Technical Manual

MDT 1-10V Control Device

AKD – 0410V.02

1 Content

2 Overview

2.1 Overview Devices

The Manual refers to the following 1-10V Control devices (Order number is printed in bold letters):
- **AKD-0410V.02** 1-10V Control Device MDRC, 4fold, 1-10V Control Voltage
  - For Controlling 1-10V ECGs, with built in relays, adjustable dimming speeds, Min-/Max-Values adjustable
  - For Controlling RGBW-Stripes via PWM-Controller, Min-/Max-Values adjustable, Dimming Speeds and transitions adjustable, up to 5 scenes adjustable, scens can be controlled via Byte or
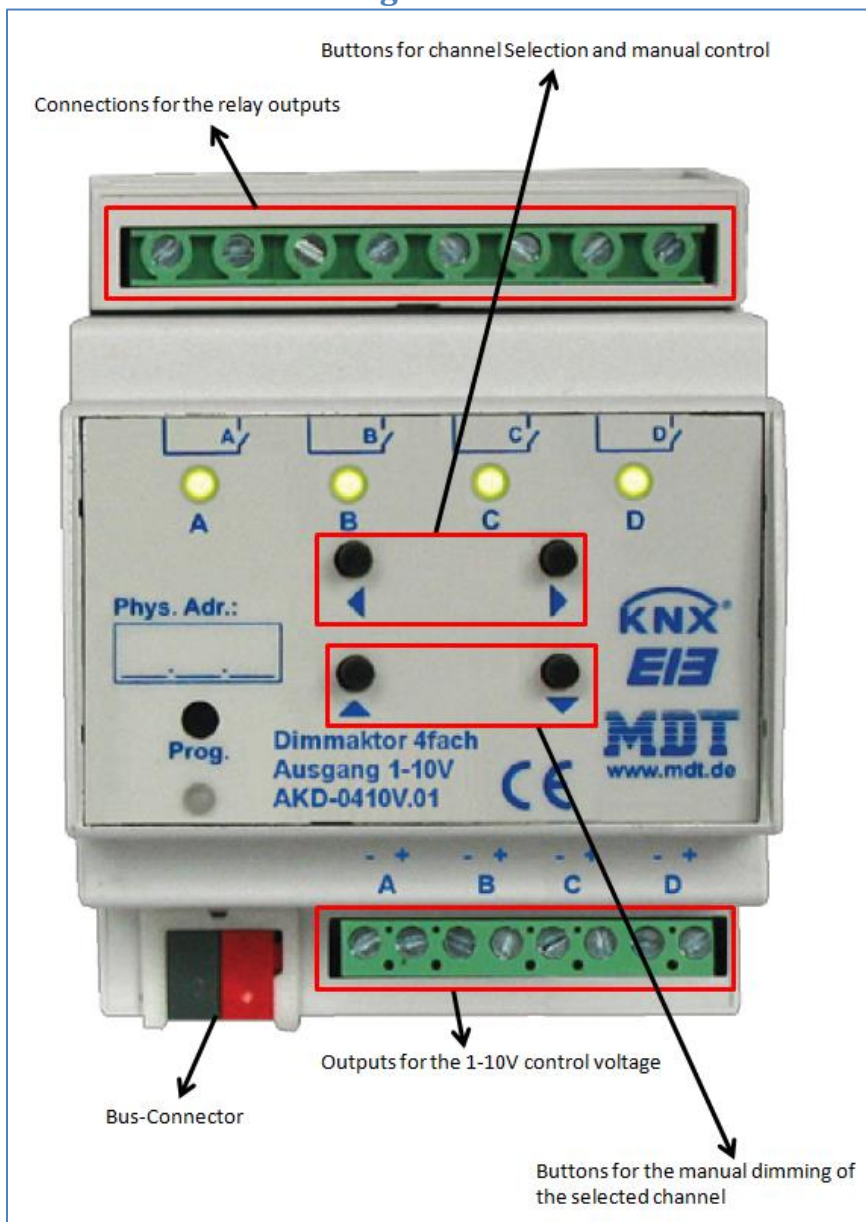
2.2 Structure & Handling

Figure 1: Structure Hardware

The 1-10V Control device AKD-0410V.02 contains of up to four 1-10V Outputs for controlling 1-10V devices. Furthermore LED PWM driver for RGB- or RGBW-Stripes can be controlled by the 1-10V Control device. The AKD-0410V.02 has two terminal blocks. The upper terminal block, internal connected to the relays, can switch the power supplies of the LED Stripes or the 1-10V ECGs for avoiding standby consumption. The 1-10V control voltage is connected to the lower terminal block. The circuit diagram differs due to the usage (controlling 1-10V ECGs and controlling RGB/RGBW Stripes) and can be seen in the appropriate sections 3.1 and 4.1 .
Manual dimming of the connected load can be done with the buttons for manual control at the top of the device. The buttons left/right are for channel selection and the buttons up/down are for dimming the selected channel.
Attention: At controlling RGB/RGBW-Stripes, only the first relays output is used (have a look at 4.1). So only the first channel indicates an active/inactive state. But the dimming of each color can be done in the normal way.

2.3 Usage and Areas of Application

The AKD-0410V.02 can be used as well for controlling 1-10V as for controlling RGB/RGBW-Stripes. For controlling RGB/RGBW-Stripes, an additional PWM Controller with 1-10V input is necessary. The parameter can be adjusted for both usages individually. There are a huge number of options for adjusting the dimming process as e.g. dimming speeds, transition speed, On-/Off-Behavior… By controlling RGB/RGBW-Stripes, additional complex sequences can be parameterized. Furthermore the AKD-0410V.02 contains of a large scene function and different automatic functions.

2.4 LEDs and manual control

The single channels can be switched on or off as well as be dimmed up or down via the hand control. The buttons left/right are for the selection of the channel. A chosen channel is indicated by its status LED. These LEDs can show the following conditions:

LED behavior	State of the channel
LED shines permanent	Channel is in use
LED is permanent off	Channel is switched off
LED flashes with the frequency of 2:1 „long on- short off"	Channel is switched on and chosen by the hand control
LED flashes with frequency of 1:2 „short on- long off"	Channel is switched off and chosen by the hand control

Table 1: Display behavior of the green LED

By the keys up/down, the channels can be switched and dimmed. A short keystroke at the button "up" switches the channel off, a short keystroke at the button "up" switches the channel on. With a long keystroke, the chosen channel can be dimmed. As long as the "up-button" is pressed, the channel is dimmed brighter. By a long keystroke at the button "down", the channel is dimmed darker. The dimming process is stopped, when the channel reaches 100% or the button is released.

2.5 Settings at the ETS-Software

Selection at the product database:

<u>Manufacturer:</u> MDT Technologies
<u>Product family:</u> Actuators
<u>Product type</u>: Dimming actuators
<u>Medium Type:</u> Twisted Pair (TP)
<u>Product name:</u> addicted to the used type, e.g.: AKD-0410V.02
<u>Order number:</u> addicted to the used type, e.g.: AKD-0410V.02

2.6. Starting up

After wiring, the allocation of the physical address and the parameterization of every channel follow:
   (1) Connect the interface with the bus, e.g. MDT USB interface
   (2) set bus power up
   (3) Press the programming button at the device(red programming LED lights)
   (4) 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)
   (5) Loading of the application, with requested parameterization
   (6) If the device is enabled you can test the requested functions(also possible by using the ETS-Software)

3 Usage as 1-10V Dimmer

If the AKD-0401V.02 should be used as "normal" 1-10V Dimmer, the following settings must be made in the Menu "Global Settings":

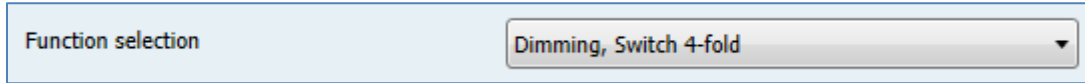| Function selection	Dimming, Switch 4-fold ▼

Figure 2: Function Selection 1-10V Dimmer

So the Application for the 1-10V Dimmer with all relevant parameters and communication objetcs is loaded.

3.1 Circuit Diagram
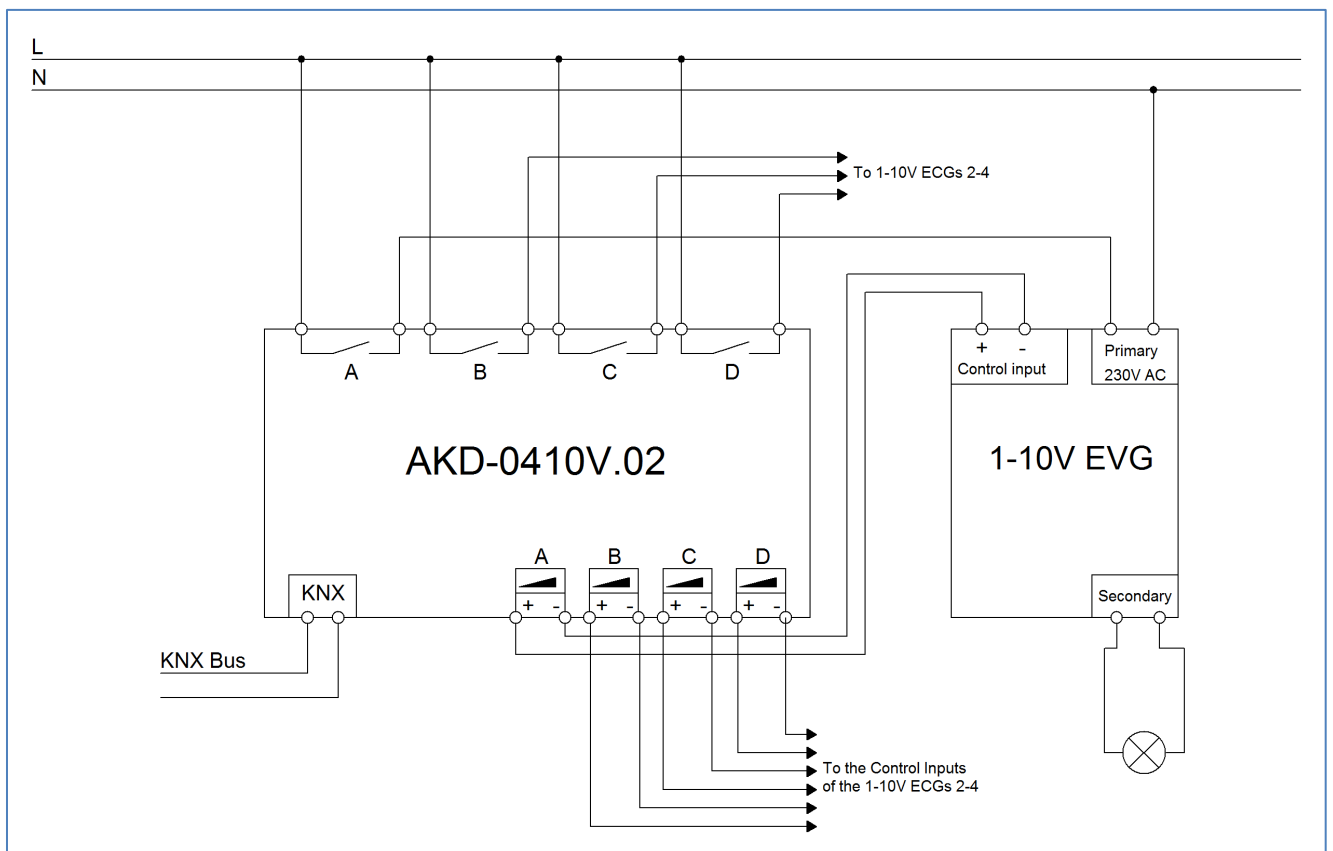
Figure 3: Circuit Diagram 1-10V ECG

3.2 Communication Objects

3.2.1 Summary and Usage

Nr.	Name	Object function	Data type	Direction	Info	Usage	Tip
Central Objects:							
60	Central	Switch	DPT 1.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication **is shown permanently** and allows the controlling of the **main function Switch On/Off for all channels with activated central function**, which is normally connected to all desired control keys.
61	Central	Dim absolutely	DPT 5.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication **is shown permanently** and allows the controlling of the **main function Dim Absolutely for all channels with activated central function**, which is normally connected to all desired control keys.

