BA01338R/09/EN/08.25-00
71762157
2025-06-09

Valid as of version
ENU000A, V2.04.xx

Operating Instructions
Memograph M RSG45

Data manager

Endress+Hauser
People for Process Automation

Table of contents

1 About this document

1.1 Document function

These Operating Instructions contain all the information required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 Safety symbols

⚠ DANGER
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠ WARNING
This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠ CAUTION
This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

1.2.2 Electrical symbols

Symbol	Meaning
⎓	Direct current
~	Alternating current
⎓ ~	Direct current and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏚	**Protective earth (PE)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: ▪ Interior ground terminal: protective earth is connected to the mains supply. ▪ Exterior ground terminal: device is connected to the plant grounding system.

1.2.3 Symbols for certain types of information

Symbol	Meaning
✓	**Permitted** Procedures, processes or actions that are permitted.
✓✓	**Preferred** Procedures, processes or actions that are preferred.

Symbol	Meaning
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Notice or individual step to be observed
1., 2., 3...	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.4 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,...	Item numbers	1., 2., 3...	Series of steps
A, B, C, ...	Views	**A-A, B-B, C-C, ...**	Sections
	Hazardous area		Safe area (non-hazardous area)

1.3 Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:

- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

The following document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads), depending on the product configuration:

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid** This document contains all the technical data on the product and provides an overview of everything that can be ordered with the product.
Brief Operating Instructions (KA)	**Quick guide to obtaining the first measured value** The Operating Instructions contain all the essential information about the product from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Reference** The Operating Instructions contain the information that is required in the various phases of the life cycle of the product: From product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

Document type	Purpose and content of the document
Description of Device Parameters (GP)	**Reference for parameters** The document contains detailed explanations of readable or configurable parameters in the product. The description is aimed at those who work with the product over its entire life cycle and perform specific configurations.
Safety Instructions (XA)	Safety Instructions for electrical equipment in hazardous areas are supplied with the product depending on the approval. These are an integral part of the Operating Instructions. The nameplate indicates the Safety Instructions (XA) that are relevant to the product.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the product documentation.

1.4 Change history

Device software Version/date	Software changes	FDM analysis software version	Version of OPC server	Operating Instructions
V02.00.00/08.2015	Original software	V01.03.00.00 and higher	V5.00.03.00 and higher	BA01338R/01.15
V02.01.00/04.2016	Extended functionality/bug fixes	V01.03.01.00 and higher	V5.00.03.00 and higher	BA01338R/02.16
V02.01.05/11.2016	Extended functionality/bug fixes	V01.03.01.01 and higher	V5.00.03.00 and higher	BA01338R/03.16
V02.02.00/11.2017	Ethernet function via USB	V01.04.00 and higher	V5.00.04.00 and higher	BA01338R/04.17
V02.04.00/09.2018	DIN rail version, web server extension, iTherm TrustSens support	V01.04.02 and higher	V5.00.04.01 and higher	BA01338R/05.18
V02.04.05/08.2021	Support for HTTPS server; bug fixes	V01.04.02 and higher	V5.00.04.01 and higher	BA01338R/06.21
V02.04.09/05.2025	Bug fixes	V01.04.02 and higher	V5.00.04.01 and higher	BA01338R/07.25

1.5 Registered trademarks

HART®
Registered trademark of the FieldComm Group, Austin, Texas, USA

PROFIBUS®
PROFIBUS and the associated trademarks (The Association Trademark, the Technology Trademarks, the Certification Trademark and the Certified by PI Trademark) are registered trademarks of the PROFIBUS User Organization e.V. (Profibus User Organization), Karlsruhe - Germany

PROFINET®
Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

EtherNet/IP™
Trademark of ODVA, Inc.

Microsoft®
Registered trademark of Microsoft Corporation, Redmond, Washington, USA

Google Chrome™ browser
Registered trademark of Google LLC in Mountain View, California, USA

Internet Explorer®
Registered trademark of Microsoft Corporation

Microsoft Edge™
Registered trademark of Microsoft Corporation

Excel™
Registered trademark of Microsoft Corporation

Mozilla Firefox®
Registered trademark of the Mozilla Foundation

Opera®
Registered trademark of Opera Software ASA.

2 Basic safety instructions

The reliable and safe operation of the device is only ensured if the user reads these Operating Instructions and complies with the safety instructions they contain.

Requirements concerning operating staff to ensure compliance with FDA 21 CFR Part 11:

In order to fully comply with the requirements of 21 CFR Part 11, the operators/users must be properly trained.

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- Trained, qualified specialists must have a relevant qualification for this specific function and task.
- Are authorized by the plant owner/operator.
- Are familiar with federal/national regulations.
- Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

- Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

2.2 Intended use

The device is designed for installation in a panel or a control cabinet and must only be operated in an installed state. Operation in a desktop or field housing is possible as an option.

This device is intended for the electronic capture, display, recording, analysis, remote transmission and archiving of analog and digital input signals.

2.2.1 Product liability

The manufacturer does not accept any responsibility for damage that results from non-designated use and from failure to comply with the instructions in this manual.

2.3 Workplace safety

For work on and with the device:
- ▶ Wear the required personal protective equipment according to federal/national regulations.

2.4 Operational safety

Damage to the device!
- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for the interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers!
- ▶ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:
- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to the repair of an electrical device.
- ▶ Use only original spare parts and accessories.

2.5 Product safety

This state-of-the-art device is designed and tested in accordance with good engineering practice to meet operational safety standards. It left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU declaration of conformity. The manufacturer confirms this by affixing the CE mark.

2.6 Safety information for desktop version (option)

- The mains plug should only be inserted into a socket with a ground contact.
- The protective effect may not be suspended by an extension cable without a protective ground.
- Relay outputs: U (max) = 30 V_{eff} (AC)/60 V (DC)

2.7 IT security

The manufacturer only provides a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Product description

3.1 Product design

This device is best suited for the electronic acquisition, display, recording, analysis, remote transmission and archiving of analog and digital input signals.

The device is intended for installation in a panel or cabinet. Operation in a desktop or field housing is possible as an option.

In addition, the "DIN rail" housing option is available for DIN rail mounting.

4 Incoming acceptance and product identification

4.1 Incoming acceptance

On receipt of the delivery:

1. Check the packaging for damage.
   ↳ Report all damage immediately to the manufacturer.
   Do not install damaged components.
2. Check the scope of delivery using the delivery note.
3. Compare the data on the nameplate with the order specifications on the delivery note.
4. Check the technical documentation and all other necessary documents, e.g. certificates, to ensure they are complete.

If one of the conditions is not satisfied, contact the manufacturer.

4.1.1 Scope of delivery

The scope of delivery of the device comprises:
- Device (with terminals, according to order)
- Panel-mounted device: 2 screw fastening clips
- Version with navigator and front interfaces or DIN rail version: USB cable
- Panel-mounted device: sealing rubber towards the panel wall
- "Industrial Grade" SD card, industry standard:
  Panel-mounted device with navigator and front interfaces: card is located in the SD slot behind the flap on the front of the device (optional).
  Panel-mounted device with stainless steel front and touchscreen: card is located in the device and cannot be replaced or retrofitted.
  DIN rail version: card is located in the SD slot (optional).
- "Field Data Manager (FDM)" analysis software (Essential, Demo or Professional version, depending on order)
- Delivery note
- Multilingual Brief Operating Instructions as hard copy
- Hard copy of Ex Safety Instructions (optional)

4.1.2 Product identification

The following options are available for identification of the device:
- Nameplate specifications
- Enter the serial number from the nameplate into *Device Viewer* (www.endress.com/deviceviewer): all the information about the device and an overview of the technical documentation supplied with the device are displayed.
- Enter the serial number from the nameplate into the *Endress+Hauser Operations app* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations app*: all the information about the device and the technical documentation pertaining to the device is displayed.

Nameplate

Do you have the correct device?

The nameplate provides you with the following information on the device:
- Manufacturer identification, device designation
- Order code
- Extended order code
- Serial number
- Tag name (TAG) (optional)
- Technical values such as supply voltage, current consumption, ambient temperature, communication-specific data (optional)
- Degree of protection
- Approvals with symbols
- Reference to Safety Instructions (XA) (optional)

▶ Compare the information on the nameplate with the order.

Name and address of manufacturer

Name of manufacturer:	Endress+Hauser Wetzer GmbH + Co. KG
Address of manufacturer:	Obere Wank 1, D-87484 Nesselwang or www.endress.com

4.2 Storage and transport

Note the following points:
The permitted storage temperature is –20 to +60 °C (–4 to +140 °F)

Pack the device for storage and transportation in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

Avoid the following environmental influences during storage:
- Direct sunlight
- Proximity to hot objects
- Mechanical vibration
- Aggressive media

5 Installation

5.1 Mounting conditions

NOTICE

Overheating due to buildup of heat in the device

▶ Always ensure adequate cooling of the device to prevent heat accumulation.

The device is designed for use in a panel or in the control cabinet.

The device must be installed in a pressurized enclosure system for operation in the hazardous area. To ensure safe installation, it is essential to follow the installation instructions for the cabinet and the installation instructions in the Ex-related Safety Instructions (XA).

- Ambient temperature range: –10 to +50 °C (14 to 122 °F)
- Climate class as per IEC 60654-1: Class B2

Degree of protection:

- Panel-mounted device:
  Front: IP65, NEMA Type 4 encl. / Rear: IP20
- Version with stainless steel front and touchscreen:
  Front: IP65, NEMA Type 4X encl. (approved by UL)/Rear: IP20
- DIN rail Version: NEMA Type 1, IP20

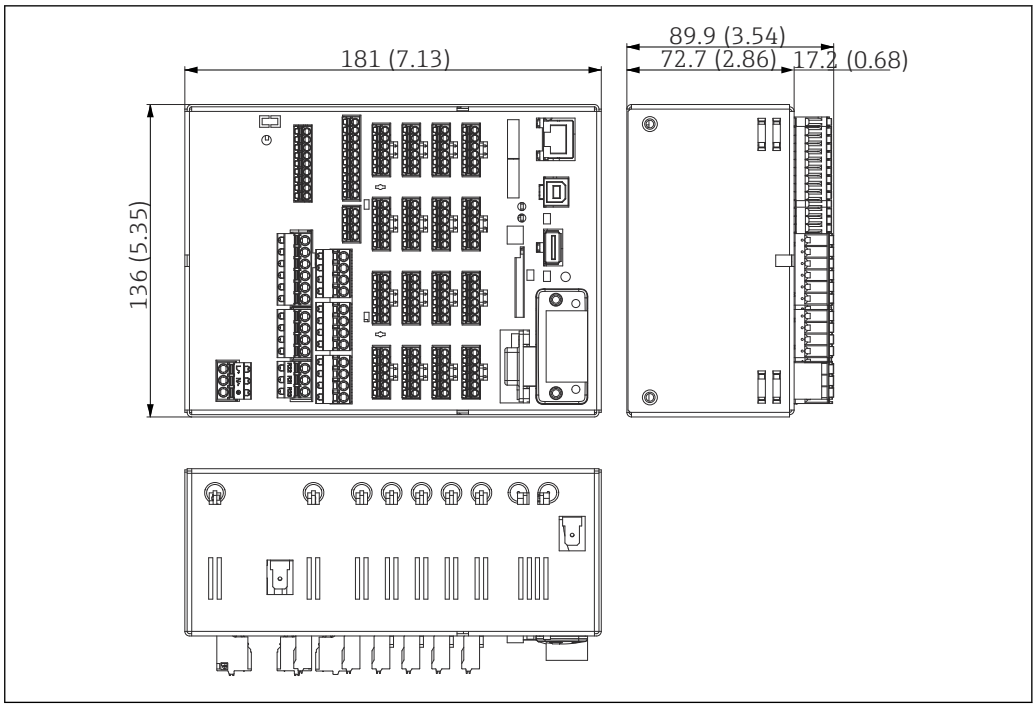
5.1.1 Installation dimensions for the panel-mounted device

