Technical Manual

State 06/2026 - Version 1.0

KNX Analog In-/Output

AIO-0210V.01

AIO-0410V.01

Further documents:

Data sheets:

https://www.mdt-group.com/for-professionals/downloads/datasheets.html

Assembly and operating instructions:

https://www.mdt-group.com/for-professionals/downloads/assembly-and-operation-instructions.html

Solution proposals for MDT products:

https://www.mdt-group.com/for-professionals/tips-tricks.html

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2 Overview

2.1 Overview devices

This manual refers to the following devices (article number in **bold**):

- **AIO-0210V.01** KNX Analog I/O 2-channel, flush mounted, 0 - 10 V, switchable In-/Output
- **AIO-0410V.01** KNX Analog I/O 4-channel, 2SU, MDRC, 0 - 10 V, switchable In-/Output

2.2 Functions

The device can be used in the configuration as an “Input” for the detection of sensor signals and in the configuration as an “Output” for the output of 0 - 10 V signals.

Due to the flexible adaptation of the input to the various sensor types, the device can evaluate almost all active sensors with current or voltage output that are commonly available on the market. This means that the measured value can be output directly as a current, voltage or percentage, or as a converted physical variable such as temperature, brightness, speed, etc.

Depending on the measured value, actions can be initiated directly, e.g. by switching according to threshold values or a step controller. Furthermore, minimum/maximum values can be recorded.

The output can be used to specify 0 - 10 V signals for various functions, such as ventilation, heating pumps, etc. The output value can be formed by specifying various input signals. In addition, various min/max values can be selected for Day/Night, and two independent lock functions and an emergency mode can be configured in the event of a control value failure.

The 4 difference measurement channels can be used to compare the recorded sensor signals with fixed values, external values or other sensor inputs, to add or subtract them, or to invoke specific actions.

2.3 Wiring diagram

The following figures shows the exemplary wiring diagrams:

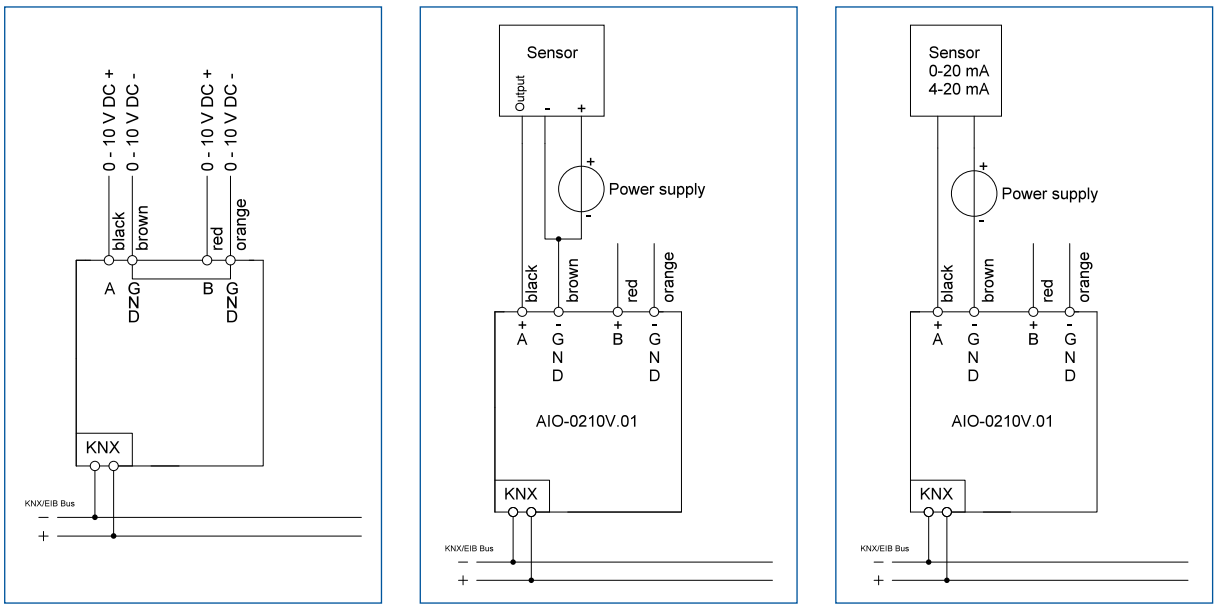


Figure 1: Wiring diagrams: AIO-0210V.01

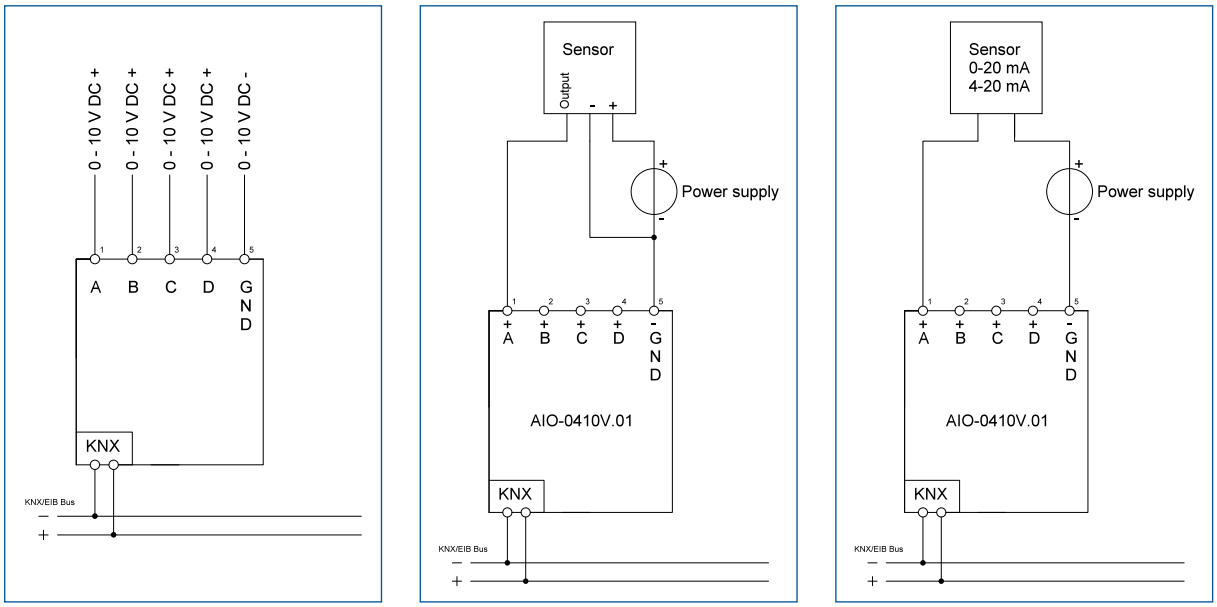


Figure 2: Wiring diagrams: AIO-0410V.01

2.4 Structure and Handling

The following pictures shows the structure of the devices:

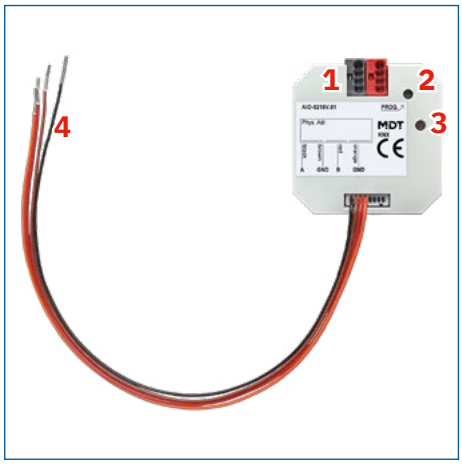


Figure 3: Structure and Handling: AIO-0210V.01

Figure 4: Structure and Handling: AIO-0410V.01

1 – KNX Bus connection terminal
2 – Programming button
3 – Programming LED (red)
4 – Connection cables
5 – Connection terminal

2.5 Commissioning

1. Wire the device according to the wiring diagram.
2. Connect programming interface to the bus.
3. Switch on bus voltage.
4. Press the programming button on the device (red programming LED lights up continuously).
5. Set and programme the individual address in the ETS (Programming LED turns off).
6. Configure and programme the settings in the application programme.

