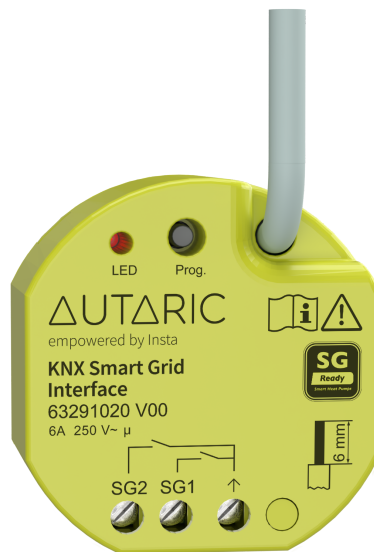


KNX Smart Grid Interface

Art. no. 63291020



Product documentation



Product image non-binding

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1 Information on the product

1.1 Product catalogue

Product name:	KNX Smart Grid Interface
Use:	Interface
Design:	FM
Art. no.	63291020

1.2 Function

The KNX Smart Grid Interface evaluates information about the energy balance of the PV system, smart meter and the KNX and uses these data to control the operating states of heat pumps via the standardised Smart Grid Ready interface. The direct connection to the PV system or smart meter is made via potential-free contacts.

Potential-free switches, push-buttons or other contacts (e.g. magnetic contacts) can be connected to inputs that are not used for connection to a PV system or a smart meter. The inputs can then transmit individual telegrams for switching or dimming for venetian blind control or value transmitter use (dimming value transmitter, light scene extension, colour or colour temperature value transmitter).

In addition, the device has 8 internal logic functions. Using these functions, logic gates (e.g. AND, OR, exclusive OR, each with up to 4 inputs) can be set up and thus switching and status information can be linked and evaluated. Alternatively, a 1-bit to 1-byte converter and a disabling element with filter and time functions can be configured for each logic function. As a further option, comparators or limit value switches with hysteresis can be set as a logic function.

The logic functions have their own KNX communication objects and can process telegrams of the actuator or of other bus devices.

The device can be updated. Firmware can be easily updated with the Insta ETS Service app (additional software).

The device is KNX Data Secure capable. KNX Data Secure offers protection against manipulation in building automation and can be configured in the ETS project. Detailed technical knowledge is required. A device certificate, which is attached to the device, is required for safe commissioning. During mounting, it is recommended to remove the certificate from the device and to store it securely.

Planning, installation and commissioning of the device are carried out with the aid of the ETS, version 5.7.7 and above or of the ETS6.

The device electronics are supplied exclusively from the bus voltage.

1.3 Device components

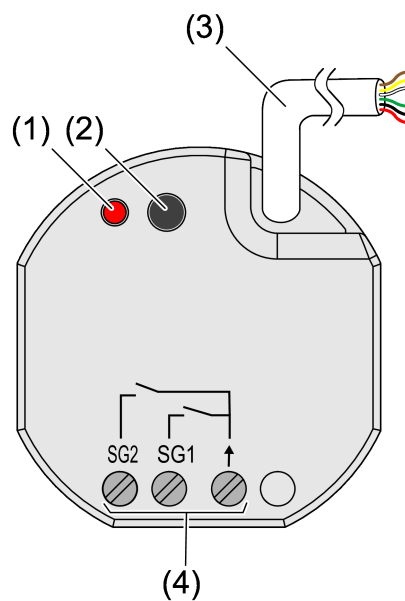


Figure 1: Device components

- (1) Programming LED
- (2) Programming button
- (3) Control cable (KNX connection and extension inputs)
- (4) Heat pump connection (relay outputs)

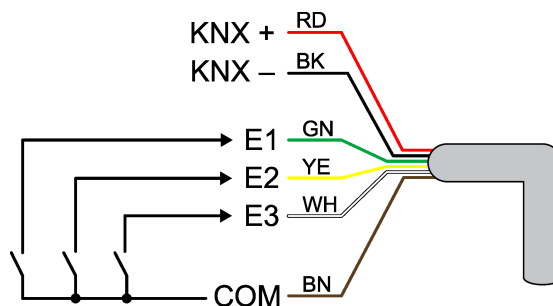


Figure 2: Connection assignment of control cable (example)

- | | |
|-------------|---------------------------|
| Red (RD) | KNX + |
| Black (BK) | KNX - |
| Green (GN) | Input 1 (contact, switch) |
| Yellow (YE) | Input 2 (contact, switch) |
| White (WH) | Input 3 (contact, switch) |
| Brown (BN) | COM inputs 1...3 |

1.4 Technical data

Ambient conditions

Ambient temperature	-5 ... +45°C
Storage/transport temperature	-25 ... +70°C

Inputs

Control cable (preassembled)	YY6x0.6
Input type	For potential-free contacts (SELV)
Number	3
Total length of extension device cable	Max. 10 m
Cable type (preferably)	J-Y(St)Y
Scanning voltage, extension inputs	Approx. 5 V

Outputs

Connection mode	Screw terminals
Switching voltage	AC 250 V ~
Switching current AC	Max. 6 A

Clampable conductor cross-section

Single stranded	0.5 ... 4 mm ²
Finely stranded without conductor sleeve	0.5 ... 4 mm ²
Finely stranded with conductor sleeve	0.5 ... 2.5 mm ²
Connection torque for screw terminals	Max. 0.8 Nm
Dimensions Ø×H	approx. 50 x 28 mm

KNX

KNX medium	TP256
Commissioning mode	S mode
Rated voltage KNX	DC 21 ... 32 V SELV
KNX current consumption	5 ... 18 mA
KNX connection mode	Device connection terminal on control cable

1.5 Accessories

Installation housing	Art. no. 52192021
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2 Safety instructions

To avoid potential damage, read and follow the following instructions:



Installation only by persons with relevant knowledge and experience in the following areas:

- Five safety regulations and standards for the installation of electrical systems
- Selection of suitable tools, measuring devices, installation materials and, if necessary, personal protective equipment
- Installation of the installation material
- Connection of devices to the building installation under consideration of local connection conditions

Improper installation endangers your own life and the lives of people using the electrical system and there is a risk of serious damage to property, e.g. through fire. You are at risk of personal liability for personal injury and damage to property.

Consult an electrically skilled person.

Danger of electric shock. During installation and cable routing, comply with the regulations and standards that apply to SELV circuits.

Danger of electric shock at the installation. Do not connect any external voltage to the inputs. The device can become damaged, and the SELV potential on the bus line will no longer be available.

Danger of electrical shock. Make sure there is always sufficient insulation between the mains voltage and the bus during the installation. A minimum distance of at least 4 mm must be maintained between bus conductors and mains voltage cores.

Read the instructions in full, observe them and keep them for future reference.

3 Mounting and electrical connection



DANGER!

Electric shock when live parts are touched.

Electric shocks can be fatal.

Always disconnect before carrying out work on the device or load. To do so, switch off all corresponding circuit breakers, secure them against being switched on again and check that there is no voltage. Cover up any adjacent live parts.



DANGER!

When connecting the bus/extensions and mains voltage wires in a shared appliance box, the KNX bus line may come into contact with the mains voltage.

This endangers the safety of the entire KNX installation. People at remote devices may also receive an electric shock.

Do not place bus/extensions and mains voltage terminals in a shared connection compartment. Use an appliance box with a fixed partition wall or separate appliance boxes.

Connecting and fitting the device

Flush mounting in a suitable appliance box (6) (recommendation: electronic appliance box with partition (7)) with suitable cover (see figure 3). Observe the cable routing and spacing (see figure 6)!

Installation in sub-distribution unit on DIN rail according to DIN EN 60715 or dado trunking with Installation housing (see Accessories chapter).

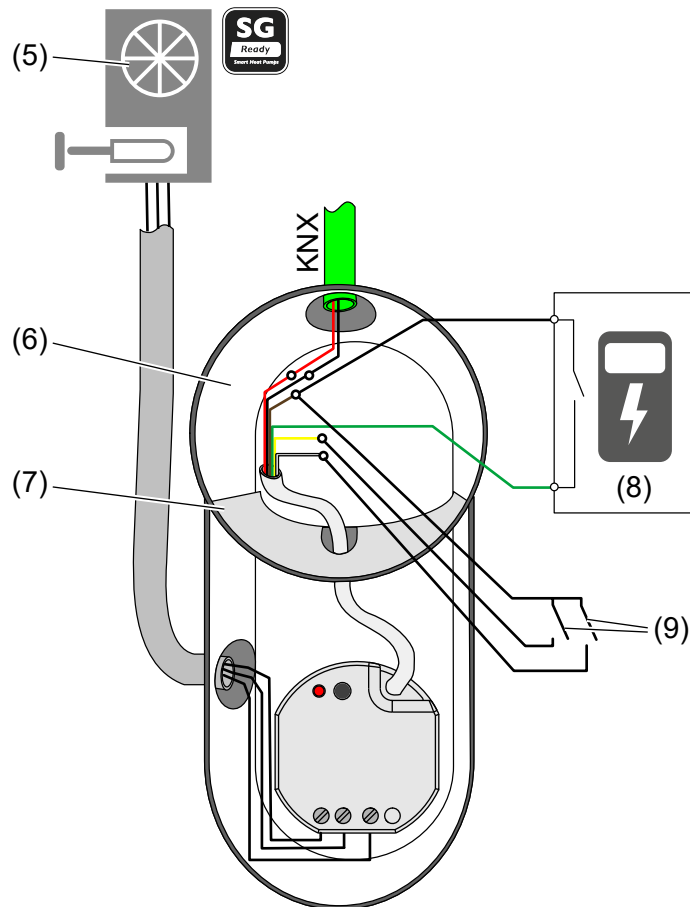


Figure 3: Mounting example, application 1

- (5) Smart Grid Ready heat pump
- (6) Appliance box
- (7) Partition
- (8) Potential-free contact*, inverter without Smart Grid Ready interface
- (9) Additional potential-free contact* (optional)

* The contacts must be suitable for SELV circuits.

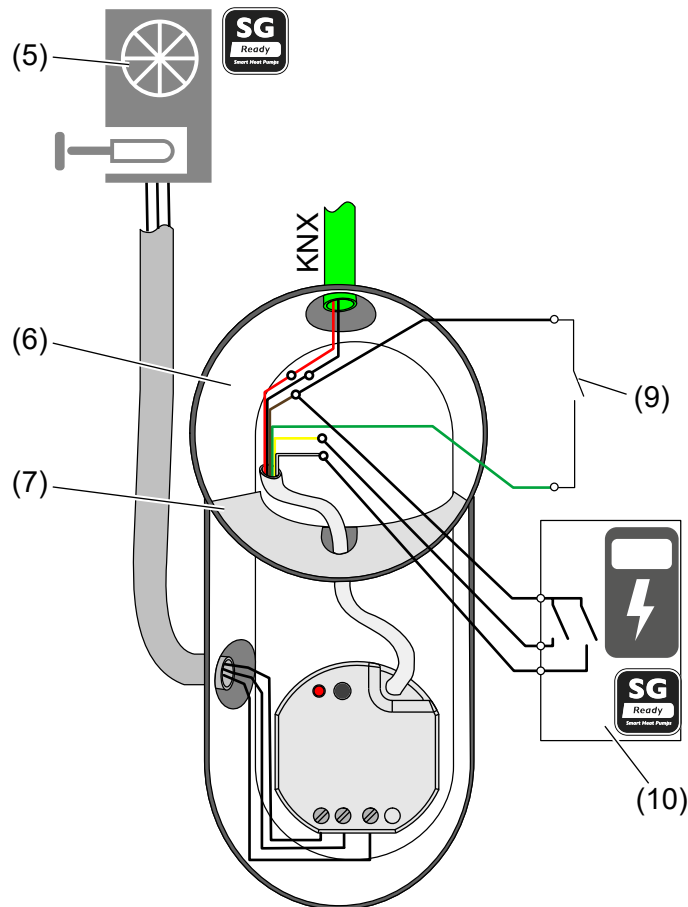


Figure 4: Mounting example, application 2

- (5) Smart Grid Ready heat pump
- (6) Appliance box
- (7) Partition
- (8) Potential-free contact*, inverter without Smart Grid Ready interface
- (9) Additional potential-free contact* (optional)
- (10) Potential-free contacts*, inverter with Smart Grid Ready interface

* The contacts must be suitable for SELV circuits.

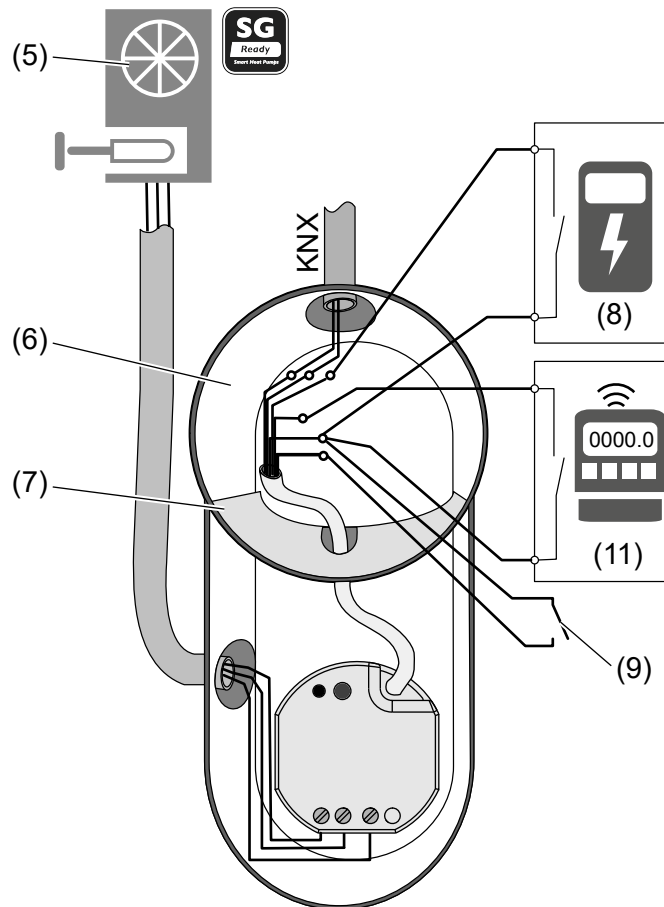


Figure 5: Connection example, application 3

- (5) Smart Grid Ready heat pump
- (6) Appliance box
- (7) Partition
- (8) Potential-free contact*, inverter without Smart Grid Ready interface
- (9) Additional potential-free contact* (optional)
- (11) Potential-free contact*, Smart Meter

* The contacts must be suitable for SELV circuits.

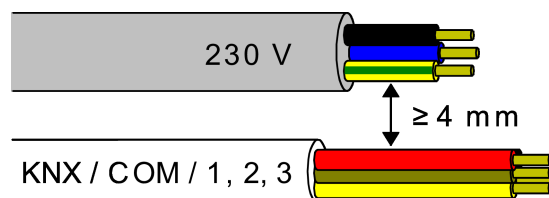


Figure 6: Cable spacing

Minimum spacing between the mains voltage and bus/extension wires: min. 4 mm

Observe the ambient temperature. Ensure sufficient cooling.

- Connect the device to KNX with the correct polarity (see figure 2).

Connection application 1

- Connect the Smart Grid Ready interface of a heat pump (5) to the outputs **SG1** and **SG2** (see figure 1).
- Connect the potential-free contact of an inverter without a Smart Grid Ready interface (8) to **E1** and **COM** (see figure 2).
- If necessary, connect the potential-free contacts (9) to **E2**, **E3** and **COM** (see figure 2).
- Mount the device (see figure 3).
- In secure operation, the device certificate must be removed from the device and stored securely.

Connection application 2

- Connect the Smart Grid Ready interface of a heat pump (5) to the outputs **SG1** and **SG2** (see figure 1).
- Connect the Smart Grid Ready interface of an inverter (10) to **E2**, **E3** and **COM** (see figure 4).
- If required, connect the potential-free contact (9) to **E1** and **COM** (see figure 4).
- Mount the device (see figure 4).
- In secure operation, the device certificate must be removed from the device and stored securely.

Connection application 3

- Connect the Smart Grid Ready interface of a heat pump (5) to the outputs **SG1** and **SG2** (see figure 1).
- Connect the potential-free contact of an inverter without a Smart Grid Ready interface (8) to **E1** and **COM** (see figure 5).
- Connect the potential-free contact of a smart meter (10) to **E2** and **COM** (see figure 5).
- Connect the potential-free contact (9) to **E3** and **COM** (see figure 5).
- Mount the device (see figure 5).
- In secure operation, the device certificate must be removed from the device and stored securely.

4 Commissioning

Commissioning the device



NOTICE!

Undefined relay state upon delivery.

Undefined control of the connected heat pump.

Before switching on the heat pump during commissioning, ensure that all relay contacts are open by applying the KNX bus voltage. Observe the commissioning sequence!

- Switch on the KNX bus voltage.
- Wait approx. 10 seconds.
- Switch on the heat pump.

i Delivery status: application 1 PV surplus, control of outputs SG1 and SG2 via contact at input 1. Inputs 2 and 3 have no function.

Input	Contact	SG1	SG2	Heat pump operating status
1	Open	Open	Open	2
1	Closed	Closed	Closed	4
2	---	---	---	---
3	---	---	---	---

Table 1: Function of the inputs in the as-delivered state

Loading the physical address and application program

- Press the programming button.
The programming LED lights up.
- Load the physical address and application program with the ETS.

Safe-state mode

The safe-state mode stops the execution of the loaded application program.

i Only the system software of the device is still functional. ETS diagnosis functions and programming of the device are possible.

Activating safe-state mode

- Switch off the bus voltage or disconnect the device from the KNX.
- Wait approx. 10 seconds.
- Press and hold down the programming button.
- Switch on the bus voltage or activate the device at KNX. Release the programming button only after the programming LED starts flashing slowly.

Safe-state mode is activated.

The programming mode can also be switched on and off in the safe-state mode as usual by briefly pressing the programming button again. The programming LED stops flashing if the programming mode is active.

Deactivating safe-state mode

- Switch off bus voltage (wait approx. 10 seconds) or carry out the ETS programming process.

Master reset

The master reset restores the default device settings (physical address 15.15.255, firmware is retained). The device must then be recommissioned with the ETS.

In secure operation: A master reset deactivates the device security. The device can then be recommissioned with the device certificate.

Performing a master reset

Prerequisite: Safe-state mode is activated.

- Press the programming button for more than 5 seconds.
The programming LED flashes quickly.

The device performs a master reset, restarts and is ready for operation again after approx. 5 seconds.

Restoring the device to factory settings

Devices can be reset to factory settings with the Insta ETS Service app. This function uses the firmware contained in the device that was active at the time of delivery (delivered state). Restoring the factory settings causes the devices to lose their physical address and configuration.

5 Application programs

ETS search paths	AUTARIC / Smart Grid Interface
Name	Smart Grid Interface C02B21
Version	2.1 for ETS5 from Version 5.7.7 onwards and ETS6
Mask version	SystemB (07B0)
Summarized description	Application for connecting heat pumps with Smart Grid Ready interface to KNX

6 Scope of functions

General

- KNX Data Secure capable.
- Control of heat pumps with Smart Grid Ready interface.
- Operating modes PV surplus, SG-Ready or grid serviceability can be parameterised.
- Functions of the inputs pre-defined depending on the operating mode.
- Non-defined inputs for connecting potential-free switches, push-buttons or contacts (e.g. magnetic contacts).
- Up to 8 independent logic functions for the implementation of simple or complex logic operations.
- Updateable with Insta ETS Service app.

Inputs

- Depending on the ETS parameterisation, the inputs either act internally on the relay outputs of the SG Ready interface or, alternatively, separately on the KNX.
- Individually adjustable functions for the inputs with effect on the KNX (switching, dimming, venetian blind, value transmitter, scene extension, 2-channel operation, controller extension, no function).
- Switching: Command adjustable when closing and opening the contact (no reaction, ON, OFF, TOGGLE). Presetting of the behaviour after bus voltage return possible.
- Dimming: Dimming of brightness and / or colour temperature. Command when closing the contact, time between switching and dimming, dimming in different steps, telegram repetition in case of long signal at the input and sending of a stop telegram at the end of the dimming process can be configured. Presetting of the behaviour after bus voltage return possible.
- Venetian blind: Command when closing the contact and operating concept parameterisable. Times for short and long signal at input and slat adjustment adjustable. Presetting of the behaviour after bus voltage return possible.
- Value transmitter: Functionality as 1-byte, 2-byte, 3-byte or 6 -byte value transmitter incl. colour temperature and colour value transmitter possible. Individually configurable values. Optionally, a value adjustment is possible with a long signal at the input (not with the 6-byte value transmitter) and the specification of the behaviour after bus voltage return.
- Scene extension: The operating mode (with or without storage function) and the scene number is adjustable.
- 2-channel operation: When closing the contact at the input, up to two telegrams can be sent out on the KNX. Operating concept adjustable (channel 1 only or channel 2 / both channels). The functioning of the channels (1-bit, 1-byte, 2-byte, 3-byte, 6-byte) can be configured separately.

- Controller extension: The function (operating mode selection, forced operating mode switch-over, presence function and setpoint shift) is adjustable.

Logic functions

- The device has 8 internal logic functions in addition to controlling the heat pump and the inputs.
- Logic gates (e.g. AND, OR, exclusive AND, exclusive OR, each with up to 4 inputs).
- 1-bit to 1-byte converter with input filter, disabling object and presetting of the output values.
- Disabling element with filter and time functions and disabling object.
- Comparator for values with 9 different input data formats and many comparison operations.
- Limit switch with hysteresis with upper and lower threshold for 9 different input data formats. Incl. presetting of the 1-bit output values.
- The logic functions have their own KNX communication objects and can process telegrams of the KNX Smart Grid Interface or other bus devices.

