

**Analogue Input
AE/S 4.2**

Intelligent Installation Systems



This manual describes the functionality of Analogue Input AE/S 4.2.

Subject to changes and errors excepted.

Exclusion of liability:

Despite checking that the contents of this document match the hardware and software, deviations cannot be completely excluded. We therefore cannot accept any liability for this. Any necessary corrections will be incorporated into new versions of the manual.

Please let us know if you have any suggestions for improvements.

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1 General

It is becoming increasingly important to be able to control complex installations in a user-friendly manner. Sensors are used, for instance, in order to control supply air valves, exhaust air valves and air flow speeds in an air conditioning system, or to control heating using an outside temperature sensor. Container levels are scanned in order to obtain information about when the containers need filling. Pipeline temperatures are recorded and evaluated. Sensors to detect the presence of persons in a room are installed in order to optimise the use of energy. Monitoring and security functions rely on the data from sensors. All of these events play a role when it comes to controlling complex installations in buildings and houses in a convenient and secure manner while minimising energy consumption. In making it possible to record and process four independent analogue input signals, our Analogue Input AE/S 4.2 product can help you control your installations using ABB i-bus®.

This manual provides detailed technical information about the Analogue Input product, including installation and programming, and explains how to use AE/S 4.2 by way of examples.

The manual is divided into the following chapters:

- Chapter 1 General
- Chapter 2 Device technology
- Chapter 3 Commissioning
- Chapter 4 Planning and application
- Appendix

1.1 Product and functional overview

Analogue Input AE/S 4.2 is a DIN rail mounted device for integration into the distribution board. The connection to the bus is established via a bus connection terminal at the front of the device. The physical address is assigned, and the parameters are set, using ETS 2, Version V1.3 or higher.

The device enables you to record and process four independent analogue input signals in accordance with DIN IEC 60381 (0 – 1 V, 0 – 5 V, 0 – 10 V, 1 – 10 V, 0 – 20 mA, 4 – 20 mA, 0 – 1000 ohm, PT100 in 2-conductor technology – 30...+ 70 °C, PT100 in 2-conductor technology – 200...+ 800 °C and floating contact interrogation).

All conventional sensors can be connected.

The device has an integrated power supply unit to supply the sensors with 24 V DC voltage. The mains voltage is 115...230 V AC (+ 10% – 15% tolerance), 50/60 Hz.

A constant output current of at most 300 mA is made available across the entire input voltage range (115...230 V AC).

The input signals are processed in the **Threshold value measurement/1** application program.

The sensor output signals can be freely set for each channel in the application program. The measured value can be sent as a 1-bit value, 1-byte value, 2-byte value or 4-byte value via the bus.

Due to the flexible setting options for the measuring range, depending on the transfer of the measured value, all the possibilities for depicting the expected measurement curve are possible. The sensor measurement curve can be corrected or adjusted, depending on the setting. This flexibility enables only a specific range of the expected measurement curve to be evaluated.

Measured values can be averaged over 4, 16 or 64 measurements. One measurement is taken every second.

It is possible to set 2 threshold values per channel, each with an upper and lower limit which can be set independently. The threshold values themselves can be modified via the bus.

It is possible to compare 2 output values, add them, subtract them or calculate the arithmetic mean.



To guarantee all the programmable functions, the technical data of the sensor manufacturer must be observed.

2 Device technology



Fig. 1: Analogue Input AE/S4.2

Analogue Input AE/S 4.2 is used to record analogue data. Four conventional sensors can be connected to AE/S 4.2. The connection to the bus is established using the enclosed bus connection terminal at the front of the device. The device is ready for operation after connecting the mains voltage of 115...230 V AC and the bus voltage. Analogue Input AE/S 4.2 is parameterised using ETS2 V1.3 or higher.

2.1 Technical data

Power supply	– Bus voltage	21 ... 32 V DC
	– Power input, bus	< 10 mA
	– Mains voltage U _s	115 ... 230 V AC (+ 10% – 15%), 50/60 Hz
	– Power consumption	Max. 11 W, at 230 V AC
	– Power input, mains	80/40 mA, at 115/230 V AC
	– Leakage loss	Max. 3 W, at 230 V AC
Auxiliary voltage output to supply the sensors	– Nominal voltage U _n	24 V DC
	– Nominal current I _n	300 mA
Inputs	– Number	4 independent sensor inputs
	– Input signal/resolution/accuracy	0–1 V / 1 mV / +/- 2% of the upper limit of the effective range (of ULE)
		0–5 V / 5 mV / +/- 2% of ULE
		0–10 V / 10 mV / +/- 2% of ULE
		1–10 V / 10 mV / +/- 2% of ULE
		0–20 mA / 20 µA / +/- 2% of ULE
		4–20 mA / 20 µA / +/- 2% of ULE
		0 – 1000 ohm resistance / 2.5 ohm / +/- 2% of ULE
		PT100 2-conductor technology
		– 30...+ 70 °C / 0.1 K / +/- 1 K of ULE
		PT100 2-conductor technology
	– 200...+ 800 °C / 1.5 K / +/- 10 K of ULE	
	Floating contact interrogation (pulse width min. 100 ms)	
	– Input resistance to voltage measurement	> 50 kohm
	– Input resistance to current measurement	260 ohm
Connections	– EIB / KNX	Via bus connection terminal, screwless
	– Mains voltage	Via screw terminals
	– Supply for the sensors	Via screw terminals
	– Sensor inputs	Via screw terminals
Connecting terminals	– Screw terminals	0,2 ... 2,5 mm ² finely stranded 0,2 ... 4,0 mm ² single-core
	– Tightening torque	Max. 0.6 Nm
Operating and display elements	– Programming LED	For assigning the physical address
	– Programming button	For assigning the physical address

Table 1: Technical data part 1

Type of protection	– IP 20	In accordance with DIN EN 60 529
Protection class	– II	In accordance with DIN EN 61 140
Temperature range	– Operation	– 5 °C ... + 45 °C
	– Storage	– 25 °C ... + 55 °C
	– Transport	– 25 °C ... + 70 °C
Design	– DIN rail mounted device (MDRC)	Modular installation device, ProM
	– Dimensions	90 x 72 x 64.5 mm (H x W x D)
	– Mounting width in modules	4, 4 modules at 18 mm
	– Mounting depth	64.5 mm
Installation	– On 35 mm mounting rail	In accordance with DIN EN 60 715
Mounting position	– As required	
Weight	– 0.2 kg	
Housing / colour	– Plastic, grey	
Certification	– EIB / KNX in accordance with EN 50 090-1, -2	Certificate
CE mark	– In accordance with EMC and low-voltage guidelines	

Table 1: Technical data part 2

Application program	Number of communication objects	Max. number of group addresses	Max. number of assignments
Threshold value measurement/1	42	100	100

Table 2: Application program

Note: ETS2 V 1.3 or higher is required for programming. When using ETS3, a file of type “.VD3” must be imported. The application program is stored in ETS2/ETS3 under ABB/Input/Analogue Input, 4-fold.

2.2 Circuit diagrams

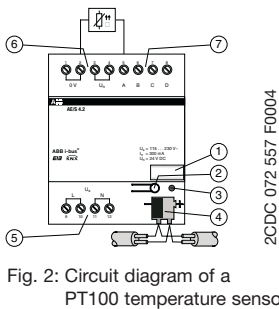


Fig. 2: Circuit diagram of a PT100 temperature sensor

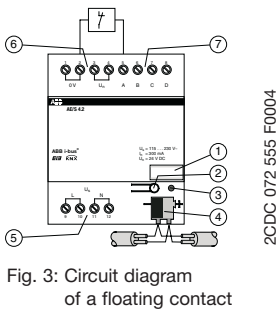


Fig. 3: Circuit diagram of a floating contact

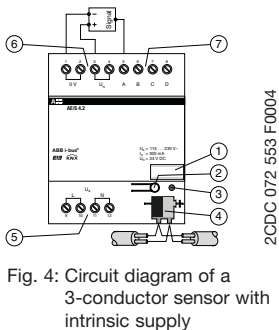


Fig. 4: Circuit diagram of a 3-conductor sensor with intrinsic supply

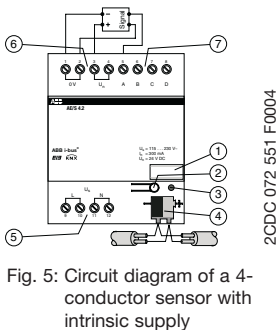


Fig. 5: Circuit diagram of a 4-conductor sensor with intrinsic supply

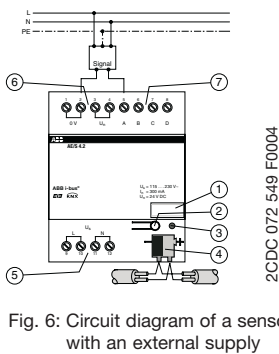


Fig. 6: Circuit diagram of a sensor with an external supply

- 1 Label carrier
- 2 Programming button
- 3 Programming LED
- 4 Bus connection terminal
- 5 Power supply
- 6 Auxiliary voltage output to supply the sensors
- 7 Sensor inputs

2.3 Dimension drawing

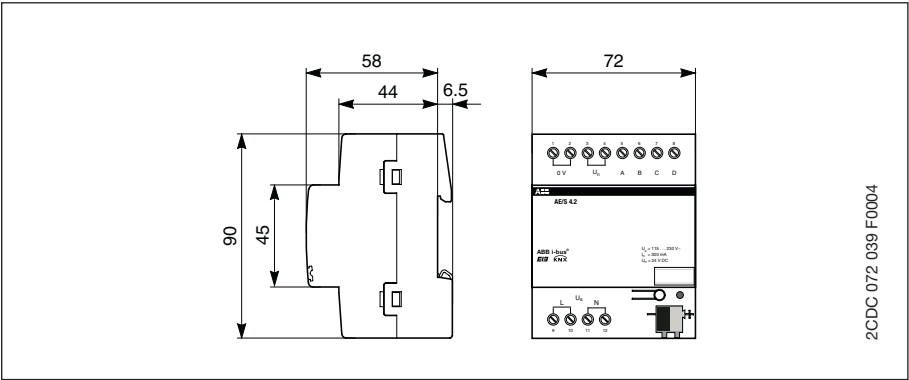


Fig. 7: Dimension drawing

2.4 Resolution and accuracy of the individual measuring ranges

Sensor signal	0–1 V	0–5 V	0–10 V	1–10 V	0–20 mA	4–20 mA	0–1000 ohm	PT100 (– 30 ... + 70 °C)	PT100 (– 200 ... + 800 °C)
Resolution	1 mV	5 mV	10 mV	10 mV	20 µA	20 µA	2.5 ohm	0.1 K	1.5 K
Accuracy of upper limit of effective range	+/-2 %	+/-2 %	+/-2 %	+/-2 %	+/-2 %	+/-2 %	+/-2 %	+/-1 K	+/-5 K

Table 3: Resolution and accuracy of the individual measuring ranges



Analogue Input AE/S 4.2 makes an output voltage $U_n = 24 \text{ V DC}$ available to supply the sensors. It should be ensured that the maximum output current of 300 mA is not exceeded.

2.5 Assembly and installation

Analogue Input is a DIN rail mounted device for integration into distribution boards by means of snap-on fixing on 35 mm mounting rails, in accordance with DIN EN 60 715.

The electrical connection is established using screw terminals. The connection to the bus is established using the bus connection terminal supplied.

The device is ready for operation once the mains voltage of $U_s = 115...230 \text{ V AC}$ and the bus voltage have been applied.

Accessibility to the device for the purpose of operation, testing, visual inspection, maintenance and repair must be provided (conform to DIN VDE 0100-520).

Note: Analogue Input AE/S 4.2 may not be mounted outdoors. In order to optimise the measuring or monitoring values, the technical data of the sensor manufacturers must be observed. The same applies to the specifications of the sensor manufacturers as regards equipment for lightning protection.

Requirements for commissioning

In order to commission Analogue Input AE/S 4.2, a PC with ETS2 version V1.3 or higher is required as well as an interface to the bus, e.g. via an RS232 interface or via a USB interface. The device is ready for operation when the mains voltage of 230 V AC and the bus voltage have been applied.

Installation and commissioning may only be carried out by skilled electricians. When planning and installing electrical installations, the relevant norms, guidelines, regulations and specifications must be observed.

- Protect the device from damp, dirt and damage during transport, storage and operation.
- Only operate the device within the specified technical data!
- Only operate the device in the enclosed housing (distribution board)!

Supplied state

Analogue Input is supplied with the physical address 15.15.255.

