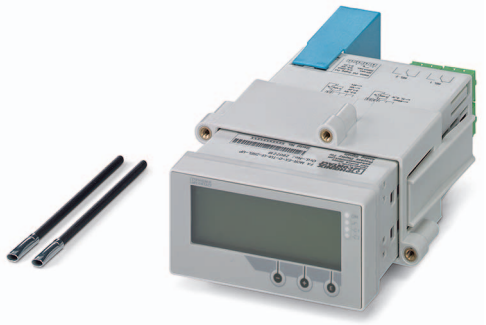
FA MCR(-EX)-D-TUI-UI-2REL-UP

Multifunctional (Ex i) process indicator



Data sheet
106945_en_00

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1 Description

The device is a multifunctional (Ex i) process indicator in control panel housing for monitoring, displaying, and transmitting analog measurement data from the Ex area to the safe area.

The device displays analog measurement variables and evaluates them.

The integrated transmitter power supply allows you to feed sensors with two conductors.

The universal inputs enable the connection of the following measured variables:

- Current
- Voltage
- RTDs
- TCs

You can monitor limits and control relays.

The analog output allows you to transmit process signals.

A color change in the event of a fault supports the detection of alarm conditions.

Features

- 5-digit, 7-segment LC display, backlit
- 1 universal input
- 2 relays
- Minimum and maximum value storage
- Linearization table
- Digital status output (open collector)
- 1 analog output

Make sure you use the latest documentation.
It can be downloaded at phoenixcontact.net/products.

This document is valid for the products listed in Section “Ordering data” on page 4.

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2 Ordering data

Products

Description	Type	Item No.	Pcs./Pkt.
Ex i, Process indicator, multifunctional, component housing in the control panel for monitoring and displaying analog measurement data. Universal inputs enable the connection of current, voltage, RTDs, and TCs. 2 relay change-over contact outputs and 1 analog output. HART	FA MCR-EX-D-TUI-UI-2REL-UP	2907216	1
Process indicator, multifunctional, in control panel component housing for monitoring and displaying analog measurement data. Universal inputs enable the connection of current, voltage, RTDs, and TCs. 2 relay change-over contact outputs and 1 analog output.	FA MCR-D-TUI-UI-2REL-UP	2907064	1

Accessories

Description	Type	Item No.	Pcs./Pkt.
Interface cable	MCR-PAC-T-USB	2309000	1
The DIN rail mounting frame can be used to mount a display on a DIN rail, e.g., in the control cabinet. The DIN rail mounting frame can be used with the following digital displays: FA MCR-(EX)-DS-I-I-OLP, FA MCR-(EX)-D-TUI-UI-2REL-UP	FA MCR-D-RM	1032996	1
FDT framework application	M&M fdtContainer.<version>.zip	-	-
DTM library	DTM-SUITE-INTERFACE_<version>.zip	-	-

3 Technical data

Universal input current	
Input signal current	0 mA ... 20 mA +10% 4 mA ... 20 mA +10%
Maximum input signal current	<150 mA
Input resistance of current input	10 Ω
Transmitter supply voltage	>14 V (22 mA)
Transmitter supply voltage range	22.8 V ... 27.6 V (no-load)
Transmitter supply current	<30 mA (short circuit and overload protection)

Universal input voltage	
Input signal voltage	0 V ... 10 V 2 V ... 10 V 0 V ... 5 V 0 V ... 1 V 1 V ... 5 V -1 V ... 1 V -10 V ... 10 V -30 V ... 30 V -100 mV ... 100 mV
Maximum input signal voltage	±35 V (≥1 V) ±12 V (<1 V)
Input resistance of voltage input	>1 MΩ

Resistance of universal input	
Resistance	30 Ω ... 3000 Ω

Universal input of resistance thermometers	
Resistance thermometer	Pt, Ni, Cu sensors
Connection technology	2, 3, 4-conductor
Temperature measuring range	-200°C ... 1100°C (range depends on sensor type, range freely adjustable via front keyboard or software)
Measuring rate	200 ms

Universal input of thermocouples	
Thermocouple sensors	J, K, T, N, B, S, R, U, L, C, D
Temperature measuring range	-200°C ... 2495°C (range depends on sensor type, range freely adjustable via front keyboard or software)
Measuring rate	200 ms

Current output	
Output signal current	0 mA ... 20 mA
	4 mA ... 20 mA
Maximum output signal current	<22 mA
Ripple	<10 mV_{PP} (500 Ω)
Load/output load of output current	≤500 Ω (22 mA)
D/A resolution	13 bit
Typical temperature coefficient	0.01%/K

Voltage output	
Output signal voltage	0 V ... 10 V
	2 V ... 10 V
	0 V ... 5 V
	1 V ... 5 V
Maximum output signal voltage	<11 V
Ripple	<10 mV_{PP} (1000 Ω)
No-load voltage	24 V DC (+15% / -5%)
Short-circuit current	<25 mA
D/A resolution	13 bit
Typical temperature coefficient	0.01%/K

Relay output	
Contact type	2 changeover contacts
Minimum switching voltage	12 V
Maximum switching voltage	30 V DC (3 A)
	230 V AC (3 A)
Switching cycles, maximum	>1,000,000
Minimum switching current	10 mA
Maximum switching current	3 A

Transistor output, active	
Output description	Open collector output
Contact type	Transistor
Maximum switching voltage	28 V
Maximum switching current	200 mA

T-PORT interface	
Connection method	4-pos. socket

Connection data	Pluggable spring terminals	Screw connection
Connection name	**Input, output, status**	**Relay, power supply**
Conductor cross-section, solid	0.14 mm² ... 1.5 mm²	0.2 mm² ... 2.5 mm²
Conductor cross-section, flexible	0.14 mm² ... 1.5 mm²	0.2 mm² ... 2.5 mm²
Conductor cross-section [AWG]	26 ... 16	24 ... 12
Tightening torque	-	0.4 Nm
Stripping length	10 mm	10 mm

General data	
Supply voltage range	24 V AC/DC ... 230 V AC/DC (-20% ... +10%, 50 Hz ... 60 Hz)
Power consumption	≤6.9 W
Ambient temperature range	
Operation	-20°C ... 60°C
Storage/transport	-40°C ... 85°C
Humidity	Front: condensation permitted
Maximum altitude for use above sea level	<2,000 m
Dimensions W / H / D	96 mm / 48 mm / 151.8 mm (Item No.: 2907064) 96 mm / 48 mm / 175 mm (Item No.: 2907216)
Mounting position	Maximum viewing angle range +/-45° from the center axis of the display in every direction
Panel cutout	92 mm x 45 mm
Protection class	I
Degree of protection	IP65 on the front

Electrical isolation	
Electrical isolation between input and all other circuits	375 V
Electrical isolation between output and all other circuits	375 V
Pollution degree	2
Overvoltage category	II
Test voltage relay/relay	2500 V
Test voltage relay to input/output/power supply	2500 V
Test voltage input/output	1500 V
Test voltage input/power supply	2500 V
Test voltage output/power supply	2500 V

Compliance / Approvals	
Compliance	CE compliant
ATEX	
PTB 15 ATEX2011	Ⓔx II (1) G [Ex ia Ga] IIC (Item No.: 2907216)
PTB 15 ATEX2011	Ⓔx II (1) D [Ex ia Da] IIIC (Item No.: 2907216)
UL, USA / Canada	UL 61010 Recognized
Shipbuilding approval	
DNV GL TAA000029G	
Temperature	B
Humidity	B
Vibration	A
EMC	B
Enclosure	B (front) / A (rear)
CSA	CSA GP (Item No.: 2907064)
	See control drawing in the packing slip (Item No.: 2907216)
FM	See control drawing in the packing slip (Item No.: 2907216)
Noise emission	IEC 61326, class A
Immunity	IEC 61326 / NAMUR NE 21

3.1 Safety-related data FA MCR-EX-D-TUI-UI-2REL-UP (Item No.: 2907216)

Technical data intrinsic safety

Supply circuit Terminals L/+, N/-, PE		U_m = 20 ... 253 V AC/DC 50/60 Hz	
Impulse and current output Terminals 4.3, 4.4		4 ... 20 mA U_m = 250 V	
Open collector Terminals 4.1, 4.2		U_m = 30 V I_{max} = 200 mA	
Relay output Terminals R.11, R.12, R.13 Terminals R.21, R.22, R.23		 U_{max} ≤ 250 V AC U_{max} ≤ 30 V DC	 I_{max} ≤ 3 A I_{max} ≤ 3 A
INTERFACE T-PORT		U = 5 V U_m = 250 V	
Temperature range		T_a = -20 ... +60 °C	
2-wire transmitter power supply (intrinsically safe) Terminals 1.1, 1.2, 1.4, 2.4 Internal capacitance Internal inductance		U_o ≤ 27.3 V I_o ≤ 96.5 mA P_o ≤ 659 mW C_i = 8 nF L_i = 75 µH	
Max. connection values	Ex ia IIC Ex ia IIB Ex ia IIA	C_o ≤ 88 nF C_o ≤ 683 nF C_o ≤ 2280 nF	L_o ≤ 4 mH L_o ≤ 17 mH L_o ≤ 34 mH
RTD temperature input (intrinsically safe) Terminals 2.1, 2.2, 2.3, 2.4 and 1.2, 1.4 Internal capacitance Internal inductance		U_o ≤ 27.3 V I_o ≤ 22.1 mA P_o ≤ 151 mW C_i = 8 nF L_i = 75 µH	
Max. connection values	Ex ia IIC Ex ia IIB Ex ia IIA	C_o ≤ 85 nF C_o ≤ 360 nF C_o ≤ 530 nF	L_o ≤ 500 µH L_o ≤ 2 mH L_o ≤ 5 mH
Thermocouple temperature input (intrinsically safe) **Voltage input <1 V** Terminals 2.3, 2.4 Internal capacitance Internal inductance		U_o ≤ 27.3 V I_o ≤ 15.5 mA P_o ≤ 105.8 mW U_i ≤ 28 V I_i ≤ 100 mA P_i ≤ 650 mW C_i = 8 nF L_i = 75 µH	
Max. connection values	Ex ia IIC Ex ia IIB Ex ia IIA	C_o ≤ 74 nF C_o ≤ 370 nF C_o ≤ 530 nF	L_o ≤ 1 mH L_o ≤ 2 mH L_o ≤ 100 mH
4-wire current input (intrinsically safe) Terminals 1.4, 2.4 Internal capacitance Internal inductance		U_o ≤ 27.3 V I_o ≤ 5 mA P_o ≤ 34.2 mW U_i ≤ 28 V I_i ≤ 100 mA P_i ≤ 650 mW C_i = 8 nF L_i = 75 µH	
Max. connection values	Ex ia IIC Ex ia IIB Ex ia IIA	C_o ≤ 88 nF C_o ≤ 380 nF C_o ≤ 540 nF	L_o ≤ 500 µH L_o ≤ 2 mH L_o ≤ 100 mH
Voltage input (intrinsically safe) Terminals 1.3, 2.4 Internal capacitance Internal inductance		U_o ≤ 27.3 V I_o ≤ 5 mA P_o ≤ 34.2 mW U_i ≤ 28 V I_i ≤ 100 mA P_i ≤ 650 mW C_i = 8 nF L_i = 75 µH	
Max. connection values	Ex ia IIC Ex ia IIB Ex ia IIA	C_o ≤ 88 nF C_o ≤ 380 nF C_o ≤ 540 nF	L_o ≤ 500 µH L_o ≤ 2 mH L_o ≤ 100 mH

4 Safety notes

4.1 FA MCR-D-TUI-UI-2REL-UP (Item No.: 2907064)

4.1.1 Installation notes

- Installation, operation, and maintenance may only be carried out by qualified personnel. Follow the installation instructions as described.
- When installing and operating the device, observe the applicable regulations and safety directives (including national safety directives), as well as the generally recognized technical regulations.
- Observe the safety information, conditions, and limits of use specified in the product documentation. Comply with them.
- Do not open or make changes to the device.
- Do not repair the device yourself; replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from non-compliance.
- The device complies with the EMC regulations for industrial areas (EMC class A). When used in residential areas, the device may cause radio interference.
- The device is intended for installation in a control panel and may only be operated when installed.
- The IP20 degree of protection (IEC/EN 60529) of the device rear side specifies that it is intended for use in a clean and dry environment. Do not subject the device to mechanical and/or thermal stress that exceeds the specified limits.
- The device must be stopped if it is damaged, was subjected to an impermissible load, was stored incorrectly, or if it malfunctions.