7 Notes on software

7.1 As-delivered state

In the as-delivered state of the KNX Smart Grid Interface, no telegrams are transmitted to the KNX. The relay contacts of the SG-Ready interface are opened when the bus voltage is applied (corresponding to operating state 2, normal operation). The KNX Smart Grid Interface is operated in the "PV surplus" application. If the contact at extension input **E1** is closed, the SG-Ready interface then switches to operating state 4 (start-up command) without any additional waiting time.

The device can be programmed and put into operation via the ETS. The physical address is preset to 15.15.255.

- i** The application program can be unloaded with the ETS. In this case, the device has no function on the part of KNX. Internal control of the SG-Ready interface via input **E1** is then possible like in the as-delivered state.

7.2 Behaviour in case of restart

The states of the input communication objects and any elapsed times for switching the operating states are not permanently saved in KNX Smart Grid Interface.

All input communication objects are initialised with the value 0 if the KNX Smart Grid Interface is restarted after the bus voltage returns or commissioning with the ETS. The relay contacts of the SG-Ready interface are opened when the bus voltage is applied (corresponding to operating state 2, normal operation). The KNX Smart Grid Interface checks the states of the extension inputs according to the parameterised application. Depending on the states of the extension inputs, the SG-Ready interface then switches to the corresponding operating state without any additional waiting time. Monitoring of the minimum and maximum times of the operating modes is then started.

8 Control of the heat pump

The use of renewable energy sources with photovoltaics and heat pumps is an essential part of reducing heating costs in the long term and adapting to future energy requirements. At the same time, the increase in heat pumps can lead to an increased load on the electricity grid. There are various ways of optimising electricity consumption, including storing thermal energy in the building.

If higher electricity consumption is expected in the electricity grid in the coming hours, the energy supply companies can temporarily switch off the heat pumps of customers with the corresponding electricity tariffs or limit the output of the heat pump.

If sufficient electricity is available from a photovoltaic system, the heat pump can switch to boosted operation or store additional energy in a buffer using an electric heating element.

The Smart Grid Ready interface has been defined for this control.

8.1 Smart Grid Ready interface

Four operating states have been defined for heat pumps with a Smart Grid Ready interface:

Operating state 1	Switch off the heat pump (3 times a day for max. 2 hours)
Operating state 2	Normal operation
Operating state 3	Start-up recommendation for boosted operation (internal controller of the heat pump decides)
Operating state 4	Start-up command Variant 1: switching on the heat pump Variant 2: higher setpoint temperature or use of heating element

Table 2: Smart Grid Ready operating states

Operating states 1, 3 and 4 remain active for at least 10 minutes after activation and can be reactivated after deactivation after 10 minutes at the earliest. Premature activation is tracked after the 10 minutes have elapsed.

The four operating states are controlled via the two switching contacts SG1 and SG2.

	Position SG1	Position SG2
Operating state 1	Closed	Open
Operating state 2	Open	Open
Operating state 3	Open	Closed
Operating state 4	Closed	Closed

Table 3: Switching position of outputs SG1 and SG2

8.2 Application of the KNX Smart Grid Interface

The commercially available inverters for photovoltaic systems, heat pumps and smart meters offer different functions and connections. Different restrictions may also apply to the tariffs of the power supply companies. This also opens up different possibilities for the use of KNX Smart Grid Interface.

To adapt to individual conditions, KNX Smart Grid Interface offers three basic configurations with various pre-settings and customisation options:

- In application 1 (PV surplus), KNX Smart Grid Interface offers a simple way of using an inverter without a Smart Grid Ready interface to generate as much heat as possible from the available solar energy with the heat pump. A simple potential-free switching contact of the inverter is sufficient for this purpose. Alternatively, the operating status can also be switched via KNX by means of a simple switching command.
- In application 2 (SG-Ready mode), the KNX Smart Grid Interface offers the option of connecting a smart meter with Smart Grid Ready interface to the heat pump. The states of the Smart Grid Ready interface can both be transferred to KNX and overridden by KNX.
- In application 3 (PV surplus + SG Ready mode + grid serviceability), the KNX Smart Grid Interface offers the most flexible option for switching between the operating states of the Smart Grid Ready interface via three potential-free contacts. Here too, the states of the Smart Grid Ready interface can both be transferred to KNX and overridden by KNX.

In all cases, the parameters of the KNX Smart Grid Interface should be adapted and set with the specifications of the manufacturers of the other devices.

8.3 PV surplus

Application 1 (PV surplus) is used for inverters without a Smart Grid Ready interface.

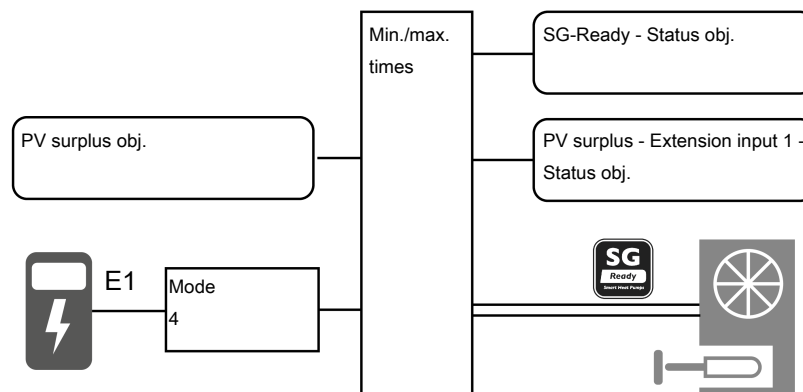


Figure 7: PV surplus application

The outputs of KNX Smart Grid Interface are connected to the Smart Grid Ready interface of a heat pump.

The switching contact of an inverter without a Smart Grid Ready interface is connected to extension input E1. Alternatively, the KNX Smart Grid Interface can receive the information via the "PV surplus" communication object. The extension input and the communication object are equivalent. The last command (whether via KNX or E1) is executed.

If there is a PV surplus, the KNX Smart Grid Interface switches to operating state 4. At the end of the PV surplus, the KNX Smart Grid Interface switches back to operating state 2.

The prescribed time limits are monitored internally each time the operating status changes. Early activation is carried out after the prescribed waiting period has expired.

The KNX Smart Grid Interface sends the current SG-Ready operating state via the 1-byte communication object "SG-Ready - Status" each time a change is made.

Extension inputs E2 and E3 can be used for any application in KNX. (see chapter "General settings" ▶ Page 29)

8.4 SG Ready mode

Application 2 (SG-Ready mode) is used for inverters with a Smart Grid Ready interface.

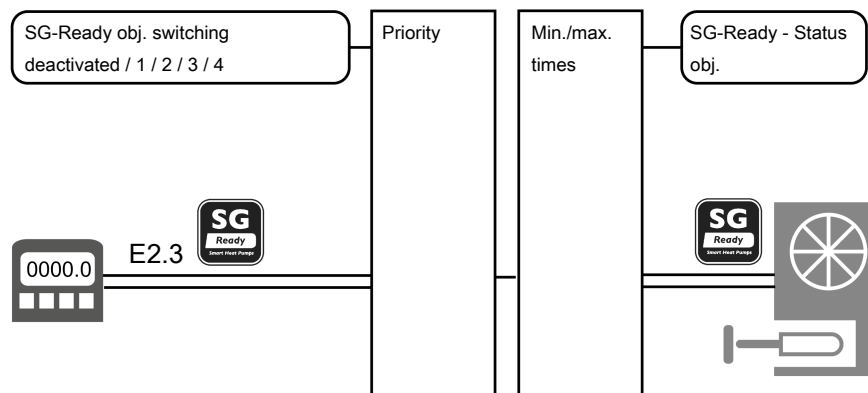


Figure 8: SG-Ready mode application

The outputs of KNX Smart Grid Interface are connected to the Smart Grid Ready interface of a heat pump.

The Smart Grid Ready interface of an inverter is connected to extension inputs E2 and E3. Alternatively, the KNX Smart Grid Interface can also receive the information via the "SG-Ready - Switchover" communication object. If the communication object has a value greater than 0, it will overwrite the state of the extension inputs. If the communication object has the value 0 (= deactivated), the KNX Smart Grid Interface will evaluate the states of the extension inputs.

The prescribed time limits are monitored internally each time the operating status changes. Early activation is carried out after the prescribed waiting period has expired.

The KNX Smart Grid Interface sends the current SG-Ready operating state via the 1-byte communication object "SG-Ready - Status" each time a change is made.

Extension input E1 can be used for any application in KNX. If the SG-Ready mode is only to be switched via the "SG-Ready - Switchover" communication object, the two extension inputs E2 and E3 can also be used for any applications in KNX. (see chapter "General settings" ▶ Page 29)

8.5 PV surplus + SG Ready mode + grid serviceability

Application 3 (PV surplus + SG Ready mode + grid serviceability) offers the option of using inverters and smart meters without a Smart Grid Ready interface and, if necessary, manual override via a switching contact and KNX.

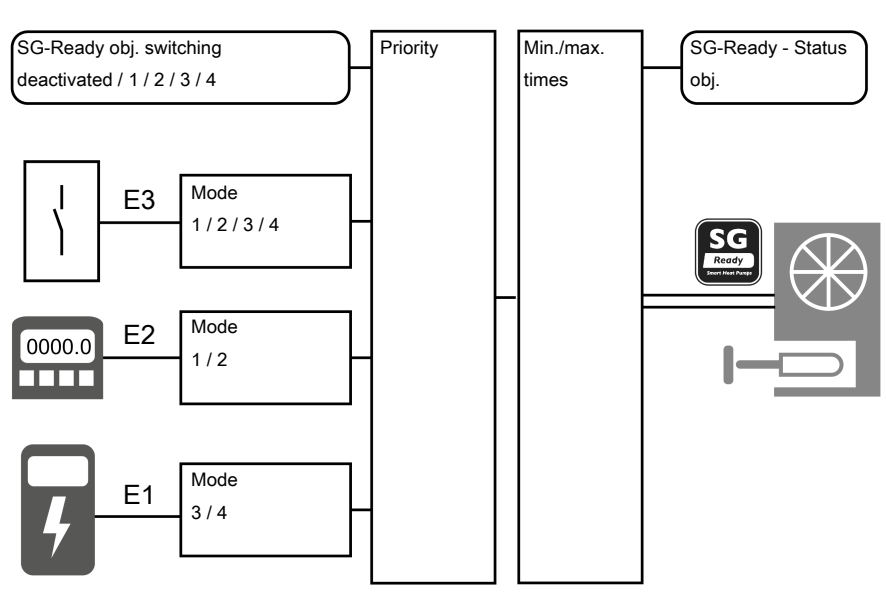


Figure 9: PV surplus application+ SG Ready mode + grid serviceability

The outputs of KNX Smart Grid Interface are connected to the Smart Grid Ready interface of a heat pump.

The output of an inverter can be connected to extension input E1 in order to switch the heat pump to operating state 3 or 4 in the event of a PV surplus.

The output of a smart meter can be connected to extension input E2 in order to switch the heat pump to operating state 1 or 2.

A potential-free contact can be connected to extension input E3 in order to switch the heat pump to any operating state that can be set.

The three inputs have different priorities.

- E1 is of lowest priority
- E2 is of medium priority and overrides the control by input E1
- E3 is of highest priority and overrides the control via inputs E1 and E2
- Operating state 2 is active when the contacts at the inputs are open.

Alternatively, the KNX Smart Grid Interface can also receive the information via the "SG-Ready - Switchover" communication object. If the communication object has a value greater than 0, it will overwrite the state of the extension inputs. If the communication object has the value 0 (= deactivated), the KNX Smart Grid Interface will evaluate the states of the extension inputs.

The prescribed time limits are monitored internally each time the operating status changes. Early activation is carried out after the prescribed waiting period has expired.

The KNX Smart Grid Interface sends the current SG-Ready operating state via the 1-byte communication object "SG-Ready - Status" each time a change is made.

8.6 Parameter General

General -> Configuration

Application	1: PV surplus 2: SG Ready mode 3: PV surplus + SG Ready mode + grid serviceability
<p>This parameter is used to set the operating modes of the SG Ready interface between which the switching contacts switch and the extent to which the binary inputs can be set.</p> <p>PV surplus:</p> <ul style="list-style-type: none"> – The switching contact of an inverter without a Smart Grid Ready interface is connected to extension input E1. – The Smart Grid Interface switches between operating states 2 (normal operation) and 4 (start-up command). – Extension inputs E2 and E3 are available for free use. <p>SG Ready mode:</p> <ul style="list-style-type: none"> – The Smart Grid Ready interface of an inverter is connected to extension inputs E2 and E3. – The Smart Grid Interface switches between operating states 1 (normal operation) to 4 (start-up command) depending on the states at extension inputs E2 and E3. – Extension input E1 is available for free use. <p>PV surplus + SG Ready mode + grid serviceability</p> <ul style="list-style-type: none"> – Contacts of an inverter and a smart meter and an additional switch can be connected to extension inputs E1, E2 and E3. – The Smart Grid Interface switches between operating states 1 (heat pump OFF) to 4 (start-up command) depending on the states of the three inputs and the value of the "SG ready switchover" communication object. – The inputs and the communication object have defined priorities. – The three extension inputs are not available for free use in KNX. 	

SG-Ready mode application

Extension inputs 2 and 3	KNX binary inputs Switching SG-Ready mode
<p>In application 2 (SG Ready mode, extension input E1 can be freely set as a KNX binary input. Extension inputs E2 and E3 can either also be used freely as KNX binary inputs or they can be used permanently for switching to SG Ready mode. When used as KNX binary inputs, additional parameter pages and communication objects are displayed.</p> <p>This parameter is available only in application 2 (SG Ready mode).</p>	

PV surplus application+ SG Ready mode + grid serviceability

Extension inputs -> E1 - PV surplus

SG-Ready mode with active input	Operating state 3 (start-up recommendation) Operating state 4 (start-up command)
Which SG Ready operating state is set for an active input in the heat pump can be parameterised for extension input E1 in application 3 (PV surplus + SG-ready mode + grid serviceability). This parameter should be set in accordance with the heat pump manufacturer's specifications.	

Extension inputs -> E2 - Grid serviceability

SG-Ready mode with active input	Operating state 1 (heat pump OFF) Operating state 2 (normal operation)
Which SG Ready operating state is set for an active input in the heat pump can be parameterised for extension input E2 in application 3 (PV surplus + SG-ready mode + grid serviceability). This parameter should be set in accordance with the heat pump manufacturer's specifications. This parameter is available only in application 3 (PV surplus + SG Ready mode + grid serviceability).	

Extension inputs -> E3 - User-defined switching

SG-Ready mode with active input	Operating state 1 (heat pump OFF) Operating state 2 (normal operation) Operating state 3 (start-up recommendation) Operating state 4 (start-up command)
Which SG Ready operating state is set for an active input in the heat pump can be parameterised for extension input E3 in application 3 (PV surplus + SG-ready mode + grid serviceability). This parameter is available only in application 3 (PV surplus + SG Ready mode + grid serviceability).	

8.7 Object list

Object no.	Function	Name	Type	DPT	Flag
1	SG-Ready - Switching	Heat pump - Input	1-byte		C, -, W, -, U

1-byte object for switching the operating mode of the heat pump. Specifying the operating mode via this communication object is of higher priority than switching via the extension inputs.

The following values are possible for the communication object:

0: deactivated

1: SG Ready operating state 1, switch off heat pump, maximum 2 hours

2: SG Ready operating state 2, normal operation

3: SG Ready operating state 3, start-up recommendation for boosted operation (internal controller decides)

4: SG Ready operating state 4, start-up command to switch on the heat pump or use the additional heating element

The prescribed time limits are monitored internally when the operating state changes. If a new operating state is activated during a prescribed waiting time, this is tracked after the time has elapsed.

This object is available only in applications 2 (SG Ready mode) and 3 (PV surplus + SG Ready mode + grid serviceability).

Object no.	Function	Name	Type	DPT	Flag
2	SG Ready - Status	Heat pump - Output	1-byte		C, R, -, T, A

1-byte object for indication of the current operating mode of the heat pump.

The following values are possible for the communication object:

1: SG Ready operating state 1, switch off heat pump, maximum 2 hours

2: SG Ready operating state 2, normal operation

3: SG Ready operating state 3, start-up recommendation for boosted operation (internal controller decides)

4: SG Ready operating state 4, start-up command to switch on the heat pump or use the additional heating element

This object is available in all applications.

Object no.	Function	Name	Type	DPT	Flag
3	PV surplus	Photovoltaics - Input	1-bit	1.003	C, -, W, -, U

1-bit object for activating SG Ready operating state 4 when there is a PV surplus. The function of this communication object corresponds to actuating extension input **E1**.

This object is available only in application 1 (PV surplus).

Object no.	Function	Name	Type	DPT	Flag
4	PV surplus - extension input 1 - status	Photovoltaics - Output	1-bit	1.003	C, R, -, T, A
<p>1-bit object for sending the current status of extension input E1. The object does not depend on the state of the "PV surplus" input communication object</p> <p>This object is available only in application 1 (PV surplus).</p>					

9 Inputs

9.1 General settings

Introduction

The device has three inputs with a common reference potential. Potential-free switches, push-buttons or other contacts (e.g. magnetic contacts) can be connected to these inputs.

Depending on the set operating mode, input 1 is preset to evaluate a PV surplus or inputs 2 and 3 are preset to switch to SG Ready mode. Individual telegrams for switching or dimming for venetian blind control or value transmitter use (dimming value transmitter, light scene extension, colour or colour temperature value transmitter) can then be transmitted via the inputs not preset in the operating mode. They then function like the inputs of a push-button interface.

Name of a output

Here, you can optionally assign a name for each input. The name is intended to clarify the use of the input (e.g. "Contact window", "Switch light") and is used exclusively in the ETS in the text of the parameter pages and communication objects.

9.1.1 Configuration inputs parameters

Extension inputs... -> I... - KNX binary input

Name of input	Free text
<p>The text entered in this parameter is adopted in the name of the communication objects and is used to identify the input in the ETS parameter window (e.g. "Contact window", "Switch light").</p> <p>The text is not programmed in the device.</p>	

Extension inputs... -> I... - KNX binary input -> Function

Function	No function
	<p>Switching</p> <p>Dimming</p> <p>Venetian blind</p> <p>Value transmitter</p> <p>Scene extension</p> <p>2-channel operation</p> <p>Controller extension</p>
<p>With the effect on the KNX, the inputs can transmit individual telegrams for switching or dimming for venetian blind control or value transmitter use (dimming value transmitter, light scene extension, colour or colour temperature value transmitter). They then function like the inputs of a push-button interface.</p> <p>The function of the input is specified here.</p>	

9.2 Switching

For each input whose function is set to "Switching", the ETS displays two 1-bit communication objects. The parameters can be used to determine which value the "Switch" object receives when the contact is closed and opened (ON, OFF, TOGGLE). No distinction is made between a brief or long press. Optionally, when using the "UM" operating command, the "Switching feedback" object can be used to switch the switching state of the input on the part of the KNX (for example, when using several operating devices).

Behaviour after bus voltage return

After a device reset (bus voltage return or ETS programming operation), the communication object "Switching" of an input can be initialised. For this, the "On bus voltage return" parameter should be configured to the required reaction. In the settings "ON telegram" or "OFF telegram" telegrams are transmitted actively to the KNX according to this requirement. In the "Transmit current input status" setting, the device evaluates the static signal status of an input and, according to this, transmits the appropriately configured telegram to the bus (contact closed at the input = telegram as on closing; contact open at input = telegram as on opening). If, in this case, the edge command dependent on the current status is configured to "no reaction", the device does not transmit a telegram on initialisation.

- i** If a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.

9.2.1 Switching parameters

Input... -> I... - Function

Debounce time (10...255 ms)	10...255
This parameter sets the debouncing time individually for the input. According to the time set here, the input signal at the input is evaluated with a delay.	
When closing the contact	no reaction ON OFF TOGGLE
This parameter determines the reaction when the contact connected to the input is closed.	
When opening the contact	no reaction ON OFF TOGGLE
This parameter determines the reaction when the contact connected to the input is opened.	

After bus voltage return	no reaction Transmit current input status Send ON telegram Send OFF telegram
<p>At this point, the behaviour of the input after a device reset (bus voltage return, ETS programming operation) is defined. If a delay after bus voltage return is set for the inputs, the device will not carry out the reaction specified at this point until the delay has expired.</p> <p>no reaction: The device does not send a telegram for initialisation.</p> <p>transmit current input status: With this setting, the device evaluates the static signal status of an input and, according to this, transmits the appropriately configured telegram to the bus (contact closed at the input = telegram as on closing; contact open at input = telegram as on opening)</p> <p>Send ON telegram: The device sends an ON command for the input via the communication object "Switch".</p> <p>Send OFF telegram: The device sends an OFF command for the input via the communication object "Switch".</p>	

9.2.2 Switching objects

Object no.	Function	Name	Type	DPT	Flag
471, 474, 477	Switching	Input... - Output	1-bit	1.001	C, (R), -, T, A
1-bit object for transmission of switching telegrams (ON, OFF).					
Object no.	Function	Name	Type	DPT	Flag
472, 475, 478	Switching feedback	Input... - Input	1-bit	1.001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF) from other control points.					

