Technical Manual

MDT Dimming Actuator

AKD – 0201.01
AKD – 0401.01
AKD – 0103.01
AKD – 0203.01
AKD – 0410V.01

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1 Content

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2 Overview

2.1 Overview devices

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

- **AKD-0201.01** Dimming actuator MRDC, 2-fold, 4 TE, 230V AC – 250W
    - Switching and dimming of light bulbs, HV-halogen lamps, NV- halogen lamps, dimmable energy-saving lamps and LEDs
- **AKD-0401.01** Dimming actuator MRDC, 4-fold, 8 TE, 230V AC – 250W
    - Switching and dimming of light bulbs, HV-halogen lamps, NV- halogen lamps, dimmable energy-saving lamps and LEDs
- **AKD-0103.01** Dimming actuator MRDC, 1-fold, 4 TE, 230V AC – 600W
    - Switching and dimming of light bulbs, HV-halogen lamps, NV- halogen lamps, dimmable energy-saving lamps and LEDs
- **AKD-0203.01** Dimming actuator MRDC, 3-fold, 8 TE, 230V AC – 600W
    - Switching and dimming of light bulbs, HV-halogen lamps, NV- halogen lamps, dimmable energy-saving lamps and LEDs

2.2 Exemplary circuit diagram
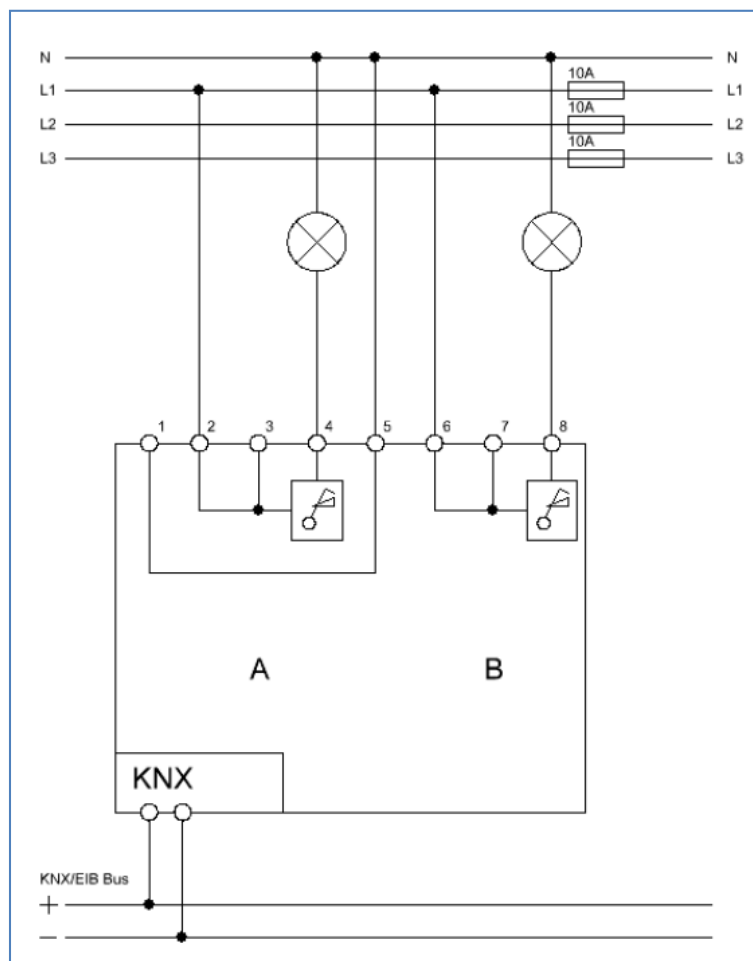
Illustration 1: Circuit diagram AKD-0201.01
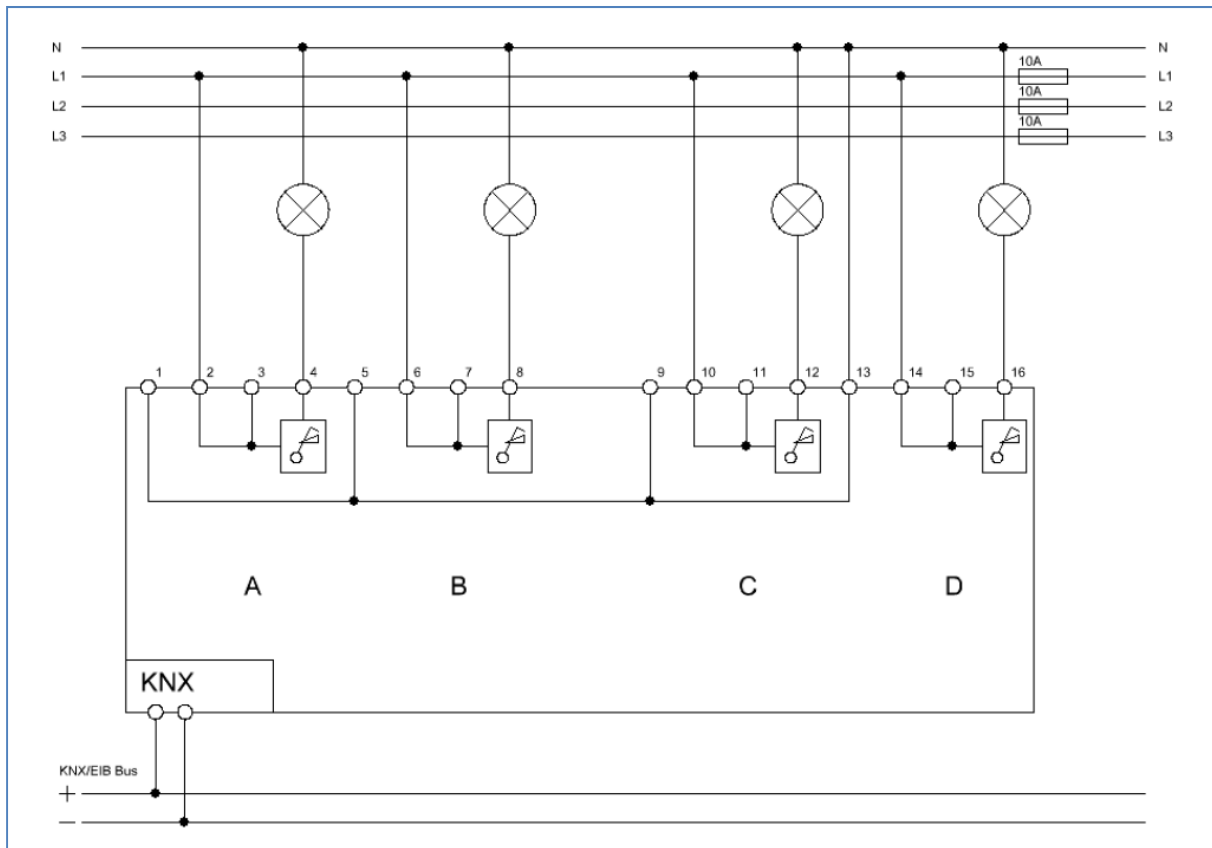
Illustration 2: Circuit diagram AKD-0401.01

