Product Manual

# ABB i-bus® EIB / KNX
# Analogue Input
# AE/S 4.2

Intelligent Installation Systems


ABB

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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# Contents

# 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

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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)<br>0–5 V / 5 mV / +/– 2% of ULE<br>0–10 V / 10 mV / +/– 2% of ULE<br>1–10 V / 10 mV / +/– 2% of ULE<br>0–20 mA / 20 µA / +/– 2% of ULE<br>4–20 mA / 20 µA / +/– 2% of ULE<br>0 – 1000 ohm resistance / 2.5 ohm / +/– 2% of ULE<br>PT100 2-conductor technology<br>– 30...+ 70 °C / 0.1 K / +/– 1 K of ULE<br>PT100 2-conductor technology<br>– 200...+ 800 °C / 1.5 K / +/– 10 K of ULE<br>Floating contact interrogation<br>(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<br>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<br>– Storage<br>– Transport | – 5 °C ... + 45 °C<br>– 25 °C ... + 55 °C<br>– 25 °C ... + 70 °C |
| **Environment conditions** | – max. humidity | 93 %, without bedewing |
| **Design** | – DIN rail mounted device (MDRC)<br>– Dimensions<br>– Mounting width in modules<br>– Mounting depth | Modular installation device, ProM<br>90 x 72 x 64.5 mm (H x W x D)<br>4, 4 modules at 18 mm<br>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

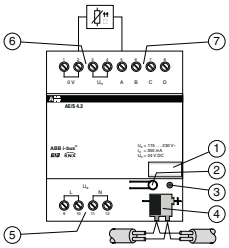



Fig. 2: Circuit diagram of a PT100 temperature sensor

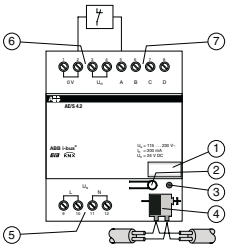



Fig. 3: Circuit diagram of a floating contact

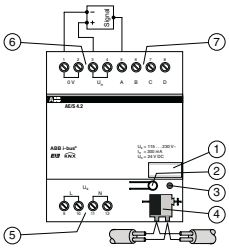



Fig. 4: Circuit diagram of a 3-conductor sensor with intrinsic supply

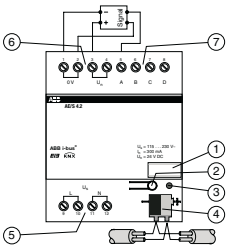



Fig. 5: Circuit diagram of a 4-conductor sensor with intrinsic supply

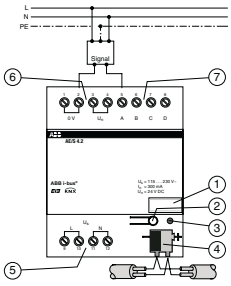



Fig. 6: Circuit diagram of a sensor with an external supply

**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

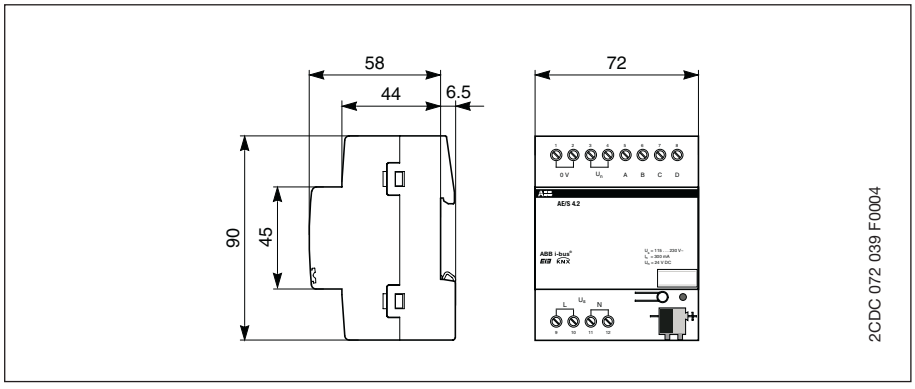



Fig. 7: Dimension drawing

## 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 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 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”

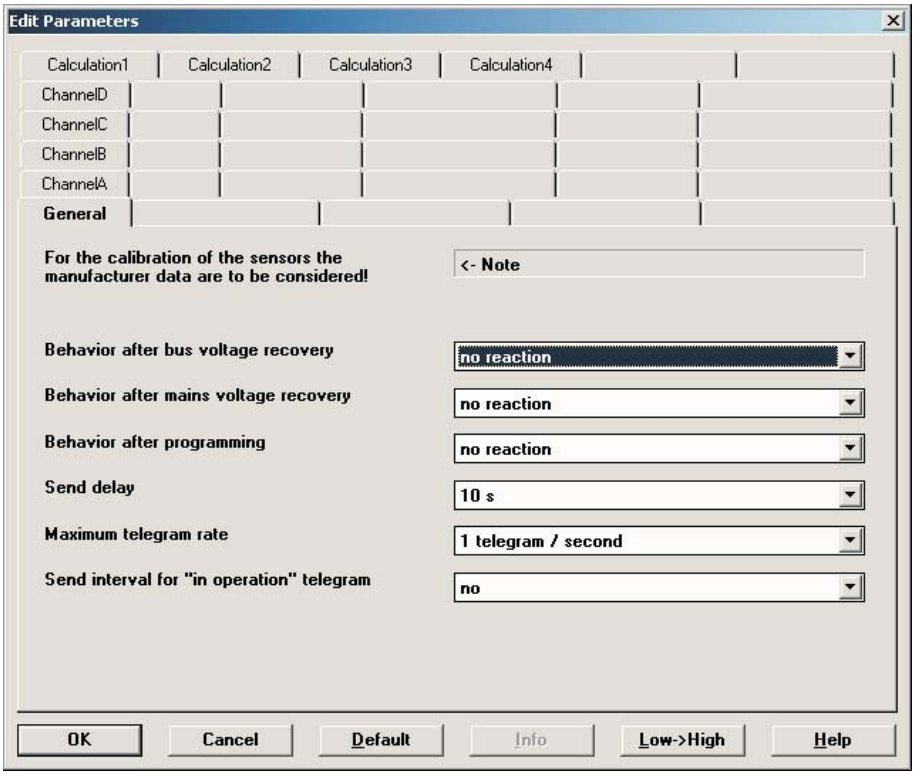



Fig. 9: Parameter window “General”

**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

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

**How does the device behave if the bus voltage recovers before the mains voltage?**
As the circuit is supplied by the mains voltage, it cannot react to the return of bus voltage event.
The circuit cannot yet be contacted.
If the mains voltage returns and the bus voltage is already available, only the reaction after mains voltage recovery will be implemented.

**How does the device behave if the mains voltage recovers before the bus voltage?**
Case 1: Option “send output and threshold values immediately”.
The telegrams are sent immediately. As the bus voltage is not present, no telegrams are visible. If the bus voltage then returns, the reaction will be in accordance with the bus voltage recovery option selected.

Case 2: Option “send output and threshold values with a delay”.
Now the reaction depends on the bus voltage recovery option.

Option “no reaction”
The send delay currently operational is not interrupted.

Option “send output and threshold values immediately”
The current send delay is interrupted and it is sent immediately.

Option “send output and threshold values with a delay”
The send delay currently operational is retriggered. Send will occur after the send delay has timed out.

**How does sending of values function?**
Generally the send options of the individual channels are superimposed with the options which are possible with mains voltage recovery or programming.

An example. If a temperature sensor is programmed to cyclically send every 5 seconds, it will do so also after mains voltage recovery regardless of the selected option at mains voltage recovery.
In contrast, the rain sensor may not send for weeks with a change provided that it does not rain in this time and because the object value does not change.

With the options in parameter Behaviour after… it is possible to achieve that after an event (mains voltage recovery, programming and bus voltage recovery) the complete process map of the channels (output values and threshold values) are sent either immediately or after a certain send delay. This ensures that all relevant information is sent once after an event (e.g. for visualisation).

**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.

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.

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

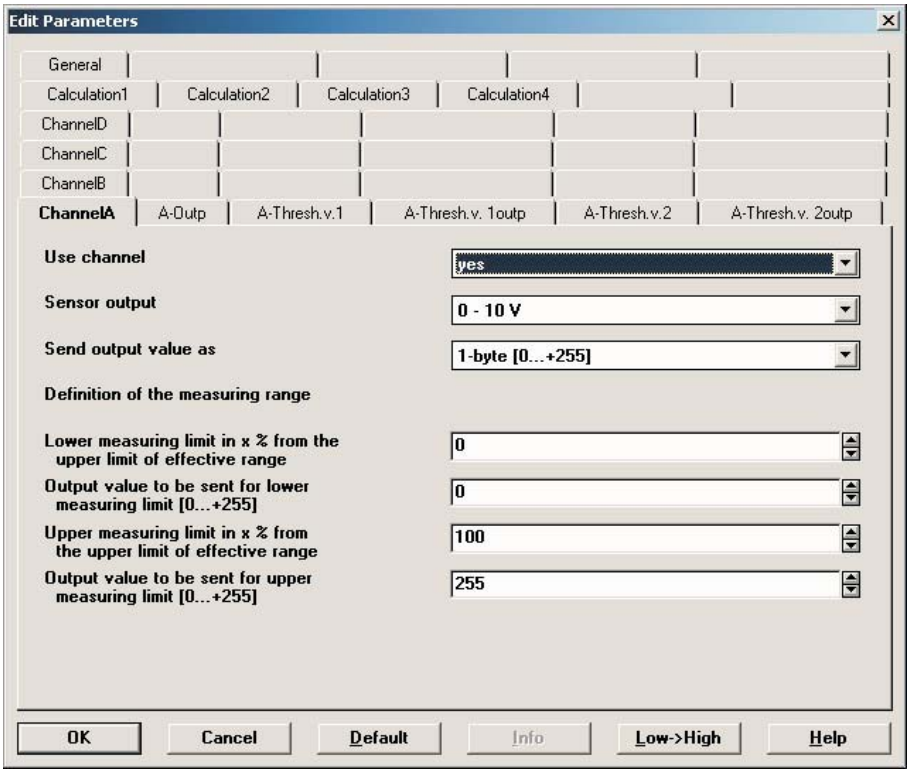



Fig. 10: Parameter window “Channel A – Voltage, current and resistance”

