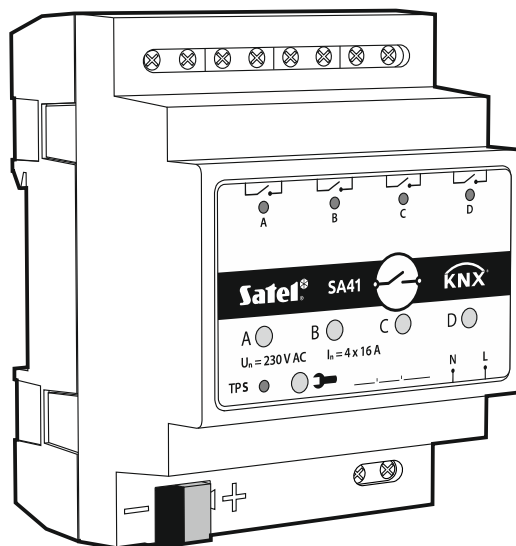


Satel®

KNX-SA41 / KNXSA24

Universal Switch Actuator



Firmware version 1.01

knx-sa_en 10/19

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IMPORTANT

The device should be installed by qualified personnel.

Prior to installation, please read carefully this manual in order to avoid mistakes that can lead to malfunction or even damage to the equipment.

Changes, modifications or repairs not authorized by the manufacturer shall void your rights under the warranty.

SATEL aims to continually improve the quality of its products, which may result in changes in their technical specifications and software. Current information about the changes being introduced is available on our website.

Please visit us at:
<http://www.satel.eu>

The declaration of conformity may be consulted at www.satel.eu/ce

The following symbols may be used in this manual:



- note;



- caution.

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The KNX-SA41 / KNX-SA24 module is an universal switch actuator, which makes it possible to control electrical devices (lighting, sirens, ventilation). The module constitutes an interface between the electrical devices and the KNX system. Signals received from various sensors and other control devices are converted, via the module, into concrete actions, such as switching on/off light or fan.



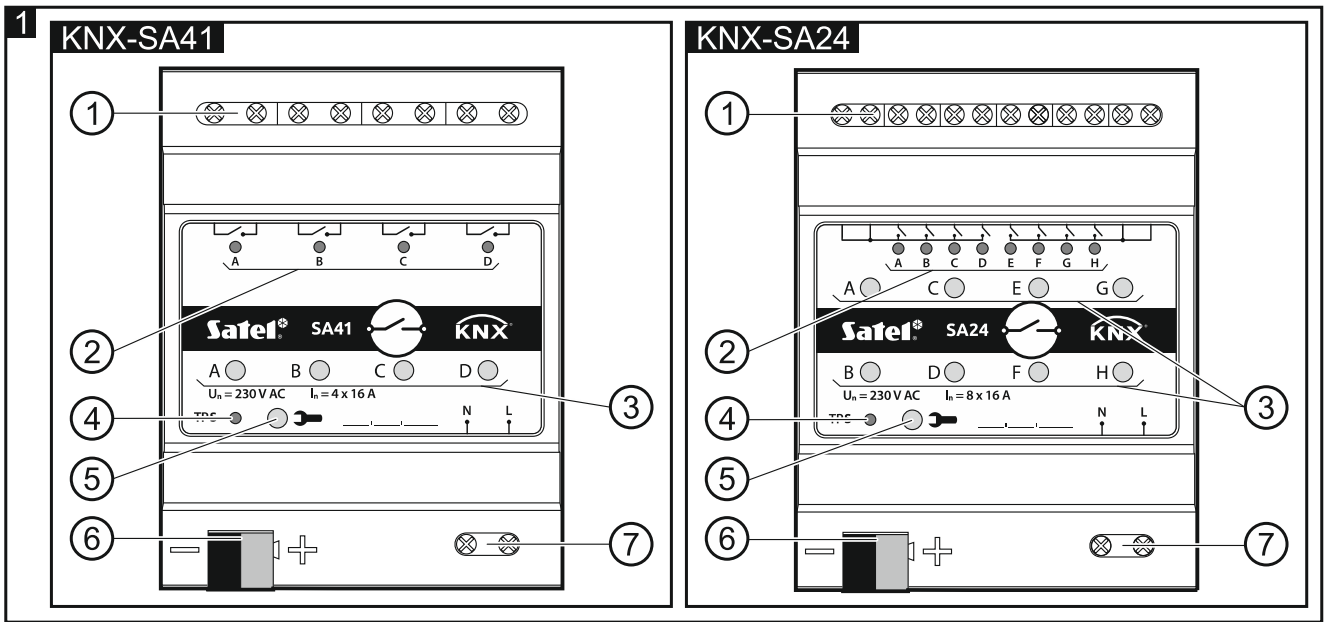
The modules differ by the number of outputs, the KNX-SA41 having four and the KNX-SA24 eight relay outputs (see “Electric diagram of relay outputs”).


Each output in the module corresponds to one logical channel. If the module is deenergized, the relays are set as NO (normally open). After energizing the module, polarity of the relays will be set as defined for the given channel. A change of the physical state of relays (outputs) takes place by adjusting the channel logic state to the defined polarity. The whole functionality described in this manual refers to the logic state and is identical in both modules.

1. Features

- Communication with KNX bus via integrated bus connector.
- Feedback on the state of module and individual channels.
- Behavior of each channel can be defined in case of KNX bus voltage loss and recovery.
- Behavior of each channel can be defined in case of mains voltage recovery.
- Time functions (flashing, on/off delay, staircase light function with advance warning option and operating time change).
- Logic functions (AND, NAND, OR, NOR, XOR, XNOR).
- Threshold value function.
- Safety functions.
- State forcing functions.
- Scenes for each of the channels can be called up by using 1- and 8-bit commands.
- Manual control of each channel state by using buttons situated on enclosure.
- Status LEDs for each channel.
- Mounted in distribution boxes, on DIN rail (35 mm).
- Module configuration using ETS software.
- Capability of switching between resistive, inductive and capacitive loads.

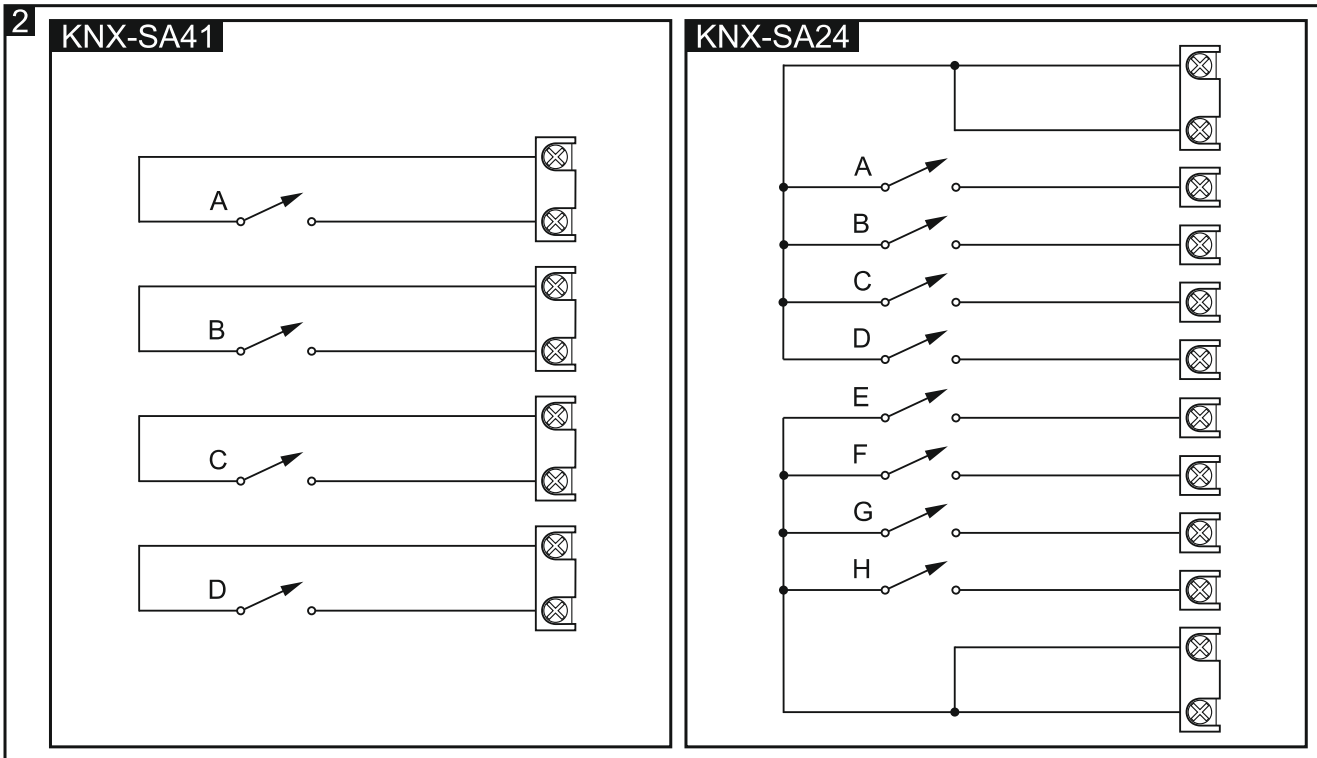
2. Description



- ① load circuit terminals for connecting loads (2 terminals per channel).
 - ② green LEDs indicating the channel state. One channel state LED is assigned to each channel:
ON – channel enabled,
OFF – channel disabled.
 - ③ buttons to manually change the channel state. One ON/OFF button is assigned to each channel.
- i** *The manual change of channel state is monitored by the module. The values of communication objects responsible for storing information about the current state of individual channels are systematically updated, according to the changes made.*
- The buttons are also used to restore the module factory default settings (see “Restoring the module factory default settings”).*
- ④ red LED – is ON when physical address is being set using the ETS program. Setting the address may be activated remotely from the ETS program or manually, using the  button on the enclosure.
 - ⑤ programming button (used when setting the physical address).
 - ⑥ terminal to connect KNX bus.
 - ⑦ mains supply terminals.