4.2 FA MCR-EX-D-TUI-UI-2REL-UP (Item No.: 2907216)

4.2.1 Installation notes

- The device is an item of associated equipment (category 1) with “intrinsic safety” type of protection and may only be installed outside of potentially explosive areas. It satisfies the requirements of the following standards.

  EN 60079-0, EN 60079-11

  For detailed information, please refer to the declarations of conformity.
- Installation, operation, and maintenance may only be carried out by qualified personnel. Follow the installation instructions as described.
- When installing and operating the device, observe the applicable regulations and safety directives (including national safety directives), as well as the generally recognized technical regulations.
- Observe the safety information, conditions, and limits of use specified in the product documentation. Comply with them.
- Do not open or make changes to the device.
- Do not repair the device yourself; replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from non-compliance.
- The device complies with the EMC regulations for industrial areas (EMC class A). When used in residential areas, the device may cause radio interference.
- The device is intended for installation in a control panel and may only be operated when installed.
- The IP20 degree of protection (IEC/EN 60529) of the device rear side specifies that it is intended for use in a clean and dry environment. Do not subject the device to mechanical and/or thermal stress that exceeds the specified limits.
- The device must be stopped if it is damaged, was subjected to an impermissible load, was stored incorrectly, or if it malfunctions.

4.2.2 Intrinsic safety

- The device is approved for intrinsically safe (Ex i) circuits up to zone 0 (gas) and zone 20 (dust) of the Ex area. The safety values of the intrinsically safe equipment and of the connecting cables must be observed during connection (IEC/EN 60079-14) and must comply with the values specified in these installation notes or the EC examination certificate.
- When installing the device, ensure that a distance of at least 50 mm (safety distance) to the intrinsic safety clamps is maintained. To do so, use the spacer.
- During measurements on the intrinsically safe side, the relevant regulations with regard to the connection of intrinsically safe equipment must be observed. Only use measuring devices approved for intrinsically safe circuits.
- If the device has been used in non-intrinsically safe circuits, it must not be used again in intrinsically safe circuits. The device must be clearly marked as non-intrinsically safe.

4.2.3 Areas with a danger of dust explosions

- The device is not suitable for installation in zone 22.
- If, however, you wish to use the device in zone 22, it must be installed in housing that complies with IEC/EN 60079-31. When doing so, observe the maximum surface temperatures. Observe the requirements of IEC/EN 60079-14.
- Connection to the intrinsically safe circuit in areas with a danger of dust explosions of zones 20, 21, or 22 is only permitted if the equipment connected to this circuit is approved for this zone (e.g., category 1D, 2D, or 3D).

4.3 Occupational safety

When working on and with the device, wear the required personal safety equipment as stipulated by national regulations.

4.4 Operational safety

Risk of injury

– Only operate the device when it has no errors and is in an operationally safe condition.
– The operator is responsible for error-free operation of the device.

4.5 Product safety

This measuring device has been built and tested for operational safety in accordance with the latest technology and good engineering practice. The device left the factory in a safe and error-free condition.

The device fulfils general safety and legal requirements.

The device complies with the EC directives that are listed in the device-specific EC declaration of conformity. By affixing the CE mark, Phoenix Contact confirms this situation.

5 Scope of supply

The scope of supply of the process indicator consists of:

– Process display for panel mounting
– Packing slip with installation and safety notes and initial startup
– Fastening material

6 Installation

6.1 Transport and storage

Please note the following points:

- Pack the device for storage and transport so that it is protected against shock. The original packaging provides optimum protection for this.
- The permissible storage temperature is -40°C … 85°C (-40°F … 185°F). The period for storage in the range of the temperature limits is restricted (48 hours, maximum).

6.2 Installation conditions

NOTE: Reduction of the display service life due to high temperatures

You must ensure sufficient cooling of the device to prevent heat accumulation.

Do not operate the device in the upper temperature limit range over long periods.

The process display has been designed for use in a control panel.

The mounting position is determined by the readability of the display. The connections and outputs are located on the back. You can connect the conductors via coded terminal blocks.

Operating temperature range:

– Non-Ex: -20°C … 60°C (–4°F … 140°F)
– UL: –20°C … 50°C (-4°F … 122°F)

6.3 Installation dimensions

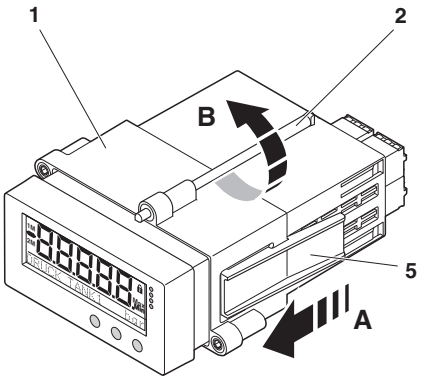
Use the Ex frame provided for devices with Ex approval. Observe the installation depth of 175 mm (6.89 in) for devices including terminal blocks and mounting clamps.

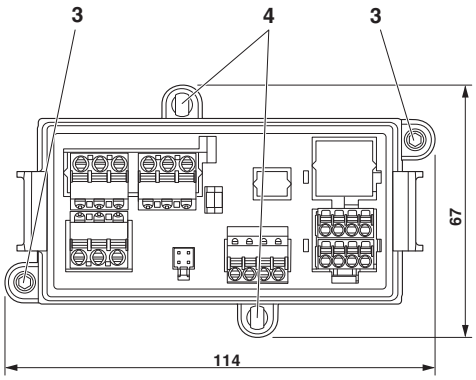
– Panel cutout: 92 mm x 45 mm (3.62 in x 1.77 in)
– Panel thickness: max. 26 mm (1 in)
– Maximum viewing angle: 45° to the left and right from the center axis of the display
– If you install several device alongside or above one another, observe the mechanical clearance that is determined by the housing and the front part.

6.4 Mounting

6.4.1 FA MCR-D-TUI-UI-2REL-UP (Item No.: 2907064)

The required panel cutout is 92 mm x 45 mm
(3.62 in x 1.77 in).





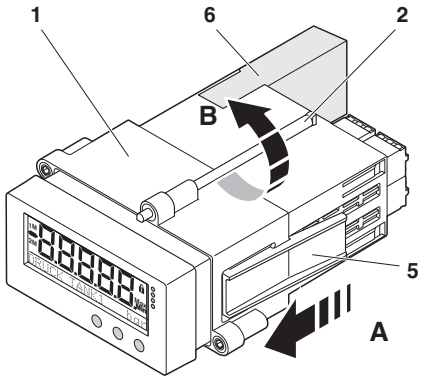
- Screw the threaded bolts (2) into the appropriate positions in the installation frame (1). Four opposing screw-in positions are available to choose from for this purpose (3 / 4).
- Push the device through the panel cutout from the front.
- To fasten the tube inside the control panel, hold the device in a horizontal position and push the installation frame (1) with the screwed-in threaded bolts over the tube until it locks into place (A).
- Then fasten the threaded bolts in order to affix the device (B).
- To remove the device, unlock the installation frame at the latches (5) and then pull it off.

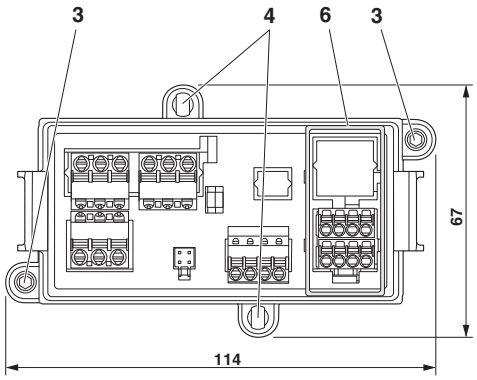
Installation check

- Is the molded seal of the housing intact?
- Is the installation frame firmly locked in place on the housing of the device?
- Are the threaded bolts fastened?
- Is the device centered inside the panel cutout?

6.4.2 FA MCR-EX-D-TUI-UI-2REL-UP (Item No.: 2907216)

The required panel cutout is 92 mm x 45 mm
(3.62 in x 1.77 in).





- Screw the threaded bolts (1) into the appropriate positions in the installation frame (2). Four opposing screw-in positions are available to choose from for this purpose (3 / 4).
- Push the device through the panel cutout from the front.
- To fasten the tube inside the control panel, hold the device in a horizontal position.
- Then push the installation frame (2) with the screwed-in threaded bolts over the tube until it locks into place (A).
- To secure the device, tighten the threaded bolts (B).

WARNING: Explosion hazard

When installing the device, ensure that a distance of at least 50 mm (safety distance) to the intrinsic terminals is maintained. To do so, use the spacer.

- Install the spacer (6) for the connection terminal blocks.
- To remove the device, unlock the installation frame at the latches (5) and then pull it off.

Installation check

- Is the molded seal of the housing intact?
- Is the installation frame firmly locked in place on the housing of the device?
- Are the threaded bolts fastened?
- Is the device centered inside the panel cutout?
- Is the spacer mounted?

7 Wiring

WARNING: Danger of electric shock!

Keep the device disconnected from the power supply when performing a task.

Connect the PE conductor before all other connections. An interrupted PE conductor connection may cause hazards.

Provide a switch or circuit breaker close to the device, which is marked as the disconnecting device for this device.

NOTE: Damage to the device due to incorrect wiring or overvoltage

Use suitable conductors for temperatures of 5°C (9°F) above ambient temperature.

Ensure compliance of the supply voltage with the indications on the rating plate before startup.

Overload protection (nominal current ≤10 A) is required for the mains connection.

Observe the labeling on the terminal blocks at the back of the device.

A mixed connection of SELV and voltage constituting a shock hazard to the relay is permitted.

8 Electrical connection

A measuring transducer supply is provided for the input. The measuring transducer supply is intended for the supply of 2-conductor sensors. It is electrically isolated from the system and from the outputs.