**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

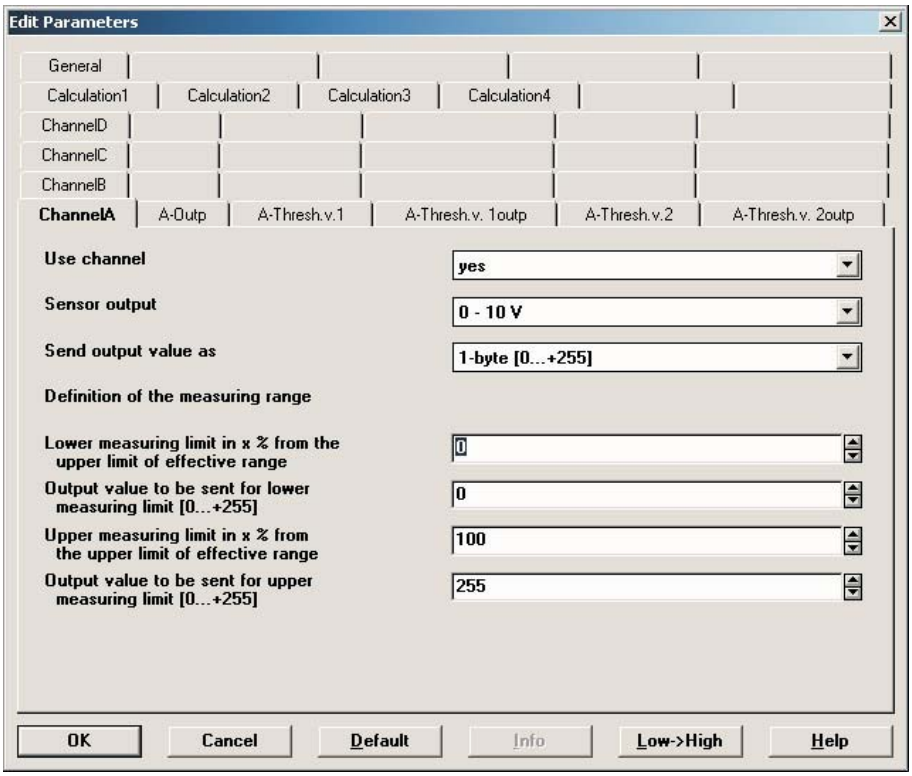



Fig. 11: Parameter window “Channel A – Definition of the measuring range”

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 values**
Options: 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 values**
Options: 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”

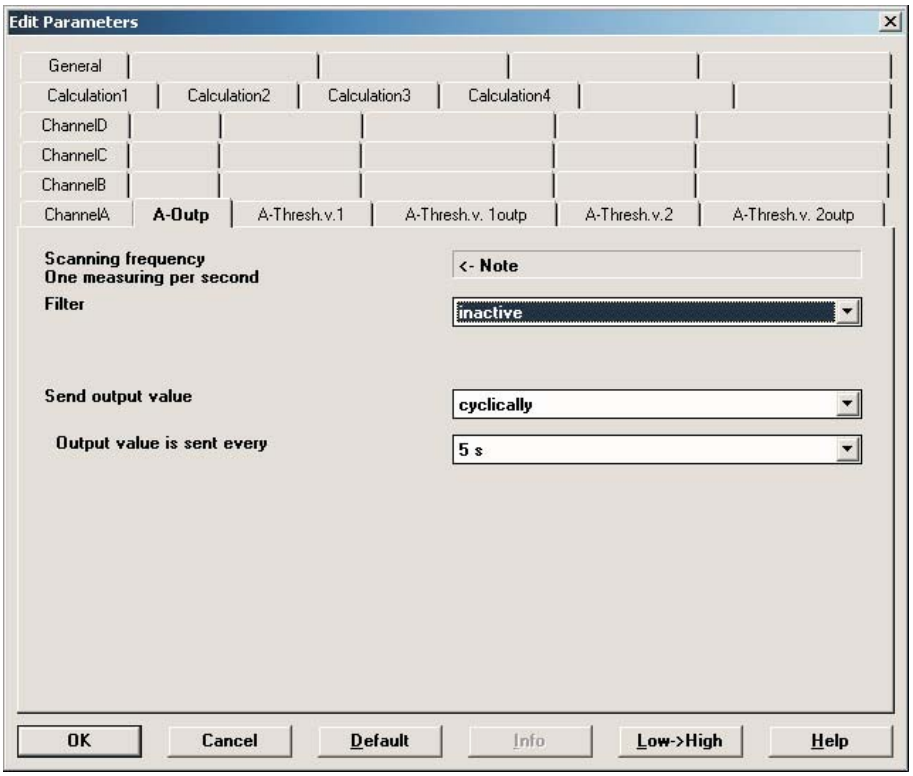



Fig. 12: Parameter window “Channel A – Output”

**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.

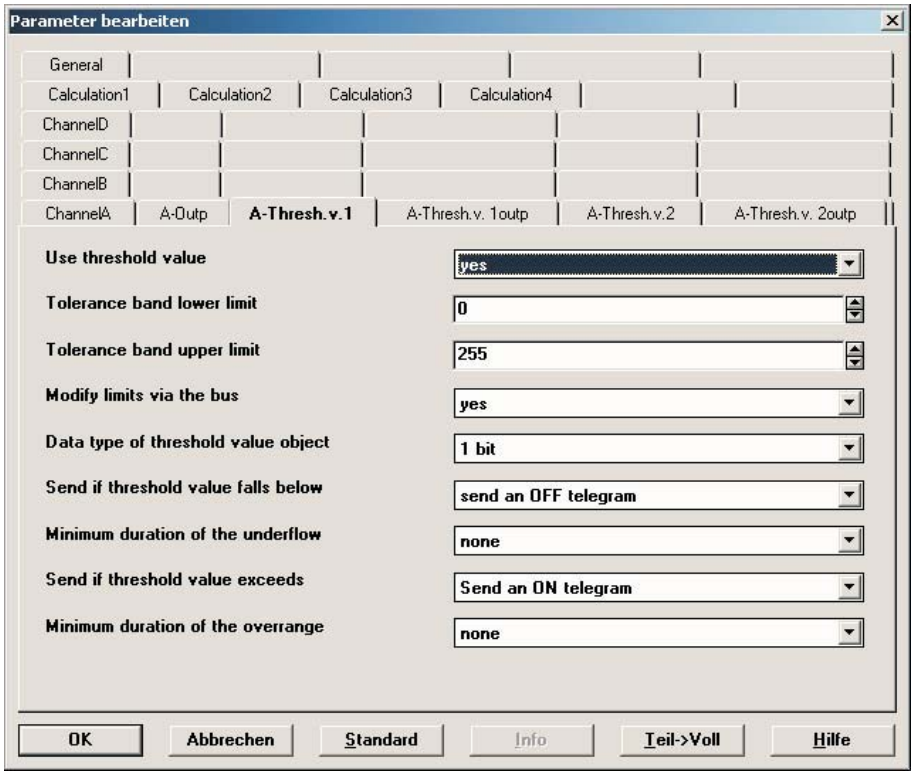



Fig. 13: Parameter window “Channel A – Threshold 1”

**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 bus**
Options: 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 valu*e 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 object**
Options: 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 below**
Options: 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.

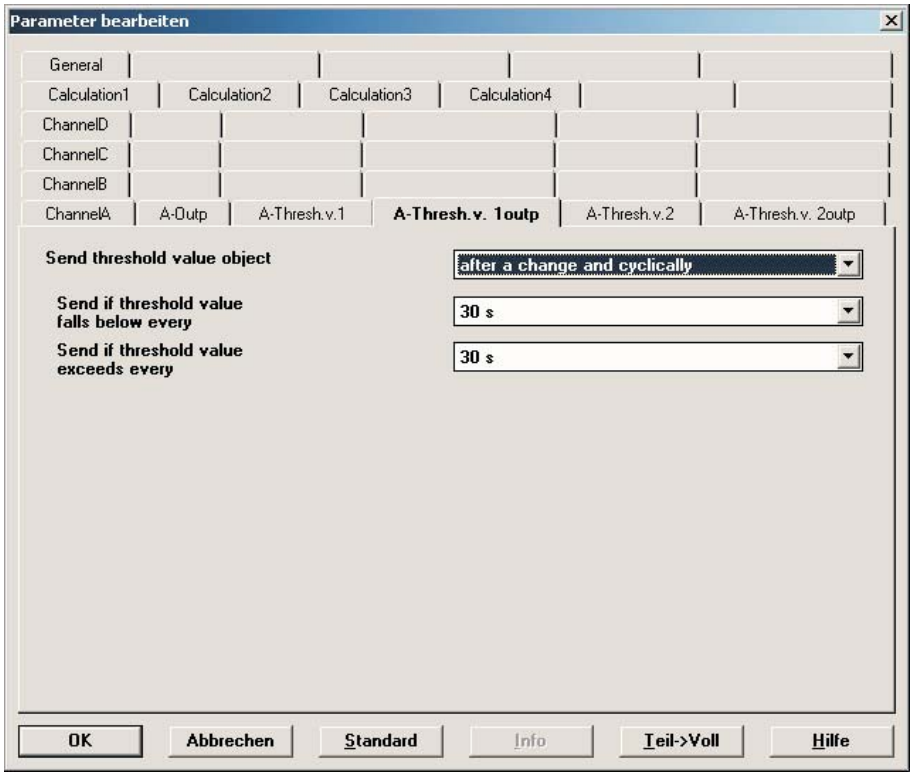



Fig. 14: Parameter window “Channel A – Threshold 1 output”

**Send threshold value object**
Options: after a change
<u>after a change and cyclically</u>

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/<u>30 s</u>/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”

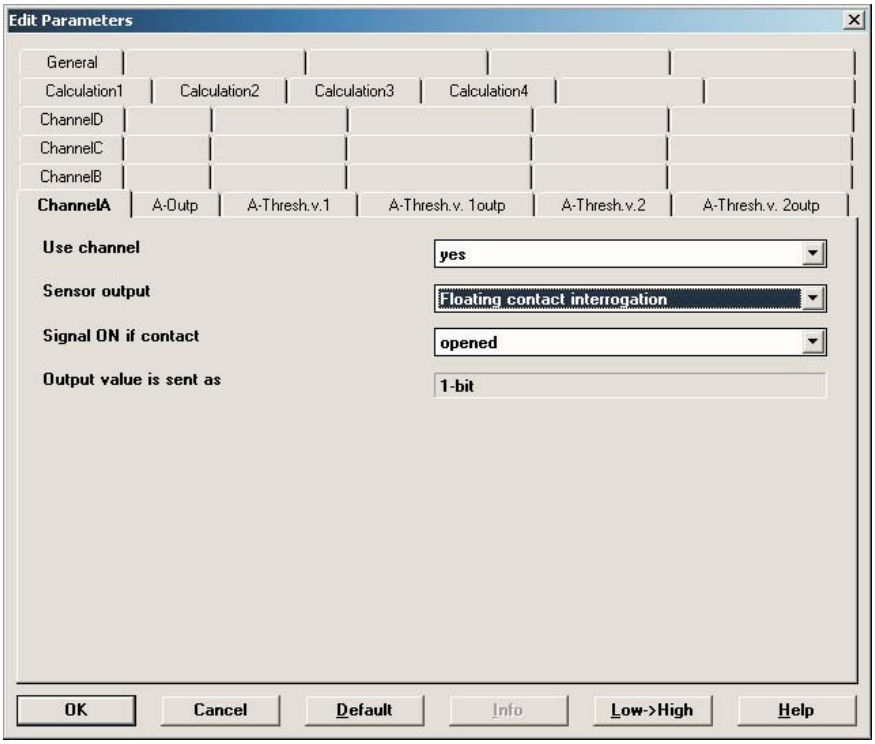



Fig. 15: Parameter window “Channel A – Floating contact interrogation”

