuator can drive to predefined positions, top or bottom, at the activation of the blocking object or stay in its current position. At an activated block function, no driving of the channel is possible.
The following chart shows the relevant communication object:

Number	Name	Length	Usage
25	Block	1 Bit	Activation/Deactivation of the normal blocking function

Chart 26: Communication object Block

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4.8.5 Action at reset of alarms and blocks

For every channel an action at the reset of the alarm and all blocking functions can be parameterized. This parameter operates to all alarms and blocking functions of the selected channel. The dynamic range of this parameter is shown at the following chart:

ETS-text	Dynamic range **[default value]**	comment
Action at reset of alarms/block	▪ **no action** ▪ drive to former position ▪ drive to top ▪ drive to bottom	Adjustment for the repeal of the alarm and blocking functions

Chart 27: Action at reset of alarms

The user has 4 different setting options for the parameter “Action at reset of the alarms/block”, which the shutter actuator can conduct for this channel.
By using the setting “no action” the channel stays in its position, which he had during the active alarm/block.
The setting “drive to former position” let the shutter actuator drive the channel to the position, which it had before the alarm/block was activated. If you chose “no action” for the action of an activated channel, this setting will have no effect to the position of this channel.
Furthermore the shutter actuator can drive the channel to the top or the bottom at the reset of an alarm/block.
The setting “Action at reset of alarms/block” is always valid for the complete channel, even if you have chosen three different settings for the three possible alarms and blocks.

4.8.6 Reaction when bus power down/up

The setting “Reaction when bus power down/up” can assign the shutter actuator an action how he shall react to faults of the bus power.
The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Reaction when bus power down	▪ **no action** ▪ drive to top ▪ drive to bottom	Reaction to a bus power breakdown
Reaction when bus power up	▪ **no action** ▪ drive to top ▪ drive to bottom	Reaction to a bus power return

Chart 28: Reaction to bus power faults

For the “reaction when bus power down” as well as for the “reaction when bus power up” three setting options are available. The channel can drive to a defined value as well for the bus power breakdown as for the bus power return and drive to the top or to the bottom. The setting “no action” let the channel maintain in its actual position.
It is important to note, that the shutter actuator can not be addressed via the bus during a bus power breakdown and so can not be driven in its „normal way“.

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4.9 Block functions

The extended block function can be activated for every channel by a separately subitem. When the extended block function was activated for a channel, a new subitem appears, under the according channel, called channel X: Extended block function at the drop down menu.
The following illustration shows the activation of the block function:

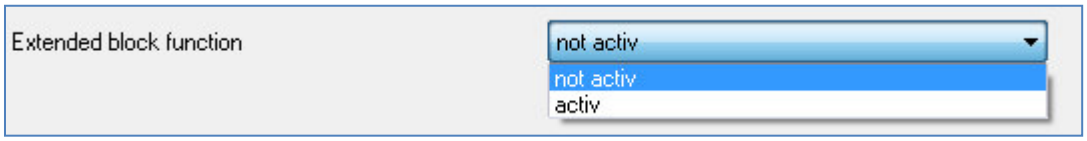

Illustration 21: Activation block function

The following illustration shows the distribution at the submenu of the block function:

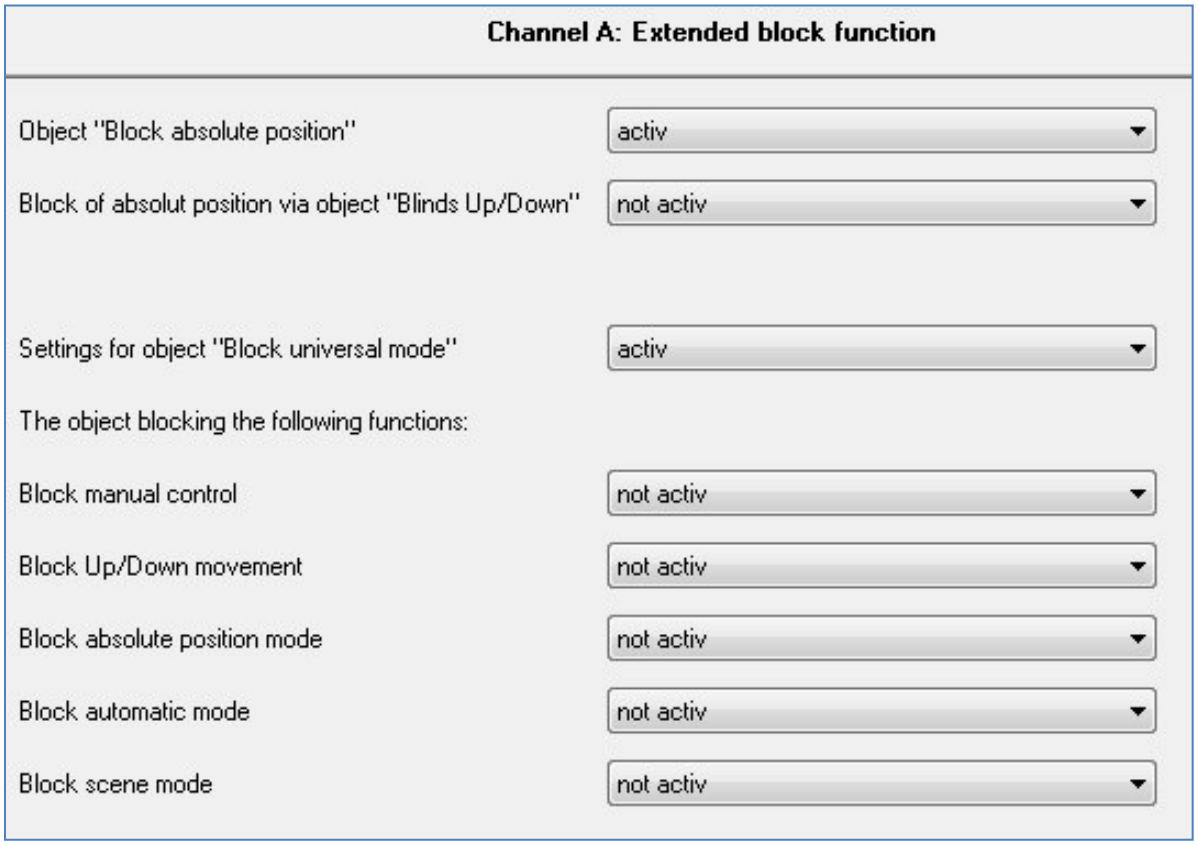

Illustration 22: Block function

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The following chart shows the dynamic range, which can be set at the submenu of the block function:

ETS-text	Dynamic range **[default value]**	comment
Action at blocking (Value=1)	▪ **no action** ▪ drive to top ▪ drive to bottom	Reaction to the activation of a blocking instance
Block of absolute position via Objects “Blinds Up/Down”	▪ **not active** ▪ active	activates the driving to absolute positions by manual driving
Settings for object “Block universal mode”	▪ **not active** ▪ active	activates the communication object and the setting options for the universal blocking mode
The object blocks the following functions:		
Block manual control	▪ **not active** ▪ active	with activation of the object “block universal mode” the manual control gets blocked
Block up/down movement	▪ **not active** ▪ active	with activation of the object “block universal mode” the up/down movement gets blocked
Block absolute position mode	▪ **not active** ▪ active	with activation of the object “block universal mode” the absolute position mode gets blocked
Block automatic mode	▪ **not active** ▪ active	with activation of the object “block universal mode” the automatic objects for this channel gets blocked
Block scene mode	▪ **not active** ▪ active	with activation of the object “block universal mode” the scen calling for this channel gets blocked