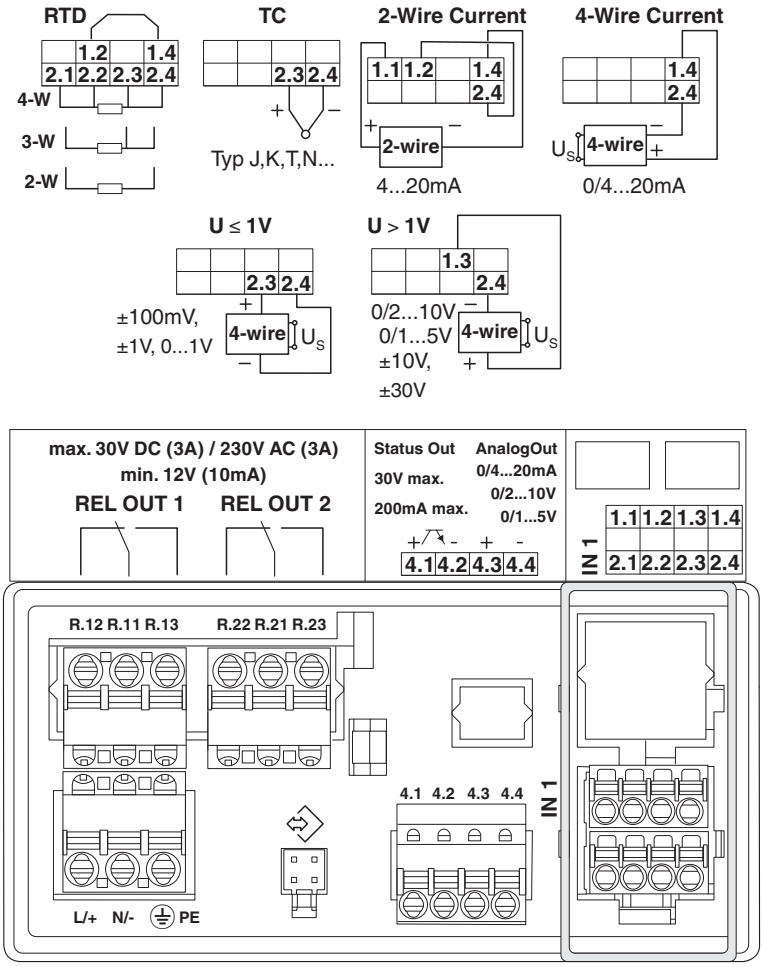


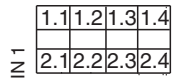
Figure 1 Connection assignment

NOTE: Damage to the device by high-energy transients

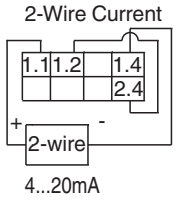
Provide suitable upstream surge protection.

8.1 Overview of connection options

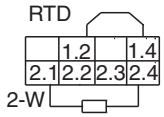
Analog input terminal designations

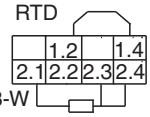


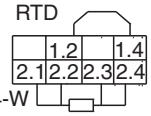
Measuring transducer supply connection

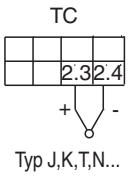


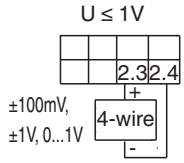
Analog input connection

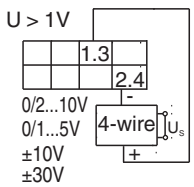


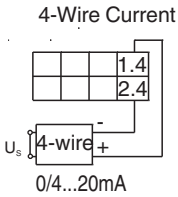




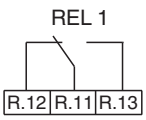


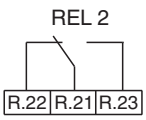




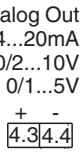


Relay connection

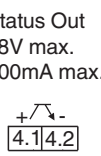




Analog output connection



Open collector status output connection

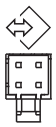


Power supply connection

24 … 230 V AC/DC (-20 % / +10 %) 50/60 Hz



Interface for configuration via PC software (T PORT)



8.2 Connection check

- Is there any damage to the device or cables?
- Does the supply voltage comply with the specifications on the rating plate?
- Are all terminal blocks firmly locked in place in their respective slots? Is the coding on the individual terminals correct?
- Is strain relief provided for the cables?
- Are the supply voltage and signal cables correctly installed?
- Is the spacer installed?
  (FA MCR-EX-D-TUI-UI-2REL Item No.: 2907216)

9 Configuration

The device is easy to operate. You can therefore commission it for many applications without the need for printed operating instructions.

You can configure the device conveniently with the FDT / DTM software solution. The software solution can be downloaded free of charge at the following address: phoenixcontact.net/products.

9.1 Operating elements

The device can be operated using the three integrated buttons on the front.



Element	Description
E	Open the configuration menu
	Confirm an entry
	Select a parameter or submenu available within a menu
- +	In the configuration menu:
	Step-by-step selection of the available parameters / menu items / characters
	Change of the selected parameter to the one above or below
	Outside of the configuration menu:
	Display the activated and computed channels as well as minimum and maximum values for all active channels

Menu items or submenus can always be exited at the end of each menu by selecting “x Back”.

If you press the “+” and “-” buttons simultaneously and hold them down (>3 s), you can exit the setup without saving the changes.

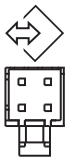
9.2 Configuration via software

CAUTION: Undefined switching of outputs and relays during configuration possible

Do not configure the device while a process is running.

Use the MCR-PAC-T-USB programming adapter (Item No.: 2309000) to connect the device to the PC.

PC software configuration interface



Connect the device to your PC to configure the device using the software solution. This requires the MCR-PAC-T-USB programming adapter (Item No.: 2309000) and the FDT / DTM software packages, which already contain the driver for the programming adapter.

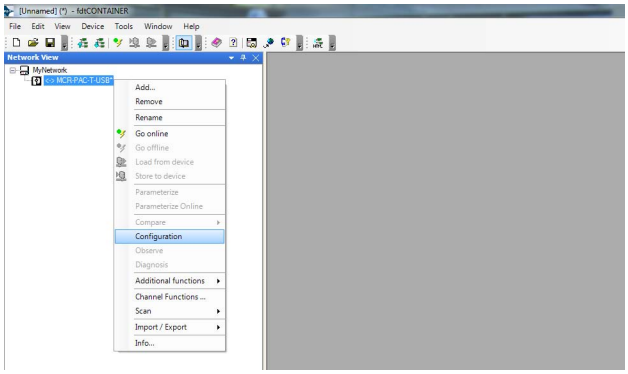
The software solution can be downloaded free of charge at the following address: phoenixcontact.net/products. Make sure to download and install both the FDT framework application and the DTM packet.

Setting the programming interface

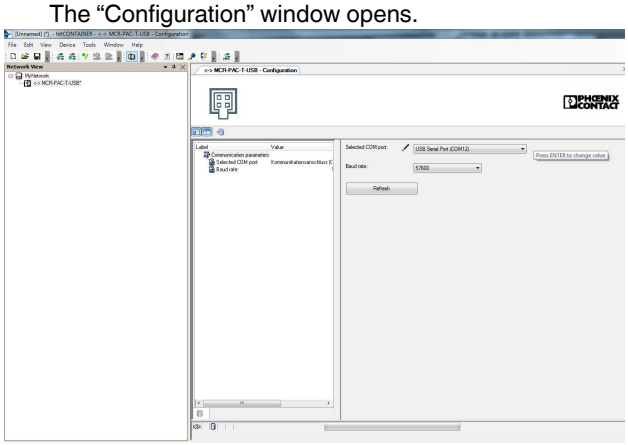
After installing the FDT / DTM packet with the programming interface driver for the first time, you have to select the programming interface in the configuration window once.

To do so, proceed as follows:

- Load the DTM for the MCR-PAC-T-USB programming adapter to your project.
- Right-click on the MCR-PAC-T-USB. Select “Configuration”.



The “Configuration” window opens.



- In the “Selected COM port” field, select the “USB Serial Port (COM xxx)” entry.
- Confirm your selection with “Enter”.
- Load the DTM of the display into your project.

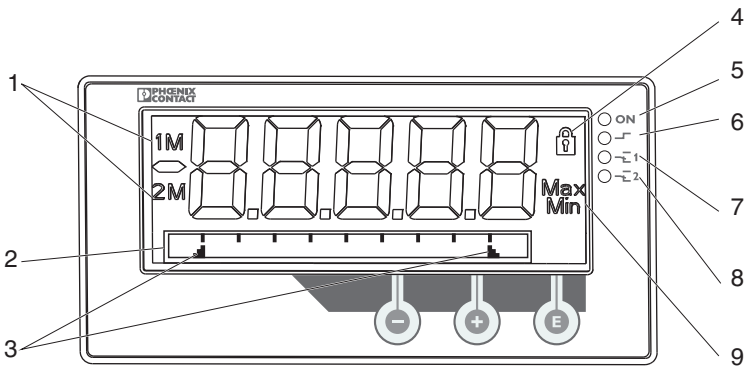
  Communication is established.

9.3 Display and device status display / LED

The device has a backlit LC display that is split into two areas. The segment area displays the value of the channel as well as additional information and alarms.

In display mode, additional channel information such as TAG, unit, or bar graph is displayed in the dot matrix area. During operation, operating text is displayed in English in this area.

The parameters for the display settings are explained in Section “Configuring the device” on page 24.



1 Channel display
2 Dot matrix display for TAG, bar graph, unit
3 Limit markers in the bar graph
4 Operation lock indication
5 LED green: Supply voltage is present
6 LED red: Error or alarm
7 LED gelb: Relay 1 has picked up
8 LED gelb: Relay 2 has picked up
9 Minimum/maximum value display

In the event of an error, the device automatically switches between displaying the error and the channel.

9.4 Symbols

9.4.1 Display symbols

Symbol	Description
	The device is locked / operation block. Parameters cannot be changed in the device setup. You can change the display.
1	Channel one (Analog in 1)
2	Not used
1M	First calculated value (Calc value 1)
2M	Not used
Max	Maximum value / value of the drag pointer for the channel displayed
Min	Minimum value / value of the drag pointer for the channel displayed

In the event of an error:

Display: - - - - -, measured value not displayed

Under or overrange: - - - - -

The error and the channel designation (TAG) will be specified in the dot-matrix area.

9.4.2 Symbols in editing mode

To enter free text, you can use the following characters:

“0 ... 9”, “a ... z”, “A ... Z”, “+”, “-”, “*”, “/”, “\”, “%”, “°”, “2”, “3”, “m”, “.”, “,”, “;”, “:”, “!”, “?”, “_”, “#”, “$”, “”, “´”, “(”, “)”, “~”

The characters “0 ... 9” and the decimal point can be used for value entries.

In addition, the following symbols are used in editing mode:

Symbol	Description
	Setup
	Expert setup
	Diagnostics
	Adopt entry By selecting this symbol, the entry of any position will be adopted and editing mode will be exited.
	Discard entry By selecting this symbol, the entry will be discarded and editing mode will be exited. The previously set text will be retained.
	Jump one position to the left. By selecting this symbol, the cursor jumps one position to the left.
	Backspace By selecting this symbol, the character to the left of the cursor will be deleted.
	Delete all By selecting this symbol, the entire entry will be deleted.

9.5 Operating matrix at a glance

All menus including the operating functions are listed in the following.