3 Communication objects

3.1 Standard settings of the communication objects

Standard settings								
No.	Name	Object Function	Length	C	R	W	T	U
0	Channel A: Input	Send value	1 Byte 2 Byte	■	■		■	
1	Channel A: Input	Wire break alarm	1 Bit	■	■		■	
3	Channel A: Input Step switch	Step 1	1 Bit	■	■		■	
4	Channel A: Input Step switch	Step 2	1 Bit	■	■		■	
5	Channel A: Input Step switch	Step 3	1 Bit	■	■		■	
6	Channel A: Input Step switch	Step 4	1 Bit	■	■		■	
7	Channel A: Input	Minimum value	1 Byte 2 Byte	■	■		■	
8	Channel A: Input	Maximum value	1 Byte 2 Byte	■	■		■	
9	Channel A: Input	Reset min/max value	1 Bit	■		■		
10	Channel A: Input	Threshold 1 exceedance and lower deviation	1 Bit 1 Byte	■	■		■	
11	Channel A: Input	Change threshold 1	1 Byte 2 Byte	■		■		
12	Channel A: Input	Threshold 2 exceedance and lower deviation	1 Bit 1 Byte	■	■		■	
14	Channel A: Input	Change threshold 2	1 Byte 2 Byte	■		■		
17	Channel A: Output	Default current set value	1 Byte 2 Byte	■		■		
18	Channel A: Output	Step 1	1 Bit	■		■		
18	Channel A: Output	Bit 0	1 Bit	■		■		
19	Channel A: Output	Step 2	1 Bit	■		■		
19	Channel A: Output	Bit 1	1 Bit	■		■		
20	Channel A: Output	Step 3	1 Bit	■		■		
20	Channel A: Output	Bit 2	1 Bit	■		■		

Standard settings								
No.	Name	Object Function	Length	C	R	W	T	U
21	Channel A: Output	Step 4	1 Bit	■		■		
22	Channel A: Output	Step 5	1 Bit	■		■		
23	Channel A: Output	Step 6	1 Bit	■		■		
24	Channel A: Output	Step 7	1 Bit	■		■		
25	Channel A: Output	Step 8	1 Bit	■		■		
26	Channel A: Output	Switch heating/cooling	1 Bit	■		■		■
27	Channel A: Output	Status current value	1 Byte 2 Byte	■	■		■	
28	Channel A: Output	Lock object 1	1 Bit	■		■		
29	Channel A: Output	Lock object 2	1 Bit	■		■		
30	Channel A: Output	Send status of emergency mode	1 Bit	■	■		■	
31	Channel A: Output	Enable emergency mode	1 Bit	■		■		
+35	**Next channel**							
70 / 140*	Difference measurement 1	Input object	1 Byte 2 Byte	■		■		
71/ 141*	Difference measurement 1	Output object	1 Bit 1 Byte 2 Byte	■	■		■	
+5	**Next difference measurement**							
90 / 160*	Operation mode	Send status	1 Bit	■	■		■	
91 / 161*	Day/Night	Switching	1 Bit	■		■		■
92 / 162*	Overload / Short circuit	Send alarm	1 Bit	■			■	

Table 1: Communication objects – Standard settings

***:** The first value refers to the numbering of the communication objects when using AIO-0210V.01, the second value when using AIO-0410V.01.

The table above shows the preset default settings. The priority of the individual communications objects and the flags can be adjusted by the user as required. The flags assign the communication objects their respective tasks in programming, where C stands for communication, R for read, W for write, T for transmit and U for update.

4 ETS Parameter

4.1 General settings

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Startup delaytime	0 s ... 120 s **[5]**	Time between restart and functional start-up of the device.
Cyclic “Operation mode”	not **use** 2 min – 24 h	Activation of an object and setting the sending interval.
Day/Night object	■ not use ■ **use, no request** ■ use, request at reset	Setting if a Day/Night object is used and whether it is actively requested after a bus voltage recovery.
Polarity of object Day/Night	■ Day = 1 / Night = 0 ■ **Day = 0 / Night = 1**	Polarity of the “Day/Night” object.
Overload / Short circuit detection	■ not active ■ **active**	Activation of an object in the event of an overload or short circuit.

Table 2: General settings

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
90 / 160*	Operation mode – Send status	1 Bit	Sending a cyclical telegram.
91 / 161*	Day/Night – Switching	1 Bit	Input of a value, whether “Day” or “Night”.
92 / 162*	Overload/Short circuit – Send alarm	1 Bit	Reports when an overload occurs at one of the channels.

Table 3: Communication objects – General

***:** The first value refers to the numbering of the communication objects when using AIO-0210V.01, the second value when using AIO-0410V.01.

4.2 Channel selection

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Channel A / B	■ **not active** ■ Input ■ Output	Activation and setting of the operating mode for the selected channel.
Channel C / D	■ **not active** ■ Input ■ Output	Activation and setting of the operating mode for the selected channel. **Only with AIO-0410V.01.**
Difference measurement 1 (... 4)	■ **not active** ■ active	Activating of a difference measurement.

Table 4: General settings – Channel selection

Two I/O channels can be activated on the AIO-0210V.01, and four I/O channels on the AIO-0410V.01. A separate menu appears for each activated channel.

4.3 Channel as input

4.3.1 Setting sensor type

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Setting sensor type	■ **0 – 10 V Sensor** ■ 2 – 10 V Sensor ■ 0 – 20 mA Sensor ■ 4 – 20 mA Sensor	Type of sensor, connected to the input.

Table 5: Settings – Select sensor type

Setting sensor type
The sensor type must always be configured according to the connected sensor in order to obtain the correct measurement results.

4.3.2 Wire break detection

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Wire break detection	■ **not active** ■ active	Sends a message if the value falls below the minimum input value. **Only with "2 – 10 V Sensor" or "4 – 20 mA Sensor"**.

Table 6: Settings – Wire break detection

Wire break detection
The wire break detection reports an alarm via the associated object when the minimum value of the sensor (2 V or 4 mA) is fallen below. As soon as a wire break has been detected, the measured values are set to 0 and the input is in error mode until the value again exceeds the 2 V / 4 mA limit.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
1	Channel A: Input – Wire break alarm	1 Bit	Transmitting a wire break alarm.
+35	**Next channel**		

Table 7: Communication objects – Wire break detection

4.3.3 Measurement output

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Object type for measurement output	■ DPT 5.001 Percent (0...100 %) ■ **DPT 9.020 Voltage (mV)** ■ DPT 9.021 Current (mA) ■ DPT 9.001 Temperature (°C) ■ DPT 9.004 Lux (Lux) DPT 9.005 Wind speed (m/s) ■ DPT 9.006 Pressure (Pa) ■ DPT 9.007 Humidity (%) ■ DPT 9.008 CO2 (ppm) ■ DPT 9.025 Flow (l/h) ■ DPT 9.026 Rain volume (l/m²)	Selection of the datapoint type for the measured value output. ■ **“DPT 9.020 Voltage (mV)“only if “0 / 2 – 10V Sensor”.** ■ **“DPT 9.021 Current (mA)“ only if “0 / 4 – 20mA Sensor“.**
Scaling of output for voltage value = 0 V / 2 V (range) Scaling of output for current value = 0 mA / 4 mA (range)	-60 ... 250 °C 0 ... 100000 Lux 0 ... 360 m/s 0 ... 670000 Pa 0 ... 100 % 0 ... 5000 ppm 0 ... 5000 l/h 0 ... 200 l/m² **[0]**	Specify the value for the lower/upper point of the measuring range. Scaling range according to the selected datapoint type. **Only for physical values.**
Scaling of output for voltage value = 10 V (range) Scaling of output for current value = 20 mA (range)		
Min/max values	■ **not active** ■ active	Activates the min/max evaluation.
Mean filtering	■ **direct** ■ fast ■ medium fast ■ slow	Setting how input changes affect the mean value.

ETS Text	Dynamic range **[Default value]**	Comment
Status output	■ **only request** ■ send cyclic ■ send at changes ■ send cyclic and at changes	Setting whether and under what condition a status value is transmitted.
Send cyclic with interval of	1 min – 60 min **[1 min]**	Interval at which the value is sent. **Only if "send cyclic ...."**.
Send value at change	1 % – 10 % **[1 %]**	Setting at which change the value is sent. **Only if "... at changes".**

Table 8: Settings – Measurement output

Object type for measurement output
The parameter "Object type for measurement output" is used to determine which datapoint type is used to send the value.

Scaling of Output
If the physical parameters are "Temperature" "Lux" "Wind speed" "Pressure" "Humidity" "CO2" "Flow" or "Rain volume", the measured values can be scaled and thus adapted to the parameters of the sensor used.

The voltage value is converted into the corresponding physical equivalent according to a linear relationship by scaling.