**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”

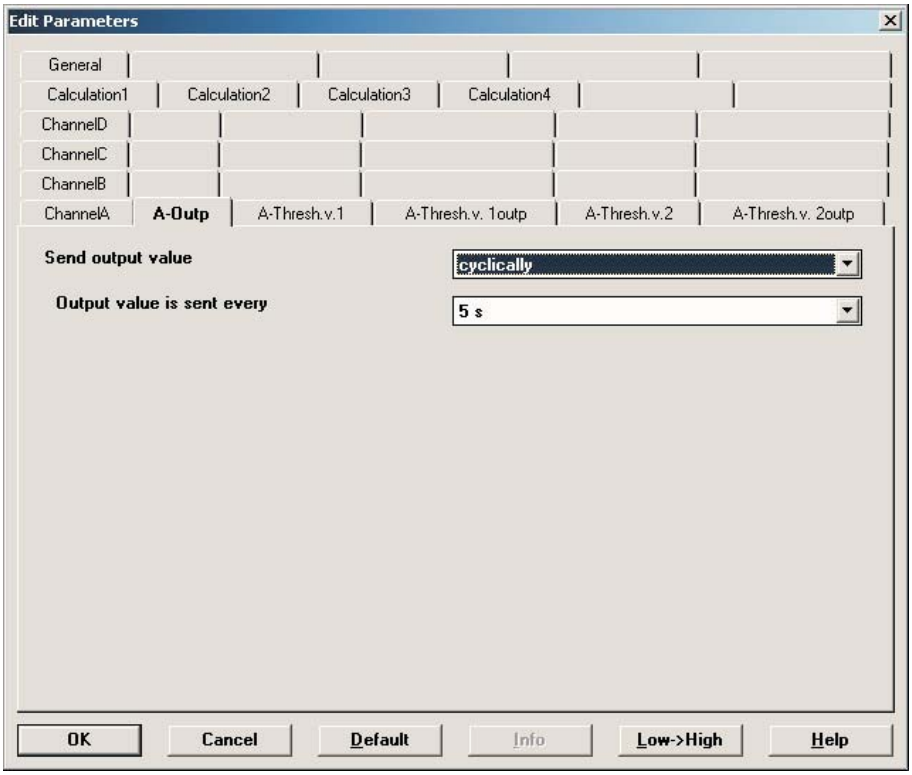



Fig. 16: Parameter window “Channel A – Output”

**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.

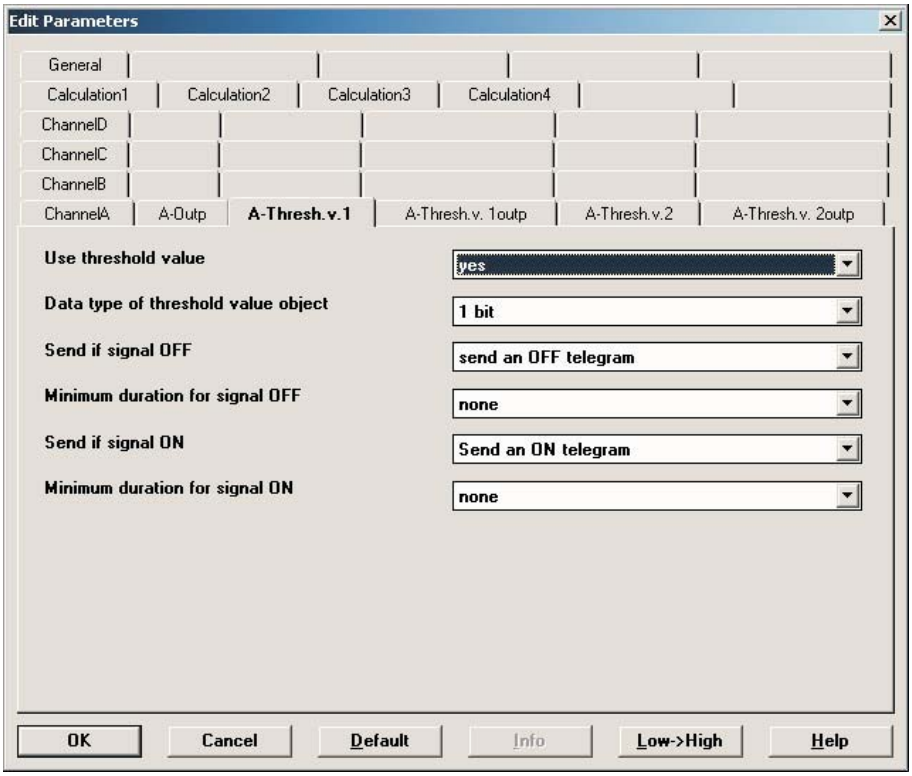



Fig. 17: Parameter window “Channel A – Threshold 1”

**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 object**
Options: 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 OFF**
Options: 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.

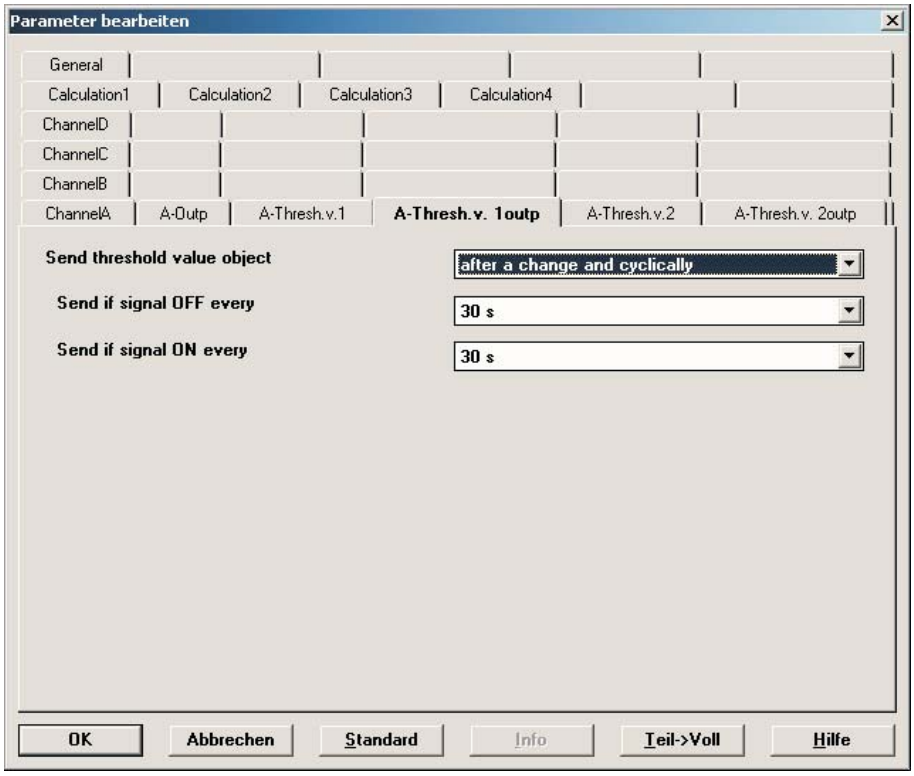



Fig. 18: Parameter window “Channel A – Threshold 1 output”

**Send threshold value object**
Options: after a change
<u>after a change and cyclically</u>

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/<u>30 s</u>/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 he 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.

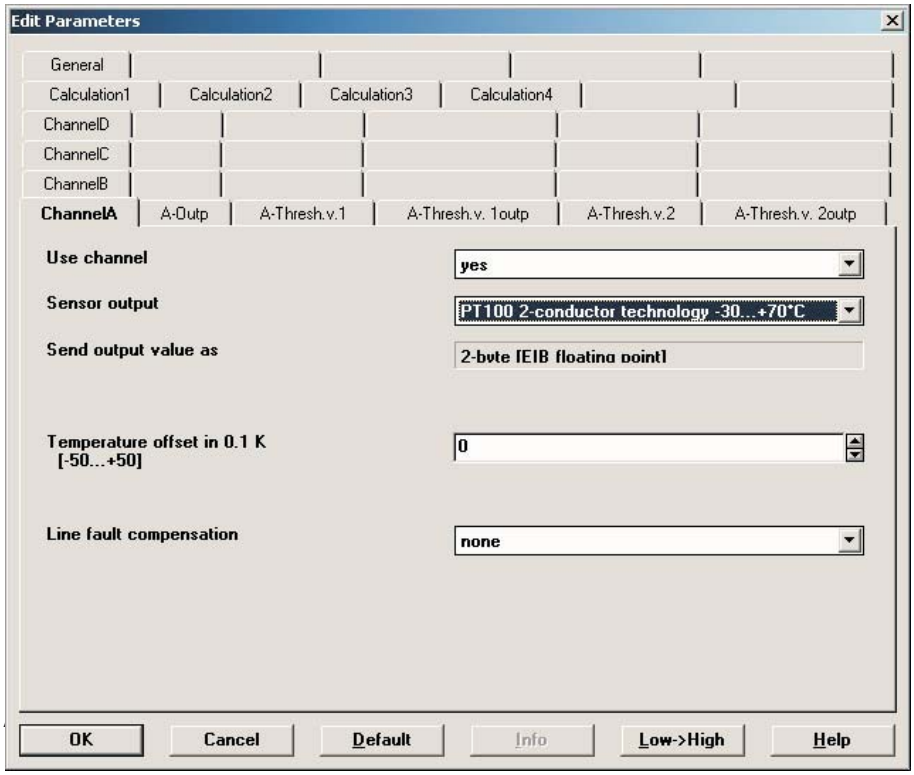



Fig. 19: Parameter window “Channel A – PT100 2-conductor technology – 30...+ 70 °C”

**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

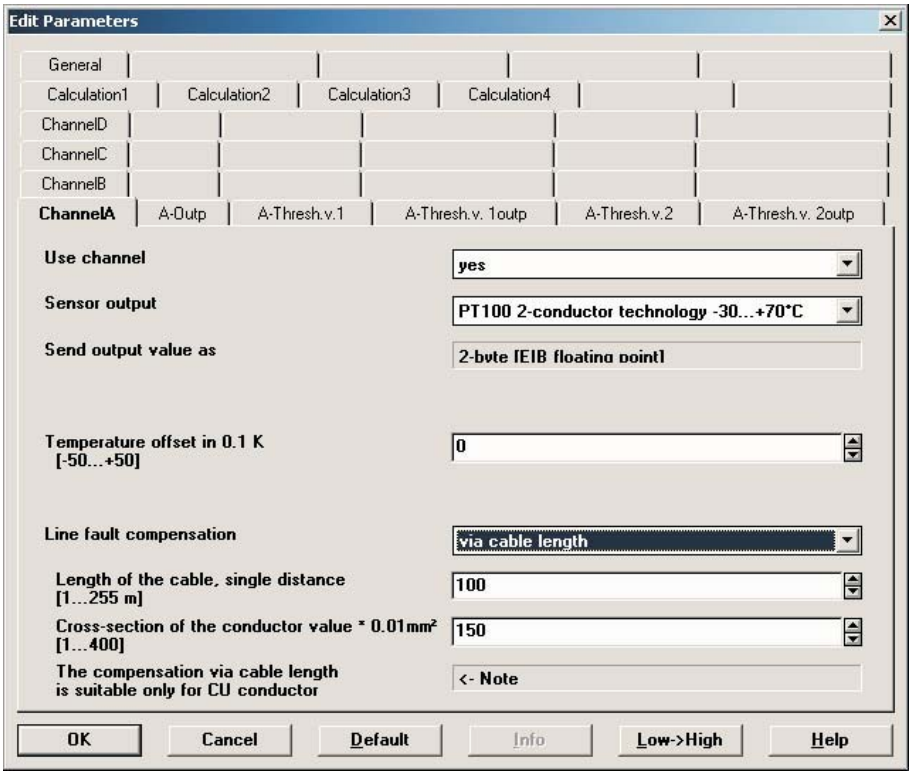



Fig. 20: Parameter Line fault compensation “via cable length”