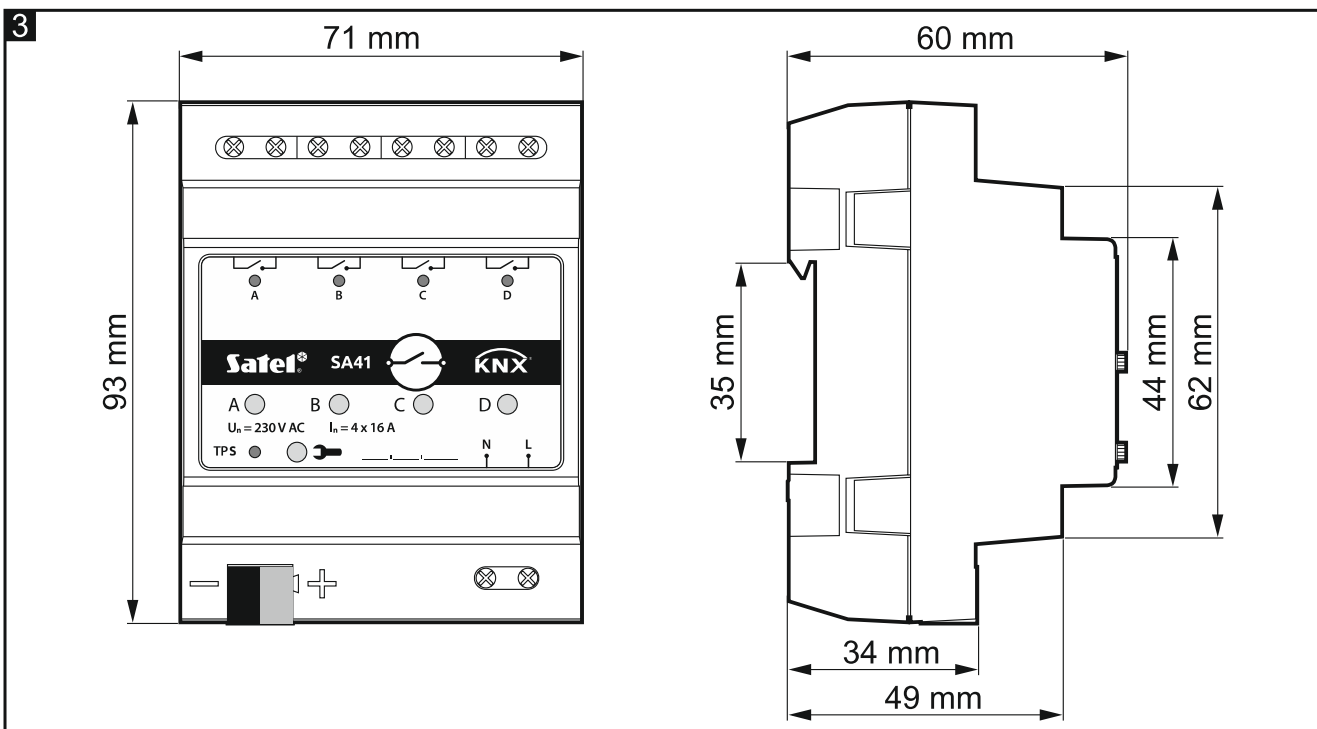
2.1 Electric diagram of relay outputs

The KNX-SA41 and KNX-SA24 modules differ by the number of independent circuits and the number of relays per each of these circuits. The KNX-SA41 has 4 independent circuits with 1 relay per circuit, while the KNX-SA24 has 2 independent circuits with 4 relays per circuit (Fig. 2).



Information on what is the number of circuits and relays in the module is contained in the module symbols (KNX-SA41/KNX-SA24). The first digit in the symbol means the number of circuits in the module, and the second – the number of relays per one circuit.

2.2 Enclosure



PCB of the KNX SA41 and KNX SA24 modules is mounted in enclosures, which have identical shape and dimensions. The enclosures only differ by their panels for manual control of channel state. In the figure 3, the enclosure dimensions are presented based on the example of KNX-SA41 module. The module occupies 4 units on the DIN rail (35 mm).

3. Installation



Disconnect power before making any electrical connections.

The module is designed for indoor installation, in spaces with normal air humidity, e.g. in distribution boxes on 35 mm DIN rail.

1. Mount the module on mounting rail.
2. Use the connecting terminal to connect KNX bus cable to the module.
3. Connect the loads to load circuit terminals.
4. Connect module power to N and L terminals.



All connections should be made in accordance with the wiring diagram for the given module (see “Wiring diagram”).

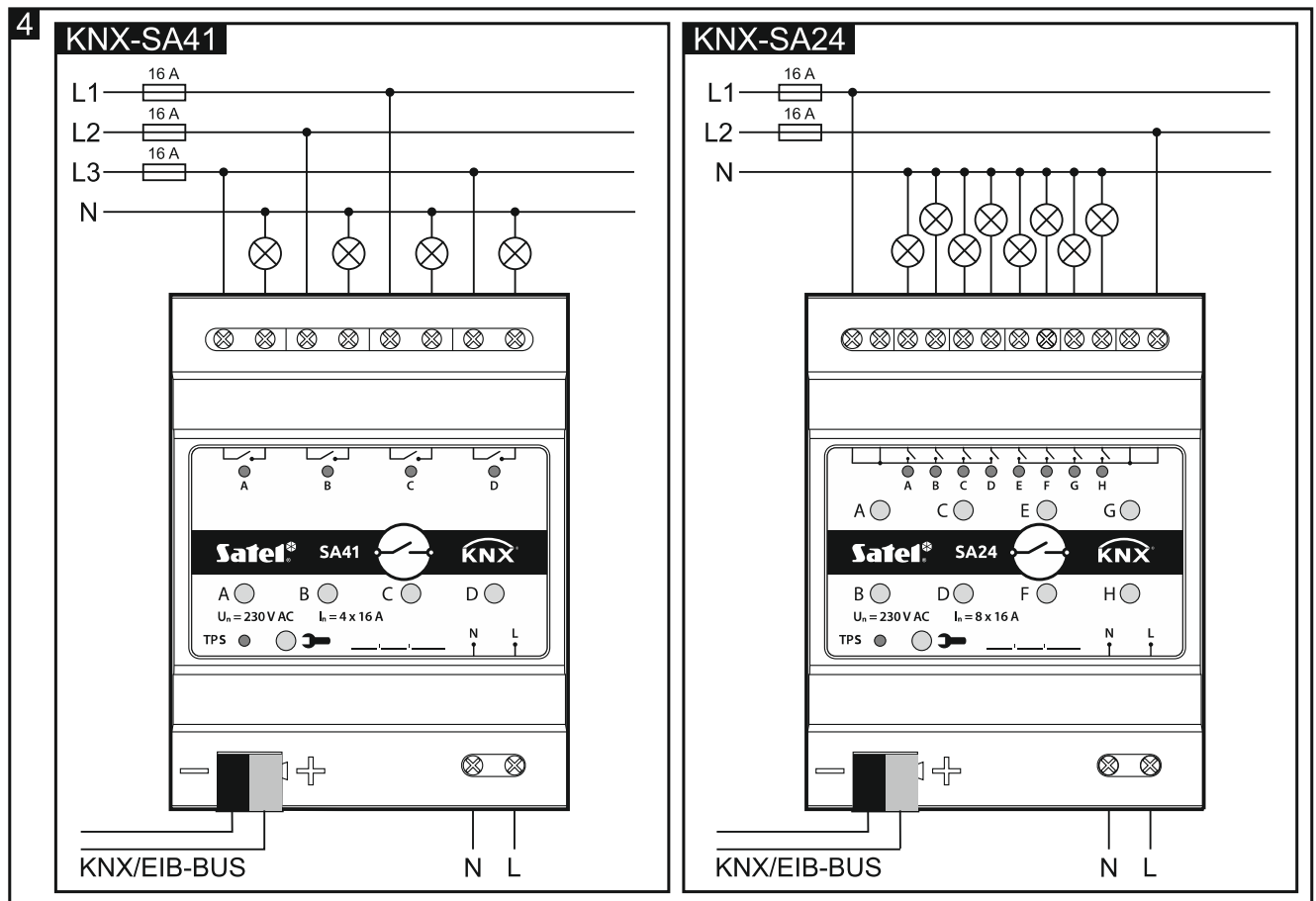
5. Connect a computer running ETS program to the KNX bus and configure the module.



To configure the module, you will require a computer running the ETS program version 5.5 or newer, provided with USB or Ethernet (TCP/IP) connector. The SATEL ETS application file, which can be downloaded from www.satel.eu/ets, must be imported into the program.

For detailed information on how to configure the module, refer to section “Configuring the module”.

3.1 Wiring diagram



4. Configuring the module

Working parameters of the module are defined in the ETS program (version 5.5 or higher). The tabs for defining individual parameters are built dynamically. Depending on the selected options, further parameters may be displayed in the tabs or further tabs may be displayed when defining parameters. Moving the cursor over the selected parameter will display a tooltip with default value or value range for that parameter.

The module has two groups of configuration parameters. The first group includes global parameters which define general functionality of the module, but have no immediate effect on individual channels (see “Configuring global parameters”). The second group includes parameters assigned to the channel. These parameters have direct effect on how the channel will react to functions activated in the module, how its state will change (see “Configuring channels”).