The following diagram shows this using the example of a temperature sensor:

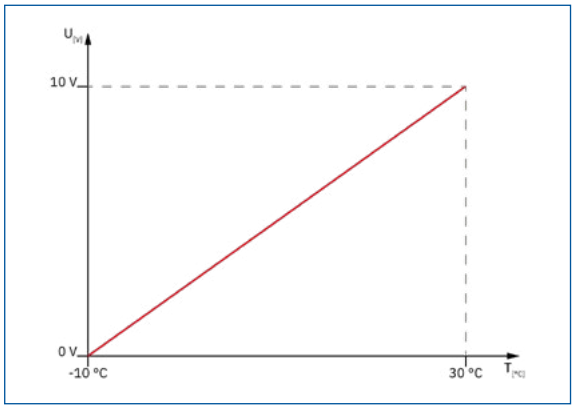


Figure 5: Diagram: Measured value scaling by using a sensor without wire break detection

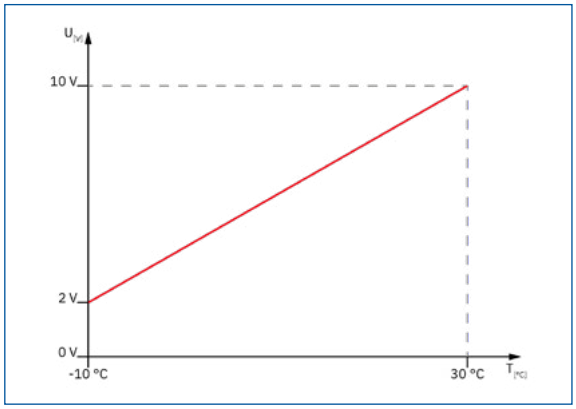


Figure 6: Diagram: Measured value scaling by using a sensor with wire break detection

Min/Max Values
If the "Min/Max values" are activated, communication objects for the minimum and maximum value as well as an object for resetting are displayed.
The minimum/maximum objects are purely requesting objects and output values since the last reset (via object or bus voltage reset).

Mean filtering
Fluctuations in the measured value can be compensated by mean value filtering.

Example: If wind gusts are to be compensated for in a wind sensor, the measurement filter can be set to medium or slow. This means that the measurement value adjusts slowly to changes and outliers in either direction are filtered out.

Sending values

- **“only request”:** no value will be sent. The status can be actively requested.
- **“send at change“**: The value is sent when a value changes by a percentage that can be set.
- **“send cyclic“:** The value is sent at an adjustable interval, regardless of any changes.
- **“send cyclic and at changes“:** The value is sent either when a change of a percentage-based adjustable value occurs or cyclically independently of changes.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
0	Channel A: Input – Send value	1 Byte 2 Byte	Sends the scaled result of the measured value. DPT according to parameter setting.
7	Channel A: Input – Minimum value	1 Byte 2 Byte	Sends the minimum value since the last reset. DPT according to parameter setting.
8	Channel A: Input – Maximum value	1 Byte 2 Byte	Sends the maximum value since the last reset. DPT according to parameter setting.
9	Channel A: Input – Reset min/max value	1 Bit	Reset the minimum and maximum values.
+35	**Next channel**		

Table 9: Communication objects – Measurement output

4.3.4 Step controller

The step controller can be used to implement a 1 Bit toggle function depending on the sensor value.

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Step regulator	■ **not active** ■ active	Activates the step regulator function.
Threshold for switching to step 1 (– 4)	Range of values according to sensor type	Setting the switchover value.
Hysteresis	0 ... 50 % **[2 %]**	Setting the switching hysteresis by falling edge.

Table 10: Settings – Step controller

Note: The threshold values for the step regulator must be set in ascending order.

Example: Threshold value for switching to step 4 > threshold value for switching to step 3, etc.!

Important: If the sensor is a 2 – 10 V or 4 – 20 mA type, values below 2 V or 4 mA are not allowed!

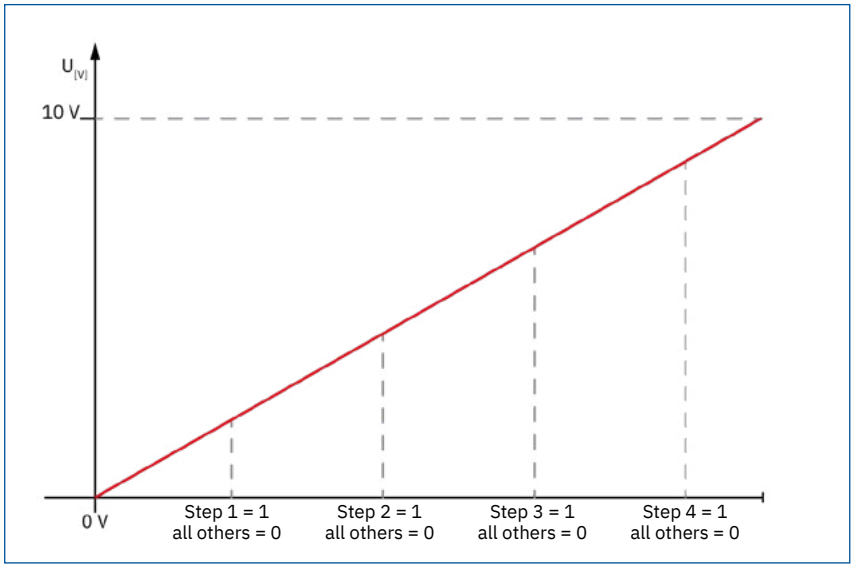


Figure 7: Diagram: Principle of the step controller

The switching levels of the step controller are entered in the parameters. If a measured value increases, the corresponding level is switched “ON” and every other level is switched “OFF” upon exceedance of the threshold value.

If the measured value is falling, the switch-off levels are calculated as follows using hysteresis: switch-on level – (switch-on level x hysteresis).

Example: The switch-off level, if the switch-on level is 2V and the hysteresis is 5%, is calculated as follows: 2 – (2 x 0,05) = 1,9 V.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
3	Channel A: Input Step switch – Step 1	1 Bit	Switch to level 1
4	Channel A: Input Step switch – Step 2	1 Bit	Switch to level 2
5	Channel A: Input Step switch – Step 3	1 Bit	Switch to level 3
6	Channel A: Input Step switch – Step 4	1 Bit	Switch to level 4
+35	**Next channel**		

Table 11: Communication objects – Step regulator

4.3.5 Activating threshold switch

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Threshold switch	■ **not active** ■ active	Activates the threshold switch function.

Table 12: Settings – Activating threshold switch

A separate menu is displayed for the activated threshold switch. The description of this follows in the next chapter.

4.3.5.1 Setting threshold switch

Two threshold values can be activated per input channel, which can be used to trigger certain events when the measured value is exceeded or falls below.

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Threshold switch is changeable via bus	■ **not active** ■ active	Activates objects for changing the set threshold values via the bus.
Output object threshold 1 / 2	■ **Bit** ■ Percent ■ Scenes	Setting the datapoint type.
If “Output object threshold 1 / 2“ → “Bit“		
Value for lower deviation	■ **Bit 0** ■ Bit 1	Value sent, when the threshold is fallen below.
Value for exceedance	■ Bit 0 ■ **Bit 1**	Value sent, when the threshold is exceeded.
If “Output object threshold 1 / 2“ → “Percent“		
Value for lower deviation	0 ... 100 % **[0 %]**	Value sent, when the threshold is fallen below.
Value for exceedance	0 ... 100 % **[100 %]**	Value sent, when the threshold is exceeded.
If “Output object threshold 1 / 2“ → “Scenes“		
Scene number at lower deviation	1 – 64 **[1]**	Scene number sent, when the threshold is fallen below.

ETS Text	Dynamic range **[Default value]**	Comment
Scene number at exceedance	1 – 64 **[2]**	Scene number sent, when the threshold is exceeded.
Threshold	Value range according to DPT **[0]**	The value at which the toggle occurs. The value range depends on the DPT for 'Object type measurement value output' in the 'Channel A input' menu.
Hysteresis for switch-off threshold	0 ... 50 % **[0 %]**	Hysteresis when falling back below "value for lower deviation".
Send threshold cyclic	**[not active]** 1 min – 60 min	Setting whether and at what interval the threshold value is sent cyclically.

Table 13: Settings – Threshold switch

Threshold switch is changeable via bus
If the change of the threshold values via the bus is activated, two further communication objects appear via which the new threshold value can be sent. The sent value is thus adopted as the new threshold value for further calculations.