Display menu		Description
E	AI1 Reset minmax[1]	Resets the minimum and maximum values for Analog in 1
+	CV1 Reset minmax[1]	Resets the minimum and maximum values for Calc value 1
+	Analog in 1	Display Analog input 1 setting
+	Calc value 1	Display Calc value 1 setting
+	Contrast	Display contrast
+	Brightness	Display brightness
+	Alternating time	Switch-over time between the values selected for the display
+	Back	Go back to main menu

[1] Only displayed when “Allow reset” = “Yes” is set for the respective channel in the “Expert” menu.

Setup menu		Description
E	Analog in 1	Analog input 1
	Signal type	Signal type
	Signal range	Signal range
	Connection	Connection method (only for signal type = RTD)
	Lower range	Lower measuring range threshold
	Upper range	Upper measuring range threshold
	Tag	Analog input designation
	Unit	Analog input unit
	Temperature unit	Temperature unit (only for signal type = RTD or TC)
	Offset	Offset for analog input
	Ref junction	Comparative measuring point (only for signal type = TC)
	Reset min/max	Resets minimum and maximum values for analog input
+	Calc value 1	Calculated value 1
	Calculation	Type of calculation
	Tag	Calculated value designation
	Unit	Calculated value unit
	Bar 0%	Lower bar graph limit for calculated value
	Bar 100%	Upper bar graph limit for calculated value
	Factor	Calculated value factor
	Offset	Calculated value offset
	No lin points	Number of grid points for linearization
	X-value	X values for grid points
	Y-value	Y values for grid points
	Reset min/max	Resets minimum and maximum values
+	Analog out 1	Analog output 1
	Assignment	Analog output assignment
	Signal type	Analog output signal type
	Lower range	Lower limit of analog output range
	Upper range	Upper limit of analog output range

Setup menu [...]		Description
+	Relay 1	Relay 1
	Assignment	Assignment of the value to be monitored for the relay
	Function	Relay operating mode
	Set point	Relay limit value
	Set point 1/2	Limit values 1 and 2 for the relay (only if Function = inBand, outBand)
	Time base	Time base for gradient evaluation (only if Function = Gradient)
	Hysteresis	Relay hysteresis
+	Relay 2	Relay 2
	See Relay 1	
+	System	System settings
	Access Code	Safeguarding of operation through access code
	Overfill protect	Overfill protection
	Reset	Device reset
+	Back	Go back to main menu

Diagnostics menu		Description
E	Current diagn	Current diagnostic message
+	Last diagn	Last diagnostic message
+	Operating time	Device operating time
+	Diagnost logbook	Diagnostics log
+	Device information	Device information
+	Back	Go back to main menu

Expert menu		Description
E	Direct Acces	Jumps directly to an operating position
	System	System settings
	Access code	Safeguarding of operation through access code
	Overfill protect	Overfill protection
	Reset	Device reset
	Save user setup	Saves the setup settings
+	Input	Inputs
	In addition to the parameters in the setup menu, the following parameters are also available:	
	Analog in 1	Analog input 1
	Bar 0%	Lower bar graph limit for analog input
	Bar 100%	Upper bar graph limit for analog input
	Decimal places	Analog input decimal places
	Damping	Attenuation
	Failure mode	Failure mode
	Fixed fail value	Fixed value in the event of error (only if Failure mode = Fixed value)
	Namur NE43	Error limits in accordance with NAMUR
	Allow reset	Resets the minimum and maximum values via Display menu
+	Output	Outputs
	In addition to the parameters in the setup menu, the following parameters are also available:	
	Analog out 1	Analog output 1
	Fail mode	Failure mode

Expert menu [...]	Description
Fixed fail value	Fixed value in the event of error (only if Fail mode = Fixed value)
Relay 1 / 2	Relay 1 / 2
Time delay	Switching delay
Operating mode	Operating mode
Failure mode	Behavior in the event of an error

10 Commissioning

10.1 Installation check and switching on the device

Perform all final checks before starting up the device:

– Checklist “Installation check” on page 13

– Checklist “Connection check” on page 17

After the operating voltage has been applied, the green LED lights up. The display shows the operational readiness of the device.

During initial commissioning of the device, program the setup in accordance with the descriptions in the supplied operating instructions in the following sections.

Remove the protective foil from the display. Otherwise, readability is limited.

10.2 General information on device configuration

You can commission and configure your device as follows:

– Via the three integrated keys

– Via PC

You need the MCR-PAC-T-USB programming cable (Item No.: 2309000) to connect the device to a PC.

Advantages of configuring via the software solution:

– You can save the device data in the software program an call it up again at any time.

– You can enter data more quickly using the PC keyboard.

10.3 Notes on setup access protection

By default, access to Setup is enabled. You can block access via Setup.

To lock the device, proceed as follows:

- Press E to enter the configuration menu.
- To display Setup, press +.
- To open the setup menu, press E.
- Press + repeatedly until System is displayed.
- To open the System menu, press E.
  Access code will be displayed.
- To open the Access protection setting, press E.
- Enter the code: You can set the desired numerical value by pressing the + and - keys. The access code is a four-digit number. The respective digit of the number will be displayed in plain text. Press E to confirm the value entered and spring to the next position.
- To leave the menu, confirm the last digit of the code. The code will be displayed in full.
- Press + and scroll to the last position of the submenu. x Back, and confirm this. By doing so, you will adopt the value and jump back to the Setup level.
- To return to the measured value and channel display, exit this submenu via the last parameter, x Back.

The x Back entry at the end of each selection list or each menu leads back from the submenu to the respective superordinate menu.

10.4 Configuring the device

Configuration steps:

- Configuring the universal input (Page 25)
- Configuring the calculations (Page 26)
- Configuring the analog output (Page 26)
- Configuring the relays (if the option is selected), assigning and monitoring the threshold values (Page 27)
- Advanced device configuration: Access protection or operation code, protecting the current setup or user setups (Page 29)
- Configuring the display functionalities (Page 30)

10.4.1 Configuring the universal input (Analog in 1)

The device has a universal input for current, voltage, resistance thermometers (RTD), or thermocouples (TC).

The input is monitored for line breaks (refer to “Measuring range thresholds” on page 34 and “Troubleshooting” on page 35).

Minimum and maximum values at the inputs:

The current minimum and maximum value is stored every 15 minutes. After an interruption to the power supply (network out and network in) a recording gap can occur. The starting point of the measuring interval is the moment when the device is switched on. Synchronizing the measuring cycles to full hours is not possible.

To monitor the measured values, threshold values and relays are available.

These can be configured as described in “Configuring the relays, assigning and monitoring the threshold values” on page 27.

The universal input stores the smallest and biggest measured values acquired. These can be reset individually for each channel. In Setup, the administrator can specify that a user can reset the minimum and maximum values of individual channels directly in the main menu, and therefore that no access code is required. The access code is reset if the device is reset and in the event of the channel scaling being adjusted.

<table>
<tr><th colspan="5">Setup</th></tr>
<tr><td colspan="5">Analog in 1</td></tr>
<tr><td>Current</td><td>Voltage</td><td>RTD (resistance thermometer)</td><td>TC (thermocouples)</td><td rowspan="9">Off (deactivates the input)</td></tr>
<tr><td colspan="4">Signal range
Signal range (see technical data), measuring range start and end defined by the type selected</td></tr>
<tr><td colspan="2">Lower range
Start of measuring range, with decimal point</td><td rowspan="2">Connection (RTD only)
Connection method (2-, 3-, 4-conductor connection)</td><td rowspan="2"></td></tr>
<tr><td colspan="2">Upper range
End of measuring range, with decimal point</td></tr>
<tr><td colspan="4">TAG
Channel designation</td></tr>
<tr><td colspan="4">Unit
Unit</td></tr>
<tr><td colspan="4">Offset
Constant value that is added to the current measured value</td></tr>
<tr><td colspan="3"></td><td>Ref junction (TC only)
Internal/fixed + input “fixed ref junc”</td></tr>
<tr><td colspan="4">Res minmax: (yes/no)
Reset minimum and maximum values?</td></tr>
</table>

10.4.2 Configuring the calculations

A channel with the following functions is available for calculations:

Setup	
Calc value 1	
• Disabled • AI1 linearization	
TAG **Unit** **Bar 0%** **Bar 100%** **Factor** **Offset**	To be set in the same way as the universal input, refer to 10.4.1 on page 25
No. lin points → X/Y coordinates The device has a linearization table with a maximum of 32 support points. These are definitively assigned to the channel “Calc value 1”. If you select “Linearization” as a calculation, the number of required support points is displayed in the “No. lin points” parameter. For each support point, an X and a X coordinate must be specified. The linearization table can be deactivated individually.	
Reset min/max	To be set in the same way as the universal input, refer to 10.4.1 on page 25

10.4.3 Configuring the analog output

The device is equipped with an analog output.

You can freely assign the output to the inputs available in the device.

Setup	
Analog out 1	
Assignment: assignment of the output • **off**: disabled • **Analog input 1**: universal input 1 • **Calc value 1**: calculated value 1	
Signal type: select the active signal range of the output	The output range for the current output corresponds to NAMUR NE43. A range from 3.8 mA or 20.5 mA is used. If the value increases further (or falls) the current remains at the thresholds, 3.8 mA or 20.5 mA. 0 ... 20 mA output: only one overrange is available. For the voltage output, only one overrange is available. The threshold of the overrange is 10%.
Lower range **Upper range**	To be set in the same way as the universal input, refer to 10.4.1 on page 25

10.4.4 Configuring the relays, assigning and monitoring the threshold values

The device has two relays with threshold values. The threshold values are either switched off or assigned to the input signal or the linearized value of the analog input 1 or the calculated values. The threshold value can be input as a numerical value including a comma. Threshold values are assigned to a relay. Each relay can be assigned a channel or calculated value. In “Error” mode, the relay functions as a failure reporting relay. The relay switches in the event of every fault or alarm.

For each of the two threshold values, you can apply the following settings: assignment, operating mode, threshold value, hysteresis, switching behavior[1], delay[1], and fault behavior[1].

[1] only adjustable via the Expert menu, Expert/Output/Relay

Setup	
Relay 1 / Relay 2	
Assignment: Which value do you wish to monitor?	**off**, Analog input 1, Calc value 1, Error
Function: Relay operating mode (See “Operating modes” on page 28 for the description)	Min, Max, Gradient, outBand, inBand
Set point: **Set point 2:** Limit value	Input the threshold value with a comma Set Point 2 is only displayed in the outBand and inBand.
Time base: Time basis for gradient calculation	Input the time basis in seconds (only for gradient operating mode)
Hysteresis: Hysteresis. You can control the switching point for each threshold value by means of an hysteresis.	You can adjust the hysteresis as an absolute value (only positive values) in the unit of the respective channel (e.g., upper threshold value = 100 m, hysteresis = 1 m: threshold value on = 100 m, threshold value off = 99 m)

Exception: hysteresis and delay time active simultaneously (see description in Section “Operating modes” on page 28).

After a mains failure, the limit value monitoring behaves as though the threshold value were not active before the mains failure. The hysteresis and a potential delay underway are reset.

Relay specification

Relay contact	Changeover contacts
Maximum DC contact load	30 V / 3 A (permanent state, without damaging the input)
Maximum AC contact load	250 V / 3 A (permanent state, without damaging the input)
Minimum contact load	500 mW (12 V / 10 mA)
Electrical isolation from all other circuits	Test voltage 1,500 V AC
Switching cycles	>1 million
Default setting	Normally closed contact Rx1/Rx2

Operating modes

Off

No action is triggered. The assigned output is in a normal operating state.