Chart 29: Block functions

When the particular block functions are activated the according communication objects appears. The chart shows the according communication objects:

Number	**Name**	**Length**	**Usage**
20	block absolute position	1 Bit	blocks the object absolute position
21	block universal mode	1 Bit	blocks the channel according to the appointed parameterization

Chart 30: communication objects block function

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It is possible to block the absolute position commands with the parameter “block absolute position”. By activation the according object the channel can no longer receive commands for an absolute height until the object is deactivated by a”0”. The sub function “Block of absolute position via Objects Blinds Up/Down” allows blocking the driving to absolute position as soon as manual driving is activated. This function has its areas of application when a weather station activates a sun protection, but the user wants to drive the shutter/blinds manual to any other value. By driving manual, the shutter actuator is blocked for receiving absolute positions for sun protection and can be driven normal.
It is possible to configure the blocking process on your own by using the parameter “Blocking universal mode”. Therefore 5 different options are available:

- Block manual control
  - blocks the manual control at the device for this channel
- Block up/down movement
  - blocks the driving commands of the channel (also the blind adjustment at shutters)
- Block absolute position mode
  - blocks the receiving of absolute position commands via the object “absolute position”
- Block automatic mode
  - blocks the automatic function for this channel, that means the call of the channel via the automatic function is blocked for this channel
- Block scene mode
  - blocks the scene mode for this channel, that means at a scene calling, in which the blocked channel is integrated, the channel is not called with and stays instead in its actual position

All blocking function can be activated by a logical “1” and deactivated by a logical “0”.

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5 Reference ETS-Parameter – Switch, Staircase

5.1 Channel selection

To operate the universal actuator as switching actuator, at first the pair of channels, e.g. Channel A/B, must be selected as “Switch, Staircase”. At the next step, for each channel can be selected if the channel shall operate as switch or as staircase.

The following illustration shows the submenu channel selection:

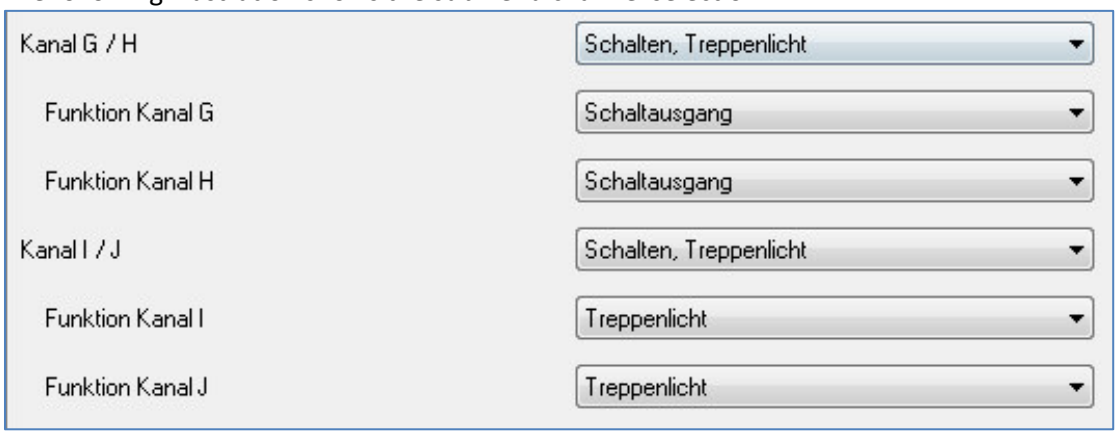

Illustration 23: Channel selection

The following chart shows the available setting sfor the channel selection:

ETS-text	Dynamic range **[default value]**	comment
Channel A/B – O/P	▪ **not active** ▪ Shutter, Blinds ▪ Switch, Staircase	Selection, if a pair of channels shall operate as switching actuator or as shutter actuator. Not active deactivates the pair of channels.
Channel A/B – O/P	▪ **Switch** ▪ Staircase	At the switch/staircase mode, theses settings are available.

Chart 31: Available settings channel selection for switch/staircase

Each of the 4/8 pair of channels can operate as switching- or as shutter actuator.
At the chapter 5, the switching actuator mode is descripted. Each channel can be parameterized as well as switching output or as staircase function.

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5.2 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.

5.2.1 Relay operating mode

The following illustration shows the setting options for this parameter:

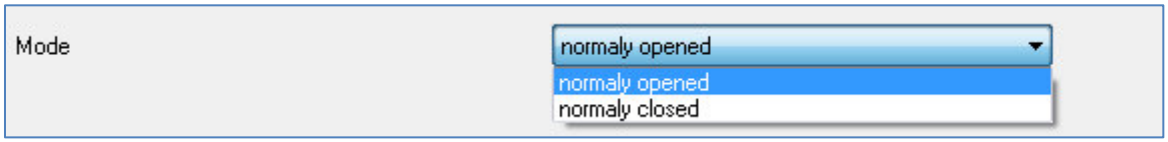


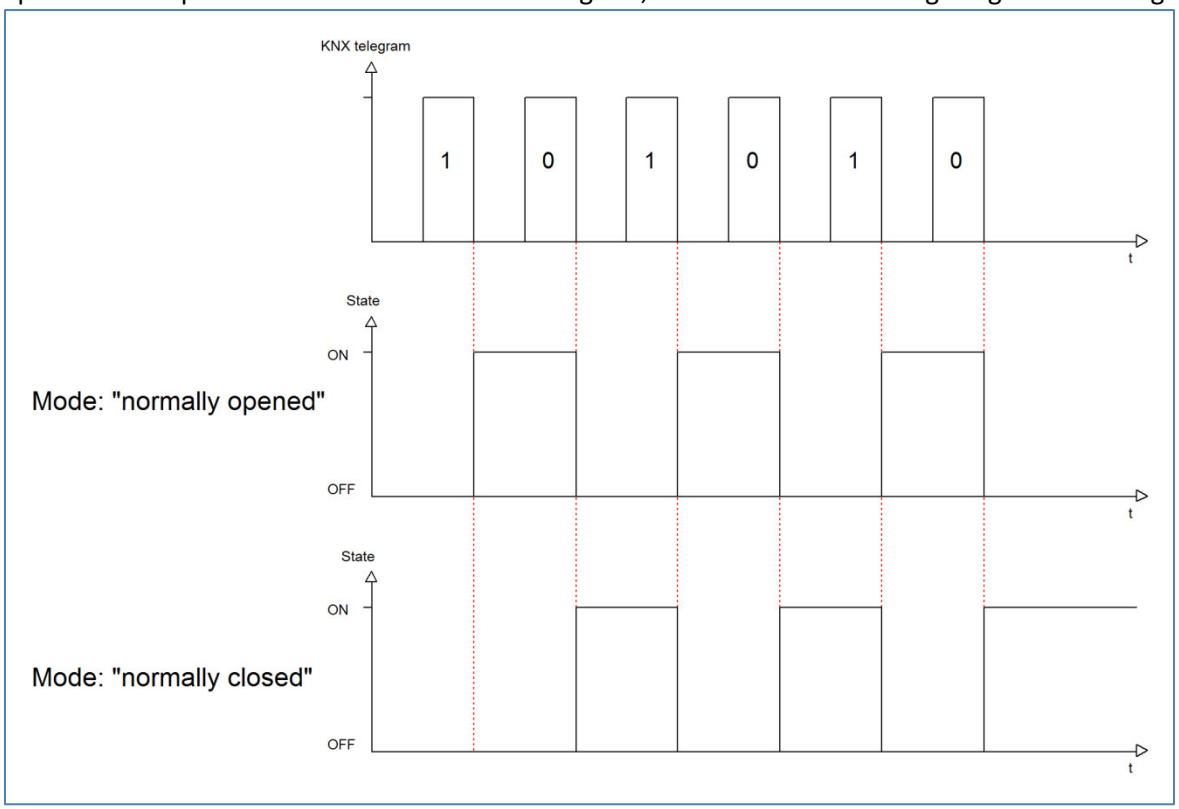
Illustration 24: Operating mode

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Mode	▪ **normally opened** ▪ normally closed	Relay operating mode of the channel