Objects per Channel:

0	Channel A	Switch	DPT 1.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is for controlling the **main function Switch On/Off for this channel**, which is normally connected to all desired control keys.
1	Channel A	Staircase	DPT 1.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is for controlling the **main function Staircase for this channel**, which is normally connected to all desired control keys.
2	Channel A	Dim relatively	DPT 3.007	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is for controlling the **main function Dim Up/Down for this channel**, which is normally connected to all desired control keys.
3	Channel A	Dim absolutely	DPT 5.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is for controlling the **main function Dim absolutely for this channel**, which is normally connected to all desired control keys.

4	Channel A	State On/Off	DPT 1.011	sending	Actuator sends current state	For display on Visu, Tableau, and Display	This Communication Object **is shown when the channel is active** and can be used for showing the switching state On/Off of this channel.
5	Channel A	State Dim value	DPT 5.001	sending	Actuator sends current state	For display on Visu, Tableau, and Display	This Communication Object is **only shown after activating in the parameter settings** and can be used as status indication. **(= Additional function if desired)**
6	Channel A	Block 1	DPT 1.003	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object **is shown when the channel is active** and can be used for blocking this channel. **(= Additional function if desired)**
7	Channel A	Block 2	DPT 1.003	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object **is shown when the channel is active** and can be used for an extended blocking function. **(= Additional function if desired)**

8	Channel A	Scene	DPT 18.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is **only shown after activating in the parameter settings** and can be used for calling scenes. **(= Additional function if desired)**
11-14	Channel A	Automatic 1-4	DPT 1.017	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is **only shown after activating in the parameter settings** and can be used for calling of absolute brightness values with a 1 Bit command. **(= Additional function if desired)**

Table 2: Communication Objects Application Dimmer 1-10V

3.2.2 Default settings of the communication objects

Nr.	Name	Object Function	Length	Priority	C	R	W	T	U
Default Settings									
0	Channel A	Switch	1 Bit	Low	X		X		
1	Channel A	Staircase	1 Bit	Low	X		X		
2	Channel A	Dim relative	4 Bit	Low	X		X		
3	Channel A	Dim absolutely	1 Byte	Low	X		X		
4	Channel A	State On/Off	1 Bit	Low	X	X		X	
5	Channel A	State dim value	1 Byte	Low	X	X		X	
6	Channel A	Block I	1 Bit	Low	X		X		
7	Channel A	Block II	1 Bit	Low	X		X		
8	Channel A	Scene	1 Byte	Low	X		X		
11	Channel A	Automatic 1	1 Bit	Low	X		X		
12	Channel A	Automatic 2	1 Bit	Low	X		X		
13	Channel A	Automatic 3	1 Bit	Low	X		X		
14	Channel A	Automatic 4	1 Bit	Low	X		X		
+15	**next Channel**								
60	Central	Switch	1 Bit	Low	X		X		
61	Central	Dim absolutely	1 Byte	Low	X		X		

Table 3: Default Settings Communication Objects (Dimmer 1-10V)

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.

3.3 Reference ETS-Parameter

3.3.1 Channel Activation

Every channel can be activated or deactivated individually. This setting can be done at the submenu channel activation:
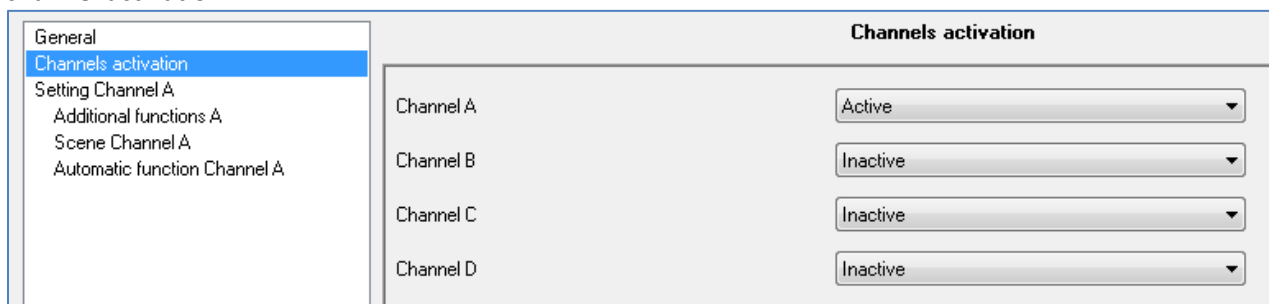

Figure 4: Channel activation

The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Channel A-[D]	• **not active** • active	Activation of the depending channel

Table 4: Channel activation

When a channel is activated, a new submenu is shown at the left selection menu. By choosing the submenu for this channel, the further parameterization can be done. Furthermore, a new submenu, with additional functions according the channel, is shown and the depending communication objects are shown.
A channel, which is chosen as "not active", cannot be parameterized. There are no communication objects shown for deactivated channels.

3.3.2 Handling/ basic functions

The basic functions of the dimming actuator are divided in three sections: Switching, dimming relatively and dimming absolutely. As soon as a channel is activated, the communication functions for the basic functions are standardly shown.

3.3.2.1 Switching

A channel can be switched on or off by the switching command. Additional there is a state object, which shows the actual switching state of the output. This object, State On/Off, can be used for visualization. When the actuator shall be switched by a binary input or a push button, this object must be connected with the state object of the binary input or the push button for toggling.

Number	Name	Length	Usage
0	Switch	1 Bit	switches the channel on or off
4	State On/Off	1 Bit	shows the switching state of the channel

Table 5: Communication objects switching

3.3.2.2 Dim relatively

The relative dimming allows continuous dimming. So the lights can be dimmed evenly form 0% to 100% or from 100% to 0%. The relative dimming process can be stopped at every state. The behavior of the dimming process can be adjusted via additional parameters, like dim speed.

Number	Name	Length	Usage
2	Dim relatively	4 Bit	dims the channel continuous up and down

Table 6: Dim relatively

3.3.2.3 Dim absolutely

A discrete brightness level can be set by the absolute dimming process. By sending an absolute percent value to the 1 Byte object "Dim absolutely", the output assumes a certain brightness level.

Number	Name	Length	Usage
3	Dim absolutely	1 Byte	adjusts a certain brightness level

Table 7: Dim absolutely

3.3.3 Time functions

The dimming actuator has the opportunities of connecting different time functions. Besides the normal on-/off- delay an additional staircase function with different sub functions is available.

3.3.3.1 On-/ Off delay

The on- and off-delay allows a delayed switching.
The following chart shows this parameter:

On delay	15 s
Off delay	20 s

Figure 5: On-/Off-delay

The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
On delay/ Off delay	**no delay,** 1s,5s,10s,15s,20s,30s,45s,60s 2min,3min,4min,5min,6min,7min,8min, 9min,10min,15min,20min,30min,45min,60min	Adjustment of the time at which the switch-on/ switch off process shall be delayed

Table 8: On-/Off-delay

By using the on-delay and off-delay, switching commands can be delayed. The delay can affect only to the rising edge (switch-on delay) or the falling edge (switch-off delay). Furthermore, both functions can be combined.
The following diagram shows the functional principle of both functions, which are activated in this example:
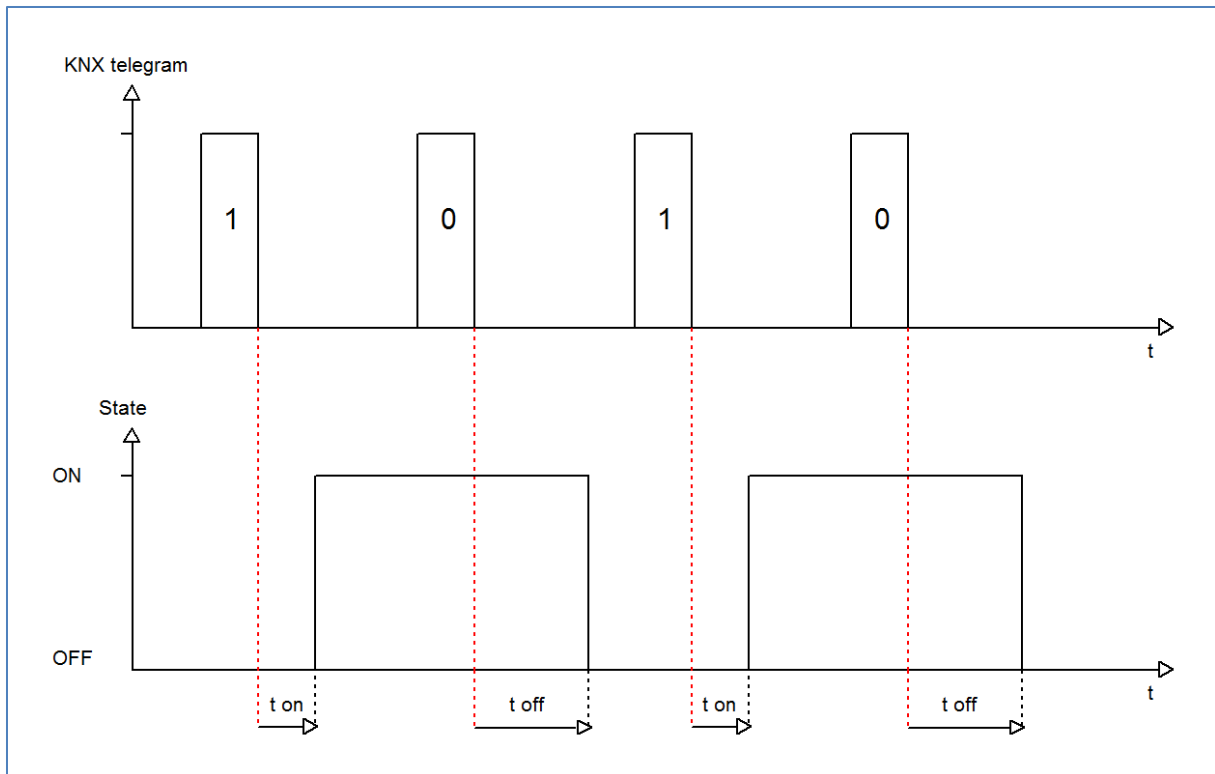
3.3.4 Staircase light

Staircase light allows an automatic off-switching of the channel, when the adjusted time runs out. To parameterize this function, the staircase light must be activated at the corresponding channel:
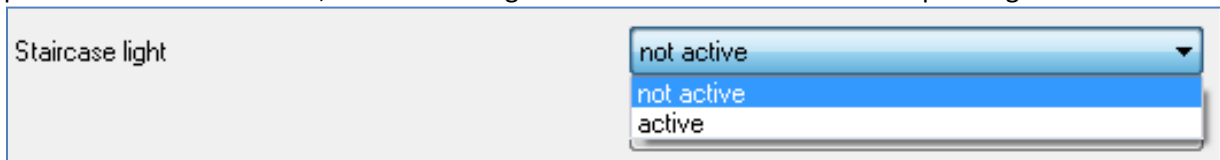

Figure 6: Staircase light activation

If the staircase light is activated, a new sub menu, called staircase light Channel A-[D] is shown at the left selection menu. At this sub menu, the further parameterization can be done.