2.3 Structure & Handling

The dimming actuator (here at the 4-fold version) contains of a programming button as wells as a programming LED, which shows an activated programming button. By the bus connection, the communication via the bus can be reached.
Every channel has a certain lead (have a look at the circuit diagram). The neutral conductor must be wired only once.
Every channel has a green status LED. These LEDs show an activated channel as well as channel, which was chosen via the hand control. The red LEDs per channel are for the alarm function. These LEDs show the three different types of alarm with a different luminescent behavior. An overview of the different display behavior is shown at "2.4 LEDs and manual control".
The function of the manual control is also described in this segment.

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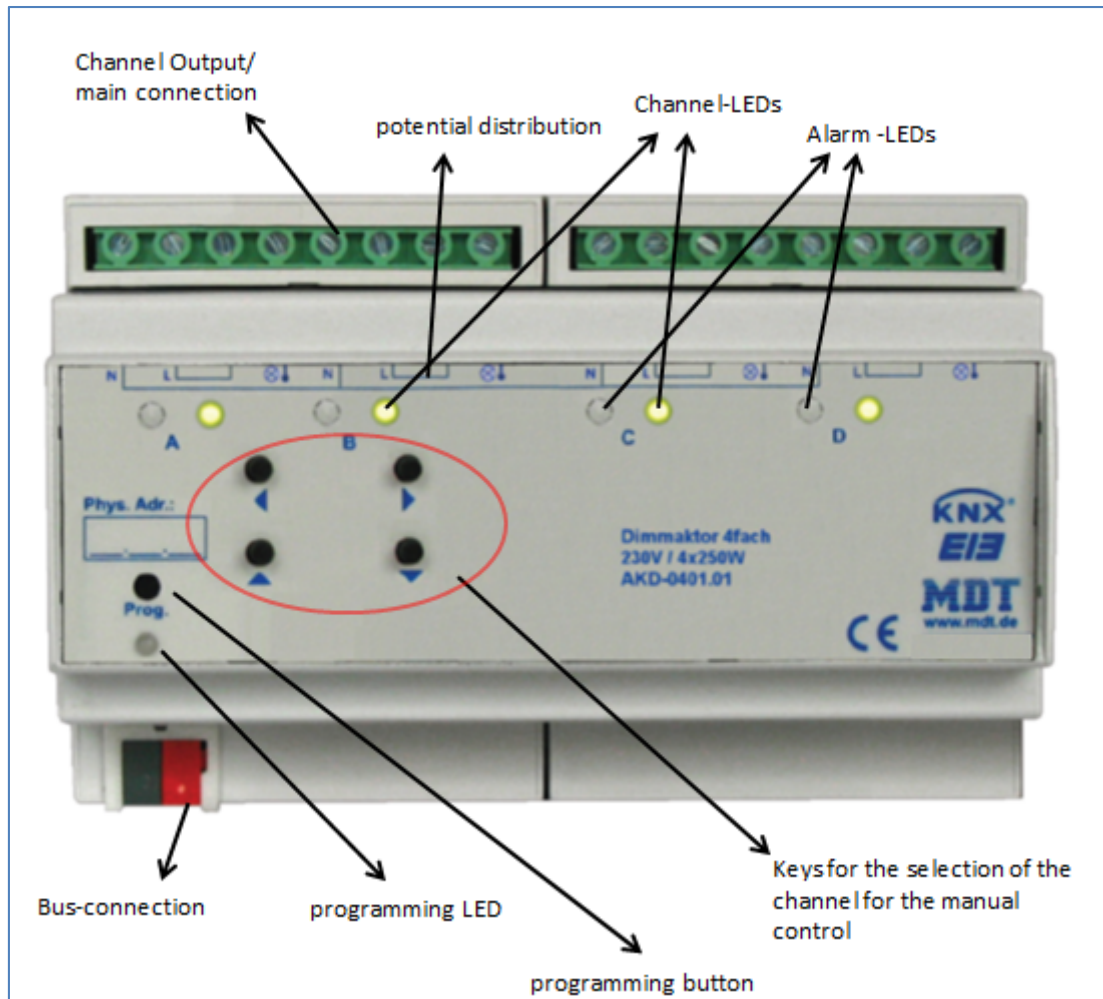
Illustration 3: Overview hardware module (AKD 0401.01)

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

Chart 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 Errors-types and Error management

Every channel contains further of a red alarm LED. According to the LED behavior, the following types of alarms are indicated:

LED behavior	Status of the channel
LED flashes steady with the frequency of 1:1	No load is connected to the output of the channel.
LED flashes with the frequency of 2:1 „long on- short off"	The channel is not connected to the power supply.
LED flashes with the frequency of 1:2 „short on- long off"	The channel is overheated and reports to high temperature or a short circuit.
LED shines permanent	The adjusted load does not fit to the connected load.

Chart 2: Display behavior of the red alarm LED

To eliminate the errors, certain actions must be done, depending to the error type, to eliminate them. These actions are described below:

- **No load at the output, LED flashes with the frequency of 1:1**
  - At first, you have to connect the load toad to the output. Afterwards you have to assign the channel the opposite signal and bring it to the original condition afterwards. That means:
    If the channel was switched off at the load failure, you have to switch the channel on and afterwards off again.
    If the channel was switched on at the load failure, you have to switch the channel off and afterwards on again.
    This mistake can also occur if a bulb fails while it is in use. Also here the steps, which are described above, must be done.
- **No power supply at the output, LED flashes with the frequency of 2:1**
  - Connect the power supply for this channel according to the circuit diagram.
- **Short circuit/Overload at the output, LED flashes with the frequency of 1:2**
  - Eliminate the short circuit/overload at the output and disconnect the actuator for min 3 sec from the power supply. Connect the actuator to the power supply afterwards again.
- **Wrong load at the output, LED shines permanent**
  - Choose the right load at the ETS-Software and program the actuator again.