The **Threshold value measurement/1** application program is preloaded.

It is therefore only necessary to load parameters and group addresses during commissioning. However the complete application program can be reloaded if required.

Download behaviour

Due to the complexity of the device, it can take up to 1.5 min. during a download until the progress bar appears, depending on the computer used.

Assignment of the physical address

The physical address, group address and parameters are assigned and programmed in the ETS software.

Cleaning

Dirty devices can be cleaned using a dry cloth. If this is not sufficient, a cloth that has been dampened slightly with a soap solution can be used. Caustic agents or solvents may not be used under any circumstances.

Maintenance

The device is maintenance-free. In the event of damage (e.g. caused during transportation or storage), no repairs may be carried out by external staff.

When the device is opened, the right to claim under guarantee expires.

The maintenance schedule for the sensors must be requested from the sensor manufacturers.

3 Commissioning

3.1 Overview

Analogue Input AE/S 4.2 is loaded with the **“Threshold value measurement /1”** application program. The programming requires ETS2 V 1.3 or higher. When using ETS3, a file of type “.VD3” must be imported. A maximum of 42 communication objects, 100 group addresses and 100 assignments can be linked.

The following functions can be selected for each of the four inputs:

Sensor output (type of input signal)	All conventional sensors with a sensor output signal of 0–1 V, 0–5 V, 0–10 V, 1–10 V, 0–20 mA, 4–20 mA, 0–1000 ohm resistance, PT100 in 2-conductor technology – 30...+ 70 °C, PT100 in 2-conductor technology – 200...+ 800 °C or floating contact interrogation can be connected.
Signal correction/ adjustment	The sensor signal can be corrected or adjusted.
Measuring range	Flexible setting option for the upper and lower measuring limit dependent on the sensor's output signal. The measurement curve is adapted linearly between the upper and lower measuring limit.
Output value	Flexible setting options for the output value. For the upper and lower measuring limit dependent on the sensor's output signal.
Data types of the output value	The output value can be sent as a 1-bit value [0/1], 1-byte value [0...+ 255], 1-byte value [– 128...+ 127], 2-byte value [0...+ 65.535], 2-byte value [– 32.768...+ 32.767], 2-byte value [EIB floating point] or 4-byte value [IEE floating point].
Filtering	Measured values can be averaged over 4, 16 or 64 measurements. One measurement is taken every second.
Threshold value	2 threshold values can be set, each with an upper and lower limit. The limits can be modified via the bus.
Calculation	This enables 2 values to be compared or calculated mathematically. The options smaller than, greater than, addition, subtraction and averaging are available.

Fig. 8: Functions of the application program

3.2 Parameters

Note: The default settings for the options are underlined, e.g. Options: no/yes

3.2.1 Parameter window "General"

Edit Parameters

Calculation1	Calculation2	Calculation3	Calculation4
ChannelID			
ChannelC			
ChannelB			
ChannelA			

General

For the calibration of the sensors the manufacturer data are to be considered! <- Note

Behavior after bus voltage recovery: no reaction

Behavior after mains voltage recovery: no reaction

Behavior after programming: no reaction

Send delay: 10 s

Maximum telegram rate: 1 telegram / second

Send interval for "in operation" telegram: no

OK Cancel Default Info Low->High Help

Fig. 9: Parameter window "General"

**Behaviour after bus voltage recovery,
Behaviour after mains voltage recovery,
Behaviour after programming**

Options: No reaction
 Send output and threshold values immediately
 Send output and threshold values with a delay

The parameters are used to set the behaviour after *bus voltage recovery*, *mains voltage recovery* and *programming*.

Option: *No reaction* = Send no values

Option: *Send output and threshold values immediately* = Send values immediately

Option: *Send output and threshold values with a delay* = Send values with a delay

The *Send delay* is set separately and applies to all three parameters.

Send delay

Options: 5 s/10 s/20 s/30 s/60 s

The send delay time determines the time between *bus voltage recovery*, *mains voltage recovery*, *programming* and the time from which the telegrams should be sent with a delay. Once the device has been started, the following communications objects also send a telegram after the set delay.

- The “In Operation - System” communication object sends an “in operation” telegram
- The “Status byte - System” communication object sends a status byte telegram

Maximum telegram rate

Options: 1/2/3/5/10/20 telegrams/second

To control the bus load, this parameter can be used to limit the *Maximum telegram rate* per second.

Send cyclical “in operation” telegram

Options: no/yes

Option *no* = Cyclical “in operation” telegram is not sent

Option *yes* = The “In operation - System” communication object appears

If *yes* is selected, the *Send interval for “in operation” telegram* parameter becomes visible at the bottom of the parameter window.

Send interval for “in operation” telegram

Options: 10 min/30 min/1h/3h/6h/12h/24h

The “In operation – System” communication object is sent cyclically to the bus after the set send interval.

In this way, Analogue Input can be monitored cyclically in order to protect security-related installations.

3.2.2 Parameter window
“Channel A – Voltage,
current and resistance”

The parameters for “Channel A” are described in the following section. The explanations also apply to channels B, C and D. When the channel is selected, 5 other parameter windows appear. The parameters for the other sensor outputs are described in Chapters 3.2.3 and 3.2.4.

General	Calculation1	Calculation2	Calculation3	Calculation4
ChannelID				
ChannelC				
ChannelB				
ChannelA	A-Outp	A-Thresh.v.1	A-Thresh.v. 1outp	A-Thresh.v.2

Use channel yes

Sensor output 0 - 10 V

Send output value as 1-byte [0...+255]

Definition of the measuring range

Lower measuring limit in x % from the upper limit of effective range 0

Output value to be sent for lower measuring limit [0...+255] 0

Upper measuring limit in x % from the upper limit of effective range 100

Output value to be sent for upper measuring limit [0...+255] 255

OK **Cancel** **Default** **Info** **Low->High** **Help**

Fig. 10: Parameter window “Channel A – Voltage, current and resistance”

Use channel

Options: no/yes

This parameter determines the use of channel A.

Sensor output

Options: 0–1 V/0–5 V/0–10 V/1–10 V
0–20 mA/4–20 mA/0–1000 ohm/
Floating contact interrogation /
PT100 2-conductor technology – 30...+ 70 °C/
PT100 2-conductor technology – 200...+ 800 °C

This parameter is used to set the *Sensor output*. The data can be found in the technical documentation of the sensor manufacturer.

Send output value as

Options: 1-byte [0...+ 255]
1-byte [– 128...+ 127]
2-byte [0...+ 65,535]
2-byte [– 32,768...+ 32,767]
2-byte [EIB floating point]
4-byte [IEEE floating point]

This parameter is used to define the format in which the *Output value* should be sent. If the “1-byte [0...+ 255]” option is selected, for example, the *Output value* is sent as a 1-byte value.

If the 2-byte [EIB floating point] or 4-byte [IEEE floating point] option is set, a further parameter appears at the bottom of the parameter window.

What is the output value?

The output value designates the value which Analogue Input sends to the bus. Analogue Input records a sensor value, converts it according to the set parameters and sends it to the bus.

3.2.2.1 Definition of the measuring range

Fig. 11: Parameter window "Channel A – Definition of the measuring range"

The following 4 parameters are dependent on the *Send output value as* parameter. The preset values change depending on which byte value is set. In addition, the *Factor* parameter appears if the *2-byte [EIB floating point]* or *4-Byte [IEEE floating point]* option is selected.

The following description is an example for all the byte values that can be set.

Lower measuring limit in x % of the upper limit of effective range

Options: 0...100

Upper measuring limit in x % of the upper limit of effective range

Options: 100...0

These two parameters are used to set the *Lower and upper measuring limit in x % of the upper limit of effective range*. When the value exceeds or falls below the set lower and upper measuring limit, the "Measured value outside range – Channel A" communication object sends a "1". When the measured value is between the two limits again, the communication object sends a "0".

What is the upper limit of effective range?

The upper limit of effective range is the maximum voltage, current, resistance or temperature value which is set in the "Sensor output" parameter, e.g. a sensor with a signal output of 0 – 10 V has an upper limit of effective range of 10 V.

Output value to be sent for lower measuring limit [0...+ 255]

Options: 0... 255

Output value to be sent for upper measuring limit [0...+ 255]

Options: 0...+ 255

These two parameters are used to set the *Output values to be sent for the lower and upper measuring limits* [0...+ 255]. The measurement curve runs linearly between the upper and lower measuring limit.

What is the measuring limit?

The measuring limit is used to define the set values up to which Analogue Input should evaluate the signal of the connected sensor. An upper and lower measuring limit can be set.

Example: A sensor with a measuring limit of 0...1000 ohm is connected but the measurement curve should only be evaluated between 10% and 90% (100...900 ohm). In this case, the measuring limits are 100 and 900 ohm.

With the 2-byte [*EIB floating point*] option, the following parameter appears.

Factor for the output and threshold valuesOptions: 0.01/0.1/1/10/100

With the 4-byte [*IEEE floating point*] option, the following parameter appears.

Factor for the output and threshold valuesOptions: 0.000001/0.00001/0.0001/0.001/0.01/0.1/
1/10/100/1000/10000/100000/1000000

These parameters are used to set the *Factors for entering the output and threshold values*.

E.g. Option 1 = Output value is transferred 1:1

By entering the factor, for instance, units can be converted. In other words, the output value corresponds to the output value to be sent multiplied by the selected factor.

3.2.2.2 Parameter window “A – Output”

The screenshot shows the 'Edit Parameters' window for 'Channel A - Output'. The window has a tabbed interface with the following tabs: General, Calculation1, Calculation2, Calculation3, Calculation4, ChannelID, ChannelC, ChannelB, and ChannelA. The 'ChannelA' tab is selected, and the 'A-Outp' sub-tab is active. The parameters are as follows:

Parameter	Value
Scanning frequency	One measuring per second
Filter	inactive
Send output value	cyclically
Output value is sent every	5 s

At the bottom of the window, there are buttons for OK, Cancel, Default, Info, Low->High, and Help.

Fig. 12: Parameter window “Channel A – Output”

Scanning frequency

The sensor signal of channel A is measured once per second.

Filter

Options:

- inactive
- low (mean value over 4 measurements)
- average (mean value over 16 measurements)
- high (mean value over 64 measurements)

This parameter is used to set a filter. The output value can thus be set as a mean value using three different options.

Option: *inactive* = Filter is not active

Option: *low* = Output value as *mean value over 4 measurements*

Option: *average* = Output value as *mean value over 16 measurements*

Option: *high* = Output value as *mean value over 64 measurements*

Note: In the case of the *average* setting, for example, it takes 16 seconds until the output value is reached after an immediate change in the sensor signal.

Send output value

Options: on request
 after a change
 cyclically
 after a change and cyclically

This parameter is used to define how the *Output value* should be sent.

If the *on request* option is selected, the “Request output value – Channel A” communication object appears.

As soon as a “1” is received at this communication object, the current output value is sent once to the “Output value – Channel A” communication object.

In the case of the *after a change*, *cyclically* and *after a change and cyclically* options, further parameters appear.

Output value is sent, every

Options: 5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/12 h/24 h

This additional parameter is used to set the interval for cyclical sending.

Output value is sent after x % deviation from the output range

Options: 1/2...100

This parameter is used to define what percentage change in the output range should cause the output value to be sent.

If 2 is selected as the option, the output value is sent after a 2% change in the output range.

What is the output range?

The output range is determined by the setting options for the upper and lower measuring limits. The difference between the upper and lower measuring limit forms the output range.

Example: If the lower measuring limit for the sensor (0...1000 ohm) is set to 10% (100 ohm) and the upper measuring limit is set to 90% (900 ohm), the output range (900 ohm – 100 ohm) = 800 ohm.
2% of 800 ohm = 16 ohm.

3.2.2.3 Parameter window “A – Threshold 1”

The following section describes the parameters for threshold 1. These also apply to threshold 2.

Fig. 13: Parameter window “Channel A – Threshold 1”

Use threshold value

Options: no/yes

This parameter is used to define whether *Threshold 1* should be used. If yes is selected, the “Threshold value – Channel A Threshold 1” communication object appears.

Tolerance band lower limit

Tolerance band upper limit

Options: Dependent on the “Send value as” parameter in the “Channel A” parameter window

These two parameters are used to set the upper and lower limit.

Note: Different limits are predefined, depending on the setting for the “Send value as” parameter in the “Channel A” parameter window.

Modify limits via the busOptions: no/yes

This parameter is used to define whether it is possible to *Modify limits via the bus*. If *yes* is selected, the “Modify – Channel A threshold 1 lower limit” and “Modify – Channel A threshold 1 upper limit” communication objects also appear.