Min (lower threshold value)

If the set value is not reached, the threshold value is active. If the threshold value, including hysteresis, is exceeded, the threshold value is switched off again.

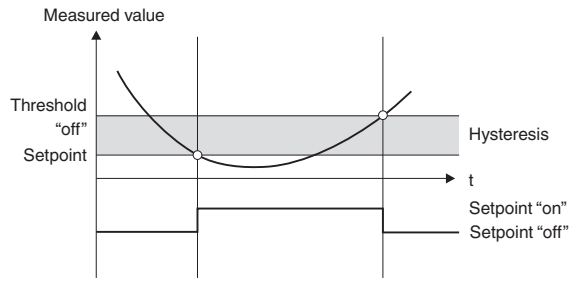


Figure 2 Min operating mode

Max (upper threshold value)

If the set value is exceeded, the threshold value is active. If the threshold value, including hysteresis, is not reached, the threshold value is switched off again.

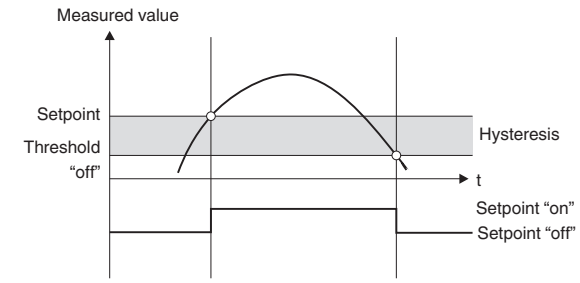


Figure 3 Max operating mode

Gradient

The Gradient operating mode monitors the time change to the input signal. If the measured value reaches or exceeds the value set, the alarm is triggered. If you set a positive value, the threshold value is monitored for increasing gradients.

The falling gradient is monitored for negative values.

If the gradient falls under the set value again, the alarm ends. A hysteresis is not possible in the Gradient operating mode. To reduce sensitivity, you can mute the alarm via the delay time (unit seconds s).

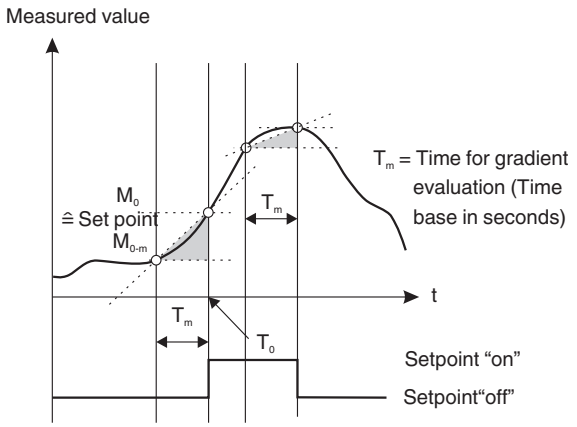


Figure 4 Gradient operating mode

OutBand

The threshold value is breached as soon as the measured value to be assessed enters a pre-determined band between minimum and maximum. Please take note of the hysteresis on the outside of the band.

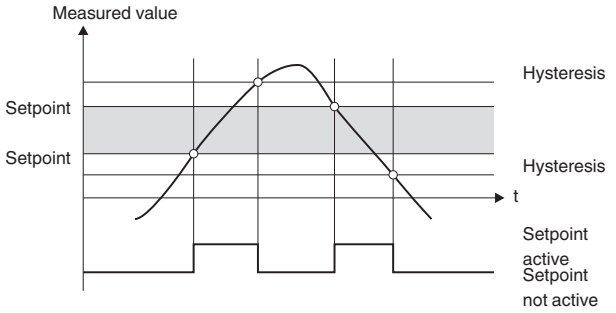


Figure 5 OutBand operating mode

InBand

The threshold value is breached as soon as the measured value to be assessed exceeds a pre-determined minimum and maximum. Please take note of the hysteresis on the inside of the band.

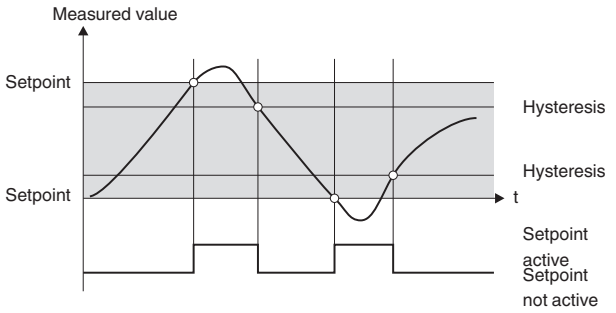


Figure 6 InBand operating mode

Exception: hysteresis and delay on a threshold value

In exceptional cases, if hysteresis and threshold value delay are activated, a threshold value is activated according to the following principle.

If you activate the hysteresis as well the threshold value delay, the delay is active when a threshold value is exceeding and measures the time since the value began to be exceeded.

If the measured value falls under the threshold value, the delay is reset. This also happens if the measured value falls under the threshold value, but still always remains over the set value of the hysteresis. If the threshold value is exceeded again, the delay time is active again and starts to measure from 0.

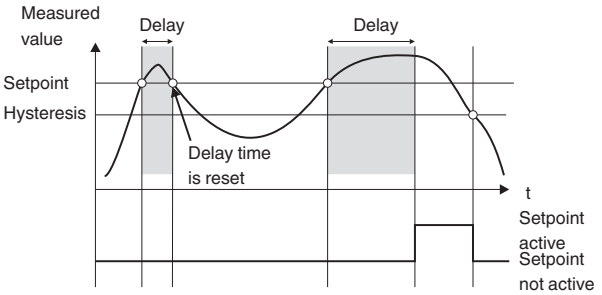


Figure 7 Hysteresis and delay active

10.4.5 Advanced device configuration: access protection and operation code, protecting the current setup

Access protection

The access protection locks all editable parameters. Setup is only accessible by entering the four-digit user code.

By default, access protection is not activated. You can protect the configuration of the device using a four-digit code.

To activate access protection, proceed as follows:

- Call up the “Setup, System, Access code” menu.
- Using the “+” and “-” keys, select the desired characters and confirm with “E”. The cursor jumps to the next position.

  After confirming the fourth position, the information entered is confirmed and the “Access code” submenu is exited.

After successfully activating access protection, the lock symbol is shown in the display.

If access protection is activated, the device automatically locks after 600 seconds without operation. The display returns to the status display. In order to delete the code completely, use the “+” and “-” keys to select “c” and confirm with “E”.

Saving the current Setup and User Setups

You can save the current device configuration. This is available for a device reset or for restarting the device in a specific setup.

To save the Setup, proceed as follows:

- Call the “Expert, System, Save user setup” menu.
- Confirm your entry with “yes”.

See “Device reset” on page 35.

10.4.6 Configuring the display functions

The display is divided into 7 sections and a dot-matrix area. The dot-matrix area can be separately configured for each channel.

All active channels (analog inputs and calculated values) are offered for selection.

To configure the display, proceed as follows:

- Press the “E” key.
- Select “Display”.
- Select the channel or calculated value.
- Set one of the following parameters.

Off	Channel is not indicated.	
Activate the display by configuring the dot-matrix area		
	Value / measured value of the channel is displayed in the 7-section display.	
	Unit	The channel unit is displayed
	Bar graph	The channel value is displayed as a bar graph across the entire width
	Bargr+unit	Division of the dot-matrix area, display value of the channel as bar graph and channel unit
	TAG+unit	Division of the dot-matrix area, display channel designation, and channel unit

– **Contrast**: select contrast, adjustable from 1 to 7

– **Brightness**: select brightness, adjustable from 1 to 7

– **Alternating time**: select the time between the automatic switch between channels and the calculated values (in seconds: 3, 5 or 10)

– **x Back** returns you to the higher-level menu.



Calculated values, as well as minimum and maximum values, can be called up manually, by pressing the “+” and “-” keys. The values appear in the display for 5 seconds.

10.4.7 Overfill protection

Containers for liquids hazardous to water are prescribed overfill protection in accordance with the German Water Resources Act (WHG). The fill level is monitored and an alarm is triggered in a timely manner, before the permitted filling level is reached. According to the approved principles for overfill protection (ZG-ÜS in German), you must use corresponding system parts that are suitable.

You can use the device according to the approved principles for overfill protection as a threshold signal switch, with continuous status measuring equipment to store liquids hazardous to water.

Adhering to the General Design Principles and Special Design Principles (Section 3 and 4) of the approved principles for overfill protection is a prerequisite. This prescribes that, in the following cases, the safety-related message is triggered as “Maximum filling level” (the threshold value relay switches off):

– In the event of an auxiliary power failure
– If the threshold values are exceeded or fall below
– If the connection cables are interrupted between the upstream measuring transducer and the threshold signal switch

Furthermore, you have to protect the threshold values set for overfill protection against inadvertent alteration.

If you wish to implement additional access protection for the configuration software, you have to activate the following functions:

“Setup / Expert, System, Overfill protect: German WHG”

Device configuration during operation in accordance with the approved principles for overfill protection:

You have to set up the device and operate it in accordance with these corresponding operating instructions.

- Configure the universal input (10.4.1 on page 25).
- Configure the threshold values as follows (10.4.4 on page 27):

  Function: MAX

  Assignment: which input signal do you wish to monitor?

  Set point: the maximum threshold value to be monitored, value for the switching threshold

  Hysteresis: no hysteresis (=0)

  Time delay: no switching delay (=0) or consider the time set for the overrun quantity

- Lock the device against access from non-authorized persons. **User Code** protects the parameters set (10.4.5 on page 29):

  Enter the 4-digit code: select a digit with “+” or “-”. Confirm the individual digits with “E”. Following confirmation of the digit, the cursor jumps to the next position or, after entering the fourth digit, it jumps back to the “System” menu item.

  The lock symbol appears in the display.

- Select “Setup, System, Overfill protect: German WHG”.

You have to assign the device a WHG application. Confirming the parameter “Overfill protect: German WHG” enables increased safety. If you wish to configure the device via the operator software, you must deactivate the parameter “Overfill protect, WGH” again.

10.4.8 Expert menu

Activate expert mode by calling “E, Expert”.

With the advanced device settings in the Expert menu, you can adjust the device to the application conditions in the best possible way.

Access to the Expert menu requires an access code. This is preset by default to “0000”. If you wish to redefine the access code, replace the access code specified by default.

After entering the amended access code, the Expert menu is released.

The configuration options provided by the Expert mode are described below, in addition to the parameters provided by the normal setup.

Input, Analog input 1

Bar 0%, Bar 100%

Change the scaling of the bar graph, standard value: channel scaling

Decimal places

Specify the decimal places desired, standard value: two decimal places

Damping

You can damp the input signal via low-pass filtering.

The attenuation is specified in seconds. It can be adjusted in 0.1 s increments (maximum 999.9 s).

Default values

Input type	Default value
Current and voltage inputs	0.0 s
Temperature inputs	1.0 s

After the period of 5-times the filter time has expired, 99% of the actual measured value is achieved.