Chart 32: 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:



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5.2.2 Central function

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

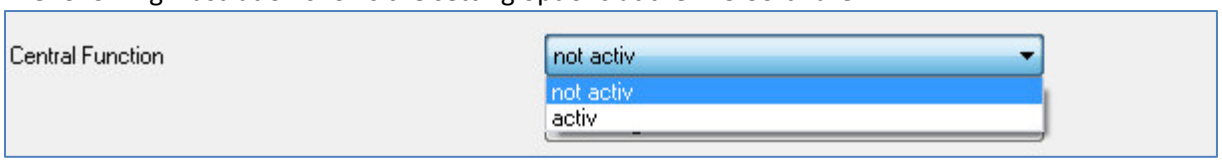

Illustration 25: Central function

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Central function	▪ **not active** ▪ active	switches the central function on/off for this channel

Chart 33: 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**
5	Central function	1 Bit	central switching of the channels

Chart 34: Communication object central function

5.2.3 Behavior at block/unblock

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

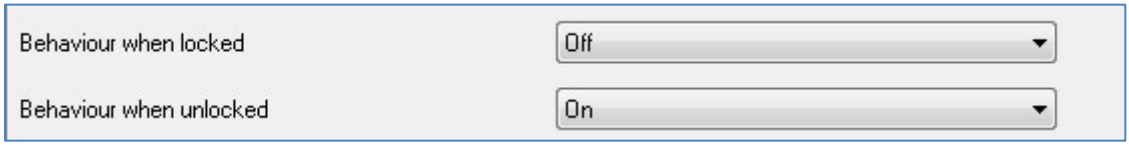

Illustration 26: Blocking function

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Behavior when locked Behavior when unlocked	▪ On ▪ Off ▪ **no change**	Behavior to a blocking/unblocking process

Chart 35: Behavior at block/unblock

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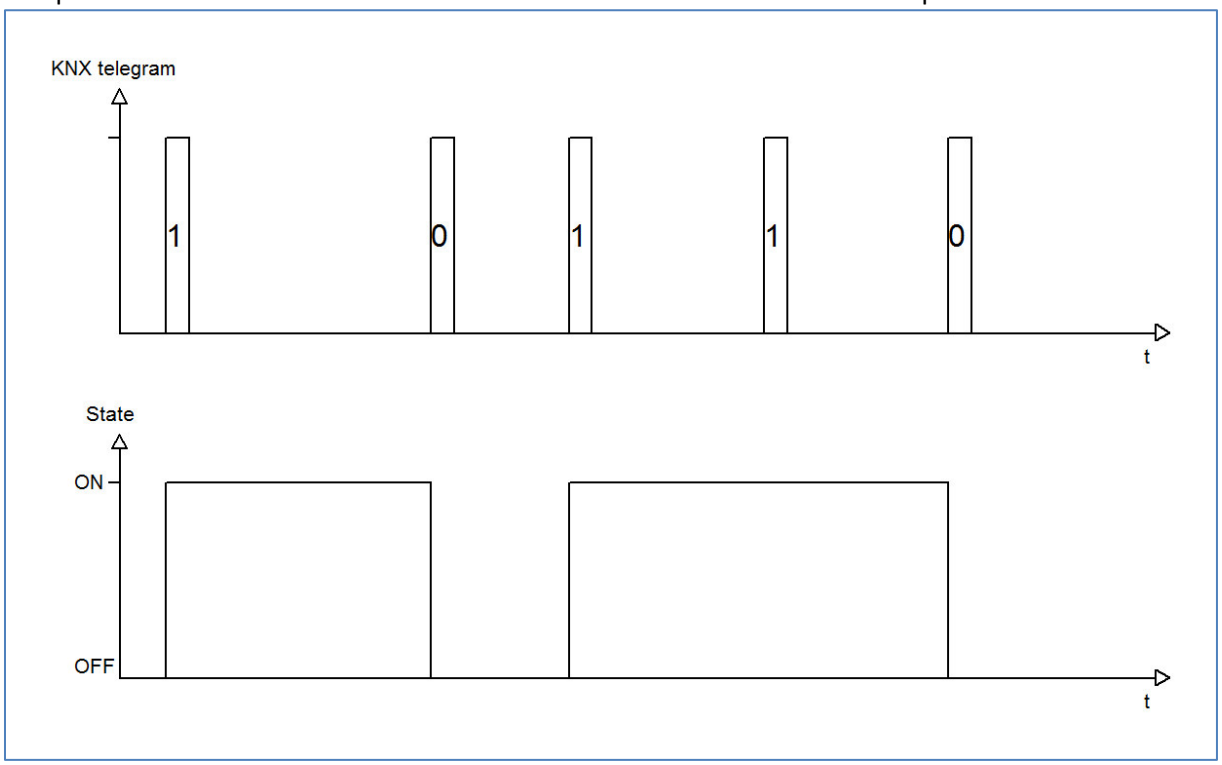
The blocking function gets active, when the corresponding communication object becomes a logical “1”. By sending a logical “0”, the blocking function can be deactivated again.
The parameter “Behavior when locked” defines an action for the output at activating the blocking process. There are the setting 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
8	Block	1 Bit	blocks the channel

Chart 36: 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.

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5.2.4 Behavior at bus power up/down

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

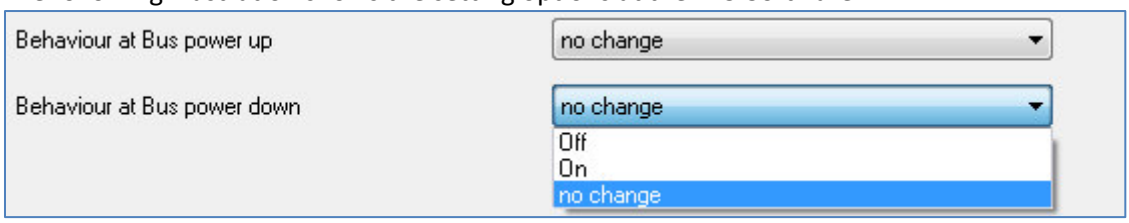

Illustration 27: Behavior at bus power up/down

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	▪ On ▪ Off ▪ **no change**	Adjustment, how the channel shall react in case of a bus power breakdown/return

Chart 37: 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.

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5.3 Switching output

The following parameters, which are described at the headings 5.3.x, are only available at channels selected as switch.