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2.6 Functions

According to the specification up to four channels can be activated. If a channel is activated, the channel can be parameterized according to its usage. The parameterization options are identical for all channels of the dimming actuator. The dimming behavior is described by the selection of the chosen load.

2.6.1 Overview functions

Dimming functions	Load type	• omic/capacitive Load / electronic transf. (trailing edge) • inductive loads / conventional transf. (leading edge) • ESL/LED without transformer (leading edge) • ESL/LED with electronic transf. (trailing edge) • ESL without transf. (leading edge) 100% Start
	Characteristic curve	• Linear (bulb, LED, halogen lamp) • Quadrate (ESL, fluorescent lamp) • Half logarithmically (optional) • Logarithmically (optional)
	Time functions	• Staircase lights • switch-on delay • switch-off delay
	Turn-on behavior	• absolute brightness level • last value(Memory-function)
	Absolute values	• minimum value • maximum value
	Dimming behavior	• dimming speed
	Alarm functions	• Temperature • Electric load alarm
	Central functions	• central switching • central dimming
	Scene functions	For every channel activatable/deactivatable
	Automatic functions	For every channel activatable/deactivatable
Additional functions	Blocking objects	• 2 blocking objects available • Behavior for blocking and unblocking independent parameterizable
	Behavior after power off/ after reset	• no reaction • Off/On • absolute Value • last Value

Chart 3: Overview functions

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2.7 Settings at the ETS-Software

Selection at the product database:

Manufacturer: MDT Technologies
Product family: Actuators
Product type: Dimming actuators
Medium Type: Twisted Pair (TP)
Product name: addicted to the used type, e.g.: AKD-0401.01 dimming actuator 4-fold, 8TE, 230V, 250W
Order number: addicted to the used type, e.g.: AKD-0401.01

2.8. 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) Switch the power supply on
(7) If the device is enabled you can test the requested functions(also possible by using the ETS-Software)

3 Communication objects

3.1 Overview

The communication objects are required for programming the project by connecting them to the group addresses.
The dimming actuator contains of three global objects as well as objects for every channel.
By activating a channel, the communication objects for this channel are shown. Which communication objects are shown depends to the individual parameterization of the channel. 15 numbers are reserved for every channel. So, the channel A has the numbers from 0 to 14, the channel B from 15 to 29 and so on.
The following illustration shows the objects for channel A:

Number	Name	Object Function	Description	Group...	Length	C	R	W	T	U	Data Type	Priority
0	Channel A	Switch			1 bit	C	-	W	-	-	1 bit DPT_Switch	Low
2	Channel A	Dim relatively			4 bit	C	-	W	-	-	3 bit controlled DPT_Control_...	Low
3	Channel A	Dim absolutely			1 Byte	C	-	W	-	-	8 bit unsigned value DPT_Scali...	Low
4	Channel A	State On/Off			1 bit	C	R	-	T	-		Low
5	Channel A	State dim value			1 Byte	C	R	-	T	-	8 bit unsigned value DPT_Scali...	Low
6	Channel A	Block I			1 bit	C	-	W	-	-	1 bit DPT_Enable	Low
7	Channel A	Block II			1 bit	C	-	W	-	-	1 bit DPT_Enable	Low
8	Channel A	Scene			1 Byte	C	-	W	-	-		Low
9	Channel A	Electrical load alarm			1 bit	C	R	-	T	-		Low
10	Channel A	Overtemperature alarm			1 bit	C	R	-	T	-		Low
11	Channel A	Automatic 1			1 bit	C	-	W	-	-	1 bit DPT_Switch	Low
12	Channel A	Automatic 2			1 bit	C	-	W	-	-	1 bit DPT_Switch	Low
13	Channel A	Automatic 3			1 bit	C	-	W	-	-	1 bit DPT_Switch	Low
14	Channel A	Automatic 4			1 bit	C	-	W	-	-	1 bit DPT_Switch	Low
60	Central	Switch			1 bit	C	-	W	-	-	1 bit DPT_Switch	Low

Illustration 4: Communication objects per channel

The global objects are always shown. They are at the end of the list and have the numbers from 60-62 (at a 4-fold device). It can be parameterized for every single channel whether it should react to the global objects or not. The global objects are for central switching of the channels or central dimming.
The following illustration shows the central objects:

Nummer	Name	Funktion	Beschreibung	Gruppenadressen	Länge	K	L	S	Ü	A	Priorität
60	Zentral	Schalten			1 bit	K	-	S	-	-	Niedrig
61	Zentral	Dimmen Absolut			1 Byte	K	-	S	-	-	Niedrig
62	Zentral	Gerätefehler			1 bit	K	L	-	Ü	-	Niedrig

Illustration 5: central communication objects

3.2 Communication object device error

The communication objects "device error sends an "1-signal" as soon as a mistake occurs. If the object is active, please check the load settings/ load connection and the temperature.
If the mistake persists, contact the support.

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3.3 Default settings of the communication objects

Default settings										
Nr.	Name	Object Function	Length	Priority	C	R	W	T	U
0	Channel A	Switch	1 Bit	Low	X		X		
1	Channel A	Staircaselight	1 Bit	Low	X		X		
2	Channel A	Dim relatively	4 Bit	Low	X		X		
3	Channel A	Dim absoutely	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		
9	Channel A	Electric load alarm	1 Bit	Low	X	X		X	
10	Channel A	Over temperature alarm	1 Bit	Low	X	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		
62	Central	Device error	1 Bit	Low	X	X		X	

Chart 4: Default settings – 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.