- Installation depth (excluding terminal cover): approx. 159 mm (6.26 in) for device incl. terminals and fastening clips.
- Installation depth including terminal cover (option): approx.198 mm (7.8 in)
- Panel cutout: 138 to 139 mm (5.43 to 5.47 in) x 138 to 139 mm (5.43 to 5.47 in)
- Panel thickness: 2 to 40 mm (0.08 to 1.58 in)
- viewing angle range: 50° in all directions from the display central axis
- A minimum distance of 12 mm (0.47 in) between the devices must be observed if aligning the devices vertically above one another or horizontally beside one another.
- The grid dimension of the panel cutouts for multiple devices must be at least 208 mm (8.19 in) horizontally and at least 162 mm (6.38 in) vertically (tolerance not considered).
- Securing to DIN 43 834

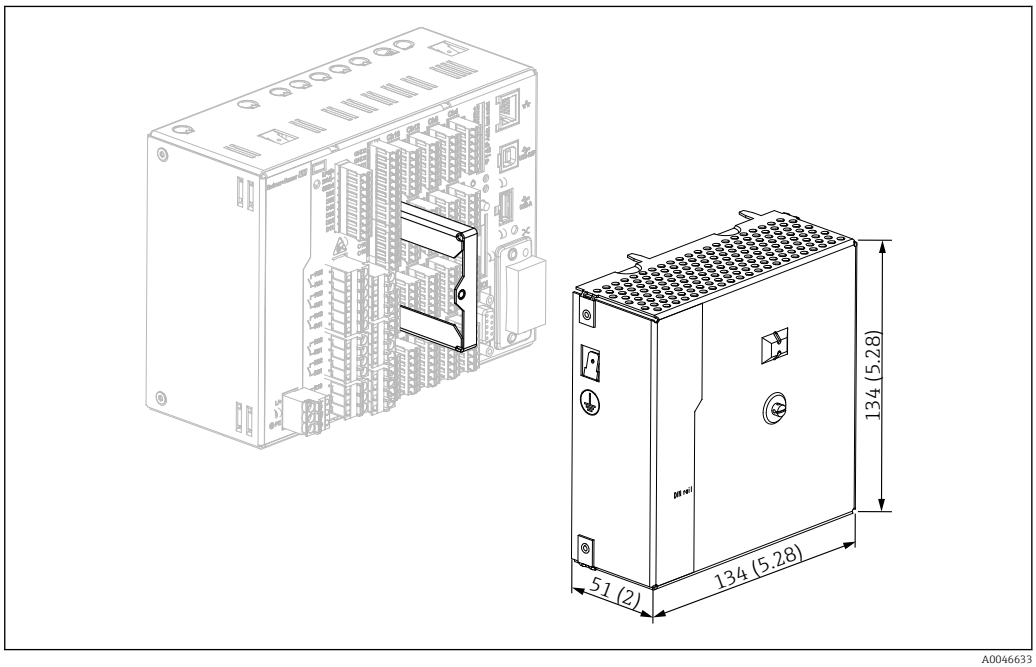
5.1.2 Mounting location and installation dimensions for the DIN rail version

The device without a display is designed for DIN rail mounting.

The DIN rail device is **not** approved for operation in the hazardous area.



1 *DIN rail version, dimensions in mm (in)*



2 *Terminal cover, DIN rail version, dimensions in mm (in)*

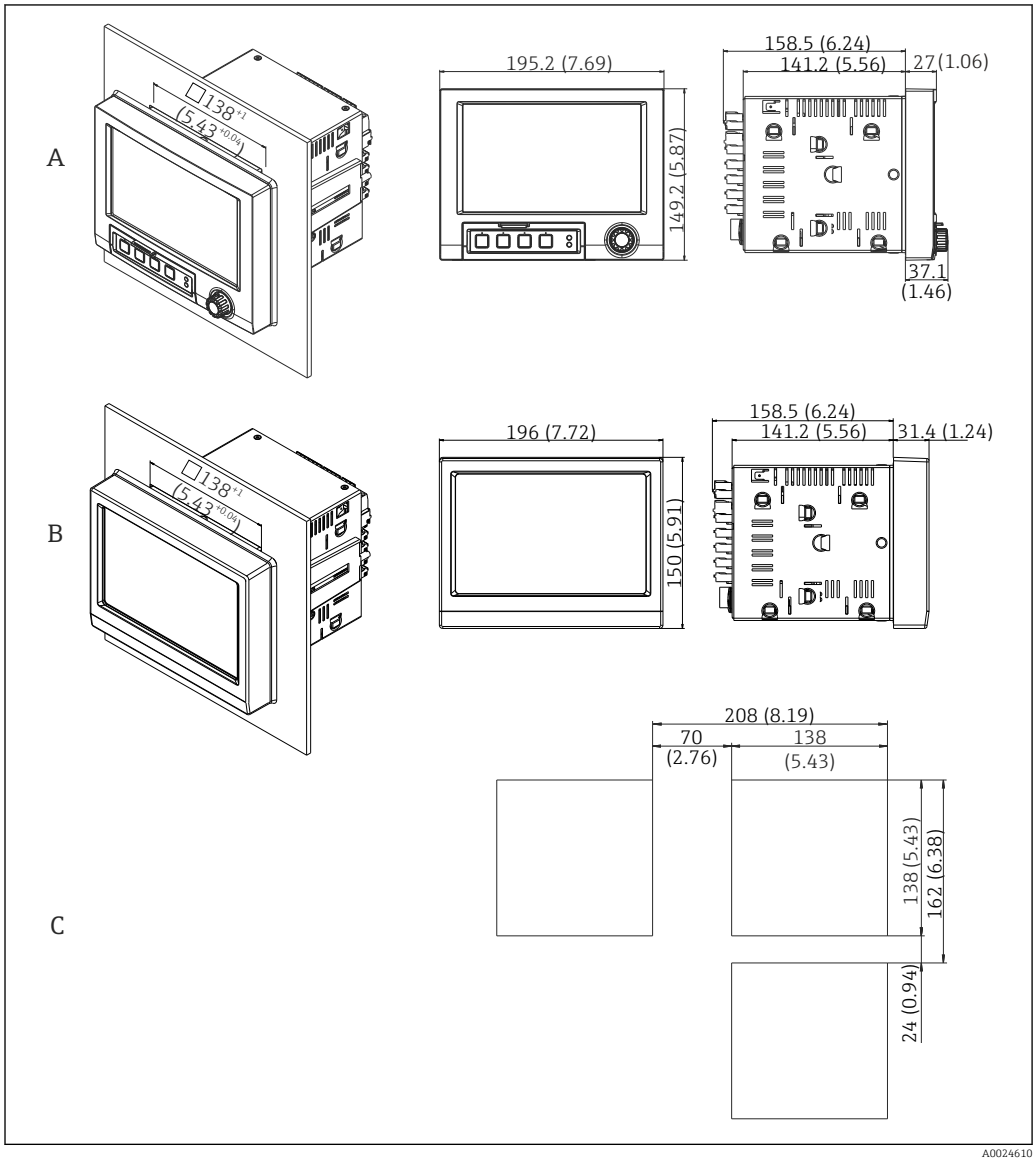
Installation dimensions

- Installation depth: approx. 90 mm (3.54 in) for device incl. terminals (w/o terminal cover).
- Mounted on DIN rail as per IEC 60715
- The devices can be arranged horizontally beside one another without clearance between the devices.

5.2 Installing the measuring instrument

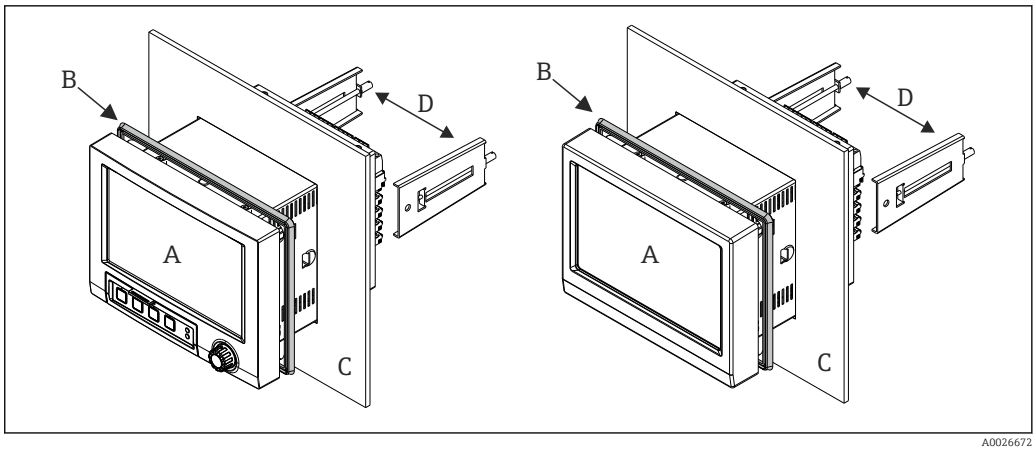
5.2.1 Mounting the panel-mounted device

Mounting tool: A screwdriver is required for installation in the panel.