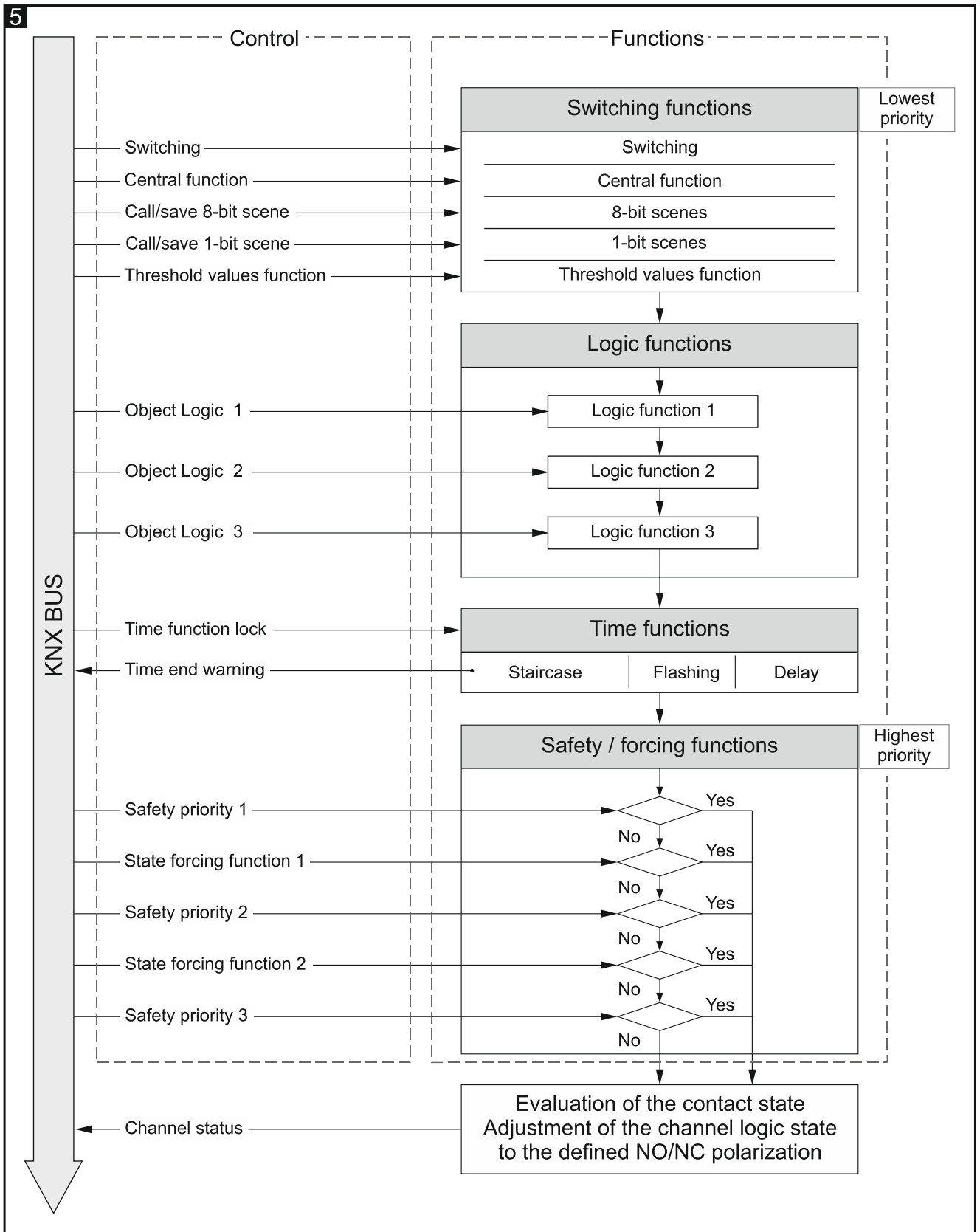
4.1 Function priorities

The order in which functions can change the module channel state depends on the priority the given function has (Fig. 5). The highest priority functions are safety functions and state forcing functions. Priorities of the other functions have been set in the following order: time functions, logic functions, and switching functions, where the switching functions have the lowest priority (see the diagram below). A higher priority function can change the channel state that has been set by a lower priority function.



The lower priority functions cannot control the channel state as long as a higher priority function is active.

Example. If the “Safety priority 1” is activated when the “Flashing” time function is running, the time function will be terminated, and the channel state will be set by the safety function. However, in the event the channel state has been set by the “Safety priority 1”, the “Flashing” time function cannot change the channel state.



4.2 Configuring global parameters

Main operating parameters of the module are defined in the “Global” tab, which is presented below.

Global		Startup delay	<input type="text" value="00:00:00"/>	hh:mm:ss
+ Channel A		Interval of cyclic device status sending	<input type="text" value="00:00:00"/>	hh:mm:ss
+ Channel B		Central function	<input checked="" type="radio"/> Disable <input type="radio"/> Enable	
+ Channel C		Safety	<input checked="" type="radio"/> Disable <input type="radio"/> Enable	
+ Channel D				

Startup delay – time period by which the module startup will be delayed after power-on. Value 00:00:00 will disable the delay.

During the delay period the telegram handling is stopped and the channels do not change their state. The module sends no telegrams to the KNX bus. After the delay expires, the telegrams are sent and the state of channels is set according to the parameters defined. If any telegrams are received from communication objects during the delay period, they will be stored. Replies to these telegrams are sent after expiry of the delay time.



The startup delay may be used to reduce load on the KNX bus and supply circuit after power-on.

Interval of cyclic device status sending – frequency with which a telegram is sent to the bus by the “Device operation status” communication object with the module status information. Information contained in the telegram makes it possible to monitor the module operation by other devices on the KNX bus. Value 00:00:00 disables the sending.



Sending telegrams may be enabled either permanently, for continuous monitoring of the module operation, or during testing only. If you do not want to load the bus with an excessive number of telegrams, you can set the sending cycle time at the highest possible value.

Central function – enables / disables the central function in the module (Disable / Enable). Enabling the function will enable the “Switch function” communication object, which makes it possible to control all the module channels. Each channel can respond in different way to the state change of that object. Reaction of the channel is defined by means of the “Reaction on central” parameter.

Safety – enables / disables the safety function in the module (Disable / Enable). Enabling the function will enable the “Safety priority 1” communication object and display the “Safety” tab.

4.2.1 Safety

You can define 3 “Safety priority n (n = 1, 2, 3)” objects. Reaction to a change of safety object state can be defined for each channel.



Remember that safety functions have the highest priority. The channel state set by such a function can only be changed by another safety function or state forcing function, provided these functions will have higher priority (see “Function priorities”).

You can define the monitoring time for each object. If a telegram with value opposite to the activating value is received during the monitoring time, the time will run from the beginning (reset). If no telegram is received during the monitoring time, the safety object will be activated.

Description of parameters

Global	Number of safety functions	<input type="text" value="1"/>
Safety	Trigger for safety telegram 1	<input type="radio"/> off <input checked="" type="radio"/> on
- Channel A	Monitoring time 1	<input type="text" value="00:00:00"/> hh:mm:ss

Number of safety functions – the number of safety functions that can be activated in the module (by default = 1, maximum = 3). Selecting values 2 and 3 will display next “Trigger for safety telegram” and “Monitoring time” parameters to enable you to define the functions 2 and 3. This will enable the “Safety priority 2” and “Safety priority 3” communication objects.

Trigger for safety telegram 1/2/3 – value of the telegram that triggers the safety function 1/2/3:

off – 0 = activates function, 1 = resets monitoring time.

on – 1 = activates function, 0 = resets monitoring time.

Monitoring time 1 – time of monitoring the safety object 1/2/3. With disabled monitoring (value in the field set at 00:00:00), the safety function will only be activated after receiving the triggering telegram.



Make sure that the monitoring time is at least three times longer (as good practice dictates) than the time defined for cyclically sending telegrams by the sensor. This prevents the safety function from being triggered, when the triggering telegram fails to be received in time because of the excessive bus load.

You can define channel reaction to the safety function using the “Reaction on safety 1/2/3” parameter.

4.3 Configuring channels

How a channel will change its status depends on the parameters defined for the channel. Each channel of the module has the same group of parameters. How to define the parameters has been discussed based on the example of channel A. Presented below is the “General” tab for defining the parameters.

Global	Polarity	<input checked="" type="radio"/> NO <input type="radio"/> NC
Safety	Reaction to KNX bus failure	last set from bus
- Channel A	Reaction to KNX bus recovery	last set from bus
General	Reaction to supply mains recovery	off
+ Channel B	Reaction on central	as central object value
+ Channel C	Reaction on safety 1	on
+ Channel D	Interval of cyclic channel state sending	00:00:00 hh:mm:ss
	Logic	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
	Time	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
	Scene 1-bit	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
	Scene	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
	Threshold	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
	State forcing	<input checked="" type="radio"/> Disable <input type="radio"/> Enable

Polarity – polarity defines how the physical state of the relay will change in relation to the logic state of the channel:

NO – 0 = relay open, 1 = relay closed,

NC – 1= relay open =, 0= relay closed.

Physical polarity of relays for each channel in the module can be set at NO (normally open) or NC (normally closed). When the module power is off, the relays in the module are set as NO. After power-on, physical polarity of relays is set according to the value defined by the “Polarity” parameter.

Reaction to KNX bus failure – channel reaction to the bus power supply loss (off / on / last value set from bus [the channel will be switched to the state set by the last telegram from the bus]).

Reaction to KNX bus recovery – channel reaction to the bus power recovery (off / on / last value set from bus [the channel will be switched to the state set by the last telegram from the bus]).

Reaction to supply mains recovery – channel reaction to the mains supply recovery (off / on / last value set from bus [the channel will be switched to the state set by the last telegram from the bus]).



The parameter defines initial state of the channel, after starting the module. Restart of the device is also treated as the supply voltage loss. It should be remembered that each change of settings in the ETS program will force restart of the module.

Reaction on central – channel reaction to a change of state of the “Switch function” communication object (no reaction / as central object value [the channel will be switched to the state corresponding to the value saved in the communication object] / inversed central object value [the channel will be switched to the state opposite to the value saved in the communication object]).

i After the central function is off, the channel will remain in the set state until the state is changed by another telegram from the bus.

Reaction on safety 1/2/3 – channel reaction to a change of state of the safety object 1/2/3. For each of the three definable safety objects you can set a different channel reaction (no reaction, on, off).

i After the safety function is off, the channel remains in the set state until the state is changed by another telegram from the bus.

Interval of cyclic channel state sending – frequency with which a telegram with information on the channel state is sent to the bus. The telegram is sent by the “Channel status” communication object. Information contained in the telegram allows the channel state to be controlled by other devices on the KNX bus. Value 00:00:00 will disable the cyclic sending of information.

Logic – enable / disable the logic functions in the channel (Disable / Enable). Enabling the function will enable the “Logic 1” communication object and display the “Logic” tab in the program.

Time – enable / disable the time functions for the channel (Disable / Enable). Enabling the function will enable the “Disable time functions” communication object and display the “Time” tab in the program.

Scene 1-bit – enable / disable the option to define the 1-bit scenes for the channel (Disable / Enable). Enabling the 1-bit scenes will enable the “Call scene 1-bit” communication object and display the “Scene 1-bit” tab in the program.