**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 $mm^2$ )

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

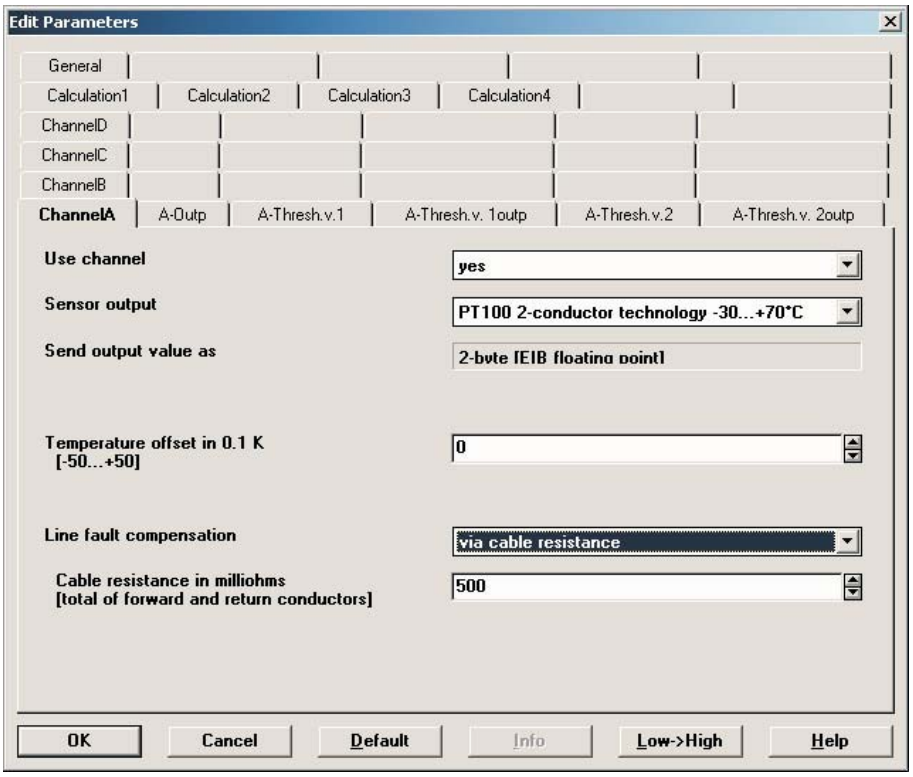



Fig. 21: Parameter Line fault compensation “via cable resistance”

**Cable resistance in milliohms [total of forward and return conductors]**
Options: 0...<u>500</u>...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.

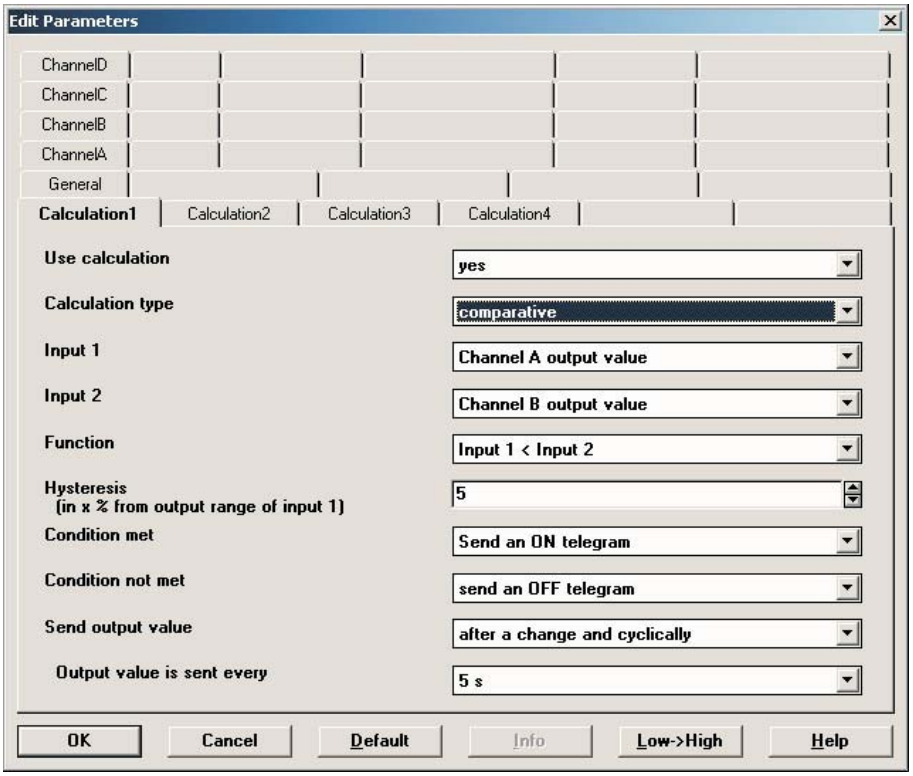



Fig. 22: Parameter window “Calculation 1, comparative”

**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
<u>after a change and cyclically</u>

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: <u>5 s</u>/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.

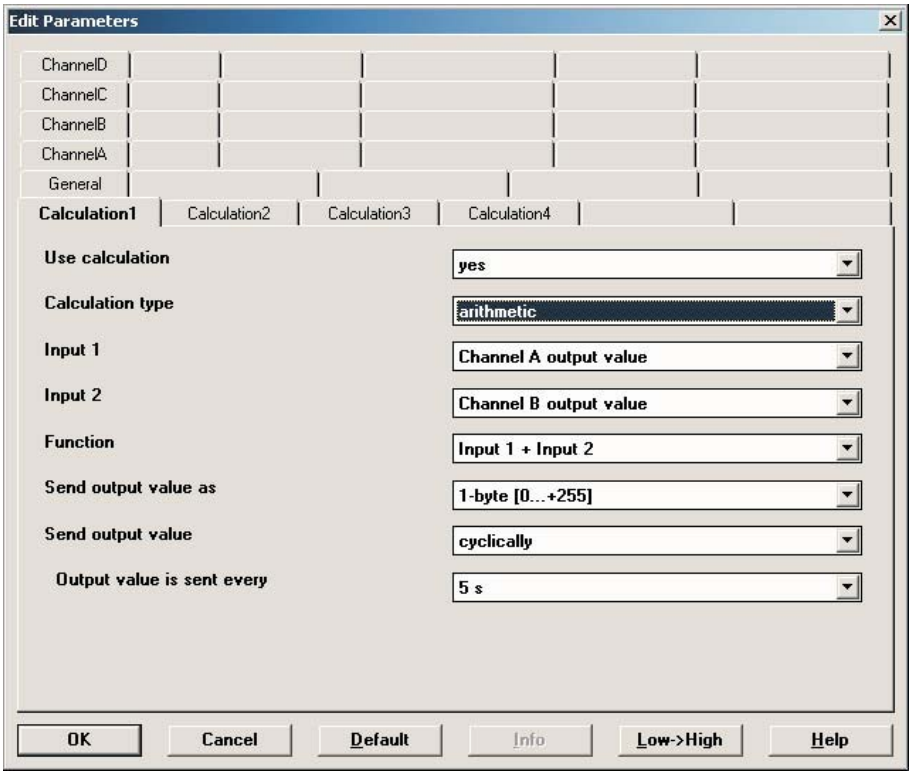



Fig. 23: Parameter window “Calculation 1, arithmetic”

**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.

In order to guarantee full interoperability with other EIB slaves, only a data type should be selected for the output which is permissible for the calculated physical size in compliance with KONNEX! (Refer to KNX manual chapter 3/7/2).

**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.

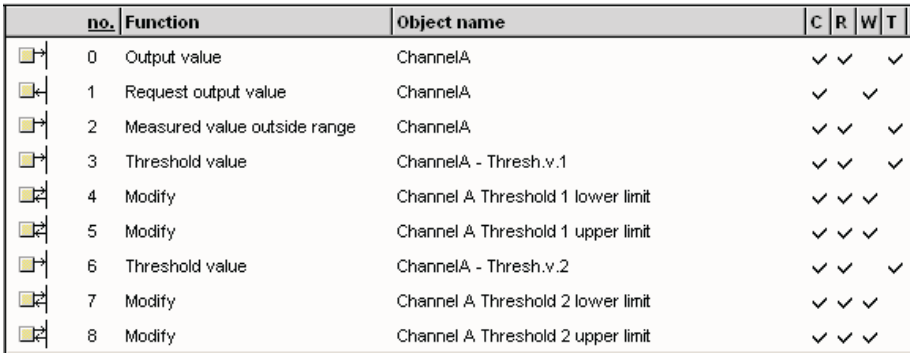
**Output value is sent after x % deviation from the output range of input 1**
Options: 1...2...100

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<br>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:<br>1-bit value [0/1] — EIS 1 — DPT 1.001<br>1-byte value [0...+ 255] — EIS 6 — DPT 5.001<br>1-byte value [– 128...+ 127] — EIS 14 — DPT 6.010<br>2-byte value [0...+ 65,535] — EIS 10 — DPT 8.001<br>2-byte value [– 32,768...+ 32,767] — EIS 10 — DPT 7.001<br>2-byte value [EIB floating point] — EIS 5 — DPT 9.001<br>4-byte value [IEE floating point] — EIS 9 — DPT 14.000 | | | | |
| **1** | **Request output value** | **Channel A** | **EIS1, 1 bit<br>DPT 1.009** | **C, W** |
| This communication object appears if the output value is to be sent “on request”.<br>If a “1” is received at this communication object, the current output value is sent once to the “Output value – Channel A” communication object. | | | | |
| **2** | **Measured value outside range** | **Channel A** | **EIS1, 1 bit<br>DPT 1.001** | **C, W** |
| The communication object can be used to check the plausibility of the sensor, e.g. wire breakage at 1 – 10 V and at 4 – 20 mA.<br>When the value exceeds or falls below the set lower and upper measuring limit, the communication object sends a “1”. When the measured value is between the two limits again, the communication object sends a “0”.<br>A “1” is also sent as soon as the measured value lies 5% above or below the set measuring limit, e.g. 21 mA at a set value of 4 – 20 mA.<br>A check is carried out after each measurement to determine whether the measured value is outside the range.<br>The output value can lie up to a maximum of 10% above or below the set measuring limit. This means that at 0 – 10 V and a set output value of 100 ohm, an output value of max. 110 ohm (11 V) can be sent. If the output value rises above 110 ohm, 110 ohm continues to be sent. If the value falls below 110 ohm, the current output value is sent.<br>Further explanations about the measured value out of range in the Annex. | | | | |

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**<br>**DPT variable** | **C, R, T** |
| As soon as the value exceeds or falls below the set threshold value, the following can be sent:<br>1-bit value [0/1] EIS 1 DPT 1.001<br>1-byte value [0...+ 255] EIS 6 DPT 5.001<br>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. | | | | |
| **4**<br><br>**5** | **Modify**<br><br>**Modify** | **Channel A threshold 1 lower limit**<br><br>**Channel A threshold 1 upper limit** | **EIS variable**<br><br>**DPT variable** | **C, R, T** |
| The upper and lower limit of threshold 1 can be modified using the bus.<br>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.<br>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**<br><br>**8** | **See e communication objects 4 and 5** | **Channel A threshold 2 lower limit**<br>**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**<br>**...**<br>**17** | **See communication objects 0...8** | **Channel B** | | |
| | | | | |
| **18**<br>**...**<br>**26** | **See communication objects 0...8** | **Channel C** | | |
| | | | | |
| **27**<br>**...**<br>**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

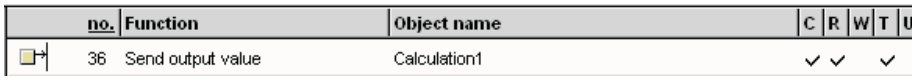



Fig. 25: Communication object “Calculation 1”

| 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 |

In order to guarantee full interoperability with other EIB slaves, only a data type should be selected for the output which is permissible for the calculated physical size in compliance with KONNEX! (Refer to KNX manual chapter 3/7/2).