4 Reference ETS-Parameter

4.1 Channel activation

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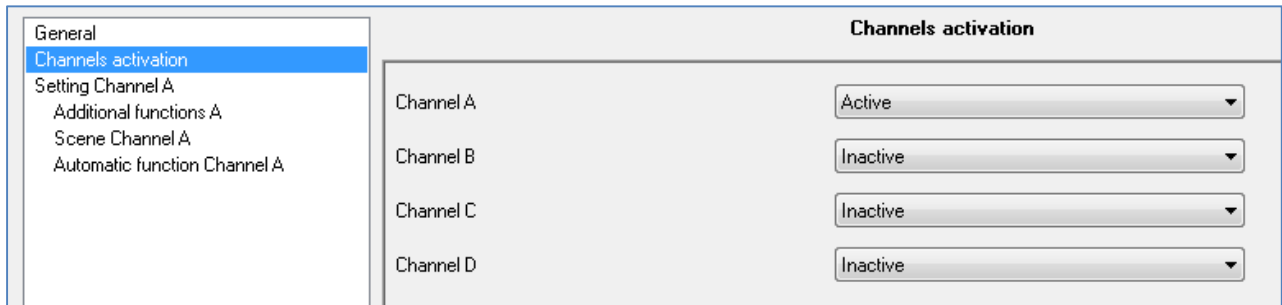

Illustration 6: Channel activation

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

Chart 5: 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.

4.2 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.

4.2.1 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

Chart 6: Communication objects switching

4.2.2 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

Chart 7: Dim relatively

4.2.3 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

Chart 8: Dim absolutely

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4.3 Load settings

4.3.1 Load type

Therewith the channel can work properly; the right load type must be selected for the channel.

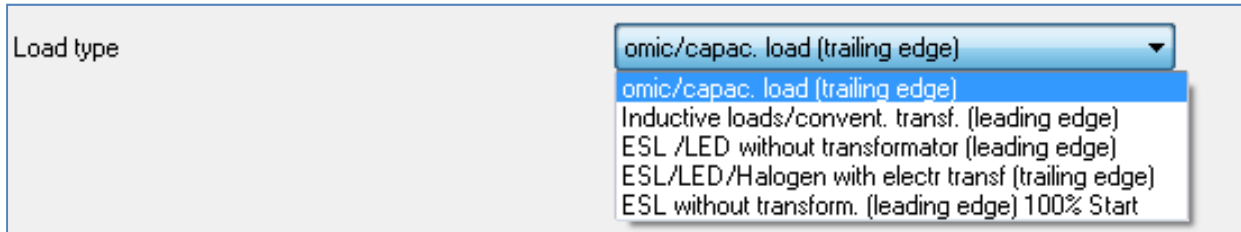| Load type	omic/capac. load (trailing edge) ▼
	omic/capac. load (trailing edge)
	Inductive loads/convent. transf. (leading edge)
	ESL /LED without transformator (leading edge)
	ESL/LED/Halogen with electr transf (trailing edge)
	ESL without transform. (leading edge) 100% Start

Illustration 7: Load type

The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Load type	• **omic/capacitive Load (trailing edge)** • Inductive loads/ conventional transf. (leading edge) • ESL/LED without transformer(leading edge) • ESL/LED/Halogen with electronic transf. (trailing edge) • ESL without transf. (leading edge), 100%Start	Selection of the wired load type at the output

Chart 9: Load type

Therewith the dimming actuator can dim the channel properly; the wired load type must fir to the selected load type. If the selected load type is different to the wired load type, the channel signals this by the communication object "Electric load alarm" or by the LED at the device itself. As long as the mistake is present, the channel does not switch. If the load is swapped by connecting another load at the output, the mistake will be as long present as a new switching command is sent and so the recognition of the load is restarted.

At the selection of the load type, especially the distinction between trailing edge and leading edge must be watched.

The following loads can be chosen and have their usages here:

- omic/capacitive Load
  - conventional bulbs,
  - trailing edge

- Inductive loads/ conventional transformer
  - halogen lamps (low voltage) with conventional transformers, fluorescent lamps with conventional electronic ballast, other fluorescent lamps with conventional transformers
  - leading edge

- ESL/LED without transformer
  - conventional energy saver (ESL), LEDs with sockets (230V)
  - leading edge

- ESL/LED with electronic transformer
  - energy saver(ESL)/ fluorescent lamps with electronic transformers, LEDs with electronic transformers
  - halogen lamps (High voltage), halogen lamps(low voltage) with electronic transformer
  - trailing edge

- ESL without transfer , 100%Start
  - energy saver/ fluorescent lamps, which needs a 100% start (lamps start at 100% and dim down to the wished turn on value)
  - leading edge

4.3.2 Characteristic curve

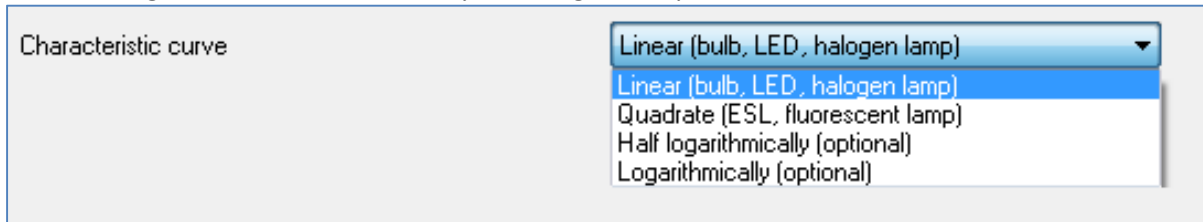The dimming behavior can be varied by choosing the respective curve.

Illustration 8: Characteristic curve

The chart shows the dynamic range for this parameter:

ETS-text	Dynamic range [default value]	comment
Characteristic curve	• **Linear (bulb, LED, halogen lamp)** • Quadrate (ESL, fluorescent lamp) • Half logarithmically (optional) • Logarithmically (optional)	Selection of the characteristic curve Determination of the dimming behavior

Chart 10: Characteristic curve

Different types of lamps show different dimming behavior. However, because most a linear dimming behavior is wished, it is necessary to adapt the characteristic curve to the connected lamps to reach a good dimming behavior.

The following characteristic curves are available:
- Linear (bulb, LED, halogen lamp)
    - ➢ good dimming behavior at omic loads, especially by conventional bulbs and halogen lamps
      because most of the LEDs are adapted to conventional bulbs, also at LEDs a good dimming behavior is achieved
- Quadrate (ESL, fluorescent lamp)
    - ➢ dimming behavior is adapted to fluorescent lamps and energy saver

Optional, the following characteristic curves are available:
- Half logarithmically
- Logarithmically

Both curves show a modified dimming behavior and can be used alternative.

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4.4 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.