Note: The value formats for these communication objects are identical to the format set under the *Send output value* as parameter in the *Channel A* parameter window. The values must be sent in the same format as the output value for the channel.

Data type of threshold value objectOptions: 1 bit/1 byte [0...255]

If the *1 bit* option is set for the *Data type of threshold value object* parameter, the following parameters appear.

Send if threshold value falls belowOptions: Do not send a telegram
Send an ON telegram
Send an OFF telegram**Send if threshold value exceeds**Options: Do not send a telegram
Send an ON telegram
Send an OFF telegram

Option *Do not send a telegram* = No reaction occurs

Option *Send an ON telegram* = Send telegram value “1”

Option *Send an OFF telegram* = Send telegram value “0”

Minimum duration of the underflow**Minimum duration of the overrange**Options: none/5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/
12 h/24 h

Option *none* = Send threshold value directly

The further time options can be used to select a minimum duration. If the send condition reverts within the minimum duration, nothing is sent.

If the *1 byte [0...255]* option is set for the *Data type of threshold value object* parameter, the following parameters appear.

Send if threshold value falls below [0...255]

Options: 0...255

Send if threshold value exceeds [0...255]

Options: 0...255

A value of 0 to 255 can be entered in single steps.

Minimum duration of the underflow**Minimum duration of the overrange**

Options: none/5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/
12 h/24 h

Option *none* = Send threshold value directly

The further time options can be used to select a minimum duration. If the send condition reverts within the minimum duration, no telegram is sent.

3.2.2.4 Parameter window “A – Threshold 1 output”

The following section describes the parameters for the output of threshold 1. They also apply to the output of threshold 2.

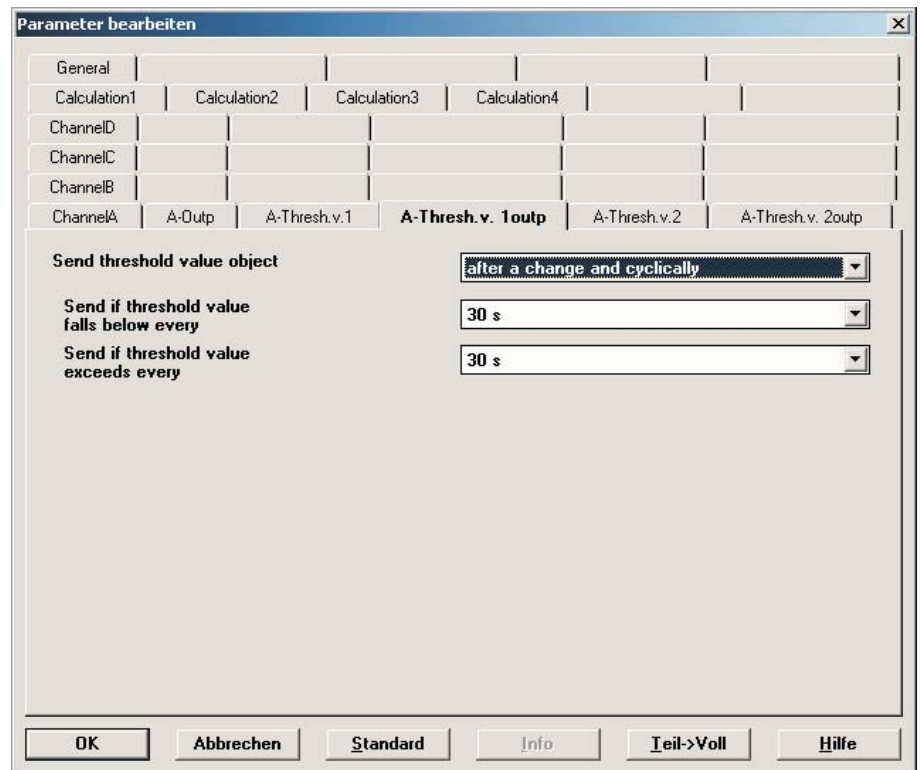


Fig. 14: Parameter window “Channel A – Threshold 1 output”

Send threshold value object

Options: after a change
after a change and cyclically

This parameter is used to specify the send behaviour of the threshold value object.

Option *After a change* = Send threshold value object after a change

Option *After a change and cyclically* = Send threshold value object after a change and cyclically.

Note: The threshold value object is sent cyclically until the value falls below or exceeds the other limit.

The following parameters appear when this option is selected.

Send if threshold value falls below every

Send if threshold value exceeds every

Options: 5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/
12 h/24 h

These two parameters are used to define the point in time at which cyclical sending should take place after the value falls below the lower limit or exceeds the upper limit.

3.2.3 Parameter window “Channel A – Floating contact interrogation”

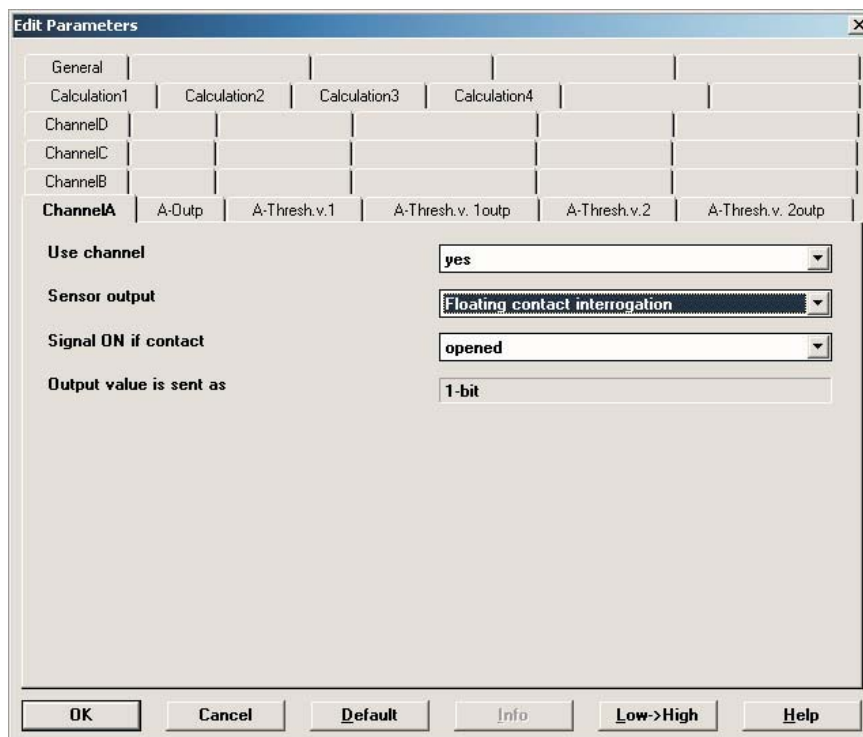


Fig. 15: Parameter window “Channel A – Floating contact interrogation”

Use channel

Options: no/yes

This parameter determines the use of channel A.

Sensor output

Options: 0 – 1 V/0 – 5 V/0 – 10 V/1 – 10 V
 0 – 20 mA/4 – 20 mA/0 – 1000 ohm/
Floating contact interrogation /
 PT100 2-conductor technology – 30...+ 70 °C/
 PT100 2-conductor technology – 200...+ 800 °C

This parameter is used to set the *Sensor output*.

The data can be found in the technical documentation of the sensor manufacturer.

Note: The minimum pulse width is 100 ms.

Signal ON upon contact

Options: closed/open

This parameter is used to set the contact setting during the ON signal.

Option *closed* = Contact closed during ON signal

Option *open* = Contact open during ON signal

Output value is sent as

This parameter is fixed as 1 bit.

Bit value “0” = OFF signal

Bit value “1” = ON signal

3.2.3.1 Parameter window “A – Output”

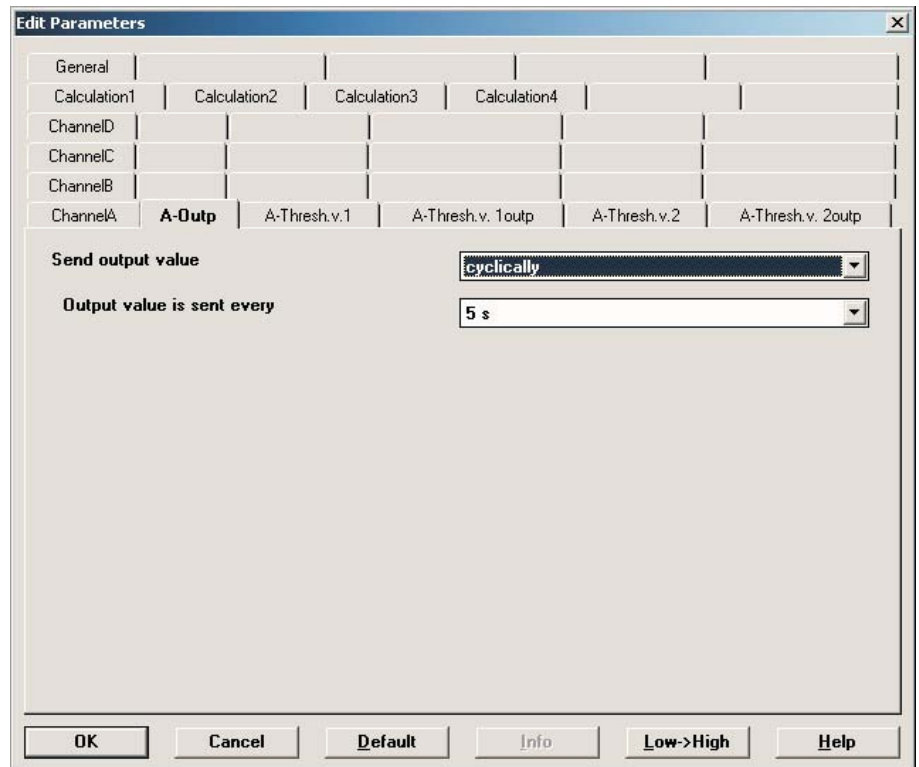


Fig. 16: Parameter window “Channel A – Output”

Send output value

Options:

- on request
- after a change
- cyclically
- after a change and cyclically

This parameter is used to define how the *Output value* should be sent.

Option *On request* = Send output value on request

When this option is selected, the “Output value – Channel A” communication object appears. As soon as a “1” is received at this communication object, the current output value is sent once to the “Output value – Channel A” communication object.

Option *After a change* = Send output value after a change

Option *Cyclically* = Send output value cyclically

Option *After a change and cyclically* = Send output value after a change and cyclically

In the case of the *after a change*, *cyclically* and *after a change and cyclically* options, further parameters appear – see next page.

Output value is sent, every

Options: 5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/12 h/24 h

This additional parameter is used to set the interval for cyclical sending.

3.2.3.2 Parameter window “A – Threshold 1”

The following section describes the parameters for threshold 1. These also apply to threshold 2.

The screenshot shows the 'Edit Parameters' window with the 'A-Thresh.v. 1' tab selected. The window has a tabbed interface with tabs for General, Calculation1, Calculation2, Calculation3, Calculation4, ChannelD, ChannelC, ChannelB, ChannelA, A-Outp, A-Thresh.v. 1, A-Thresh.v. 1outp, A-Thresh.v. 2, and A-Thresh.v. 2outp. The 'A-Thresh.v. 1' tab contains the following parameters:

Parameter	Value
Use threshold value	yes
Data type of threshold value object	1 bit
Send if signal OFF	send an OFF telegram
Minimum duration for signal OFF	none
Send if signal ON	Send an ON telegram
Minimum duration for signal ON	none

At the bottom of the window are buttons for OK, Cancel, Default, Info, Low->High, and Help.

Fig. 17: Parameter window “Channel A – Threshold 1”

Use threshold value

Options: no/yes

This parameter is used to define whether *Threshold 1* should be used. If *yes* is selected, the “Threshold value – Channel A Threshold 1” communication object appears.

Data type of threshold value objectOptions: 1 bit/1 byte [0...255]

If the *1 bit option* is set for the *Data type of threshold value object* parameter, the following parameters appear.

Send if signal OFFOptions: Do not send a telegram
Send an ON telegram
Send an OFF telegram**Send if signal ON**Options: Do not send a telegram
Send an ON telegram
Send an OFF telegram

Option *Do not send a telegram* = No reaction occurs

Option *Send an ON telegram* = Send telegram value “1”

Option *Send an OFF telegram* = Send telegram value “0”

Minimum duration for signal OFF**Minimum duration for signal ON**Options: none/5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/
12 h/24 h

Option *none* = Send threshold value directly

The further time options can be used to select a minimum duration. If the send condition reverts within the minimum duration, no telegram is sent. If the *1 byte [0...255]* option is set for the *Data type of threshold value object* parameter, the following parameters appear.