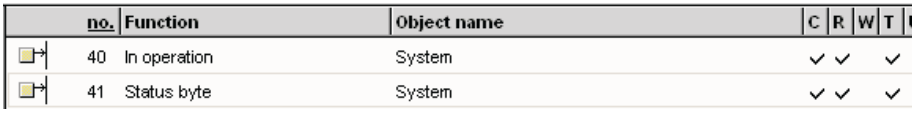
Table 7: Communication object 36 “Calculation 1”

### 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<br>DPT 1.003** | **C, R, T** |
| This communication object is active if “yes” has been selected in the “Send cyclical “in operation” telegram” parameter.<br>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.<br>The presence of the Analogue Input product can be monitored using this communication object. | | | | |
| **41** | **Status byte** | **System** | **EIS none<br>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.<br><br>Bit sequence: 76543210<br>Bit 7: Not assigned always “0”<br>Bit 6: Not assigned always “0”<br>Bit 5: Internal error in analogue component<br>Telegram value “0”: In range<br>“1”: Outside range<br>Bit 4: Undervoltage V+ < 20 V<br>Telegram value “0”: OK > 20 V<br>“1”: Not OK < 20 V<br>Bit 3: Status of channel D, measured value outside range<br>Telegram value “0”: In range<br>“1”: Outside range<br>Bit 2: Status of channel C, measured value outside range<br>Telegram value “0”: In range<br>“1”: Outside range<br>Bit 1: Status of channel B, measured value outside range<br>Telegram value “0”: In range<br>“1”: Outside range<br>Bit 0: Status of channel A, measured value outside range<br>Telegram value “0”: In range<br>“1”: Outside range<br>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.<br>A truth table is included in the appendix.<br>With perfect function the value of the status byte is zero. | | | | |

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?

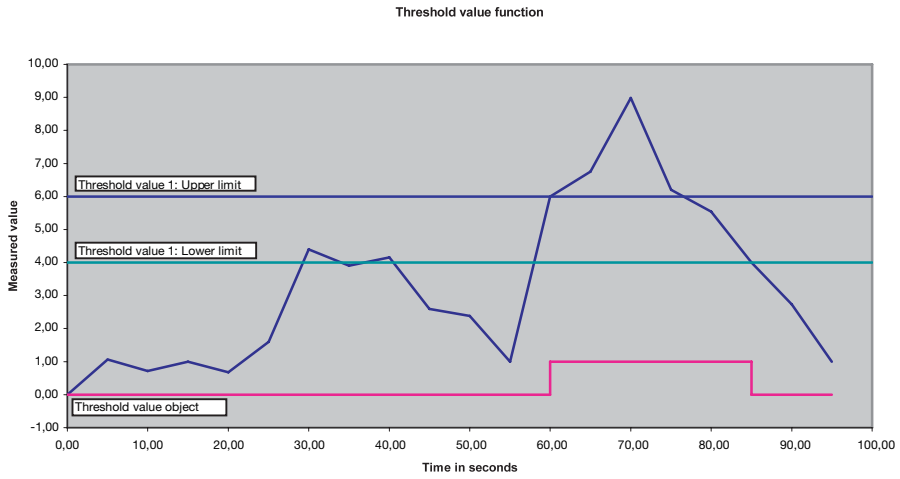



Fig. 27: Threshold value function

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:

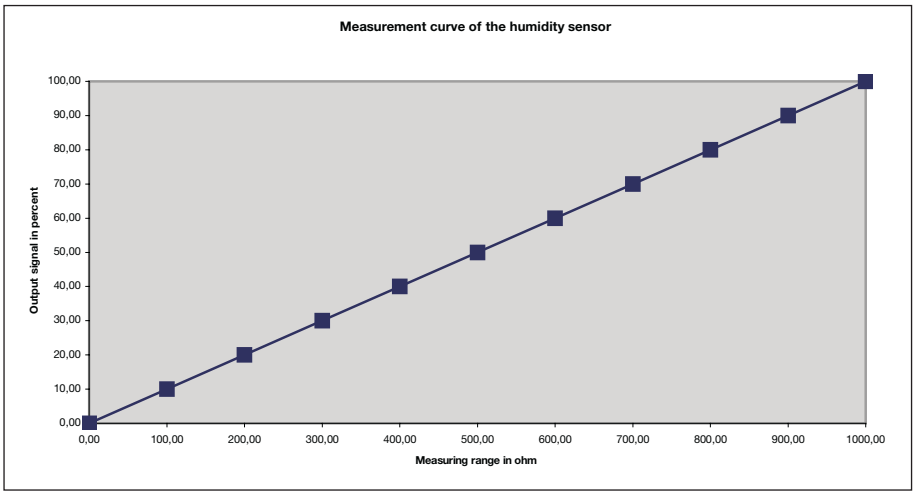



Fig. 28: Measurement curve for the humidity sensor

### Measurement curve taking all specifications into account:

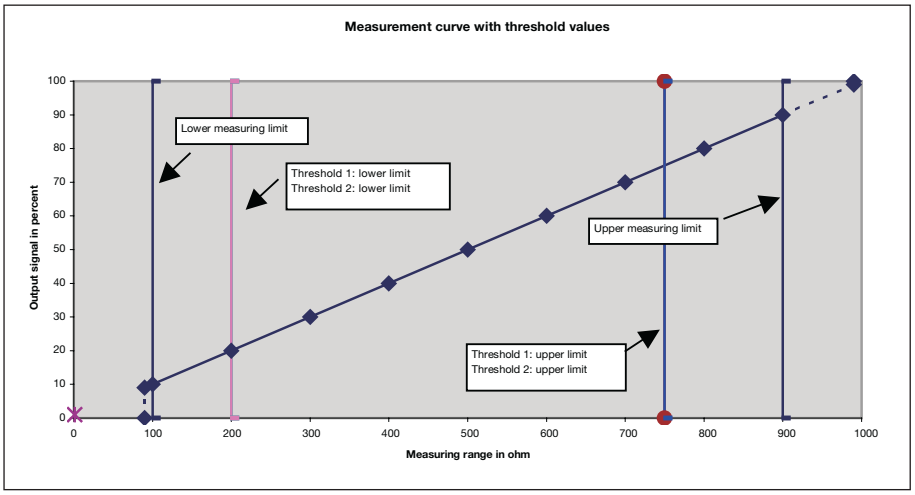



Fig. 29: Measurement curve for the humidity sensor with threshold values

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:**

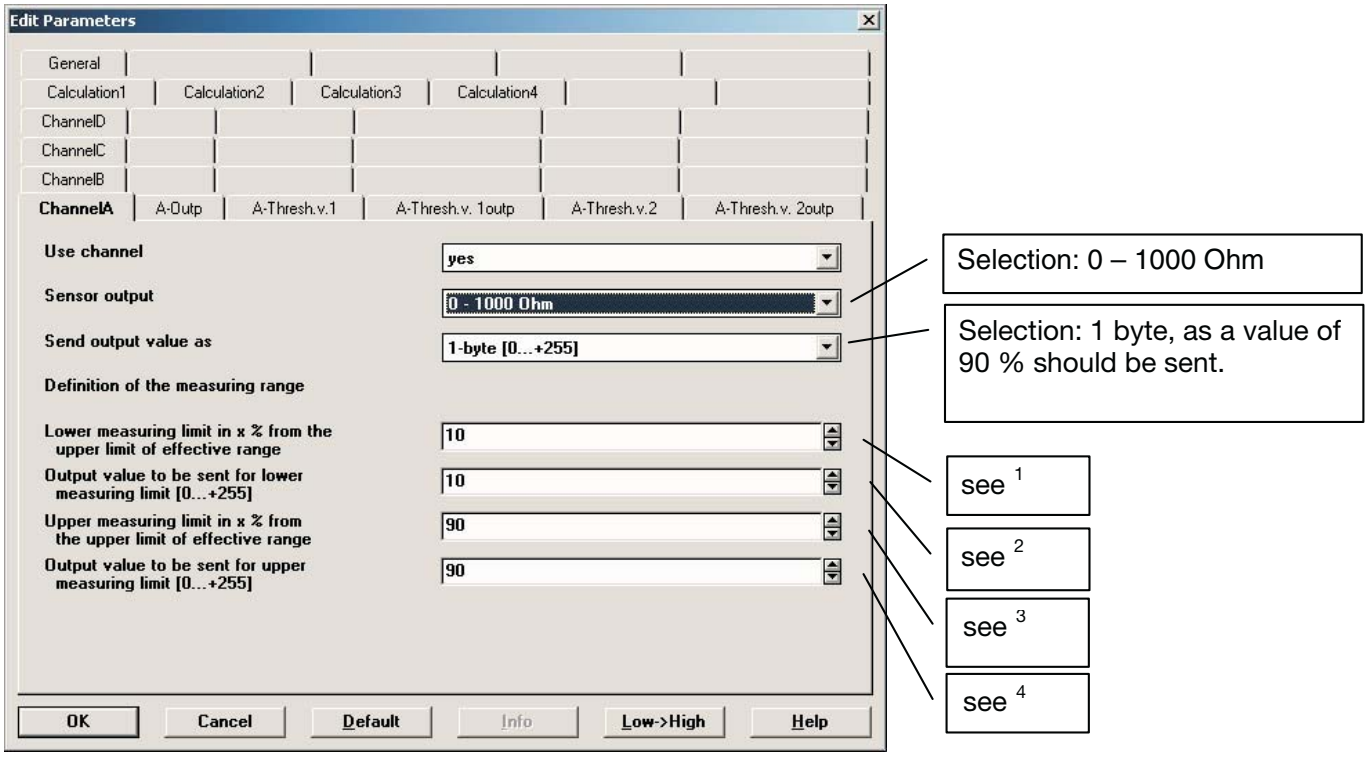



Fig. 30: Parameter window “Channel A – 0 - 1000 ohm”