4.4.1 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

Illustration 9: 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

Chart 11: 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:
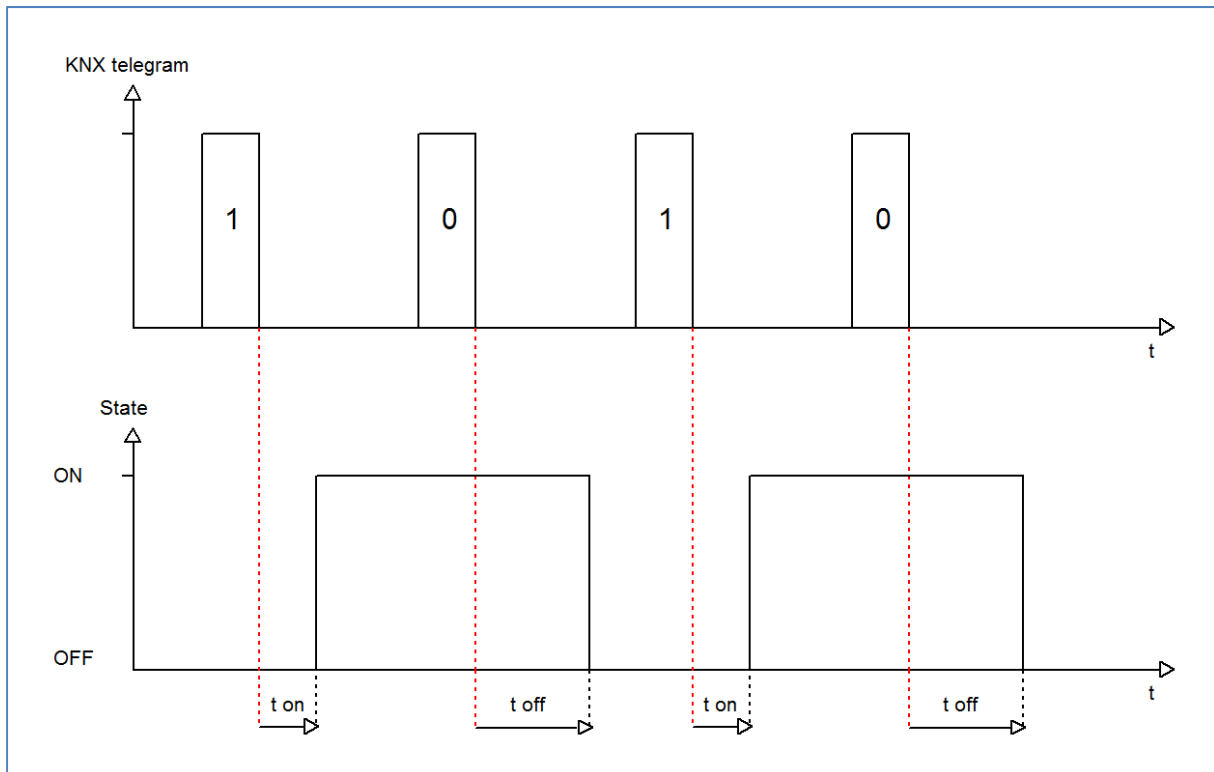
4.4.2 Staircase light

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:
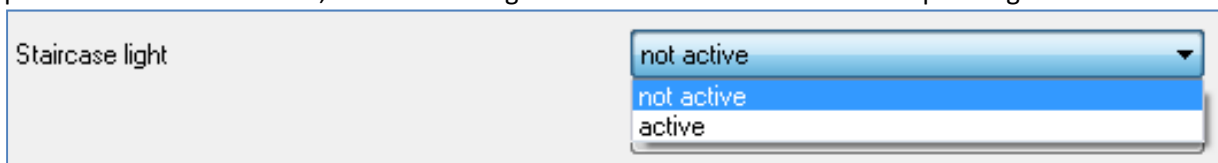

Illustration 10: Staircase light activation

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.

Illustration 11: 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

Chart 12: Staircase light

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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

Chart 13: 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%:

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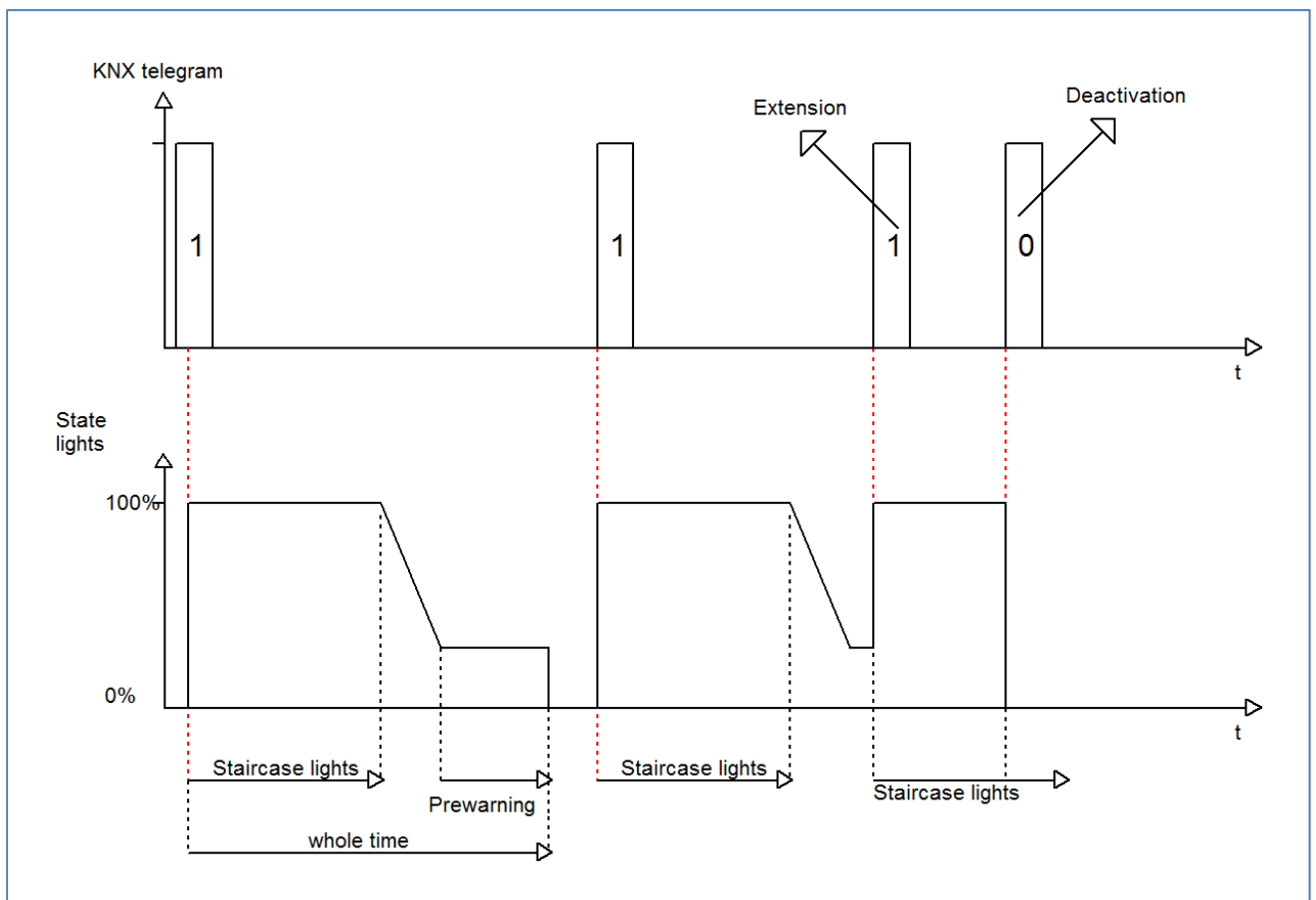
4.5 Absolute Values