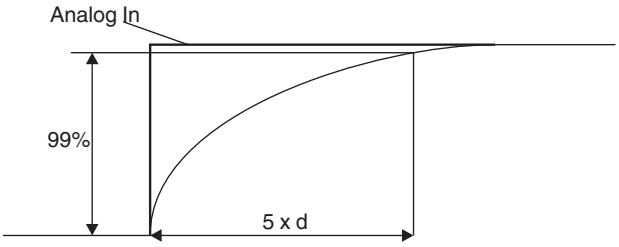


Figure 8 Signal damping

Analog In: signal analog input

d: attenuation set

Failure mode

If a failure is detected at one of the two inputs, the internal status of the input is set to Failure. You can define the behavior of the measured in the event of an error here.

– Invalid = Invalid value:
  This value is no longer used, as is it has been processed as invalid.
– Fixed value = Constant value:
  You can enter a constant value. This is used should an ongoing calculation occur. The input still has failure status.

NAMUR NE43

Only for 4 mA … 20 mA. The measured value as well as the lines are monitored according to NAMUR NE43 recommendations (refer to “Measuring range thresholds” on page 34). Preset value: activated

Open circ detect

Only for 1 V … 5 V. Monitoring the input for line break

Failure delay

Delay time for failures, 0 s ...99 s

Allow reset

If you activate this function, you can reset the minimum and maximum values outside of the setup in the Display menu. Activated access protection does not affect this storage when resetting.

Output, Analog output 1

Failure mode

– Min = stored minimum value:
  The stored minimum value is output.
– Max = stored maximum value:
  The stored maximum value is output.
– Fixed value = Constant value:
  You can enter a constant value that is output in the event of a failure.

Output, Relay 1/2

Time delay

Setting of the time delay for switching the relay

Operating mode

Relay operating mode

– norm opened
– norm closed

Failure mode

– norm opened
– norm closed

Failure handling settings of the threshold value relay

You can adjust the failure handling of the threshold value relay in setup. If an input on which a threshold value is set has a fault, the threshold value relay accepts the status set. In setup, you can determine the threshold value relay mechanism in the event of a failure (switches on or turns off). If you have set a failure handling process in the assigned input with a specific failure substitute value, the corresponding relay does not react to the failure on the input. The relays check the substitute value for threshold value breaches and switches off depending on the breach. The standard value of the relay mechanism is switching on.

Application, Calc value 1

Failure mode

– Invalid:
  The calculated value is invalid and is not output.
– Fixed value:
  You can enter a constant value that is output in the event of a failure.

Diagnostics

Verify HW set

Internal function

Simulation

You can specify the output value of the analog outputs as well as the switching state of the relay in simulation mode. The simulation remains active until it is set to “off”.

The beginning and end of the simulation are stored in the diagnostic results.

“Expert, Diagnostics, Simulation”:

- Select the output to be simulated with “Simulation value”.
- Select the relays to be simulated with “Status”.

10.5 During operation

10.5.1 Fast keys + and -

By using the “+” and “-” fast keys, you can switch to display mode through all the active channels (universal input and calculated value). The measured value or calculated value is then shown for 5 seconds. In the dot-matrix area of the display, you can see the channel name of the value displayed. For each active channel, the maximum and minimum values are offered.

If you press the “+” and “-” keys simultaneously, you can exit a menu at any time. By doing so, any changes made are discarded.

10.5.2 Min/max memory

The device cyclically stores the highest and lowest input values and calculated values in the non-volatile memory every 15 minutes.

Displays:

Select the relevant channel using the fast keys “+” and “-”.

Resetting the minimum and maximum values:

Resetting in setup: Select the channel (Analog in 1, Calc value 1), “Reset min/max”. The minimum and maximum values of the corresponding channel are reset.



Resetting outside of the setup (resetting without User Code) is only possible if you have approved this for the channel in setup (Allow reset 10.4.1 on page 25). Press “E” and select “Display”. All channels which permit resetting outside of setup, are displayed one after the other. Select the relevant channel. Set it to “yes”. The channel is reset.

10.5.3 Device self-diagnostics, fault handling and line break detection, measuring range thresholds

The device software contains comprehensive monitoring mechanisms (e.g., a cyclical memory test). This allows the device to monitor its inputs for line breaks as well as its own internal functionalities.

If the device self-diagnostics detects a failure, the device reacts by taking the following steps:

– Open collector output switches
– Red LED lights up
– If the relay is active and is assigned as a failure reporting relay or alarm relay, the relay switches.
– The display changes to failure mode: The color of the affected channel and the failure display change to red
– Automatic switching between the active channels and the failure display

Notes on troubleshooting and a list of all failure messages can be found in Section “Troubleshooting” on page 35.

Table 1 Measuring range thresholds

Display							
Display Status Area	**----- F**	**----- F Underrange**	**Measured value Displayed and processed measured value**	**----- F Overrange**	**----- F**	**----- F Invalid measured value**	**Note**
0 mA … 20 mA		0 mA … 22 mA		>22 mA		Not calibrated	Negative currents are not displayed or calculated (value remains at 0)
4 mA … 20 mA (without NAMUR)		≤2 mA	>2 mA <22 mA	≥22 mA		Not calibrated	
4 mA …20 mA (in accordance with NAMUR)	≤2 mA[1] 2<x≤3.6 mA[2]	>3.6 mA ... ≤3.8 mA	>3.8 mA ... <20.5 mA	≥20.5 mA ... <21 mA	≥21 mA[2]	Not calibrated	In accordance with NAMUR 43
+/- voltage ranges		<-110%	-110% ... 110%	>110%		Not calibrated	
Voltage ranges above 0 V		<-10%	-10% ... 110%	>110%		Not calibrated	
	No ongoing calculation or ongoing calculation with a fixed failure value		Ongoing calculation in Math and as min/max				
Voltage range 1 V … 5 V with activated line break detection	≤0.8 V		1 V … 5 V		≥5.2 V	Not calibrated	
Thermocouples	Below the lower range threshold[2]		0% … 100%		Above the upper range threshold[2]		Line break detection above approx. 50 kΩ[1]
Resistance	Below the lower range threshold[1]		0% … 100%		Above the upper range threshold[1]		
	No ongoing calculation or ongoing calculation with a fixed failure value		Ongoing calculation in Math and as min/max	No ongoing calculation or ongoing calculation with a fixed failure value			

[1] Line break

[2] Failure at sensor

10.5.4 Storage of diagnostic results or alarms and failures

Diagnostic results such as alarms and failure states are stored in the device, as soon as a new failure or a status alteration occurs on the device. The results stored are described cyclically every 30 minutes in the non-volatile device memory.

The device displays the following values in the “Diagnostics” menu:

– Current device diagnostics
– Latest device diagnostics
– Previous five diagnostic messages

For a list of failure codes, see Table 2 on page 36.

Losing stored events from the last 30 minutes is possible.

10.5.5 Operating hours counter

The device has an internal operating hour counter that also serves as a reference for diagnostic results.

The operating hours can be found under the “Diagnostics, Operating time” menu item. You cannot reset or alter the operating hours.

10.5.6 Device reset

Various stages are available for a device reset.

“**Expert, System, Reset, Factory reset**”: reset all parameters to the delivery state. All set parameters are overwritten.

A user code that has already been defined will be overwritten. In the event of locking by means of a user code, this is indicated in the Display with the lock symbol.

“**Expert, System, Reset, User reset**”: parameters are loaded and configured corresponding to the stored User Setups. The User Setup overwrites the currently set configuration or factory settings.

The user code defined in User Setup overwrites a previously defined user code. If no code is stored in User Setup, the device is no longer locked. In the event of locking by means of a user code, this is indicated in the Display with the lock symbol.

11 Maintenance

The device does not require special service or maintenance.

12 Troubleshooting

To provide initial guidance for troubleshooting, below you can find an overview of potential causes of the failure.

12.1 Error messages

WARNING: Danger of electric shock

Do not operate the device to troubleshoot while open.

The failure codes indicated in the display are described in table “Failure codes or device malfunctions” on page 36. For additional information on fault handling, please also refer to Section “Commissioning” on page 24.

Malfunctions are of the highest priority. The corresponding failure code is displayed.

Table 2 Failure codes or device malfunctions

Error code	Meaning	Remedy
F041	Sensor or line break	Checking wiring
F045	Sensor failure	Check the sensor
F101	Underrange	Check measurement, threshold value breached
F102	Overrange	
F221	Fault: comparative measuring point	Contact your service organization.
F261	Fault: flash	Contact your service organization.
F261	Fault: RAM	Contact your service organization.
F261	Fault: EEPROM	Contact your service organization.
F261	Failure: ADU channel 1	Contact your service organization.
F261	Failure: invalid device identification	Contact your service organization.
F281	Initialization phase	Contact your service organization.
F282	Failure: parameter data not stored	Contact your service organization.
F283	Failure: parameter data incorrect	Contact your service organization.
F431	Failure: reference values incorrect	Contact your service organization.
C411	Info: upload or download active	For information only. Device functions correctly.
C432	Info: calibration or test mode	For information only. Device functions correctly.
C482	Info: relay simulation mode or Open Collector	For information only. Device functions correctly.
C483	Info: analog output simulation mode	For information only. Device functions correctly.
C561	Display overrun	For information only. Device functions correctly.

13 Disposal

The device contains electronic components. It must therefore be disposed of as electronic waste. Observe local disposal regulations.

14 Appendix

14.1 Performance characteristics

14.1.1 Reference conditions

Power supply: 230 V AC, 50/60 Hz

Ambient temperature: 25°C (77°F) ± 5°C (9°F)

Humidity: 20% ... 60% relative humidity

14.1.2 Measurement deviation

Table 3 Universal input

Accuracy	Input	Area	Measurement deviation from measuring range (fMR)
	Current	0 mA … 20 mA, 0 mA … 5 mA, 4 mA … 20 mA Overrange up to 22 mA	±0.05%
	Voltage ≥1 V	0 V … 10 V, 2 V … 10 V, 0 V … 5 V, 1 V … 5 V, 0 V … 1 V, ±1 V, ±10 V, ±30 V	±0.1%
	Voltage <1 V	±100 mV	±0.05%
	Resistance measurement	30 Ω … 3000 Ω	4-conductor: ± (0.10% fMR +0.8 Ω) 3-conductor: ± (0.10% fMR +1.6 Ω) 2-conductor: ± (0.10% fMR + 3 Ω)
	Resistance thermometer	Pt 100, -200 C … 850 C (-328 F … 1562 F) (IEC60751, α=0.00385) Pt 100, -200 C … 850 C (-328 F … 1562 F) (JIS1604, w=1.391) Pt 100, -200°C … 649°C (-328°F … 1200°F) (GOST, α=0.003916) Pt 500, -200°C … 850°C (-328°F … 1562°F) (IEC60751, α=0.00385) Pt 1000, -200°C … 600°C (-328°F … 1112°F) (IEC60751, α=0.00385)	4-conductor: ± (0.10% fMR +0.3 K (0.54°F)) 3-conductor: ± (0.10% fMR +0.8 K (1.44°F)) 2-conductor: ± (0.10% fMR +1.5 K (2.7°F))
		Cu 100, -200°C … 200°C (-328°F … 392°F) (GOST, w=1.428) Cu 50, -200°C … 200°C (-328°F … 392°F) (GOST, w=1.428) Pt 50, -200°C … 1100°C (-328°F … 2012°F) (GOST, w=1.391) Pt 46, -200°C … 850°C (-328°F … 1562°F) (GOST, w=1.391) Ni 100, -60°C … 250°C (-76°F … 482°F) (DIN43760, α=0.00617) Ni 1000, -60°C … 250°C (-76°F … 482°F) (DIN43760, α=0.00617)	4-conductor: ± (0.10% fMR +0.3 K (0.54°F)) 3-conductor: ± (0.10% fMR +0.8 K (1.44°F)) 2-conductor: ± (0.10% fMR +1.5 K (2.7°F))
		Cu 53, -50°C … 200°C (-58°F … 392°F) (GOST, w=1.426)	4-conductor: ± (0.10% fMR +0.3 K (0.54°F)) 3-conductor: ± (0.10% fMR +0.8 K (1.44°F)) 2-conductor: ± (0.10% fMR +1.5 K (2.7°F))

Table 3 Universal input [...]