Send if signal OFF [0...255]Options: 0...255**Send if signal ON [0...255]**Options: 0...255

A value of 0 to 255 can be entered in single steps.

Minimum duration for signal OFF**Minimum duration for signal ON**Options: none/5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/
12 h/24 h

Option *none* = Send threshold value directly

The further time options can be used to select a minimum duration. If the send condition reverts within the minimum duration, no telegram is sent.

3.2.3.3 Parameter window “A – Threshold 1 output”

The following section describes the parameters for the output of threshold 1. They also apply to the output of threshold 2.

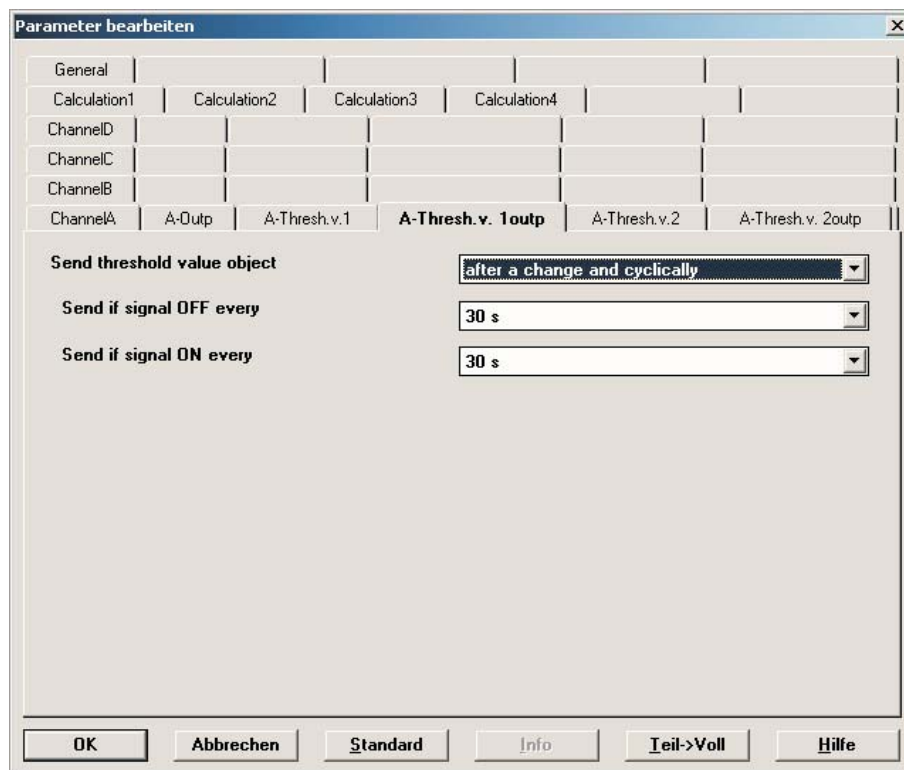


Fig. 18: Parameter window “Channel A – Threshold 1 output”

Send threshold value object

Options: after a change
after a change and cyclically

This parameter is used to specify the send behaviour of the threshold value object.

Option *After a change* = Send threshold value object after a change

Option *After a change and cyclically* = Send threshold value object after a change and cyclically.

Note: The threshold value object is sent cyclically until the value falls below or exceeds the other limit.

The following parameters appear when this option is selected.

Send if signal OFF every

Send if signal ON every

Options: none/5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/12 h/24 h

These two parameters are used to define the point in time at which cyclical sending should take place after the value falls below the lower limit or exceeds the upper limit.

3.2.4 Parameter window “Channel A – PT100 2-conductor technology”

The following section displays and describes the parameters which differ from the description of the “Voltage, current and resistance”.

The parameters apply both to PT100 2-conductor technology – 30...+ 70 °C and to PT100 2-conductor 200...+ 800 °C. The difference concerns the accuracy and resolution of the measuring range.



So that the measurement is not corrupted, the return conductor of a PT100 sensor must be routed separately to the 0 V terminal and may not be used as a return conductor for other sensors.

Fig. 19: Parameter window “Channel A – PT100 2-conductor technology – 30...+ 70 °C”

Use channel

Options: no/yes

This parameter determines the use of channel A.

Sensor output

Options: 0 – 1 V/0 – 5 V/0 – 10 V/1 – 10 V
0 – 20 mA/4 – 20 mA/0 – 1000 ohm/
Floating contact interrogation /
PT100 2-conductor technology – 30...+ 70 °C/
PT100 2-conductor technology – 200...+ 800 °C

This parameter is used to set the *Sensor output*. The data can be found in the technical documentation of the sensor manufacturer.

Send output value as

This parameter is fixed as 2 byte [EIB floating point].

Temperature offset in 0.1 K [– 50...+ 50]

Options: – 50...0...+ 50

An additional maximum offset of + /– 5 K (Kelvin) can be added to the recorded temperature using this parameter.

Line fault compensation

Options: non/via cable length/via cable resistance

This parameter is used to set a *Line fault compensation* to compensate for the measuring error caused by the cable resistance.

In the case of the *via cable length* and *via cable resistance* options, further parameters appear – see next page.

3.2.4.1 Line fault compensation via cable length

The screenshot shows the 'Edit Parameters' dialog box with the 'General' tab selected. The 'ChannelA' section is active, showing various parameters for line fault compensation. The 'Line fault compensation' dropdown is set to 'via cable length'. The 'Length of the cable, single distance' is set to 100, and the 'Cross-section of the conductor value * 0.01 mm²' is set to 150. The 'Temperature offset in 0.1 K' is set to 0. The 'Sensor output' is set to 'PT100 2-conductor technology -30...+70°C'. The 'Send output value as' is set to '2-byte IEIB floating point'. The 'Use channel' dropdown is set to 'yes'. The 'The compensation via cable length is suitable only for CU conductor' note is displayed.

General	Calculation1	Calculation2	Calculation3	Calculation4
ChannelD				
ChannelC				
ChannelB				
ChannelA	A-Outp	A-Thresh.v.1	A-Thresh.v.1outp	A-Thresh.v.2

Use channel yes
Sensor output PT100 2-conductor technology -30...+70°C
Send output value as 2-byte IEIB floating point
Temperature offset in 0.1 K [-50...+50] 0
Line fault compensation via cable length
Length of the cable, single distance [1...255 m] 100
Cross-section of the conductor value * 0.01 mm² [1...400] 150
The compensation via cable length is suitable only for CU conductor <- Note

OK Cancel Default Info Low->High Help

Fig. 20: Parameter Line fault compensation "via cable length"

Length of the cable, single distance [1...255 m]

Options: 1...100...255

For setting the single cable length of the connected temperature sensor PT100.

Cross-section of the conductor value * 0.01 mm² [1...400]

Options: 1...150...400 (150 = 1.5 mm²)

This parameter is used to enter the cross-section of the conductor to which the PT100 is connected.

3.2.4.2 Line fault compensation via cable resistance

The screenshot shows the 'Edit Parameters' dialog box for Channel A. The 'Line fault compensation' dropdown is set to 'via cable resistance', and the 'Cable resistance in milliohms' is set to 500. Other parameters include 'Use channel' (yes), 'Sensor output' (PT100 2-conductor technology -30...+70°C), and 'Send output value as' (2-byte IEIB floating point).

General	Calculation1	Calculation2	Calculation3	Calculation4
ChannelID				
ChannelC				
ChannelB				
ChannelA	A-Outp	A-Thresh.v.1	A-Thresh.v. 1outp	A-Thresh.v.2
				A-Thresh.v. 2outp

Use channel: yes

Sensor output: PT100 2-conductor technology -30...+70°C

Send output value as: 2-byte IEIB floating point

Temperature offset in 0.1 K [-50...+50]: 0

Line fault compensation: via cable resistance

Cable resistance in milliohms [total of forward and return conductors]: 500

Buttons: OK, Cancel, Default, Info, Low->High, Help

Fig. 21: Parameter Line fault compensation "via cable resistance"

Cable resistance in milliohms [total of forward and return conductors]

Options: 0...500...10000

For setting the cable resistance of the connected temperature sensor PT100.

Note: To avoid incorrect measurements when setting the cable resistance, neither forward nor return conductors may be connected to Analogue Input during measurement.

Note: For details of the other parameters, please refer to the description for "Channel A – Voltage, current and resistance".

3.2.5 Parameter window “Calculation 1” with “comparative” calculation type

The parameters for “Calculation 1, comparative” are described in the following section. The explanations also apply to calculations 2, 3 and 4.

The screenshot shows the 'Edit Parameters' window with the 'Calculation1' tab selected. The window contains the following fields and options:

- ChannelID**, **ChannelC**, **ChannelB**, **ChannelA**: Input fields for channel identification.
- General**: Tab selector.
- Calculation1**, **Calculation2**, **Calculation3**, **Calculation4**: Tab selectors for different calculations.
- Use calculation**: Dropdown menu set to 'yes'.
- Calculation type**: Dropdown menu set to 'comparative'.
- Input 1**: Dropdown menu set to 'Channel A output value'.
- Input 2**: Dropdown menu set to 'Channel B output value'.
- Function**: Dropdown menu set to 'Input 1 < Input 2'.
- Hysteresis (in x % from output range of input 1)**: Input field set to '5'.
- Condition met**: Dropdown menu set to 'Send an ON telegram'.
- Condition not met**: Dropdown menu set to 'send an OFF telegram'.
- Send output value**: Dropdown menu set to 'after a change and cyclically'.
- Output value is sent every**: Input field set to '5 s'.

At the bottom of the window are buttons for **OK**, **Cancel**, **Default**, **Info**, **Low->High**, and **Help**.

Fig. 22: Parameter window “Calculation 1, comparative”

Use calculation

Options: no/yes

This parameter is used to define whether calculation 1 should be used. If yes is selected, the “Send output value – Calculation 1” communication object appears.

Calculation type

Options: comparative/arithmetic

This parameter is used to set the calculation type.

Option *comparative* = Comparison of two output values

Option *arithmetic* = Arithmetic logic operation on two output values

Input 1

Options: Channel A output value
Channel B output value
Channel C output value
Channel D output value

Input 2

Options: Channel A output value
Channel B output value
Channel C output value
Channel D output value

These two parameters are used to set the operands for the comparative calculation.

Function

Options: Input 1 < Input 2
Input 1 > Input 2
Input 1 = Input 2

For setting the comparison functions.

Hysteresis (in x % of the output range of input 1)

Options: 1...5...100

This parameter is used to set the hysteresis band, which is dependent on the output range of input 1.

Condition met

Options: Do not send a telegram
Send an ON telegram
Send an OFF telegram

Condition not met

Options: Do not send a telegram
Send an ON telegram
Send an OFF telegram

For setting the reaction as a result of the comparison.

Send output value

Options: after a change
 after a change and cyclically

This parameter is used to define how the *Output value* should be sent.

Option *After a change* = Send output value after a change

Option *After a change and cyclically* = Send output value after a change and cyclically

A further parameter appears in the case of these options.

Output value is sent, every

Options: 5 s/10 s/30 s/1 min/5 min/1 min/30 min/1 h/6 h/12 h/24 h

This additional parameter is used to set the interval for cyclical sending.

3.2.6 Parameter window “Calculation 1” with “arithmetic” calculation type

The following section describes the parameters for “Calculation 1, arithmetic” which differ from the description of “Calculation 1, comparative”. The explanations also apply to calculations 2, 3 and 4.

The screenshot shows the 'Edit Parameters' window for 'Calculation 1, arithmetic'. The window has a title bar 'Edit Parameters' and a close button. Below the title bar is a table with columns for ChannelID, ChannelC, ChannelB, ChannelA, and General. The 'Calculation1' tab is selected. The parameters are as follows:

Use calculation	yes
Calculation type	arithmetic
Input 1	Channel A output value
Input 2	Channel B output value
Function	Input 1 + Input 2
Send output value as	1-byte [0...+255]
Send output value	cyclically
Output value is sent every	5 s

At the bottom of the window are buttons: OK, Cancel, Default, Info, Low->High, and Help.