3 Panel cutout and dimensions in mm (in).

A Version with navigator and front interfaces
B Version with stainless steel front and touchscreen
C Grid dimensions of panel cutouts for multiple devices

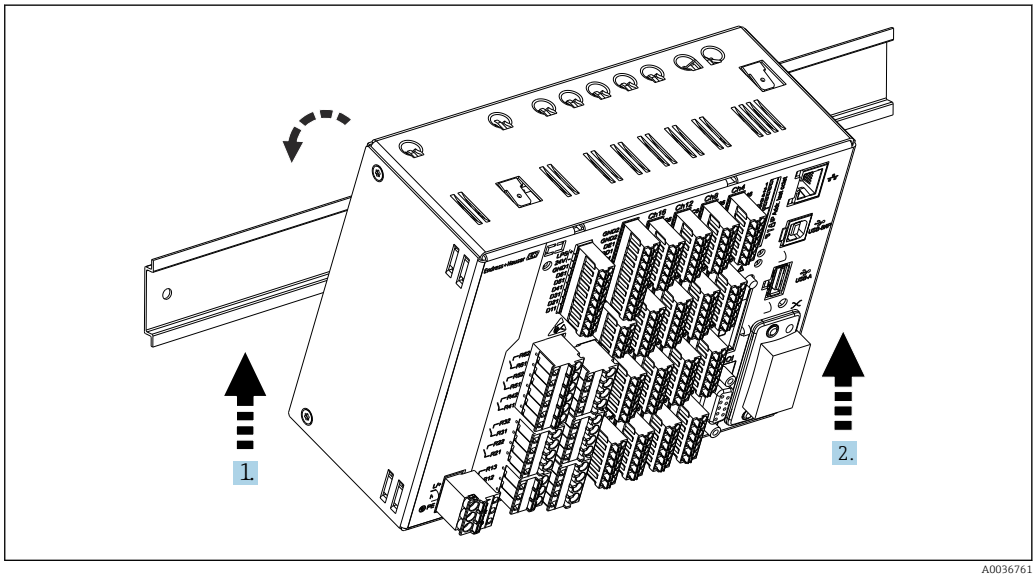


A0026672

4 *Panel mounting*

1. Push the supplied sealing rubber (B) from the rear of the device onto the front frame of the device (A).
2. Slide the device (A) through the panel cutout from the front (C). To avoid the buildup of heat, maintain a distance of >12 mm (>0.47 in) from walls and other devices.
3. Hold the device (A) level and hook the fastening clips (D) into the openings (1 x left, 1 x right).
4. Evenly tighten the screws on the fastening clips (D) using a screwdriver to guarantee a secure seal to the panel (torque: 100 Ncm).

5.2.2 Mounting and disassembling the DIN rail version



A0036761

5 *DIN rail version*

1. Set the device on the DIN rail from below.
2. Swivel the device into the end position by pushing it gently upwards and turning it towards the carrier rail.
3. Lower the device gently to release it. The device is now engaged on the DIN rail.

Disassembly is the reverse of the assembly sequence.

5.3 Post-installation check

Panel-mounted device:
- Is the sealing ring undamaged?
- Does the seal run all around the housing collar?
- Are the fastening clips tightened?
- Is the device fixed firmly in the center of the panel cutout?

DIN rail version:
Check that the device is firmly seated on the DIN rail

6 Electrical connection

6.1 Connecting requirements

⚠ WARNING

Danger! Electric voltage
- ▶ The entire connection of the device must take place while the device is de-energized.
- ▶ The mixed connection of safety extra-low voltage and dangerous contact voltage to the relay is **not** permitted.
- ▶ Apart from the relays and the supply voltage, only energy-limited circuits according to IEC/EN 61010-1 may be connected.

Danger if protective ground is disconnected
- ▶ The protective ground connection must be established before all other connections.

NOTICE

Cable heat load
- ▶ Use suitable cables for temperatures of 5 °C (9 °F) above ambient temperature.

Incorrect supply voltage can damage the device or cause malfunctions
- ▶ Before commissioning the device, make sure that the supply voltage matches the voltage specifications on the nameplate.

Check emergency shutdown for device
- ▶ Provide suitable switch or circuit breaker in building installation. This switch must be provided close to the device (within easy reach) and marked as a circuit breaker.

Protect the device from overload
- ▶ Provide overload protection (nominal current = 10 A) for power cable.

Incorrect wiring may result in the device being destroyed
- ▶ Note terminal designation on the rear of the device.

Energy-rich transients in the case of long signal cables
- ▶ Install suitable overvoltage protection (e.g., HAW562 from Endress+Hauser) upstream.

Special requirements according to FDA 21 CFR Part 11:
- The user must have the appropriate skills and qualifications to connect the device. Connection errors can only be prevented in this way.
- The user is responsible for selecting the right input ranges and for connecting suitable sensors.
- Users must ensure that the connected sensors cannot be tampered with by making sure they are suitably mounted and wired.
- An optional terminal cover is available to prevent tampering at the device terminals and terminal temperature measurement. It is the responsibility of the user to verify that the device is correctly installed and sealed following validation.
- The user is responsible for compliance with the EMC limit values at the installation location (see technical data).

6.2 Connecting instructions

6.2.1 Cable specifications

Cable specification, spring terminals

All connections on the rear of the device are designed as pluggable screw or spring terminal blocks with reverse polarity protection. The spring terminals are unlocked with a slotted screwdriver (size 0).

Note the following when connecting:
- Wire cross-section, auxiliary voltage output, digital I/O and analog I/O: max. 1.5 mm^2 (14 AWG) (spring terminals)
- Wire cross-section, mains: max. 2.5 mm^2 (13 AWG) (screw terminals)
- Wire cross-section, relays: max. 2.5 mm^2(13 AWG) (spring terminals)
- Stripping length: 10 mm (0.39 in)

No ferrules must be used when connecting flexible wires to spring terminals.

Shielding and grounding

Optimum electromagnetic compatibility (EMC) can only be guaranteed if the system components and the cables - both sensor and communication cables - are shielded and the shielding forms as complete a cover as possible. A shielded cable must be used for sensor cables that are longer than 30 m (100 ft). A shield coverage of 90% is ideal. Make sure that the communication cables and sensor cables do not cross when routing them. Connect the shielding as often as possible to the reference ground to ensure optimum EMC protection for the different communication protocols and the connected sensors.

To comply with requirements, three different types of shielding are possible:
- Shielding at both ends
- Shielding at one end on the supply side with capacitance termination at the device
- Shielding at one end on the feed side

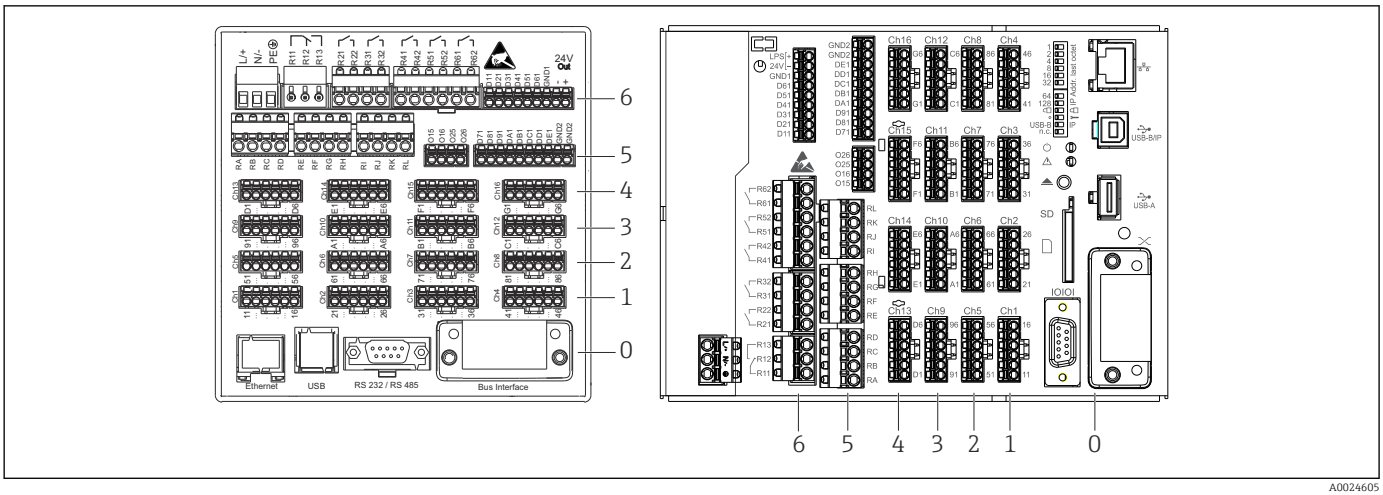
The best results are achieved in installations with shielding at one end on the supply side (without capacitance termination at the device). Appropriate internal device wiring measures must be taken to allow unrestricted operation when EMC interference is present. These measures have been taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is thus guaranteed.

Observe national installation requirements and guidelines during installation. Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground.

If the shielding of the cable is grounded at more than one point in systems without potential matching, mains frequency equalizing currents can occur. These can damage the signal cable and significantly impact signal transmission. In such cases, the shield of the signal cable should be grounded on one side only and must not be connected to the ground terminal of the housing. The unconnected shield must be insulated.

6.3 Connecting the measuring instrument

6.3.1 Terminal assignment



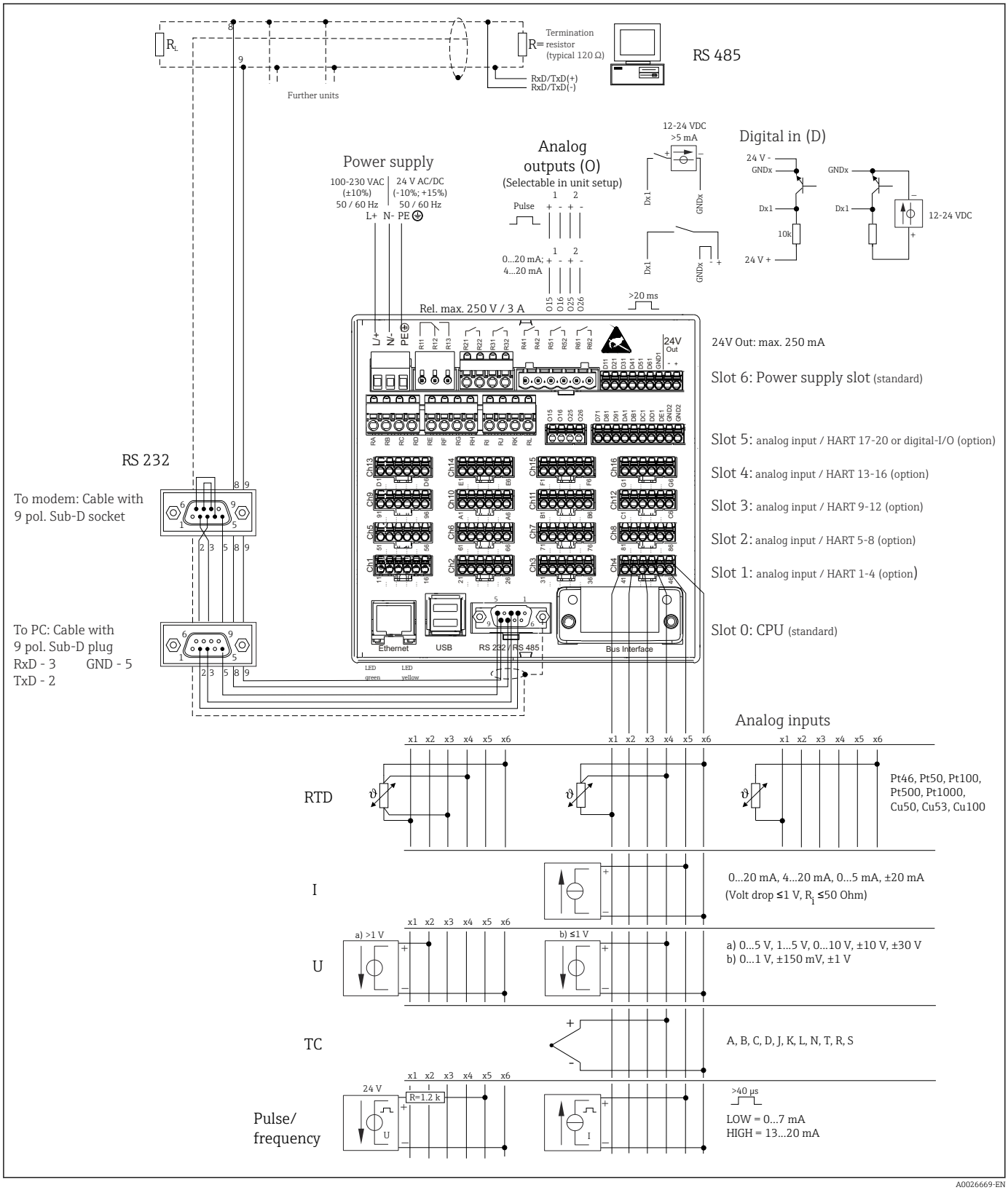
6 Connections: back of device, panel version (left), DIN rail version (right)