Functionality of the threshold switch
The threshold switch sends the value defined in **"Value for exceedance"** if the threshold is exceeded. When the value falls below the threshold value minus the hysteresis, [threshold value – (threshold value x hysteresis)], the **"Value for lower deviation"** is sent.

Example: With a threshold value of 10 °C and a hysteresis of 5 %, the "value for exceedance" is sent at 10 °C for a rising flank and the "value for lower deviation" is sent at 9.5 °C for a falling flank (10 – (10 x 0,05) = 9.5).

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
10	Channel A: Input – Threshold 1 exceedance and lower deviation	1 Bit 1 Byte	Sending the value for threshold 1. DPT according to parameter setting.
11	Channel A: Input – Change threshold 1	1 Byte 2 Byte	Threshold received via bus. DPT according to parameter setting.
12	Channel A: Input – Threshold 2 exceedance and lower deviation	1 Bit 1 Byte	Sending the value for threshold 1. DPT according to parameter setting.
14	Channel A: Input – Change threshold 2	1 Byte 2 Byte	Threshold received via bus. DPT according to parameter setting.
+35	**Next channel**		

Table 14: Communication objects – Threshold switch

4.4 Channel as output

4.4.1 Setpoint

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Set value default setting over	■ **1 Byte continuous (0 – 100 %)** ■ 1 Byte (0 – 100 %) as step switch ■ 2 Byte continuous floating value ■ 2 Byte floating value as step switch ■ 1 Bit as step switch	Select the control mode for the voltage output.

Table 15: Settings – Selecting DPT for setpoint

4.4.1.1 Setpoint via: 1 Byte continuous (0 – 100 %)

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Day/Night object	■ **not active** ■ active	If activated, the voltage values for day/night mode vary.
If “Day/Night object“ → “not active“		
Minimum value	0 ... 100 x 0,1 V **[0 x 0,1 V]**	Defines the minimum output voltage.
Maximum value	0 ... 100 x 0,1 V **[100 x 0,1 V]**	Defines the maximum output voltage.
If “Day/Night object“ → “active“		
Minimum value day/night	0 ... 100 x 0,1 V **[0 x 0,1 V]**	Defines the minimum output voltage in day/night mode.
Maximum value day/night	0 ... 100 x 0,1 V **[100 x 0,1 V]**	Defines the maximum output voltage in day/night mode.

Table 16: Settings – Setpoint via “1 Byte continuous“

Note: The parameters “Minimum value...” and “Maximum value...” do not scale the input value to a new range. The voltage value is raised to the minimum value if it falls below the minimum value, or limited in the event of exceedance of the maximum value.

Functional principle
If the setpoint is specified via 1 Byte, a 0 – 100 % value is linearly converted into the equivalent voltage value.
Example: A value of 50 % results in an output voltage of 5 V.

The following graphic illustrates this type of control:

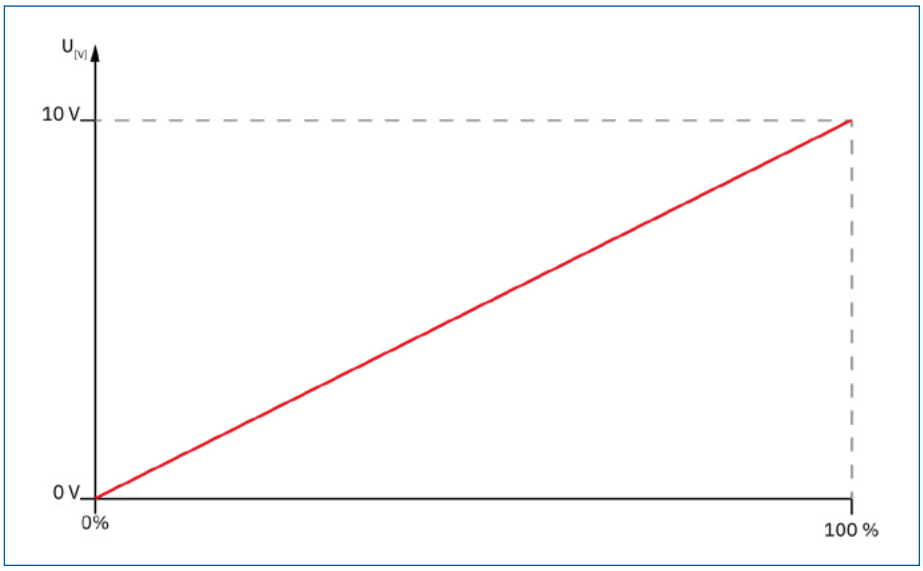


Figure 8: Diagram: Setpoint via “1 Byte continuous“

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
17	Channel A: Output – Default current set value	1 Byte	Receiving the control value for the 0 – 10 V output.
+35	**Next channel**		

Table 17: Communication objects – Setpoint via “1 Byte continuous“

4.4.1.2 Setpoint via: 1 Byte continuous (0 – 100 %) as step switch

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Day/Night object	■ **not active** ■ active	If activated, the voltage values for day / night mode vary.
Number of steps	2 – 8 **[2]**	Defines the number of voltage levels.
If Day/Night object → “not active“		
Switching threshold step 1 (... 7) <-> step 2 (...8)	0 ... 100 % **[Default values vary according to levels]**	Setpoint at which the next step is activated. **The number of switching thresholds depends on the “number of steps”.**
Voltage value step 1 (... 8)	0 ... 100 x 0,1 V **[Default values vary according the level]**	The voltage value assigned to the level, which is output. **The number of voltage value levels depends on the “Number of steps”.**
If Day/Night object → “active“		
Switching threshold step 1 (... 7) <-> step 2 (... 8)	0 ... 100 % **[Default values vary according the level]**	Value at which the next level is activated. **The number of switching thresholds depends on the “number of steps”.**
Voltage value step 1 (...8) at day	0 ... 100 x 0,1 V **[Default values vary according the level]**	The value that will be given out in day mode. **The number of voltage value steps depends on the “number of steps”.**
Voltage value step 1 (... 8) at night	0 ... 100 x 0,1 V **[Default values vary according the level]**	The value that will be given out in night mode. **The number of voltage value steps depends on the “number of steps”.**
Hysteresis	0 ... 50 % **[0 %]**	Hysteresis for switching back to the next lower level at falling edge.

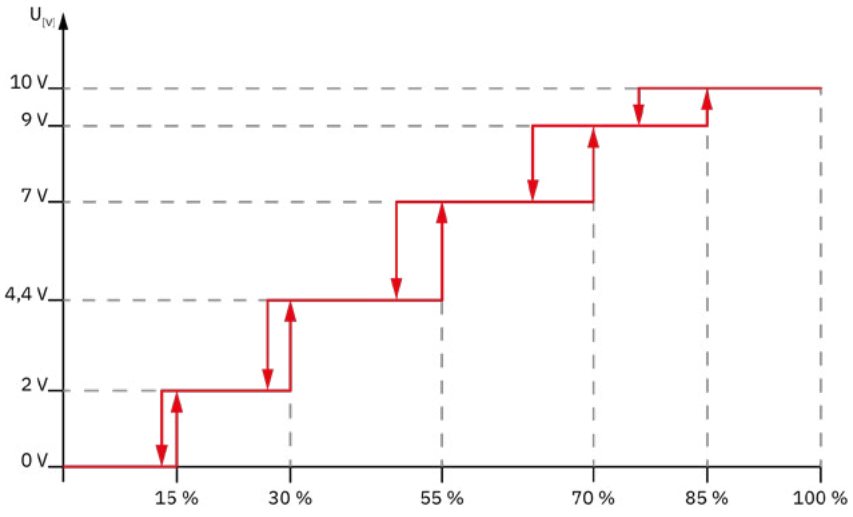
Table 18: Settings – Setpoint via “1 Byte as step switch“

Hysteresis
If the measured value is falling, the switch-off levels are calculated as follows using hysteresis: threshold – (threshold x hysteresis).

Example: The switch-back threshold with a threshold of 30 % and a hysteresis of 10 % is calculated as follows: 30 – (30 x 0,1) = 27.

Functional principle
If the control value is specified via “1 Byte continuous (0 - 100 %) as step switch”, a 0 – 100 % value is converted into different voltage levels. Both, the voltage levels and the switchover thresholds are adjustable. Up to 8 voltage levels can be set.