9.3 Dimming

For each input whose function is set to "dimming", two 1-bit objects and one 4-bit or one 3-byte object are available. In general, the device sends out a switching telegram when there is a short signal at the input (closed contact) and a dimming telegram when there is a long signal. After a long signal, the device sends a telegram to stop the dimming process in the standard parameterisation when the contact is opened. How long a signal must last until the device recognises it as long can be set in the parameters. The brightness or the colour temperature can be dimmed.

When an actuator is controlled by several control points, it is necessary for the actuator to report its switching status back to the 1-bit object "Switching feedback" of the input. Due to the feedback, the device detects that the actuator has changed its switching status by input from another element and adjusts the dimming direction accordingly.

The dimming direction is always only evaluated and switched locally, unless the actuator changes its switching status due to input from multiple elements (e.g. lighting ON / change of brightness value only). The 4-bit dimming objects and the 3-byte combi object are not tracked via the KNX.

Advanced configuration options

The device has advanced parameters for the dimming function. If necessary, these advanced parameters can be activated and thus be made visible.

The advanced parameters can be used to determine whether the device is to cover the full adjusting range of the actuator with one dimming telegram continuously ("Increase brightness / Dimming colder by 100 %", "Reduce brightness / Dimming warmer by 100 %") or whether the dimming range is to be divided into several small levels (50 %, 25 %, 12.5 %, 6 %, 3 %, 1.5 %). With stepless dimming (100%), the device only sends a telegram at the beginning of a long signal to start the dimming process and usually a stop telegram when the contact at the input opens. For dimming in small levels it may be useful if the device repeats the dimming telegram in case of a sustained signal for a presettable time (parameter "Telegram repetition"). In return, the stop telegram can be omitted when opening the contact.

- i** When the parameters are hidden ("Advanced parameters = deactivated"), the dimming range is set to 100 %, the stop telegram is activated and the telegram repetition is deactivated.

Behaviour after bus voltage return

After a device reset (bus voltage return or ETS programming operation), the communication object "Switching" of an input can be initialised. For this, the "On bus voltage return" parameter should be configured to the required reaction. In the settings "ON telegram" or "OFF telegram" telegrams are transmitted actively to the KNX according to this requirement.

- i** If a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.

9.3.1 Dimming of brightness

In the standard parameterisation, the brightness is dimmed, which is why the "Colour temperature control" parameter is deactivated.

- i** Even with "colour temperature control" activated, the brightness can be dimmed when using the combi object.

The "Dimming" function with the control of the brightness distinguishes between dual-area operation and single-area operation. The "Brightness when closing the contact" parameter defines the single- or dual-surface dimming principle.

dual-area operation	single-area operation
Brighter (ON)	Brighter/darker (TOGGLE)
Darker (OFF)	Brighter (TOGGLE)
	Darker (TOGGLE)

With dual-area operation, the device sends a telegram for switching on or off with a short signal and a telegram for dimming up ("Brighter") or dimming down ("Darker") with a long signal.

With single-area operation, the device sends switch-on and switch-off telegrams ("UM") alternately with a short signal and "Brighter" and "Darker" telegrams alternately with a long signal.

9.3.2 Dimming of colour temperature

When "Colour temperature control" is activated, only the colour temperature can be dimmed via an individual object.

- i** Even with "colour temperature control" activated, the brightness can be dimmed when using the combi object.

The "Dimming" function with the control of the colour temperature distinguishes between dual-area operation and single-area operation. The "Colour temperature when closing the contact" parameter defines the single- or dual-surface dimming principle.

dual-area operation	single-area operation
Colder (ON)	Colder / warmer (TOGGLE)
Warmer (OFF)	Colder (TOGGLE)
	Warmer (TOGGLE)

With dual-area operation, the device sends a telegram for switching on or off with a short signal and a telegram for dimming colder or dimming warmer with a long signal.

With single-area operation, the device sends switch-on and switch-off telegrams ("UM") alternately with a short signal and "Colder" and "Warmer" telegrams alternately with a long signal.

9.3.3 Dimming of brightness and colour temperature

If "colour temperature control" is activated, both the brightness and the colour temperature can be dimmed when using the combi object.

The "Dimming" function with the control of the brightness and colour temperature distinguishes between dual-area operation and single-area operation. The "Brightness + colour temperature when closing the contact" parameter defines the single- or dual-surface dimming principle.

dual-area operation	single-area operation
Brighter + colder (ON)	Brighter + colder / darker + warmer (TOGGLE)
Darker + warmer (OFF)	Brighter + colder (TOGGLE)
	Darker + warmer (TOGGLE)

With dual-area operation, the device sends a telegram for switching on or off with a short signal and a telegram for dimming brighter and colder or dimming darker and warmer with a long signal.

With single-area operation, the device sends switch-on and switch-off telegrams ("UM") alternately with a short signal of the relative button and "Brighter + Colder" and "Darker + Warmer" telegrams alternately with a long signal.

9.3.4 Dimming parameters

Input... -> I... - Function

Debounce time (10...255 ms)	10...255
This parameter sets the debouncing time individually for the input. According to the time set here, the input signal at the input is evaluated with a delay.	
Colour temperature control	Checkbox (yes/no)
This parameter activates the variable colour temperature control and thus the Tunable White function if required. Additional parameters become visible.	
Communication	Individual objects Combi object
When colour temperature control is activated, either the brightness or the colour temperature can be dimmed via an individual object. Alternatively, the brightness and the colour temperature can be controlled together via a combi object.	
Adjustment of	Brightness Colour temperature
For communication via individual objects, this parameter sets whether the brightness or the colour temperature is dimmed via the individual object.	
Brightness when closing the contact	no reaction Brighter (ON) Darker (OFF) Brighter/darker (TOGGLE) Brighter (TOGGLE) Darker (TOGGLE)
This parameter determines the reaction when the contact at the input is closed. If the device is to toggle on a brief signal, the corresponding switching objects of other sensors with the same function must be interlinked.	
This parameter is only visible if colour temperature control is deactivated or colour temperature control is active and communication is via a single object for brightness control.	

Colour temperature when closing the contact	no reaction Colder (ON) Warmer (OFF) Colder / warmer (TOGGLE) Colder (TOGGLE) Warmer (TOGGLE)
<p>This parameter determines the reaction when the contact at the input is closed. If the device is to toggle on a brief signal, the corresponding switching objects of other sensors with the same function must be interlinked.</p> <p>This parameter is only visible if colour temperature control is active and communication is via a single object for controlling the colour temperature.</p>	
Brightness + colour temperature when closing the contact	no reaction Brighter + colder (ON) Darker + warmer (OFF) Brighter + colder / darker + warmer (TOGGLE) Brighter + colder (TOGGLE) Darker + warmer (TOGGLE)
<p>This parameter determines the reaction when the contact at the input is closed. If the device is to toggle on a brief signal, the corresponding switching objects of other sensors with the same function must be interlinked.</p> <p>This parameter is only visible if colour temperature control is active and communication is via a combi object for controlling brightness and colour temperature.</p>	
After bus voltage return	no reaction Send ON telegram Send OFF telegram
<p>At this point, the behaviour of the input after a device reset (bus voltage return, ETS programming operation) is defined. If a delay after bus voltage return is set for the inputs, the device will not carry out the reaction specified at this point until the delay has expired.</p> <p>no reaction: The device does not send a telegram for initialisation.</p> <p>Send ON telegram: The device sends an ON command for the input via the communication object "Switch".</p> <p>Send OFF telegram: The device sends an OFF command for the input via the communication object "Switch".</p>	
Time between switching and dimming Seconds (0...50)	0 ... 50 s
<p>This parameter determines how long a signal must last with a closed contact until a long signal is identified and a dimming telegram is triggered.</p> <p>Setting the seconds of time between switching and dimming.</p>	

Milliseconds (100...990)	100 ... 400 ... 990 ms
Setting the milliseconds of time between switching and dimming.	

Advanced parameters	Checkbox (yes/no)
At this point, the extended parameters of the dimming function can be activated and thus made visible, if required.	

Increase brightness by	1.5 % 3 % 6 % 12.5 % 25 % 50 % 100 %
------------------------	---

This parameter sets the relative dimming level when the brightness is increased. On each new signal, the brightness is changed at maximum by the configured step width.

It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Dimming darker by	1.5 % 3 % 6 % 12.5 % 25 % 50 % 100 %
-------------------	---

This parameter sets the relative dimming level when the brightness is reduced. On each new signal, the brightness is changed at maximum by the configured step width.

It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Dimming colder by	1.5 % 3 % 6 % 12.5 % 25 % 50 % 100 %
<p>This parameter sets the relative dimming step for cold dimming. On each new signal, the brightness is changed at maximum by the configured step width. It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").</p>	
Dimming warmer by	1.5 % 3 % 6 % 12.5 % 25 % 50 % 100 %
<p>This parameter sets the relative dimming step for dimming warmer. On each new signal, the brightness is changed at maximum by the configured step width. It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").</p>	
Stop telegram	Checkbox (yes/no)
<p>If this parameter is activated, the device sends a telegram to stop the dimming process when the contact is opened.</p>	
Telegram repetition	Checkbox (yes/no)
<p>At this point, the telegram repetition can be activated during dimming. With telegram repetition activated, the device cyclically sends relative dimming telegrams (in the parameterised step width) to the KNX if the button is pressed long.</p>	
Time between two telegrams	200 ms 300 ms 400 ms 500 ms 750 ms 1 s 2 s
<p>This parameter defines the interval at which the dimming telegrams are automatically repeated in the telegram repetition mode. This parameter is only visible when telegram repetition is activated.</p>	

9.3.5 Dimming objects

Object no.	Function	Name	Type	DPT	Flag
486, 492, 498	Switching	Input... - Output	1-bit	1.001	C, (R), -, T, A
1-bit object for transmission of switching telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
487, 493, 499	Dimming brightness	Input... - Output	4-bit	3.007	C, (R), -, T, A
4-bit individual object for sending relative dimming telegrams to adjust the brightness.					

Object no.	Function	Name	Type	DPT	Flag
489, 495, 501	Dimming colour temperature	Input... - Output	4-bit	3.007	C, (R), -, T, A
4-bit object for sending relative dimming telegrams to adjust the colour temperature.					

Object no.	Function	Name	Type	DPT	Flag
487, 493, 499	Dimming brightness + colour temperature	Input... - Output	3-byte	250.600	C, (R), -, T, A
3-byte combination object for sending dimming telegrams for adjusting the brightness and the colour temperature in combination.					

Object no.	Function	Name	Type	DPT	Flag
488, 494, 500	Switching feedback	Input... - Input	1-bit	1.001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF) from other control points.					

9.4 Venetian blind

For each input whose function is set to "Venetian blind", the 1-bit objects "Short time operation" and "Long time operation" are available. The function distinguishes between dual-area operation (UP, DOWN) and single-area operation (TOGGLE). The "Command when closing the contact" parameter defines the single- or dual-area dimming principle.

dual-area operation	single-area operation
UP	TOGGLE
DOWN	

With dual-area operation, the device sends an UP or DOWN telegram when the contact closes according to the configuration. With single-area operation, the device switches the direction of travel for short- and long-term operation (UM) every time the contact closes on a long signal.

Feedback

If the actuator can be controlled from several control points, a faultless single-area operation requires that the long time objects of the control elements are interlinked. The device would otherwise not be able to detect that the actuator has been addressed from another sensor, in which case it would have to be actuated twice during the next use in order to produce the desired reaction.

Behaviour after bus voltage return

After a device reset (bus voltage return or ETS programming operation), the communication object "Long time operation" of an input can be initialised. For this, the "On bus voltage return" parameter should be configured to the required reaction. With the settings "DOWN" or "UP", telegrams are actively sent out on the KNX according to this specification.

- i** If a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.

Operating concepts

For the control of Venetian blind, shutter, awning or similar drives, the device supports four operating concepts, for which the telegrams are transmitted in different time sequences. The device can therefore be used to operate a wide variety of drive configurations.

Operating concept "short – long – short":

In the operation concept "short – long – short", the device shows the following behaviour:

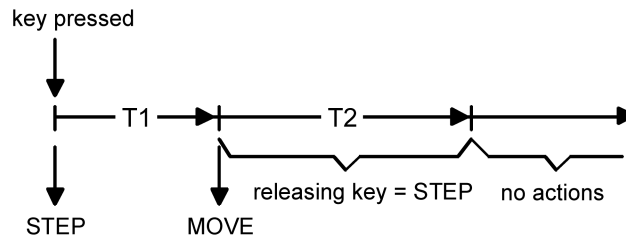


Figure 10: Operating concept "short – long – short"

- Immediately when the contact closes, the device sends a short time telegram. Pressing the button stops a running drive and starts time T1 ("time between short time and long time command"). If the contact at the input is opened again within T1, no further telegram is sent. This short time serves the purpose of stopping a continuous movement. The "time between short and long time command" in the device should be selected shorter than the short-time operation of the actuator to prevent a jerky movement of the venetian blind.
- If the signal at the input is longer than T1, the device transmits a long time telegram after the end of T1 for starting up the drive and time T2 ("slat adjusting time") is started.
- If the contact at the input is opened within the slat adjusting time, the device sends out another short time telegram. This function is used for adjusting the slats of a venetian blind. The function permits stopping the slats in any position during their rotation. The "slat adjusting time" should be chosen as required by the drive for a complete rotation of the slats. If the "slat adjusting time" is selected longer than the complete running time of the drive, a push button function is possible as well. In this case, the drive only moves as long as the contact at the input is closed.
- If the signal at the input lasts longer than T2, the device does not send another telegram. The drive remains on until the end position is reached.

Operating concept "long – short":

In the operation concept "long – short", the device shows the following behaviour:

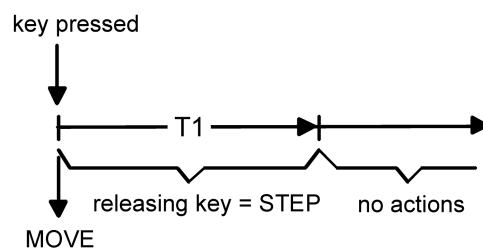


Figure 11: Operating concept "long – short"

- Immediately when the contact closes, the device sends a long time telegram. The drive begins to move and time T1 ("slat adjusting time") is started.
- If the contact at the input is opened again within the slat adjusting time, the device sends out a short-time telegram. This function is used for adjusting the slats of a venetian blind. The function permits stopping the slats in any position during their rotation. The "slat adjusting time" should be chosen as required by the drive for a com-

plete rotation of the slats. If the "slat adjusting time" is selected longer than the complete running time of the drive, a push button function is possible as well. In this case, the drive only moves as long as the contact at the input is closed.

- If the signal at the input lasts longer than T1, the device does not send another telegram. The drive remains on until the end position is reached.

Operating concept "short – long":

In the operation concept "short – long", the device shows the following behaviour:

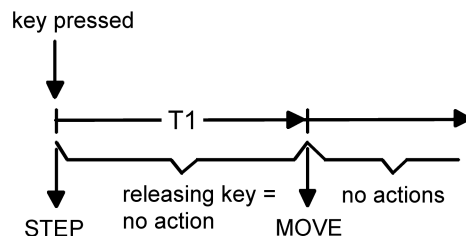


Figure 12: Operating concept "short – long"

- Immediately when the contact closes, the device sends a short time telegram. Pressing the button stops a running drive and starts time T1 ("time between short time and long time command"). If the contact at the input is opened again within T1, the device does not send another telegram. This short time serves the purpose of stopping a continuous movement. The "time between short and long time command" in the device should be selected shorter than the short-time operation of the actuator to prevent a jerky movement of the venetian blind.
- If the signal at the input lasts longer than T1, the device sends out a long term telegram to drive the actuator after T1 has elapsed.
- When the contact is opened, the device does not send another telegram. The drive remains on until the end position is reached.

Operating concept "long – short or short":

In the operation concept "long – short or short", the device shows the following behaviour:

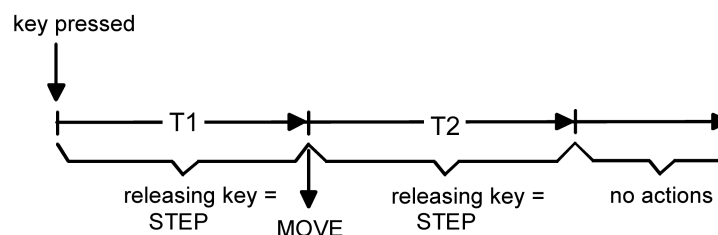


Figure 13: Operating concept "long – short or short"

- Immediately on closing the contact, the device starts time T1 ("time between short time and long time command") and waits. If the contact at the input is opened again before T1 expires, the device sends a short time telegram. This telegram can be used to stop a running drive. A stationary drive rotates the slats by one level.

- If the signal at the input lasts longer than T1, the device sends a long term telegram and starts time T2 ("slat adjusting time").
- If the contact at the input is opened within T2, the device sends out another short-time telegram. This function is used for adjusting the slats of a venetian blind. The function permits stopping the slats in any position during their rotation.
The "slat adjusting time" should be chosen as required by the drive for a complete rotation of the slats. If the "slat adjusting time" is selected longer than the complete running time of the drive, a push button function is possible as well. In this case, the drive only moves as long as the contact at the input is closed.
- If the contact at the input remains closed longer than T2, the device does not send another telegram. The drive remains on until the end position is reached.

9.4.1 Shutter/blind parameters

Input... -> I... - Function

Debounce time (10...255 ms)	10...255
This parameter sets the debouncing time individually for the input. According to the time set here, the input signal at the input is evaluated with a delay.	
When closing the contact	UP DOWN TOGGLE
This parameter determines the direction of movement of the drive when closing the contact. If the setting is "TOGGLE", the direction is changed after each long time command. If several devices are to control the same drive, the long time objects of the devices must be interlinked to ensure that the running direction can be changed correctly.	
After bus voltage return	no reaction UP DOWN
<p>At this point, the behaviour of the input after a device reset (bus voltage return, ETS programming operation) is defined. If a delay after bus voltage return is set for the inputs, the device will not carry out the reaction specified at this point until the delay has expired.</p> <p>no reaction: The device does not send a telegram for initialisation.</p> <p>DOWN: The device sends a shutdown command for the input via the communication object "Long term operation".</p> <p>UP: The device sends a open command for the input via the communication object "Long term operation".</p>	
Operating concept	short – long – short long – short short – long long – short or short
<p>For the control of Venetian blind, shutter, awning or similar drives, the device supports four operating concepts, for which the telegrams are transmitted in different time sequences. The device can therefore be used to operate a wide variety of drive configurations.</p> <p>At this point, the operating concepts can be selected.</p>	

Time between short-time and long-time command Minutes (0...5)	0...5
<p>The time after which long term operation is evaluated when the contact closes is set here.</p> <p>Setting the minutes of time between short and long command.</p>	
Seconds (0...59)	0...59
<p>Setting the seconds of time between short and long command.</p>	
Milliseconds (100...990)	100...400...990
<p>Setting the milliseconds of time between short and long command.</p> <p>The parameters "Time between short and long command" are not visible with "Operating concept = Long - Short".</p>	
Slat adjusting time Minutes (0...5)	0...5
<p>Here you set the time during which an emitted short time telegram can be terminated by opening the contact. This function serves to adjust the slats of a venetian blind.</p> <p>Setting the minutes of the slat adjusting time.</p>	
Seconds (0...59)	0...59
<p>Setting the seconds of the slat adjusting time.</p>	
Milliseconds (0...990)	0...500...990
<p>Setting the milliseconds of the slat adjusting time.</p> <p>The "Slat adjusting time" parameters are not visible with "Operating concept = Short - Long".</p>	

9.4.2 Shutter/blinds objects

Object no.	Function	Name	Type	DPT	Flag
516, 519, 522	Short-time operation	Input... - Output	1-bit	1.007	C, (R), -, T, A

1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be stopped or with which the blind slats can be adjusted by short time operation.

Object no.	Function	Name	Type	DPT	Flag
517, 520, 523	Long-time operation	Input... - Output	1-bit	1.008	C, (R), W, T, A

1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be can be moved upwards or downwards.

9.5 Value transmitter

With the "Value transmitter" function, the device sends parameterised values to the KNX when the contact at the input closes. The value transmitter distinguishes between different value ranges depending on the data format. Depending on the application, the parameters "Function" and "Value range" determine which value range the value transmitter uses.

Function	Value range	Range end below	Range end top
1-byte value transmitter	0...255	0	255
1-byte value transmitter	0...100%	0%	100%
1-byte value transmitter	-128...127	-128	127
1-byte value transmitter	0...255%	0%	255%
1-byte value transmitter	0...360°	0°	360°
2-byte value transmitter	0...65535	0	65535
2-byte value transmitter	-32768...32767	-32768	32767
2-byte value transmitter	Temperature value	0°C	40°C
2-byte value transmitter	Brightness value	0 lux	1500 lux
2-byte value transmitter	Colour temperature value	1000 K	10000 K
3-byte value transmitter	RGB/HSV with colour wheel sequence	#000000	#FFFFFF
3-byte value transmitter	RGB/HSV with brightness adjustment	#000000	#FFFFFF
6-byte value transmitter	Colour value RGBW/HSVW	#000000 + 0	#FFFFFF + 255
6-byte value transmitter	Colour temperature value + brightness	1000 K 0%	10000 K 100%

Behaviour after bus voltage return

The communication object of an input for sending the value can be initialised after a device reset (bus voltage return or ETS programming operation). For this, the "On bus voltage return" parameter should be configured to the required reaction. With the setting "Reaction as when closing the contact", the device sends out the configured values.

- i** If a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.