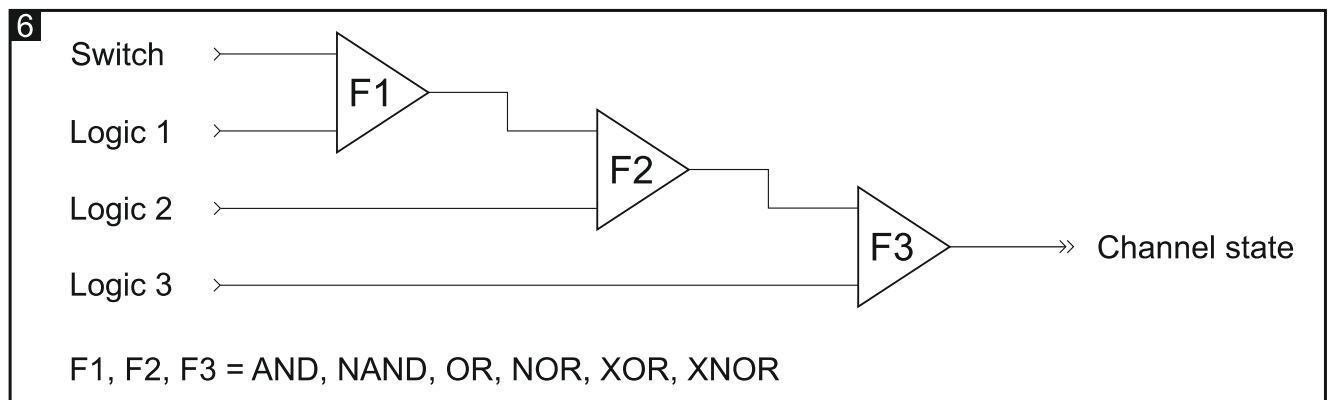
Scene – enable / disable the possibility to define scenes for the channel (Disable / Enable). Enabling the scenes will enable the “Scene” communication object and display the “Scene” tab in the program.

Threshold – enable / disable the threshold function in the channel (Disable / Enable). Enabling the function will enable the “Input for threshold value” communication object and display the “Threshold” tab in the program.

State forcing – enable / disable the state forcing function in the channel (Disable / Enable). Enabling the function will enable the “Forced state 1” and “Forced state 2” communication objects and display the “State forcing” tab in the program.

4.3.1 Logic

Logic functions allow the channel to be controlled by means of multiple communication objects. 3 logical links can be defined for each channel. Using the available AND, NAND, OR, NOR, XOR, XNOR logic functions, you can create a combinatorial function, in which the signal received from the “Switch” switching function (see “Function priorities”) will be linked to the signal from the other communication objects: “Logic 1”, “Logic 2”, “Logic 3” (where: X - channel symbol). The channel state will be the result of defined connections (see the figure below).



Description of parameters

Global	Number of logic functions	1
Channel A	Logic 1: function	and
General	Logic 1: initial value	off
Logic		

Number of logic functions – the number of logic functions used to control the channel state (by default = 1, maximum = 3). Selecting values 2 and 3 will display further fields in the tab to define the logic functions 2 and 3. This will enable the “Logic 2” and “Logic 3” communication objects.

Logic 1/2/3: function – type of function (AND / NAND / OR / NOR / XOR / XNOR).

Logic 1/2/3: initial value – initial value for the “Logic 1/2/3” communication object (off / on / last value set from bus [the channel will be switched to the state set by the last telegram from the bus]).

4.3.2 Time

3 time functions are available in the module:

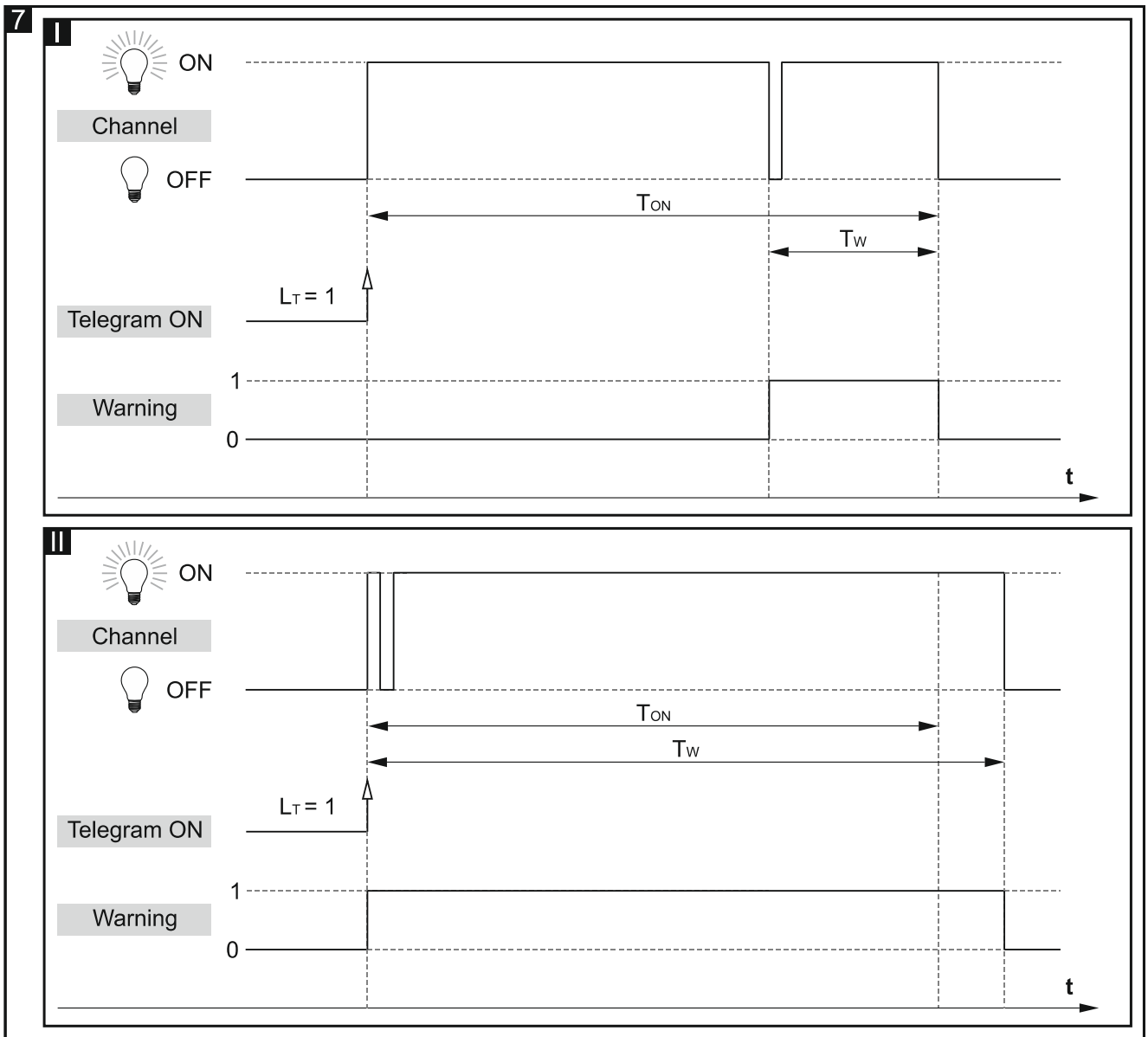
- Staircase light.
- ON/OFF delay.
- Flashing.

The “Disable time functions” communication object, which is enabled by enabling the time functions, makes it possible to disable these functions in the channel. When the object is set to “1”, running the time functions in the channel is stopped. The channel becomes off and its state can only be changed by other functions. The channel state can be changed by the time function only after the object is set to “0”.

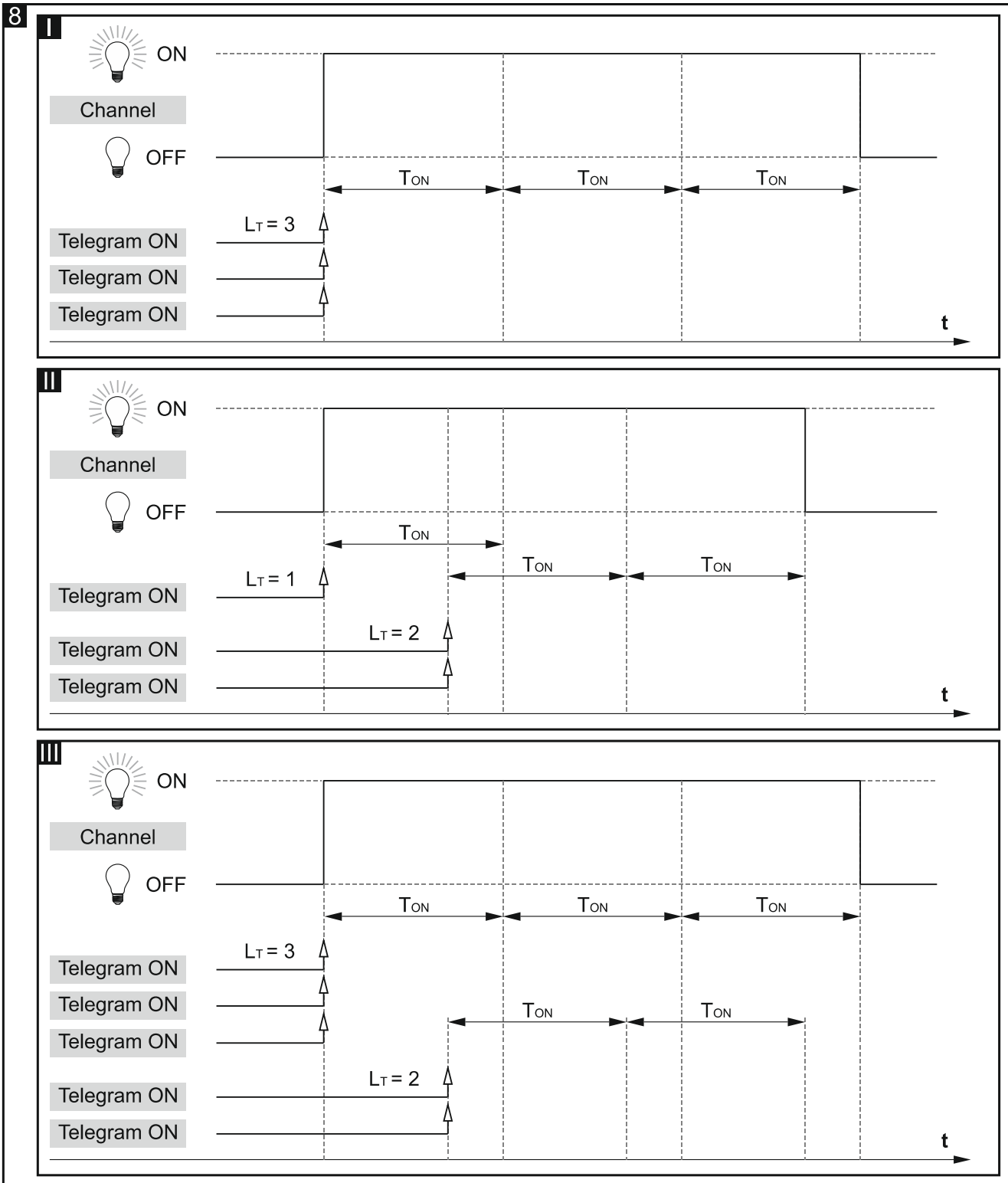
Staircase light

You can define the following parameters:

- the time T_{ON} during which the channel (and the staircase lighting) will be on (Fig. 7-I). With the “Duration set from bus” option enabled, the channel ON time can be changed from the bus using the “Staircase duration” communication object.
- warning against the coming switch-off in the form of:
 - special “Staircase warning” group object,
 - momentary switch-off/ switch-on of the channel,
 - both methods at the same time,
- warning duration T_W , which defines how long the warning will be activated before the channel is switched off (Fig. 7-I). If the time T_W is longer than the time T_{ON} , switching on the channel will activate the warning, and the channel will be ON for the time T_W (Fig. 7-II).

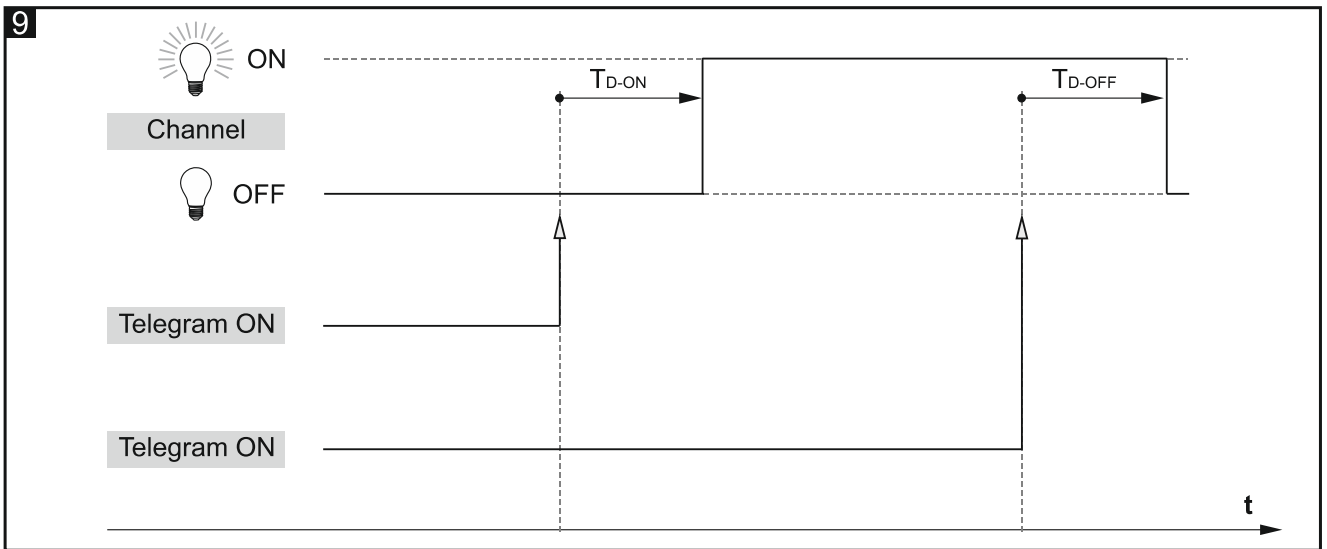


- number of telegrams L_T that can prolong the channel ON time. If the channel is switched off, each successive telegram will extend the channel ON time by the time T_{ON} (Fig. 8-I). Figures 8-II & 8-III show how the channel will react to telegrams when it is switched on.



ON/OFF delay

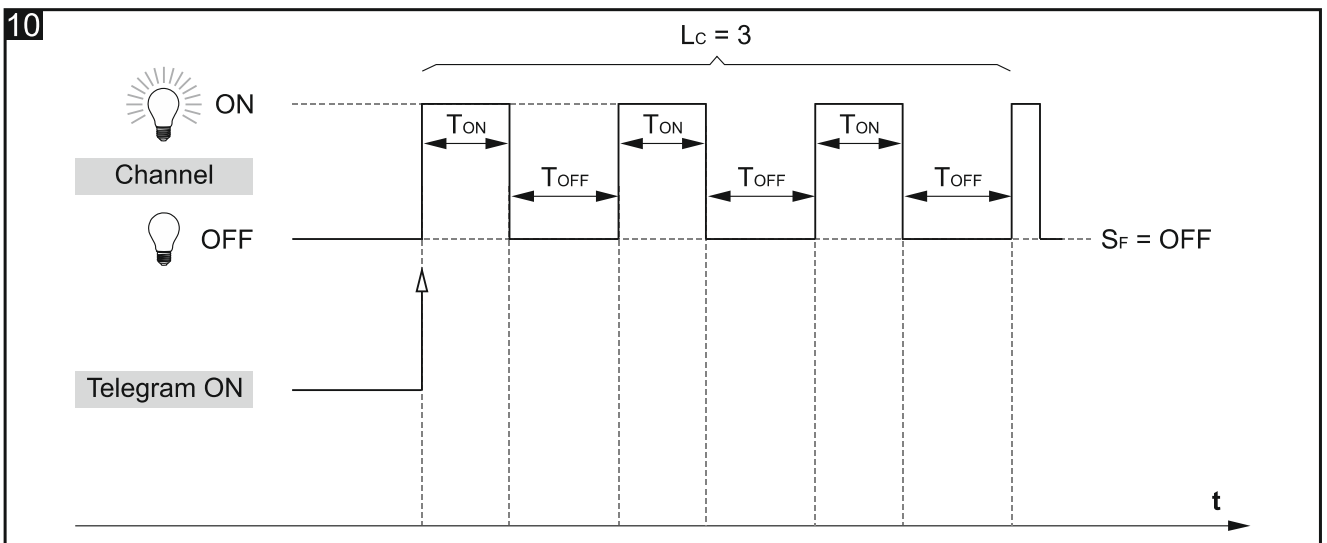
The time which is to elapse from receiving the control telegram to changing the channel state. If, during the delay countdown, the channel receives another telegram with ON/OFF value, the delay time will run from the beginning. The figure 9 shows how the function operates (where: T_{D-ON} = ON delay time, T_{D-OFF} = OFF delay time).



Flashing

The flashing function enables the channel to be defined so as to cyclically change its state (Fig. 10). The following parameters can be defined in the function:

- value of the telegram which triggers the function,
- number of cycles (flashes) L_C ,
- time during which the channel is to remain on T_{ON} and off T_{OFF} ,
- state S_F to which the channel is to be changed after the function execution is completed.



Description of parameters

Global	Function	Staircase
- Channel A	Control	ON=1; OFF not possible
General	Default duration	00:00:00 hh:mm:ss
Time	Duration set from bus	<input checked="" type="radio"/> no <input type="radio"/> yes
+ Channel B	Maximum number of repeats	1
+ Channel C	Warning method	none
+ Channel D		

Function – you can select from:

Staircase – enables the channel to be on for defined time (see “Staircase”).

On/Off delay – defines the time which is to elapse from receiving the control telegram to changing the channel state (see “ON/OFF delay”).

Flashing – enables the channel state to be changed cyclically (see “Flashing”).

Different parameters are displayed for each time function.

Staircase

Control – value of the control telegram:

ON=1; OFF=0 – telegram with the value “1” switches on, “0” switches off the channel.

ON=0; OFF=1 – telegram with value “0” switches on, “1” switches off the channel.

ON=1; OFF not possible – telegram with value “1” switches on, switching off the channel is impossible.

ON=0; OFF not possible – telegram with value “0” switches on, switching off the channel is impossible.

Default duration – time during which the channel will be on (00:00:00 - 18:12:15 [hh:mm:ss]).

Maximum number of repeats – the number of telegrams which can extend the time during which the channel will be on (0 – 100 telegrams).

Duration set from bus – selecting the “Yes” option will enable the “Staircase duration” communication object, which allows the “Staircase” function duration to be changed from the bus. The following parameter will be displayed:

Duration value – you can select how the initial value is to be set:

default – value defined in the “Default duration” field.

last set from bus – value that was set by the last telegram from the bus. If the object value has not been changed by a telegram from the bus, default value from the “Default duration” field will be set.

Warning method – how the device is to warn the user that the channel will be switched off (staircase lighting will be switched off) soon:

none – the channel will be switched off without warning.

via object – warning by means of the “Staircase duration” special communication object. If the object is set to “1”, warning will be activated. When the warning time elapses, the object is set to “0”.

via output flashing – warning by changing the channel state (off/on).

via object and output flashing – warning using the two methods at the same time.

Selecting any option other than “none” will display the following field:

Warning duration – duration of the warning that the channel will be switched off soon.



If the value entered in the field is higher than 0, the staircase lighting duration will be extended by this value.

ON/OFF delay

Global	Function	On/Off delay	
- Channel A	On delay	00:00:00	hh:mm:ss
General	Off delay	00:00:00	hh:mm:ss
Time			

On delay – time that must elapse from receiving the telegram with “switch on” value to switch on the channel (00:00:00 - 18:12:15 [hh:mm:ss]).

Off delay – time that must elapse from receiving the telegram with “switch off” value to switch off the channel (00:00:00 - 18:12:15 [hh:mm:ss]).