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.

4.5.1 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":
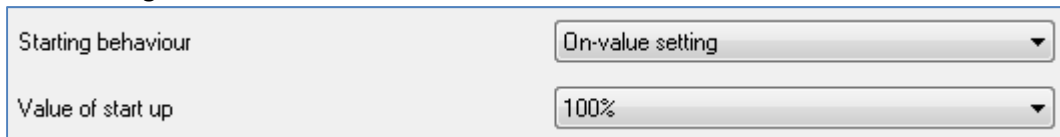
Starting behaviour	On-value setting ▼
Value of start up	100% ▼

Illustration 12: 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

Chart 14: 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.

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4.5.2 Dimming area

Via the parameters "minimum light" and "maximum light" the dimming area can be restricted.

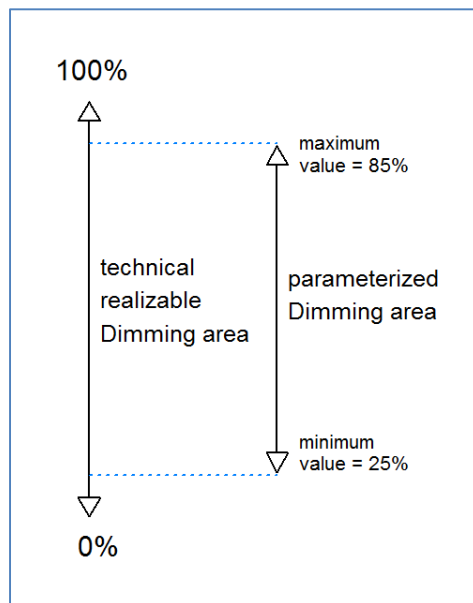| Minimum light | 30% ▼ |
| Maximum light | 100% ▼ |

Illustration 13: 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

Chart 15: 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)

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4.6 specific Dimming settings

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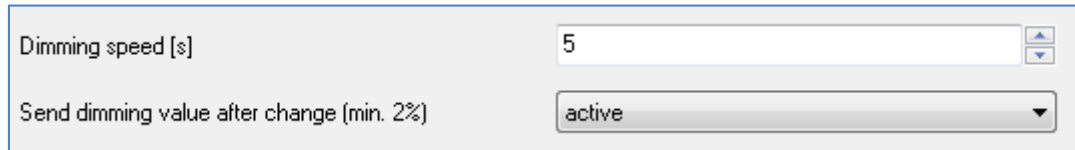

Illustration 14: Specific dimming settings

4.6.1 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%

Chart 16: 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 is chosen by absolute values.
Normally values from 5-8s are used for normal used rooms.

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4.6.2 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

Chart 17: 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 %

Chart 18: Communication object dimming value

4.7 Alarm functions

It is possible to activate communication objects for alarms. These must be activated at the following parameter:

| Overtemperature alarm | not active |
| Electrical load alarm | active |

Illustration 15: Alarm functions

The communication objects for the alarms are especially used at visualizations or for the observation of the right behavior of the actuator.
If an alarm is activated, the channel does not switch.

4.7.1 Overtemperature alarm

The chart shows the dynamic range for the parameter overtemperature alarm:

ETS-text	Dynamic range [default value]	comment
Overtemperature alarm	• **not active** • active	activates the status object for the alarm function

Chart 19: Overtemperature alarm

When the overtemperature alarm is activated, a communication object for the overtemperature alarm for this channel is shown. This object sends an 1-siganl in case of overtemperature.

Number	Name	Length	Usage
10	Overtemperature alarm	1 Bit	sends an 1-signal in case of overtemperature

Chart 20: Communication object overtemperature alarm

To avoid a damage of the dimming actuator, the actuator dims an overheated channel down to 70%. If the temperature still increase, the channel will be dimmed down to 50%. At a still increasing temperature, the channel will be switched off.
The dimming actuator does not dim the channel automatically up again. So the channel will be only dimmed up again when it becomes a command to dim up again.

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4.7.2 Electric load alarm

The following settings are available for the electric load alarm:

ETS-text	Dynamic range [default value]	comment
Electric load alarm	• **not active** • active	activates the status object for the electric load alarm

Chart 21: Electric load alarm

If the parameter "electric load alarm" is activated, the communication object for this kind of alarms will be shown. When a load is wired at this channel, which is different from the adjusted load, the communication object will send an 1-signal.

Number	Name	Length	Usage
9	Electric load alarm	1 Bit	send an 1-signal, when a wrong load is connected

Chart 22: Communication object electric load alarm

Reasons for an electric load alarm can be a wrong adjusted type of load or there is no load connected to the output.