Figure 7: Staircase light

The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Duration of staircase	0-30.000s **[90s]**	Duration of the switching process
Prewarning	• active • **not active**	activates the prewarning
Prewarning duration in [s]	0-30.000 **[0s]**	is only shown, when the prewarning is activated
Value of dimming down	1-100% **[20%]**	is only shown, when the prewarning is activated Value of which the channel shall be dimmed down, when the staircase time ran out
Extension	• active • **not active**	Activation of a possible extension of the staircase light
Deactivation	• active • **not active**	Activation of Deactivation of the staircase light, before the whole time ran out

Table 9: Staircase light

The duration of the staircase light indicates how long the channel shall be switched on after an On-signal. After lapse of time, the channel is switched off automatically. Via the parameter Extension/ deactivation, the staircase function can be modified. The deactivation allows switching off the channel before the time ran out. The extension allows an extension of the staircase time, by sending another on-telegram, so the time is restarted.

The prewarning function creates a dimming down of the lights after expiration of the staircase time. So the lights are still switched on, but with another value. The lights stay at this position for the duration of the prewarning.

If the staircase function is activated, the communication object "Switch" is replaced by the communication object "Staircaselight":

Number	Name	Length	Usage
1	Staircaselight	1 Bit	switches the staircase function on

Table 10: Communication object staircaselight

The staircase function has no influence to the relative or absolute dimming.

At the following diagram, the staircase function is shown, with an activated deactivation and extension. The prewarning is activated with a dim down value of 20%:
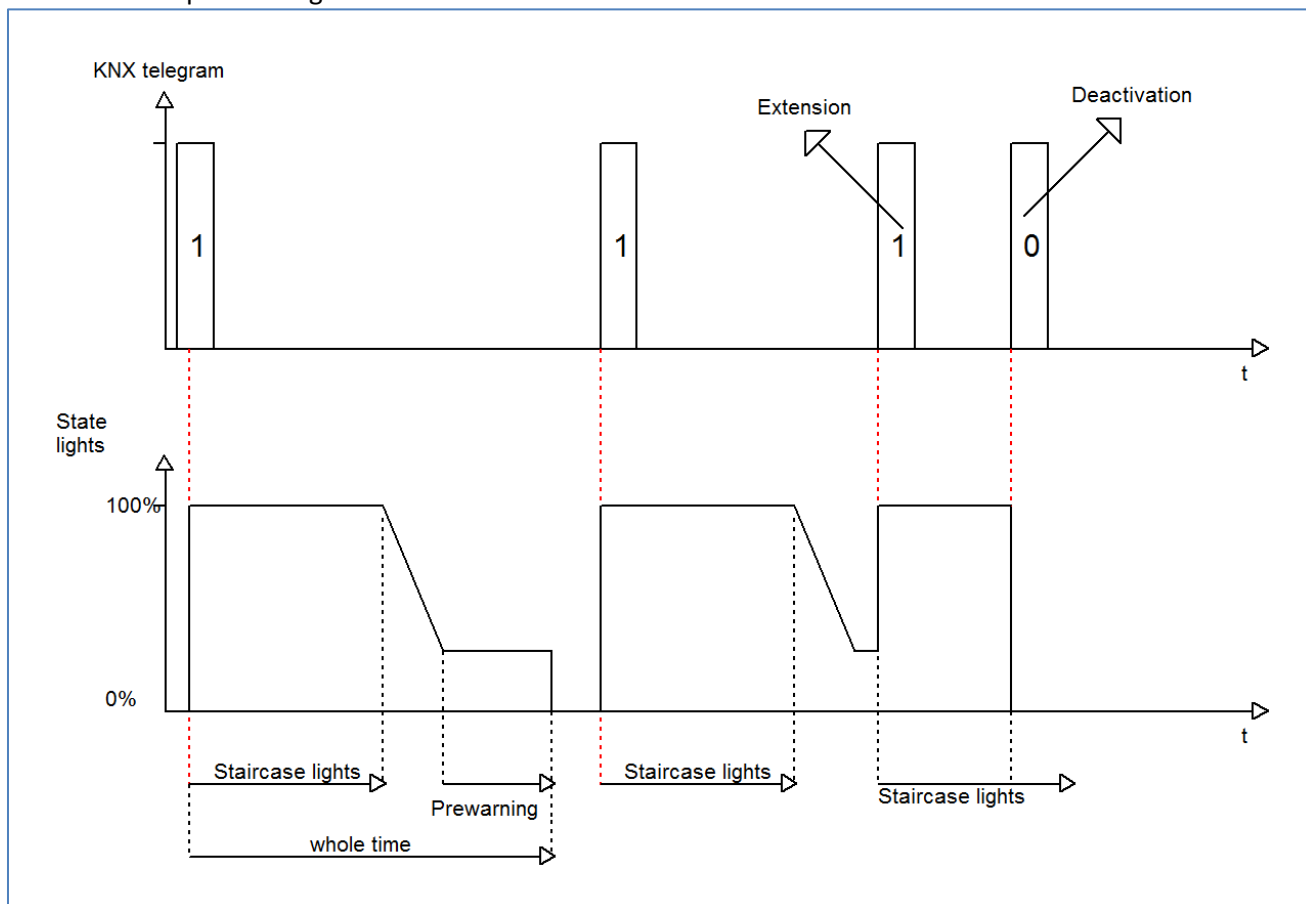
3.3.5 Absolute Values

The dimming area of the dimming actuator can be restricted by absolute values. Furthermore absolute or saved values can be called, when the actuator is switched on.

3.3.5.1 Starting behavior

The function starting behavior defines the turn off of the channel. The function is parameterize able for every channel individually. The following illustration shows the function with the setting „On-value setting":
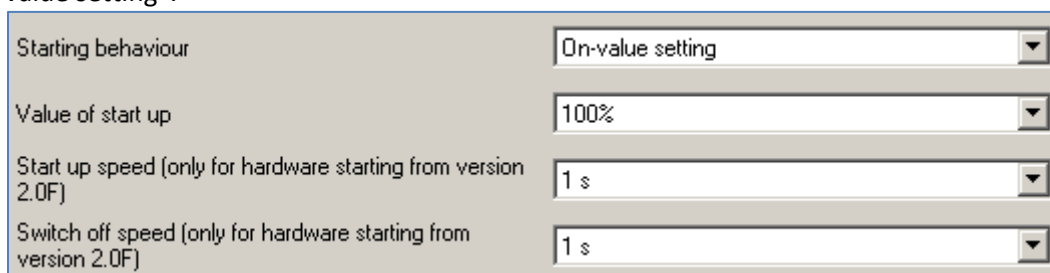

Starting behaviour	On-value setting
Value of start up	100%
Start up speed (only for hardware starting from version 2.0F)	1 s
Switch off speed (only for hardware starting from version 2.0F)	1 s

Figure 8: Starting behavior

The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
On-value setting	Sub-function: Value of start up 1-100% **[100%]**	If this sub-function is chosen, a new sub-function is shown, at which an absolute value for switching on can be chosen
Last light value (Memory)		The channel starts with the last value before switching off
Start up speed/Switch off speed (from hardware version 2.0F)	1s – 240s [1s]	Soft-Start/-stop function defines the time for dimming up to the adjusted value after witched on/ for dimming down after switched off

Table 11: Starting behavior

Via the parameter "Value for startup" an absolute value for switching on, can be assigned to the channel. The value for startup contains the whole technical possible area, so form 1-100%. But if the dimming area is restricted, the dimming actuator will be at least switched on with the lowest allowed value and maximum with the highest allowed value; independent from the chosen Value of startup. The parameter "Last light value", also called "memory function", causes a switching on of the actuator with the value before the last switching off. So the actuator saves the last value. If, for example, the channel is dimmed to 50% and switched off afterwards, the channel will be switched on with 50% again.
The parameterization of the starting behavior affects only to the switching objects, so the objects 0: Switch or 1: Staircase light. If the channel is dimmed up from a power off condition, the channel will be dimmed normal up without any startup behavior.

3.3.5.2 Dimming area

Via the parameters "minimum light" and "maximum light" the dimming area can be restricted.
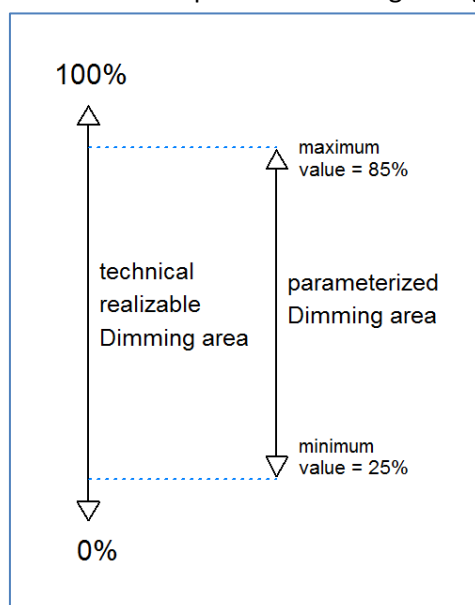
Minimum light	30%
Maximum light	100%

Figure 9: Dimming area

The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Minimum light	1-100% [1%]	lowest, minimum allowed light value
Maximum light	1-100% [100%]	highest, maximum allowed light value

Table 12: Dimming area

If the technical possible dimming area (1-100%) shall be restricted to a lower area, you have to set values for the minimum light above 1% and for the maximum light under 100%. This restriction of the dimming area is possible for every channel. If the dimming area is restricted, the channel will only move in the adjusted restriction. This setting has also effects to the other parameter: If for example the channel is restricted to a maximum of 85% and the value of startup is chosen as 100%, the channel will switch on with the maximum of 85%. An exceed of the maximum value is no longer possible. The restriction of a dimming area is useful when certain values must not be reached, because of technical reasons, for example preservation of the life span or the avoidance of flickering at lower dim values (especially at Energy saver).

Example: Minimum light = 25%, maximum light = 85%, Value for startup= 100%
- On telegram   -->   adjusted light value 85%
- 50% telegram   -->   adjusted light value 50%
- 95% telegram   -->   adjusted light value 85%
- 15% telegram   -->   adjusted light value 25%
- Off telegram   -->   adjusted light value 0% (Off)

3.3.6 specific Dimming settings

The dimming behavior can be adapted individually via the dimming speed. Additional a status object can be activated for visualization.
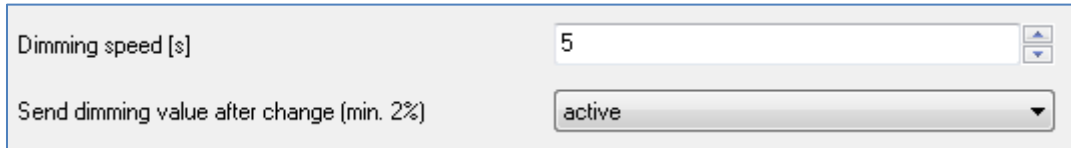

Figure 10: Specific dimming settings

3.3.6.1 Dimming speed

The dimming speed allows parameterizing the duration of the dimming process individually.
The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Dimming speed[s]	1-120s [5s]	indicates the time, which is need for dimming form 0 to 100%

Table 13: Dimming speed

The dimming process can be adapted individually via the setting of the dimming speed. A very long dimming speed allows a very precise dimming. So, almost every dimming value can be controlled. A short adjusted dimming speed causes a fast dimming process. This setting is useful, when it is not necessary to adjust the light very precise or the vernier adjustment is performed by using absolute values, which are switch independent of the dimming speed directly to the adjusted value.
Normally values from 5-8s are used for normal used rooms.

3.3.6.2 Send dimming value after change

To visualize the dimming value, for example via a display, the following communication object must be activated:

ETS-text	Dynamic range [default value]	comment
Send dimming value after change (min. 2%)	• **not active** • active	activates the status object for the dimming process

Table 14: Send dimming value after change

The communication object for the actual dimming value is shown continuous, but sends only the actual dimming value, when the parameter "Send dimming value after change" is activated. The object of the size 1 Byte sends now the current dimming value at a change of 2% and more.