Value adjustment

If the value adjustment is activated in the ETS, the contact at the input for adjusting the value must remain closed for longer than the parameterised time period. The value adjustment function continues until the contact is opened again.

- With the 1-byte and 2-byte value transmitter functions the value is adjusted across the entire number range.
- With the 3-byte value transmitter function in the function RGB/HSV with colour wheel adjustment, the colour hue (H) is adjusted in the range from 0 to 360°.
- With the 3-byte value transmitter function in the RGB / HSV function with brightness adjustment, the brightness value (V) is adjusted in the range from 0 to 100%.

With the activation of the "Value adjustment" parameter, further parameters become visible in the ETS, whereby the value adjustment can be configured.

- i** For the value transmitter 1-byte with the value range "0...100%", the step width of the value adjustment is also specified in "%". If the starting value of the communication object is used, it may happen in this case during value adjustment that the value last received via the object must be rounded and adapted before a new value can be calculated on the basis of the step width and transmitted. Due to the computation procedure used, the new calculation of the value may be slightly inaccurate.

- i** The value adjustment is not available with the "6-byte" mode of operation.

Example 1: Value adjustment without overflow

- Mode of operation and value range = 1-byte (0...255)
- Value = 227
- Step width = 5
- Starting value on value adjustment = same as configured value
- Direction of value adjustment = toggling (alternating)
- Time between two telegrams = 0.5 s

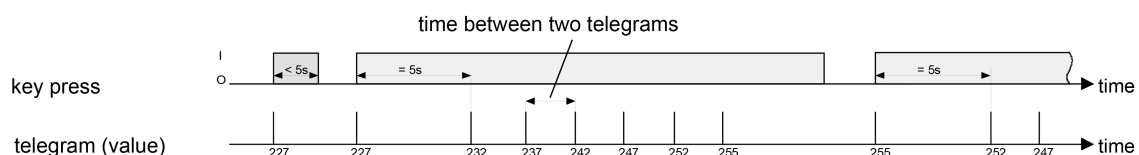


Figure 14: Example of value adjustment without value range overflow

Example 2: Value adjustment with overflow

- Mode of operation and value range = Value transmitter 1-byte (0...255)
- Value = 227

Example 2: Value adjustment with overflow

- Step width = 5
- Starting value on value adjustment = same as configured value
- Direction of value adjustment = toggling (alternating)
- Time between two telegrams = 0.5 s

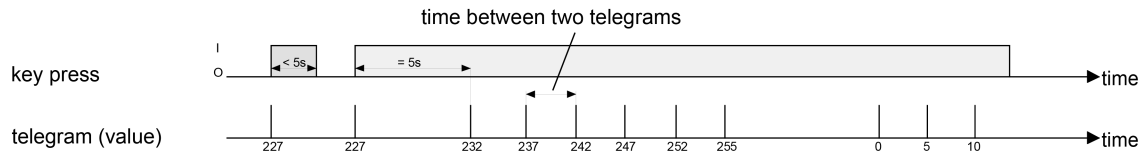


Figure 15: Example of value adjustment with value range overflow

- i** The newly adjusted values are stored in non-volatile memory. The stored values are thereby replaced by the preset values programmed in the ETS when a reset of the device occurs (bus voltage failure or ETS programming).

9.5.1 1-byte value transmitter

The 1-byte value transmitter is available in the following four variants:

- 0 ... 255
- 0 ... 100%
- -128 ... 127
- 0 ... 255%
- 0 ... 360°

For each input, an object is available in the ETS for sending out the parameterised value. When the contact closes, the parameterised value is sent out on the KNX.

9.5.2 2-byte value transmitter

The 2-byte value transmitter is available in the following five variants:

- 0 ... 65535
- -32768 ... 32767
- Temperature value (0 ... 40 °C)
- Brightness value (0, 50, ..., 1500 lux)
- Colour temperature value (1000, 1100, ..., 10000)

For each input, an object is available in the ETS for sending out the parameterised value. When the contact closes, the parameterised value is sent out on the KNX.

9.5.3 3-byte value transmitter

The 3-byte value transmitter is available in the following variant:

- RGB/HSV with colour wheel sequence
- RGB/HSV with brightness adjustment

Objects for sending the parameterised values are available in the ETS for each input. When the contact closes, the parameterised values are sent out on the KNX. The colour circle run and the brightness adjustment are realised by a value adjustment.

Communication takes place via a 3-byte combination object according to DPT 232.600 in the RGB colour space or via three 1-byte individual objects in the HSV colour space. All four communication objects are displayed in the object overview. The object values to be sent out are parameterised via a colour picker in the ETS.

Value adjustment with colour wheel sequence

The colour wheel sequence performs a value adjustment of the colour angle (H) in the range from 0 to 360°.

- i** For the colour space "RGB", an adjustment of the colour angle (H) is converted internally in the device.

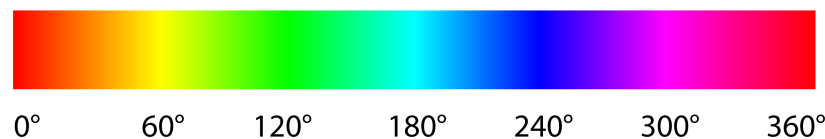


Figure 16: Colour scale (Colour hue H)

The colour wheel sequence is realised according to the direction of the value adjustment and the step width via KNX telegrams. During a colour wheel sequence, the device cyclically sends new values to the KNX, whereby the colour wheel is continuously run through. The colour hue (H) changes cyclically by the parameterised step width. The saturation (S) and the brightness value (V) remain unaffected by a colour pass. Depending on the start position at the beginning of the adjustment, the values R, G or B change cyclically.

Using the colour picker of the ETS, the colour wheel sequence can be traced by adjusting the slider of the H value from 0° to 360°.

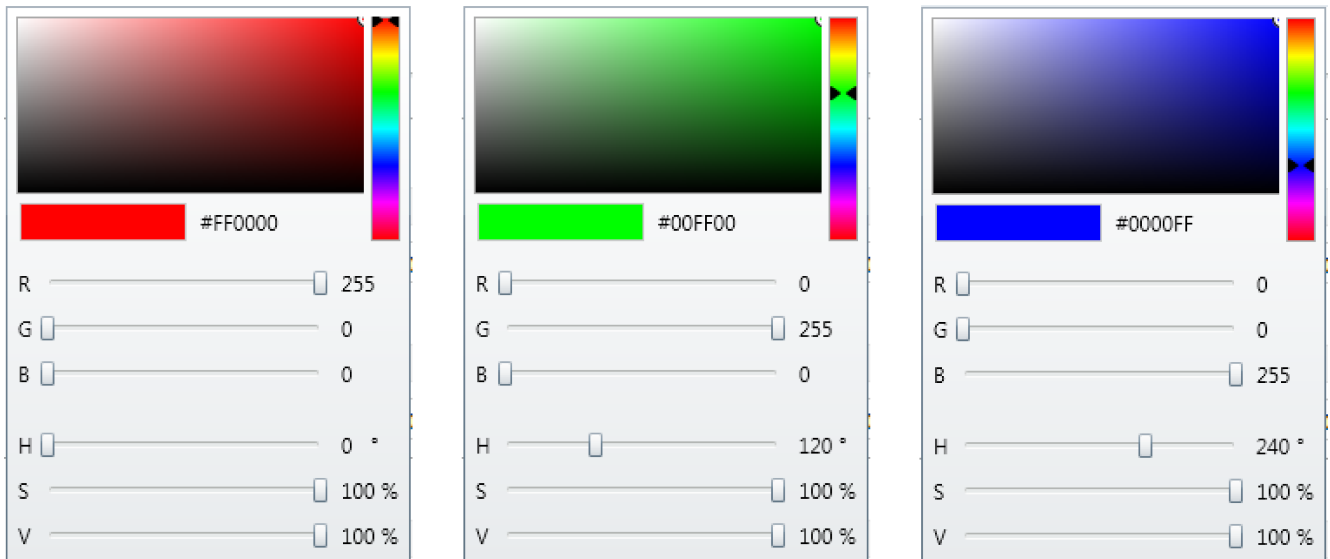


Figure 17: Examples of colour adjustment using the ETS colour picker

Examples of HSV-RGB conversion:

Example	HSV values	RGB values	Colour
1	0°, 100%, 100%	255, 0, 0	Red
2	120°, 100%, 100%	0, 255, 0	Green
3	240°, 100%, 100%	0, 0, 255	Blue
4	360°, 0%, 100%	255, 255, 255	White
5	360°, 0%, 0%	0, 0, 0	Black

- i** With "Saturation (S) = 0%" and "Brightness (V) = 100%", a change in the colour hue (H) has no effect on the RGB values and thus no effect on the colour.
- i** With "Saturation (S) = 0%" and "Brightness (V) = 0%", a change in the colour hue (H) has no effect on the RGB values and thus no effect on the colour.

Value adjustment with brightness adjustment

The brightness adjustment performs a value adjustment of the brightness value (V) in the range from 0 to 100%.

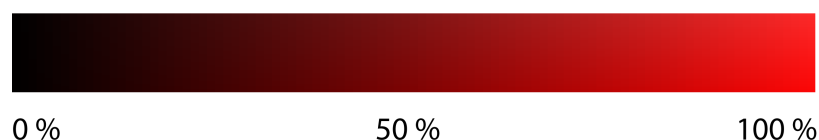


Figure 18: Brightness scale (brightness value V) - example red

The brightness adjustment is realised according to the direction of the value adjustment and the step width via KNX telegrams. When adjusting the brightness, the device cyclically sends new values to the KNX, which continuously changes the brightness.

- i** The brightness adjustment ends automatically either when the brightness is increased at 100% or when the brightness is decreased at 0%. The brightness value (V) changes cyclically by the parameterised step width. The colour hue (H) and the saturation (S) remain unaffected by a brightness adjustment. Depending on the start position at the beginning of the adjustment, the values R, G or B change cyclically.

Using the colour picker of the ETS, the brightness adjustment can be reproduced by adjusting the slider of the V-value from 0% to 100%.



Figure 19: Examples of brightness adjustment using the colour picker of the ETS

Examples of HSV-RGB conversion:

Example	HSV values	RGB values	Colour
1	83°, 65%, 0%	0, 0, 0	Black
2	83°, 65%, 50%	95, 127, 44	Dark green
3	83°, 65%, 100%	191, 255, 89	Light green

- i** With "Brightness value (V) = 0%", a change in the colour angle (H) or saturation (S) has no effect on the RGB values and thus no effect on the colour.

9.5.4 6-byte value transmitter

The 6-byte value transmitter is available in the following two variants:

- Colour value RGBW/HSVW
- Colour temperature value + brightness

Objects for sending the parameterised values are available in the ETS for each input. When the contact closes, the parameterised values are sent out on the KNX.

With the value range "Colour value RGBW/HSVW", the colour space of this function can be defined in the parameters. The object values RGB or HSV to be transmitted are parameterised via a colour picker in the ETS. The object value for the white component (W) is configured via a separate slider.

Communication takes place in the RGBW colour space via a 6-byte combination object according to DPT 251.600 and in the HSVW colour space via four 1-byte individual objects. All five communication objects are displayed in the object overview.

For the value range "Colour temperature value + brightness", the object values to be transmitted for colour temperature and brightness as well as a time window are defined in the parameters. The device combines all three pieces of information together in one communication object according to DPT 249.600 and sends them to the KNX. The receiving actuator converts this information and sets the colour temperature and brightness in the parameterised time window.

9.5.5 Value transmitter parameters

Input... -> I... - Function

Debounce time (10...255 ms)	10...255
This parameter sets the debouncing time individually for the input. According to the time set here, the input signal at the input is evaluated with a delay.	
Function	No function 1-byte 2-byte 3-byte 6-byte
At this point, the functionality of the encoder is defined.	
Value range	0...255 0...100% -128...127 0...255% 0...360°
The 1-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	
Value range	0...65535 -32768...32767 Temperature value Brightness value Colour temperature value
The 2-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	
Value range	RGB/HSV with colour wheel sequence RGB/HSV with brightness adjustment
The 3-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	
Value range	Colour value RGBW/HSW Colour temperature value + brightness
The 6-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	
Value when closing the contact (0...255)	0...255
This parameter determines the object value when closing the contact. It is only visible with "Function = 1-byte" and "Value range = 0...255".	

Value when closing the contact (0...100 %)	0...100
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 1-byte" and "Value range = 0...100%".	
Value when closing the contact (-128...127)	-128...0...127
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 1-byte" and "Value range = -128...127%".	
Value when closing the contact (0...255%)	0...255
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 1-byte" and "Value range = 0...255%".	
Value when closing the contact (0...360°)	0...360
This parameter determines the object value when closing the contact. It is only visible if "Function = 0...360%".	
Value when closing the contact (0...65535)	0...65535
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 2-byte" and "Value range = 0...65535%".	
Value when closing the contact (-32768...32767)	-32768...0...32767
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 2-byte" and "Value range = -32768...32767%".	
Temperature value when closing the contact (0...40 °C)	0...20...40
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 2-byte" and "Value range = temperature value".	
Brightness value when closing the contact (0, 50, ..., 1500 lux)	0, 50, ..., 300, ..., 1500
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 2-byte" and "Value range = brightness value".	
Colour temperature value when closing the contact (1000, 1100, ..., 10000 K)	1000, 1100, ..., 2700, ..., 10000
This parameter determines the object value when closing the contact. This parameter is only visible if "Function = 2-byte" and "Value range = colour temperature value".	

Colour value when closing the contact (RGB/HSV)	#000000 ... #FFFFFF
<p>This parameter determines the object values of the objects Value transmitter 3-byte and Value transmitter 6-byte, Brightness value (V), Saturation (S) and Colour hue (H) when closing the contact. It is visible for "Function = 3-byte RGB/HSV with colour wheel sequence", "Function = 3-byte RGB/HSV with brightness adjustment" and "6-byte RGBW/HSVW".</p>	
White value (W)	0...255
<p>This parameter determines the value of the White value (W) object when the contact closes. Visible only if "Function = 6-byte RGBW/HSVW".</p>	
Colour temperature value (1000, 1100, ..., 10000 K)	1000, 1100, ..., 2700, ..., 10000
<p>This parameter determines the colour temperature of the object value when the contact closes. It is only visible with "Function = 6-bytes" and "Value range = colour temperature value + brightness".</p>	
Brightness value (0...100%)	0...100
<p>This parameter determines the brightness of the object value when the button is pressed. It is only visible with "Function = 6-bytes" and "Value range = colour temperature value + brightness".</p>	
Time frame (0...100 minutes)	0...100
<p>This parameter determines the time period in which the actuator adjusts the colour temperature and brightness after the contact is closed. It is only visible with "Function = 6-bytes" and "Value range = colour temperature value + brightness".</p> <p>Setting the minutes of the time window.</p>	
(0...59 seconds)	0...1...59
<p>Setting the seconds of the time window.</p>	
(0...900 milliseconds)	0...900
<p>Setting the milliseconds of the time window.</p>	
After bus voltage return	no reaction
<p>Reaction as when closing the contact</p>	
<p>At this point, the behaviour of the input after a device reset (bus voltage return, ETS programming operation) is defined. If a delay after bus voltage return is set for the inputs, the device will not carry out the reaction specified at this point until the delay has expired.</p> <p>no reaction: The device does not send a telegram for initialisation.</p> <p>Reaction as when closing the contact: When closing the contact, the device sends out the configured values.</p>	

Value adjustment	Checkbox (yes/no)
<p>This parameter optionally enables the value adjustment.</p> <p>i The value adjustment is not available with the "6-byte" mode of operation.</p>	
Starting value in case of value adjustment	<p>same as configured value</p> <p>Same as value after last adjustment</p> <p>Same as value from communication object</p>
<p>Value adjustment can begin with different starting values. This parameter is visible only if the value adjustment is enabled! The selection is only available for the 1-byte and 2-byte modes.</p> <p>Same as parameterised value: After each long press, the device always starts with the value configured in the ETS.</p> <p>Same as value after last adjustment: After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p> <p>Same as value from communication object: After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p>	
Starting value in case of value adjustment	<p>same as configured value</p> <p>Same as value after last adjustment</p> <p>same as value from feedback object (1-byte colour hue/H-value)</p> <p>as value from feedback object (3-byte RGB)</p>
<p>Value adjustment can begin with different starting values. This parameter is visible only if the value adjustment is enabled! The selection is only available with the 3-byte RGB/HSV mode of operation with colour wheel scrolling.</p> <p>Same as parameterised value: After each long press, the device always starts with the value configured in the ETS.</p> <p>Same as value after last adjustment: After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p> <p>Same as value on feedback object (1-byte colour hue/H-value): After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p> <p>Same as value from feedback object (3-byte RGB): After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p>	

Starting value in case of value adjustment	same as configured value Same as value after last adjustment same as value on feedback object (1-byte brightness/V-value) as value from feedback object (3-byte RGB)
<p>Value adjustment can begin with different starting values. This parameter is visible only if the value adjustment is enabled! The selection is only available with the 3-byte RGB/HSV function with brightness adjustment.</p> <p>Same as parameterised value: After each long press, the device always starts with the value configured in the ETS.</p> <p>Same as value after last adjustment: After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p> <p>Same as value on feedback object (1-byte brightness/V-value): After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p> <p>Same as value from feedback object (3-byte RGB): After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.</p>	
Direction of value adjustment	Upwards Downwards Toggling (alternating)
<p>The device can either always adjust the values in the same direction when there is a long signal at the input, or it stores the direction of the last adjustment and reverses it when there is a new signal at the input. This parameter is visible only if the value adjustment is enabled! The selection is only available for the 1-byte and 2-byte modes.</p>	
Direction of the colour sequence	Colour sequence in clockwise direction (red -> green -> blue -> red -> ...) Colour sequence in anti-clockwise direction (red -> blue -> green -> red -> ...) Toggling colour sequence (alternating whenever a button is pressed for a longer period of time)
<p>The device can either always adjust the values in the same direction when there is a long signal at the input, or it stores the direction of the last adjustment and reverses it when there is a new signal at the input. This parameter is visible only if the value adjustment is enabled! The selection is only available with the 3-byte RGB/HSV mode of operation with colour wheel scrolling.</p>	

Direction of the brightness adjustment	Brighter Darker Toggling (alternating)
<p>The device can either always adjust the values in the same direction when there is a long signal at the input, or it stores the direction of the last adjustment and reverses it when there is a new signal at the input. This parameter is visible only if the value adjustment is enabled! The selection is only available with the 3-byte RGB/HSV function with brightness adjustment.</p>	
Step width	1...15
<p>In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the lower limit of the adjustment range is not reached or the upper limit is exceeded, the device automatically adjusts the step size for the last step.</p> <p>This parameter is only visible when value adjustment is enabled and is only available with the following functions: 1-byte (0...255), 1-byte (0...100%), 1-byte (-128...127), 1-byte (0...255%) and 1-byte (0...360°).</p>	
Step width	1, 2, 5, 10, 20, 50, 75, 100, 200, 500, 750, 1000
<p>In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the lower limit of the adjustment range is not reached or the upper limit is exceeded, the device automatically adjusts the step size for the last step.</p> <p>This parameter is only visible when value adjustment is enabled and is only available with the following functions: 2-bytes (0...65535) and 2-bytes (-32768...32767).</p>	
Step width	1
<p>With the 2-byte temperature value transmitter, the step size of the value adjustment is always set to "1°C" and cannot be changed.</p> <p>This parameter is only visible with enabled value adjustment and only available with the following mode of operation: 2-byte temperature value.</p>	
Step width (1...1000 K)	1, 10, 20, ..., 500, ..., 1000
<p>In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the lower limit of the adjustment range is not reached or the upper limit is exceeded, the device automatically adjusts the step size for the last step.</p> <p>This parameter is only visible with enabled value adjustment and only available with the following function: 2-byte colour temperature value.</p>	

Step width	50
<p>With the 2-byte brightness value transmitter, the step size of the value adjustment is always set to "50 lux" and cannot be changed.</p> <p>This parameter is only visible with enabled value adjustment and only available with the following function: 2-byte brightness value.</p>	
Step width	1°, 2°, 4°, 5°, 10°, 20°, 25°, 30°, 50°, 60°
<p>In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the lower limit of the adjustment range is not reached or the upper limit is exceeded, the device automatically adjusts the step size for the last step.</p> <p>This parameter is only visible when the value adjustment is enabled and is only available with the following modes of operation: 3-byte RGB/HSV with colour circle run-through.</p>	
Step width	1...15
<p>In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the lower limit of the adjustment range is not reached or the upper limit is exceeded, the device automatically adjusts the step size for the last step.</p> <p>This parameter is only visible with enabled value adjustment and only available with the following function: 3-byte RGB/HSV with brightness adjustment.</p>	
Time period until the start of value adjustment	0.5 s 1 s 2 s 3 s 5 s
<p>This parameter determines the time from which the device starts the value adjustment after the contact is closed.</p> <p>This parameter is visible only if the value adjustment is enabled!</p>	
Time between two telegrams	0.5 s 1 s 2 s 3 s
<p>This parameter defines the interval at which the device transmits new telegrams during a value adjustment.</p> <p>This parameter is visible only if the value adjustment is enabled!</p>	

Value adjustment with overflow	Checkbox (yes/no)
<p>If the value adjustment is to take place without overflow (parameter deactivated) and the device reaches the lower limit of the adjustment range or the upper limit during the value adjustment, it ends the value adjustment automatically.</p> <p>If the value adjustment is to be made with overflow (parameter activated) and the device reaches the lower or upper range limit, it sends the value of this range limit and then inserts a pause whose duration corresponds to two steps. Thereafter, the device transmits a telegram with the value of the other range limit and continues the value adjustment in the same direction.</p>	

9.5.6 Value transmitter objects

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter 0...255	Input... - Output	1-byte	5.010	C, (R), W, T, A

1-byte object for transmitting values from 0 to 255.