[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:**

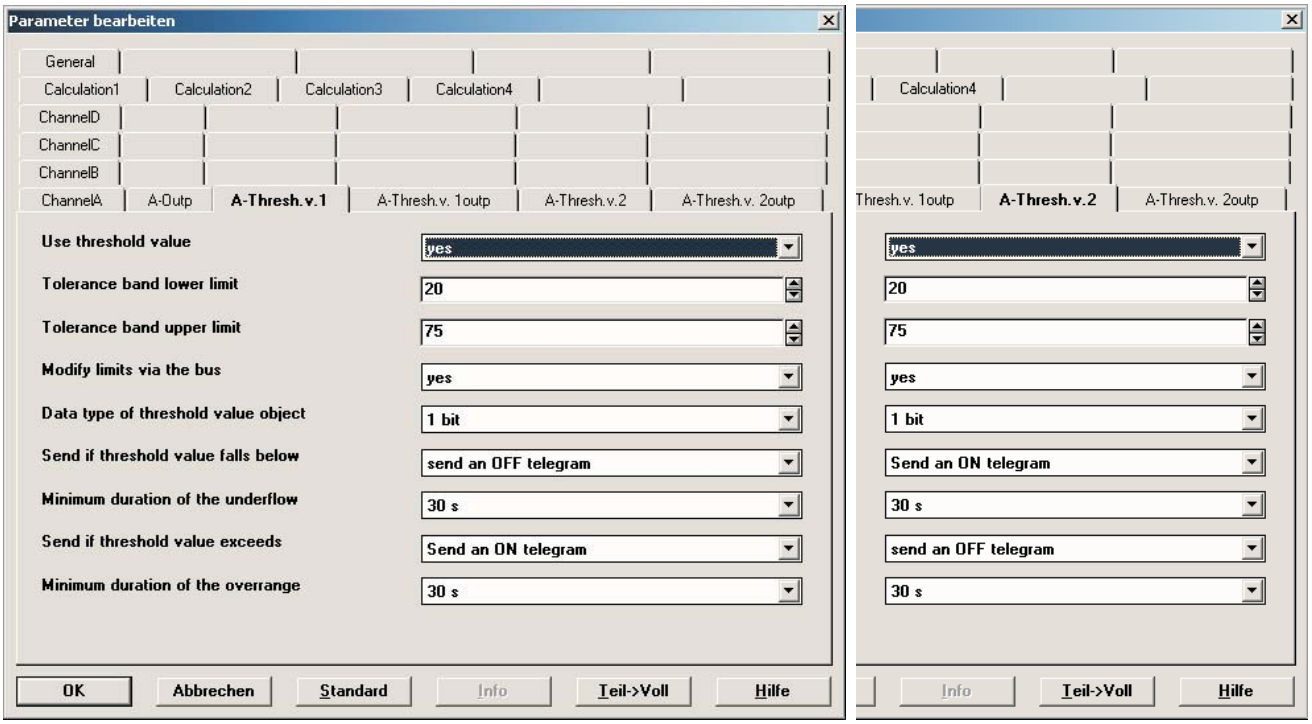



Fig. 31: Parameter window “Channel A – 0 – 1000 ohm, threshold 1 and 2”

## 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 $mm^2$. 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.

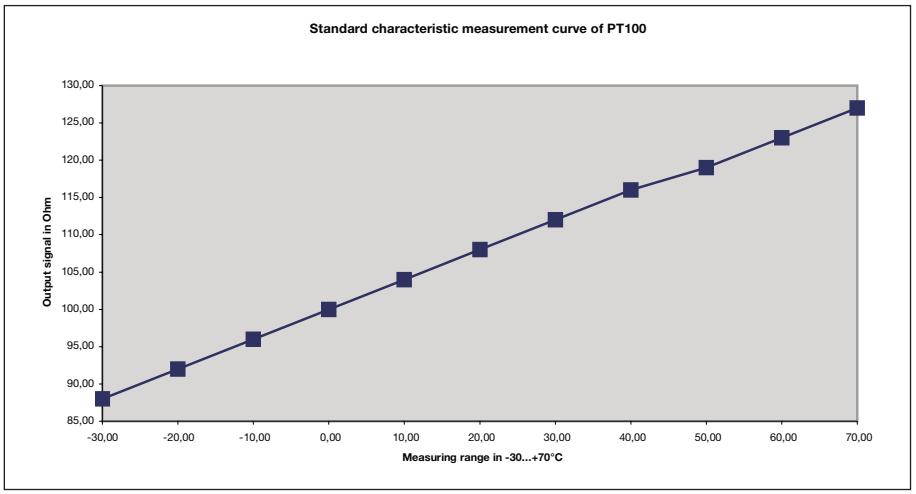



Fig. 32: Measurement curve for the standard PT100 with threshold values. Values are rounded.

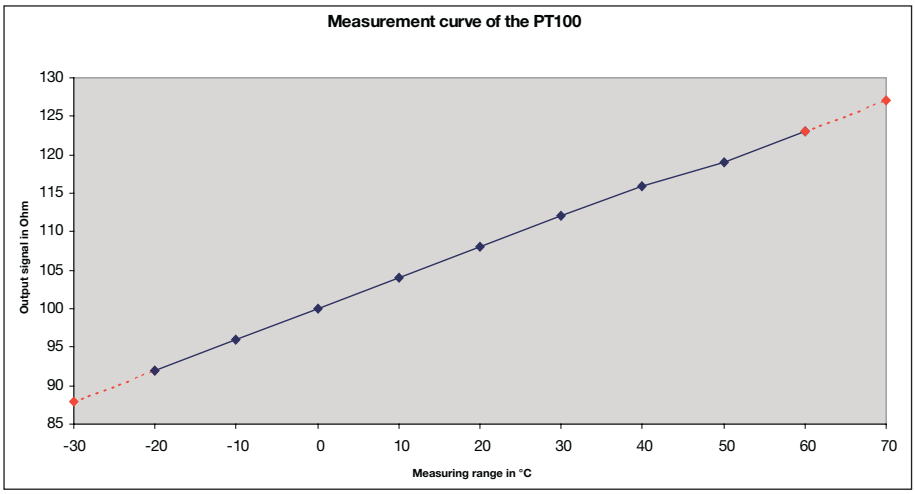



Fig. 33: Measurement curve for the PT100

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 °C. This example shows that the resistance values of < – 20 °C and > + 60 °C do not correspond to the standard resistance values.

### Measurement curve taking all specifications into account:

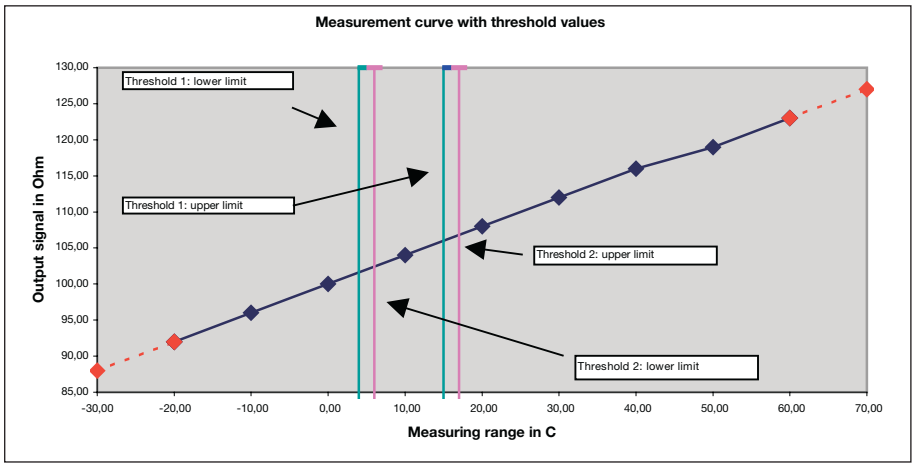



Fig. 34: Measurement curve for the PT100 with threshold values

### Settings for the Channel A parameter window:

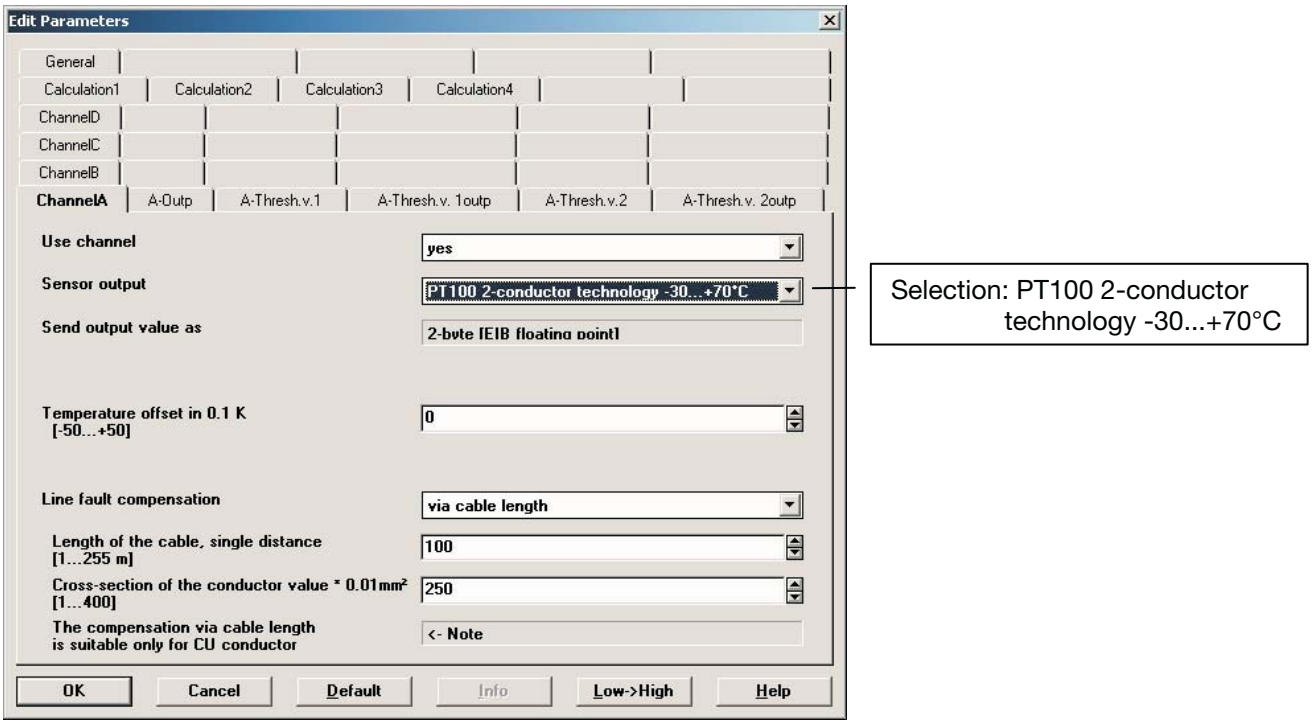



Fig. 35: Parameter window “Channel A – PT100 2-conductor technology – 30...+ 70 °C”