The following diagram shows this type of control with the following values:



Number of steps	6	Switchover thresholds:	-	15 %	30 %	55 %	70 %	85 %
Hysteresis:	10 %	Voltage values:	0V	2 V	4,4 V	7 V	9 V	10 V

Figure 9: Diagram: Setpoint via “1 Byte as step switch“

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
17	Channel A: Output – Default current set value	1 Byte	Receiving the control value for the 0 – 10 V output.
+35	**Next channel**		

Table 19: Communication objects – Setpoint via “1 Byte as step switch“

4.4.1.3 Setpoint via: 2 Byte continuous floating value

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Day/Night object	■ **not active** ■ active	If activated, the voltage values for day/night mode can vary.
Datapoint setting	■ **DPT 9.020 Voltage (mV)** ■ DPT 9.001 Temperature (°C) ■ DPT 9.004 Lux (Lux) DPT 9.005 Wind speed (m/s) ■ DPT 9.006 Pressure (Pa) ■ DPT 9.007 Humidity (%) ■ DPT 9.008 CO2 (ppm) ■ DPT 9.025 Flow (l/h) ■ DPT 9.026 Rain volume (l/m²)	Selecting the data point type for the control value.
Switch-off point (Output = 0V) (Range)	0 mV ... 10000 mV -60 ... 200 °C 0 ... 100000 Lux 0 ... 360 m/s 0 ... 670000 Pa 0 ... 100 % 0 ... 5000 ppm 0 ... 5000 l/h 0 ... 200 l/m²	Specifying the value for the 0 V / 10 V analog value. The default values correspond to the minimum value (switch-off point) and the maximum value (end stop). Value range according to the selected datapoint type.
End stop (Output = 10V) (Range)		
If Day/Night object → “not active“		
Minimum value	0 ... 100 x 0,1 V **[0 x 0,1 V]**	Defines the minimum output voltage.
Maximum value	0 ... 100 x 0,1 V **[100 x 0,1 V]**	Defines the maximum output voltage.
If Day/Night object → “active“		
Minimum value day/night	0 ... 100 x 0,1 V **[0 x 0,1 V]**	Defines the minimum output voltage in day / night mode.
Maximum value day/night	0 ... 100 x 0,1 V **[100 x 0,1 V]**	Defines the maximum output voltage in day / night mode.

Table 20: Settings – Setpoint via “2 Byte continuous“

Functional principle
When the control value is specified as “2-byte continuous floating values”, a 2-byte value is converted into a voltage value with a linear increase within the specified limits. A value of 24 °C will result in an output voltage of 5 V if the limits are between 22 °C and 26 °C.

Example: The setpoint specification via “2 Byte continuous floating value” can be used for a simple realization of a ventilation control. For a fan with a 0 – 10 V interface, if the fan is to switch on at a temperature of 22 °C and linearly increase the speed of the fan up to a temperature of 26 °C, the switch-on point is set to 22 °C and the switch-off point to 26 °C.

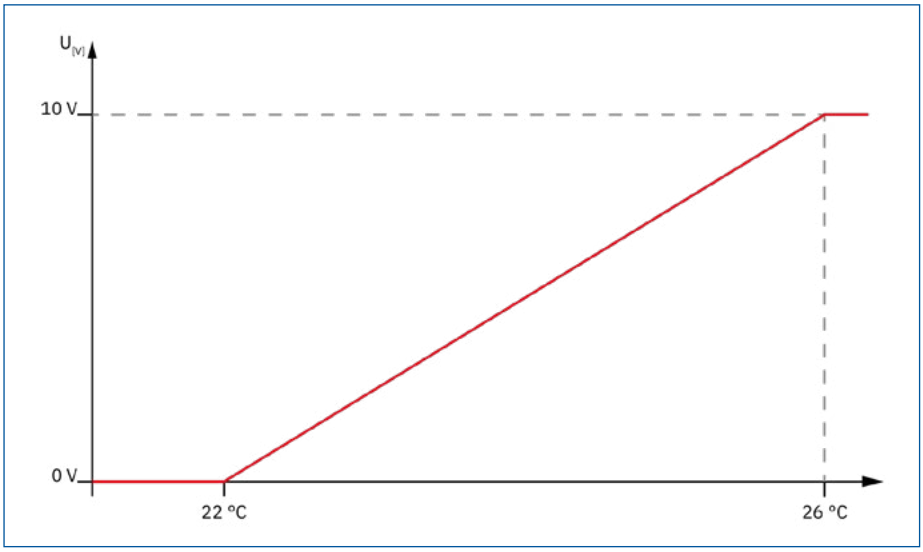


Figure 10: Diagram: Setpoint via “2 Byte continuous“

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
17	Channel A: Output – Default current set value	2 Byte	Receiving the control value for the 0 – 10 V output.
+35	**Next channel**		

Table 21: Communication objects – Setpoint via “2 Byte continuous“

4.4.1.4 Setpoint via: 2 Byte continuous floating value as step switch

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Day/Night object	■ **not active** ■ active	If activated, the voltage values for day/night mode vary.
Datapoint setting	■ **DPT 9.020 Voltage (mV)** ■ DPT 9.001 Temperature (°C) ■ DPT 9.004 Lux (Lux) DPT 9.005 Wind speed (m/s) ■ DPT 9.006 Pressure (Pa) ■ DPT 9.007 Humidity (%) ■ DPT 9.008 CO2 (ppm) ■ DPT 9.025 Flow (l/h) ■ DPT 9.026 Rain volume (l/m²)	Selecting the datapoint type for the switching threshold
Number of steps	2 – 8 **[2]**	Defines the number of voltage levels.
If Day/Night object → “not active“		
Switching threshold step 1 (... 7) <-> step 2 (... 8)	Value range according to DPT **[0]**	Setpoint at which the next step is activated. **The number of switching thresholds depends on the “number of steps”.**
Voltage value step 1 (... 8)	0 ... 100 x 0,1 V **[Default values vary according to the level]**	The voltage value assigned to the level, which is output. **The number of voltage value levels depends on the “Number of steps”.**
If Day/Night object → “active“		
Switching threshold step 1 (... 7) <-> step 2 (... 8)	Value range according to DPT **[0]**	Value at which the next level is activated. **The number of switching thresholds depends on the “number of steps”.**
Voltage value step 1 (... 8) at day	0 ... 100 x 0,1 V **[Default values vary according to the level]**	The value that will be given out in day mode. **The number of voltage value steps depends on the “number of steps”.**
Voltage value step 1 (... 8) at night	0 ... 100 x 0,1 V **[Default values vary according to the level]**	The value that will be given out in night mode.. **The number of voltage value steps depends on the “number of steps”.**
Hysteresis	0 ... 50 % **[0 %]**	Hysteresis for switching back to the next lower level at falling edge.

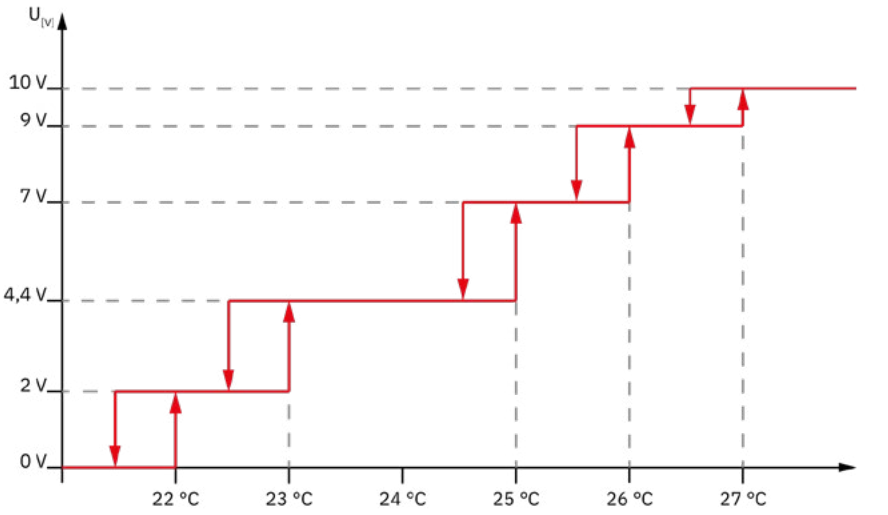
Table 22: Settings – Setpoint via “2 Byte as step switch“

Hysteresis
If the measured value is falling, the switch-off levels are calculated as follows using hysteresis: threshold – (threshold x hysteresis).

Example: The switch-back threshold if the threshold is 30 % and the hysteresis is 10 % is calculated as follows: 30 – (30 x 10%) = 27

Functional principle
If the control value is specified via “2 Byte continuous floating value as step switch”, a 2 Byte value is converted into different voltage levels. Both, the voltage levels and the switchover thresholds are adjustable. Up to 8 voltage levels can be set.