6 Slot 6: Power supply with relays
5 Slot 5: Multifunction card or HART® card (channels 17-20) or digital card
4 Slot 4: Multifunction card or HART® card (channels 13-16)
3 Slot 3: Multifunction card or HART® card (channels 9-12)
2 Slot 2: Multifunction card or HART® card (channels 5-8)
1 Slot 1: Multifunction card or HART® card (channels 1-4)
0 Slot 0: CPU card with interfaces

6.3.2 Electrical connection, terminal assignment

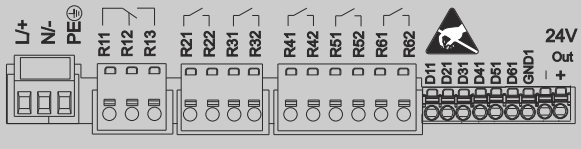
All connection examples are illustrated using the panel version. The connections on the DIN rail version are identical.

Circuit diagram

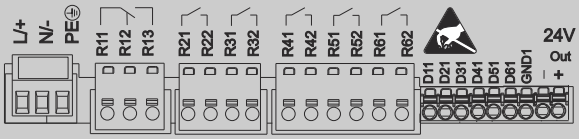


7 For connection examples of the HART® inputs (optional), see the Operating Instructions → 25

Supply voltage (power unit, slot 6)

Power unit type	Terminal		
	 A0019103		
100-230 VAC	**L+**	**N-**	**PE**
	Phase L	Zero conductor N	Ground
24 V AC/DC	**L+**	**N-**	**PE**
	Phase L or +	Zero conductor N or -	Ground

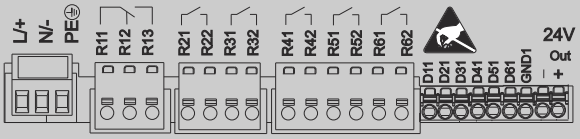
Relay (power unit, slot 6)

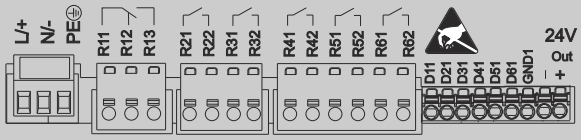
Type	Terminal (max. 250 V, 3 A)				
	 A0019103				
Alarm relay 1	**R11**	**R12**	**R13**		
	Changeover contact	Normally closed contact (NC) [1]	Normally open contact (NO) [2]		
Relay 2 to 6				**Rx1**	**Rx2**
				Switching contact	Normally open contact (NO [2])

1) NC = normally closed (breaker)
2) NO = normally open (maker)

The open or close function (= activation or deactivation of the relay coil) in a limit event can be configured in the setup: "Setup -> Advanced setup -> Outputs -> Relay -> Relay x". However, in the event of a power failure, the relay adopts its quiescent switch state regardless of the setting programmed.

Digital inputs; auxiliary voltage output (power unit, slot 6)

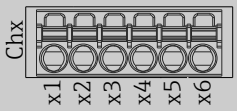
Type	Terminal			
	 A0019103			
Digital input 1 to 6	**D11 to D61**	**GND1**		
	Digital input 1 to 6 (+)	Ground (-) for digital inputs 1 to 6		

Type	Terminal			
	 A0019103			
Auxiliary voltage output, not stabilized, max. 250 mA			24V Out -	24V Out +
			- Ground	+ 24V (±15%)

If the auxiliary voltage is to be used for the digital inputs, the **24 V out -** terminal of the auxiliary voltage output must be connected with the **GND1** terminal.

Analog inputs (slot 1-5)

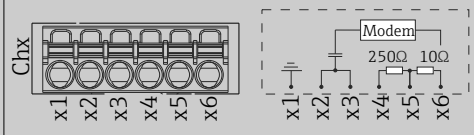
The first digit (x) of the two-digit terminal number corresponds to the associated channel:

Type	Terminal					
	 A0019303					
	x1	x2	x3	x4	x5	x6
Current/pulse/frequency input [1]					(+)	(-)
Voltage > 1V		(+)				(-)
Voltage ≤ 1V				(+)		(-)
Resistance thermometer RTD (2-wire)	(A)					(B)
Resistance thermometer RTD (3-wire)	(A)			b (sense)		(B)
Resistance thermometer RTD (4-wire)	(A)		a (sense)	b (sense)		(B)
Thermocouples TC				(+)		(-)

1) If a universal input is used as a frequency or pulse input, a series resistor must be used in series connection with the voltage source. Example: 1.2 kΩ series resistor at 24 V

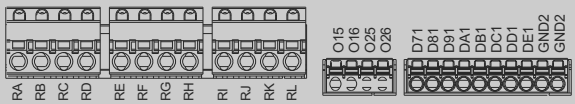
HART® inputs (slot 1-5)

The first digit (x) of the two-digit terminal number corresponds to the associated channel:

Type	Terminal					
	 A0024862					
	x1	**x2**	**x3**	**x4**	**x5**	**x6**
HART® (4 to 20 mA)	SHD	H_1	H_2	R_{com}	I+	I-

- A 250 Ω communication resistor (load) is installed on the device side between terminals x4 and x5.
- A 10 Ω resistor (shunt) is installed on the device side at the current input between terminals x5 and x6.
- Terminals x2 and x3 (H_1 and H_2) are jumpered internally.
- The internal HART® modem is located between terminals x2/x3 and x6.

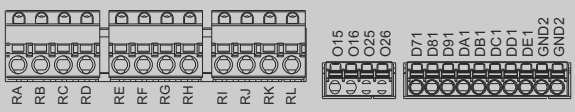
Relay extension (digital card, slot 5)

Type	Terminal (max. 250 V, 3 A)			
	 A0024736			
Relay 7, 8	**RA**	**RB**	**RC**	**RD**
Relay 9, 10	**RE**	**RF**	**RG**	**RH**
Relay 11, 12	**RI**	**RJ**	**RK**	**RL**
	Switching contact	Normally open contact ([1])	Switching contact	Normally open contact ([2])

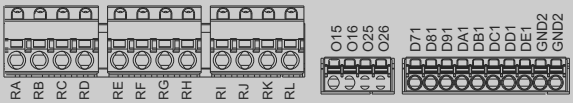
1) NO)
2) NO)

The open or close function (= activation or deactivation of the relay coil) in a limit event can be configured in the setup: "Setup -> Advanced setup -> Outputs -> Relay -> Relay x". However, in the event of a power failure, the relay adopts its quiescent switch state regardless of the setting programmed.

Analog outputs (digital card, slot 5)

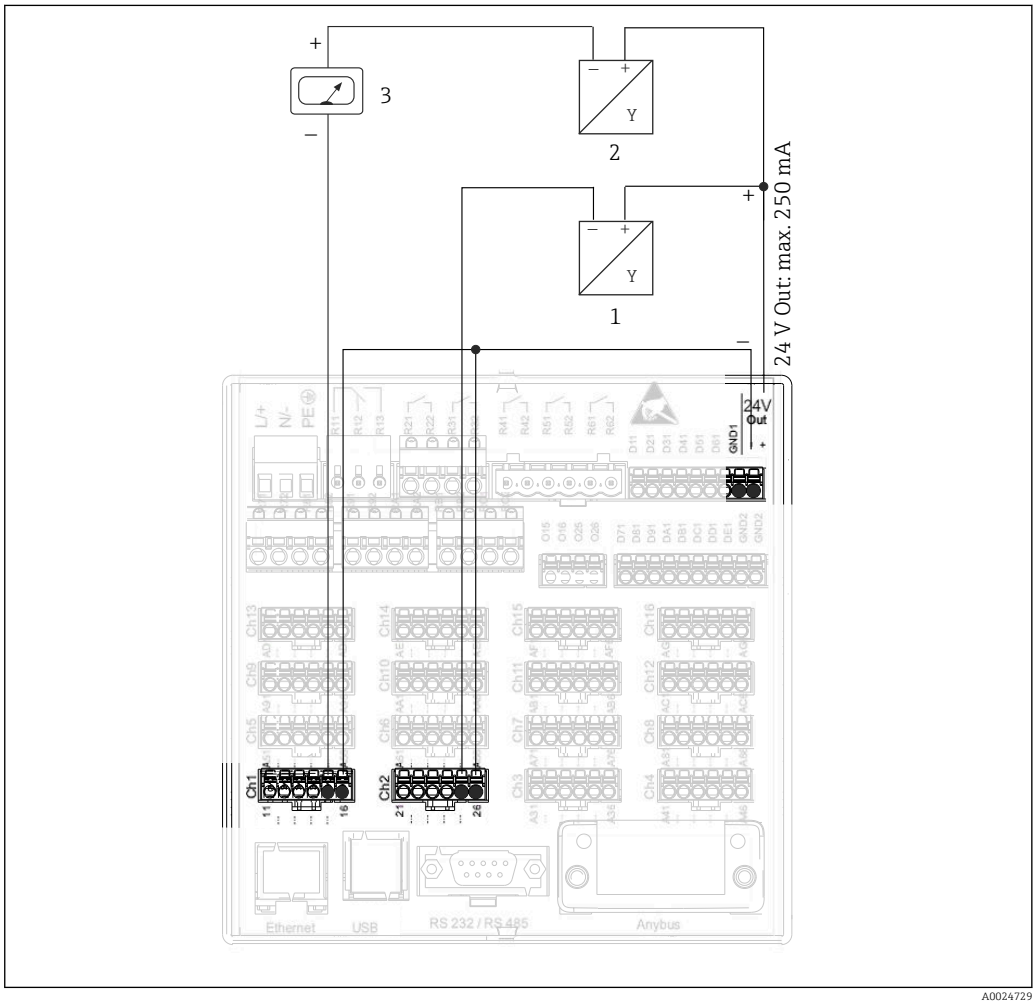
Type	Terminal			
	 A0024736			
Analog output 1-2	**O15**	**O16**	**O25**	**O26**
	Analog output 1 (+)	Ground, analog output 1 (-)	Analog output 2 (+)	Ground, analog output 2 (-)

Extension of digital inputs (digital card, slot 5)

Type	Terminal		
	 A0024736		
Digital input 7 to 14	**D71 to DE1**	**GND2**	**GND2**
	Digital input 7 to 14 (+)	Ground (-) for digital inputs 7 to 14	Ground (-) for digital inputs 7 to 14

If the auxiliary voltage is to be used for the digital inputs, the **24 V out -** terminal of the auxiliary voltage output (power unit, slot 6) must be connected with the **GND2** terminal.