Flashing

Global	Function	Flashing	
- Channel A	Trigger	on & off	
General	On duration	00:00:00	hh:mm:ss
Time	Off duration	00:00:00	hh:mm:ss
+ Channel B	Number of cycles	1	
+ Channel C	Channel state on completion	initial state	
+ Channel D			

Trigger – telegram value that must be received by the “Switch” object so as to activate the flashing function for the channel:

on & off – telegrams with value “1” or “0” can activate the flashing function.

on – telegram with value “1” will activate the flashing function, telegram with value “0” will end it.

off – telegram with value “0” will activate the flashing function, telegram with value “1” will end it.

On duration – time for which the channel will be on during the cycle (00:00:00 - 18:12:15 [hh:mm:ss]).

Off duration – time for which the channel will be off during the cycle (00:00:00 - 18:12:15 [hh:mm:ss]).

Number of cycles – number of cycles (flashes) during which the channel will be switched from one state to the other (1-100).



When defining the number of cycles you must keep in mind that an excessive number of switchovers may significantly reduce the life of relay contacts.

Channel state on completion – the channel state after the flashing function ends:

initial state – the channel will be switched to the state in which it was before activating the function.

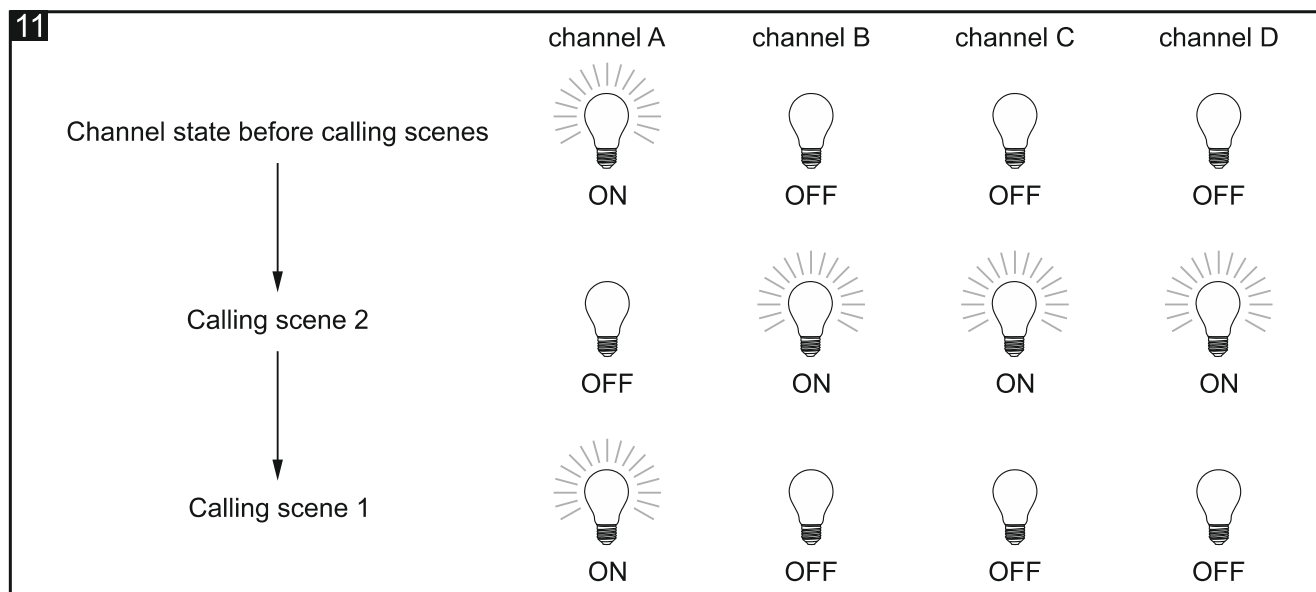
on – channel will be on.

off – channel will be off.

4.3.3 Scene 1-bit

For each channel in the module, reaction to two 1-bit scenes can be defined. These scenes are activated by a 1-bit telegram. Telegram with value “0” will activate the first scene and telegram with value “1” – the second scene. The figure 11 shows how you can use 1-bit scenes to control the state of channels (e.g. in lighting scenes). By defining appropriately reaction of the channels to the first scene, you can undo the changes made by the second scene:

- initial state of the channels before calling up the scenes: A – ON, B, C and D – OFF;
- reaction of the channels to calling up the scene 2: A – OFF, B, C and D – ON;
- reaction of the channels to calling up the scene 1: A, B, C and D – set value from before the scene 2.



Channel can learn 1-bit scenes from the bus. Selecting the learning option when configuring will activate the “Channel A set scene (1-bit)” communication object, which allows for storing the 1-bit scenes. If the object receives a telegram with value “0”, the current channel state will be assigned to the first scene. Telegram with value “1” will assign the current channel state to the second scene.

Description of parameters

Global	Reaction to scene 1 (tel.=0)	no change
Channel A	Reaction to scene 2 (tel.=1)	no change
General	Learning 1-bit scenes from bus	<input checked="" type="radio"/> no <input type="radio"/> yes
Scene 1-bit		

Reaction to scene 1 (tel.=0) – reaction of the channel after receiving a telegram with value “0” from the “Call scene 1-bit” communication object (no change / on / off / set value from before scene 2 [the channel will be switched over to the state set before calling up the scene number 2]).

Reaction to scene 2 (tel.=1) – reaction of the channel after receiving a telegram with value “1” from the “Call scene 1-bit” communication object (no change / on / off).

Learning 1-bit scenes from bus – selecting the “yes” option will enable the function of learning 1-bit scenes by the channel using the “Call scene 1-bit” communication object. The following parameter will be displayed:

Initial value – you can select how the initial value will be set:

default – value defined in the program. After receiving a telegram with value “0”, the value from the “Reaction to scene 1 (tel.=0)” field will be set, and after receiving a telegram with value “1”, the value from the “Reaction to scene 2 (tel.=1)” field.

last set from bus – value that was taught by the last telegram from the bus. If the object value has not been changed by the learning function, default value will be set.

4.3.4 Scene

You can define 8 scenes for each channel in the module. It will allow you to manage up to 32 different scenes in the KNX-SA41 module and 64 scenes in the KNX-SA24 module when using one group address. Communication with all participants linked in scenes takes place via the same group address. Consequently, one telegram is sufficient to call up or save a scene. Such a telegram contains the number of the scene and information on whether the scene is to be called or the learning during which the current value set in the channel will be saved for the scene with this number.

The following parameters can be set for each scene:

- scene number,
- delay (time that must elapse after receiving the telegram before the scene is called up),
- channel reaction to the given scene.



Scenes make it possible to reduce the telegram traffic and relieve the bus overload. Owing to them, all information about what is to be done by participants of the scene is saved into the module memory. This information is not sent when the scene is being called up or stored. Only the telegram that calls up or stores the scene is sent.

Description of parameters

Global	Number of scenes	1
- Channel A	Learning scenes from bus	<input checked="" type="radio"/> no <input type="radio"/> yes
General	Scene 1: number	1
Scene	Scene 1: value	off
+ Channel B	Scene 1: delay	00:00:00 hh:mm:ss

Number of scenes – number of scenes assigned to the channel (up to 8). For each activated scene, a group of fields is displayed for configuration: “Scene 1...8: number”, “Scene 1...8: value” and “Scene 1...8: delay”.

Learning from bus – if you select the “yes” option, the function of learning scenes by the channel will be enabled. The “Scene” communication object will be able not only to call up

the given scene, but also to store the scene, if it receives a telegram activating the learning function. The following parameter will be displayed:

Initial value – you can select how the initial value is to be set:

default – each scene assigned to the channel has its own unique number and value defined in the “Scene 1...8: value” field. If the object receives a telegram with scene number, it will be set at the same value that has been defined for the scene with this number.

last set from bus – the value that has been taught by the last telegram from the bus. If the object value has not been changed by the learning function, the default value will be set.

Scene 1...8: number – unique number of the scene assigned to the channel.

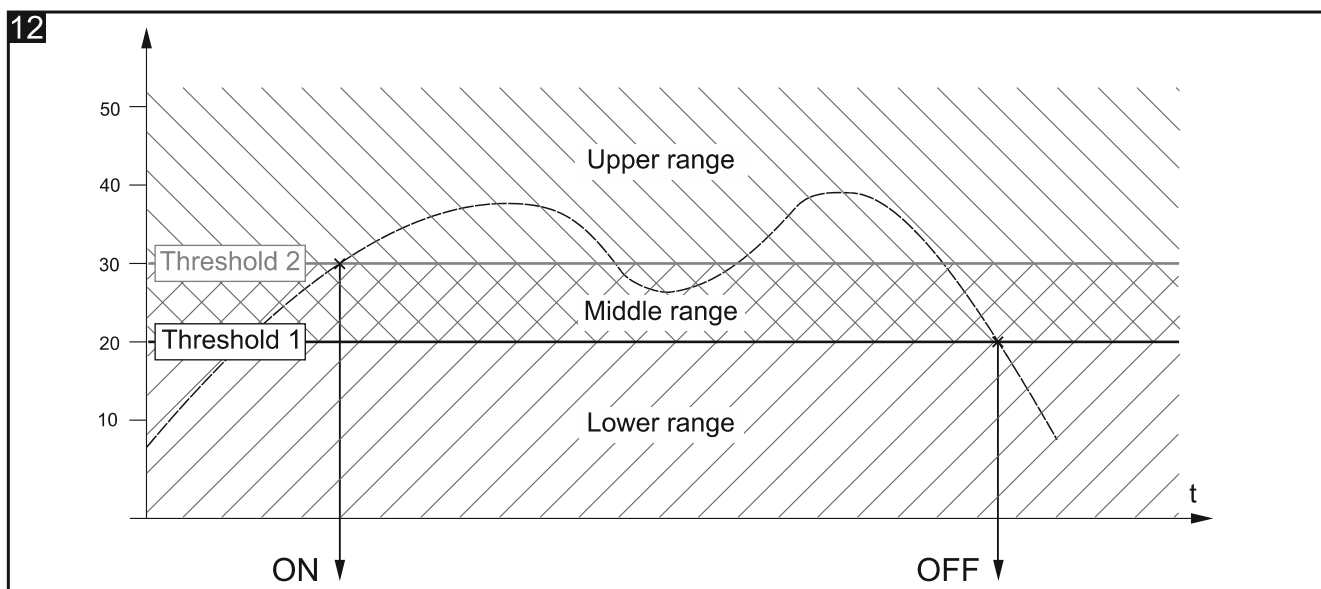
Scene 1...8: value – state of the channel that will be set after receiving a telegram with the scene number selected in the “Scene 1...8: number” field (off / on / no change).