### Settings for threshold values 1 and 2:

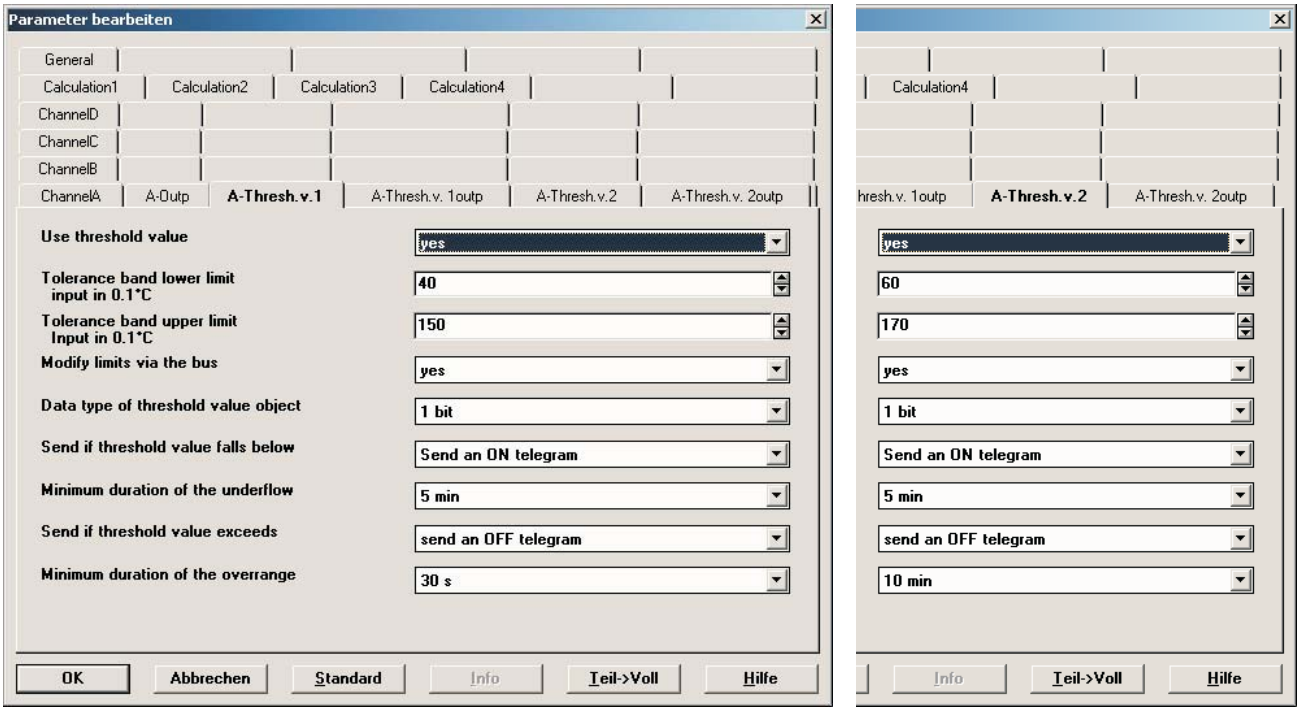



Fig. 36: Parameter window “Channel A – PT100 2-conductor technology – 30...+ 70 °C, threshold 1 and 2”

## 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:

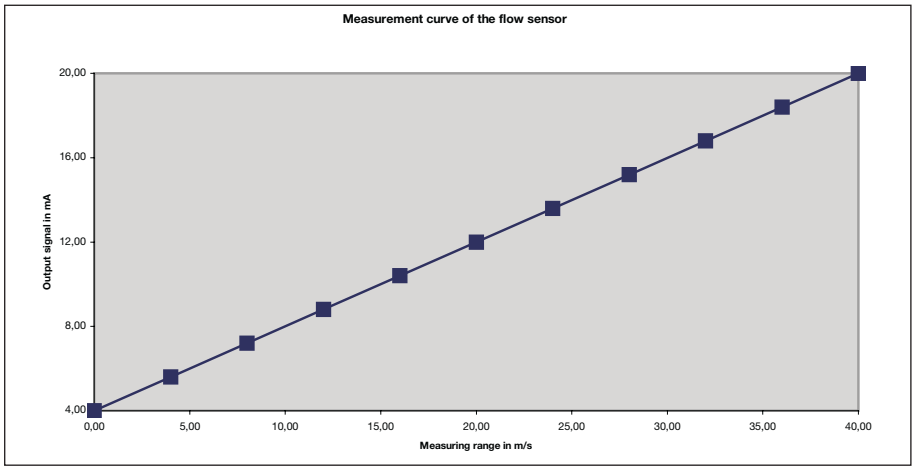



Fig. 37: Measurement curve for the flow sensor

### Measurement curve taking all specifications into account:

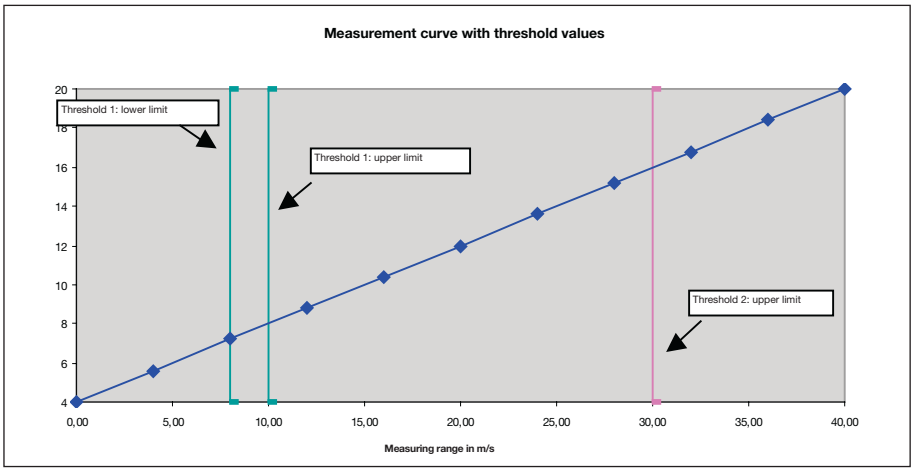



Fig. 38: Measurement curve for the flow sensor with threshold values

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:

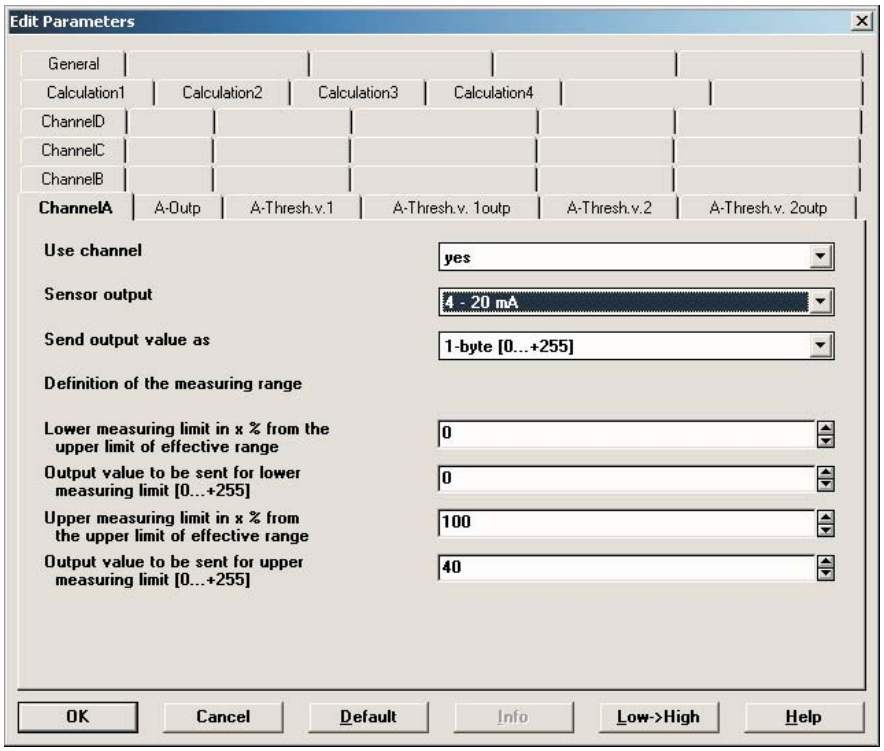



Fig. 39: Parameter window “Channel A, 4 - 20 mA”

### Settings for threshold values 1 and 2:

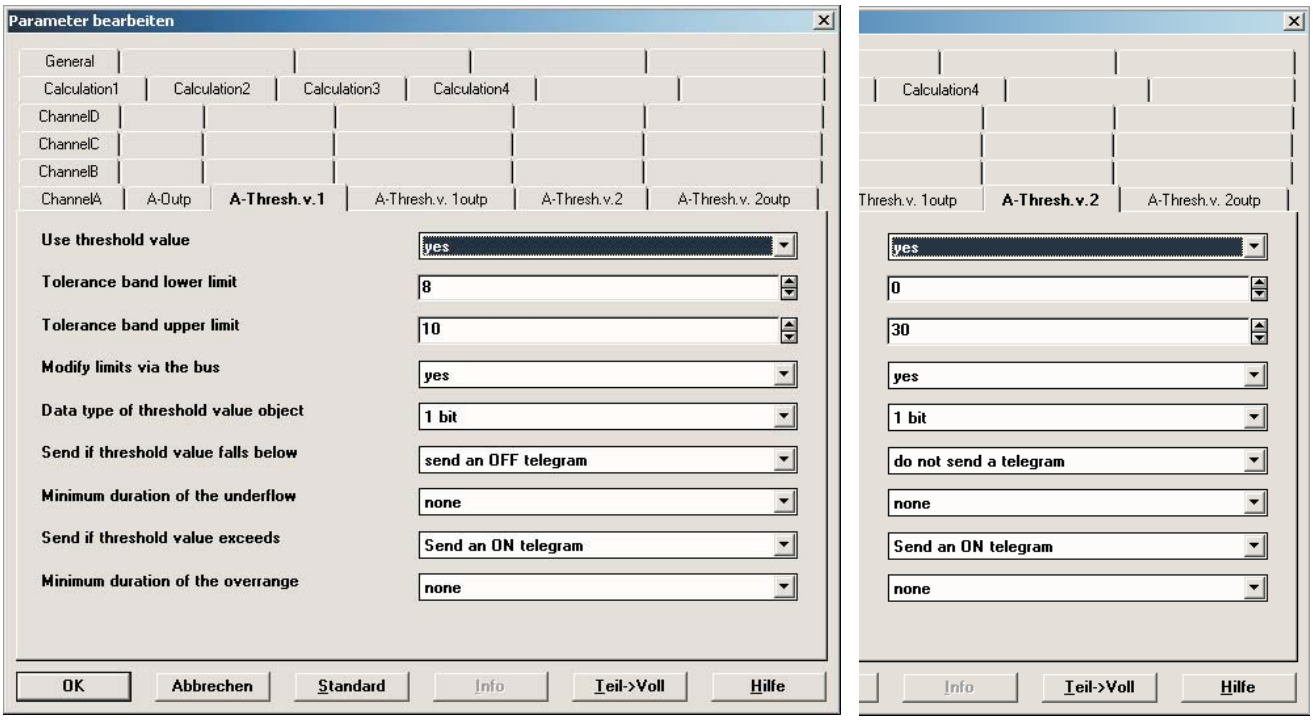



Fig. 40: Parameter window “Channel A, 4 – 20 mA, threshold 1 and 2”

# 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 Communication object measured value out of range

**When is the communication object measured value out of range sent?**

Measured value out of range is sent if the measured value exceeds the lower threshold by about 5 %. This only applies if the lower limit is not equal to 0. If the lower value is 0 it is not possible to determine an undershoot.