Fig. 23: Parameter window “Calculation 1, arithmetic”

Function

Options: Input 1 + Input 2
Input 1 - Input 2
Arithmetic mean value

Option *Input 1 + Input 2* = Inputs 1 and 2 are added

Option *Input 1 - Input 2* = Input 2 is subtracted from input 1

Option *Arithmetic mean value* = The arithmetic mean of inputs 1 and 2 is calculated

Send output value as

Options: 1-byte [0...+ 255]
 1-byte [– 128...+ 127]
 2-byte [0...+ 65,535]
 2-byte [– 32,768...32,767]
 2-byte [EIB floating point]
 4-byte [IEEE floating point]

This parameter is used to define the format in which the *Output value* should be sent. If the “1-byte [0...+ 255]” option is selected, for example, the *Output value* is sent as a 1-byte value.

Note: The setting requires the result of the calculation to be adapted to the set format. Otherwise the result will be truncated.

Send output value

Options: after a change
 cyclically
 after a change and cyclically

This parameter is used to define how the *Output value* should be sent.

Option *After a change* = Send output value after a change

Option *Cyclically* = Send output value cyclically

Option *After a change and cyclically* = Send output value after a change and cyclically

In the case of the *after a change*, *cyclically* and *after a change and cyclically* options, further parameters appear.

Output value is sent, every

Options: 5 s/10 s/30 s/1 min/5 min/10 min/30 min/1 h/6 h/12 h/24 h

This additional parameter is used to set the interval for cyclical sending.

Output value is sent after x % deviation from the output range of input 1

Options: 1...2...100

This parameter is used to define what percentage change in the output range of input 1 should cause the output value to be sent.

If 2 is selected as the option, the output value is sent after a 2% change in the output range of input 1.

3.3 Communication objects

3.3.1 Channel A

no.	Function	Object name	C	R	W	T
	0 Output value	ChannelA	✓	✓	✓	✓
	1 Request output value	ChannelA	✓	✓		
	2 Measured value outside range	ChannelA	✓	✓	✓	
	3 Threshold value	ChannelA - Thresh.v.1	✓	✓	✓	
	4 Modify	Channel A Threshold 1 lower limit	✓	✓	✓	
	5 Modify	Channel A Threshold 1 upper limit	✓	✓	✓	
	6 Threshold value	ChannelA - Thresh.v.2	✓	✓	✓	
	7 Modify	Channel A Threshold 2 lower limit	✓	✓	✓	
	8 Modify	Channel A Threshold 2 upper limit	✓	✓	✓	

Fig. 24: Communications objects – “Channel A”

No.	Function	Object name	Data type	Flags
0	Output value	Channel A	EIS variable DPT variable	C, R, T
This communication object is used to send the output value to the bus. The output value can be sent as:				
1-bit value [0/1]				

Table 4: Communication objects 0 to 2 – “Channel A”

No.	Function	Object name	Data type	Flags								
3	Threshold value	Channel A threshold 1	EIS variable DPT variable	C, R, T								
As soon as the value exceeds or falls below the set threshold value, the following can be sent: <table><tr><td>1-bit value [0/1]</td><td>EIS 1</td><td>DPT</td><td>1.001</td></tr><tr><td>1-byte value [0...+ 255]</td><td>EIS 6</td><td>DPT</td><td>5.001</td></tr></table> The object value depends on the “Data type of threshold value object” parameter (1 bit, 1 byte). The parameter can be found in the “A – Threshold 1” parameter window.					1-bit value [0/1]	EIS 1	DPT	1.001	1-byte value [0...+ 255]	EIS 6	DPT	5.001
1-bit value [0/1]	EIS 1	DPT	1.001									
1-byte value [0...+ 255]	EIS 6	DPT	5.001									
4	Modify	Channel A threshold 1 lower limit	EIS variable	C, R, T								
5	Modify	Channel A threshold 1 upper limit	DPT variable									
The upper and lower limit of threshold 1 can be modified using the bus. In case of bus- and/or main voltage failure the changed threshold value limits are stored. With a new download of the application program the threshold value limits will be overwritten. The data type of these communication objects depends on the data type selected for the “Output value – Channel A” communication object.												
6	See communication object 3	Channel A threshold 2										
7	See e communication objects 4 and 5	Channel A threshold 2 lower limit										
8		Channel A threshold 2 upper limit										

Table 5: Communication objects 3 to 8 – "Channel A"

3.3.2 Channels B, C and D

No.	Function	Object name	Data type	Flags
9 ... 17	See communication objects 0...8	Channel B		
18 ... 26	See communication objects 0...8	Channel C		
27 ... 35	See communication objects 0...8	Channel D		

Table 6: Communication objects 9 to 35 – "Channels B, C and D"

3.3.3 Calculation 1

no.	Function	Object name	C	R	W	T	U
36	Send output value	Calculation1	✓	✓	✓		

Fig. 25: Communication object “Calculation 1”

No..	Function	Object name	Data type	Flags
36	Send output value	Calculation 1	EIS variable DPT variable	C, R, T
This communication object is used to send the result of calculation 1.				
Depending on the calculation type selected, the result is sent as				
1-bit value [0/1]		EIS 1	DPT	1.001
1-byte value [0...+ 255]		EIS 6	DPT	5.001
1-byte value [– 128...+ 127]		EIS 14	DPT	6.010
2-byte value [0...+ 65,535]		EIS 10	DPT	8.001
2-byte value [– 32,768...+ 32,767]		EIS 10	DPT	7.001
2-byte value [EIB floating point]		EIS 5	DPT	9.001
4-byte value [IEE floating point]		EIS 9	DPT	14.000

Table 7: Communication object 36 “Calculation 1”

3.3.4 Calculation 2, 3 und 4

No.	Function	Object name	Data type	Flags
37	See communication object 36	Calculation 2		
38	See communication object 36	Calculation 3		
39	See communication object 36	Calculation 4		

Table 8: Communication objects 37 to 39 – “Calculation 2, 3 and 4”

3.3.5 General

no.	Function	Object name	C	R	W	T
40	In operation	System	✓	✓	✓	
41	Status byte	System	✓	✓	✓	

Fig. 26: Communication objects "General"

No.	Function	Object name	Data type	Flags
40	In operation	System	EIS1, 1 bit DPT 1.003	C, R, T
This communication object is active if "yes" has been selected in the "Send cyclical "in operation" telegram" parameter. If the communication object is active, it sends a "1" telegram cyclically. This communication object is sent once when the device is started and then cyclically after the set send delay. The presence of the Analogue Input product can be monitored using this communication object.				
41	Status byte	System	EIS none DPT none	C, R, T
The communication object is used to establish whether one of the measured values lies outside the measuring range, whether the supply voltage of the sensors falls below 20 V, whether the sensors have a short circuit, whether an error can be detected in the analogue component and whether time synchronisation is available. Telegram code: 76543210 7: Not assigned 6: Not assigned 5: Internal error in analogue component Telegram value "0": In range "1": Outside range 4: Undervoltage $V_+ < 20\text{ V}$ Telegram value "0": OK $> 20\text{ V}$ "1": Not OK $< 20\text{ V}$ 3: Status of channel D, measured value outside range Telegram value "0": In range "1": Outside range 2: Status of channel C, measured value outside range Telegram value "0": In range "1": Outside range 1: Status of channel B, measured value outside range Telegram value "0": In range "1": Outside range 0: Status of channel A, measured value outside range Telegram value "0": In range "1": Outside range The communication object is sent after a change and can be read using a value read command. This communication object is sent once automatically after the set send delay when the device is started. A truth table is included in the appendix.				

Table 9: Communication objects 40 and 41 – "General"

4 Planning and application

4.1 Description of the threshold value function

How does the threshold value function?

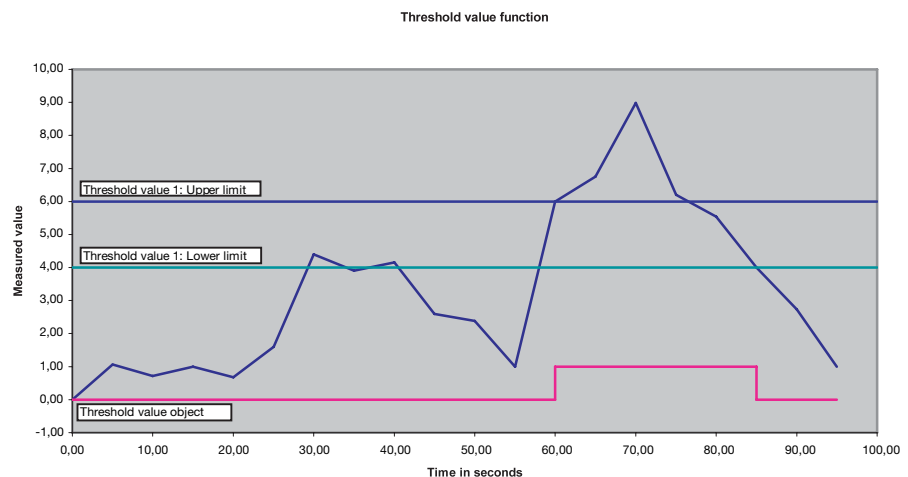


Fig. 27: Threshold value function

In the example diagram above, it can be seen that the measured value begins with a zero value and the communication object for the threshold value 1 has the value „0“. This value can be cyclically sent onto the bus if the relevant parameter in the application program is set.

As long as the measured value **does not** exceed the upper limit of the threshold value 1, the communication object threshold value 1 will remain „0“.

As soon as the measured value exceeds the upper limit of the threshold value 1, the communication object threshold will change value to „1“.

The communication object threshold value 1 will remain „1“, until the measured value once again falls below the lower limit of the threshold value 1.

**4.2 Planning example:
“Humidity sensor”**

The air conditioning and heating in a laboratory is to be controlled in relation to the relative humidity. If the value falls below 20%, the air conditioning should be switched off and the heating should be switched on. If the value rises above 75%, the air conditioning should be switched on and the heating should be switched off. The minimum duration of the underflow or overrange is a maximum of 30 seconds.

The relative humidity should not be evaluated below 10% and over 90%.

Humidity sensor:

Signal output: 0 – 1000 ohm

Measuring range: 0...100%

Measurement curve: Linear

Threshold 1: Air conditioning

Threshold 2: Heating

Connection to channel A.

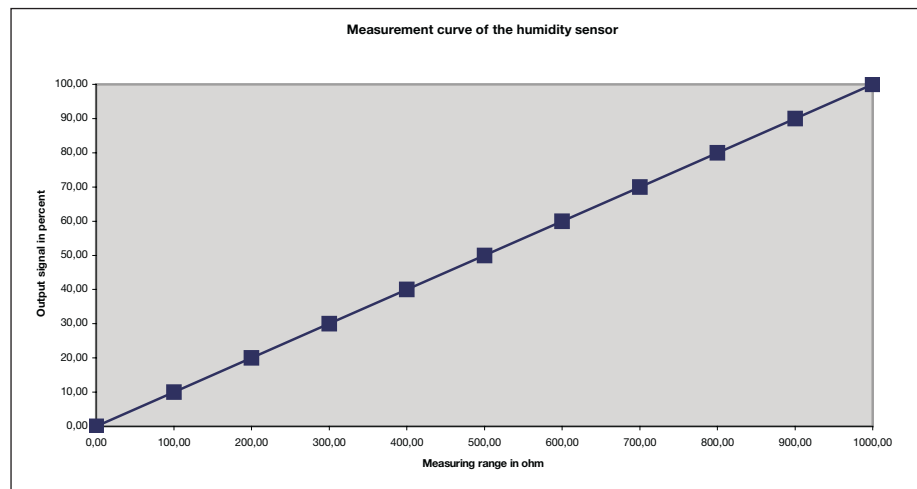
Measurement curve for the connected humidity sensor:

Fig. 28: Measurement curve for the humidity sensor

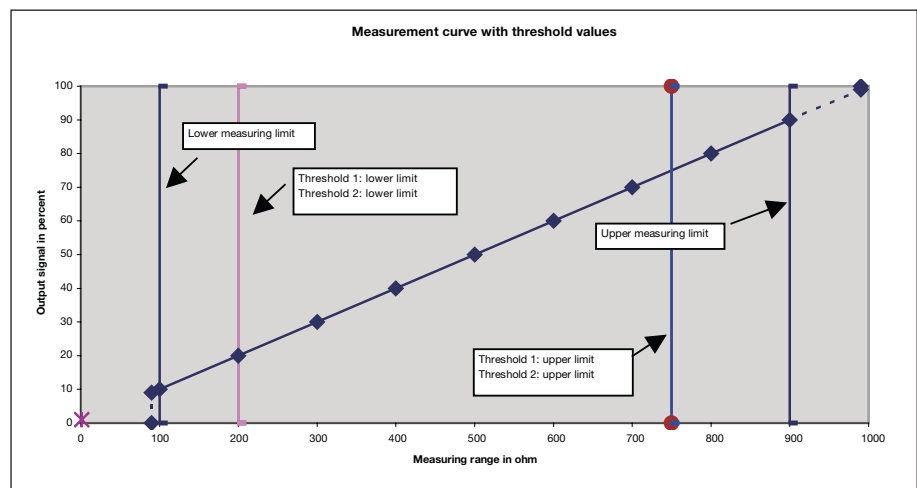
Measurement curve taking all specifications into account:

Fig. 29: Measurement curve for the humidity sensor with threshold values

As a result of the option of limiting the measuring range, the output values set are sent automatically below the lower measuring limit and above the upper measuring limit.