6.3.3 Connection example: Auxiliary voltage output as transmitter power supply for 2-wire sensors

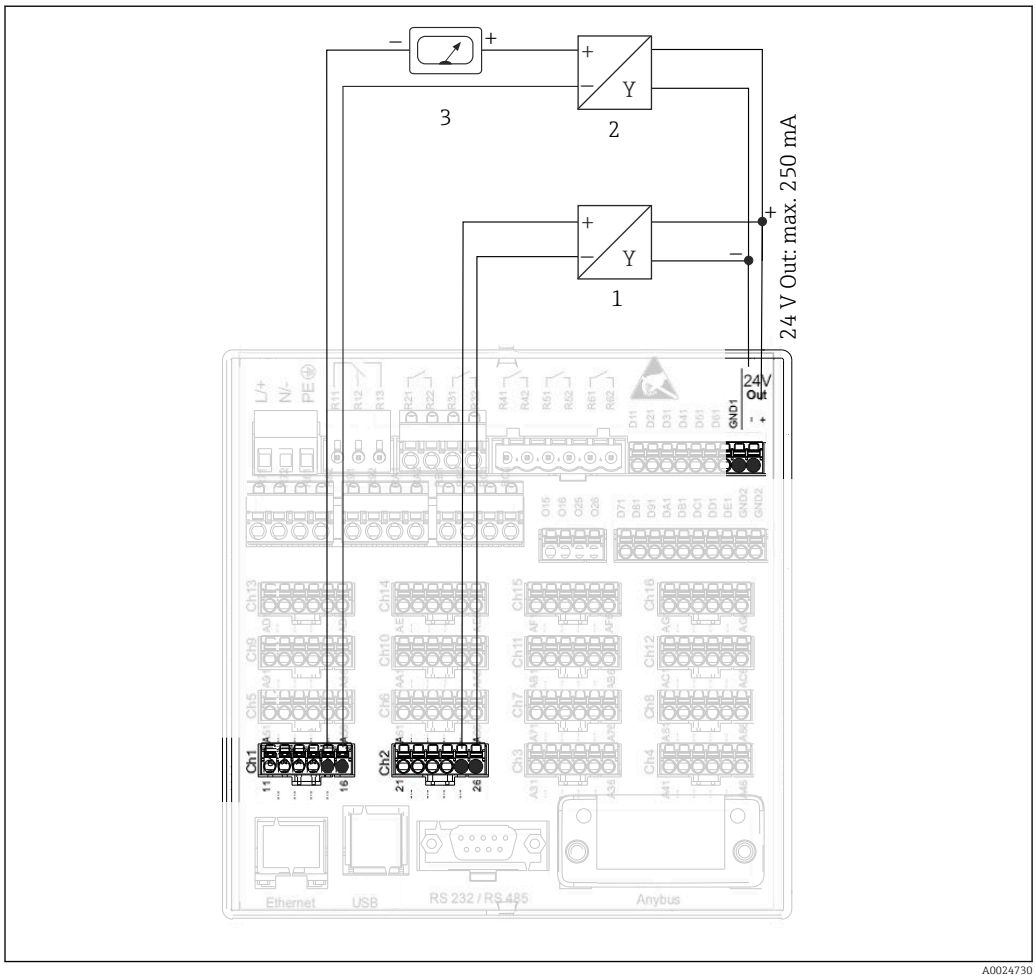


A0024729

8 *Connecting the auxiliary voltage output when using as a transmitter power supply for 2-wire sensors in the current measuring range*

1 *Sensor 1 (e.g., Cerabar from Endress+Hauser)*
2 *Sensor 2*
3 *External indicator (optional) (e.g., RIA16 from Endress+Hauser)*

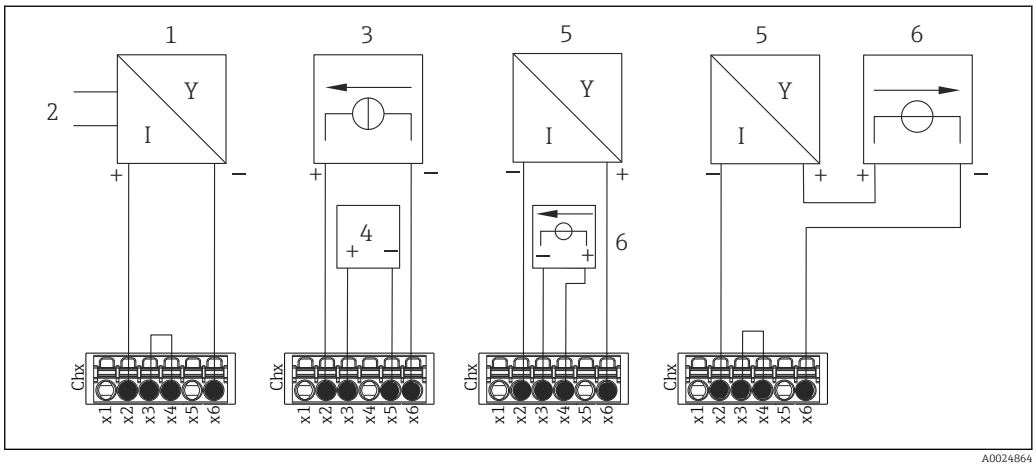
6.3.4 Connection example: Auxiliary voltage output as transmitter power supply for 4-wire sensors



9 *Connecting the auxiliary voltage output when using as a transmitter power supply for 4-wire sensors in the current measuring range*

1 *Sensor 1 (e.g., Thermophant T TTR31 temperature switch from Endress+Hauser)*
2 *Sensor 2*
3 *External indicator (optional) (e.g., RIA16 from Endress+Hauser)*

6.3.5 Connection example: HART® input in a point-to-point connection



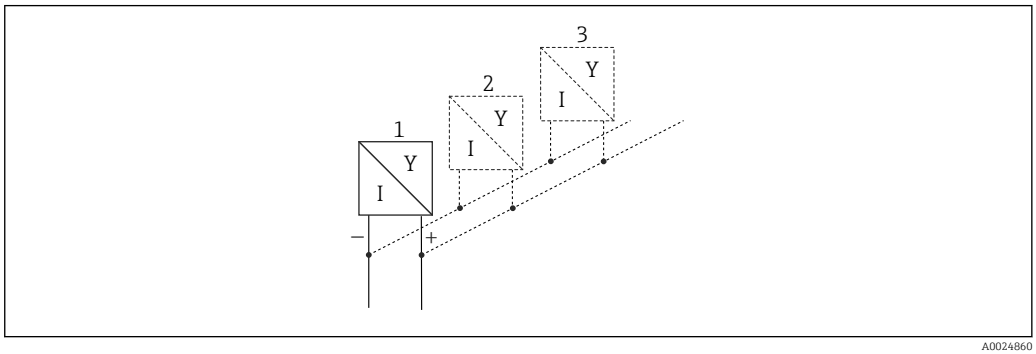
10 *Connection example: HART® inputs in a point-to-point connection*

1 *Active 4-wire sensor (slave)*
2 *Power supply for 4-wire sensor*
3 *Power supply (electricity source) for actuator*
4 *Actuator (e.g., final control element or valve)*
5 *Passive 2-wire sensor (slave)*
6 *Power supply (voltage source) for sensor.*

The internal auxiliary voltage (24 V OUT) can also be used as the transmitter power supply.

6.3.6 Connection example: HART® input in a Multidrop connection

Information on HART® Multidrop topology:
- The analog signal is not available for the process variable. Only the digital signal is used.
- Multidrop topology is **not** recommended for time-critical applications due to the slower update rate.
- The device supports a maximum of 5 sensors per current loop. The address should be in the 1 to 15 range (compatibility with HART®5).



11 *Connection example: HART® inputs in a Multidrop connection*

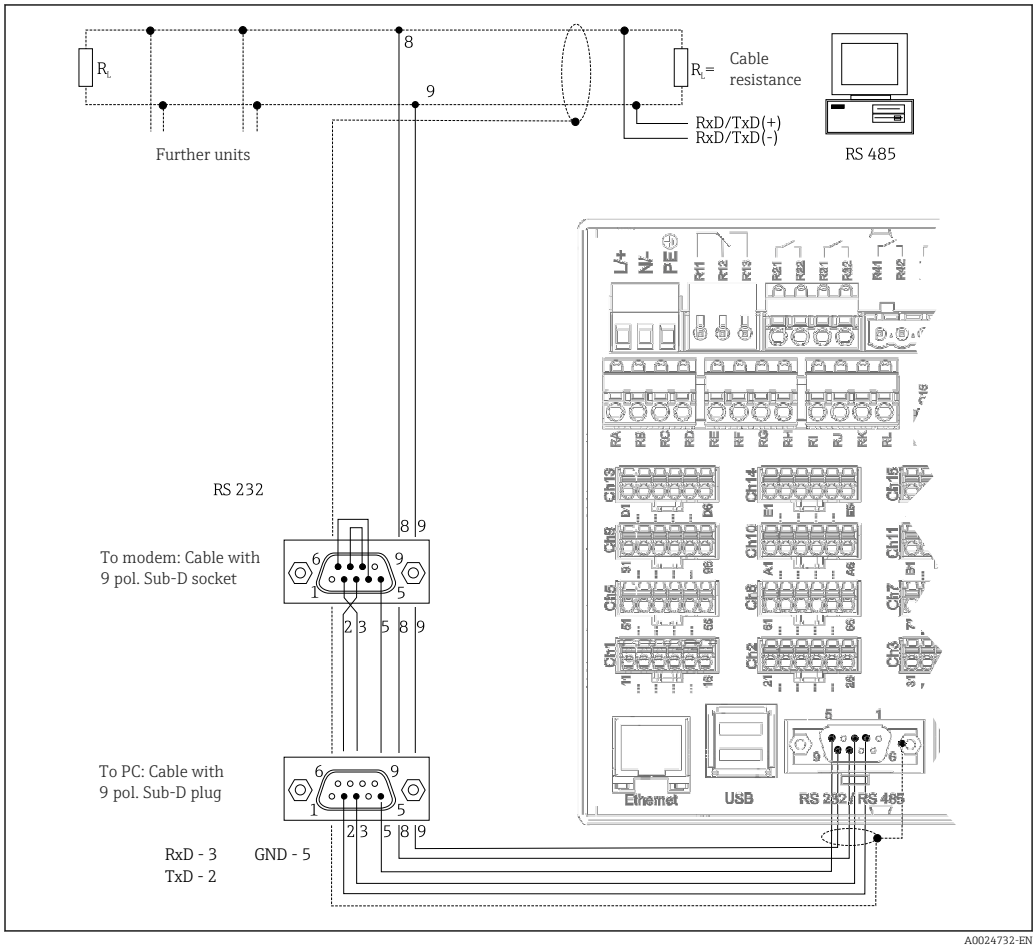
1 *Sensor (slave 1)*
2 *Sensor (slave 2)*
3 *Sensor (slave 3-5)*

The internal auxiliary voltage (24 V OUT) can also be used as the transmitter power supply.