Measured value out of range is sent if the measured value upper limit is exceeded by 5 % or if the physical input variable of the analog input can no longer be detected (overflow).

**Is sent if exceed or undershot by 10 %?**

The measured value is kept down if the measured value exceeds the lower threshold by about 10 %. This only applies if the lower limit is not equal to 0. If the lower value is 0 it is not possible to determine an undershoot.

The measured value is kept up if the measured value upper limit is exceeded by 10 % or if the physical input variable of the analog input can no longer be detected (overflow).

**Which exception applies for the PT100 sensor input?**

With the calculation of the maximum and minimum output values the PT100 sensor input is an exception. Here the lower limit of – 10 % or upper limit + 10 % applies.

The smallest measurable resistance is about 88 ohms and corresponds to about – 30°C. The largest measurable resistance is about 130 ohms and corresponds to about 78°C. The measured resistance is subtracted from the programmable line resistance. Then any possible programmable temperature offset is added. The following differences result depending on the parameterization of the line resistance‘s and the temperature offset Minimum and maximum values.

If the measurement limits are achieved, the communication object “measured value out of range” is set to “1” without further tolerance.

The table shows the maximum limits, see 100 % usage of the measurement range.

| 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) |
|---|---|---|---|---|---|---|---|---|---|
| Undershotout of range (5 %) | no | no | no | < 0.95 V | 0 mA | < 3.8 mA | no | – 31°C | <– 202°C |
| 10 % and higher | 0 V | 0 V | 0 V | 0,9 V | 0 mA | 3.6 mA | 0 Ohm | – 31°C | – 205°C |
| Overshotout of range (about 5 %) | > 1.05 V | > 5.25 V | > 10.5 V | > 10.5 V | 20.28 mA | 20.28 mA | 1050 Ohm | + 79°C | >+ 816°C |
| about 10 % and higher | 1.06 V | 5.3 V | 10.6 V | 10.6 V | 20.28 mA | 20.28 mA | 1100 Ohm | + 79°C | + 878°C |

Table 10: Communication object measured value out of range

**An example:**
If the measurement range is not fully used, the conditions for the measured value out of range communication object change. A sensor with the following properties should be connected to the analog input.

| | |
|---|---|
| Signalausgang: | 0 – 1000 Ohm |
| Signal output: | 0 – 1000 ohms |
| Measurement range: | 0…100 % |
| Measurement curve: | linear |
| Defined measurement range: | less than 10 % and over 90 % should not be evaluated, i.e. upper measurement limit is about 90 % (900 ohms). |

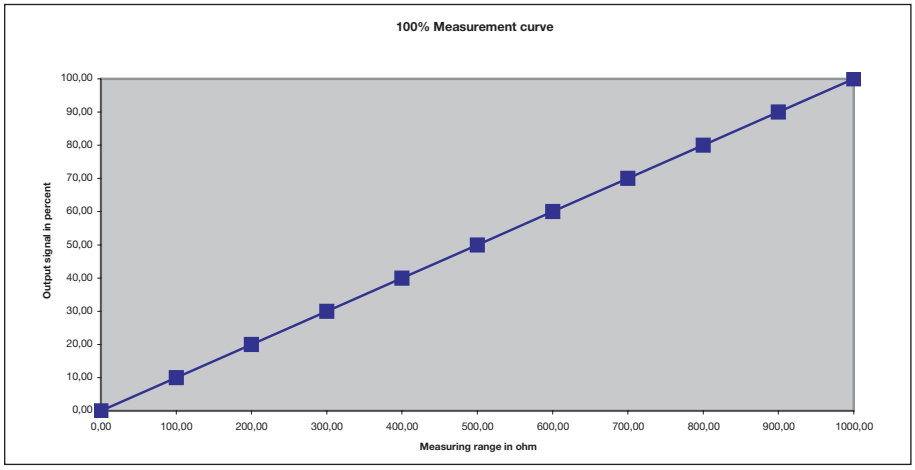



Fig. I: 100% Measurement curve

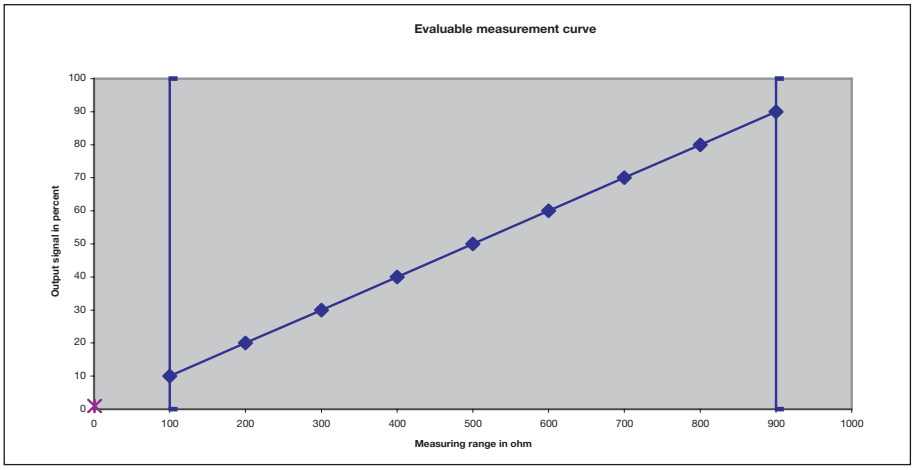



Fig. II: Evaluable measurement curve

**Upper measurement limit:**
At more than 5 %, i.e. 5 % of 90 % => 4.5 % = 94.5 % => 945 ohms.
If 94.5 % is exceeded, the measured value out of range communication object sends.

Up to the measured limit of 10 % the respective value is sent.

At more than 10 %, i.e. 10 % of 90 % => 9 % = 99 % => 990 ohms.
If 99 % is exceeded, 99 % is still sent.

**Lower measurement limit:**

At less than 5 %, i.e. 5 % of 10 % => 0.5 % = 9.5 % => 95 ohms. If 9.5 % is undershot, the measured value out of range communication object sends.

Up to the measured limit of 10 % the respective value is sent.

At less than 10 %, i.e. 10 % of 10 % => 1 % = 9 % => 90 ohms. If 9 % is undershot, 9 % is still sent.

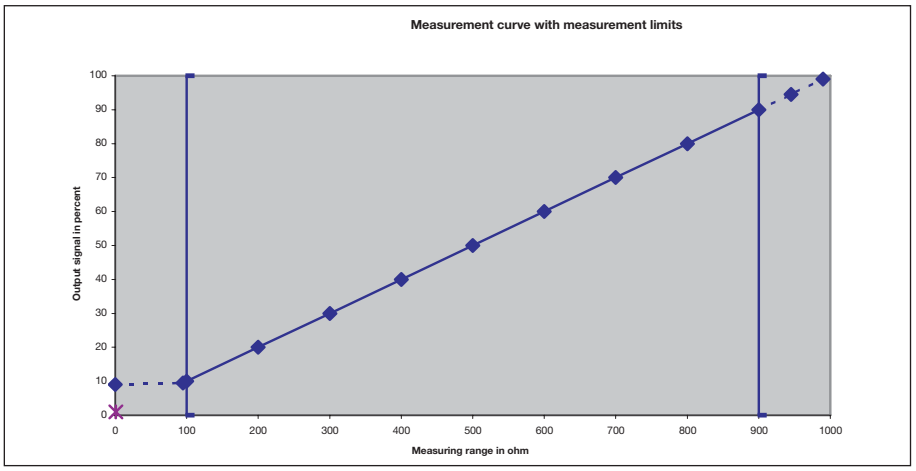



Fig. III: Measurement curve with measurement limits

## A.3 Truth table for the “Status byte – System” communication object

| Bit no. | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8-bit value | 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 | |
| 168 | A8 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | |
| 169 | A9 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | |
| 170 | AA | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | |
| 171 | AB | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | |
| 172 | AC | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | |
| 173 | AD | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | |
| 174 | AE | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | |
| 175 | AF | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | |
| 176 | B0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | |
| 177 | B1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | |
| 178 | B2 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | |
| 179 | B3 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | |
| 180 | B4 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | |
| 181 | B5 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | |
| 182 | B6 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | |
| 183 | B7 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | |
| 184 | B8 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | |
| 185 | B9 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | |
| 186 | BA | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | |
| 187 | BB | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | |
| 188 | BC | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | |
| 189 | BD | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | |
| 190 | BE | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | |
| 191 | BF | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 192 | C0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 193 | C1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | |
| 194 | C2 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | |
| 195 | C3 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | |
| 196 | C4 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | |
| 197 | C5 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | |
| 198 | C6 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | |
| 199 | C7 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | |
| 200 | C8 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 201 | C9 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | |
| 202 | CA | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | |
| 203 | CB | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | |
| 204 | CC | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | |
| 205 | CD | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | |
| 206 | CE | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | |
| 207 | CF | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | |
| 208 | D0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | |
| 209 | D1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | |
| 210 | D2 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | |
| 211 | D3 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | |
| 212 | D4 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | |
| 213 | D5 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| 214 | D6 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | |
| 215 | D7 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | |
| 216 | D8 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | |
| 217 | D9 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | |
| 218 | DA | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | |
| 219 | DB | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | |
| 220 | DC | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | |
| 221 | DD | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | |
| 222 | DE | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | |
| 223 | DF | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | |
| 224 | E0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | |
| 225 | E1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | |
| 226 | E2 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | |
| 227 | E3 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | |
| 228 | E4 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | |
| 229 | E5 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | |
| 230 | E6 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | |
| 231 | E7 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | |
| 232 | E8 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | |
| 233 | E9 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | |
| 234 | EA | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | |
| 235 | EB | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | |
| 236 | EC | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | |
| 237 | ED | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | |
| 238 | EE | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | |
| 239 | EF | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | |
| 240 | F0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | |
| 241 | F1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | |
| 242 | F2 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | |
| 243 | F3 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | |
| 244 | F4 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | |
| 245 | F5 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | |
| 246 | F6 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | |
| 247 | F7 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | |
| 248 | F8 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | |
| 249 | F9 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | |
| 250 | FA | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | |
| 251 | FB | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | |
| 252 | FC | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | |
| 253 | FD | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | |
| 254 | FE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| 255 | FF | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |

## A.4 List of diagrams



## A.5 List of tables

## A.6 Index

## A.7 Ordering information

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

Table 11: Ordering information for Analogue Input, 4-fold, MDRC

### A.8 Notes

The information in this leaflet is subject to change without further notice.

Pub. No. 2CDC 504 033 D0203
replace 2CDC 504 033 D0202

**Your EIB-Partner**