Number	Name	Length	Usage
5	State dim value	1 Byte	sends the actual dimming value in %

Table 15: Communication object dimming value

3.3.7 Central objects

For each channel can be chosen, whether it should react to the central objects or not. The activation of the central objects can be done at the following parameter:
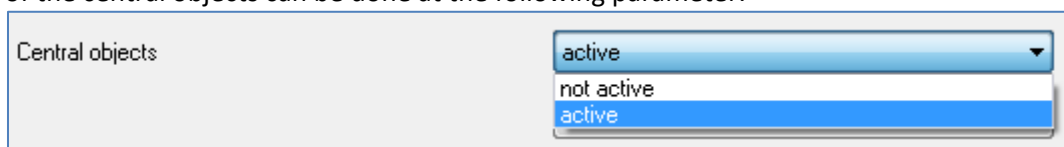
Central objects	active ▼
	not active
	active

Figure 11: Central objects

If the central function is activated for a channel, the channel will react to the central objects with its individual parameterization.
The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Central objects	• **not active** • active	sets whether a channel shall react to the central objects or not

Table 16: Central objects

There are two central objects for the handling of the activated channels. At the one hand the 1 Bit switching object, which switches the channels with activated central function on or off and to the other hand the 1 Byte object "Dim absolutely". This object assigns absolute light values to the relevant channels.
To watch at the central objects is, that every channel is called with its individually parameter settings. If for example a channel with activated staircase light function is called by the central objects, the channel will be switched on for the adjusted staircase time and will be switched off afterwards.

Number	Name	Object function	Length	Usage
60	Central	Switch	1 Bit	switches all channels with activated central function
61	Central	Dim absolutely	1 Byte	dims all channels with activated central function

Table 17: Central communication objects

The communication object "device error" is independent from the parameter "central objects". The object sends an 1-signal, if an error occurs at the device.

Number	Name	Object function	Length	Usage
62	Central	Device error	1 Bit	sends a 1-signal in case of an error

Table 18: Central communication object device error

3.3.8 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.

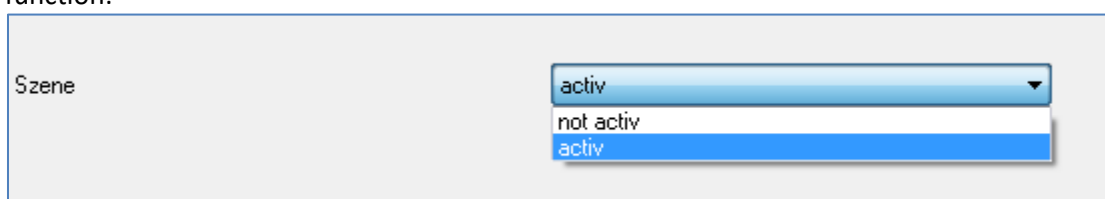The following illustration shows the setting options at the ETS-Software for activating the scene function:

Figure 12: Scene function

The scene function can only be activated for the normal switching mode. If the staircase light function is activated, the scene function cannot be activated for this channel.

The following chart shows the communication object for calling a scene:

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

Table 19: 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.
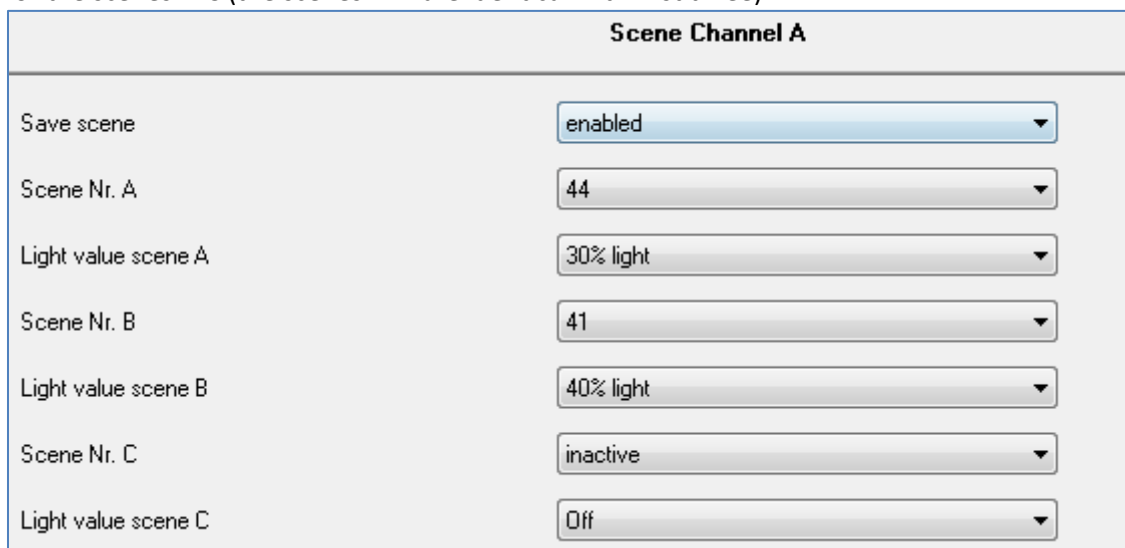
If you want to call scenes by a binary input or another KNX device, you have to set the same number at the calling device as at the receiving device. The calling device, e.g. a binary input, sends automatically the right value for calling the scene.

3.3.8.1 Submenu scene

If a scene is activated, as shown above, a new submenu will appear at the left selection menu. At this submenu, the further parameterization can be done.
For every channel are up to 8 storage options available. These 8 presets have numbers A-H. One of the 64 scene numbers can be assigned to each scene.

The following illustration shows the setting options at the submenu for the scenes (Channel X: Scene) for the scenes A-C (the scenes D-H are identical with first three):

Scene Channel A

Save scene	enabled
Scene Nr. A	44
Light value scene A	30% light
Scene Nr. B	41
Light value scene B	40% light
Scene Nr. C	inactive
Light value scene C	Off

Figure 13: Submenu scene

The following chart shows the dynamic range for an activated scene function:

ETS-text	Dynamic range **[default value]**	comment
Save scene	• **disabled** • enabled	adjusts whether the saving function shall be enabled for the scenes of this channel or not
Scene Nr. A-[H]	1-64, inactive **[inactive]**	adjusts the number for calling a scene
Light value scene A-[H]	Off, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100% light **[Off]**	adjusts the light value for a scene call

Table 20: Submenu scene

At the submenu for the scenes, a reaction can be assigned for the call of each scene. This reaction includes an absolute light value (0-100%) for this channel. Every channel can react to 8 different scenes. By sending of the pick-up value of the relevant scene, the scene is called and the channel adjusts its parameterized values. The individual parameterization is also watched at calling the scene. If the channel shall dim to 50% at the call of the scene A and the channel has a parameterized switch-on delay of 5s, the channel will be switched on after this 5s and be dimmed to the 50% in compliance to the adjusted dimming speed.

To watch at the programming is that if two or more channels shall react to the same scene number, the communication objects for the scenes of these channels have to be connected to the same group address. By sending of the pick-up value for the scenes, all channels will be called. It is practical to divide the group addresses by scenes at the programming. If a channel shall react now to 8 scenes, the communication object has to be connected to 8 different group addresses.

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

Table 21: Calling and saving scenes

3.3.9 Automatic function

An automatic function can be activated for every channel. The automatic function allows calling up to 4 absolute exposure values for every channel. Calling can be done via a 1 bit commands.
For further setting options, the automatic function of a channel must be activated.
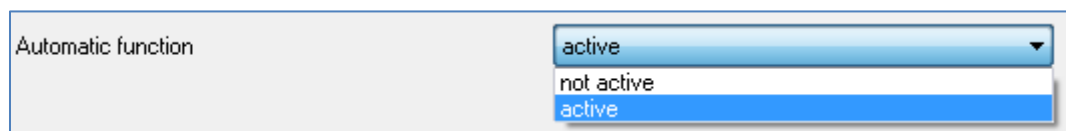

Figure 14: Parameter Automatic function

By activation the automatic function a submenu for further parameterization is shown. Furthermore, the following communication objects are shown:

Number	Name	Length	Usage
11	Automatic 1	1 Bit	Calling of the automatic value 1
12	Automatic 2	1 Bit	Calling of the automatic value 2
13	Automatic 3	1 Bit	Calling of the automatic value 3
14	Automatic 4	1 Bit	Calling of the automatic value 4

Table 22: Communication objects automatic function

3.3.9.1 Submenu automatic function

The further parameterization can be done at the submenu of the automatic function.

Figure 15: Submenu automatic function

The chart shows the dynamic range for the four automatic slots:

ETS-text	Dynamic range [default value]	comment
Automatic function 1-[4] – Exposure value	**Off**, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100% light	defines the exposure value for an automatic call

Table 23: Dynamic range automatic function

Every automatic function can be assigned an absolute exposure value (in 10% steps). The call of the automatic function is done by an 1 bit object.

3.3.10 Additional functions

Additional functions can be parameterized for every channel. Via the additional functions, the behavior of the channel for calling the blocking objects can be assigned. Furthermore, the behavior after power off and reset can be defined. The additional functions are shown at the submenu "Additional functions A-[D]":

Additional functions A	
Behavior at Block I = value 1	Light value
Light value	100% light
Behavior at Block I = value 0	Light value
Light value	100% light
Behavior at Block II = value 1	no change
Behavior at Block II = value 0	Light value
Light value	100% light
Behavior after power off	35%
Behavior after reset	Last value

Figure 16: Additional functions

3.3.10.1 Blocking objects

For both blocking objects an action for activation as well as deactivation can be defined.

ETS-text	Dynamic range [default value]	comment
Behavior at Block 1 = Value 1	Off, no change, Light value (10%,20%,30%,..,100%) **[no change]**	Defines the action for activation of the first blocking object
Behavior at Block 1 = Value 0	Off, no change, Light value (10%,20%,30%,..,100%) **[no change]**	Defines the action for deactivation of the first blocking object
Behavior at Block 2 = Value 1	Off, no change, Light value (10%,20%,30%,..,100%) **[no change]**	Defines the action for activation of the second blocking object
Behavior at Block 2 = Value 0	Off, no change, Light value (10%,20%,30%,..,100%) **[no change]**	Defines the action for deactivation of the second blocking object

Table 24: Dynamic range blocking objects

By using the blocking objects, the channel can be blocked for further usage. Additional, the channel can perform an adjusted function, as dimming to a certain value, switch the channel of or stay in its current state, when it is blocked. The same actions can be performed by the channel, when he is unblocked.

To note is, that the channel cannot be operated when it is blocked. Furthermore the manual usage is blocked during a blocking process. All telegrams, which are sent to the corresponding channel during a blocking process, have no effect for the channel.

If both blocking processes are activated, the first one is of prime importance. But if you activate the second blocking process during the first blocking process, the second blocking process will get active when the first one is deactivated. The action for the deactivation of the first blocking process will not be performed, but the channel calls the adjusted settings for the second blocking process.

The communication objects for both blocking processes are shown at the following chart:

Number	Name	Length	Usage
6	Block 1	1 Bit	Activation/Deactivation of the first blocking process
7	Block 2	1 Bit	Activation/Deactivation of the second blocking process

Table 25: Communication objects blocking

3.3.10.2 Behavior after power off/ after reset

To avoid an unintended behavior of the channel in case of bus power off, the channel can be parameterized for the case of a power off and a reset of the bus power.
The following settings are available:

ETS-text	Dynamic range [default value]	comment
Behavior after power off	no reaction, Off, 20%,35%,50%,65%,80%,100% [no reaction]	defines the behavior at a bus power breakdown
Behavior after reset	Off, On, last value, light value(10%,20%,30%,..,100%) [last value]	defines the behavior at a bus power reset

Table 26: Behavior at bus power off/reset

Every channel can respond the bus power off with its individual parameterized settings. So a channel can be switched off, dim to absolute light values or respond with no reaction. Also for the reset, individual settings can be parameterized. The channel can be switched off, dim to a certain light value or calling the last light value, before power off, with the setting "last value".
Especially in rooms without other light sources or in rooms in which a failure off the lights can cause danger, you have to parameterize this setting conscientious.