The following diagram shows this type of control with the following values:



Number of steps	6	Switchover thresholds:	-	22 °C	23 °C	25 °C	26 °C	27 °C
Hysteresis:	10 %	Voltage values:	0V	2 V	4,4 V	7 V	9 V	10 V

Figure 11: Diagram: Setpoint via “2 Byte as step switch“

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
17	Channel A: Output – Default current set value	2 Byte	Receiving the control value for the 0 – 10 V output.
+35	**Next channel**		

Table 23: Communication objects – Setpoint via “2 Byte as step switch“

4.4.1.5 Setpoint via: 1 Bit as step switch

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Day/Night object	■ **not active** ■ active	If activated, the voltage values for day/ night mode can vary.
Mode	■ **1 Bit Inputs** ■ 3 Bit binary coded	Defines the selection format for the levels.
Number of steps	2 – 8 **[2]**	Defines the number of voltage levels.
If Day/Night object → “not active“		
Voltage value step 1 ... 8)	0 ... 100 x 0,1 V **[Default values vary according to the level]**	The value that will be given out. **The number of voltage value steps depends on the “number of steps”.**
If Day/Night object → “active“		
Voltage value step 1 (... 8) at day	0 ... 100 x 0,1 V **[Default values vary according to the level]**	The value that will be given out in day mode. **The number of voltage value steps depends on the “number of steps”.**
Voltage value step 1 (... 8) at night	0 ... 100 x 0,1 V **[Default values vary according to the level]**	The value that will be given out in night mode.. **The number of voltage value steps depends on the “number of steps”.**

Table 24: Settings – Setpoint via “1 Bit as step switch“

Functional principle
If the control value is specified via “1 Bit as a step switch”, two different modes are possible. The first is the control mode via 8 x 1 Bit inputs and the second is the control mode via 3 Bit binary coded.

4.4.1.5.1 Mode: 1 Bit inputs

The following diagram illustrates control via “1 Bit Inputs”:

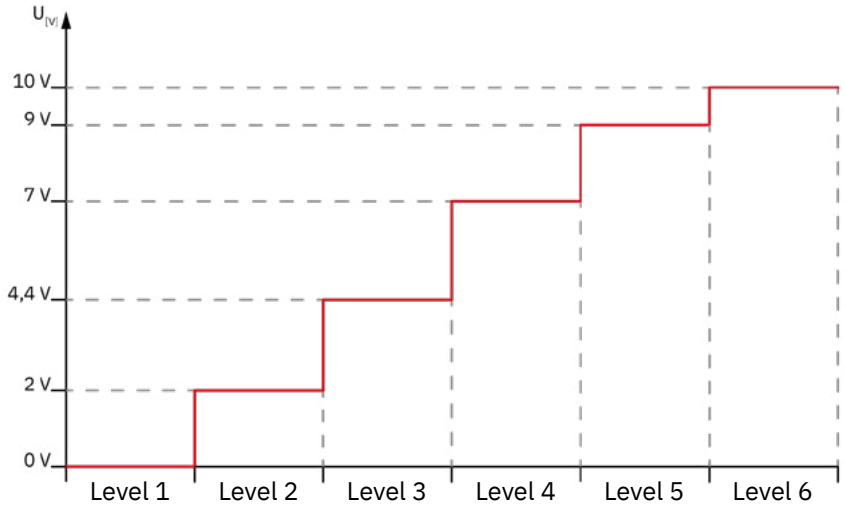


Figure 12: Diagram: Setpoint via “1 Bit inputs“

Functional principle
When controlled via “1-bit inputs,” a communication object is displayed for each active stage. As shown in the figure above, if six levels are activated, six objects corresponding to steps 1 to 6 are displayed. Levels can be activated with an “ON” value. Only the most recently activated stage remains active, while all others are deactivated.
For instance, if step 3 is active and step 6 receives an “ON” value, the analog module switches to the target voltage for step 6, while all other levels are set to 0 V and become inactive.

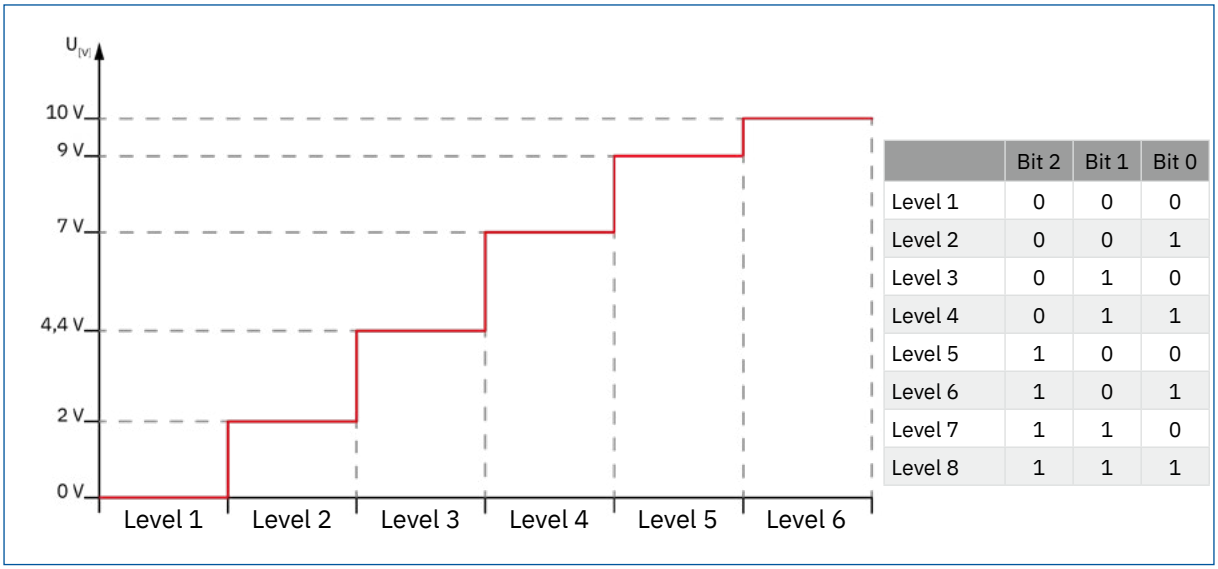
The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
18	Channel A: Output – Step 1	1 Bit	Receiving the setpoint for level 1.
19	Channel A: Output – Step 2	1 Bit	Receiving the setpoint for level 2.
...			
25	Channel A: Output – Step 8	1 Bit	Receiving the setpoint for level 8.
+35	**Next channel**		

Table 25: Communication objects – Setpoint via “1 Bit inputs“

4.4.1.5.2 Mode: 3 Bit binary coded

The following diagram illustrates control via “3 Bit binary coded“



	Bit 2	Bit 1	Bit 0
Level 1	0	0	0
Level 2	0	0	1
Level 3	0	1	0
Level 4	0	1	1
Level 5	1	0	0
Level 6	1	0	1
Level 7	1	1	0
Level 8	1	1	1

Figure 13: Diagram: Setpoint via “3 Bit binary coded“

Note: The diagram above shows the control mode for 6 levels.

Functional principle
If the mode is via “3 Bit binary coded”, 3 objects with the size 1 Bit are displayed. The objects are binary coded evaluated.

The assignment of bit word / level can be found in the table above.

Example: The bit sequence 010 activates the voltage value for level 3.
The bit sequence 111 activates the voltage value for level 8.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
18	Channel A: Output – Binary coded: Bit 0	1 Bit	The value for activating the level is received as a binary-coded 3-Bit word.
19	Channel A: Output – Binary coded: Bit 1	1 Bit	
20	Channel A: Output – Binary coded: Bit 2	1 Bit	
+35	**Next channel**		

Table 26: Communication objects – Setpoint via “3 Bit binary coded“

4.4.2 Output behaviour

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Operating action of output	■ **normal** ■ inverse ■ invert over object Heating/Cooling	Setting whether and by which trigger the output is inverted.
Inversion of Heating/Cooling	■ **Heating = inverse** **Cooling = normal** ■ Heating = normal Cooling = inverse	Setting for how the object “Switch heating/cooling” reacts. **Only if “invert over object Heating/ Cooling“.**
Time to achieve target value scaled to a throughput of 0 - 10 V (0 s = directly)	**0 ... 120 s** **[0 s]**	Affects how quickly the value is increased or decreased.