Accuracy	Input	Area	Measurement deviation from measuring range (fMR)
	Thermocouples	Type J (Fe-CuNi), -210°C … 1200°C (-346°F … 2192°F) (IEC 60584)	± (0.10% fMR +0.5 K (0.9°F)) from -100°C (-148°F)
		Type K (NiCr-Ni), -200°C … 1372°C (-328°F … 2502°F) (IEC 60584)	± (0.10% fMR +0.5 K (0.9°F)) from -130°C (-202°F)
		Type T (Cu-CuNi), -270°C … 400°C (-454°F … 752°F) (IEC 60584)	± (0.10% fMR +0.5 K (0.9°F)) from -200°C (-328°F)
		Type N (NiCrSi-NiSi), -270°C … 1300°C (-454°F … 2372°F) (IEC 60584)	± (0.10% fMR +0.5 K (0.9°F)) from -100°C (-148°F)
		Type L (Fe-CuNi), -200°C … 900°C (-328°F … 1652°F) (DIN 43710, GOST)	± (0.10% fMR +0.5 K (0.9°F)) from -100°C (-148°F)
		Type D (W3Re/W25Re), 0°C … 2495°C (32°F … 4523°F) (ASTME 998)	± (0.15% fMR +1.5 K (2.7°F)) from 500°C (932°F)
		Type C (W5Re/W26Re), 0°C … 2320°C (32°F … 4208°F) (ASTME 998)	± (0.15% fMR +1.5 K (2.7°F)) from 500°C (932°F)
		Type B (Pt30Rh-Pt6Rh), 0°C … 1820°C (32°F … 3308°F) (IEC 60584)	± (0.15% fMR +1.5 K (2.7°F)) from 600°C (1112°F)
		Type S (Pt10Rh-Pt), -50°C … 1768°C (-58°F … 3214°F) (IEC 60584)	± (0.15% fMR +3.5 K (6.3°F)) for -50 … 100°C (-58 … 212°F) ± (0.15% fMR +1.5 K (2.7°F)) from 100°C (212°F)
		Type U (Cu-CuNi), -200°C … 600°C (-328°F … 1112°F) (DIN 43710)	± (0.15% fMR +1.5 K (2.7°F)) from 100°C (212°F)
Resolution of AD converters		16 bit	
Temperature drift		≤0.01%/K (0.1%/18°F) fMR ≤0.02%/K (0.2%/18°F) fMR for Cu 100, Cu 50, Cu 53, Pt 50, and Pt 46	

Table 4 Analog output

Current	0/4 mA … 20 mA, overrange up to 22 mA	±0.05% from measuring range
	Maximum load	500 Ω
	Maximum inductance	10 mH
	Maximum capacity	10 µF
	Maximum ripple	10 mVpp at 500 Ω, frequency < 50 kHz
Voltage	0 V … 10 V, 2 V … 10 V 0 V … 5 V, 1 V … 5 V Overrange: up to 11 V, short-circuit-proof, Imax < 25 mA	±0.05% fMR ±0.1% fMR
	Maximum ripple	10 mVpp at 1,000 Ω, frequency <50 kHz
Resolution	13 bit	
Temperature drift	≤0.01%/K (0.1%/18°F) fMR	
Electrical isolation	For all other circuits test voltage 500 V	

14.2 Dimensions

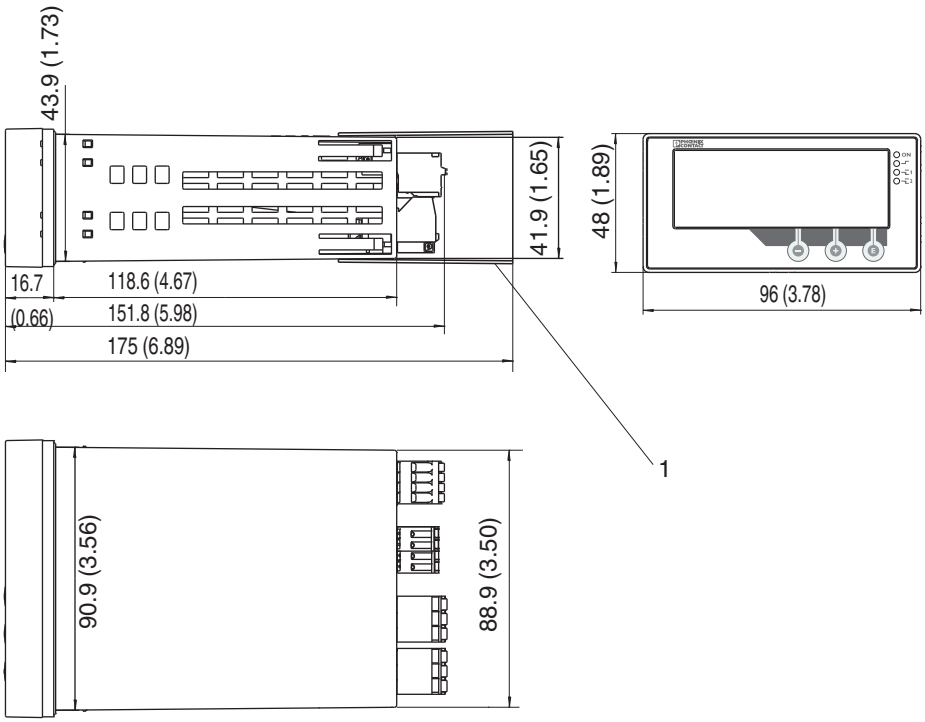


Figure 9 Dimensions in mm

1 Spacer for terminal blocks

14.3 Description of menus

In the following tables you can find all the parameters available in the configuration menu.

14.3.1 Display menu

AI1 Reset minmax	
Navigation	Display, AI1 Reset minmax
Description	Resets the saved minimum and maximum values from analog input 1
Selection	Yes No
Default setting	No
Additional information	Only available if “Expert, Analog in 1, Allow reset” is set to “= yes”

Cv1 Reset minmax	
Navigation	Display, Cv1 Reset minmax
Description	Resets the saved minimum and maximum values from Math 1
Selection	Yes No
Default setting	No
Additional information	Only available if “Expert, Calc val 1, Allow reset” is set to “= yes”

Analog in 1	
Navigation	Display, Analog in 1
Description	Setting of the display for analog input 1. If the parameter is set to “off”, the channel is not displayed.
Selection	Off Unit Bar graph Bar + unit Tag + unit
Default setting	Tag + unit

Calc value 1	
Navigation	Display, Calc value 1
Description	Setting of the display for Math 1. If the parameter is set to “off”, the channel is not displayed.
Selection	Off Unit Bar graph Bar + unit Tag + unit
Default setting	Off

Contrast	
Navigation	Display, Contrast
Description	Contrast setting
Selection	1 ... 7
Default setting	6

Brightness	
Navigation	Display, Brightness
Description	Brightness setting
Selection	1 ... 7
Default setting	6

Alternating time	
Navigation	Display, Alternating time
Description	Setting of the time for alternating between the channels displayed
Selection	3 seconds 5 seconds 10 seconds
Default setting	5 seconds

14.3.2 Setup menu

“Analog in 1” submenu	
Navigation	Setup, Analog in1
Description	Settings for analog input 1

Signal type	
Navigation	Setup, Analog in1, Signal type
Description	Setting of the input type
Selection	Off Current Voltage RTD TC
Default setting	Current
Additional information	If Signal type is set to “off”, all the parameters below this are hidden.

Signal range	
Navigation	Setup, Analog in 1, Signal range
Description	Setting of the input signal. The options depend on the “Signal type” set.
Selection	4-20 mA, 4-20 mA squar, 0-20 mA, 0-20 mA squar 0-10 V, 0-10 V squar, 0-5 V, 2-10 V, 1-5 V, 1-5 V squar, 0-1 V, 0-1 V squar, +/- 1 V, +/- 10 V, +/- 30 V, +/- 100 mV Pt46GOST, Pt50GOST, Pt100IEC, Pt100JIS, Pt100GOST, Pt500IEC, Pt1000IEC, Ni100DIN, Ni1000DIN, Cu50GOST, Cu53GOST, Cu100GOST, 3000 ohms Type B, type J, type K, type N, type R, type S, type T, type C, type D, type L, type L, GOST, type U
Default setting	4 … 20 mA, 0-10 V, Pt100IEC, type J, depending on the input signal selected

Lower range	
Navigation	Setup, Analog in 1, Lower range
Description	Lower measuring range threshold setting
Input	Numerical value
Default setting	100
Additional information	Only visible for “Signal type” = “Current” or “Voltage”

Connection	
Navigation	Setup, Analog in 1, Connection
Description	Setting of the connection method for resistance thermometers
Selection	2-wire 3-wire 4-wire
Default setting	2-wire
Additional information	Only visible for “Signal type” = “RTD”

Tag	
Navigation	Setup, Analog in 1, Tag
Description	Channel indicator, TAG i on channel 1 of device designation
Input	Free text, maximum 12 characters

Unit	
Navigation	Setup, Analog in 1, Unit
Description	Channel unit
Input	Free text, maximum 5 characters
Additional information	Only visible for “Signal type” = “Current” or “Voltage”

Temperature unit	
Navigation	Setup, Analog in 1, Temperature unit
Description	Setting of the temperature unit
Selection	°C °F K
Default setting	°C
Additional information	Only visible for “Signal type” = “RTD” or “TC”

Offset	
Navigation	Setup, Analog in 1, Offset
Description	Offset setting
Input	Numerical value
Default setting	0

Ref junction	
Navigation	Setup, Analog in 1, Ref junction
Description	Reference temperature setting
Selection	Internal Fixed
Default setting	Internal
Additional information	Only visible for “Signal type” = “TC”

Fixed ref junc	
Navigation	Setup, Analog in 1, Fixed ref junc
Description	Constant reference temperature setting
Input	Numerical value
Additional information	Only visible when “Ref junction” = “Fixed” is selected

Reset min/max	
Navigation	Setup, Analog in 1, Reset min/max
Description	Resets the minimum and maximum values
Selection	No Yes
Default setting	No

“Calc value 1” submenu	
Navigation	Setup, Calc value 1
Description	Settings for Math 1

Calculation	
Navigation	Setup, Calc value 1, Calculation
Description	Selection of the calculation method
Selection	Off Lineariz. AI1
Default setting	Off
Additional information	If Calculation is set to “Off”, all the parameters below this are hidden.