4 Controlling LED Stripes

If the AKD-0401V.02 should be used for controlling RGB LED Stripes, the following settings must be made in the Menu "Global Settings":

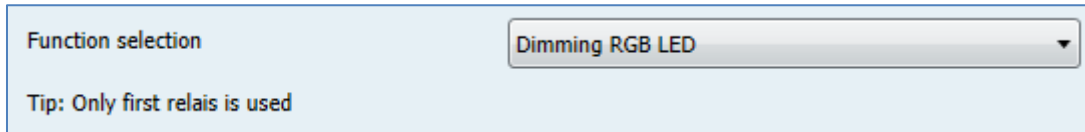| Function selection	Dimming RGB LED ▼
Tip: Only first relais is used	

Figure 17: Function Selection Dimming RGB LED

If the AKD-0401V.02 should be used for controlling RGBW LED Stripes, the following settings must be made in the Menu "Global Settings":
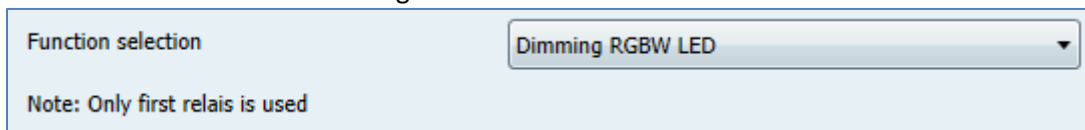
Function selection	Dimming RGBW LED ▼
Note: Only first relais is used	

Figure 18: Function Selection Dimming RGBW LED

This setting loads the application for controlling LED stripes with its relevant parameter and communication object. The applications for RGB- and RGBW- Stripes differ only in the point of controlling the white stripe.

At the manual control via the buttons, only the LED for the first channel is active. But the manual selection and dimming of the channels works in the same way as the "normal" 1-10V application.
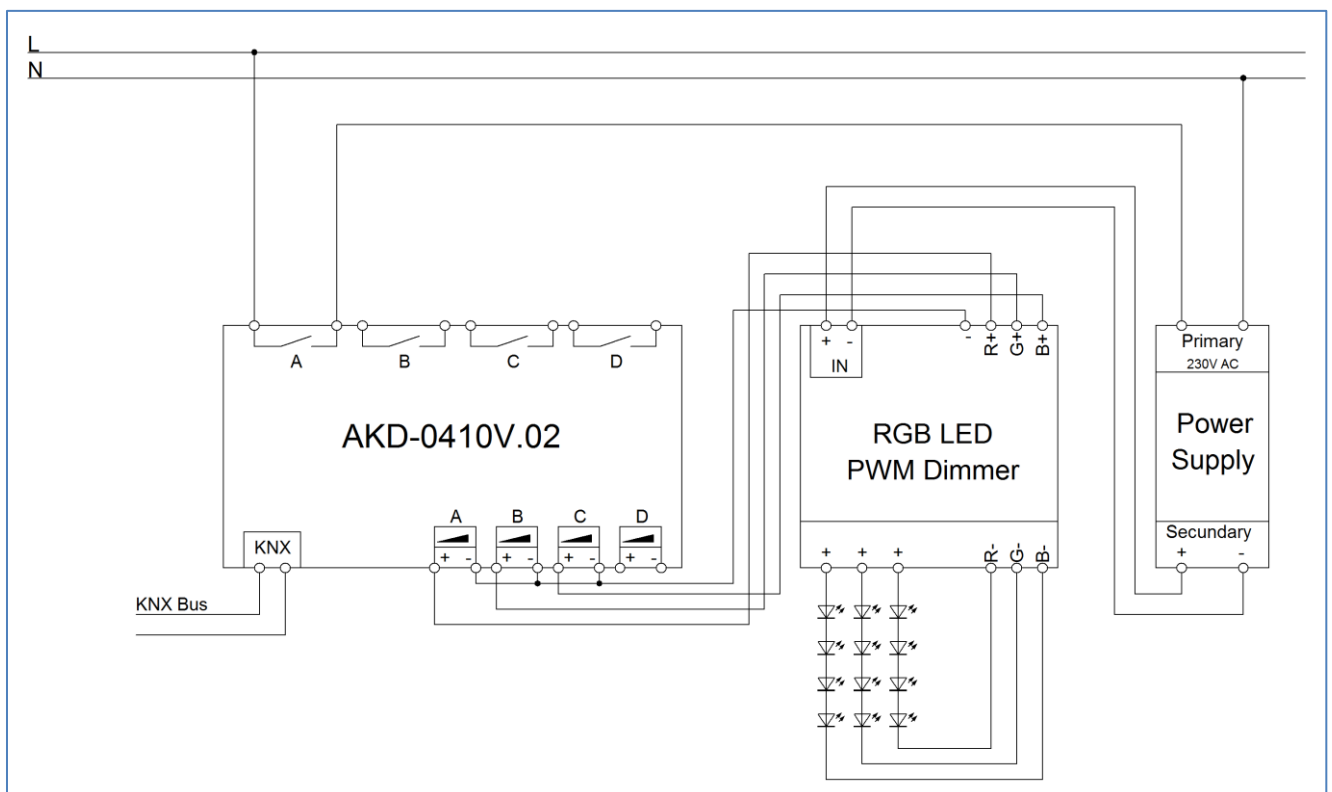
4.1 Circuit Diagram

Figure 19: Circuit Diagram RGB-/RGBW-Stripes

4.2 Communication Objects

4.2.1 Overview and Usage

Nr.	Name	Object function	Data type	Direction	Info	Usage	Tip
General Objects per Channel:							
63	LED RGB/RGBW	Switch	DPT 1.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication **is shown permanently** and allows the controlling of the **main function LED Stripe On/Off**, which is normally connected to all desired control keys.
64	LED RGB/RGBW	Color Setting	DPT 232.600	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object is shown if the controlling of the LED Stripe is selected as "RGB/RGBW" via the parameter settings. The Object allows the controlling of the three colors with only one object. The first byte controls red, the second green and the third blue.
65	LED HSV	Color Setting	DPT 232.600	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object is shown if the controlling of the LED Stripe is selected as "HSV" via the parameter settings. The Object allows the controlling of color circle with only one object. The first byte controls hue, the second saturation and the third brightness.

72	LED RGB/RGBW	State ON/OFF	DPT 1.011	send	Actuator sends current state	For display on Visu, Tableau, and Display	This Communication **is shown permanently** and sends the state of the **main function LED Stripe On/Off**, which is normally connected to all desired display elements.
81	LED RGB/RGBW	Block	DPT 1.003	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication **is shown permanently** and can be used for blocking the actuator.
82	LED RGB/RGBW	Teach-In for white balance	DPT 1.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication **is shown permanently** and starts the white balance of the connected LED Stripe.
Controlling via RGB/RGBW:							
2/ 17/ 32/ 47	LED Red/Green/Blue/White	Change relative	DPT 3.007	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "RGB/RGBW"** and can be used for relative dimming of each color.
3/ 18/ 33/ 48	LED Red/Green/Blue/White	Change Absolute	DPT 5.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "RGB/RGBW"** and can be used for absolute dimming of each color.

Controlling via HSV:

66	LED H (Hue)	Absolute Value	DPT 5.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "HSV"** and can be used for sending a new absolute value for hue.
67	LED S (Saturation)	Absolute Value	DPT 5.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "HSV"** and can be used for sending a new absolute value for saturation.
68	LED H (Brightness)	Absolute Value	DPT 5.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "HSV"** and can be used for sending a new absolute value for brightness.
69	LED H (Hue)	Change relative	DPT 3.007	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "HSV"** and can be used for changing hue relative.
70	LED S (Saturation)	Change relative	DPT 3.007	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu… for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "HSV"** and can be used for changing saturation relative.

71	LED H (Brightness)	Change relative	DPT 3.007	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object **is shown if the controlling of the LED Stripe is selected as "HSV"** and can be used for changing brightness relative.
State Objects:							
5/ 20/ 35/ 50	LED Red/Green/Blue/White	Status Wert	DPT 5.001	send	Actuator sends current state	For display on Visu, Tableau, and Display	This Communion Object is **only shown if the state objects are activated** and can be used for showing the state of each color. (=Additional Function if desired)
73	LED RGB	State RGBW	DPT 232.600	send	Actuator sends current state	For display on Visu, Tableau, and Display	This Communion Object is **only shown if the state objects are activated** and can be used for showing a 3 Byte State with each color. (=Additional Function if desired)
74	LED HSV	State HSV	DPT 232.600	send	Actuator sends current state	For display on Visu, Tableau, and Display	This Communion Object is **only shown if the state objects are activated** and can be used for showing a 3 Byte State with the HSV values. (=Additional Function if desired)

75	LED H (Hue)	State absolute value	DPT 5.003	send	Actuator sends current state	For display on Visu, Tableau, and Display	This Communion Object is **only shown if the state objects are activated** and can be used for showing the angle of the color in the color circle. **(=Additional Function if desired)**
76	LED S (Saturation)	State absolute value	DPT 5.001	send	Actuator sends current state	For display on Visu, Tableau, and Display	This Communion Object is **only shown if the state objects are activated** and can be used for showing the absolute value of the saturation. **(=Additional Function if desired)**
77	LED V (Brightness)	State absolute value	DPT 5.001	send	Actuator sends current state	For display on Visu, Tableau, and Display	This Communion Object is **only shown if the state objects are activated** and can be used for showing the absolute value of the brightness. **(=Additional Function if desired)**
Sequences:							
83-87	LED RGB/RGBW	Start Sequence 1-5	DPT 1.007	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is **only shown if the sequence is activated** and enables the calling of the sequences. **(=Additional Function if desired)**

Scene function:

78	LED RGB/RGBW	Scene	DPT 18.001	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is **only shown if the scenes are activated** and enables the calling of scenes. **(=Additional Function if desired)**
79	LED RGB/RGBW	Bit Scene 1	1.022	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is **only shown if the Bit scenes are activated** and enables the calling of scenes. **(=Additional Function if desired)**
80	LED RGB/RGBW	Bit Scene 2	1.022	receive	Actuator reacts to Incoming-telegram	Push buttons, Visu... for manual control	This Communication Object is **only shown if the Bit scenes are activated** and enables the calling of scenes. **(=Additional Function if desired)**

Table 27: Communication Objects Controlling RGB/RGBW-Stripes

4.2.2 Default settings of the communication objects

Default Settings										
Nr.	Name	Object Function	Length	Priority	C	R	W	T	U
63	LED RGB/RGBW	Switch	1 Bit	Low	X		X		
64	LED RGB/RGBW	Color Setting	3 Bye	Low	X		X		
65	LED HSV	Color Setting	3 Byte	Low	X		X		
72	LED RGB/RGBW	State On/Off	1 Bit	Low	X	X		X	
81	LED RGB/RGBW	Block	1 Bit	Low	X		X		
82	LED RGB/RGBW	Teach-In for white balance	1 Bit	Low	X		X		
2/ 17/ 32/ 47	LED Rot/Grün/Blau/Weiß	Change relative	4 Bit	Low	X		X		
3/ 18/ 33/ 48	LED Rot/Grün/Blau/Weiß	Change absolute	1 Byte	Low	X		X		
66	LED H (Hue)	Absolute value	1 Byte	Low	X		X		
67	LED S (Saturation)	Absolute value	1 Byte	Low	X		X		
68	LED V (Brightness)	Absolute value	1 Byte	Low	X		X		
69	LED H (Hue)	Change relative	4 Bit	Low	X		X		
70	LED S (Saturation)	Change relative	4 Bit	Low	X		X		
71	LED V (Brightness)	Change relative	4 Bit	Low	X		X		
5/ 20/ 35/ 50	LED Rot/Grün/Blau/Weiß	State value	1 Byte	Low	X	X		X	
73	LED RGB	State RGBW	3 Byte	Low	X	X		X	
74	LED HSV	State HSV	3 Byte	Low	X	X		X	
75	LED H (Hue)	Status Absolut value	1 Byte	Low	X	X		X	
76	LED S (Saturation)	Status Absolut value	1 Byte	Low	X	X		X	
77	LED V (Brightness)	Status Absolut value	1 Byte	Low	X	X		X	
83-87	LED RGB/RGBW	Start Sequence 1-5	1 Bit	Low	X		X		
78	LED RGB/RGBW	Scene	1 Byte	Low	X		X		
79	LED RGB/RGBW	Bit Scene 1	1 Bit	Low	X		X		
80	LED RGB/RGBW	Bit Scene 2	1 Bit	Low	X		X		

Table 28: Default Settings Communication Objects (RGB/RGBW)

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

4.3 Color circle presentation/ Controlling via RGBW

There are two options for controlling RGB-/RGBW-Stripes. On the one hand the LED-Stripes can be controlled easily by RGB/RGBW values. This method gives each color separately a value. So the user can mix the desired value by sending a value to each color.