6.3.7 RS232/RS485 interface (CPU card, slot 0)

Use shielded signal cables for serial interfaces!

A combined RS232/RS485 connection is available on a shielded SUB D9 socket. This can be used for data transfer and to connect a modem. For communication via modem, we recommend an industrial modem with a watchdog function.



Type	Pin of the SUB-D9 socket								
	1	2	3	4	5	6	7	8	9
RS232 assignment		TxD (data output)	RxD (data input)		GND				
RS485 assignment					GND			RxD/TxD −	RxD/TxD +
Unoccupied connections should be left empty. Maximum cable length: RS232: 2 m (6.6 ft) RS485: 1000 m (3280 ft)									

Only one interface can be used at any one time (RS232 or RS485).

Option: Modbus RTU master

As a Modbus master, the device can interrogate other Modbus slaves via RS485. The Modbus RTU master can be operated in parallel with the Profibus DP slave, EtherNet/IP adapter, PROFINET I/O device or Modbus TCP slave.

Up to 40 analog inputs can be transmitted via Modbus and stored in the device.

Option: Modbus RTU slave

The device can be interrogated as a Modbus slave by another Modbus master via RS485.

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via Modbus and stored in the device.

A Modbus RTU master and RTU slave cannot be operated in parallel.

Remote interrogation with analog or GSM/GPRS wireless modem:

Analog modem:
An analog modem for industrial use (e.g., Devolo or WESTERMO), which is connected to the RS232 interface with a special modem cable (see accessories → 90), is recommended.

GSM/GPRS wireless modem:
An industrial GSM/GPRS wireless modem (e.g., Cinterion, INSYS or WESTERMO, incl. antenna and power unit), which is connected to the RS232 interface with a special modem cable (see accessories → 90), is recommended.
Important: the wireless modem needs a SIM card and data transfer subscription. In addition, it must be possible to deactivate the PIN prompt.

If the web server is operated via a wireless modem, this may result in high provider costs as data are transmitted continuously.

6.3.8 Ethernet connection (CPU card, slot 0)

The Ethernet interface can be used to integrate the device via a hub or switch into a PC network (TCP/ IP Ethernet). A standard patch cable (e.g., CAT5E) can be used for the connection. Using DHCP, the device can be fully integrated into an existing network without the need for additional configuration. The device can be accessed from every PC in the network.

- Standard: 10/100 Base T/TX (IEEE 802.3)
- Socket: RJ-45
- Max. cable length: 100 m
- The Ethernet network cable cannot be routed outside the building.

The following functions are implemented:
- Data communication with PC software (analysis software, configuration software, OPC server)
- Web server

Meaning of the LEDs
Beneath the Ethernet connection there are two light emitting diodes which indicate the status of the Ethernet interface.
- Yellow LED: link signal; is lit when the device is connected to a network. If this LED is not lit, communication is not possible.
- Green LED: Tx/Rx; flashes irregularly if the device is transmitting or receiving data.

Requirements with regard to a network printer

The printer must support PCL5c (or higher). Laser jet and ink jet printers are supported. The printouts are always color printouts (if supported by the printer). The printout has different shades of gray if you use a black/white printer.

Reference list: HP Color LaserJet CP1515n, HP Color LaserJet Pro CP1525n, Kyocera FS-C5015N

GDI printers are not supported!

Option: Ethernet Modbus TCP master

As a Modbus master, the device can interrogate other Modbus slaves via Ethernet. The Modbus TCP master can be operated in parallel with the Profibus DP slave, Modbus RTU, Modbus TCP slave, EtherNet/IP adapter or PROFINET I/O device.

Up to 40 analog inputs can be transmitted via Modbus and stored in the device.

Option: Ethernet Modbus TCP slave

The Modbus TCP interface is used to connect to higher-ranking SCADA systems (Modbus master) to transmit all measured values and process values.

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via Modbus and stored in the device.

6.3.9 Option: Anybus® interface (CPU card, slot 0)

PROFIBUS–DP slave:

The device can be integrated into a fieldbus system as per the PROFIBUS–DP standard by means of the PROFIBUS-DP interface. Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via PROFIBUS-DP and stored in the device. For bidirectional communication in cyclic data transfer. Connection via Sub-D socket.

Baud rate: maximum 12 Mbit/s

EtherNet/IP adapter (slave):

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via EtherNet/IP and stored in the device. The built-in module corresponds to I/O server category (Level 2). It has an integrated 2-port switch, thereby supporting EtherNet/IP communication with line or ring topology. Connection via 2 RJ45 standard sockets.

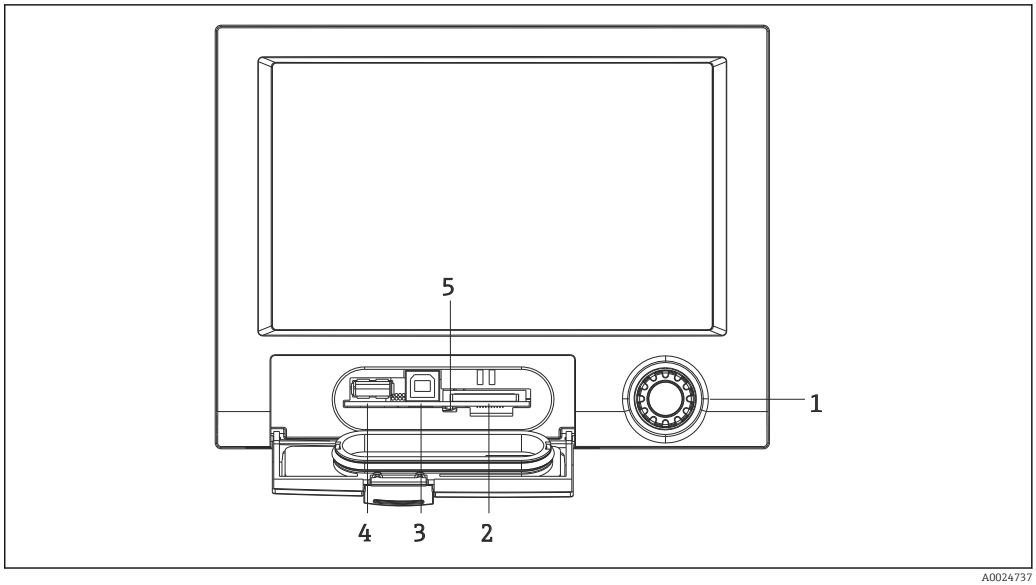
PROFINET I/O device:

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via PROFINET IO and stored in the device. The 2-port module for Profinet IO meets compliance class B. The integrated switch enables real-time communication (RT classification) in star, line, or bus topologies without an additional external switch. Connection via 2 RJ45 standard sockets.

6.3.10 USB connection, type A (host) (CPU card, slot 0)

Two USB-2.0 ports are available (panel version) or one USB-2.0 port is available (DIN rail version) on shielded USB-A sockets. A USB memory stick, for example, can be connected to these ports as a storage medium. An external keyboard or mouse for device operation, a USB hub, a barcode reader, or a printer (PCL5c or higher) can also be connected.

6.3.11 Front of device (version with navigator and front interfaces)



12 *Version with navigator and front interfaces with open flap*

1 *Navigator*
2 *Slot for SD card*
3 *USB-B socket "Function", e.g., to connect to a PC or laptop*
4 *USB-A socket "Host", e.g., for a USB memory stick, external keyboard or mouse, USB hub, barcode reader or printer*
5 *LED at SD slot. Yellow LED lit or flashing when the device writes to the SD card or reads it.*

USB connection type A (host)

A USB 2.0 port is available on a shielded USB-A socket at the front of the device. A USB memory stick, for example, can be connected to this port as a storage medium. An external keyboard or mouse for device operation, a USB hub, a barcode reader, or a printer (PCL5c or higher) can also be connected.

USB connection type B (function)

A USB 2.0 port is available on a shielded USB-B socket at the front of the device. This can be used to connect the device to a laptop for communication, for example. → 42

USB 2.0 is compatible with USB 1.1 or USB 3.0, i.e. communication is possible.

Requirements for the SD card

Industrial grade SD-HC cards with max. 32 GB are supported.

Use only the industrial grade SD cards described in the "Accessories" section of the Operating Instructions. These have been tested by the manufacturer and are guaranteed to function correctly in the device. → 90

The SD card must be formatted to FAT or FAT32. NTFS format is not readable.

6.3.12 General information on USB devices

The USB devices are detected by the "plug-and-play" function. If several devices of the same type are connected, only the USB device that was connected first is available. Settings for the USB devices are made in the setup. A maximum of 8 external USB devices (incl. USB hub) can be connected if they do not exceed the maximum load of 500 mA. If overloaded, the corresponding USB devices are automatically disabled. An active USB hub can be used for higher power ratings.

Requirements with regard to the USB stick

There is no guarantee that all manufacturers' USB sticks will function faultlessly. That is why an industrial grade SD card is recommended to ensure the reliable recording of data. → 90

The USB stick must be formatted to FAT or FAT32. NTFS format is not readable. The system supports only USB sticks with max. 32 GB.

The USB stick must not be connected to the device via a USB hub. Interference from other USB devices may result in data loss.

Requirements with regard to an external USB keyboard

The system only supports keyboards which can be addressed using generic drivers (HID keyboard - Human Interface Device). Special buttons are not supported (e.g., the Windows button). Users can only enter characters that are available in the input character set of the device. All unsupported characters are rejected. It is not possible to connect a wireless keyboard. The following keyboard layouts are supported: DE, CH, FR, USA, USA International, UK, IT. See setting under "Setup -> Advanced setup -> System -> Keyboard layout".

Requirements with regard to an external USB barcode reader

The connected barcode reader has to act like a HID keyboard (human interface device) (universal keyboard driver). The barcode reader must complete every barcode with a carriage return (0x0D) + line feed (0x0A).

Checking the barcode reader at a PC

Before connecting the barcode reader to the device, it should be checked at a Windows® PC.