Settings for the Channel A parameter window:

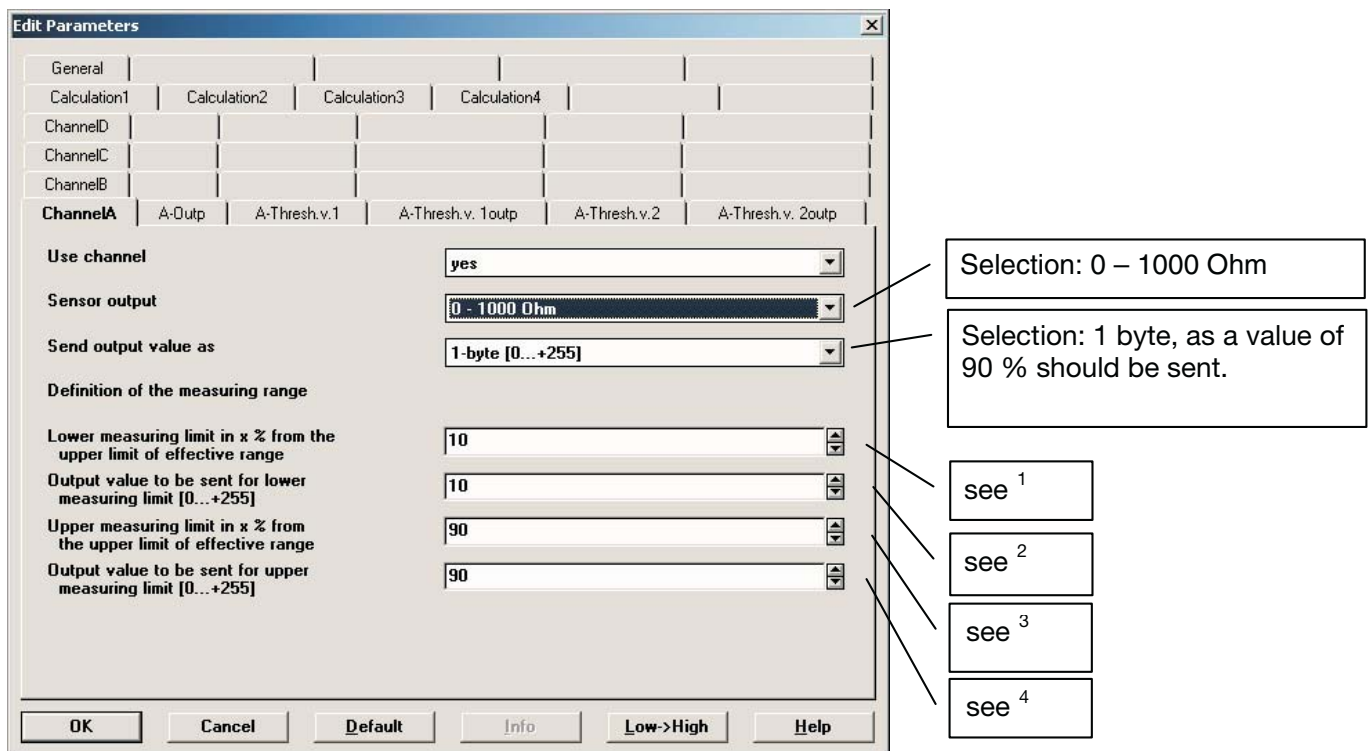


Fig. 30: Parameter window "Channel A – 0 - 1000 ohm"

- ¹ The setting for the "Lower measuring limit in x % of the upper limit of effective range" is 10.

The specification for the lower limit was 10%.

100% rel. humidity = 1000 ohm => 10% rel. humidity = 100 ohm

100 ohm = 10% von 1000 ohm => 10

- ² The "Output value to be sent for lower measuring limit [0...+ 255]" parameter is 10.

The specification for the lower limit was 10% => 10.

- ³ The setting for the "Upper measuring limit in x % of the upper limit of effective range" is 90.

The specification for the upper limit was 90%.

100% rel. humidity = 1000 ohm => 90% rel. humidity = 900 ohm

900 ohm = 90% von 1000 ohm => 90

- ⁴ The "Output value to be sent for upper measuring limit [0...+ 255]" parameter is 90.

The specification for the upper limit was 90% => 90.

Settings for threshold values 1 and 2 for channel A:

Parameter bearbeiten

General

Calculation1

Calculation2

Calculation3

Calculation4

ChannelD

ChannelC

ChannelB

ChannelA

A-Outp

A-Thresh.v.1

A-Thresh.v.1outp

A-Thresh.v.2

A-Thresh.v.2outp

Use threshold value

Tolerance band lower limit

Tolerance band upper limit

Modify limits via the bus

Data type of threshold value object

Send if threshold value falls below

Minimum duration of the underflow

Send if threshold value exceeds

Minimum duration of the overrange

yes

20

75

yes

1 bit

send an OFF telegram

30 s

Send an ON telegram

30 s

OK

Abbrechen

Standard

Info

Teil->Voll

Hilfe

Calculation4

Thresh.v.1outp

A-Thresh.v.2

A-Thresh.v.2outp

yes

20

75

yes

1 bit

Send an ON telegram

30 s

send an OFF telegram

30 s

Info

Teil->Voll

Hilfe

Fig. 31: Parameter window "Channel A – 0 – 1000 ohm, threshold 1 and 2"

4.3 Planning example: “PT100 2-conductor technology – 30...+ 70 °C”

A container located outdoors, for storing liquids with a circulation pump, needs to be protected against minus temperatures (lower than 0 °C). The heating for the container should be automatically switched on below + 4 °C and switched off above + 15 °C. The temperature below 4 °C should be recorded for longer than 1 minute. The temperature above 15 °C should be recorded for longer than 30 seconds. The circulation pump should be switched on below + 6 °C and switched off above + 17 °C. The temperature below 6 °C should be recorded for longer than 5 minute. The temperature above 17 °C should be recorded for longer than 10 minutes. In addition, a line fault compensation via the cable length should be taken into account. The distance between Analogue Input and PT100 is 150 metres. The cross-section of the copper cable is 2.5 mm². The user wishes to be able to change the threshold values via the bus.

PT100 2-conductor technology – 30...+ 70 °C:

Signal output: PT100 2-conductor technology in ohms

Measuring range: – 20...+ 60 °C

Measurement curve: Linear

Connection to channel A.



The standard characteristic curve for PT100 2-conductor technology – 30...+ 70 °C is stored in Analogue Input. The measuring range of the stored measurement curve is – 30...+ 70 °C.

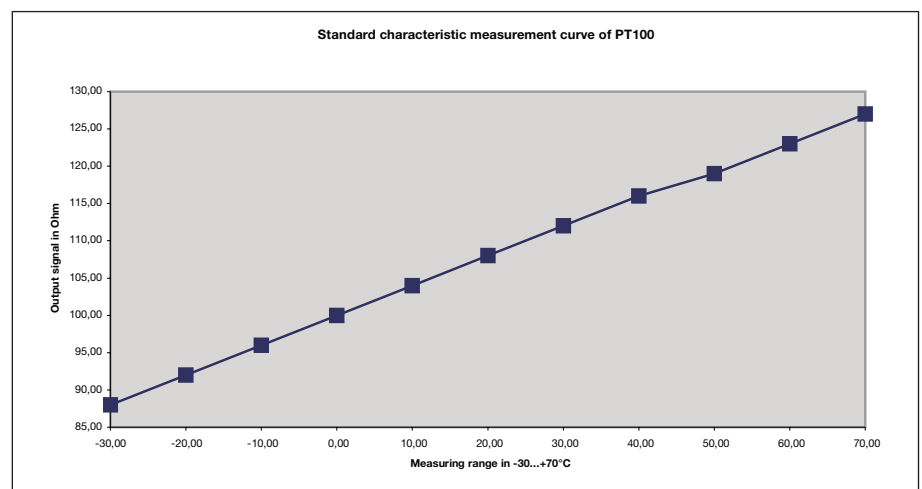


Fig. 32: Measurement curve for the standard PT100 with threshold values. Values are rounded.

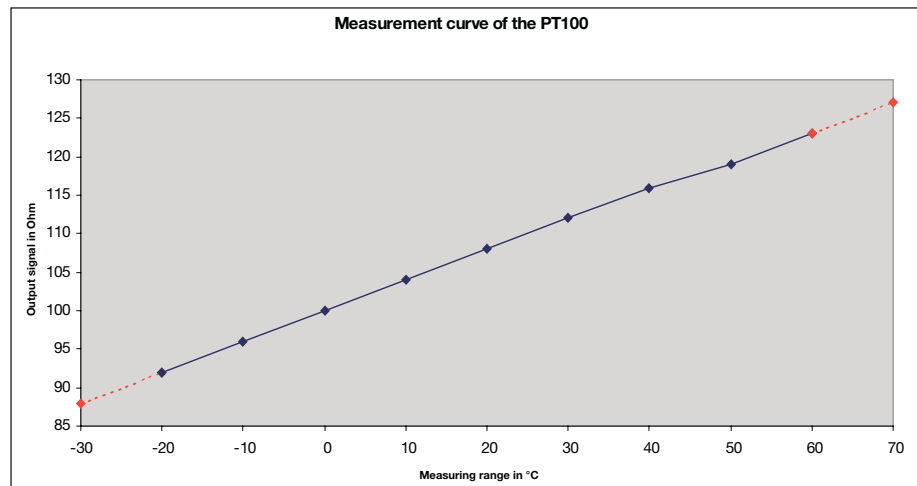


Fig. 33: Measurement curve for the PT100

The two hatched lines indicate the possible further progression of the measurement curve. The manufacturer guarantees the standardised values for the measuring range from -20 °C to $+60\text{ °C}$. This example shows that the resistance values of $< -20\text{ °C}$ and $> +60\text{ °C}$ do not correspond to the standard resistance values.

Measurement curve taking all specifications into account:

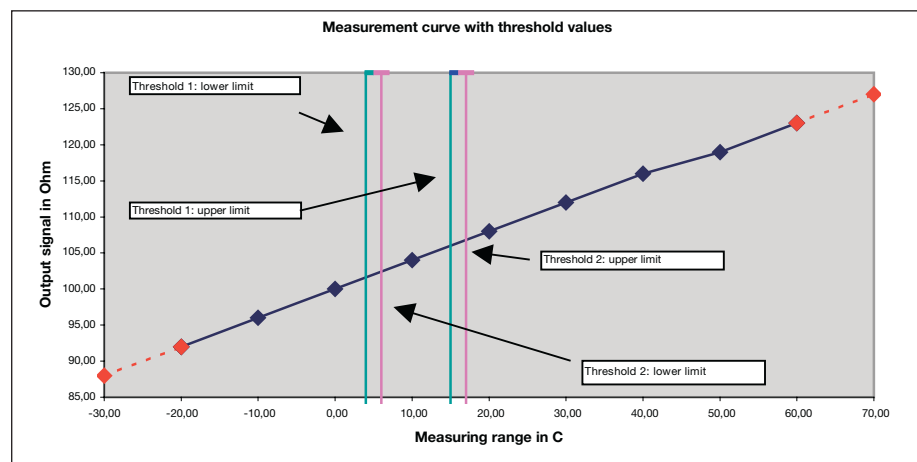


Fig. 34: Measurement curve for the PT100 with threshold values

Settings for the Channel A parameter window:

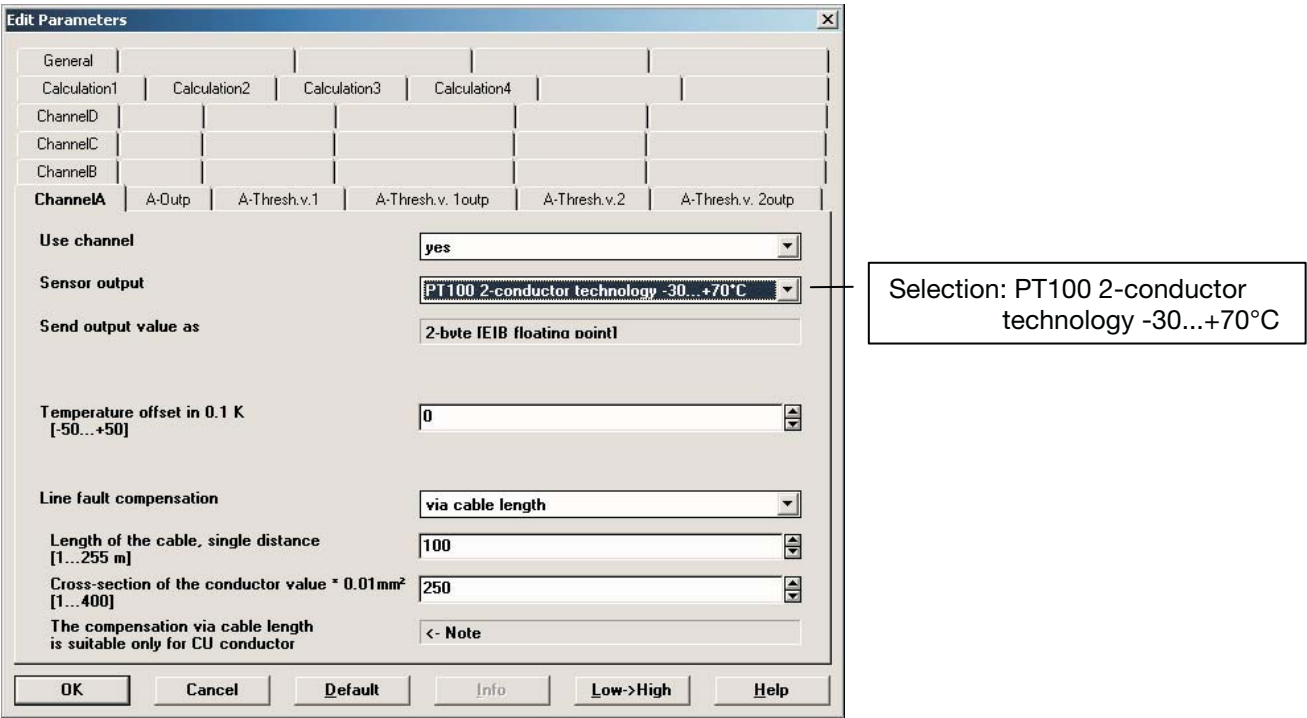


Fig. 35: Parameter window “Channel A – PT100 2-conductor technology – 30...+ 70 °C”

Settings for threshold values 1 and 2:

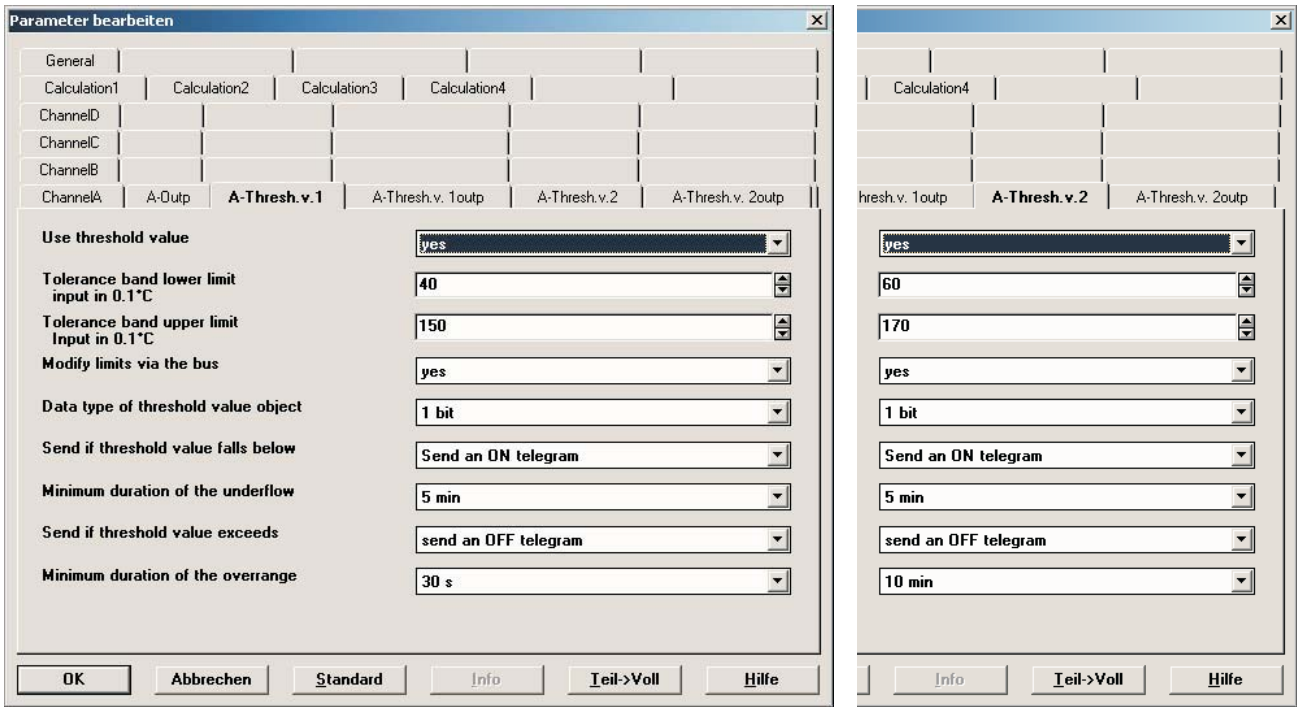


Fig. 36: Parameter window “Channel A – PT100 2-conductor technology – 30...+ 70 °C, threshold 1 and 2”

4.4 Planning example: “Air flow measurement”

In a ventilation system, ventilation flaps should be controlled based on air flow measurement. The ventilation flaps should be opened at an air flow of 10 m/s and closed at an air flow of 8 m/s. In addition, an “ON telegram” should be sent to a visualisation unit at an air flow of more than 30 m/s. The current air flow should be visible on a display. The sensor should be monitored with regard to wire breakage. Moreover, a telegram should be sent to the bus at more than 5% of the maximum value.

Flow sensor:

Signal output: 4–20 mA

Measuring range: 0...40 m/s

Measurement curve: Linear

Connection to channel A

Measurement curve for the sensor:

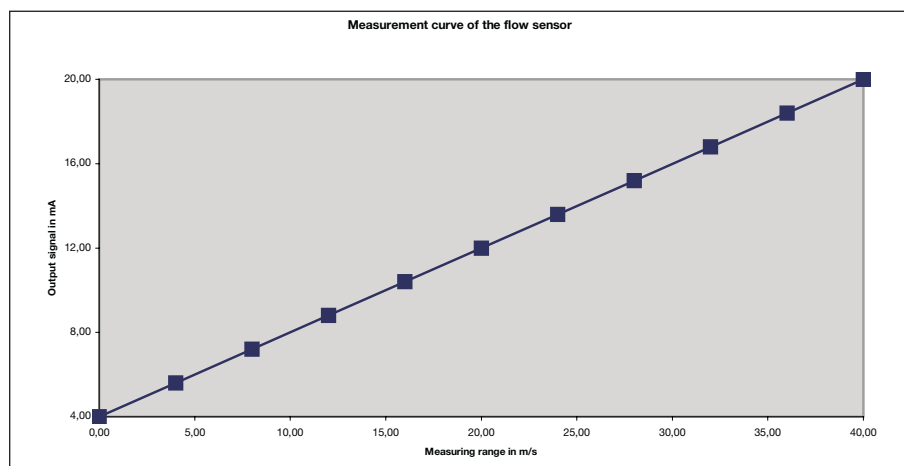


Fig. 37: Measurement curve for the flow sensor

Measurement curve taking all specifications into account:

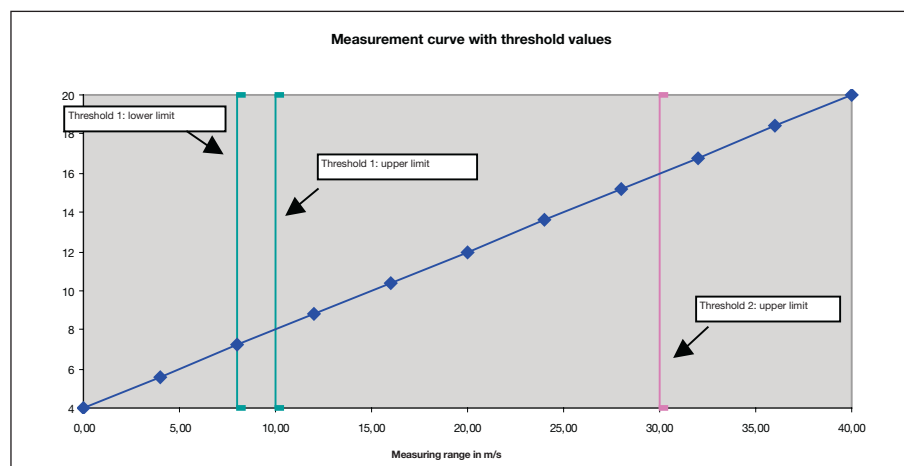


Fig. 38: Measurement curve for the flow sensor with threshold values

The “Measured value outside range – Channel A” communication object covers both wire breakage and the demand for a telegram to be sent at more than 5% above the maximum value.

Settings for the Channel A parameter window:

Edit Parameters

General

Calculation1

Calculation2

Calculation3

Calculation4

ChannelID

ChannelC

ChannelB

ChannelA

A-Outp

A-Thresh.v.1

A-Thresh.v.1outp

A-Thresh.v.2

A-Thresh.v.2outp

Use channel

yes

Sensor output

4 - 20 mA

Send output value as

1-byte [0...+255]

Definition of the measuring range

Lower measuring limit in x % from the upper limit of effective range

0

Output value to be sent for lower measuring limit [0...+255]

0

Upper measuring limit in x % from the upper limit of effective range

100

Output value to be sent for upper measuring limit [0...+255]

40

OK

Cancel

Default

Info

Low->High

Help

Fig. 39: Parameter window "Channel A, 4 - 20 mA"

Settings for threshold values 1 and 2:

Parameter bearbeiten

General

Calculation1

Calculation2

Calculation3

Calculation4

ChannelID

ChannelC

ChannelB

ChannelA

A-Outp

A-Thresh.v.1

A-Thresh.v.1outp

A-Thresh.v.2

A-Thresh.v.2outp

Use threshold value

yes

Tolerance band lower limit

8

Tolerance band upper limit

10

Modify limits via the bus

yes

Data type of threshold value object

1 bit

Send if threshold value falls below

send an OFF telegram

Minimum duration of the underflow

none

Send if threshold value exceeds

Send an ON telegram

Minimum duration of the overrange

none

OK

Abbrechen

Standard

Info

Teil->Voll

Hilfe

Calculation4

Thresh.v.1outp

A-Thresh.v.2

A-Thresh.v.2outp

yes

0

30

yes

1 bit

do not send a telegram

none

Send an ON telegram

none

Info

Teil->Voll

Hilfe

Fig. 40: Parameter window "Channel A, 4 - 20 mA, threshold 1 and 2"

Anhang

A.1 Scope of delivery

Analogue Input AE/S 4.2 is supplied with the following parts.
Please check the scope of delivery against the following list.