On the other hand the LED Stripes can be controlled via HSV value, the so called color circle presentation. Here, the color is set via the "H-value". The color circle represents the color space from 0°-360° (have a look at the cone). If a color is set, the brightness V and the Saturation S can be selected (have a look at the triangle).

The following illustration gives a first impression of controlling the color via the color circle:
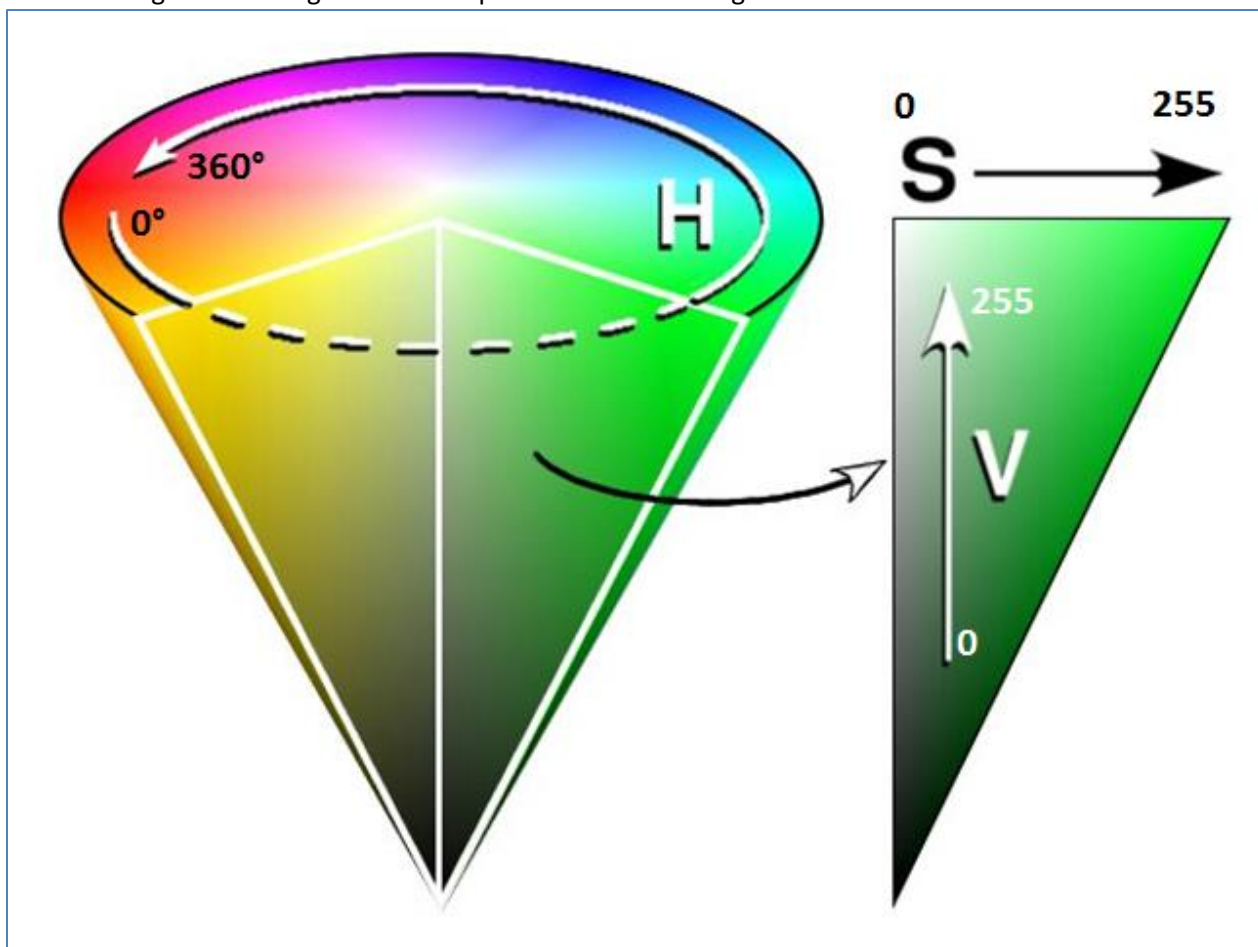
Figure 20: Color Circle

Attention should be paid to the fact that every LED Stripes reacts different due to manufacturing tolerances. So every LED Stripes can react a bit different. These facts must be proofed in detail for each LED Stripes.

4.4 Reference ETS-Parameter

4.4.1 Selection of the way of controlling

The following parameter defines the way of controlling (HSV or RGB/RGBW) for the LED Stripes:
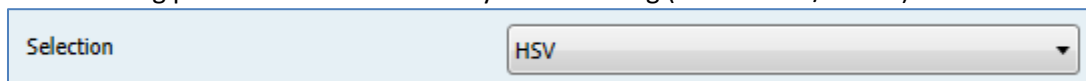
Selection	HSV ▼

Figure 21: Way of Controlling

The following table shows the available settings for this parameter:

ETS-text	Dynamic range [default value]	comment
Selection	• **RGB/RGBW** • HSV	defines if each color of the RGB-/RGBW-Stripes should be controlled separately or via the color circle

Table 29: Way of Controlling

Due to the selected way of controlling the relevant communication objects for the manual control are shown. These can be dimmed as well relative as absolute.
For controlling via HSV the following objects are shown:

Number	Name	Length	Usage
66	LED H – Absolute value	1 Byte	Sending a new absolute value for Hue (in degree)
67	LED S – Absolute value	1 Byte	Sending a new absolute value for Saturation (in %)
68	LED V – Absolute value	1 Byte	Sending a new absolute value for Brightness (in %)
69	LED H – Change relative	4 Bit	Changing the color manual via relative dimming
70	LED S – Change relative	4 Bit	Changing the saturation manual via relative dimming
71	LED V – Change relative	4 Bit	Changing the brightness manual via relative dimming

Table 30: Communication Objects controlling via HSV

The controlling via RGB/RGBW controls every color separately. So every color has its own communication object for manual and absolute dimming:

Number	Name	Length	Usage
2	LED Red – Change relative	4 Bit	Relative dimming of the color red
3	LED Red – Absolute value	1 Byte	Sending a new absolute value for color red (in %)
17	LED Green – Change relative	4 Bit	Relative dimming of the color green
18	LED Green – Absolute value	1 Byte	Sending a new absolute value for color green (in %)
32	LED Blue – Change relative	4 Bit	Relative dimming of the color blue
33	LED Blue – Absolute value	1 Byte	Sending a new absolute value for color blue (in %)
47	LED White – Change relative	4 Bit	Relative dimming of the color white
48	LED White – Absolute value	1 Byte	Sending a new absolute value for color white (in %)

Table 31: Communication Objects RGB-/RGBW Controlling

As well as at relative dimming of the colors as at sending a new absolute value the dimming speeds, as described in 4.4.2.3 Dimming speed, are kept.

Additional 3 Byte Objects exists for controlling the LED Stripes via RGB or HSV:

Number	Name	Length	Usage
LED RGB	Color Setting	3 Byte	Color Setting of the RGB values via 3 Byte
LED HSV	Color Setting	3 Byte	Color Setting of the HSV values via 3 Byte

Table 32: Communication Objects 3 Byte Color Setting

At RGB controlling, the color setting via 3 Byte controls with the first byte the color red, with the second byte the color green and with the third byte the color blue.
At HSV controlling, the first byte defines the color, the second byte the saturation and the third byte the brightness.
The 3 Byte object is defined with the DPT 232.600.

4.4.2 LED RGB/RGBW Settings

All parameter in the chapter 4.4.2 refer to the menu LED RGB/RGBW Settings.

4.4.2.1 White Balance/Teach-In

By using the white balance, bad balanced RGB LEDs can be taught a clear white. If you take the color circle theory as basis, the 3 colors red, green and blue should generate the color white when all colors have the same intensity. This means for RGB Stripes, that when all colors are set to 100%, the color white should be reflected. This looks often different in reality. For getting a real white, the white balance is available. The white balance causes a proportional adaption off all color. So after setting all colors to 100% the adjusted clear white appears. So you can define your own white color as reference by using the white balance.
Attention should be paid due to the fact that the white balance always reduce the maximum brightness of the LED Stripe, because dominating colors must be set to a lower value. For starting a white balance, this must be activated in the parameter settings:

White balance	active ▼
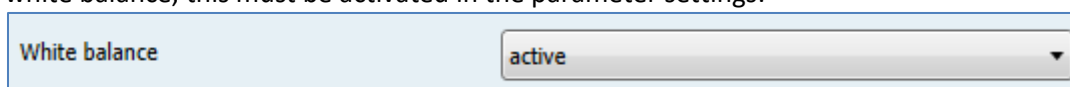
Figure 22: White balance/Teach-In

Thereupon the relevant communication object for controlling the white balance is shown:

Number	Name	Length	Usage
82	Teach-In for white balance	1 Bit	Starting of the white balance

Table 33: Communication Object Teach-In

The process of the Teach-In is as follows:
1. Sending the value 0 to the Communication Object „Teach-In for white balance". Now the colors Red, Green and Blue are set to 0%. At RGBW Stripes also the white color is set to 0%.
2. Now the colors Red, Green and Blue must be controlled to a clear white by sending absolute or relative dimming commands. For example, if the color Blue dominates, this one must be controlled down until all colors are balanced.
3. Now the value 1 must be send to the Communication Object "Teach-In for white balance" for stopping the Teach-In process and saving the adjusted values. The proportionality is saved in the device. The three colors are set to 0% again.
    The White balance is completed.

The white balance is also kept after a new download or a bus power failure.
For resetting the white balance: Sending a 0 to the object „Teach-In for white balance" and without sending any other commands a 1 to the same object.