Table 27: Settings – Output behaviour

Operating action of output
The output can be operated either normally or in reverse to adapt it to different 0 – 10 V interfaces.
The ‘Switch Heating/Cooling’ object can also be used to invert the direction of action. This adjusts the assignment of the output voltage to achieve the opposite effect if the same control value is used (reversing from rising to dropping voltage and back). This setting allows flexible adaptation to different requirements, for example if the behaviour of the controlled devices is contrary.
A normal direction of action means that the output voltage increases if the control value increases, as described in chapter 4.4.1.1 Setpoint via: 1 Byte continuous (0 – 100 %). If the output is inverted, the voltage behaviour is reversed.

The following diagram shows an inverted output:

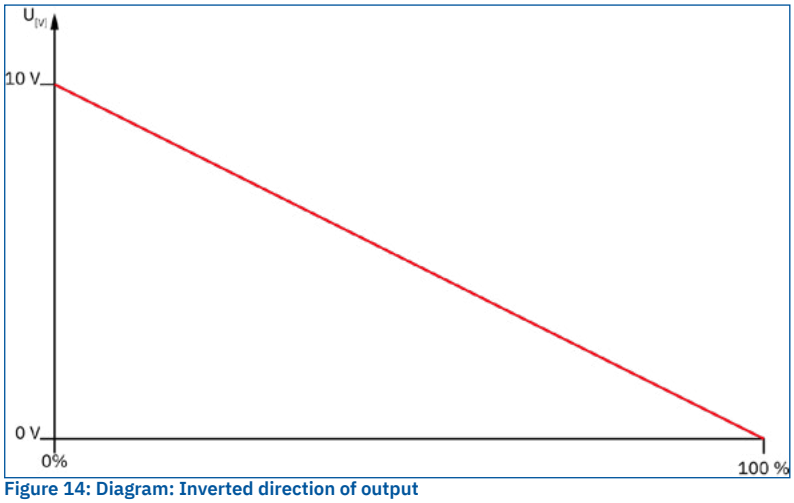


Figure 14: Diagram: Inverted direction of output

Time to reach target value
To allow a smooth adjustment of the output voltage, for example to change the speed of a fan evenly, the time for a complete loop from 0–10 V can be configured. The “Time to achieve target value scaled to a throughput of 0 - 10 V” parameter refers to the duration of a complete voltage loop from 0 V up to 10 V.

Example: With a set time of 10 seconds, the output needs 5 seconds to increase the output voltage to 5 V, if there is a step change in the control value from 0 % to 50 %.

If the value is set to 0 seconds, the output voltage changes almost immediately (within the limits of the system-related delays).

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
26	Channel A: Output – Switch Heating/ Cooling	1 Bit	Switch between Heating/Cooling. **If „Operating action of output“ → „invert over object Heating/Cooling“.**
+35	**Next channel**		

Table 28: Communication objects – Output behaviour

4.4.3 Status output

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Status output	■ **only request** ■ send cyclic ■ send at changes ■ send cyclic and at changes	Setting the output condition for sending the output.
Send value cyclic each	1 min ... 60 min **[1 min]**	Setting the interval at which the value is sent. **Only if "send Cyclic ...".**
Send value at change	1 % – 10 % **[1 %]**	Setting from which change the value is sent. **Only if "... at changes".**
Datapoint for status object	■ **DPT 9.020 Voltage (mV)** ■ DPT 5.001 Percent (0...100 %)	Specify the datapoint type to be used for sending the status object.

Table 29: Settings – State output

State output
This is where you specify if, and under what conditions a status value is sent.

Send value cyclic each
Here you can set the intervals at which a status value is sent. Status values are also sent if no changes have been registered.

Send value at change
This parameter specifies, when the current status value is sent if there is a change.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
27	Channel A: Output – Send current value	1 Byte 2 Byte	Sends status value. DPT depends on parameter setting.
+35	**Next channel**		

Table 30: Communication objects – Status output

4.4.4 Lock function

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Lock function 1 (higher priority)	■ **not active** ■ active	Activate the lock function 1.
Lock function 2	■ **not active** ■ active	Activate the lock function 2.
If “Lock function 1 / 2“ →“active“		
Action at activation	■ no change ■ **switch output to voltage value 0 – 10 V**	Setting of the action if the lock function is activated.
Voltage value	0 ... 100 x 0,1 V **[50 x 0,1 V]**	Setting a voltage value. **Only if “switch output to voltage value 0 – 10 V“.**
Action at deactivation	■ no change ■ **memory function** ■ switch output to voltage value 0 – 10 V	Setting of the action if the lock function is deactivated.
Voltage value	0 ... 100 x 0,1 V **[100 x 0,1 V]**	Setting a voltage value. **Only if “switch output to voltage value 0 – 10 V“.**

Table 31: Settings – Lock functions

Activating a lock function will lock the output from further operation up to the point when it is unlocked again. Both lock functions can be activated independent of each other, where lock function 1 has a higher priority than lock function 2.

Example: If “lock function 2” is active and “lock function 1” is activated afterwards, the function assigned to “lock function 1” will be executed. As soon as “lock function 1” is deactivated again, the function assigned to “lock function 2” will be executed again. Deactivating “Lock function 2” if “Lock function 1” is activated has no effect because of the prioritisation.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
28	Channel A: Output – Lock object 1	1 Bit	Activates lock function 1.
29	Channel A: Output – Lock object 2	1 Bit	Activates lock function 2.
+35	**Next channel**		

Table 32: Communication objects – Lock functions

4.4.5 Behaviour after reset and emergency mode

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
If “Setpoint via“ → “1 Byte continuous (0 – 100 %)“ or “2 Byte continuous floating value“		
Behaviour after bus power return	■ **no changes (Memory function)** ■ switch output to voltage value 0 – 10 V	Behaviour on bus power return.
If “Setpoint via“ → “... as Step switch“		
Behaviour after bus power return	■ **no changes (Memory function)** ■ set output to 0 V ■ switch to step 1 ■ switch to step 2 : ■ switch to step 8	Behaviour on bus power return. **The number of steps depends on the parametrization.**
Emergency mode	■ **not use** ■ use with time input ■ use with 1 Bit input ■ use with time or 1 Bit input	Setting whether and how emergency operation is activated.
Activation of emergency mode	30 min ... 90 min **[30 min]**	Setting a time after which the system will switch to emergency operation. **If “Emergency mode“ → “... with time input“.**
If Day/Night object → “not active“		
Action at activation of emergency mode	■ **no change** ■ switch output to voltage value 0 – 10 V	Setting the action if emergency mode is activated.
Voltage value	0 ... 100 x 0,1 V **[50 x 0,1 V]**	Setting a voltage value. **Only if “Switch output to voltage ...”.**
If Day/Night object → “active“		
Action at activation of emergency mode at day/night mode	■ **no change** ■ switch output to voltage value 0 – 10 V	Setting the action if emergency mode is activated at day or night mode.
Voltage value	0 ... 100 x 0,1 V **[50 x 0,1 V]**	Setting a voltage value. **Only if “Switch output to voltage ...”.**

Table 33: Settings – Behaviour after reset and emergency mode

Behaviour after bus power return
The settings in this menu item differ depending on whether the control value specification is “continuous” or “... as a step switch”:

- **No changes (Memory function):** The output is switched to the voltage which was active before the bus voltage failed.
- **Switch output to voltage value 0 – 10 V:** The output is switched to a defined voltage. (Only if “... continuous.“).
- **Set output to 0V:** The output is switched to 0 V. (only if “... as step switch”).
- **Switch to step 1–8:** The output is switched to a defined level. (Only if “... as step switch”).

Emergency mode
The emergency mode is used to switch the output to a defined value if the control value fails. The activation of the emergency mode can be done either via an object, such as the wire break object of a 2 – 10 V or 4 – 20 mA sensor, or via a time monitoring of the control value. If the control value is sent within a specified time period, the time monitoring is checked. If the system receives a new control value in activated emergency mode, the emergency mode is automatically terminated.

Note: To prevent accidental triggering of emergency operation, the control value should be sent cyclically. It is recommended that the transmission interval be about half as long as the switchover time to emergency operation.

Example: If the time up to activation of emergency mode is 30 minutes, the control value should be sent cyclically every 15 minutes.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
30	Channel A: Output – Send status of emergency mode	1 Bit	Sends whether emergency operation is active.
31	Channel A: Output – Enable Emergency mode	1 Bit	Activates / deactivates emergency operation.
+35	**Next channel**		

Table 34: Communication objects – Emergency mode

4.5 Difference measurement

Difference measurement can be used to compare a measured value input with other inputs, external objects or fixed values, and to calculate the sum, difference or average.