- i** These objects are only visible when:
- "Function = 1-bytes" and
 - "Value range: 0...255"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter 0...100 %	Input... - Output	1-byte	5.001	C, (R), W, T, A

1-byte object for transmitting values from 0 to 100%.

- i** These objects are only visible when:
- "Function = 1-bytes" and
 - "Value range: 0...100%"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter -128...127	Input... - Output	1-byte	6.010	C, (R), W, T, A

1-byte object for transmitting values from -128 to 127.

- i** These objects are only visible when:
- "Function = 1-bytes" and
 - "Value range: -128...127"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter 0...255 %	Input... - Output	1-byte	5.004	C, (R), W, T, A

1-byte object for transmitting values from 0 to 255%.

- i** These objects are only visible when:
- "Function = 1-bytes" and
 - "Value range: 0...255%"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter 0...360°	Input... - Output	1-byte	5.003	C, (R), W, T, A

1-byte object for transmitting values from 0 to 360°.

- i** These objects are only visible when:
- "Function = 1-bytes" and
 - "Value range: 0...360°"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter 0...65535	Input... - Output	2-byte	7.001	C, (R), W, T, A

2-byte object for transmitting values from 0 to 65535.

- i** These objects are only visible when:
- "Function = 2-bytes" and
 - "Value range: 0...65535"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter -32768...32767	Input... - Output	2-byte	8.001	C, (R), W, T, A

2-byte object for transmitting values from -32768 to 32767.

- i** These objects are only visible when:
- "Function = 2-bytes" and
 - "Value range: -32768...32767"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Temperature value transmitter	Input... - Output	2-byte	9.001	C, (R), W, T, A

2-byte object for transmitting temperature values from 0 to 40 °C.

- i** These objects are only visible when:
- "Function = 2-bytes" and
 - "Value range = temperature value"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Brightness value transmitter	Input... - Output	2-byte	9.004	C, (R), W, T, A

2-byte object for transmitting brightness values from 0 to 1500 Lux.

- i** These objects are only visible when:
- "Function = 2-bytes" and
 - "Value range = brightness value"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Colour temperature value transmitter	Input... - Output	2-byte	7.600	C, (R), W, T, A

2-byte object for transmitting colour temperature values from 1000 to 10000 Kelvin.

- i** These objects are only visible when:
- "Function = 2-bytes" and
 - "Value range = colour temperature value"

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter 3-bytes (colour wheel sequence)	Input... - Output	3-byte	232.600	C, (R), -, T, A

3-byte object for transmitting 3-byte colour information.

i These objects are only visible if function: 3-byte RGB/HSV with colour wheel sequence.

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	Value transmitter 3-byte (brightness adjustment)	Input... - Output	3-byte	232.600	C, (R), -, T, A

3-byte object for transmitting 3-byte colour information.

i These objects are only visible if function: 3-byte RGB/HSV with brightness adjustment.

Object no.	Function	Name	Type	DPT	Flag
531, 543, 555	6-byte value transmitter	Input... - Output	6-byte	251.600	C, (R), -, T, A

6-byte object for transmitting 6-byte colour information.

i These objects are only visible if function: 6-byte RGBW/HSVW.

Object no.	Function	Name	Type	DPT	Flag
532, 544, 556	Colour hue (H)	Input... - Output	1-byte	5.003	C, (R), -, T, A

1-byte object for transmitting the colour hue.

i These objects are only visible if functions:

- 3-byte RGB/HSV with colour wheel sequence
- 3-byte RGB/HSV with brightness adjustment
- 6-byte RGBW/HSVW

Object no.	Function	Name	Type	DPT	Flag
533, 545, 557	Saturation (S)	Input... - Output	1-byte	5.001	C, (R), -, T, A

1-byte object for transmitting the saturation.

i These objects are only visible if functions:

- 3-byte RGB/HSV with colour wheel sequence
- 3-byte RGB/HSV with brightness adjustment
- 6-byte RGBW/HSVW

Object no.	Function	Name	Type	DPT	Flag
534, 546, 558	Brightness (V)	Input... - Output	1-byte	5.001	C, (R), -, T, A

1-byte object for transmitting the brightness value.

- i** These objects are only visible if functions:
- 3-byte RGB/HSV with colour wheel sequence
 - 3-byte RGB/HSV with brightness adjustment
 - 6-byte RGBW/HSVW

Object no.	Function	Name	Type	DPT	Flag
535, 547, 559	White value (W)	Input... - Output	1-byte	5.001	C, (R), -, T, A

1-byte object for transmitting the white level.

- i** These objects are only visible if function: 6-byte RGBW/HSVW.

Object no.	Function	Name	Type	DPT	Flag
537, 549, 561	Feedback brightness value (V)	Input... - Input	1-byte	5.001	C, (R), W, -, A

1-byte object for receiving the brightness value.

- i** These objects are only visible with the following configuration:
- "Function" parameter = 3-byte RGB/HSV with brightness adjustment
 - "Starting value of value adjustment" parameter = same as value from feedback object (1-byte brightness/V-value)

Object no.	Function	Name	Type	DPT	Flag
537, 549, 561	Feedback colour hue (H)	Input... - Input	1-byte	5.003	C, (R), W, -, A

1-byte object for receiving the colour hue.

- i** These objects are only visible with the following configuration:
- "Function" parameter = 3-byte RGB/HSV with colour wheel sequence
 - "Starting value of value adjustment" parameter = same as value from feedback object (1-byte/colour hue/H-value)

Object no.	Function	Name	Type	DPT	Flag
537, 549, 561	Value transmitter feedback RGB	Input... - Input	3-byte	232.60 0	C, (R), W, -, A

3-byte object for receiving 3-byte colour information.

- i** These objects are only visible with the following configuration:
- The "Function" parameter" = 3-byte RGB/HSV with colour wheel sequence or 3-byte RGB/HSV with brightness adjustment and
 - "Starting value of value adjustment" parameter = same as value from feedback object (3-byte RGB)

Object no.	Function	Input... - Output	Type	DPT	Flag
531, 543, 555	Colour temperature value transmitter + brightness	Input... - Output	6-byte	249.60 0	C, (R), -, T, A

6-byte object for sending the time window, colour temperature and brightness.

- i** These objects are only visible when:
- "Function = 6-bytes" and
 - "Value range = colour temperature value + brightness"

9.6 Scene extension

For each input whose function is set to "Scene extension device", a 1-byte communication object is available according to DPT 18.001. The "Function" parameter defines the specific operating function:

- "Scene extension without storage function"
- "Scene extension with storage function"

In the function as a scene extension, the device sends a preset scene number (1...64) to the KNX via the communication object when the contact at the input closes. This feature permits recalling scenes stored in other devices and also storing them, if the storage function is used.

Function for the setting "... Scene extension without storage function":

Closing the contact leads to easy retrieval of the scene. A long signal at the input has no further effect.

Function for the setting "... Scene extension with storage function":

Closing the contact with a signal length shorter than one second results in easy recall of the scene. If the signal at the input lasts longer than five seconds, the device generates a save command. In the scene extension function, a storage telegram is in this case transmitted to the KNX.

- i** A signal at the input with a time length between one and five seconds is rejected as invalid.

9.6.1 Scene extension parameters

Input... -> I... - Function

Debounce time (10...255 ms)	10...255
This parameter sets the debouncing time individually for the input. According to the time set here, the input signal at the input is evaluated with a delay.	
Function	Scene extension without storage function Scene extension with storage function
This parameter defines the specific operating function of the scene extension. Scene extension without storage function: Closing the contact leads to simple retrieval of the scene. A long signal at the input has no further effect. Scene extension with storage function: Closing the contact with a signal length shorter than one second results in easy recall of the scene. If the signal at the input lasts longer than five seconds, the device generates a save command. In the scene extension function, a storage telegram is in this case transmitted to the KNX.	
Scene number when closing the contact (1 ... 64)	1...64
In accordance with the KNX standard, objects with data type 18.001 can retrieve or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the contact is closed.	

9.6.2 Scene extension objects

Object no.	Function	Name	Type	DPT	Flag
592, 595, 598	Scene extension	Input... - Output	1-byte	18.001	C, (R), -, T, A
1-byte object for recalling or storing one of max. 64 external KNX scenes.					

9.7 2-channel operation

The "2-channel operation" function allows two function channels to be operated with only one input. This makes it possible to carry out two different functions with one contact and to send different types of telegrams.

For the two channels, the parameters "Function channel 1" and "Function channel 2" can be used independently of each other to determine which data formats the operating function uses in each case. The following functions are available:

- 1-bit switching
- Value transmitter 1-byte (0...255)
- Value transmitter 1-byte (0...100%)
- Value transmitter 1-byte (-128...127)
- Value transmitter 1-byte (0...255%)
- Value transmitter 1-byte (0 ... 360 °)
- Value transmitter 2-byte (0...65535)
- Value transmitter 2-byte (-32768...32767)
- Value transmitter 2-byte temperature value
- Value transmitter 2-byte brightness value
- Value transmitter 2-byte colour temperature value
- Value transmitter 3-byte colour value RGB/HSV
- Value transmitter 6-byte colour value RGBW/HSVW
- Value transmitter 6-byte colour temperature value + brightness
- Recalling scene (external)

Depending on the set function, the value command that the device sends to the KNX when the contact closes can be individually parameterised in the ETS. With "1-bit switching" it can be set whether an ON or OFF telegram is to be sent. Alternatively, the object value can be switched and sent at "UM".

With parameterization as a value transmitter "1-byte ..." or "2-byte ..." it is possible to select the object value within the intended value range. When used as a colour value transmitter "3-byte..." the object values can be set according to RGB or HSV via a colour picker. With the colour value transmitter "6-byte..." the object values RGB or HSV are configured via a colour picker and the white value "W" via a slider.

When used as a value transmitter "6-byte colour temperature value + brightness", the object values colour temperature and brightness as well as a time window can be specified. With "Call scene (external)", the scene number is set which is to be sent out on the KNX when the contact closes.

The "Operation concept" parameter determines whether both channels or only one channel at a time sends the configured telegram when the contact closes.

Operating concept channel 1 or channel 2

With this operation concept, exactly one telegram is sent each time the contact is closed.

- With a short signal, the device only sends the telegram for channel 1.
- If the signal is long, the device only sends the telegram for channel 2.

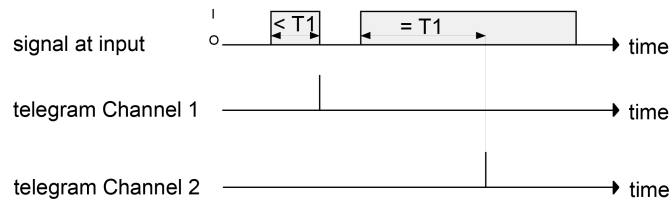


Figure 20: Example of operating concept "Channel 1 or Channel 2"

The time duration ($T1$) for distinguishing between a short and a long signal is determined by the parameter "Time between channel 1 and channel 2". If the signal is shorter than the parameterised time, only the telegram to channel 1 is sent when the contact is opened. If the signal is longer, only the telegram to channel 2 is sent after time $T1$ has elapsed. This concept provides the transmission of only one channel.

Operating concept channel 1 and channel 2

With this operating concept, either only one or alternatively two telegrams are sent each time the contact is closed.

- With a short signal, the device only sends the telegram for channel 1.
- With a long signal, the device first sends the telegram for channel 1 and then the telegram for channel 2.

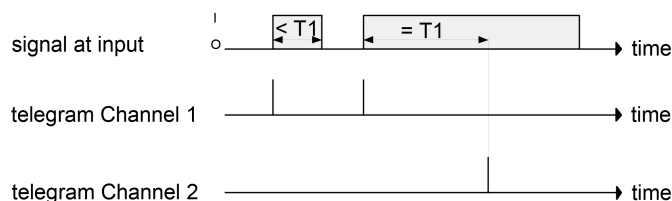


Figure 21: Example for operating concept "Channel 1 and channel 2"

The time duration ($T1$) for distinguishing between a short and a long signal is determined by the parameter "Time between channel 1 and channel 2". When the contact is closed, the telegram for channel 1 is sent immediately. If the signal lasts longer than $T1$, the telegram for the second channel is also sent immediately after the time has elapsed. If the contact at the input is released before the time $T1$ has elapsed, the device does not send a telegram for channel 2.

9.7.1 2-channel operation parameters

Input... -> I... - Function

Debounce time (10...255 ms)	10...255
This parameter sets the debouncing time individually for the input. According to the time set here, the input signal at the input is evaluated with a delay.	
Operating concept	Channel 1 or channel 2 Channel 1 and channel 2
<p>This is where the 2-channel operating concept is defined.</p> <p>Channel 1 or channel 2: With this operating concept, exactly one telegram is sent each time the contact closes. The time duration for distinguishing between a short and a long signal is determined by the parameter "Time between channel 1 and channel 2". If the signal is shorter than the parameterised time, only the telegram to channel 1 is sent when the contact is opened. If the signal is longer, only the telegram to channel 2 is sent after time has elapsed. This concept provides the transmission of only one channel.</p> <p>Channel 1 and channel 2: With this operating concept, either only one or alternatively two telegrams are sent each time the contact closes. The time duration for distinguishing between a short and a long signal is determined by the parameter "Time between channel 1 and channel 2". When the contact is closed, the telegram for channel 1 is sent immediately. If the signal lasts longer than the set time, the telegram for the second channel is also sent immediately after the time has expired. If the contact at the input is released before the time has elapsed, the device does not send a telegram for channel 2</p>	

Function channel 1	No function 1-bit switching 1-byte (0...255) 1-byte (0...100%) 1-byte (-128...127) 1-byte (0...255%) 1-byte (0...360°) 2-byte (0...65535) 2-byte (-32768...32767) 2-bytes temperature value 2-byte brightness value 2-bytes colour temperature value 3-bytes colour value RGB/HSV 6-bytes colour value RGBW/HSVW 6-bytes colour temperature value + brightness Recalling scene (external)
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This parameter determines the function of the first channel and defines which other parameters and which communication objects are displayed for channel 1.

Function channel 2	No function 1-bit switching 1-byte (0...255) 1-byte (0...100%) 1-byte (-128...127) 1-byte (0...255%) 1-byte (0...360°) 2-byte (0...65535) 2-byte (-32768...32767) 2-bytes temperature value 2-byte brightness value 2-bytes colour temperature value 3-bytes colour value RGB/HSV 6-bytes colour value RGBW/HSVW 6-bytes colour temperature value + brightness Recalling scene (external)
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This parameter determines the function of the second channel and defines which other parameters and which communication objects are displayed for channel 2.

Colour space	RGB HSV
<p>This parameter defines the colour space of the function "3-byte colour value RGB/HSV".</p> <p>With "RGB", the data format of the communication objects can be set by the "Communication" parameter. With HSV, communication takes place via 1-byte individual objects.</p>	
Communication	Single object Combi object
<p>This parameter defines the data format of the communication objects for the function "3-byte colour value RGB/HSV" in the colour space "RGB". Communication can take place via 1-byte individual objects or via a 3-byte combination object according to DPT 232.600.</p>	
Colour space	RGBW HSVW
<p>This parameter defines the colour space of the function "6-byte colour value RGBW/HSVW".</p> <p>With "RGBW", the data format of the communication objects can be set by the "Communication" parameter. With HSVW, communication takes place via 1-byte individual objects.</p>	
Communication	Single object Combi object
<p>This parameter defines the data format of the communication objects for the function "3-byte colour value RGBW/HSVW" in the colour space "RGBW". Communication can take place via 1-byte individual objects or via a 6-byte combination object according to DPT 251.600.</p>	
Time between channel 1 and channel 2 (0...25 seconds)	0... 3 ...25
<p>Depending on the selected operating concept, this parameter defines the interval at which the device transmits the telegram for channel 1 and the telegram for channel 2.</p> <p>Setting the seconds of time between channel 1 and channel 2.</p>	
(0...990 milliseconds)	0...990
<p>Setting the milliseconds of time between channel 1 and channel 2.</p>	
Command for channel 1 (2)	ON OFF TOGGLE
<p>This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 1-bit switching".</p>	

Value (0...255)	0...255
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 1-byte (0...255)".	
Value (0...100%)	0...100
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 1-byte (0...100%)".	
Value (-128...127)	-128...0...127
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 1-byte (-128...127)".	
Value (0...255%)	0...255
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 1-byte (0...255%)".	
Value (0...360°)	0...360
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 1-byte (0...360°)".	
Value (0...65535)	0...65535
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 2-byte (0...65535)".	
Value (-32768...32767)	-32768...0...32767
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 2-byte (-32768...32767)".	
Temperature value (0...40 °C)	0...20...40
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 2-byte temperature value".	
Brightness value (0, 50, ..., 1500 lux)	0...300...1500
This parameter determines the object value that is sent out on the KNX when the contact closes. Visible only if "Function channel 1 (2) = 2-byte brightness value".	
Colour temperature value (1000, 1100, ..., 10000 K)	1000, 1100, ...2700, ..., 10000
This parameter determines the colour temperature value of the object value that is sent out on the KNX when the contact closes. It is only visible with "Function channel 1 (2) = 2-byte colour temperature value".	

Colour value (RGB/HSV)	#000000...#FFFFFF
<p>This parameter determines the object values when closing the contact for the following output objects:</p> <ul style="list-style-type: none"> - "Channel 1 (2) colour value red", "Channel 1 (2) colour value green", "Channel 1 (2) colour value blue" or - "Channel 1 (2) colour value RGB", "Channel 1 (2) colour value RGBW" or - "Channel 1 (2) colour hue (H)", "Channel 1 (2) saturation (S)", "Channel 1 (2) brightness (V)" <p>The parameter is only visible with "Function channel 1 (2) = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW".</p>	
White value (W)	0...255
<p>This parameter determines the object values of the following output objects, which is sent out on the KNX when the contact closes:</p> <ul style="list-style-type: none"> - "Channel 1 (2) colour value white" or - "Channel 1 (2) colour value RGBW" <p>The parameter is only visible with "Function channel 1 (2) = 6-byte colour value RGBW/HSVW" in the colour space "RGB".</p>	
Value (W %)	0...100
<p>This parameter determines the object values of the following output objects, which is sent out on the KNX when the contact closes:</p> <ul style="list-style-type: none"> - Channel 1 (2) white level (W) <p>The parameter is only visible with "Function channel 1 (2) = 6-byte colour value RGBW/HSVW" in the colour space "HSV".</p>	
Colour temperature value (1000, 1100, ..., 10000 K)	1000, 1100, ..., 2700 , ..., 10000
<p>This parameter determines the object value for the colour temperature that is sent out on the KNX when the contact closes. It is only visible with "Function channel 1 (2) = 6-byte colour temperature value + brightness".</p>	
Brightness (0...100%)	0...100
<p>This parameter determines the object value for the brightness that is sent out on the KNX when the contact closes. It is only visible with "Function channel 1 (2) = 6-byte colour temperature value + brightness".</p>	
Time frame (0...100 minutes)	0...100
<p>This parameter determines the time period in which the actuator adjusts the colour temperature and brightness after the contact is closed. It is only visible with "Function channel 1 (2) = 6-byte colour temperature value + brightness".</p> <p>Setting the minutes of the time window.</p>	

(0...59 seconds)	0...1...59
Setting the seconds of the time window.	
(0...900 milliseconds)	0...900
Setting the milliseconds of the time window.	
Scene number (1...64) for channel 1 (2)	1...64
This parameter determines the object value that is sent out on the KNX when the contact closes. It is only visible if "Function channel 1 (2) = Recalling scene (external)".	