4.4.2.2 State values

For visualization of the dimming process, different state objects can be shown. There as well single objects for the state as combined 3 Byte state objects. The following illustration shows how to activate the state objects:
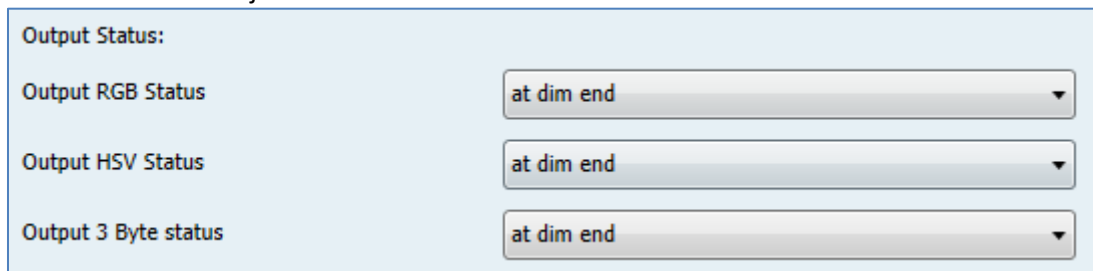
Figure 23: State Objects

The Parameter **"Output RGB/RGBW State"** shows the objects for each color:

Number	Name	Length	Usage
5	LED Red-Status Value	1 Byte	Sending the State 0-100% for the Color Red
20	LED Green-Status Value	1 Byte	Sending the State 0-100% for the Color Green
35	LED Blue-Status Value	1 Byte	Sending the State 0-100% for the Color Blue
50	LED White-Status Value	1 Byte	Sending the State 0-100% for the Color White

Table 34: Communication Objects RGB/RGBW individually

The parameter "Output HSV state" shows the state objects for Hue(H), Saturation(S) and Brightness(V):

Number	Name	Length	Usage
75	LED Hue(H)	1 Byte	Sending of the state 0°-360° for color in the color circle
76	LED Saturation(S)	1 Byte	Sending of the state 0-100% for the saturation
77	LED Brightness(V)	1 Byte	Sending of the state 0-100% for the brightness

Table 35: Communication objects HSV individually

The Parameter **"Output 3 Byte State"** shows additional combined 3 Byte State objects. The combined state objects at HSV sends on the first byte information about Hue, on the second byte about saturation and at the third byte about brightness. The object for RGB has the same structure (Byte 1 = Red, Byte 2 = Green, Byte 3 = Blue). Also at RGBW Stripes, the object has only the length of 3 Bytes. The state of color white is not displayed in this object.

Number	Name	Length	Usage
73	Status RGB	3 Byte	Sending of the 3 Byte State for RGB
74	Status HSV	3 Byte	Sending of the 3 Byte State for HSV

Table 36: Communication Objects 3 Byte State

4.4.2.3 Dimming speed

For adjusting transitions and Soft-Start/Stop, the dimming speeds can be adjusted:

Figure 24: Dimming Speeds

The parameters have the following effects:
- **Dim speed for relative dimming**
  Defines the time for all relative dim processes related to relative dimming process of 100%. If a time of 10s is adjusted, the relative dimming from 0% to 100% and vice versa would last 10s. So the relative dimming from 0% to 50% would last 5s.
- **Dim speed for absolute dimming**
  Defines the time for all absolute dimming processes related to an absolute dimming process of 100%. If a time of 10s is adjusted, the absolute dimming from 0% to 100% and vice versa would last 10s. So the absolute dimming from 0% to 50% would last 5s.
- **On Speed**
  The On Speed realizes a Soft Start function. The On Speed refers only to the „hard" switching via the object 63 "LED RGB/RGBW switch" or a Reset and not to the dimming up from 0%. At an On Speed of 2s, the LED stripes will be dimmed up to 100% in 2s at switching on.
- **Off Speed**
  The On Speed realizes a Soft Stop function. The Off Speed refers only to the „hard" switching via the object 63 "LED RGB/RGBW switch" and not to the dimming down to 0%. At an Off Speed of 2s, the LED stripes will be dimmed down to 0% in 2s at switching off.
- **Transition time at scenes**
  The transition times between scenes defines the transition behavior between single scenes. The time refers as well to Bit Scenes (have a look at 4.4.4 LED RGB/RGBW Bit Scene) as to normal scenes (have a look at 4.4.5 LED RGB/RGBW Scene). It causes soft color transitions between two scenes. A time off 0s causes a hard switchover from one to the other scene.

4.4.2.4 Block Function

The block function blocks the RGB/RGBW-Stripe for further control and can call defined states. The following illustration shows the parameter for the blocking process:

Block function

Behavior at Block value = 1	no change ▼
Behavior at Block value = 0	switch to hue ▼
Hue	Red ▼

Figure 25: Block function

The following table shows the available settings:

ETS-text	Dynamic range [default value]	comment
Behavior at Block value = 1	• off • **no change** • switch to Hue	defines the behavior of the RGB/RGBW-Stripe at activating the block function
Hue	• **Red,…**	If the parameter "Behavior at Block" is set to "switch to Hue", a predefined color can be called.
Behavior at Unblock value = o	• **off** • no change • switch to Hue	defines the behavior of the RGB/RGBW-Stripe at deactivating the block function
Hue	• **Rot,…**	If the parameter "Behavior at Unblock" is set to "switch to Hue", a predefined color can be called.

Table 37: Parameter block function

The following table shows the relevant communication object:

Number	Name	Length	Usage
81	Block	1 Bit	blocks the RGB/RGBW stripe

Table 38: Communication Object block function

4.4.3 LED RGB/RGBW Sequences

Up to 5 sequences can be adjusted. These sequences can be set with predefined sequences or own sequences. The own sequences can be adjusted by using RGBW values or HSV values and can have up to 5 steps.
The following illustration shows the activation of the sequences:
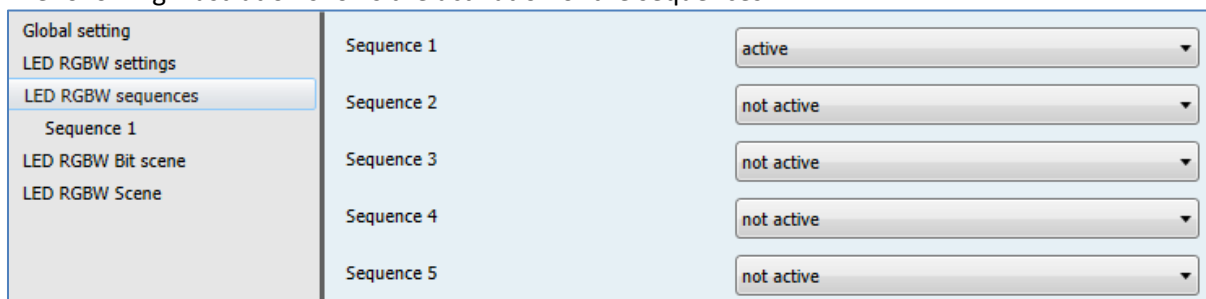
Figure 26: Activation of sequences

A submenu is shown for each activated sequence in which the sequences can be adjusted in detail. Furthermore a communication object, for starting and stopping, is shown for each sequence:

Number	Name	Length	Usage
83	Start sequence 1	1 Bit	1 = Start Sequence 1, 0 = Stop Sequence 1
84	Start sequence 2	1 Bit	1 = Start Sequence 2, 0 = Stop Sequence 2
85	Start sequence 3	1 Bit	1 = Start Sequence 3, 0 = Stop Sequence 3
86	Start sequence 4	1 Bit	1 = Start Sequence 4, 0 = Stop Sequence 4
87	Start sequence 5	1 Bit	1 = Start Sequence 5, 0 = Stop Sequence 5

Table 39: Communication Object Sequences

Applies to all sequences: If the sequence is adjusted and controlled in the RGB/RGBW behavior, the state values only the RGB/RGBW state values are transmitted. At sequences in HSV behavior, only HSV state values are transmitted.
At the end of the dimming process all state values are transmitted.

4.4.3.1 Predefined sequences

If the following parameter is selected, a number of predefined sequences are available:
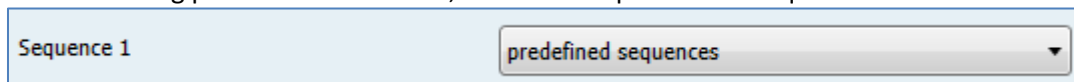
Figure 27: Predefined sequences

The following sequences can be selected:

- **Colorful**
  The sequence "Colorful" runs through all colors of the color circle. At the initial step, the color circle will be run through clockwise. In the second step, the color circle will be run through contraclockwise. The starting point is the color red (0° or 360°°). The sequence is an endless loop, which means it will be swing back and forth in the color circle.
  The sequence has the following parameter:
  Saturation: Defines the saturation of the colors, which will be run through.
  Brightness: Defines the brightness of the colors, which will be run through.
  Transition time up to step 2: Defines the time, which is need for the run-through clockwise.
  Transition time up to step 3: Defines the time, which is need for the run-through contraclockwise

- **Warm Colors**
  The sequence „Warm Colors" contains 3 steps and runs through the colors Red->Orange ->Yellow, this means the first quarter of the color circle. This sequence is an endless loop.
  The sequence has the following parameter:
  Saturation: Defines the saturation of the colors, which will be run through.
  Brightness: Defines the brightness of the colors, which will be run through.
  Transition time up to step 2: Defines the time which is need for the transition from red to orange.
  Transition time up to step 3: Defines the time which is need for the transition from orange to yellow.
  Transition time up to step 4: Defines the time which is need for the transition from yellow back to red(starting point).

- **Cold Colors**
  The sequence „Cold Colors" contains of 4 steps and runs through the colors Aquamarine green->Turquoise->Mint->Blue. So the lower part of the color circle will be ran through.
  The sequence has the following parameter:
  Saturation: Defines the saturation of the colors, which will be run through.
  Brightness: Defines the brightness of the colors, which will be run through.
  Transition time up to step 2: Defines the time which is need for the transition from aquamarine green to turquoise.
  Transition time up to step 3: Defines the time which is need for the transition from turquoise to mint.
  Transition time up to step 4: Defines the time which is need for the transition from mint to blue.

- **TV simulation/presence simulation**
  The „TV simulation/presence simulation" is an endless loop, which is built up completely with random values. That means as well the called colors as the transition times and the hold times are completely random. This sequence simulates the behavior of a TV.

- **Sunrise**
  The sequence "sunrise" dims from an off state in the steps Red with low intensity->Red with higher intensity->Orange->Yellow. So the sunrise from the early red sky to the rise of the sun is simulated. The sequence has only one run-through.
  The length of the "sunrise" can be adjusted via the parameters hold time and transition time.

- **Lounge random**
  The sequence „Lounge random" runs through the whole color circle from 0° to 360° with middle saturation. This sequence is an endless loop.
  The sequence has the following parameter:
  Brightness: Defines the brightness of the colors, which will be run through.
  Transition time[s]: Defines the transition time between the steps.
  Hold time in 100ms: Defines the hold time of the steps in multiple of 100ms.

- **Indicate HSV**
  The sequence „Indicate HSV" toggles between 2 free parameterizable colors. This sequence is an endless loop.
  The sequence has the following parameter:
  <u>On- Values:</u>
  Hue H: Defines the color which is called by switching on.
  Saturation S: Defines the saturation which is called by switching on.
  Brightness: V: Defines the brightness which is called by switching on.
  Period in 100ms: Defines the time how long a color is hold.
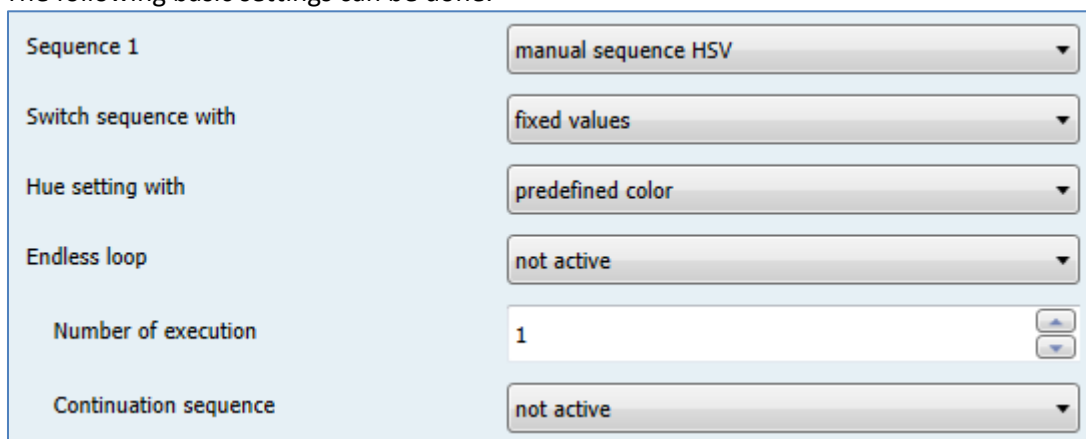
  The Off-Values can be parameterized in the same way.