- 1 x AE/S 4.2, Analogue Input, 4-fold, MDRC
- 1 x installation and operating instructions
- 1 x bus connection terminal (red/black)

A.2 Truth table for the “Status byte – System” communication object

Bit no.	8-bit value	7	6	5	4	3	2	1	0	
	Hexadecimal	Not assigned	Not assigned	Internal error	Undervoltage	Status of channel D	Status of channel C	Status of channel B	Status of channel A	
0	00	0	0	0	0	0	0	0	0	
1	01	0	0	0	0	0	0	0	1	
2	02	0	0	0	0	0	0	1	0	
3	03	0	0	0	0	0	0	1	1	
4	04	0	0	0	0	0	1	0	0	
5	05	0	0	0	0	0	1	0	1	
6	06	0	0	0	0	0	1	1	0	
7	07	0	0	0	0	0	1	1	1	
8	08	0	0	0	0	1	0	0	0	
9	09	0	0	0	0	1	0	0	1	
10	0A	0	0	0	0	1	0	1	0	
11	0B	0	0	0	0	1	0	1	1	
12	0C	0	0	0	0	1	1	0	0	
13	0D	0	0	0	0	1	1	0	1	
14	0E	0	0	0	0	1	1	1	0	
15	0F	0	0	0	0	1	1	1	1	
16	10	0	0	0	1	0	0	0	0	
17	11	0	0	0	1	0	0	0	1	
18	12	0	0	0	1	0	0	1	0	
19	13	0	0	0	1	0	0	1	1	
20	14	0	0	0	1	0	1	0	0	
21	15	0	0	0	1	0	1	0	1	
22	16	0	0	0	1	0	1	1	0	
23	17	0	0	0	1	0	1	1	1	
24	18	0	0	0	1	1	0	0	0	
25	19	0	0	0	1	1	0	0	1	
26	1A	0	0	0	1	1	0	1	0	
27	1B	0	0	0	1	1	0	1	1	
28	1C	0	0	0	1	1	1	0	0	
29	1D	0	0	0	1	1	1	0	1	
30	1E	0	0	0	1	1	1	1	0	
31	1F	0	0	0	1	1	1	1	1	
32	20	0	0	1	0	0	0	0	0	
33	21	0	0	1	0	0	0	0	1	
34	22	0	0	1	0	0	0	1	0	
35	23	0	0	1	0	0	0	1	1	
36	24	0	0	1	0	0	1	0	0	
37	25	0	0	1	0	0	1	0	1	
38	26	0	0	1	0	0	1	1	0	
39	27	0	0	1	0	0	1	1	1	
40	28	0	0	1	0	1	0	0	0	
41	29	0	0	1	0	1	0	0	1	
42	2A	0	0	1	0	1	0	1	0	
43	2B	0	0	1	0	1	0	1	1	
44	2C	0	0	1	0	1	1	0	0	
45	2D	0	0	1	0	1	1	0	1	
46	2E	0	0	1	0	1	1	1	0	
47	2F	0	0	1	0	1	1	1	1	
48	30	0	0	1	1	0	0	0	0	
49	31	0	0	1	1	0	0	0	1	
50	32	0	0	1	1	0	0	1	0	
51	33	0	0	1	1	0	0	1	1	
52	34	0	0	1	1	0	1	0	0	
53	35	0	0	1	1	0	1	0	1	
54	36	0	0	1	1	0	1	1	0	
55	37	0	0	1	1	0	1	1	1	
56	38	0	0	1	1	1	0	0	0	
57	39	0	0	1	1	1	0	0	1	
58	3A	0	0	1	1	1	0	1	0	
59	3B	0	0	1	1	1	0	1	1	
60	3C	0	0	1	1	1	1	0	0	
61	3D	0	0	1	1	1	1	0	1	
62	3E	0	0	1	1	1	1	1	0	
63	3F	0	0	1	1	1	1	1	1	
64	40	0	1	0	0	0	0	0	0	
65	41	0	1	0	0	0	0	0	1	
66	42	0	1	0	0	0	0	1	0	
67	43	0	1	0	0	0	0	1	1	
68	44	0	1	0	0	0	1	0	0	
69	45	0	1	0	0	0	1	0	1	
70	46	0	1	0	0	0	1	1	0	
71	47	0	1	0	0	0	1	1	1	
72	48	0	1	0	0	1	0	0	0	
73	49	0	1	0	0	1	0	0	1	
74	4A	0	1	0	0	1	0	1	0	
75	4B	0	1	0	0	1	0	1	1	
76	4C	0	1	0	0	1	1	0	0	
77	4D	0	1	0	0	1	1	0	1	
78	4E	0	1	0	0	1	1	1	0	
79	4F	0	1	0	0	1	1	1	1	
80	50	0	1	0	1	0	0	0	0	
81	51	0	1	0	1	0	0	0	1	
82	52	0	1	0	1	0	0	1	0	
83	53	0	1	0	1	0	0	1	1	
84	54	0	1	0	1	0	1	0	0	
85	55	0	1	0	1	0	1	0	1	
86	56	0	1	0	1	0	1	1	0	
87	57	0	1	0	1	0	1	1	1	
88	58	0	1	0	1	1	0	0	0	
89	59	0	1	0	1	1	0	0	1	
90	5A	0	1	0	1	1	0	1	0	
91	5B	0	1	0	1	1	0	1	1	
92	5C	0	1	0	1	1	1	0	0	
93	5D	0	1	0	1	1	1	0	1	
94	5E	0	1	0	1	1	1	1	0	
95	5F	0	1	0	1	1	1	1	1	
96	60	0	1	1	0	0	0	0	0	
97	61	0	1	1	0	0	0	0	1	
98	62	0	1	1	0	0	0	1	0	
99	63	0	1	1	0	0	0	1	1	
100	64	0	1	1	0	0	1	0	0	
101	65	0	1	1	0	0	1	0	1	
102	66	0	1	1	0	0	1	1	0	
103	67	0	1	1	0	0	1	1	1	
104	68	0	1	1	0	1	0	0	0	
105	69	0	1	1	0	1	0	0	1	
106	6A	0	1	1	0	1	0	1	0	
107	6B	0	1	1	0	1	0	1	1	
108	6C	0	1	1	0	1	1	0	0	
109	6D	0	1	1	0	1	1	0	1	
110	6E	0	1	1	0	1	1	1	0	
111	6F	0	1	1	0	1	1	1	1	
112	70	0	1	1	1	0	0	0	0	
113	71	0	1	1	1	0	0	0	1	
114	72	0	1	1	1	0	0	1	0	
115	73	0	1	1	1	0	0	1	1	
116	74	0	1	1	1	0	1	0	0	
117	75	0	1	1	1	0	1	0	1	
118	76	0	1	1	1	0	1	1	0	
119	77	0	1	1	1	0	1	1	1	
120	78	0	1	1	1	1	0	0	0	
121	79	0	1	1	1	1	0	0	1	
122	7A	0	1	1	1	1	0	1	0	
123	7B	0	1	1	1	1	0	1	1	
124	7C	0	1	1	1	1	1	0	0	
125	7D	0	1	1	1	1	1	0	1	
126	7E	0	1	1	1	1	1	1	0	
127	7F	0	1	1	1	1	1	1	1	
128	80	1	0	0	0	0	0	0	0	
129	81	1	0	0	0	0	0	0	1	
130	82	1	0	0	0	0	0	1	0	
131	83	1	0	0	0	0	0	1	1	
132	84	1	0	0	0	0	1	0	0	
133	85	1	0	0	0	0	1	0	1	
134	86	1	0	0	0	0	1	1	0	
135	87	1	0	0	0	0	1	1	1	
136	88	1	0	0	0	1	0	0	0	
137	89	1	0	0	0	1	0	0	1	
138	8A	1	0	0	0	1	0	1	0	
139	8B	1	0	0	0	1	0	1	1	
140	8C	1	0	0	0	1	1	0	0	
141	8D	1	0	0	0	1	1	0	1	
142	8E	1	0	0	0	1	1	1	0	
143	8F	1	0	0	0	1	1	1	1	
144	90	1	0	0	1	0	0	0	0	
145	91	1	0	0	1	0	0	0	1	
146	92	1	0	0	1	0	0	1	0	
147	93	1	0	0	1	0	0	1	1	
148	94	1	0	0	1	0	1	0	0	
149	95	1	0	0	1	0	1	0	1	
150	96	1	0	0	1	0	1	1	0	
151	97	1	0	0	1	0	1	1	1	
152	98	1	0	0	1	1	0	0	0	
153	99	1	0	0	1	1	0	0	1	
154	9A	1	0	0	1	1	0	1	0	
155	9B	1	0	0	1	1	0	1	1	
156	9C	1	0	0	1	1	1	0	0	
157	9D	1	0	0	1	1	1	0	1	
158	9E	1	0	0	1	1	1	1	0	
159	9F	1	0	0	1	1	1	1	1	
160	A0	1	0	1	0	0	0	0	0	
161	A1	1	0	1	0	0	0	0	1	
162	A2	1	0	1	0	0	0	1	0	
163	A3	1	0	1	0	0	0	1	1	
164	A4	1	0	1	0	0	1	0	0	
165	A5	1	0	1	0	0	1	0	1	
166	A6	1	0	1	0	0	1	1	0	
167	A7	1	0	1	0	0	1	1	1	
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169	A9	1	0	1						

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A.6 Ordering information

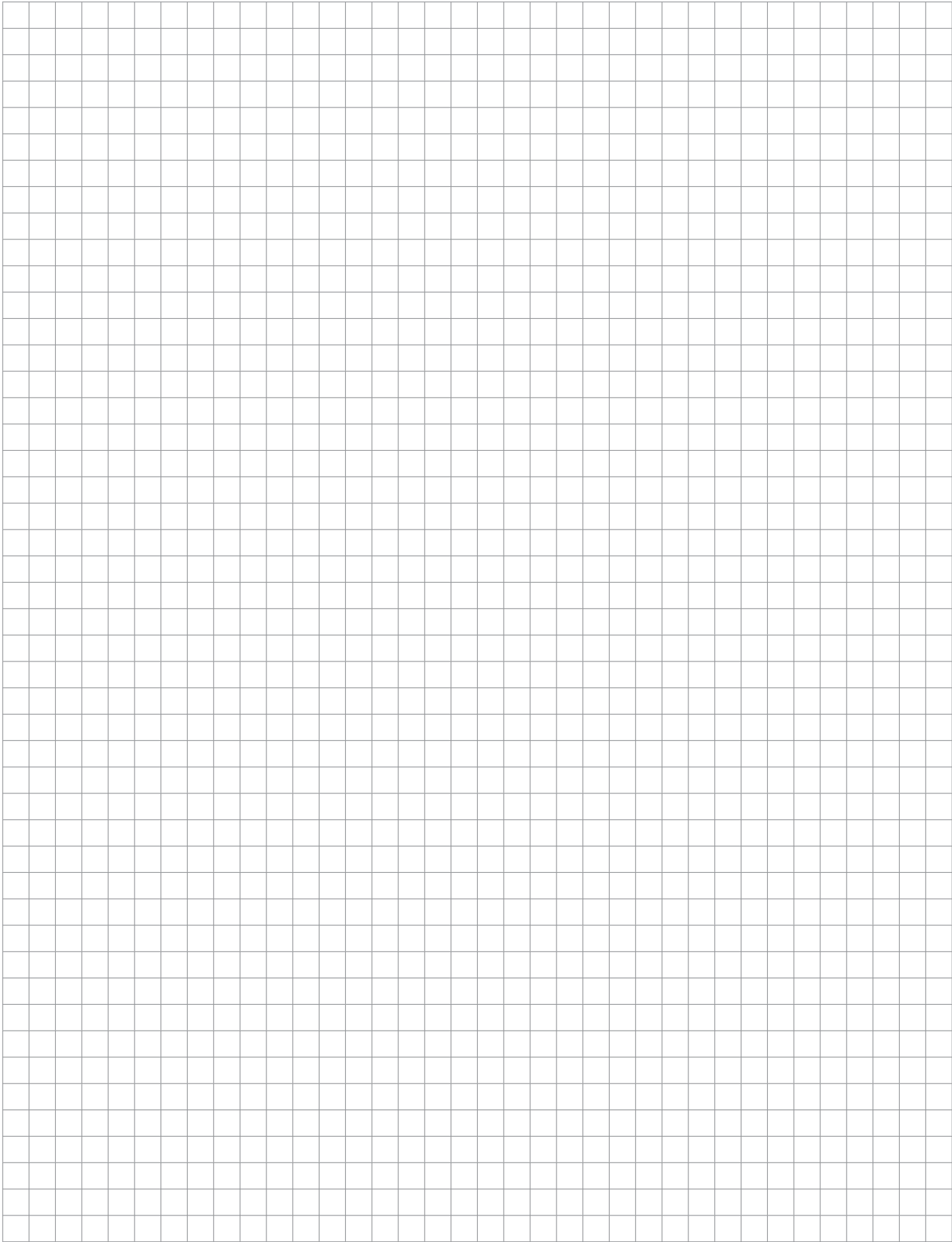
Description	Ordering information		bbn 40 16779 EAN	Price group	Unit weight [kg]	Pack. unit [pc.]
	Short code	Order no.				
Analogue Input, 4-fold MDRC	AE/S 4.2	2CDG 110 030 R0011	58092 2	26	0.1	1

Table 10: Ordering information for Analogue Input, 4-fold, MDRC

A.7 Notes

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form small squares across the entire surface. There are no margins, text, or other markings on the paper.







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