5.3.1 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:

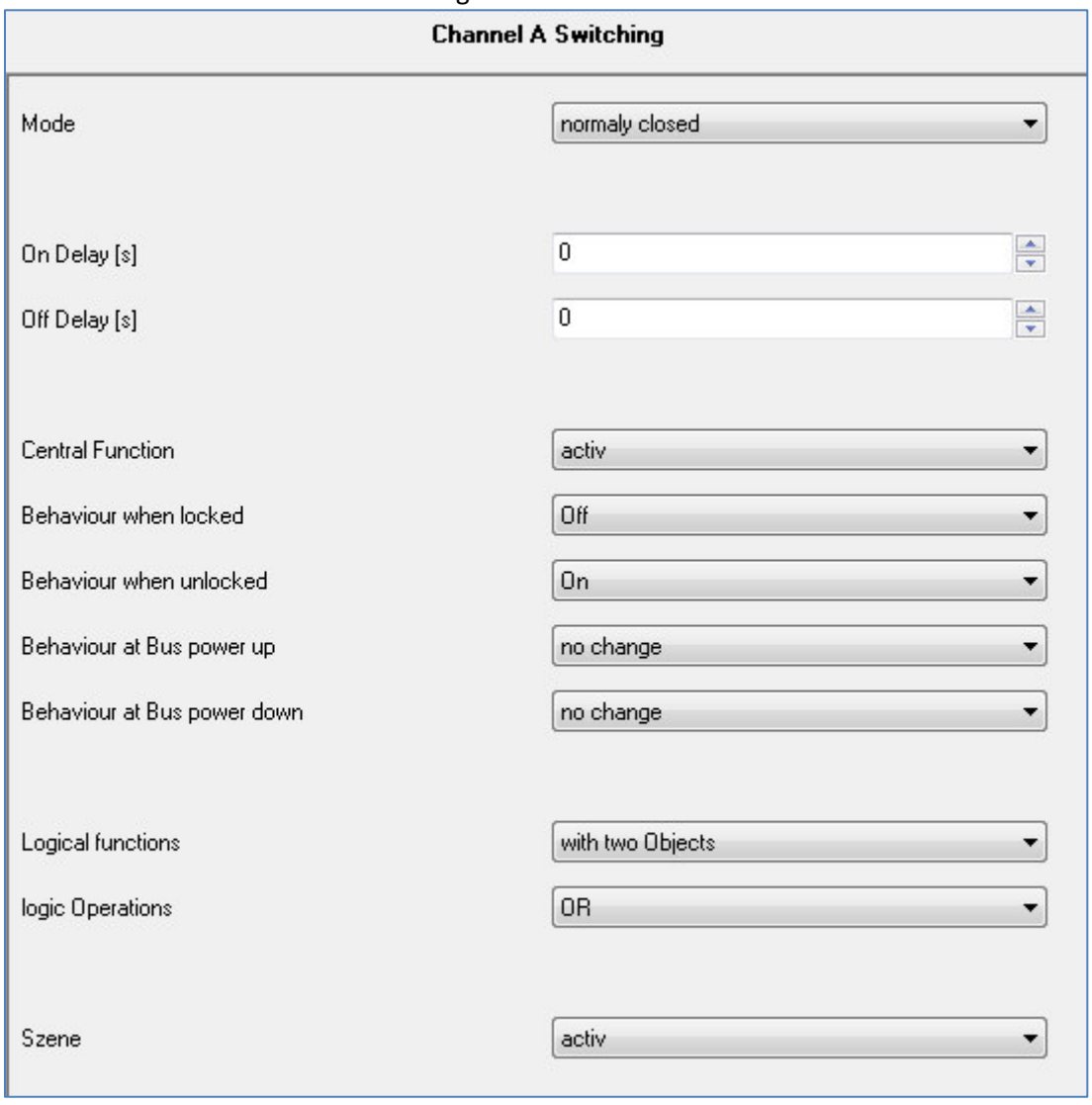

Illustration 28: Switching output

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The chart shows the possible settings for switching outputs:

ETS-text	Dynamic range **[default value]**	comment
Mode	▪ **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	▪ **not active** ▪ active	Activates the central function for this channel
Behavior when locked	▪ Off ▪ On ▪ **no change**	Action for activating the blocking process
Behavior when unlocked	▪ Off ▪ On ▪ **no change**	Action for deactivating the blocking process
Behavior at bus power down	▪ Off ▪ On ▪ **no change**	Action for a bus power breakdown
Behavior at bus power up	▪ Off ▪ On ▪ **no change**	Action for a bus power return
Logic function	▪ **not active** ▪ with one object ▪ with two objects	Activation of the logic function with one or two objects
Logic operation	▪ **And** ▪ Or	Selection of the logic function only available, when the logic function was activated
Scene	▪ **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 38: Switching output

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5.3.2 On/Off delay

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

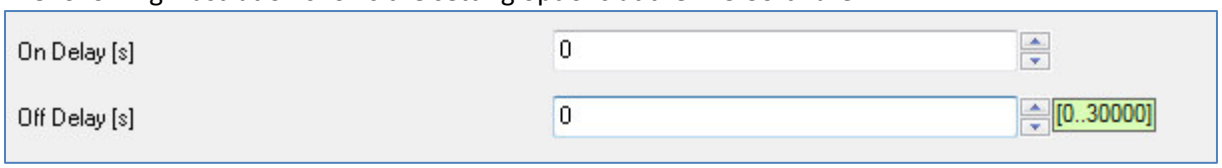
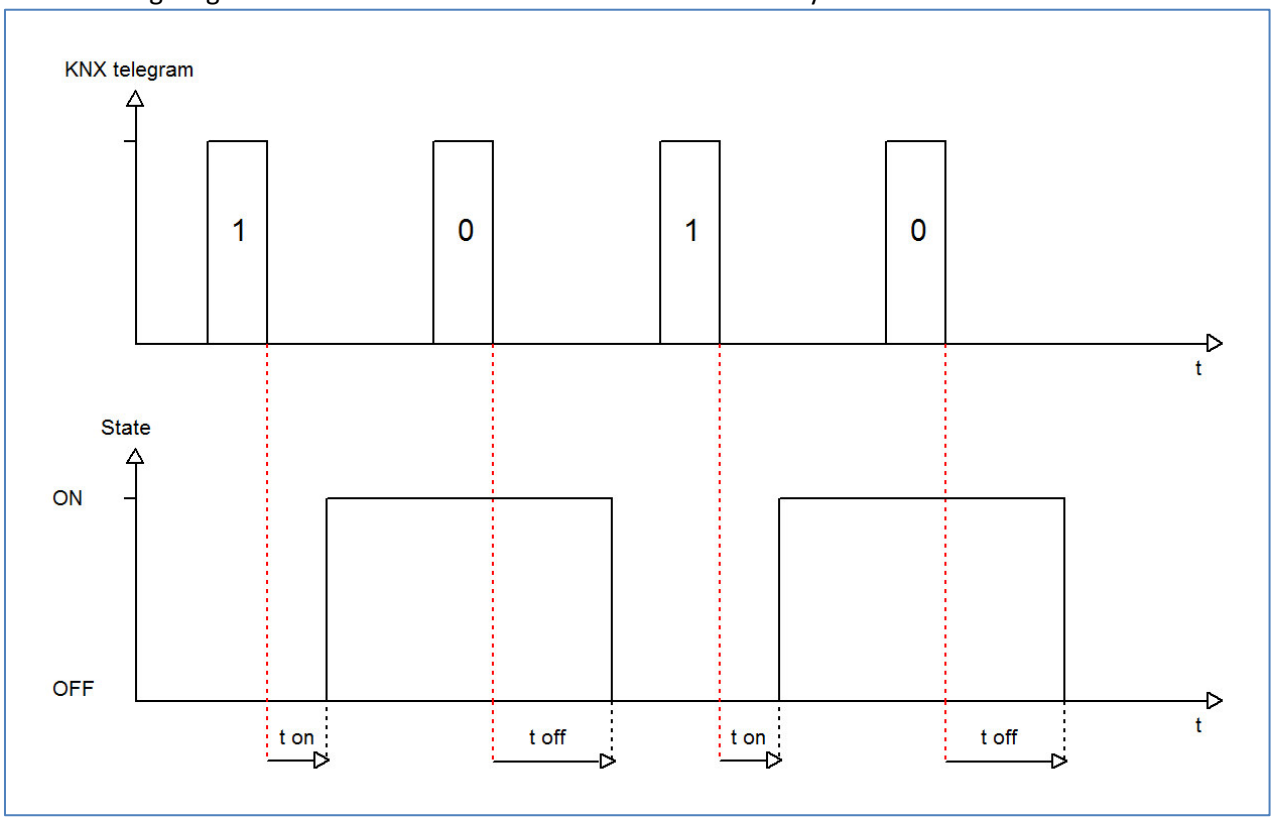