4.4.3.2 Manual Sequences RGBW/HSV

There are two choices for the manual sequences available. On the one hand the manual sequences can be parameterized via RGB/RGBW and on the other hand via HSV. The available options are basically the same, only the presentation and the selection of the colors are different.

The following basic settings can be done:

Figure 28: Basic settings manual sequences

The following table shows the available settings:

ETS-text	Dynamic range [default value]	comment
Switch sequence with	• **fixed values** • random values	defines whether the colors of the steps are fixed or random values are generated for each step
Number of parameter steps	1-5 **[1]**	defines the number of steps of this sequence
Random transition time	• **not active** • active	**only at random values** defines whether the time between two steps should be random or fixed
Endless loop	• **not active** • active	defines whether the sequence shall run in an endless loop or not
Number of execution	1-255 **[1]**	**is only shown if no endless loop is active** Parameter defines the number of executions
Continuation sequence	• **not active** • 1 • 2 • 3 • 4 • 5	**is only shown if no endless loop is active** Parameter defines the sequence which shall be called after this sequence

Table 40: Basic settings manual sequence

Sequence with fixed values:

When the sequence is controlled with fixed values, the fixed values which are called can be adjusted.
The following figure shows the available settings for fixed values with HSV-Control:

Hue	Red (H=0°)
Saturation S	100%
Brightness V	100%
Hold time in 100 ms	5
Transition time up to next step [s]	10

Figure 29: Manual sequence with fixed values

As shown at the upper figure, for every step a predefined color can be called. Additional the saturation and the brightness can be called at the HSV-Control. The hold time defines how long a step is hold, which means the sequence stays for the adjusted time at this step.
The transition time defines the time how long the dimming takes from one step to the next one.
Furthermore it is possible to select predefined colors or adjust them by your own.
The following parameter switches between predefined colors and manual configuration:

Hue setting with	predefined color

Figure 30: Manual Sequence RGB/RGBW Hue setting

Sequence with random values:

If the sequence is switched with random values, the colors will be generated randomly of the device. The random values can be restricted. The following illustration shows the sequence with random values at RGB –Control:

Figure 31: Manual sequence with random values

As seen on the upper picture, every color can be restricted. These settings are in the same way available for HSV-Control. In this setting the values for H, S and V can be restricted. The hold time defines how long a step is hold, which means the sequence stays for the adjusted time at this step. Furthermore the transition time can be switched between random or fixed values:

Figure 32: Transition time

A random transition time can be restricted from zero to fixed maximum value. So the random time has an upper maximum.
The following parameter is shown for a random transition time:
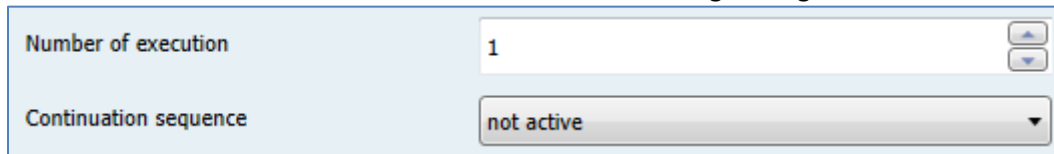
Figure 33: Random transition time

If the parameter "Random transition time" is switched to not active, a fixed value for the transition time must be adjusted.
The transition time defines the time of the dimming process between two steps.

Number of executions:

The number of executions can be defined with the following setting:

| Number of execution | 1 | |
| Continuation sequence | not active | |

Figure 34: Manual sequence - Number of Executions

If the sequence is defined as endless loop, the sequence runs as long it will be stopped by sending a stop command to its communication object. Further settings for the number of executions are not available for this setting.

If the endless loop is not active, the number of executions can be defined. Furthermore a continuation sequence can be called. For example, sequence 1 can call sequence2, which calls sequence 3, which calls again sequence 1. So an endless loop with 3 sequences is performed. Furthermore this parameter can be used for extending a sequence with 5 more steps per continuation sequence.

4.4.4 LED RGB/RGBW Bit Scenes

Two different Bit scenes can be adjusted. The Bit scene-function enables calling absolute values with a one Bit communication object. As well for the value 1 as for the value 0 colors can be adjusted, which can be selected via RGB/RGBW or HSV.
The following illustration shows the parameter for the Control mode of Bit scene 1:

Bit Scene 1	active ▼
Mode	RGBW ▼
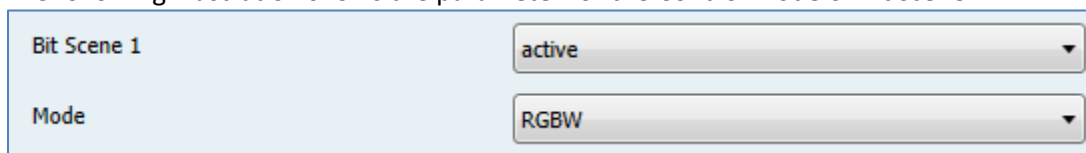
Figure 35: Bit scene - Control Mode

The color selection can be done with predefined values of by manual control:

Hue setting with	predefined color ▼
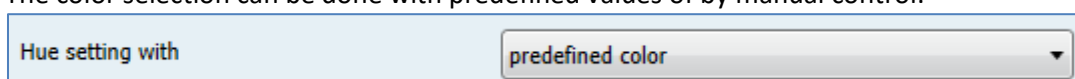
Figure 36: Hue setting with predefined colors

At the setting "predefined color", for each value and each Bit scene individual settings are available.
The following settings are available for HSV-Control:

ETS-text	Dynamic range [default value]	comment
Hue for Bit value 0/1	Red, Orange, Yellow, … [Red]	Adjustment of the color, which should be called
Saturation S for Bit value 0/1	0-100% [100%]	Adjustment of the saturation, which should be called
Brightness H for Bit value 0/1	0-100% [100%]	Adjustment of the brightness, which should be called

Table 41: Bit scenes-HSV with predefined values

The following settings are available for RGB/RGBW-Control:

ETS-text	Dynamic range [default value]	comment
Hue for Bit value 0/1	Red, Orange, Yellow, … [Red]	Adjustment of the color, which should be called

Table 42: Bit scenes-RGB with predefined values

At the setting "manual setting", for each value and each Bit scene individual settings are available.
The following settings are available for HSV-Control:

ETS-text	Dynamic range [default value]	comment
Hue for Bit value 0/1	0°-360° [Red H=0°]	Adjustment of the angle which shall be called in the color circle
Saturation S for Bit value 0/1	0-100% [100%]	Adjustment of the saturation which shall be called
Brightness V for Bit value 0/1	0-100% [100%]	Adjustment of the brightness which shall be called

Table 43: Bit scenes-HSV Control with manual setting

The following settings are available for RGB/RGBW-Control:

ETS-text	Dynamic range [default value]	comment
Hue Red for Bit value 0/1	0%-100% [0%]	Adjustment of the absolute value for the red channel
Hue green for Bit value 0/1	0%-100% [0%]	Adjustment of the absolute value for the red channel
Hue blue for Bit value 0/1	0%-100% [0%]	Adjustment of the absolute value for the red channel
Hue white for Bit value 0/1	0%-100% [0%]	Adjustment of the absolute value for the red channel

Table 44: Bit scenes-RGB/RGBW Control with manual setting

The following communication objects call the Bit-Scenes:

Number	Name	Length	Usage
79	Bit Scene 1	1 Bit	Calling Bit Scene 1
80	Bit Scene 2	1 Bit	Calling Bit Scene 2

Table 45: Communication objects Bit scenes

The communication objects for the Bit scenes are only shown if the bit scenes are activated.

The transition time for the scenes can be defined as described in 4.4.2.3 Dimming speed.

4.4.5 LED RGB/RGBW Scenes

Up to 8 scenes can be programmed, which can be assigned one of the 64 available scene numbers.
The following illustration shows the available settings for submenu LED RGBW scenes:

Scenes	active
Save scene	disabled
Mode	RGBW
Scene A	not active
Scene B	not active
Scene C	not active
Scene D	not active
Scene E	not active
Scene F	not active
Scene G	not active
Scene H	not active

Figure 37: LED RGB/RGBW scenes

The following table shows the available settings for an activated scene function:

ETS-text	Dynamic range [default value]	comment
Save scenes	• **disabled** • enabled	defines if the memory function shall be enabled for the scenes
Mode	• **RGB/RGBW** • HSV	Adjustment of the Control Mode
Scene Nr. A-[H]	• **not active** • active	Activation/Deactivation of the scenes
Scene number	1-64 **[1]**	defines the value for calling this scene
Hue setting with	• **predefined color** • manual setting	Adjustment how the color for this scene shall be set

Table 46: Scene function

According to the adjusted mode and the selection of the hue setting, the color which shall be called, can be adjusted in different ways.
For the HSV-Mode with predefined colors, the following settings are available:

ETS-text	Dynamic range [default value]	comment
Hue	Rot, Orange, Gelb, … **[Rot]**	Adjustment of the color
Saturation S	0-100% **[100%]**	Adjustment of the saturation
Brightness V	0-100% **[100%]**	Adjustment of the brightness

Table 47: Scenes- HSV control with predefined colors

For the RGB/RGBW-Mode with predefined colors, the following settings are available:

ETS-text	Dynamic range [default value]	comment
Hue	Rot, Orange, Gelb, … **[Rot]**	Adjustment of the color

Table 48: Scenes-RGB control with predefined colors

For the HSV-Mode with manual setting, the following settings are available:

ETS-text	Dynamic range [default value]	comment
Hue	0°-360° [Rot = 0°]	Adjustment of the angle in the color circle
Saturation S	0-100% [100%]	Adjustment of the saturation
Brightness V	0-100% [100%]	Adjustment of the brightness

Table 49: Scenes-HSV control with manual setting

For the RGB/RGBW-Mode with manual setting, the following settings are available:

ETS-text	Dynamic range [default value]	comment
Hue Red	0%-100% [0%]	Adjustment of the absolute value for the red channel
Hue Green	0%-100% [0%]	Adjustment of the absolute value for the green channel
Hue Blue	0%-100% [0%]	Adjustment of the absolute value for the blue channel
Hue White	0%-100% [0%]	Adjustment of the absolute value for the white channel

Table 50: Scenes-RGB Control with manual setting

The following communication object calls the adjusted scenes:

Number	Name	Length	Usage
78	Scene	1 Byte	Calling the scenes

Table 51: Communication object scene

The communication object for the scenes is only shown if the scenes are active.

The transition time of the scenes can be adjusted as described in 4.4.2.3 Dimming speed.

For calling a scene or saving a scene with a new value, the corresponding code must be sent to the communication object for the scenes:

Scene	Calling		Saving	
	Hex.	Dec.	Hex.	Dec.
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

Table 52: Calling and saving scenes

5 Index

5.1 List of Illustrations

5.2 List of Tables

6 Attachment

6.1 Statutory requirements

The above-described devices must not be used with devices, which serve directly or indirectly the purpose of human, health- or lifesaving. Further the devices must not be used if their usage can occur danger for humans, animals or material assets.
Do not let the packaging lying around careless, plastic foil/ -bags etc. can be a dangerous toy for kids.

6.2 Routine disposal

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

6.3 Assemblage

⚠️   **Risk for life of electrical power!**

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

6.4 Datasheet