4.8 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:

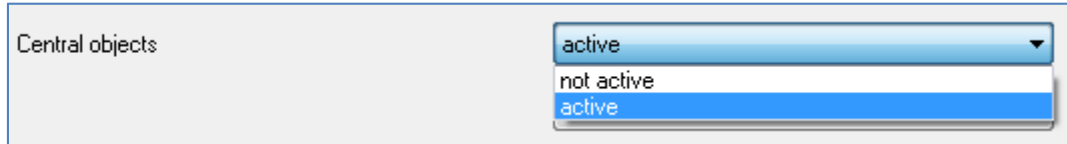| Central objects	active ▼
	not active
	active

Illustration 16: 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

Chart 23: 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

Chart 24: 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

Chart 25: Central communication object device error

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4.9 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.

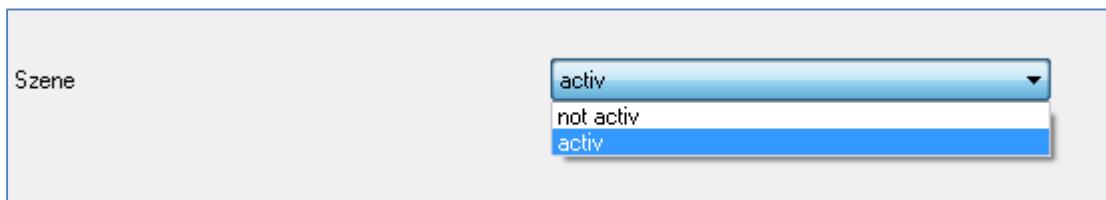The following illustration shows the setting options at the ETS-Software for activating the scene function:

Illustration 17: 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

Chart 26: 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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4.9.1 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):

Illustration 18: 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

Chart 27: Submenu scene

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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

Chart 28: Calling and saving scenes

4.10 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.
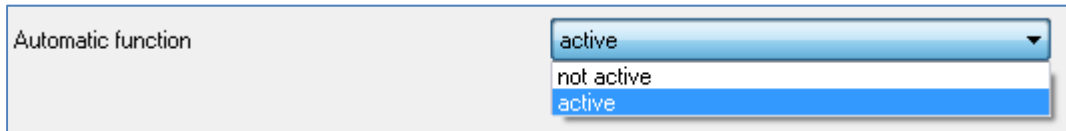
Automatic function	active ▾
	not active
	active

Illustration 19: 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

Chart 29: Communication objects automatic function

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4.10.1 Submenu automatic function

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

Automatic function Channel A	
Automatic function 1 - Exposure value	40% light
Automatic function 2 - Exposure value	50% light
Automatic function 3 - Exposure value	Off
Automatic function 4 - Exposure value	100% light

Illustration 20: 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

Chart 30: 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.

4.11 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

Illustrations 21: Additional functions

4.11.1 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

Chart 31: 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

Chart 32: Communication objects blocking

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4.11.2 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

Chart 33: 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.

5 Index

5.1 List of Illustrations

5.2 List of tables

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6 Attachment

6.1 Statutory requirements

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

6.2 Routine disposal

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

6.3 Assemblage

⚠ Risk for life of electrical power!

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

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MDT Dimming Actuator 1/2/4-fold, MDRC

Version		
AKD-0201.01	Dimming Actuator 2-fold	4SU MDRC, 230VAC, 250W
AKD-0401.01	Dimming Actuator 4-fold	8SU MDRC, 230VAC, 250W
AKD-0103.01	Dimming Actuator 1-fold	4SU MDRC, 230VAC, 600W
AKD-0203.01	Dimming Actuator 2-fold	8SU MDRC, 230VAC, 600W
AKD-0410V.01	Control Device 4-fold	4TE MDRC, 1-10V

The MDT Dimming Actuator receives KNX/EIB telegrams and dimms/switches up to 4 independent electrical loads. Each output can be operated manually via a push button.

The outputs are for switching and dimming incandescent lamps, HV halogen lamps, LV halogen lamps (with conventionel or suitable electronic transformers), dimmable energy saving lamps and LED lightning. Leading or trailing edge principle can be chosen. The device has an integrated shortcircuit and excess temperature protection plus softstart function to increase lamp life time.

Programmable performance after mains voltage failure, bus voltage failure or return.

The 1-10V MDT Control Device has embedded switching relays for 30 ECG/30W, 20 ECG/58W, 15 ECG/2x36W or 10ECG/2x58W. Each channel offers control voltage up to 30 electronic transformers (ECG).

The MDT Dimming 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 Dimming Actuator it is recommended to use the ETS3f/ETS4 or later. Please download the application software at www.mdt.de\Downloads.html
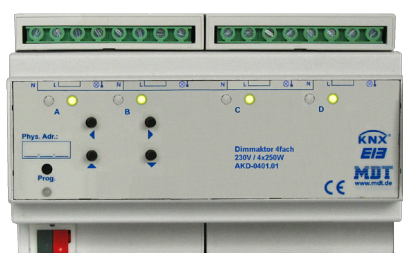
AKD-0201.01   AKD-0410V.01
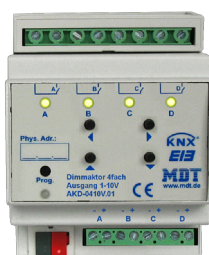
AKD-0401.01

- Production in Germany, certified according to ISO 9001
- Modern design
- Fully compatible to all KNX/EIB devices
- **4W minimum load for LED lightning possible**
- Push Button and LED indicator for each channel
- For dimming and switching incandescent lamps, HV halogen lamps, LV halogen lamps (with conventional or suitable electronic transformers), dimmable energy saving lamps and LED lightning
- Dimming operation in leading or trailing edge
- Short circuit and temperature protection with alarm, softstart
- Time functions (swich-on/switch-off delay, staircase light function)
- Each contact has an own supply phase
- Modular installation device for DIN 35mm rails
- Integrated bus coupling unit
- 3 years warranty

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Technical Data	AKD-0201.01 AKD-0401.01	AKD-0103.01 AKD-0203.01	Technical Data	AKD-0410V.01
Number of outputs	2/4	1/2	Number of outputs	4
Switching voltage outputs	230VAC	230VAC	Switching voltage outputs	230VAC
			Switching voltage control outputs	1-10V
Maximum lamp load*	250W	600W	Maximum number of ECG	30
Minimum lamp load**	12W	20W	Maximum current switching relais	16A
Maximum fuse per channel	10A	10A	Maximum capacitive load	100uF
Permitted wire gauge			Permitted wire gauge	
Screw terminal	0,5 - 4,0mm² solid core 0,5 - 2,5mm² finely stranded		Screw terminal	0,5 - 4,0mm² solid core 0,5 - 2,5mm² finely stranded
KNX busconnection terminal	0,8mm Ø, solid core		KNX busconnection terminal	0,8mm Ø, solid core
Power supply	via KNX bus	via KNX bus	Power supply	via KNX bus
Power consumption***	< 0,3W	< 0,3W	Power consumption***	< 0,3W
Power dissipation no load****	<0,5W	<0,5W		
Power dissipation nominal load****	<4W	<8W		
Operation temperature range	0 to + 45°C	0 to + 45°C	Operation temperature range	0 to + 45°C
Enclosure	IP 20	IP 20	Enclosure	IP 20
Dimensions MDRC (Space Units)	4/8SU	4/8SU	Dimensions MDRC (Space Units)	4SU