9.7.2 2-channel operation objects

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 switching	Input... - Output	1-bit	1.001	C, (R), W, T, A
1-bit object for transmitting switching telegrams on channel 1 if 2-channel operation is activated.					
Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 switching	Input... - Output	1-bit	1.001	C, -, W, T, U
1-bit object for transmitting switching telegrams on channel 2 if 2-channel operation is activated.					
Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 value 0...255	Input... - Output	1-byte	5.010	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					
Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 value 0...255	Input... - Output	1-byte	5.010	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					
Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 value 0...100 %	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					
Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 value 0...100 %	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					
Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 value -128...127	Input... - Output	1-byte	6.010	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 value -128...127	Input... - Output	1-byte	6.010	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 value 0...255 %	Input... - Output	1-byte	5.004	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 value 0...255 %	Input... - Output	1-byte	5.004	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 value 0...360°	Input... - Output	1-byte	5.003	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 value 0...360°	Input... - Output	1-byte	5.003	C, (R), -, T, A
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 value 0...65535	Input... - Output	2-byte	7.001	C, (R), -, T, A
2-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 value 0...65535	Input... - Output	2-byte	7.001	C, (R), -, T, A
2-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 value -32768...32767	Input... - Output	2-byte	8.001	C, (R), -, T, A
2-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 value -32768...32767	Input... - Output	2-byte	8.001	C, (R), -, T, A
2-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 temperat- ure value	Input... - Output	2-byte	9.001	C, (R), -, T, A
2-byte object for transmitting temperature values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 temperat- ure value	Input... - Output	2-byte	9.001	C, (R), -, T, A
2-byte object for transmitting temperature values on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 bright- ness value	Input... - Output	2-byte	9.004	C, (R), -, T, A
2-byte object for transmitting brightness values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 bright- ness value	Input... - Output	2-byte	9.004	C, (R), -, T, A
2-byte object for transmitting brightness values on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 colour temperature value	Input... - Output	2-byte	7.600	C, (R), -, T, A
2-byte object for sending colour temperature values from 1000 to 10000 Kelvin on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 colour temperature value	Input... - Output	2-byte	7.600	C, (R), -, T, A
2-byte object for sending colour temperature values from 1000 to 10000 Kelvin on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 colour value RGB	Input... - Output	3-byte	232.600	C, (R), -, T, A
3-byte object for sending the colour information red, green and blue in a communication object on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 colour value RGB	Input... - Output	3-byte	232.600	C, (R), -, T, A
3-byte object for sending the colour information red, green and blue in a communication object on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 colour value RGBW	Input... - Output	6-byte	251.600	C, (R), -, T, A
6-byte object for sending the colour information red, green, blue and white in a communication object on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 colour value RGBW	Input... - Output	6-byte	251.600	C, (R), -, T, A
6-byte object for sending the colour information red, green, blue and white in a communication object on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
638, 651, 664	Channel 1 colour value red	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value red from 0 to 100 percent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
642, 655, 668	Channel 2 colour value red	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value red from 0 to 100 percent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
639, 652, 665	Channel 1 colour value green	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value green from 0 to 100 percent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
643, 656, 669	Channel 2 colour value green	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value green from 0 to 100 percent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
640, 653, 666	Channel 1 colour value blue	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value blue from 0 to 100 percent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
644, 657, 670	Channel 2 colour value blue	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value blue from 0 to 100 percent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
641, 654, 667	Channel 1 colour value transmitter White	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value white from 0 to 100 percent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
645, 658, 671	Channel 2 colour value transmitter White	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the colour value white from 0 to 100 percent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
638, 651, 664	Channel 1 colour hue (H)	Input... - Output	1-byte	5.003	C, (R), -, T, A
1-byte object for sending the colour angle (H) from 0 ... 360° on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
642, 655, 668	Channel 2 colour hue (H)	Input... - Output	1-byte	5.003	C, (R), -, T, A
1-byte object for sending the colour angle (H) from 0 ... 360° on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
639, 652, 665	Channel 1 saturation (S)	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the saturation (S) from 0 to 100 percent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
643, 656, 669	Channel 2 saturation (S)	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the saturation (S) from 0 to 100 percent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
640, 653, 666	Channel 1 brightness (V)	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the brightness value (V) from 0 to 100 percent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
644, 657, 670	Channel 2 brightness (V)	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the brightness value (V) from 0 to 100 percent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
641, 654, 667	Channel 1 white level (W)	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the white value (W) from 0 to 100 percent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
645, 658, 671	Channel 2 white level (W)	Input... - Output	1-byte	5.001	C, (R), -, T, A
1-byte object for sending the white value (W) from 0 to 100 percent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 colour temperature value + brightness	Input... - Output	6-byte	249.60 0	C, (R), -, T, A
6-byte object for sending the time window, colour temperature and brightness on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 1 colour temperature value + brightness	Input... - Output	6-byte	249.60 0	C, (R), -, T, A
6-byte object for sending the time window, colour temperature and brightness on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
636, 649, 662	Channel 1 scene (external) 1...64	Input... - Output	1-byte	18.001	C, (R), -, T, A
1-byte object for transmitting scene values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
637, 650, 663	Channel 2 scene (external) 1...64	Input... - Output	1-byte	18.001	C, (R), -, T, A
1-byte object for transmitting scene values on channel 2 if 2-channel operation is activated.					

9.8 Controller extension

The function "controller extension" can be used to control a KNX room temperature controller. The controller extension itself is not involved in the regulating process. With it, the user can operate the single-room regulation from different places in the room. It can also be used to adjust central heating control devices which are located, for instance, in a sub-distribution unit.

Typical KNX room temperature controllers generally offer different ways of influencing the room temperature control:

- Operating mode switchover:
Switching over between different modes of operation (e.g. "Comfort", "Night" ...) with different setpoint temperatures assigned to each mode by the controller.
- Presence function:
Signalling the presence of a person in a room. The signalling may also be combined with a configured switchover in the mode of operation.
- Setpoint shift:
Adjustment of the target temperature via a temperature offset (DPT 9.002) or via levels (DPT 6.010).

The controller extension is operated by the input functions of the device. In this way, it is possible to completely control a room temperature controller by changing the operating mode, by predefining the presence function or by readjusting the setpoint shift.

9.8.1 Operating mode switchover

The switching of the controller operating mode can be carried out with two 1-byte communication objects in accordance with the KNX specification for room temperature controllers. The operating mode can be switched over with the normal and with the forced objects. The "Operating mode switchover" object offers a selection between the following modes:

- Comfort mode
- Standby mode
- Night mode
- Frost/heat protection mode

The "Forced object operating mode" communication object has a higher priority. It permits forced switching between the following modes of operation:

- Auto (normal operating mode switchover)
- Comfort mode
- Standby mode
- Night mode
- Frost/heat protection mode

i Notes on multiple selection: In order to ensure that a change-over from one operating mode to another works properly even from different locations, the operating mode objects of the controller and those of all controller extensions must be interlinked. By checking the linked operating mode switchover feedback object, the controller extension knows which of the possible operating modes is active. Based on this information, the system switches to the next operating mode when the contact is closed. In the event that none of the possible operating modes is active, the next operating mode in the sequence is activated. As far as switching over between the forced operating modes and "Auto" is concerned, the device switches into the "Auto" operating mode when none of the configured operating modes is active.

9.8.2 Presence function

In the "Presence function" function mode, the two communication objects "Presence function" and "Presence function feedback" are available. The "Presence function when closing the contact" parameter determines the object value that is sent out on the KNX when the contact at the input closes.

To ensure that the appropriate object value is always sent with the "Presence TOGGLE" setting, the presence object of the room temperature controller and the feedback objects of the controller extension devices must be connected to each other via a separate group address (this group address must be transmitting at the controller).

9.8.3 Setpoint shift

The setpoint shift is another available function of the controller extension. It makes use of either two 2-byte communication objects with datapoint type 9.002 or two 1-byte communication objects with datapoint type 6.010 (integer with sign).

This extension function allows the basic setpoint for the temperature to be shifted on a room temperature controller by signals at the input. Operation of the extension is generally the same as the operation of the main controller. An input parameterised as setpoint shift decreases or increases the value of the setpoint shift once each time the contact closes. The direction of the value adjustment is determined by the parameters "Temperature difference when closing the contact" or "Setpoint shift when closing the contact".

Type of setpoint shift

The device provides two options for setpoint shifting. Depending on the setting of the parameter "Type of setpoint shift", the shift takes place via the 2-byte communication object "Setpoint shift specification" (acc. to KNX DPT 9.002) or via the 1-byte-communication object "Setpoint shift specification" (acc. to KNX DPT 6.010).

The setting "Via offset (DPT 9.002)" defines the temperature difference in Kelvin by which the setpoint temperature will be shifted up or down when the contact is closed. For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift". The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller.

With the "Via levels (DPT 6.010)" setting, only the direction of the setpoint shift on the extension is defined. For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift". The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller.

Communication with main controller

In order to enable the device to effect a setpoint shift in a room temperature controller, the controller must have input and output objects for setpoint shifting. In this case, the output object of the controller must be linked with the input object of the extension device and the input object of the controller must be linked with the output object of the extension via an independent group address.

All objects are of the same datapoint type and have the same value range. A setpoint shift is interpreted by count values: a shift in positive direction is expressed by positive values whereas a shift in negative direction is represented by negative object values. An object value of "0" means that no setpoint shift has been activated.

Via the "Current setpoint shift" object of the controller extensions, which is linked with the room temperature controller, the extensions are enabled to determine the current setpoint shift position. Based on the value of the communication object, the setpoint is adjusted in the configured direction each time the contact at an extension closes. Each time the setpoint is adjusted, the new shift is transmitted to the room temperature controller via the "Controller extension setpoint value specification" object of the controller extension. The controller itself checks the received value for the minimum and maximum temperature limits (see controller documentation) and adjusts the new setpoint shift if the values are valid. When the new count value is accepted as valid, the controller transfers this value to its output object for setpoint shifting and retransmits the value to the extension as feedback.

Due to the standard data point type used as the output and input object of the controller extension, each extension device is able to determine whether a shift took place, in which direction it took place and by which value (DPT 9.002) or by how many levels (DPT 6.010) the setpoint was shifted.

- i In "Via levels (DPT 6.010)" function, the weighting of the respective level is done by the controller itself.
- i This requires that the communication objects are connected on all controller extensions and the controller. The feedback information from the controller enables the extension to continue the adjustment anytime at the right point.

9.8.4 Controller extension parameters

Input... -> I... - Function

Debounce time (10...255 ms)	10...255
This parameter sets the debouncing time individually for the input. According to the time set here, the input signal at the input is evaluated with a delay.	
Function	Operating mode switchover Forced oper. mode switchover Presence function Setpoint shift
A controller extension can optionally switch over the operating mode with normal or high priority (forced), change the presence state or change the current room temperature setpoint value. With regard to the setting of this parameter, the ETS shows further parameters.	
Operating mode when closing the contact	Comfort mode Standby mode Night mode Frost/heat protection mode Comfort mode -> Standby mode ->* Comfort mode -> Night mode ->* Standby mode -> Night mode ->* Comfort mode -> Standby mode -> Night mode ->*
If the controller extension is to change over the operating mode of the room temperature controller with normal priority, the extension can – when operated – either switch on a defined operating mode or change over between different operating modes. This parameter is only visible if "Function = operating mode switchover".	

<p>Forced operating mode when closing the contact</p>	<p>Auto (Normal operating mode switchover) Comfort mode Standby mode Night mode Frost/heat protection mode Comfort mode -> Standby mode ->* Comfort mode -> Night mode ->* Standby mode -> Night mode ->* Comfort mode -> Standby mode -> Night mode ->* Auto -> Comfort mode ->* Auto -> Standby mode ->* Auto -> Night mode ->* Auto -> Frost/heat protection mode ->*</p>
<p>If the controller extension is to change over the operating mode of the room temperature controller with high priority, the extension can – when operated – either enable change-over with normal priority (Auto), switch on a defined operating mode with high priority or change over between different operating modes. This parameter is only visible if "Function = forced operating mode switchover".</p>	
<p>Presence function when closing the contact</p>	<p>Presence OFF Presence ON Presence TOGGLE</p>
<p>On closing the contact, the controller extension can switch the presence state of the room temperature controller either on or off in a defined way or change over between both states ("Presence TOGGLE"). This parameter is only visible if "Function = presence function".</p>	
<p>Type of setpoint shift</p>	<p>Via offset (DPT 9.002) Via levels (DPT 6.010)</p>
<p>Depending on the setting of this parameter, the shift takes place via the 2-byte communication object "Setpoint shift specification" (acc. to KNX DPT 9.002) or via the 1-byte-communication object "Setpoint shift specification" (acc. to KNX DPT 6.010). This parameter is only visible if "Function = Setpoint shift".</p>	

Temperature difference when closing the contact	+2 K
	+1.5 K
	+1 K
	+0.5 K
	-0.5 K
	-1 K
	-1.5 K
	-2 K

The temperature difference is defined in Kelvin here by which the setpoint temperature will be shifted up or down when the contact is closed.

For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift".

The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller.

This parameter is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset (DPT 9.002)".

Setpoint shift when closing the contact	Increase setpoint (level size)
	Reduce setpoint value (level size)

This parameter defines the direction of the setpoint shift on the extension.

For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift".

The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller.

This parameter is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels (DPT 6.010)".

9.8.5 Controller extension objects

Object no.	Function	Name	Type	DPT	Flag
606, 613, 620	Controller extension operating mode switchover	Input... - Output	1-byte	20,102	C, (R), -, T, A
<p>1-byte object for changing over a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes.</p> <p>This object is only visible if "Function = operating mode switchover".</p>					

Object no.	Function	Name	Type	DPT	Flag
607, 614, 621	Controller extension operating mode switchover feedback	Input... - Input	1-byte	20.102	C, (R), W, -, A
<p>1-byte object for receiving the operating mode of a room temperature controller.</p> <p>This object is only visible if "Function = operating mode switchover".</p>					

Object no.	Function	Name	Type	DPT	Flag
606, 613, 620	Controller extension forced-object operating	Input... - Output	1-byte	20.102	C, (R), -, T, A
<p>1-byte object for changing over a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes.</p> <p>This object is only visible if "Function = forced operating mode switchover".</p>					

Object no.	Function	Name	Type	DPT	Flag
607, 614, 621	Controller extension forced-object operating feedback	Input... - Input	1-byte	20.102	C, (R), W, -, A
<p>1-byte object for receiving the operating mode of a room temperature controller.</p> <p>This object is only visible if "Function = forced operating mode switchover".</p>					

Object no.	Function	Name	Type	DPT	Flag
606, 613, 620	Controller extension presence function	Input... - Output	1-bit	1.018	C, (R), -, T, A
<p>1-bit object for changing over the presence status of a room temperature controller.</p> <p>This object is only visible if "Function = presence function".</p>					

Object no.	Function	Name	Type	DPT	Flag
607, 614, 621	Controller extension presence function feedback	Input... - Input	1-bit	1.018	C, (R), W, -, A
<p>1-bit object for receiving the presence status of a room temperature controller.</p> <p>This object is only visible if "Function = presence function".</p>					

Object no.	Function	Name	Type	DPT	Flag
606, 613, 620	Controller extension setting setpoint shift	Input... - Output	2-byte	9.002	C, (R), -, T, A

2-byte object for presetting a basic setpoint shift in Kelvin. The value "0" means that no shift is active . Values can be specified between -670760 K and 670760 K.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset (DPT 9.002)".

Object no.	Function	Name	Type	DPT	Flag
607, 614, 621	Controller extension actual setpoint shift	Input... - Input	2-byte	9.002	C, (R), W, -, A

2-byte object for receiving the feedback from the current basic setpoint shift in Kelvin.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset (DPT 9.002)".

Object no.	Function	Name	Type	DPT	Flag
606, 613, 620	Controller extension setting setpoint shift	Input... - Output	1-byte	6.010	C, (R), -, T, A

1-byte object for presetting a basic setpoint shift. The value "0" means that no shift is active . The value is depicted in a two's complement in the positive or negative direction.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels (DPT 6.010)".

Object no.	Function	Name	Type	DPT	Flag
607, 614, 621	Controller extension actual setpoint shift	Input... - Input	1-byte	6.010	C, (R), W, -, A

1-byte object for receiving the feedback from the current basic setpoint shift.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels (DPT 6.010)".

10 Logic functions

The device contains up to 8 logic functions. Simple or complex logical operations in a KNX installation can be performed using these functions. Linking of input and output objects allows the networking of logic functions, permitting the execution of complex operations.

Enabling and configuring the number of logic functions

To be able to use logic functions, they must be enabled centrally on the "General" parameter page.

- Activate the parameter "Logic functions".

The logic functions can be used. The "Logic functions" parameter node becomes available, which contains additional parameter pages. The configuration of the logic functions takes place in this parameter node.

Logic functions can be enabled in steps so that the number of visible functions and, in consequence, the available parameters and communication objects are visible in the ETS. The number of available logic functions can be defined on the "Logic functions" parameter page.

- Configure the "Number of logic functions" parameter to the desired value.
As many logic functions are created as have been selected.

i The application program deletes existing logic functions from the configuration if the number of available functions is reduced.

Up to two time functions can be preset for each switching output, independently of each other. The time functions affect the communication objects "Switching" and delay the object value received depending on the telegram polarity .

i At the end of a disabling function, the switching state received during the function or set before the function can be tracked. At the same time, residual times of time functions are also tracked if these had not yet fully elapsed at the time of the reactivation.

i The time delays do not influence the staircase function if this is enabled.

i A time delay still in progress will be fully aborted by a reset of the actuator (bus voltage failure or ETS programming).

10.1 Logic functions parameters

General

Logic functions	Checkbox (yes/no)
This parameter enables the logic functions globally. If the parameter is activated, the "Logic functions" parameter node becomes available, which contains additional parameter pages. The configuration of the logic functions takes place in this parameter node.	

Number of logic functions (1...8)	1...8
The number of required logic functions is defined here.	

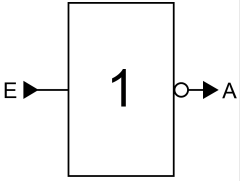
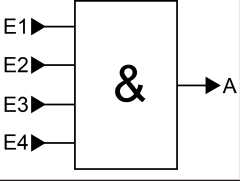
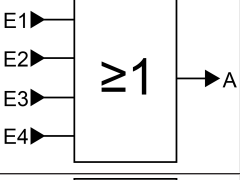
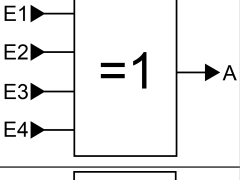
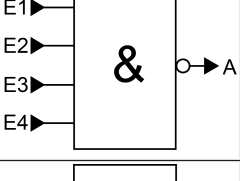
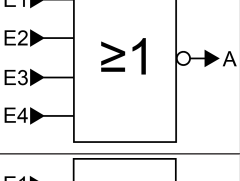
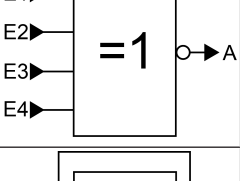
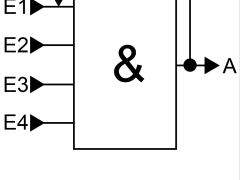
Logic functions -> Logic function...

Name of logic function	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the logic function in the ETS parameter window (e. g. "limit value switch outside temperature", disabling of venetian blind garden door). The text is not programmed in the device.	

<p>Type of logic function</p>	<p>Logic gate Converter (1-bit -> 1-byte) Disabling element (Filtering/Time) Comparator Limit value switch with hysteresis</p>
<p>It is possible to be define which logical operation is to be executed for each logic function. This parameter is only visible if the logic functions have been enabled on the "General" parameter page.</p> <p>Logic gate: The logic function works as a Boolean logic gate with optionally 1 ... 4 inputs and one output.</p> <p>Converter (1-bit -> 1-byte): The logic function is configured as a converter. The converter has a 1-bit input and a 1-byte output and also a disabling object. ON / OFF telegrams can be converted to preconfigured values. The disabling object is able to deactivate the converter.</p> <p>Disabling element (Filtering/Time): The logic function is configured as a disabling element. The disabling element has a 1-bit input and a 1-bit output. This logic function can delay input signals depending on the state (ON or OFF) and output them filtered at the output. A disabling object is also available, which can be used to deactivate the disabling element.</p> <p>Comparator: The logic function works as a comparator with an input whose data format can be parameterised, and with a 1-bit output to output the result of the comparison operation. The reference function and the reference value are configured in the ETS.</p> <p>Limit value switch with hysteresis: The logic function acts like a limit switch with hysteresis. An input with a configurable data format and a 1-bit output are available. The hysteresis is determined by an upper and lower threshold. The threshold values can be parameterised in the ETS. The input value is compared with the threshold values. The command at the output (ON / OFF) upon exceeding or falling below the configured threshold values can be configured.</p>	

10.2 Logic gate

A logic gate has up to 4 Boolean inputs (1-bit) and one logic output (1-bit). In consequence, a logic operation only supports the 1-bit data format. The following table shows configurable comparison operations Logic gate and explains their function.

Logic gate	Description	Icon
Invert (NOT)	The logic gate has only one input. The input is forwarded to the gate output inverted.	
AND (AND)	Logic gate has 4 inputs. The output is "1" if all inputs are "1". Otherwise the output is "0".	
OR (OR)	Logic gate has 4 inputs. The output is "0" if all inputs are "0". Otherwise the output is "1".	
Exclusive OR (XOR)	Logic gate has 4 inputs. The output is "1" if only one input is "1". Otherwise the output is "0".	
Inverted AND (NAND)	Logic gate has 4 inputs. The output is "0" if all inputs are "1". Otherwise the output is "1".	
Inverted OR (NOR)	Logic gate has 4 inputs. The output is "1" if all inputs are "0". Otherwise the output is "0".	
Inverted Exclusive OR (NXOR)	Logic gate has 4 inputs. The output is "0" if only one input is "1". Otherwise the output is "1".	
AND with feedback (ANDR)	Logic gate has 4 inputs. The output is fed back to the first input of the gate. The output is "1" if all inputs are "1". Otherwise the output is "0". If input 1 is set to "1" and the output is still "0", the feedback of input 1 is also reset to "0". Only when	

Logic gate	Description	Icon
	<p>inputs 2 ... 4 are "1" will a newly received "1" at input 1 cause the output to assume the logical state "1".</p> <p>Application: Switch light manually only at twilight -> Switch on input 1, twilight sensor on input 2 -> The manual switching signal is ignored for as long as the twilight sensor has not issued an enabling signal. The manual switching sign is only executed at twilight.</p>	

Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. As an option, it is possible to invert inputs.

The transmission behaviour of the gate output can be configured.

10.2.1 Logic gate parameters

Logic functions -> Logic function...