Illustration 29: On/Off delay

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:



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5.3.3 Logical functions

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

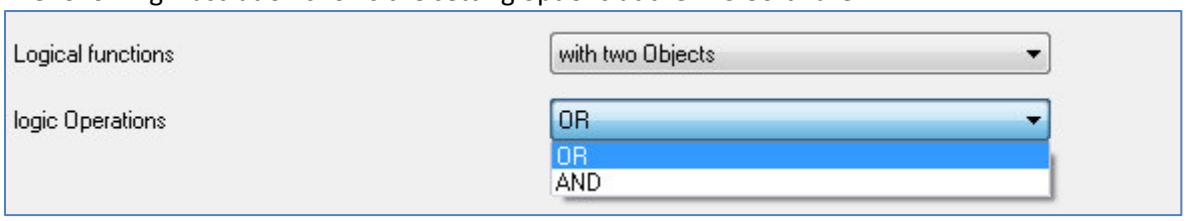

Illustration 30: Logical functions

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
11	Logic 1	1 Bit	Logic object 1, is the first input for the logic block
12	Logic 2	1 Bit	Logic object 2, is the second input for the logic block

Chart 39: 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 40: Logic operations

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5.3.4 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:

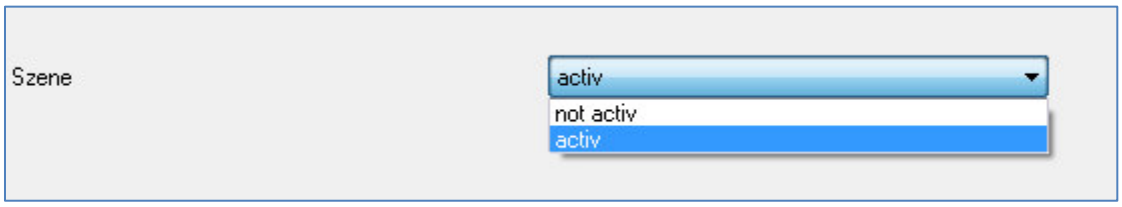

Illustration 31: Scene function

The following chart shows the relevant communication object:

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

Chart 41: 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.

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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.

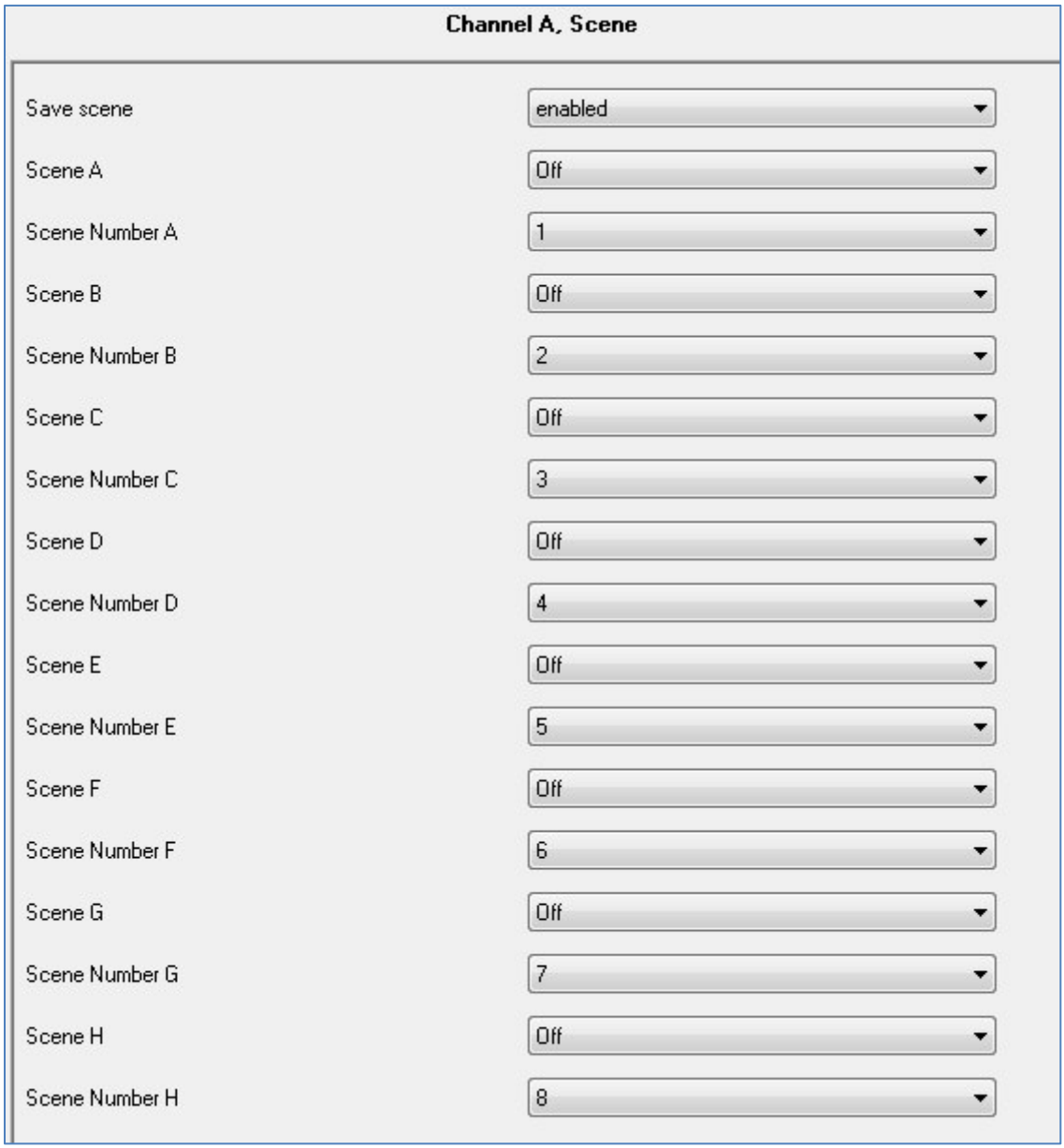

Illustration 32: Sub function scene

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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	▪ **disabled** ▪ enabled	Learning of scenarios; enable/disable memory function
Scene A	▪ **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	▪ **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	▪ **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	▪ **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	▪ **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	▪ **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	▪ **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	▪ **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 42: Parameter scene

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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 43: Calling and saving scenes

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5.3.4.1 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:

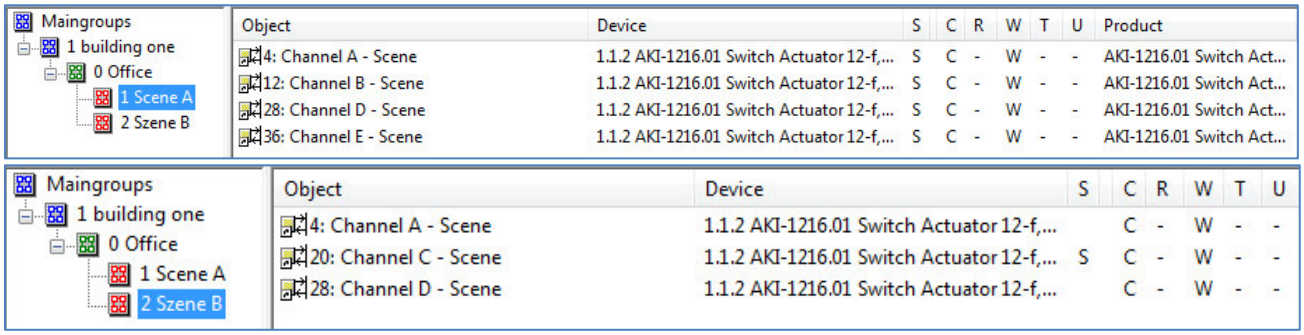

Illustration 33: Programming of scenes

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.