Scene 1...8: delay – time that must elapse from receiving the telegram to switching the channel over to the state as defined for the scene.

4.3.5 Threshold

The function allows the channel state to be changed depending on how the signal input value changes. Values received from 1- or 2-byte communication objects can be analyzed in the function. Rise above / drop below the threshold defined in the function can result in a specified change of the channel state.

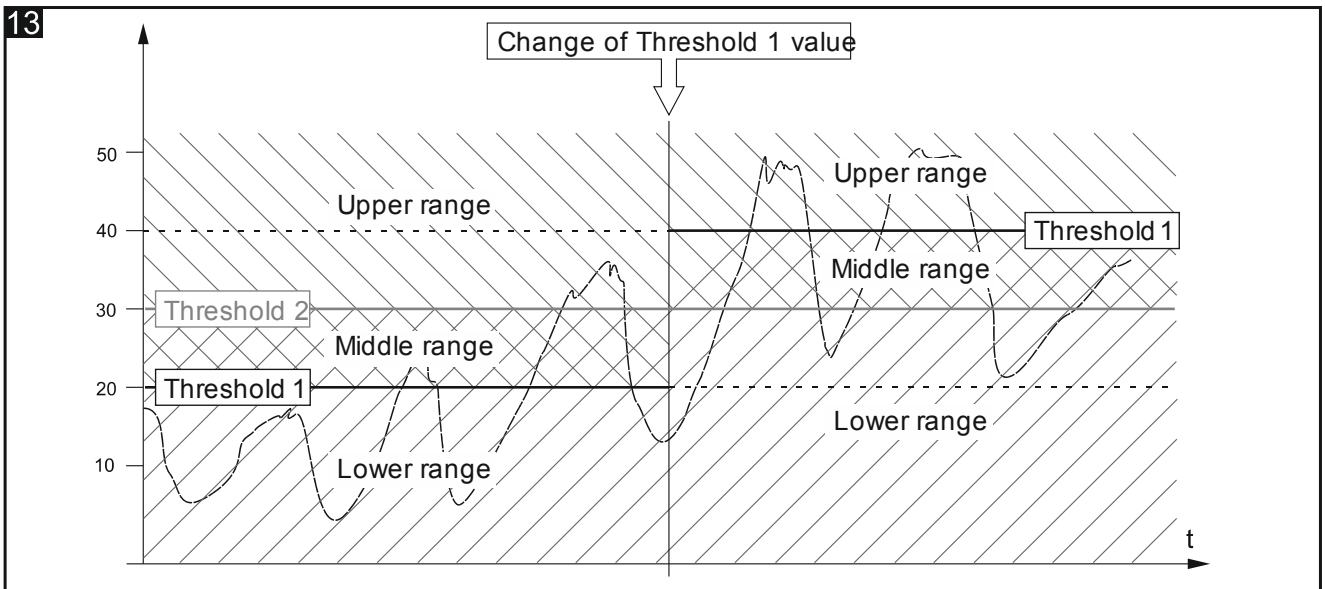
Two thresholds (upper and lower) can be defined in the function for the read values. This makes it possible to divide the whole interval of analyzed values into three ranges. You can define for each range how the channel will react (on / off / no change). By properly defining the ranges (lower – off, middle - no reaction, upper – on), you can receive the hysteresis function (Fig. 12).



Values of the individual thresholds can be changed from the KNX bus using the “Set value for threshold 1” and “Set value for threshold 2” communication objects. The objects can be enabled when defining the function.



It should be remembered that which threshold is the lower one and which is the upper one can be identified by the values defined for them, not by their names (Fig. 13).



Description of parameters

Global	Object type	<input checked="" type="radio"/> 1 byte <input type="radio"/> 2 bytes
- Channel A	Object value	<input checked="" type="radio"/> default <input type="radio"/> last set from bus
General	Object default value	0
Threshold	Threshold 1 value set from bus	<input checked="" type="radio"/> no <input type="radio"/> yes
+ Channel B	Threshold 1 default value	0
+ Channel C	Threshold 2 value set from bus	<input checked="" type="radio"/> no <input type="radio"/> yes
+ Channel D	Threshold 2 default value	0
	Channel reaction above upper threshold	off
	Channel reaction between thresholds	off
	Channel reaction below lower threshold	off

Object type – selection of the type of data which can receive the “Input for threshold value”, “Set value for threshold 1” and “Set value for threshold 2” communication objects. The type selection determines the range in which threshold values can be defined (1 byte: 0-255; 2 bytes: 0-65535).

Object value – you can select how the initial value of communication object “Input for threshold value”:

default – value defined in the “Object default value” field.

last set from bus – the value that was set by the last telegram from the bus. If the object value has not been changed by a telegram from the bus, default value from the field “Object default value” will be set.

Object default value – initial value of the “Input for threshold value” communication object (1 byte: 0-255, 2 bytes: 0-65535).

Threshold 1 value set from bus – if you select “yes”, the communication object value for threshold 1 “Set value for threshold 1” can be changed by a telegram from the bus. The following parameter will be displayed:

Threshold 1 value – you can select how the initial value will be set:

default – value defined in the “Threshold 1 default value” field.

last set from bus – value that was set by the last telegram from the bus. If the object value has not been changed by a telegram from the bus, default value from the “Threshold 1 default value” field will be set.

Threshold 1 default value – value of the communication object for threshold 1 (1 byte: 0-255, 2 bytes: 0-65535).

Threshold 2 value set from bus – if you select “yes”, the communication object value for threshold 2 “Set value for threshold 2” can be changed by a telegram from the bus. The “Threshold 2 default value” parameter will be displayed (definable in the same way as for threshold 1).

Threshold 2 default value – value of the communication object for threshold 2 (1 byte: 0-255, 2 bytes: 0-65535).


Channel reaction above upper threshold – reaction of the channel when the communication object value exceeds the value defined for the upper threshold (off / on / no change).

Channel reaction between thresholds – reaction of the channel when the communication object value is between the values defined for the lower and upper thresholds (off / on / no change).

Channel reaction below lower threshold – reaction of the channel when the communication object value drops below the value defined for the lower threshold (off / on / no change).

4.3.6 State forcing

You can define the channel reaction to change of the state of “Forced state 1” and “Forced state 2” communication objects. If any of the objects is set to “1”, the channel will be switched to the defined state and locked. The channel can only be unlocked when the object is set to “0”. After unlocking, the channel does not return to the state it was before locking.

 *The channel state set by the state forcing function can only be changed by another forcing function or by a safety function, if these functions have higher priority (see “Function priorities”).*

Description of parameters

Global	Channel reaction to forced state 1	no reaction
- Channel A	Channel reaction to forced state 2	no reaction
General		
State forcing		


Channel reaction to forced state 1 – channel reaction to a change of the “Forced state 1” communication object state (no reaction / on / off).

Channel reaction to forced state 2 – channel reaction to a change of the “Forced state 2” communication object state (no reaction / on / off).

4.4 Communication objects

4.4.1 Global objects

	Number ^	Name	Object Function	Length	C	R	W	T	U
↔	1	General	Device operation status	1 bit	C	R	-	T	-
↔	2	Central	Switch function	1 bit	C	-	W	-	-
↔	3	Safety	Safety priority 1	1 bit	C	-	W	-	-
↔	4	Safety	Safety priority 2	1 bit	C	-	W	-	-
↔	5	Safety	Safety priority 3	1 bit	C	-	W	-	-

Global communication objects				
No	Object name	Object function	Data type	Flags
1	General	Device operation status	1 bit, DPT 1.001	C, R, T
<p>The object sends cyclically a telegram to the KNX bus with information on module status. To disable the sending, enter the value 00:00:00 in the field “Interval of cyclic device status sending”, in the “Global” tab.</p> <p>Telegram: 1 = the module is running.</p>				
2	Central	Switch function	1 bit, DPT 1.001	C, W
<p>The object will be enabled, if the “Enable” option is selected for “Central function” parameter in the “Global” tab. The object allows the state of many channels to be changed by means of one 1-bit telegram from the bus.</p>				
3	Safety	Safety priority 1	1 bit, DPT 1.001	C, W
<p>The object will be enabled, if the “Enable” option is selected for “Safety” parameter in the “Global” tab. The object can receive 1-bit telegrams from the KNX bus sent cyclically by another device (e.g. flooding sensor or wind sensor). This allows you to monitor the sensor and bus operation. If, within the defined monitoring time, the object receives no resetting telegram or receives an triggering telegram, the safety function will be activated and the channel will be switched over to safety state. The channel will be locked and will not process the incoming telegrams. The channel can only be unlocked after an unlocking telegram is received by the object. If, during the monitoring time, a telegram with the value opposite to the activating value is received, the time will restart (reset).</p> <div style="border-left: 1px solid black; padding-left: 10px; margin-left: 10px;"> <p> Remember that the channel state set using this object can only be changed by the position forcing function or by a safety function having higher priority (see “Function priorities”).</p> </div>				
4	Safety	Safety priority 2	1 bit, DPT 1.001	C, W
<p>The object will be enabled, if the value 2 or 3 is selected in the “Safety” tab, “Number of safety function” field. For the other information, see the “Safety priority 1” object.</p>				

Global communication objects				
No	Object name	Object function	Data type	Flags
5	Safety	Safety priority 3	1 bit, DPT 1.001	C, W
The object will be enabled, if the value 3 is selected in the “Safety” tab, “Number of safety function” field. For the other information, see the “Safety priority 1” object.				

Flag: C – communication, R – read, W – write, T – transmit, U – update.

4.4.2 Channel objects

Communication objects for all channels are the same and have been discussed, based on the example of channel A.