1. Connect the barcode reader to the PC and wait until Microsoft Windows® recognizes the device as a HID keyboard and installs it (check with the Windows Device Manager).
2. Configure the barcode reader as specified in the Operating Instructions of the barcode reader.
3. Start the Notepad (editor).
4. Using the barcode reader, read in a barcode (as it is used later) and check it.
5. Do not connect the barcode reader to the device until the barcode reader has been correctly configured and tested on the PC.
6. Select the character set at the device under "Setup -> Advanced setup -> System -> Barcode reader -> Character set". The following character sets are supported: DE, CH, FR, USA, USA International, UK, IT. Note: This setting has to be identical to the configuration of the barcode reader! The system only reads characters that are available in the entry character set of the device. All other characters are rejected.
7. The barcode reader should also be tested at the device via "Main menu -> Diagnostics -> Simulation -> Test barcode reader" (function not available with DIN rail version).

If problems arise, please contact the manufacturer of the barcode reader.

Reference list: Datalogic Gryphon D230, Metrologic MS5100 Eclipse Series, Symbol LS2208, Datalogic Quickscan 1, Godex GS220, Honeywell Voyager 9590.

Requirements with regard to an external USB printer

The printer must support PCL5c (or higher). Laser jet and ink jet printers are supported. The printouts are always color printouts (if supported by the printer). The printout has different shades of gray if you use a black/white printer.

Reference list: HP Color LaserJet CP1515n, HP Color LaserJet Pro CP1525n, Kyocera FS-C5015N

GDI printers are not supported!

6.4 Post-connection check

Device condition and specifications	Notes
Are cables or the device damaged?	Visual inspection
Electrical connection	**Notes**
Does the supply voltage match the information on the nameplate?	-
Are all terminals firmly engaged in their correct slot?	-
Are the mounted cables strain-relieved?	-
Are the power supply and signal cables correctly connected?	See connection diagram and device.

7 Operating options

7.1 Overview of operating options

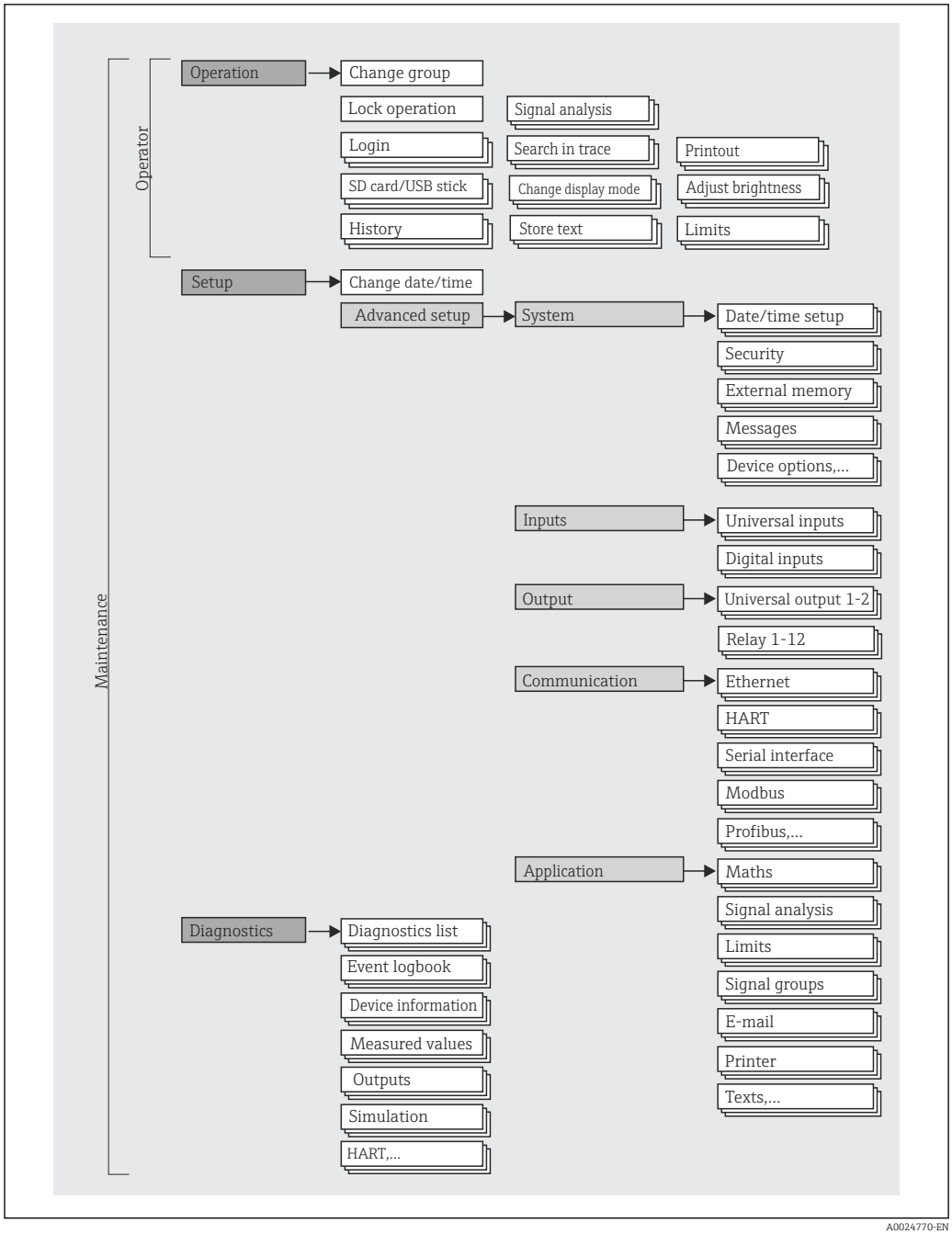
The device can be operated directly on site with the navigator and USB keyboard/mouse (only panel-mounted device) or via interfaces (serial, USB, Ethernet) and operating tools (web server); FieldCare/DeviceCare configuration software).

The DIN rail device is operated exclusively via the operating tools.

7.2 Structure and function of the operating menu

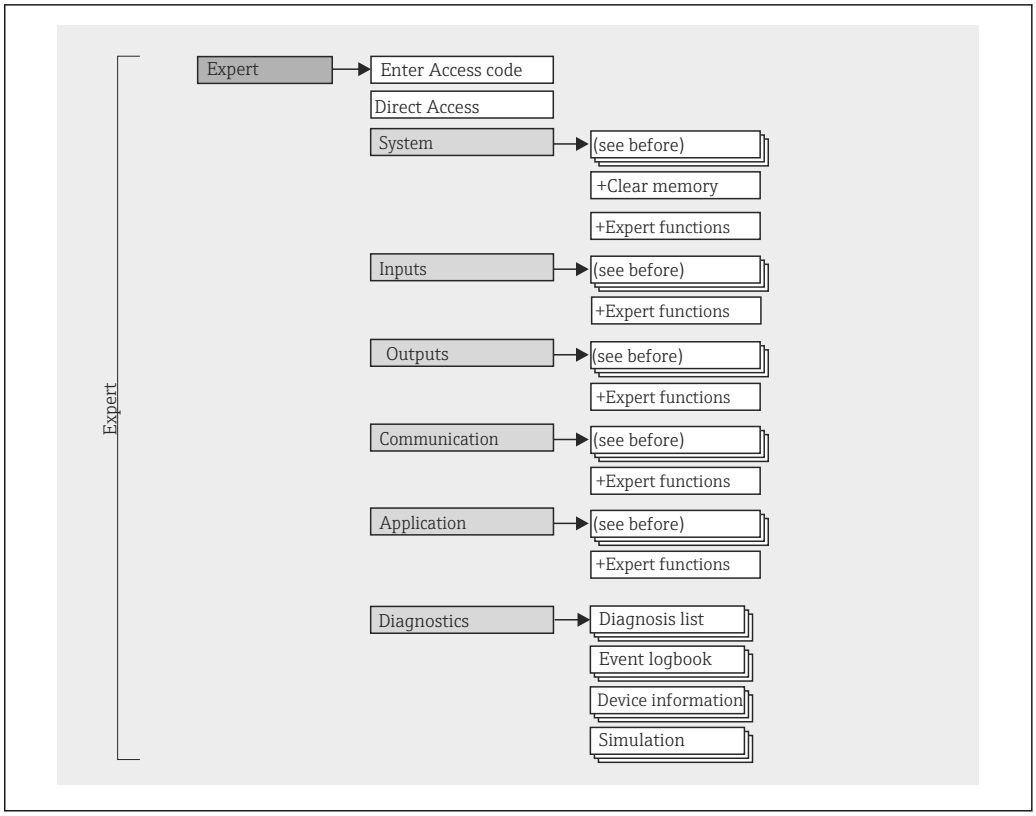
The layout and structure of the operating menu can differ slightly in parts on the web server.

7.2.1 Operating menu for operators and maintenance personnel



A0024770-EN

7.2.2 Operating menu for experts



7.2.3 Submenus and users

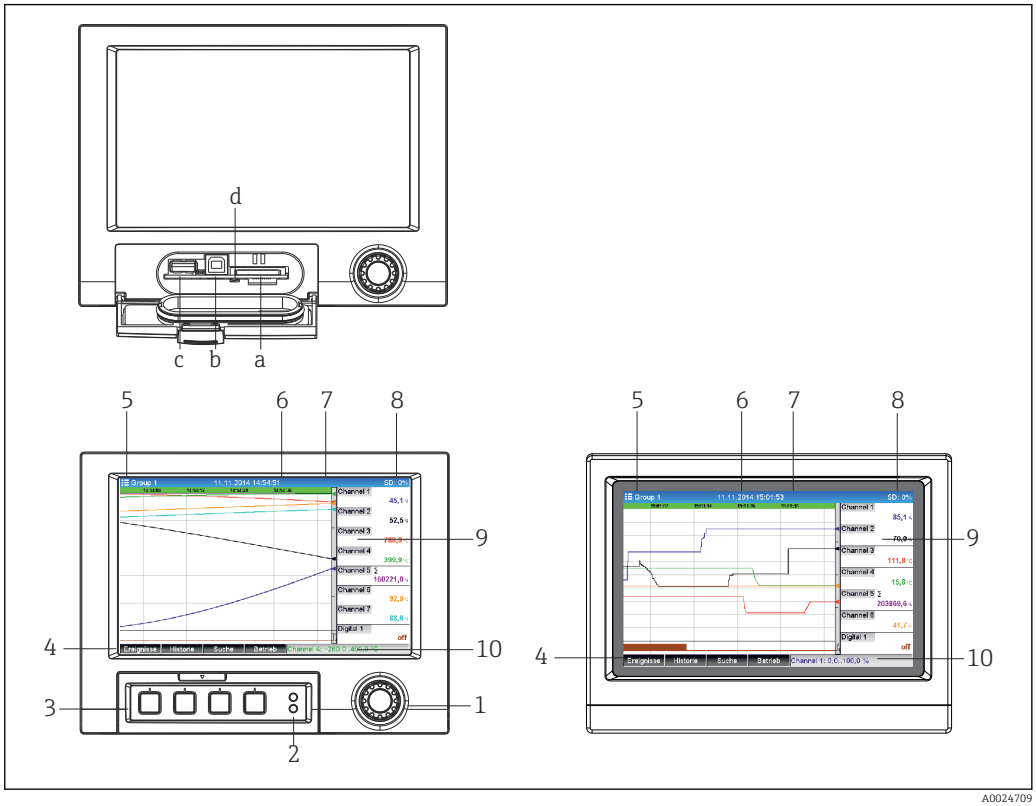
Certain parts of the menu are assigned to certain user roles. Each user role corresponds to typical tasks within the life cycle of the device.