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5.4 Staircase

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

5.4.1 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:

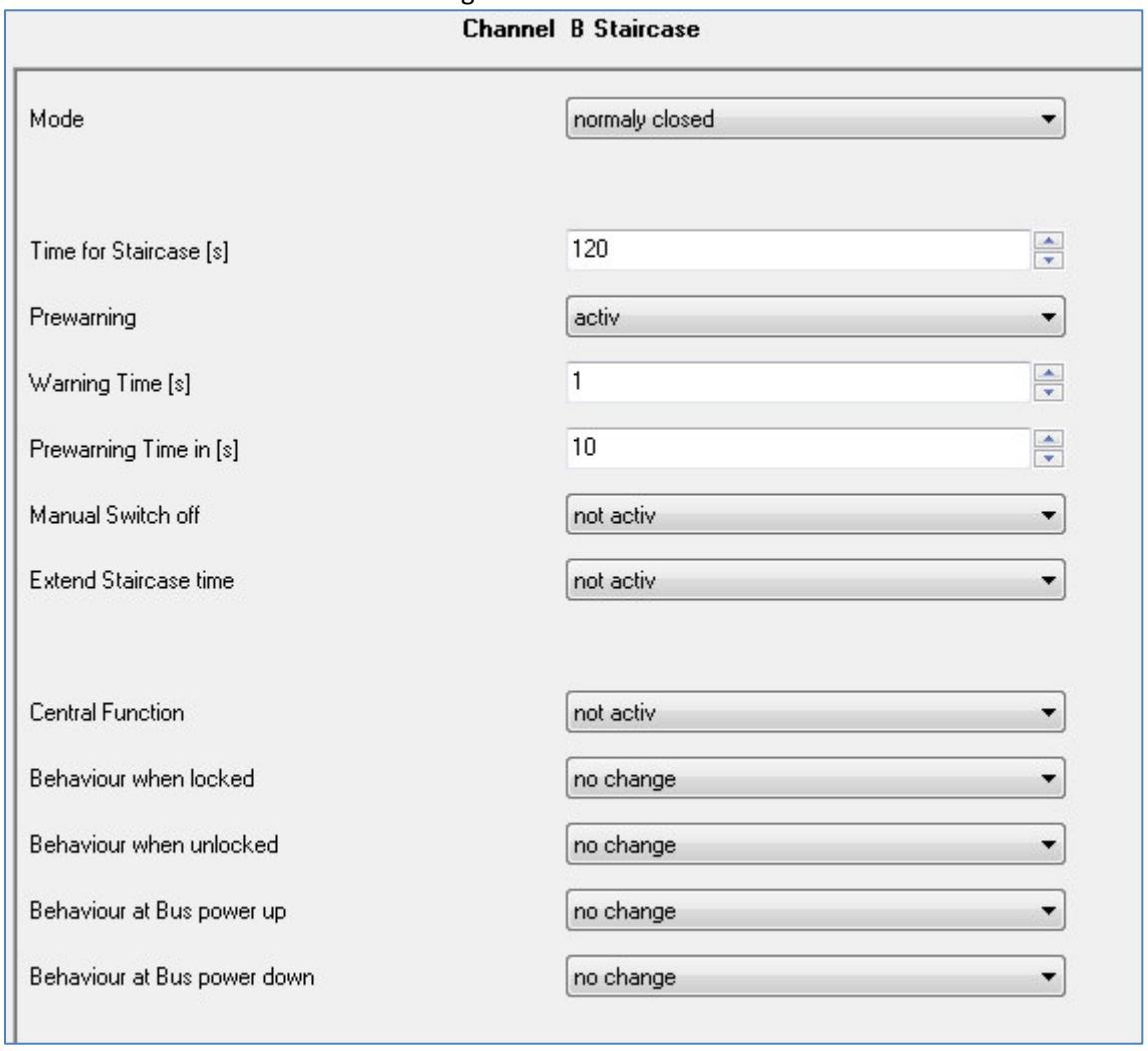

Illustration 34: Staircase

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The chart shows all possible settings for staircase outputs:

ETS-text	Dynamic range **[default value]**	comment
Mode	▪ **normally opened** ▪ normally closed	Operation mode of the channel
Time for staircase [s]	0…65535 sec [120 sec]	Duration of the switching process
Prewarning	▪ **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	▪ **not active** ▪ active	Activation of the manual turn off of the staircase
Extend staircase time	▪ **not active** ▪ active	Activation of the extension of the staircase
Central function	▪ **not active** ▪ active	Activates the central function for this channel
Behavior when locked	▪ Off ▪ On ▪ **no change**	Action for activating the blocking process
Behavior when unlocked	▪ Off ▪ On ▪ **no change**	Action for deactivating the blocking process
Behavior at bus power down	▪ Off ▪ On ▪ **no change**	Action for a bus power breakdown
Behavior at bus power up	▪ Off ▪ On ▪ **no change**	Action for a bus power return

Chart 44: Parameter staircase

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5.4.2 Staircase time

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

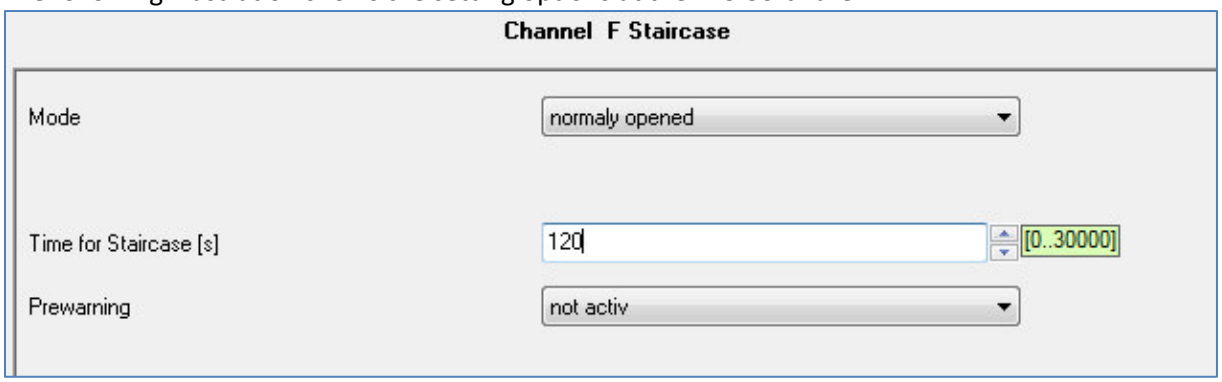

Illustration 35: Staircase time

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
7	Staircase	1 Bit	Calling of the staircase function