Tag	
Navigation	Setup, Calc value 1, Tag
Description	Channel identifier
Input	Free text, maximum 12 characters

Unit	
Navigation	Setup, Calc value 1, Unit
Description	Channel unit
Selection	Free text, maximum 5 characters

Bar 0%	
Navigation	Setup, Calc value 1, Bar 0%
Description	Setting for 0% value for bar graph
Input	Numerical value
Default setting	0

Bar 100%	
Navigation	Setup, Calc value 1, Bar 100%
Description	Setting for 100% value for bar graph
Input	Numerical value
Default setting	100

Factor	
Navigation	Setup, Calc value 1, Factor
Description	Calculated value factor setting
Input	Numerical value
Default setting	1.0

Offset	
Navigation	Setup, Calc value 1, Offset
Description	Offset setting
Input	Numerical value
Default setting	0

No. lin points	
Navigation	Setup, Calc value 1, No. lin points
Description	Number of grid points for linearization
Input	2 … 32
Default setting	2

X-value	
Navigation	Setup, Calc value 1, X-value
Description	Entry for the grid points for linearization (maximum 32)
Input	X value 1 ... X value 32, each a numerical value
Default setting	0
Additional information	Only visible if “Calculation” = “Linearization” is set

Y-value	
Navigation	Setup, Calc value 1, Y-value
Description	Entry for the grid points for linearization (maximum 32)
Input	Y value 1 ... Y value 32, each a numerical value
Default setting	0
Additional information	Only visible if “Calculation” = “Linearization” is set

Reset min/max	
Navigation	Setup, Calc value 1, Reset min/max
Description	Resets the minimum and maximum values
Selection	No Yes
Default setting	No

“Analog Out 1” submenu	
Navigation	Setup, Analog Out 1
Description	Settings for analog output 1

Assignment	
Navigation	Setup, Analog Out 1, Assignment
Description	Selection of the source for the output signal
Selection	Off Analog 1 Calc Val 1
Default setting	Off

Signal type	
Navigation	Setup, Analog Out 1, Signal type
Description	Selection of the signal type for the output signal
Selection	4…20 mA 0…20 mA 0…10 V 2…10 V 0…5 V 1…5 V
Default setting	4…20 mA

Lower range	
Navigation	Setup, Analog Out 1, Lower range
Description	Lower measuring range threshold setting
Input	Numerical value
Default setting	0

Upper range	
Navigation	Setup, Analog Out 1, Upper range
Description	Upper measuring range threshold setting
Input	Numerical value
Default setting	0

“Relay 1” / “Relay 2” submenu	
Navigation	Setup, Relay 1/Relay 2
Description	Settings for relay 1 or relay 2

Source	
Navigation	Setup, Relay 1/Relay 2, Source
Description	Selection of the source for the relay
Selection	Off Analog input 1 Calc value 1 Error
Default setting	Off

Function	
Navigation	Setup, Relay 1/Relay 2, Function
Description	Relay function
Selection	Min Max Gradient Inband Outband
Default setting	Min

Setpoint	
Navigation	Setup, Relay 1/Relay 2, Setpoint
Description	Relay switching threshold
Input	Numerical value
Default setting	0

Setpoint 2	
Navigation	Setup, Relay 1/Relay 2, Setpoint 2
Description	Second switching threshold for relay
Input	Numerical value
Default setting	0
Additional information	Only for the inBand and outBand functions

Time base	
Navigation	Setup, Relay 1/Relay 2, Time base
Description	Time base for gradient evaluation in seconds
Input	0…60
Default setting	0
Additional information	Only visible if “Function” = “Gradient” is set

Hysteresis	
Navigation	Setup, Relay 1/Relay 2, Hysteresis
Description	Hysteresis for switching threshold(s)
Input	Numerical value
Default setting	0

"System" submenu	
Navigation	Setup, System

Access code	
Navigation	Setup, System, Access code
Description	User code for safeguarding the device configuration
Input	0000 … 9999
Default setting	0000
Additional information	0000 = User code safeguarding function disabled

Overfill protect	
Navigation	Setup, System, Overfill protect
Description	If the device is used for overfill protection (10.4.7 on page 31), you must set Overfill protect = yes.
Selection	No Yes
Default setting	No

Reset	
Navigation	Setup, System, Reset
Description	Resets the device to the delivery state
Selection	No Yes
Default setting	No

14.3.3 Diagnostics menu

Current diagn	
Navigation	Diagnostics, Current diagn
Description	Displays the error code currently present

Last diagn	
Navigation	Diagnostics, Last diagn
Description	Displays the last error code

Operating time	
Navigation	Diagnostics, Operating time
Description	Displays the operating hours so far

"Diagnost logbook" submenu	
Navigation	Diagnostics, Diagnost logbook
Description	Displays the last five error codes

Diagnostics x	
Navigation	Diagnostics, Diagnost logbook, Diagnostics x
Description	Displays a message from the diagnostics log

"Device information" submenu	
Navigation	Diagnostics, Device information,

Device tag	
Navigation	Diagnostics, Device information, Device tag
Description	Displays the device name i TAG channel 1

Serial number	
Navigation	Diagnostics, Device information, Serial number
Description	Displays the serial number

Order code	
Navigation	Diagnostics, Device information, Order code
Description	Displays the order number

Order identifier	
Navigation	Diagnostics, Device information, Order identifier
Description	Displays the order code

Firmware version	
Navigation	Diagnostics, Device information, Firmware version
Description	Displays the firmware version

ENP Version	
Navigation	Diagnostics, Device information, ENP Version
Description	Displays the ENP version

14.3.4 Expert menu

In addition to the parameters in the setup menu, the following parameters are also available in expert mode.

Direct access	
Navigation	Expert, Direct access
Description	Code for jumping directly to an operating position
Input	Four-digit code

“System” submenu	
Navigation	Expert, System

Save user setup	
Navigation	Expert, System, Save user setup
Description	To save the current device settings, select “Yes”. You can reset the device to the saved settings via “Reset, User reset”.
Input	No Yes
Default setting	No

“Input” submenu	
Navigation	Expert, Input

“Analog in 1” submenu	
Navigation	Expert, Input, Analog in 1
Description	Settings for the analog inputs
Additional information	The following parameters are available for Analog input 1.

Bar 0%	
Navigation	Expert, Input, Analog in 1, Bar 0%
Description	Setting for 0% value for the bar graphs
Input	Numerical value
Default setting	0

Bar 100%	
Navigation	Expert, Input, Analog in 1, Bar 100%
Description	Setting for 100% value for the bar graphs
Input	Numerical value
Default setting	100

Decimal places	
Navigation	Expert, Input, Analog in 1, Decimal places
Description	Setting of the decimal places for the display
Input	XXXXX XXXX.X XXX.XX XX.XXX X.XXXX
Default setting	XXX.XX

Damping	
Navigation	Expert, Input, Analog in 1, Damping
Description	Setting of the attenuation for the input signal. Input in 0.1 s increments from 0.0 s ... 999.9 s.
Input	Numerical value
Default setting	0.0 for current / voltage 1.0 for temperature inputs

Failure mode	
Navigation	Expert, Input, Analog in 1, Failure mode
Description	Setting of the behavior in the event of an error
Selection	Invalid Fixed value
Default setting	Invalid
Additional information	Invalid: In the event of an error, an invalid value will be issued. Fixed value: In the event of an error, a preset value will be issued.

Fixed fail value	
Navigation	Expert, Input, Analog in 1, Fixed fail value
Description	In the event of an error, the value set here value will be issued.
Input	Numerical value
Default setting	0
Additional information	Only visible when “Failure mode = Fixed value” is selected

Namur NE 43	
Navigation	Expert, Input, Analog in 1, Namur NE 43
Description	Setting for whether error behavior is to be in accordance with NAMUR NE 43
Selection	On Off
Default setting	On

Open circ detect	
Navigation	Expert, Input, Analog in 1, Open circ detect
Description	Setting of line break detection
Selection	On Off
Default setting	On
Additional information	Only visible if the signal range is between 1-5 V.

Failure delay	
Navigation	Expert, Input, Analog in 1, Failure delay
Description	Delay time for errors in seconds
Input	Integer (0-99)
Default setting	0

Allow reset	
Navigation	Expert, Input, Analog in 1, Allow reset
Description	Setting for whether stored minimum and maximum values in the Display menu can be reset, without entering the potential User Code already set.
Input	No Yes
Default setting	No

“Output” submenu	
Navigation	Expert, Output

“Analog Out 1” submenu	
Navigation	Expert, Output, Analog Out 1
Description	Settings for the analog outputs
Additional information	The following parameters are each available for analog output 1.

Failure mode	
Navigation	Expert, Output, Analog Out 1, Failure mode
Description	Setting of the behavior in the event of an error
Selection	Min Max Fixed value
Default setting	Min
Additional information	Min: In the event of a failure, the stored minimum value is output. Max: In the event of a failure, the stored maximum value is output. Fixed value: In the event of an error, a preset value will be issued.

Fixed fail value	
Navigation	Expert, Output, Analog Out 1, Fixed fail value
Description	In the event of an error, the value set here value will be issued.
Input	Numerical value
Default setting	0
Additional information	Only visible when “Failure mode = Fixed value” is selected.

“Relay 1”/“Relay 2” submenu	
Navigation	Expert, Output, Relay 1/ Relay 2
Description	Relay settings
Additional information	The following parameters are each available for relay 1 and relay 2.

Time delay	
Navigation	Expert, Output, Relay 1/ Relay 2, Time delay
Description	Delay to switching the relay in seconds
Input	0-9999
Default setting	0

Operating mode	
Navigation	Expert, Output, Relay 1/ Relay 2, Operating mode
Description	Normally closed = N/C contact Normally open = N/O contact
Selection	Normally closed Normally open
Default setting	Normally closed

Failure mode	
Navigation	Expert, Output, Relay 1/ Relay 2, Failure mode
Description	Normally closed = N/C contact Normally open = N/O contact
Selection	Normally closed Normally open
Default setting	Normally closed

“Application” submenu	
Navigation	Expert, Application

“Calc value 1” submenu	
Navigation	Expert, Application, Calc value 1
Description	Settings for the mathematics channels
Additional information	The following parameters are each available for Math 1.

Decimal places	
Navigation	Expert, Application, Calc value 1, Decimal places
Description	Setting of the decimal places for the display
Selection	XXXXX XXXX.X XXX.XX XX.XXX X.XXXX
Default setting	XXX.XX

Failure mode	
Navigation	Expert, Application, Calc value 1, Failure mode
Description	Failure behavior setting
Selection	Invalid Fixed value
Default setting	Invalid

Fixed fail value	
Navigation	Expert, Application, Calc value 1, Fixed fail value
Description	In the event of an error, the value set here value will be issued.
Input	Numerical value
Default setting	0
Additional information	Only visible when “Failure mode = Fixed value” is selected.

Allow reset	
Navigation	Expert, Application, Calc value 1, Allow reset
Description	Setting for whether stored minimum and maximum values in the Display menu can be reset, without entering the potential User Code already set.
Selection	No Yes
Default setting	No

“Diagnostics” submenu	
Navigation	Expert, Diagnostics

“Simulation” submenu	
Navigation	Expert, Simulation

Simulation AO1	
Navigation	Expert, Simulation, Simulation AO1
Description	Simulation analog output 1 The value set in the simulation is output on analog output 1.
Selection	Off 0 mA 3.6 mA 4 mA 10 mA 12 mA 20 mA 21 mA 0 V 5 V 10 V
Default setting	Off

Simu relay 1/2	
Navigation	Expert, Simulation, Simu relay 1/2
Description	Simulation relay 1 or relay 2
Input	Off Closed Open
Default setting	Off