* Maximum load for dimmable energy saving lamps is 80W (AKD-xx01.01) or 200W (AKD-xx03.01)
   Maximum load for dimmable LED lamps is, depending on the LED lamp manufacturer, 25-80W (AKD-xx01.01) or 60-200W (AKD-xx03.01)

** Minimum load for dimmable LED lamps are 4-12W, depending on the LED lamp manufacturer

*** Power consumption from KNX Bus

**** Maximum power dissipation for each channel

Note: Dimming Actuators **AKD** have separate Power supply terminals for each channel. The channel outputs can not be bridged.
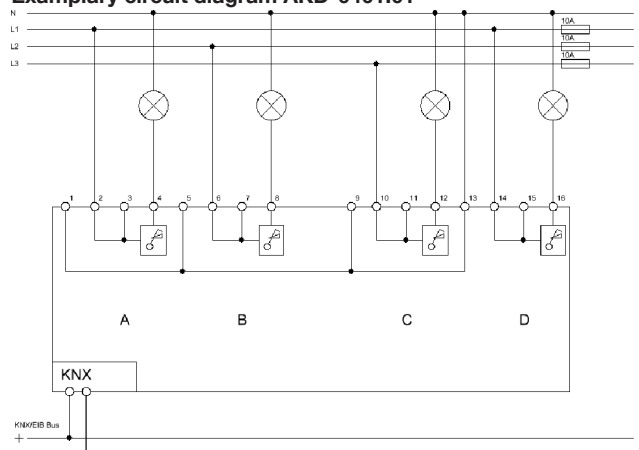
Important assembly note:
Conventionel transformers must be fused on primary side with adequate fuse according to the size of the transformator.
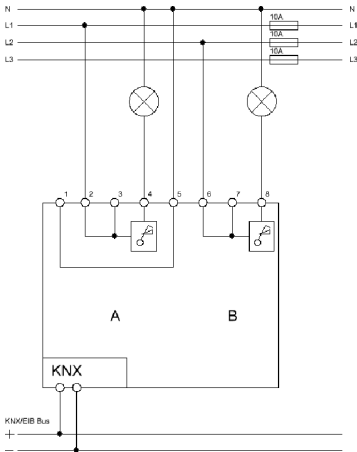
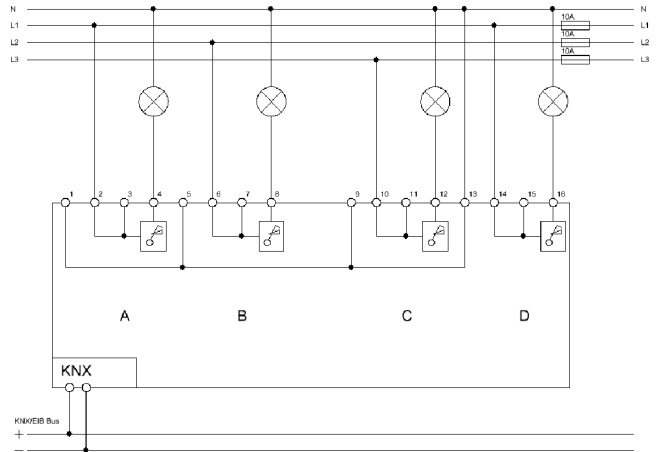**Examplary circuit diagram AKD-0201.01**
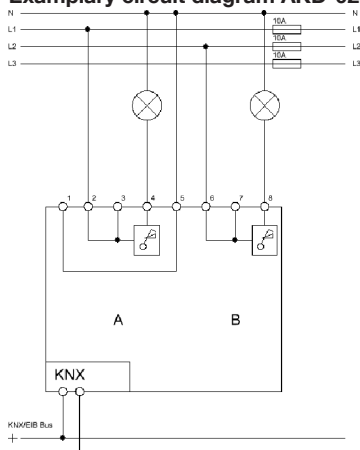
Examplary circuit diagram AKD-0401.01

Technical Data	AKD-0201.01 AKD-0401.01	AKD-0103.01 AKD-0203.01	Technical Data	AKD-0410V.01
Configuration			**Configuration**	
Number of outputs	2/4	1/2	Number of outputs	4
Power supply			**Power supply**	
Supply voltage	230VAC / 50Hz	230VAC / 50Hz	Switched outputs	230VAC
Output voltage	230VAC	230VAC	Analog control outputs	1-10V
Power consumption	< 0,3W	< 0,3W	**Power consumption**	< 0,3W
Maximum lamp load *	250W	600W	**Maximum number of ET**	30
Minimum lamp load	12W	20W	**Maximum current switching relais**	16A
max. fuse per channel	10A	10A	**Maximum capacitive load**	100uF
Permitted wire gauge			**Permitted wire gauge**	
Screw terminal	2,5mm²	2,5mm²	Screw terminal	2,5mm²
KNX busconnection terminal	0,8mm²	0,8mm²	KNX busconnection terminal	0,8mm²
Operation temperature range	0 to + 45°C	0 to + 45°C	**Operation temperature range**	0 to + 45°C
Enclosure	IP 20	IP 20	**Enclosure**	IP 20
Dimensions MDRC	4/8 TE	4/8 TE	**Design**	4 TE

* Maximum load for LED lightning and dimmable energy saving lamps is 80W (AKD-xx01.01) or 200W (AKD-xx03.01)
Note: Dimming Actuators **AKD** have separate Power supply terminals for each channel. The channels can not be bridged.

Examplary circuit diagram AKD-0201.01

Examplary circuit diagram AKD-0401.01

Important assembly note

• Conventionel transformers must be fused on primary side with adequate fuse according to the size of the transformator