Chart 45: Communication object staircase

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5.4.3 Prewarning und Warning

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

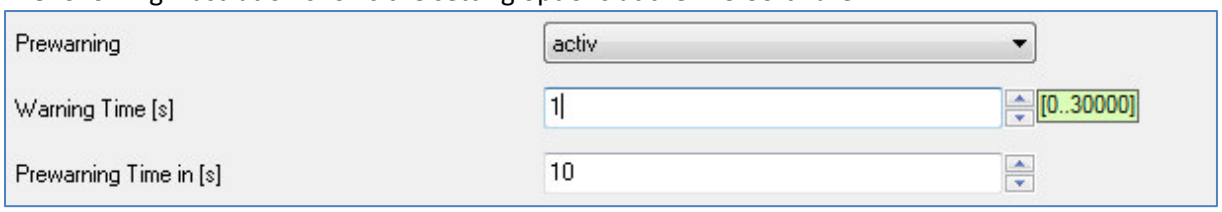
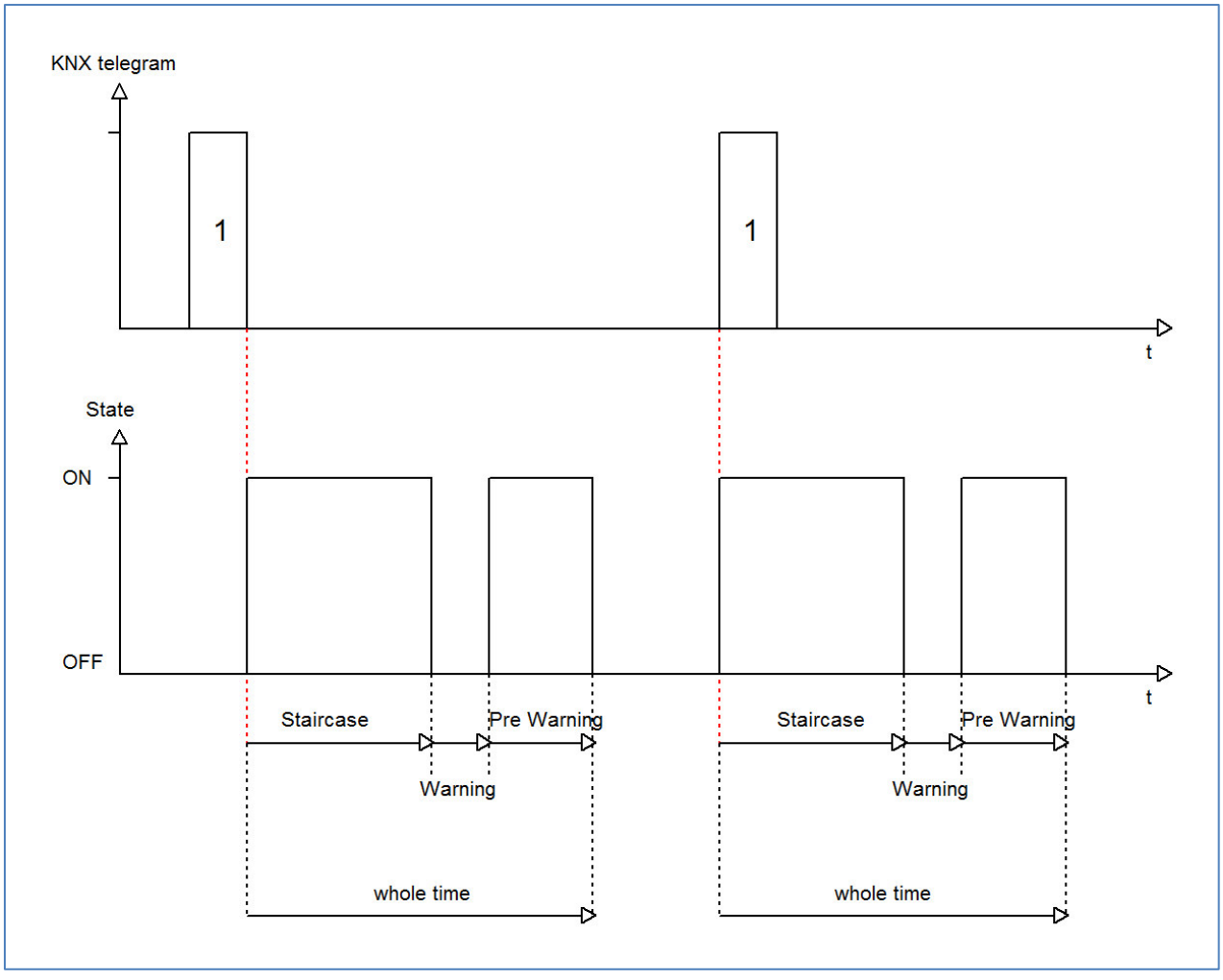


Illustration 36: Warning timer & prewarning time

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 trough 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:



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5.4.4 Manual switch off

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

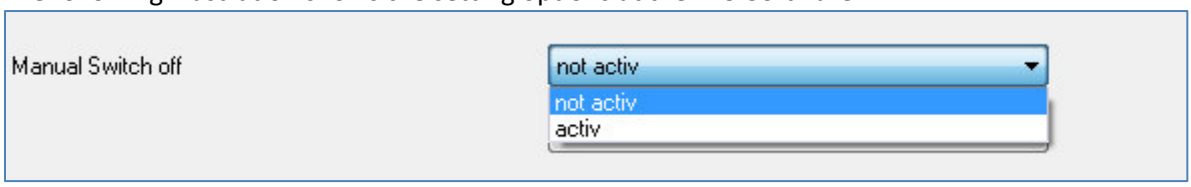


Illustration 37: Manual switch off

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.