Selection logic gate	Invert (NOT) AND (AND) OR (OR) Exclusive OR (XOR) Inverted AND (NAND) Inverted OR (NOR) Inverted Exclusive OR (NXOR) AND with feedback (ANDR)
<p>This parameter defines the function of the logic gate and is only visible if "Type of logic function = logic gate".</p> <p>Invert (NOT): The inverter is configured. The gate has one input and one output. The Boolean data value of the input is forwarded to the output inverted.</p> <p>And (AND): An AND gate is configured. The gate has 1...4 inputs and one output. The inputs are logically AND-linked. The result is forwarded to the output.</p> <p>OR (OR): An OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically OR-linked. The result is forwarded to the output.</p> <p>Exclusive-OR (XOR): An exclusive-OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically Exclusive-OR-linked. The result is forwarded to the output.</p> <p>Inverted AND (NAND): An AND gate is configured. The gate has 1...4 inputs and one output. The inputs are logically AND-linked. The result is forwarded to the output inverted.</p> <p>Inverted OR (NOR): An OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically OR-linked. The result is forwarded to the output inverted.</p> <p>Inverted Exclusive OR (NXOR): An inverted Exclusive OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically Exclusive-OR-linked. The result is forwarded to the output inverted.</p> <p>AND with feedback (ANDR): An AND gate with feedback is configured. The gate has 1...4 inputs and one output. The output is fed back to the first input of the gate.</p>	
Input 1	deactivated Input object
<p>Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the first input of the gate should be used.</p> <p>This parameter is only visible if "Type of logic function = logic gate".</p>	

Input 2	deactivated Input object
<p>Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the second input of the gate should be used.</p> <p>This parameter is only visible if "Type of logic function = logic gate".</p>	
Input 3	deactivated Input object
<p>Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the third input of the gate should be used.</p> <p>This parameter is only visible if "Type of logic function = logic gate".</p>	
Input 4	deactivated Input object
<p>Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the fourth input of the gate should be used.</p> <p>This parameter is only visible if "Type of logic function = logic gate".</p>	
Invert input	Checkbox (yes/no)
<p>It is possible to invert inputs of the logic gate as an option. This parameter is available for each input of the gate and defines whether the respective input should be evaluated unchanged or inverted.</p> <p>This parameter is only visible if "Type of logic function = logic gate".</p>	
Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically
<p>The transmission behaviour of the output can be configured here.</p> <p>Always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input.</p> <p>Transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. During the first telegram to an input after bus voltage return or after an ETS programming operation, the output always transmits to an input.</p> <p>Transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After bus voltage return or after an ETS programming operation, the cyclical transmission is only started once the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!</p>	

Transmission delay for sending the hours result (0...99)	0...99
<p>An optional delay before result transmission (telegram at output) can be configured.</p> <p>With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input.</p> <p>With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart.</p> <p>This parameter defines the hours of the delay time.</p>	
Minutes (0...59)	0...59
<p>This parameter defines the minutes of the delay time.</p>	
Seconds (0...59)	0...59
<p>This parameter defines the seconds of the delay time.</p> <p>The parameters for the transmission delay are only visible for "Transmission criteria" = "Always transmit when the input is updated" and "Only transmit when the output changes".</p>	
Cycle time hours (0...99)	0...99
<p>During cyclical transmission of the output, this parameter defines the cycle time.</p> <p>Setting the cycle time hours.</p>	
Minutes (0...59)	0...5...59
<p>This parameter defines the minutes of the cycle time.</p>	
Seconds (0...59)	0...59
<p>This parameter defines the seconds of the cycle time.</p> <p>The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".</p>	

10.2.2 Object list for logic gate

Object no.	Function	Name	Type	DPT	Flag
295, 299, 303, 307, 311, 315, 319, 323	Logic gate... Input 1	Logic... - Input	1-bit	1.002	C, (R), W, -, A
<p>1-bit object as input 1 of a logic gate (1...8). The input status can be inverted optionally.</p> <p>This object is only available if the type of logic function is configured to "logic gate" and input 1 is used.</p>					

Object no.	Function	Name	Type	DPT	Flag
296, 300. 304, 308, 312, 316, 320, 324	Logic gate... Input 2	Logic... - Input	1-bit	1.002	C, (R), W, -, A
<p>1-bit object as input 2 of a logic gate (1...8). The input status can be inverted optionally.</p> <p>This object is only available if the type of logic function is configured to "logic gate" and input 2 is used.</p>					

Object no.	Function	Name	Type	DPT	Flag
297, 301. 305, 309, 313, 317, 321, 325	Logic gate... Input 3	Logic... - Input	1-bit	1.002	C, (R), W, -, A
<p>1-bit object as input 3 of a logic gate (1...8). The input status can be inverted optionally.</p> <p>This object is only available if the type of logic function is configured to "logic gate" and input 3 is used.</p>					

Object no.	Function	Name	Type	DPT	Flag
298, 302. 306, 310, 314, 318, 322, 326	Logic gate... Input 4	Logic... - Input	1-bit	1.002	C, (R), W, -, A
<p>1-bit object as input 4 of a logic gate (1...8). The input status can be inverted optionally.</p> <p>This object is only available if the type of logic function is configured to "logic gate" and input 4 is used.</p>					

Object no.	Function	Name	Type	DPT	Flag
383, 385, 387, 389, 391, 393, 395, 397	Logic gate output	Logic... - Output	1-bit	1.002	C, (R), -, T, A
<p>1-bit object as output of a logic gate (1...8).</p> <p>This object is only available if the type of logic function is configured to "logic gate".</p>					

10.3 Converter (1-bit -> 1-byte)

The converter has a 1-bit input and a 1-byte output and also a disabling object. ON / OFF telegrams can be converted to preconfigured values. The disabling object is able to deactivate the converter.

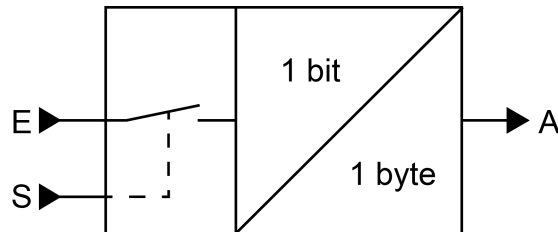


Figure 22: Converter (1-bit -> 1-byte)

The converter can react differently to input states. The parameter "Reaction at input to" defines whether the converter responds to ON and OFF commands or alternatively only processes ON or OFF telegrams.

A concrete 1-byte output value can be assigned to each 1-bit input status. The two output values can be configured anywhere in the range 0 ... 255 as required. The data format of the converter output object is set to DPT 5.001 (0...100%).

The disabling object can be deactivated via the converter. A deactivated converter no longer processes input states and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary). At the end of a disabling function, the converter is enabled again. The converter then waits for the next telegram at the input.

The telegram polarity of the disabling object can be configured.

The transmission behaviour of the converter output can be configured.

10.3.1 Converter parameters

Logic functions -> Logic function...

Reaction at input to	ON and OFF telegrams ON telegrams OFF telegrams
The converter can react differently to input states. It is defined here whether the converter responds to ON and OFF commands or alternatively only processes ON or OFF telegrams.	
Polarity of the disabling object	0 = enabled / 1 = disabled 0 =disabled/ 1 = enabled
This parameter defines the polarity of the disabling object.	
Output value for ON (0...255)	0...255
A concrete 1-byte output value can be assigned to each 1-bit input status. This parameter defines the output value for ON telegrams. This parameter is only visible when the input should react to ON telegrams.	
Output value for OFF (0...255)	0...255
A concrete 1-byte output value can be assigned to each 1-bit input status. This parameter defines the output value for OFF telegrams. This parameter is only visible when the input should react to OFF telegrams.	
Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically
The transmission behaviour of the output can be configured here. Always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input. Transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. During the first telegram to an input after bus voltage return or after an ETS programming operation, the output always transmits to an input. Transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After bus voltage return or after an ETS programming operation, the cyclical transmission is only started once the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!	

Transmission delay for sending the hours result (0...99)	0...99
<p>An optional delay before result transmission (telegram at output) can be configured.</p> <p>With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input.</p> <p>With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart.</p> <p>This parameter defines the hours of the delay time.</p>	
Minutes (0...59)	0...59
<p>This parameter defines the minutes of the delay time.</p>	
Seconds (0...59)	0...59
<p>This parameter defines the seconds of the delay time.</p> <p>The parameters for the transmission delay are only visible for "Transmission criteria" = "Always transmit when the input is updated" and "Only transmit when the output changes".</p>	
Cycle time hours (0...99)	0...99
<p>During cyclical transmission of the output, this parameter defines the cycle time.</p> <p>Setting the cycle time hours.</p>	
Minutes (0...59)	0...5...59
<p>This parameter defines the minutes of the cycle time.</p>	
Seconds (0...59)	0...59
<p>This parameter defines the seconds of the cycle time.</p> <p>The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".</p>	

10.3.2 Object list for converter

Object no.	Function	Name	Type	DPT	Flag
295, 299, 303, 307, 311, 315, 319, 323	Converter Input	Logic... - Input	1-bit	1.002	C, (R), W, -, A

1-bit object as input of a converter. It is possible to configure whether the converter responds to ON and OFF commands or alternatively processes only ON or only OFF telegrams.

This object is only available if the type of logic function is configured to "converter".

Object no.	Function	Name	Type	DPT	Flag
296, 300, 304, 308, 312, 316, 320, 324	Converter Disabling function	Logic... - Input	1-bit	1.002	C, (R), W, -, A

1-bit object as disabling input of a converter. A disabled converter no longer processes input states and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary).

The telegram polarity can be configured.

This object is only available if the type of logic function is configured to "converter".

Object no.	Function	Name	Type	DPT	Flag
431, 432, 433, 434, 435, 436, 437, 438	Converter Output	Logic... - Output	1-byte	5.001	C, (R), -, T, A

1-byte object as value output of a converter.

This object is only available if the type of logic function is configured to "converter".

10.4 Disabling element (Filtering/Time)

The disabling element has a 1-bit input and a 1-bit output as well as a disabling object. Input states (ON/OFF) can be delayed independently of one another and filtered at the output before output. The filter makes it possible to invert the states of the output (e.g. ON -> OFF) or to suppress it completely (e.g. OFF -> ---, OFF is not transmitted). If the filter is not used, the disabling element only works with the time functions if required. Alternatively, it is possible to use only the filter (without delays).

The disabling object is able to deactivate the disabling element.

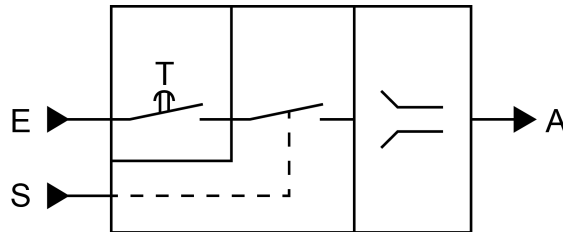


Figure 23: Disabling element (Filtering/Time)

The parameter "Time function" defines whether ON or OFF telegrams or both states are evaluated with a delay after reception at the input. If a delay is provided, the delay time can be configured separately for ON and OFF telegrams. A delay is only effective if the delay time is set to greater than "0". Each telegram received at the input re-triggers the receptive delay time.

If no delay is configured, the input telegrams go directly into the filter.

i Special feature when using the delays: If no telegram is received at the input, a configured delay time (time > 0) acts like an automatic cyclic trigger of the filter. The most recently received input status is then forwarded to the filter automatically and repeatedly after the delay has elapsed. This then works according to its configuration and forwards the result to the output of the disabling element. Consequently, the output then also transmits telegrams depending on the transmission criteria set. If the cyclical transmission of the output is not desired due to the automatic triggering of the filter, the transmission criterion should be set to "only transmit if the output changes".

If no delay is provided, the filter is only triggered automatically via the received telegrams and thus not automatically.

i After bus voltage return or after an ETS programming operation, the delays are triggered automatically.

The filter is set by the parameter "Filter function" according to the following table.

Filter function	Result
ON -> ON / OFF -> OFF	Input telegrams are forwarded to the output unchanged. Filter deactivated.
ON -> --- / OFF -> OFF	ON telegrams are filtered and not forwarded to the output. OFF telegrams are forwarded to the output unchanged.

Filter function	Result
ON -> ON / OFF -> ---	OFF telegrams are filtered and not forwarded to the output. ON telegrams are forwarded to the output unchanged.
ON -> OFF / OFF -> ON	ON telegrams are converted to OFF telegrams and OFF telegrams are converted to ON telegrams and are forwarded to the output.
ON -> --- / OFF -> ON	ON telegrams are filtered and not forwarded to the output. OFF telegrams are converted to ON telegrams and forwarded to the output.
ON -> OFF / OFF -> ---	OFF telegrams are filtered and not forwarded to the output. ON telegrams are converted to OFF telegrams and forwarded to the output.

The disabling element can be deactivated by the disabling object. A deactivated disabling element no longer forwards any input states to the filter and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary). However, the input states are still evaluated (even with effective delays). At the end of a disabling function, the disabling element is enabled again. The disabling element waits for the next telegram at the input or for the next cycle of the configured delay times.

The telegram polarity of the disabling object can be configured.

The transmission behaviour of the disabling element output can be configured.

10.4.1 Disabling element parameters

Logic functions -> Logic function...

Time function	no delay Delay only ON telegrams Delay only OFF telegrams Delay ON and OFF telegrams
---------------	--

This parameter defines whether ON or OFF telegrams or both states are evaluated with a delay after reception at the input. If a delay is provided, the delay time can be configured separately for ON and OFF telegrams. If no delay is configured, the input telegrams go directly into the filter.

Delay for ON telegrams Minutes (0...59)	0...59
--	--------

The delay for ON telegrams is configured here. A delay is only effective if the delay time is set to greater than "0". Each ON telegram received at the input re-triggers the delay time.

Special feature when using the delays: If no telegram is received at the input, a configured delay time (time > 0) acts like an automatic cyclic trigger of the filter. The most recently received input status is then forwarded to the filter automatically and repeatedly after the delay has elapsed. This then works according to its configuration and forwards the result to the output of the disabling element. Consequently, the output then also transmits telegrams depending on the transmission criteria set. If the cyclical transmission of the output is not desired due to the automatic triggering of the filter, the transmission criterion should be set to "only transmit if the output changes".

After bus voltage return or after an ETS programming operation, the delays are triggered automatically.

Setting the ON delay time minutes.

Seconds (0...59)	0...10...59
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Setting the seconds of the ON delay time.

The parameters for the ON delay are only available if the parameter "Time function" is set to "only delay ON telegrams" or "delay ON and OFF telegrams".

Delay for OFF telegrams Minutes (0...59)	0...59
<p>The delay for OFF telegrams is configured here. A delay is only effective if the delay time is set to greater than "0". Each OFF telegram received at the input re-triggers the delay time.</p> <p>Special feature when using the delays: If no telegram is received at the input, a configured delay time (time > 0) acts like an automatic cyclic trigger of the filter. The most recently received input status is then forwarded to the filter automatically and repeatedly after the delay has elapsed. This then works according to its configuration and forwards the result to the output of the disabling element. Consequently, the output then also transmits telegrams depending on the transmission criteria set. If the cyclical transmission of the output is not desired due to the automatic triggering of the filter, the transmission criterion should be set to "only transmit if the output changes".</p> <p>After bus voltage return or after an ETS programming operation, the delays are triggered automatically.</p> <p>Setting the OFF delay time minutes.</p>	
Seconds (0...59)	0...10...59
<p>Setting the OFF delay time seconds.</p> <p>The parameters for the OFF delay are only available if the parameter "Time function" is set to "only delay OFF telegrams" or "delay ON and OFF telegrams".</p>	
Polarity of the disabling object	<p>0 = enabled / 1 = disabled</p> <p>0 =disabled/ 1 = enabled</p>
<p>This parameter defines the polarity of the disabling object.</p>	

Filter function	ON -> ON / OFF -> OFF ON -> --- / OFF -> OFF ON -> ON / OFF -> --- ON -> OFF / OFF -> ON ON -> --- / OFF -> ON ON -> OFF / OFF -> ---
-----------------	--

This parameter defines the function of the filter.

ON -> ON / OFF -> OFF: Input telegrams are forwarded to the output unchanged. Filter deactivated.

ON -> --- / OFF -> OFF: ON telegrams are filtered and not forwarded to the output. OFF telegrams are forwarded to the output unchanged.

ON -> ON / OFF -> ---: OFF telegrams are filtered and not forwarded to the output. ON telegrams are forwarded to the output unchanged.

ON -> OFF / OFF -> ON: ON telegrams are converted to OFF telegrams and OFF telegrams are converted to ON telegrams and forwarded to the output.

ON -> --- / OFF -> ON: ON telegrams are filtered and not forwarded to the output. OFF telegrams are converted to ON telegrams and forwarded to the output.

ON -> OFF / OFF -> ---: OFF telegrams are filtered and not forwarded to the output. ON telegrams are converted to OFF telegrams and forwarded to the output.

Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically
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The transmission behaviour of the output can be configured here.

Always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input. In addition, transmission at the output is repeated if no telegram was received at the input when the delay times were used and the configured time has expired.

Transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. After bus voltage return or an ETS programming operation, the output always transmits.

Transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After bus voltage return or after an ETS programming operation, the cyclical transmission is only started once the first telegram has been received at the input. If the ON / OFF delay is used, after bus voltage return or after an ETS programming, operation cyclical transmission starts automatically once the delay time has expired. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!

Cycle time hours (0...99)	0...99
---------------------------	--------

During cyclical transmission of the output, this parameter defines the cycle time. Setting the cycle time hours.

Minutes (0...59)	0...5...59
This parameter defines the minutes of the cycle time.	
Seconds (0...59)	0...59
This parameter defines the seconds of the cycle time. The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".	

10.4.2 Object list for disabling element

Object no.	Function	Name	Type	DPT	Flag
295, 299, 303, 307, 311, 315, 319, 323	Disabling element Input	Logic... - Input	1-bit	1.002	C, (R), W, -, A
<p>1-bit object as input of a disabling element.</p> <p>This object is only available if the type of logic function is configured to "disabling element".</p>					

Object no.	Function	Name	Type	DPT	Flag
296, 300. 304, 308, 312, 316, 320, 324	Disabling element Disabling function	Logic... - Input	1-bit	1.002	C, (R), W, -, A
<p>1-bit object as disabling input of a disabling element. A disabled disabling element no longer forwards any input states to the filter and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary).</p> <p>The telegram polarity can be configured.</p> <p>This object is only available if the type of logic function is configured to "disabling element".</p>					

Object no.	Function	Name	Type	DPT	Flag
384, 386, 388, 390, 392, 394, 396, 398	Disabling element Output	Logic... - Output	1-bit	1.002	C, (R), -, T, A
<p>1-bit object as output of a disabling element.</p> <p>This object is only available if the type of logic function is configured to "disabling element".</p>					

10.5 Comparator

The comparator works with an input whose data format can be parameterised, and with a 1-bit output to output the result of the comparison operation. The comparator compares the value received at the input with a configured reference value and evaluates whether the reference is correct (result = true) or not (result = false) according to the specified reference function.

The reference function and the reference value are configured in the ETS.

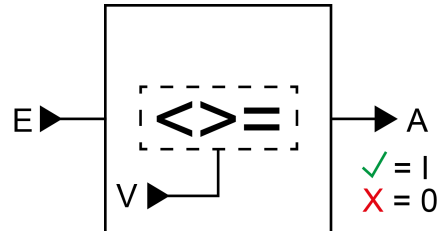


Figure 24: Comparator

The parameter "data format" defines the size and format of input object according to the following table. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the comparison operation (ON = true / OFF = false). The reference value that can be set in the ETS adapts to the input data format.

Data format	KNX DPT
4-bit dimming	3.007
1-byte operating mode switchover	20,102
1-byte scene extension	18.001
1-byte value 0...255	5.010
1-byte brightness value 0...100%	5.001
2-byte value 0...65535	7.001
2-byte value -32768...32767	8.001
2-byte floating-point number	9.0xx
4-byte value -2147483648...2147483647	13.001

The following table shows the possible reference functions (I = input value, R = reference value).

Reference function	Function
equal ($E = V$)	The comparator output is "ON" (true) if the input is equal to the reference value. Otherwise the output is "OFF" (false).
unequal ($E \neq V$)	The comparator output is "ON" (true) if the input is unequal to the reference value. If the input value is equal to the reference value, the output is "OFF" (false).
greater than ($E > V$)	The comparator output is "ON" (true) if the input is greater than the reference value. If the input value is less than or equal to the reference value, the output switches "OFF" (false).

Reference function	Function
greater than or equal to ($E \geq V$)	The comparator output is "ON" (true) if the input is greater than the reference value or equal to the reference value. If the input value is less than the reference value, the output switches "OFF" (false).
less than ($E < V$)	The comparator output is "ON" (true) if the input is less than the reference value. If the input value is greater than or equal to the reference value, the output switches "OFF" (false).
less than or equal to ($E \leq V$)	The comparator output is "ON" (true) if the input is less than the reference value or equal to the reference value. If the input value is greater than the reference value, the output switches "OFF" (false).
Range testing less than ($V1 < E < V2$)	There are two reference values. The comparator output is "ON" (true) if the input is greater than the first reference value or less than the second reference value. If the input value is less than the first reference value or equal to the first reference value or greater than the second reference value or equal to the second reference value, the output switches "OFF" (wrong).
Range testing less than or equal to ($V1 \leq E \leq V2$)	There are two reference values. The comparator output is "ON" (true) if the input is greater than or equal to the first reference value and less than or equal to the second reference value. If the input value is less than the first reference value or greater than the second reference value, the output switches "OFF" (false).

The transmission behaviour of the comparator output can be configured.

10.5.1 Comparator parameters

Logic functions -> Logic function...