	Number ^	Name	Object Function	Length	C	R	W	T	U
■ ↕	6	Channel A	Switch	1 bit	C	-	W	-	-
■ ↕	7	Channel A	Channel status	1 bit	C	R	-	T	-
■ ↕	8	Channel A	Logic 1	1 bit	C	-	W	-	-
■ ↕	9	Channel A	Logic 2	1 bit	C	-	W	-	-
■ ↕	10	Channel A	Logic 3	1 bit	C	-	W	-	-
■ ↕	11	Channel A	Disable time functions	1 bit	C	-	W	-	-
■ ↕	12	Channel A	Staircase duration	2 bytes	C	-	W	-	-
■ ↕	13	Channel A	Staircase warning	1 bit	C	R	-	T	-
■ ↕	14	Channel A	Scene	1 byte	C	-	W	-	-
■ ↕	15	Channel A	Input for threshold value	1 byte	C	-	W	-	-
■ ↕	16	Channel A	Set value for threshold 1	1 byte	C	-	W	-	-
■ ↕	17	Channel A	Set value for threshold 2	1 byte	C	-	W	-	-
■ ↕	18	Channel A	Call scene 1-bit	1 bit	C	-	W	-	-
■ ↕	19	Channel A	Set scene 1-bit	1 bit	C	-	W	-	-
■ ↕	20	Channel A	Forced state 1	1 bit	C	-	W	-	-
■ ↕	21	Channel A	Forced state 2	1 bit	C	-	W	-	-

Channel communication objects				
No	Object name	Object function	Data type	Flags
6	Channel A	Switch	1 bit, DPT 1.001	C, W
Communication object enables switching of the channel state. Telegram: relay NO: 0 = on, 1 = off relay NC: 1 = on, 0 = off				
7	Channel A	Channel status	1 bit, DPT 1.001	C, R, T
The object value shows the current state of the channel. The object sends a telegram with information on channel state to the KNX bus. The information is sent at each change of the channel state and cyclically at defined time intervals. The cyclic sending can be disabled by entering value 00:00:00 in the “Interval of cyclic channel state sending” field, in the “General” tab for defining the channel A parameters.				

Channel communication objects				
No	Object name	Object function	Data type	Flags
8	Channel A	Logic 1	1 bit, DPT 1.002	C, W
<p>The object will be started, if the “Enable” option is selected for the “Logic” parameter in the “General” tab for defining channel A parameters. Up to three logical objects can be assigned to a channel. Logical links between the objects are defined in the “Logic” tab.</p> <p>i <i>In the event of bus voltage failure, the values of “Logic 1/2/3” communication objects are saved and are restored after bus voltage recovery.</i></p> <p>See “Logic”.</p>				
9	Channel A	Logic 2	1 bit, DPT 1.002	C, W
<p>The object will be enabled, if value 2 or 3 is selected in the “Logic” tab, “Number of logic functions” field.</p> <p>See “Logic”.</p>				
10	Channel A	Logic 3	1 bit, DPT 1.002	C, W
<p>The object will be enabled, if value 3 is selected in the “Logic” tab, “Number of logic functions” field.</p> <p>See “Logic”.</p>				
11	Channel A	Disable time functions	1 bit, DPT 1.001	C, W
<p>The object will be enabled, if the “Enable” option is selected for the “Time” parameter in the “General” tab for defining channel A parameters. The object makes it possible to disable time functions in the channel. The channel state can only be changed by the next telegram sent to the “Switch” communication object.</p> <p>Telegram: 1 = Disable time functions in the channel 0 = Enable time functions in the channel</p> <p>See “Time”.</p>				
12	Channel A	Staircase duration	2 bytes, DPT 7.005	C, W
<p>The object will be enabled, if the “yes” option is selected for “Duration set from bus” parameter in the “Time” tab. The staircase duration is written into the object.</p> <p>See “Staircase”.</p>				
13	Channel A	Staircase warning	1 bit, DPT 1.001	C, R, T
<p>The object will be enabled, if the “via object” or “via object and output flashing” option is selected in the tab “Time” in the “Warning method” field. At the beginning of the warning time, the object value is set to “1”. This value is only changed to “0” when the warning time has elapsed.</p>				

Channel communication objects				
No	Object name	Object function	Data type	Flags
See "Staircase".				
14	Channel A	Scene	1 byte DPT 17.001 DPT 18.001	C, W
<p>The object will be enabled, if the "Enable" option is selected for the "Scene" parameter in the "General" tab for defining channel A parameters. The object makes it possible to send a 1-byte telegram which can call a scene or activate the scene learning function. Such a telegram contains the scene number (1-64) and information on whether the scene is to be called up, or the current channel state is to be assigned to the scene.</p> <p>See "Scene".</p>				
15	Channel A	Input for threshold value	1 byte DPT 5.* 8-bit unsigned value 2 bytes DPT 7.* 2-byte unsigned value	C, W
<p>The object will start, if the "Enable" option is selected for the "Threshold" parameter in the "General" tab for defining channel A parameters. In the "Threshold" tab, you can define what type of data the object can receive (1-byte, values 0-255; 2-bytes, values 0-65535). If you select the "last set from bus" in the "Object value" field, the object value can be changed by the bus.</p> <p>See „Threshold“.</p>				
16	Channel A	Set value for threshold 1	1 byte DPT 5.* 8-bit unsigned value 2 bytes DPT 7.* 2-byte unsigned value	C, W
<p>The object will start, if the "yes" option is selected for the "Threshold 1 set from bus" parameter in the "Threshold" tab for channel A. Which type of data can be received by the object depends on the type of data defined in the tab (1-byte, values 0-255; 2-bytes, values 0-65535).</p> <p>See „Threshold“.</p>				
17	Channel A	Set value for threshold 2	1 byte DPT 5.* 8-bit unsigned value 2 bytes DPT 7.* 2-byte unsigned value	C, W
<p>The object will start, if the "yes" option is selected for the "Threshold 2 set from bus" parameter in the "Threshold" tab for, channel A. Which type of data can be received by the</p>				

Channel communication objects				
No	Object name	Object function	Data type	Flags
object depends on the type of data defined in the tab (1-byte, values 0-255; 2-bytes, values 0-65535). See „Threshold”.				
18	Channel A	Call scene 1-bit	1 bit, DPT 1.001	C, W
The object will be enabled, if the “Enable” option is selected for the “Scene 1-bit” parameter in the “General” tab for defining channel A functions. The object allows to call up 1-bit scenes assigned to the channel. Telegram: 0 = activates the first scene. 1 = activates the second scene. See “Scene 1-bit”.				
19	Channel A	Set scene 1-bit	1 bit, DPT 1.001	C, W
The object will be enabled, if the “yes” option is selected for the “Learning 1-bit scenes from bus” parameter in the “Scene 1-bit” tab for channel A. The object enables the current channel state to be assigned to the scene. Telegram: 0 = current channel state will be assigned to the first scene. 1 = current channel state will be assigned to the second scene. See “Scene 1-bit”.				
20	Channel A	Forced state 1	1 bit, DPT 1.001	C, W
The object will be enabled, if the “Enable” option is selected for the “State forcing” parameter in the “General” tab for channel A. The object makes it possible to change the channel state and lock it to prevent any new change. The channel state to be set is defined in the “State forcing” tab, “Channel reaction to forced state 1” field. The channel state can only be changed again after the object receives an unlocking telegram. Receiving the telegram does not restore the channel state from before the locking. The state will only be changed after receiving a telegram from the bus. Telegram: 1 = change state and lock 0 = unlock See “State forcing”.				
21	Channel A	Forced state 2	1 bit, DPT 1.001	C, W
See object “Forced state 1”.				

Flag: C – communication, R – read, W – write, T – transmit, U – update.

4.5 Restoring the module factory default settings

1. Disconnect the module from KNX bus.
2. Power off the module.
3. Power on the module again.
4. Press simultaneously the four channel state control buttons situated on the module enclosure (see "Description"). For the KNX-SA24 module, use the control buttons grouped in the upper row of buttons (A,C,E,G) to reset memory. The indicator LEDs situated above the buttons will go on.
5. Hold down the buttons until the indicator LEDs go off (about 10 seconds). The module will restart with restored factory default settings.
6. Connect the module to KNX bus.

5. Specifications

Power supply

Supply voltage	230 VAC
Maximum power consumption	5 W
KNX bus voltage	20...30 VDC
Current consumption from KNX bus	<10 mA

Number of relay outputs

KNX-SA41 (4 independent circuits with 1 relay per circuit)	4
KNX-SA24 (2 independent circuits with 4 relays per circuit)	8

Relays

Rated load (capacity):

AC1	16 A / 250 VAC
AC15	3 A / 120 V 1.5 A / 240 V (B300)
AC3	750 W (single-phase motor)
DC1	16 A / 24 VDC
DC13	0.22 A / 120 V 0.1 A / 250 V (R300)

Minimum switching current.....10 mA

Maximum inrush current.....168 A 20 ms; 800 A 200 µs

Rated current 16 A

Maximum breaking capacity in AC1 category 4 000 VA

Maximum operating frequency:

at rated load in AC1 category	600 cycles/hour
no load	3 600 cycles/hour

Electrical life (number of cycles):

resistive AC1, 600 cycles/hour	>10 ⁵ 16 A / 250 VAC
resistive DC1, 600 cycles/hour	>10 ⁵ 16 A / 24 VDC
AC3, I = 3.5 A	>2.5 x 10 ⁵
at incandescent lamp load, 1000 W	>0.9 x 10 ⁵

Connections

Maximum wire cross-section.....2.5 mm²

Maximum tightening torque.....0.5 Nm

KNX parameters

Maximum time of reaction to telegram..... <20 ms

Maximum number of communication objects KNX-SA41/KNX-SA24 69/133

Maximum number of group addresses..... 256

Maximum number of associations 256

Mechanical parameters

Operating temperature range..... 0°C...+45°C

Storage/transport temperature range.....-25°C...+70°C

IP code.....IP20

Number of units on DIN rail..... 4

Enclosure dimensions.....70 x 92 x 60 mm

Weight

KNX-SA41..... 192 g

KNX-SA24..... 240 g

5.1 Maximum output loads

Resistive load 3680 W

Capacitive load 16 A, max. 200 µF

5.2 Maximum output loads for lighting

Incandescent lamps 1000 W

HV 230V halogen lamps 3680 W

LV halogen lamps:

inductive transformer..... 2000 VA

electronic transformer 2500 W

Fluorescent lamps:

non compensated..... 3680 W

parallel compensated 2500 W, 200 µF

series compensated 3680 W, 200 µF

Compact fluorescent lamp (CFL):

non compensated..... 3680 W

parallel compensated 2500 W, 200 µF

High-pressure mercury lamps:

non compensated..... 3680 W

parallel compensated 3680 W, 200 µF



Exceeding the limit values of the module working parameters may damage the module and pose hazard to human health or life.