5.4.5 Extend staircase time

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

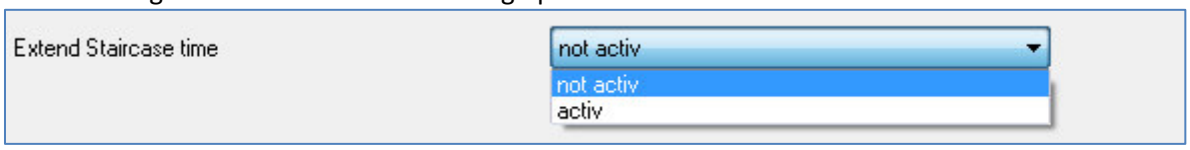
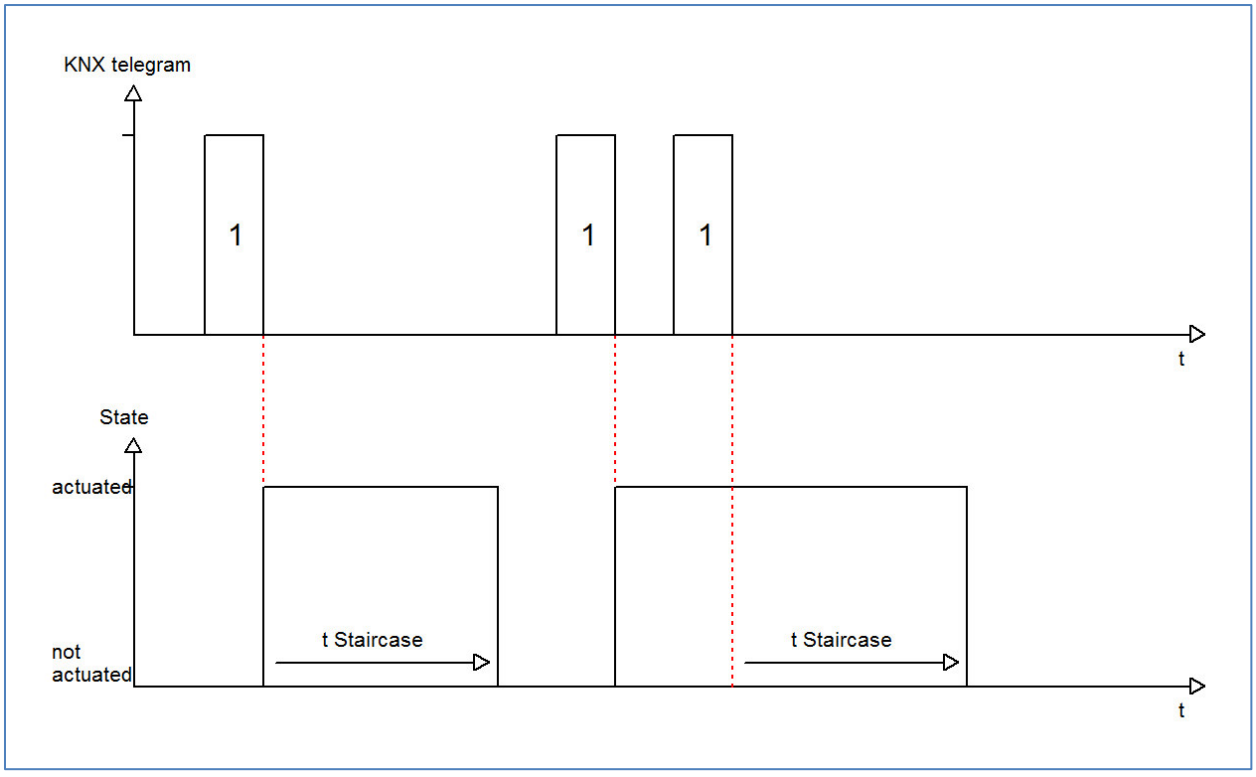


Illustration 38: Extend staircase time

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:



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6 Index

6.1 Register of illustrations

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6.2 List of tables

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7 Attachment

7.1 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.

7.2 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.

7.3 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.

7.4 Datasheet

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MDT Universal Actuator

MDT Universal Actuator 8/16-fold, MDRC

Version		
AKU-0816.01	Universal Actuator 8-fold	4SU MDRC, 230VAC, 16A
AKU-1616.01	Universal Actuator 16-fold	4SU MDRC, 230VAC, 16A

The MDT Universal Actuator receives KNX/EIB telegrams and can be used as Switch Actuator or Shutter Actuator. Mixed applications from Switch- and Shutter Actuator are possible. Each output uses a monostable relay and can be operated manually via a push button. A green LED indicates the switching status of each channel.

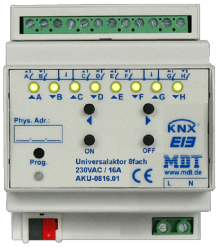
Functions as Switch Actuator:
The outputs are parameterized individually via ETS3/4. The device provides extensive functions like logical operation, status response, block functions, central function, delay functions and staircase lighting function. Additionally the device provides several time and scene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

Functions as Shutter Actuator:
The outputs are parameterized individually via ETS3/4. The device provides extensive functions like status response, block functions, central function and positioning shutters, blinds and other hangings. Additionally the device provides up to 8 scenes per channel. If the mains voltage fails, all outputs are switched off. After bus voltage failure or recovery the position of the shutter is selected in dependence on the parameterization.

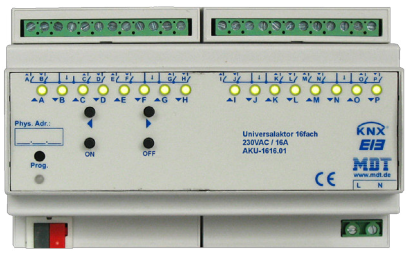
The MDT Universal Actuator is a modular installation device for fixed installation in dry rooms. It fits on DIN 35mm rails in power distribution boards or closed compact boxes.

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

AKU-0816.01



AKU-1616.01



- Production in Germany, certified according to ISO 9001
- **Can be used as Switch Actuator or Shutter Actuator**
- **Mixed applications from Switch- and Shutter Actuator possible**
- Push Button and LED indicator for each channel
- NO and NC contact operation
- Time functions (switch-on/switch-off delay)
- Staircase light function with adjustable warning time
- Status response (active/passive) for each channel
- Logical linking of binary data, 8 scenes per channel
- Central switching functions and block functions
- Operation mode blind/shutter programmable
- Travel-, pause-at-change-of-direction- and step time adjustable
- 1-bit automatic function and sun protection
- 8-bit positioning for shutter and blinds
- Programmable behaviour in case of bus voltage failure or return
- Four contacts share one supply phase
- Power supply 230VAC
- Modular installation device for DIN 35mm rails
- Integrated bus coupling unit
- 3 years warranty

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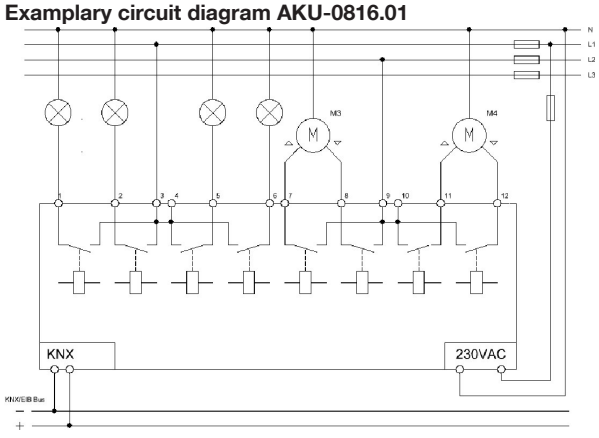
Stand: 1012

MDT Universal Actuator

Technical Data	AKU-0816.01	AKU-1616.01
Number of Switching outputs	8	16
Number of Shutter outputs	4	8
Output switching ratings		
Ohmic load	16A	16A
Capacitive load	max. 21uF at 16A	max. 21uF at 16A
Voltage	230VAC	230VAC
Maximum inrush current	80A/150µs 40A/600µs	80A/150µs 40A/600µs
Maximum load		
Shutter motor*	600W	600W
Incandescent lamps	2300W	2300W
Halogen lamps 230V	2000W	2000W
Halogen lamps, electronic transformer**	800W	800W
Fluorescent lamps, not compensated	800W	800W
Fluorescent lamps, parallel comp.	180W	180W
Max. number of electronic transformers	3	3
Output life expectancy (mechanical)	1.000.000	1.000.000
Permitted wire gauge		
Screw terminal	0,5 - 4,0mm² solid core 0,5 - 2,5mm² finely stranded	
KNX busconnection terminal	0,8mm Ø, solid core	0,8mm Ø, solid core
Power supply	230VAC/50Hz	230VAC/50Hz
Power consumption KNX bus typ.	< 0,15W	< 0,15W
Power consumption mains 230V typ.**	< 0,5-2W	< 0,5-4W
Operation temperature range	0 to + 45°C	0 to + 45°C
Enclosure	IP 20	IP 20
Dimensions MDRC (Space Units)	4SU	8SU

* no three-phase asynchronous ** Power consumption when operate as Shutter Actuator 0,5W. Power consumption when operate as Switch Actuator depends on relays position.

Examplary circuit diagram AKU-0816.01



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Stand: 1012