Data format	4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100% (DPT 5.001) 2-byte value 0...65535 (DPT 7.001) 2-byte value -32768...32767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)
<p>This parameter defines the size and format of input object. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the comparison operation (ON = true / OFF = false).</p>	

Reference function	<p>equal (E = V)</p> <p>unequal (E ≠ V)</p> <p>greater than (E > V)</p> <p>greater than or equal to (E ≥ V)</p> <p>less than (E < V)</p> <p>less than or equal to (E ≤ V)</p> <p>Range testing less than (V1 < E < V2)</p> <p>Range testing less than or equal to (V1 ≤ E ≤ V2)</p>
--------------------	--

The comparator compares the value received (I) at the input with a configured reference value (R) and evaluates whether the comparison is correct (result = true) or not (result = false) according to the specified reference function here.

equal (E = V): The comparator output is "ON" (true) if the input is equal to the reference value. Otherwise the output is "OFF" (false).

unequal (E ≠ V): The comparator output is "ON" (true) if the input is unequal to the reference value. If the input value is equal to the reference value, the output is "OFF" (false).

greater than (E > V): The comparator output is "ON" (true) if the input is greater than the reference value. If the input value is less than or equal to the reference value, the output switches "OFF" (false).

greater than or equal to (E ≥ V): The comparator output is "ON" (true) if the input is greater than the reference value or equal to the reference value. If the input value is less than the reference value, the output switches "OFF" (false).

less than (E < V): The comparator output is "ON" (true) if the input is less than the reference value. If the input value is greater than or equal to the reference value, the output switches "OFF" (false).

less than or equal to (E ≤ V): The comparator output is "ON" (true) if the input is less than the reference value or equal to the reference value. If the input value is greater than the reference value, the output switches "OFF" (false).

Range testing less than (V1 < E < V2): There are two reference values. The comparator output is "ON" (true) if the input is greater than the first reference value or less than the second reference value. If the input value is less than the first reference value or equal to the first reference value or greater than the second reference value or equal to the second reference value, the output switches "OFF" (wrong).

Range testing less than or equal to (V1 ≤ E ≤ V2): There are two reference values. The comparator output is "ON" (true) if the input is greater than or equal to the first reference value and less than or equal to the second reference value. If the input value is less than the first reference value or greater than the second reference value, the output switches "OFF" (false).

Reference value (V)	<p>dimming darker, stop (0)</p> <p>dimming darker, 100% (1)</p> <p>dimming darker, 50% (2)</p> <p>dimming darker, 25% (3)</p> <p>dimming darker, 12.5% (4)</p> <p>dimming darker, 6% (5)</p> <p>dimming darker, 3% (6)</p> <p>dimming darker, 1.5% (7)</p> <p>increase brightness, stop (8)</p> <p>increase brightness, 100% (9)</p> <p>increase brightness, 50% (10)</p> <p>increase brightness, 25% (11)</p> <p>increase brightness, 12.5% (12)</p> <p>increase brightness, 6% (13)</p> <p>increase brightness, 3% (14)</p> <p>increase brightness, 1.5% (15)</p>
---------------------	--

This parameter specifies the internal reference value (R) for the reference function.
 This parameter is only available if the "data format" is set to "4-bit dimming (DPT 3.007)".

Reference value (V)	<p>Automatic (0)</p> <p>Comfort mode (1)</p> <p>Standby mode (2)</p> <p>Night mode (3)</p> <p>Frost/heat protection (4)</p>
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This parameter specifies the internal reference value (R) for the reference function.
 This parameter is only available if the "data format" is set to "1-byte operating mode switchover (DPT 20.102)".

Reference value (V)	<p>Recall scene 1 (0)</p> <p>Recall scene 2 (1)</p> <p>...</p> <p>Recall scene 64 (63)</p> <p>Save scene 1 (128)</p> <p>Save scene 2 (129)</p> <p>...</p> <p>Save scene 64 (191)</p>
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This parameter specifies the internal reference value (R) for the reference function.
 This parameter is only available if the "data format" is set to "1-byte scene extension (DPT 18.001)".

Reference value (V) (0...255)	0...255
<p>This parameter specifies the internal reference value (R) for the reference function. This parameter is only available if the "data format" is set to "1-byte value -0...255 (DPT 5.010)".</p>	
Reference value (V) (0...100%)	0...100
<p>This parameter specifies the internal reference value (R) for the reference function. This parameter is only available if the "data format" is set to "1-byte brightness value 0...100% (DPT 5.001)".</p>	
Reference value (V) (0...65535)	0...65535
<p>This parameter specifies the internal reference value (R) for the reference function. This parameter is only available if the "data format" is set to "2-byte value 0...65535 (DPT 7.001)".</p>	
Reference value (V) (-32768...32767)	-32768...0...32767
<p>This parameter specifies the internal reference value (R) for the reference function. This parameter is only available if the "data format" is set to "2-byte value -32768...32767 (DPT 8.001)".</p>	
Reference value (V) (-671088...670760)	-671088...0...670760
<p>This parameter specifies the internal reference value (R) for the reference function. This parameter is only available if the "data format" is set to "2-byte floating point value (DPT 9.0xx)".</p>	
Reference value (V) (-2147483648...2147483647)	-2147483648...0...2147483647
<p>This parameter specifies the internal reference value (R) for the reference function. This parameter is only available if the "data format" is set to "4-byte value -2147483648...2147483647 (DPT 13.001)".</p>	

- i** Two reference values (R1 & R2) can be configured if the range testing is configured as "reference function". In this case, the setting options are identical.

Transmission criteria	<p>always transmit when the input is updated transmit only if the output changes transmit cyclically</p>
<p>The transmission behaviour of the output can be configured here.</p> <p>Always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input.</p> <p>Transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. During the first telegram to an input after bus voltage return or after an ETS programming operation, the output always transmits to an input.</p> <p>Transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After bus voltage return or after an ETS programming operation, the cyclical transmission is only started once the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!</p>	
Transmission delay for sending the hours result (0...99)	0...99
<p>An optional delay before result transmission (telegram at output) can be configured.</p> <p>With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input.</p> <p>With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart.</p> <p>This parameter defines the hours of the delay time.</p>	
Minutes (0...59)	0...59
<p>This parameter defines the minutes of the delay time.</p>	
Seconds (0...59)	0...59
<p>This parameter defines the seconds of the delay time.</p> <p>The parameters for the transmission delay are only visible for "Transmission criteria" = "Always transmit when the input is updated" and "Only transmit when the output changes".</p>	
Cycle time hours (0...99)	0...99
<p>During cyclical transmission of the output, this parameter defines the cycle time.</p> <p>Setting the cycle time hours.</p>	
Minutes (0...59)	0... 5 ...59
<p>This parameter defines the minutes of the cycle time.</p>	

Seconds (0...59)	0...59
<p>This parameter defines the seconds of the cycle time.</p> <p>The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".</p>	

10.5.2 Object list for Comparator

Object no.	Function	Name	Type	DPT	Flag
327, 328, 329, 330, 331, 332, 333, 334	Comparator Input	Logic... - Input	4-bit	3.007	C, (R), W, -, A
<p>4-bit object as input of a comparator.</p> <p>This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "4-bit dimming (DPT 3.007)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Comparator Input	Logic... - Input	1-byte	20.102	C, (R), W, -, A
<p>1-byte object as input of a comparator.</p> <p>This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte operating mode switchover (DPT 20.102)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Comparator Input	Logic... - Input	1-byte	18.001	C, (R), W, -, A
<p>1-byte object as input of a comparator.</p> <p>This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte scene extension (DPT 18.001)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Comparator Input	Logic... - Input	1-byte	5.010	C, (R), W, -, A
<p>1-byte object as input of a comparator.</p> <p>This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte value 0...255 (DPT 5.010)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Comparator Input	Logic... - Input	1-byte	5.001	C, (R), W, -, A
1-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte brightness value 0...100% (DPT 5.001)".					

Object no.	Function	Name	Type	DPT	Flag
359, 360, 361, 362, 363, 364, 365, 366	Comparator Input	Logic... - Input	2-byte	7.001	C, (R), W, -, A
2-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "2-byte value 0...65535 (DPT 7.001)".					

Object no.	Function	Name	Type	DPT	Flag
359, 360, 361, 362, 363, 364, 365, 366	Comparator Input	Logic... - Input	2-byte	8.001	C, (R), W, -, A
2-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "2-byte value -32768...32767 (DPT 8.001)".					

Object no.	Function	Name	Type	DPT	Flag
359, 360, 361, 362, 363, 364, 365, 366	Comparator Input	Logic... - Input	2-byte	9.xxx	C, (R), W, -, A
2-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "2-byte floating point value (DPT 9.0xx)".					

Object no.	Function	Name	Type	DPT	Flag
375, 376, 377, 378, 379, 380, 381, 382	Comparator Input	Logic... - Input	4-byte	13.001	C, (R), W, -, A
4-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "4-byte value -2147483648...2147483647 (DPT 13.001)".					

Object no.	Function	Name	Type	DPT	Flag
383, 385, 387, 389, 391, 393, 395, 397	Comparator Output	Logic... - Output	1-bit	1.002	C, (R), -, T, A
<p>1-bit object as output of a comparator. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the comparison operation (ON = true / OFF = false). This object is only available if the type of logic function is configured to "comparator".</p>					

10.6 Limit value switch

The limit value switch works with an input whose data format can be configured, and with a 1-bit output to output the result of the threshold evaluation. The limit value switch compares the value received at the input with two configurable hysteresis threshold values. Once the upper threshold value (H2) is reached or exceeded, the output can transmit a switching telegram (e.g. ON = true). If the value falls below the lower threshold value (H1), the output can transmit another switching telegram (e.g. OFF = false).

The switching telegrams can always be configured in the ETS when the threshold values are exceeded and undershot.

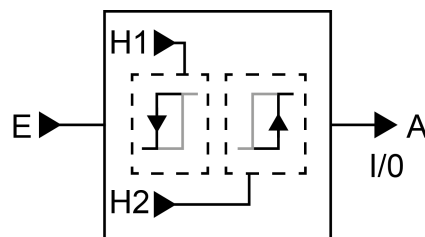


Figure 25: Limit value switch

The two threshold values define a hysteresis. The hysteresis prevents frequent switching back and forth of the output, provided that the input value changes continuously in small intervals. Only when the change in value at the input exceeds the hysteresis as a whole, does the output switch the status.

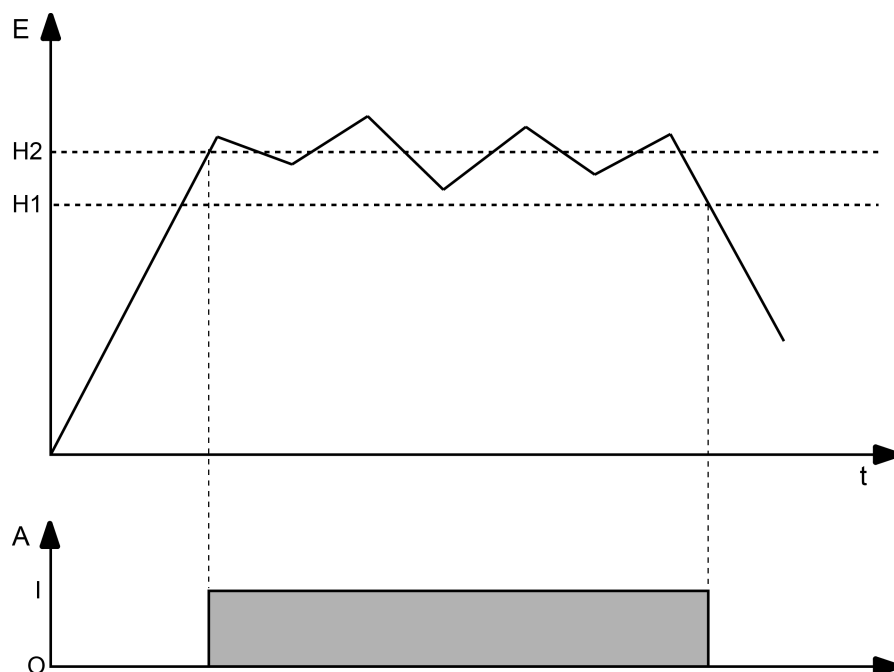


Figure 26: Example of a hysteresis evaluation by upper and lower threshold value

- i** The two threshold values can be freely configured in the ETS. Make sure that the upper threshold value is greater than the lower one!

- i** After bus voltage return or after an ETS programming operation, the output always transmits a telegram when the first value has been received at the input. The telegram depends on whether the value reaches or exceeds the upper threshold (H2) or not. If the value is less than the upper threshold, a telegram is transmitted in accordance with "Telegram upon not reaching the lower threshold". Otherwise the output transmits the "telegram on exceeding the upper threshold value".

The parameter "data format" defines the size and format of input object according to the following table. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the threshold evaluation (ON = true / OFF = false). The threshold values that can be set in the ETS adapt to the input data format.

Data format	KNX DPT
4-bit dimming	3.007
1-byte operating mode switchover	20.102
1-byte scene extension	18.001
1-byte value 0...255	5.010
1-byte brightness value 0...100%	5.001
2-byte value 0...65535	7.001
2-byte value -32768...32767	8.001
2-byte floating-point number	9.0xx
4-byte value -2147483648...2147483647	13.001

The transmission behaviour of the limit value switch can be configured.

10.6.1 Limit value switch parameters

Logic functions -> Logic function...

<p>Data format</p>	<p>4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100% (DPT 5.001) 2-byte value 0...65535 (DPT 7.001) 2-byte value -32768...32767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)</p>
<p>This parameter defines the size and format of input object. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the threshold evaluation (ON = true / OFF = false).</p>	
<p>Lower threshold value (H1)</p>	<p>dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) increase brightness, stop (8) increase brightness, 100% (9) increase brightness, 50% (10) increase brightness, 25% (11) increase brightness, 12.5% (12) increase brightness, 6% (13) increase brightness, 3% (14) increase brightness, 1.5% (15)</p>
<p>This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "4-bit dimming (DPT 3.007)".</p>	

Lower threshold value (H1)	Automatic (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "1-byte operating mode switchover (DPT 20.102)".	
Lower threshold value (H1)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "1-byte scene extension (DPT 18.001)".	
Lower threshold value (H1) (0...255)	0...255
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "1-byte value -0...255 (DPT 5.010)".	
Lower threshold value (H1) (0...100%)	0...100
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "1-byte brightness value 0...100% (DPT 5.001)".	
Lower threshold value (H1) (0...65535)	0...65535
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "2-byte value 0...65535 (DPT 7.001)".	

Lower threshold value (H1) (-32768...32767)	-32768...0...32767
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "2-byte value -32768...32767 (DPT 8.001)".	
Lower threshold value (H1) (-671088...670760)	-671088...0...670760
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "2-byte floating point value (DPT 9.0xx)".	
Lower threshold value (H1) (-2147483648...2147483647)	-2147483648...0...2147483647
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "4-byte value -2147483648...2147483647 (DPT 13.001)".	
Upper threshold value (H2)	<ul style="list-style-type: none"> dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) increase brightness, stop (8) increase brightness, 100% (9) increase brightness, 50% (10) increase brightness, 25% (11) increase brightness, 12.5% (12) increase brightness, 6% (13) increase brightness, 3% (14) increase brightness, 1.5% (15)
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter is only available if the "data format" is set to "4-bit dimming (DPT 3.007)".	

Upper threshold value (H2)	Automatic (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
----------------------------	---

This parameter defines the upper threshold value (H2) of the limit value switch.
 This parameter is only available if the "data format" is set to "1-byte operating mode switchover (DPT 20.102)".

Upper threshold value (H2)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
----------------------------	--

This parameter defines the upper threshold value (H2) of the limit value switch.
 This parameter is only available if the "data format" is set to "1-byte scene extension (DPT 18.001)".

Upper threshold value (H2) (0...255)	0...255
---	----------------

This parameter defines the upper threshold value (H2) of the limit value switch.
 This parameter is only available if the "data format" is set to "1-byte value -0...255 (DPT 5.010)".

Upper threshold value (H2) (0...100%)	0...100
--	----------------

This parameter defines the upper threshold value (H2) of the limit value switch.
 This parameter is only available if the "data format" is set to "1-byte brightness value 0...100% (DPT 5.001)".

Upper threshold value (H2) (0...65535)	0...65535
---	------------------

This parameter defines the upper threshold value (H2) of the limit value switch.
 This parameter is only available if the "data format" is set to "2-byte value 0...65535 (DPT 7.001)".

Upper threshold value (H2) (-32768...32767)	-32768...0...32767
<p>This parameter defines the upper threshold value (H2) of the limit value switch.</p> <p>This parameter is only available if the "data format" is set to "2-byte value -32768...32767 (DPT 8.001)".</p>	
Upper threshold value (H2) (-671088...670760)	-671088...0...670760
<p>This parameter defines the upper threshold value (H2) of the limit value switch.</p> <p>This parameter is only available if the "data format" is set to "2-byte floating point value (DPT 9.0xx)".</p>	
Upper threshold value (H2) (-2147483648...2147483647)	-2147483648...0...2147483647
<p>This parameter defines the upper threshold value (H2) of the limit value switch.</p> <p>This parameter is only available if the "data format" is set to "4-byte value -2147483648...2147483647 (DPT 13.001)".</p>	
Telegram on reaching or exceeding the upper threshold value	ON telegram OFF telegram
<p>The telegram of the output upon reaching or exceeding the upper threshold can be configured here.</p>	
Telegram on falling below the lower threshold value	ON telegram OFF telegram
<p>The telegram of the output upon not reaching the lower threshold can be configured here.</p>	
Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically
<p>The transmission behaviour of the output can be configured here.</p> <p>Always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input.</p> <p>Transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. During the first telegram to an input after bus voltage return or after an ETS programming operation, the output always transmits to an input.</p> <p>Transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After bus voltage return or after an ETS programming operation, the cyclical transmission is only started once the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!</p>	

Transmission delay for sending the hours result (0...99)	0...99
<p>An optional delay before result transmission (telegram at output) can be configured.</p> <p>With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input.</p> <p>With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart.</p> <p>This parameter defines the hours of the delay time.</p>	
Minutes (0...59)	0...59
<p>This parameter defines the minutes of the delay time.</p>	
Seconds (0...59)	0...59
<p>This parameter defines the seconds of the delay time.</p> <p>The parameters for the transmission delay are only visible for "Transmission criteria" = "Always transmit when the input is updated" and "Only transmit when the output changes".</p>	
Cycle time hours (0...99)	0...99
<p>During cyclical transmission of the output, this parameter defines the cycle time.</p> <p>Setting the cycle time hours.</p>	
Minutes (0...59)	0...5...59
<p>This parameter defines the minutes of the cycle time.</p>	
Seconds (0...59)	0...59
<p>This parameter defines the seconds of the cycle time.</p> <p>The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".</p>	

10.6.2 Object list for limit value switch

Object no.	Function	Name	Type	DPT	Flag
327, 328, 329, 330, 331, 332, 333, 334	Limit value switch Input	Logic... - Input	4-bit	3.007	C, (R), W, -, A
<p>4-bit object as input of a limit value switch.</p> <p>This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "4-bit dimming (DPT 3.007)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Limit value switch Input	Logic... - Input	1-byte	20.102	C, (R), W, -, A
<p>1-byte object as input of a limit value switch.</p> <p>This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte operating mode switchover (DPT 20.102)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Limit value switch Input	Logic... - Input	1-byte	18.001	C, (R), W, -, A
<p>1-byte object as input of a limit value switch.</p> <p>This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte scene extension (DPT 18.001)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Limit value switch Input	Logic... - Input	1-byte	5.010	C, (R), W, -, A
<p>1-byte object as input of a limit value switch.</p> <p>This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte value 0...255 (DPT 5.010)".</p>					

Object no.	Function	Name	Type	DPT	Flag
343, 344, 345, 346, 347, 348, 349, 350	Limit value switch Input	Logic... - Input	1-byte	5.001	C, (R), W, -, A

1-byte object as input of a limit value switch.

This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte brightness value 0...100% (DPT 5.001)".

Object no.	Function	Name	Type	DPT	Flag
359, 360, 361, 362, 363, 364, 365, 366	Limit value switch Input	Logic... - Input	2-byte	7.001	C, (R), W, -, A

2-byte object as input of a limit value switch.

This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "2-byte value 0...65535 (DPT 7.001)".

Object no.	Function	Name	Type	DPT	Flag
359, 360, 361, 362, 363, 364, 365, 366	Limit value switch Input	Logic... - Input	2-byte	8.001	C, (R), W, -, A

2-byte object as input of a limit value switch.

This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "2-byte value -32768...32767 (DPT 8.001)".

Object no.	Function	Name	Type	DPT	Flag
359, 360, 361, 362, 363, 364, 365, 366	Limit value switch Input	Logic... - Input	2-byte	9.xxx	C, (R), W, -, A

2-byte object as input of a limit value switch.

This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "2-byte floating point value (DPT 9.0xx)".

Object no.	Function	Name	Type	DPT	Flag
375, 376, 377, 378, 379, 380, 381, 382	Limit value switch Input	Logic... - Input	4-byte	13.001	C, (R), W, -, A

4-byte object as input of a limit value switch.

This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "4-byte value -2147483648...2147483647 (DPT 13.001)".

Object no.	Function	Name	Type	DPT	Flag
383, 385, 387, 389, 391, 393, 395, 397	Limit value switch Output	Logic... - Output	1-bit	1.002	C, (R), -, T, A

1-bit object as output of a limit value switch. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the threshold evaluation (ON = true / OFF = false).

This object is only available if the type of logic function is configured to "limit value switch".

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