Important: For the difference measurement, the used channels must be set to “Input” in the parameters.

4.5.1 Difference measurement: Inputs

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
If device type AIO-0210V.01		
Measurement input 1	■ **Channel A** ■ Channel B	Select which channel is used for measurement input 1.
Measurement input 2	■ Channel A ■ Channel B ■ **external object** ■ fix value	Setting the data origin for the comparison value.
If device type AIO-0410V.01		
Measurement input 1	■ **Channel A** ■ Channel B ■ Channel C ■ Channel D	Select which channel is used for measurement input 1.
Measurement input 2	■ Channel A ■ Channel B ■ Channel C ■ Channel D ■ **external object** ■ fix value	Setting the data origin for the comparison value.
Only if “Measurement input 2” → “fixed value”.		
Reference value	0 (2000)mV ... 10000 mV 0 (4) mA ... 20 mA -60 ... 250 °C 0 ... 100000 Lux 0 ... 360 m/s 0 ... 670000 Pa 0 ... 100 % 0 ... 5000 ppm 0 ... 5000 l/h 0 ... 200 l/m²	Determining the comparative value. Value range according to the channel set under “Measurement input 1”. The default value corresponds to the minimum value of the permitted range of values.

Table 35: Settings – Difference measurement: Inputs

One of the channels can be selected as “Measurement input 1”. Care must be taken to ensure that this is a channel that is parameterized as an “Input”.
One of the channels parameterized as an input, an external object or a fixed value can be used as “Measurement input 2”.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
70 / 140*	Difference measurement 1 – Input object	1 Byte 2 Byte	Input object for “Measurement input 2”. **Only if “Measurement input 2“ → “external object“.**
+5	**Next difference measurement**		

Table 36: Communication objects – Difference measurement: Inputs

***:** The first value refers to the numbering of the communication objects when using AIO-0210V.01, the second value when using AIO-0410V.01.

4.5.2 Difference measurement: Calculation

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Type of calculation	■ compare ■ **arithmetic**	Decide whether a comparison or a calculation should be carried out.

Table 37: Settings – Difference measurement: Basic setting of calculation

The individual settings are described in the following chapters.

4.5.2.1 Comparison operation

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Reference operation	■ Input 1 > Input 2 ■ Input 1 < Input 2 ■ **Input 1 = Input 2**	Defines the comparison operation.
Hysteresis	1 % – 10 % **[2 %]**	Hysteresis of the comparison operation.
Output object	■ **Bit** ■ Percent ■ Scene	Data point type of the output object.
If “Output object“ → “Bit“		
Send telegram if reference condition is complied	■ no ■ **yes**	Specifies whether an object is sent when the condition is fulfilled.
Bit Value	■ Bit 0 ■ **Bit 1**	Value that is sent when the condition is fulfilled.
Send telegram if reference condition is not complied	■ no ■ **yes**	Specifies whether an object is sent when the condition is not fulfilled.
Bit Value	■ **Bit 0** ■ Bit 1	Value that is sent if the condition is not fulfilled.
If “Output object“ → “Percent“		
Send telegram if reference condition is complied	■ no ■ **yes**	Specifies whether an object is sent when the condition is fulfilled.
Percent value	0 ... 100 % **[100 %]**	Value that is sent when the condition is fulfilled.
Send telegram if reference condition is not complied	■ no ■ **yes**	Specifies whether an object is sent when the condition is not fulfilled.
Percent value	0 ... 100 % **[0 %]**	Value that is sent if the condition is not fulfilled.
If “Output object“ → “Scene“		
Send telegram if reference condition is complied	■ no ■ **yes**	Specifies whether an object is sent when the condition is fulfilled.
Scene number	1 ... 64 **[1]**	Scene number that is sent when the condition is fulfilled.
Send telegram if reference condition is not complied	■ no ■ **yes**	Specifies whether an object is sent when the condition is not fulfilled.

ETS Text	Dynamic range **[Default value]**	Comment
Scene number	1 ... 64 **[2]**	Scene number that is sent if the condition is not fulfilled.
Send cyclical	■ **not active** ■ active	Specifies whether the output object is sent cyclically.
Send value with a interval of	1 min ... 60 min **[1 min]**	Setting the transmission interval .

Table 38: Settings – Comparison operation

The “Measurement input 1” can be compared with the “Measurement input 2” using the reference operations. If the condition is fulfilled/not fulfilled, a settable value is sent as a bit value, a percentage value or as a scene number.

The “Reference operation” work as follows:

- **“Input 1 > Input 2”:** The “Hysteresis” and “Measurement input 1” are used to set the switch-on and switch-off threshold.
  Example: If the measured value is 10 °C and 5 % hysteresis is selected, the condition is met when the measured value input 2 falls below 9.5 °C. The condition is no longer met when the measured value input 2 rises above 10.5 °C.
- **“Input 1 < Input 2”:** The “Hysteresis” and “Measurement input 1” are used to set the switch-on and switch-off threshold.
  Example: If the measured value is 10 °C and 5 % is selected as the hysteresis, the condition is met when the measured value input 2 is above 10.5 °C. The condition is no longer met when the measured value input 2 falls below 9.5 °C again.
- **“Input 1 = Input 2”:** Using the hysteresis, a corridor is calculated on the basis of the “measurement input 1”, within which the “measurement input 2” must fall in order to fulfil the condition.
  Example: If the “Measurement input 1” has the value of 10 °C and the hysteresis is 5 %, the “Measurement input 2” must be between 9.5 °C and 10.5 °C for the comparison operation to be fulfilled.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
71 / 141*	Difference measurement 1 – Output object	1 Bit 1 Byte	Sends the result of the compare operation. DPT corresponding to the output object.
+5	**Next difference measurement**		

Table 39: Communication objects – Compare

***:** The first value refers to the numbering of the communication objects when using AIO-0210V.01, the second value when using AIO-0410V.01.

4.5.2.2 Arithmetic operation

The following table shows the available settings:

ETS Text	Dynamic range **[Default value]**	Comment
Arithmetic operation	■ **Input 1 + Input 2** ■ Input 1 – Input 2 ■ Input 2 – Input 1 ■ arithmetic mean	Defines the arithmetic operation.
Send behaviour	■ send at change ■ send cyclic ■ **send at changes and cyclic**	Condition when the output is sent.
Send value with a interval of	1 min – 60 min [1 min]	Interval at which the value is sent. **Only if "... cyclic".**
Send at change of	2 % – 20 % **[2 %]**	Setting the change from which the value is sent. **Only if "Send at change ...".**

Table 40: Settings – Arithmetic

Send behaviour

- **"send at change"**: This setting specifies that the current calculation result is sent when a value changes by a percentage that can be set.
- **"send cyclic":** The calculation result is sent at an adjustable interval, regardless of any changes.
- **"send at changes and cyclic":** The calculation result is sent either when a change of a percentage-based adjustable value occurs or cyclically independently of changes.

Send value with a interval of
Here you can set the intervals at which a value is sent. Values are also sent if there is no new calculation result.

Send at change of
This parameter specifies the change at which the calculation result is sent.

The following table shows the associated communication objects:

No.	Name / Object function	Length	Usage
71 / 141*	Difference measurement 1 – Output object	1 Byte 2 Byte	Sends the result of the calculation. DPT corresponding to the output object.
+5	**Next difference measurement**		

Table 41: Communication objects – Arithmetic

***:** The first value refers to the numbering of the communication objects when using AIO-0210V.01, the second value when using AIO-0410V.01.

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6 Appendix

6.1 Statutory requirements

The devices described above must not be used in conjunction with devices which directly or indirectly serve human, health, or life-safety purposes. Furthermore, the devices described must not be used if their use may cause danger to people, animals, or property.
Do not leave the packaging material carelessly lying around. Plastic foils/ bags etc. can become a dangerous toy for children.

6.2 Disposal

Do not dispose of the old devices in the household waste. The device contains electrical components that must be disposed of as electronic waste. The housing is made of recyclable plastic.

6.3 Assembly

Danger to life from electric current!

The device may only be installed and connected by qualified electricians. Observe the country-specific regulations and the applicable KNX guidelines.

The devices are approved for operation in the European Union and in the United Kingdom. The products are respectively marked with the CE and UKCA symbols.

Use in the USA and Canada is prohibited!

6.4 History

V 1.0	First Technical Manual	DB V 1.2	03/2025