User role	Typical tasks	Menu	Content/meaning
Operator	Tasks during operation: ▪ Configuration of the display. ▪ Reading measured values.	"Operation"	Contains all the parameters that are required in ongoing operation: configuration of the measured value display (displayed values, display format, etc.).
Maintenance	Commissioning: ▪ Configuration of the measurement. ▪ Configuration of data processing.	"Setup"	Contains all of the parameters for commissioning: ▪ **Change date/time** ▪ **"Advanced setup" submenu** Contains additional submenus and parameters: ▪ **System**: Basic settings required for operating the device. ▪ **Inputs:** Settings for analog and digital inputs. ▪ **Outputs:** Settings required only if outputs (e.g., relays) are to be used. ▪ **Communication:** Settings required if the USB, RS232, RS485 or Ethernet interface or the HART inputs of the device are used (PC operation, serial data read-out, modem operation, etc). ▪ **Application:** Various application-specific settings (e.g., group settings, limit values etc.). Once values have been set for these parameters, the measurement should usually be fully configured.

User role	Typical tasks	Menu	Content/meaning
	Troubleshooting: ▪ Diagnosing and eliminating process errors. ▪ Interpretation of device error messages and correcting associated errors.	"Diagnostics"	Contains all parameters for detecting and analyzing errors: ▪ **Diagnostic list** All diagnostic messages are listed in chronological order. ▪ **Event logbook** Events, such as limit value violations and power failures are listed in chronological order. ▪ **Device information** Displays important device information (e.g., serial number, firmware version, device options for hardware and software, memory information, etc.). ▪ **Measured values** Displays the current measured values of the device. ▪ **Outputs** Displays the current status of the outputs, e.g., switch status of relay outputs. ▪ **Simulation** Various functions/signals can be simulated for test purposes here. **Note:** In Simulation mode, normal recording of the measured values is interrupted and the intervention is logged in the event logbook. ▪ **HART** Displays the exact device information of a selected HART device and the HART communication signal quality. ▪ **Initialize modem** Initializes the modem connected to the serial interface (for automatic call answering).
Expert	Tasks that require detailed knowledge of the device's functionality: ▪ Commissioning measurements under difficult conditions. ▪ Optimal adaptation of the measurement to difficult conditions. ▪ Detailed configuration of the communication interface. ▪ Error diagnostics in difficult cases.	"Expert"	Contains all the parameters of the device (including those already contained in one of the other menus). The expert menu is protected by a code. Factory setting: 0000. This menu is structured according to the function blocks of the device: ▪ **"System" submenu** Contains all higher-level device parameters that do not affect measurement or measured value communication. ▪ **"Inputs" submenu** Contains all parameters for configuring the analog and digital inputs. ▪ **"Output" submenu** Contains all parameters for configuring the outputs (e.g, relays). ▪ **"Communication" submenu** Contains all parameters for configuring the communication interfaces. ▪ **"Application" submenu** Contains all the parameters for configuring the application-specific settings (e.g., group settings, limit values etc.). ▪ **"Diagnostics" submenu** Contains all parameters needed to detect and analyze operational errors.

7.3 Measured value display and operating elements

7.3.1 Measured value display and operating elements on panel-mounted device

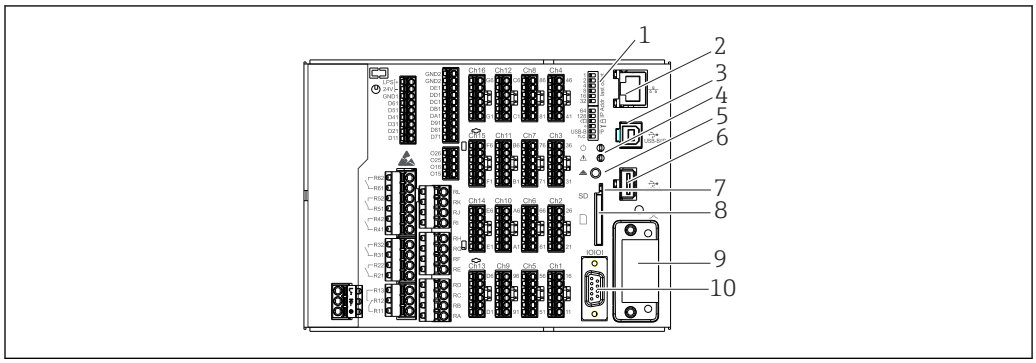


13 *Device front (left: version with navigator and front interfaces; right: version with stainless steel front and touchscreen)*

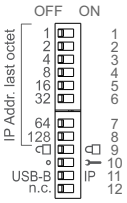
Item no.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)
a	Slot for SD card
b	USB-B socket "Function", e.g., to connect to a PC or laptop
c	USB-A socket "Host", e.g., for USB memory stick, external keyboard, barcode reader or printer
d	LED at SD slot. Yellow LED lit or flashing when the device is accessing the SD card. **Do not remove the SD card if the LED is lit or flashing! Risk of data loss!**
1	"Navigator": Jog/shuttle dial for operating with additional press/hold function. In display mode: Turn the dial to switch between the various signal groups. Press the dial to display the main menu. In setup mode and in a selection menu: Turn the dial anticlockwise to move the bar or the cursor up or to the left, changes the parameter. Turning clockwise moves the bar or cursor down or clockwise, changes parameter. Press = select highlighted function, start parameter change (ENTER key).
2	Functions of LED indicators (according to NAMUR NE44:) ▪ Green LED (top) lit: power supply OK ▪ Red LED (bottom) flashing: maintenance required, caused by external factor (e.g., cable open circuit etc.), or a message/notification requiring acknowledgment is pending, calibration is running.
3	Variable "soft keys" 1-4 (from left to right)
4	Function indicator of "soft keys"
5	In display mode: current group name, type of analysis; In setup mode: name of the current operating item (dialog title)

Item no.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)
6	In display mode: displays current date/time In setup mode: --
7	In display mode: user ID (if function is active) In setup mode: --
8	In display mode: alternating display indicating the percentage space on the SD card or USB stick that has already been used. Status symbols are also displayed in alternation with the memory information (e.g., simulation mode, data storage active, operation locked, batch active) In setup mode: the current "direct access" operating code is displayed
9	In display mode: window for measured value display (e.g., curve display). Displays the current measured values and the status in the event of an error/alarm condition. In the case of counters, the type of counter is displayed as a symbol. If a measuring point has limit value status, the corresponding channel identifier is highlighted in red (quick detection of limit value violations). During a limit value violation and device operation, the acquisition of measured values continues uninterrupted.
9	In setup mode: displays the operating menu
10	In display mode: alternating status display (e.g., set zoom range) of the analog or digital inputs in the appropriate color of the channel. In setup mode: different information is displayed here depending on the display type.

7.3.2 Operating elements of the DIN rail version



14 Device front of the DIN rail version

Item no.	Operating function
1	**DIP switches** The behavior of the Ethernet interface is configured via DIP switches (left = OFF, right = ON). For a detailed description of the DIP switch functions, see → 🖹 48 Function of the DIP switches (1 = top, 12 = bottom): ▪ DIP switches 1-8: configuration of IP address in last octet (e.g., 192.168.1.**212**) ▪ DIP switch 9: OFF = setup change not locked ON = setup locked ▪ DIP switch 10: OFF = default/OFF ON = service addressing ▪ DIP switch 11 for the configuration of the USB-B interface: OFF = USB standard ON = Ethernet over USB (web server) ▪ DIP switch 12: not assigned ℹ The DIN rail version is supplied with the following Ethernet settings: IP address: 192.168.1.212; subnet mask: 255.255.255.0; gateway: 0.0.0.0  A0036815
2	Ethernet interface
3	USB-B socket "Function", e.g., to connect to a PC or laptop
4	Functions of LED indicators (according to NAMUR NE44:) ▪ Green LED (top) lit: power supply OK ▪ Red LED (bottom) flashing: maintenance required, caused by external factor (e.g., cable open circuit etc.), or a message/notification requiring acknowledgment is pending, calibration is running.
5	Cyclic storage is completed via the "Safe SD card removal" button, the LED (d) goes out. The SD card can now be removed. ℹ If the SD card is not removed within 5 minutes, the write cycles start again.
6	USB-A socket "Host", e.g., for USB memory stick or printer If a USB stick is inserted, data that have not yet been saved are copied to the stick automatically. The red LED on the USB socket flashes while the data are being copied to the stick. ℹ **Do not remove the USB stick when the red LED is flashing! Risk of data loss!** If an error occurs (e.g., USB stick full or defective), the red LED is lit constantly. Remove the USB stick and replace it.
7	LED at SD slot. Yellow LED lit or flashing when the device is accessing the SD card. ℹ **Do not remove the SD card if the LED is lit or flashing! Risk of data loss!**
8	Slot for SD card
9	Anybus interface (option)
10	Serial RS232/RS485 interface

7.4 Display representation of symbols used in operation

Item no.	Function	Description
9	**Symbols for counters:**	
	Σ1, Σ2, Σ3, Σ4	Intermediate analysis 1 to 4/external analysis 1 to 4
	ΣD	Daily analysis
	ΣW	Weekly analysis
	ΣM	Monthly analysis
	ΣY	Annual analysis

Item no.	Function	Description
	Σ	Totalizer
9	**Channel-related symbols:**	
		Violation of lower limit value
		Violation of upper limit value or limit value on counter
		Violation of upper and lower limit values at the same time
	S	**"Out of specification"** e.g., input signal too high/low
	F	**Error message "Failure detected"** An operating error has occurred. The measured value is no longer valid (e.g., a channel not displayed in the current group is defective).
	M	**"Maintenance required"** Maintenance is required. The measured value remains valid.
	-----	**Error, measured value not displayed.** Possible causes: Sensor / input error, line break, invalid value, input signal too high/low
8	**Symbol for status signals:**	
		"Device locked" Setup is locked via a control input. Disable setup lock via a control input.
	S	**"Out of specification"** The device is being operated outside its technical specifications (e.g., during startup or cleaning processes).
	C	**"Function check"** The device is in Service mode.
	M	**"Maintenance required"** Maintenance is required. The measured value remains valid.
	F	**Error message "Failure detected"** An operating error has occurred. The measured value is no longer valid (e.g., a channel not displayed in the current group is defective).
		"External communication" The device is communicating externally (e.g., via Modbus).
	SIM	**"Simulation"** Simulation is active.
4		**"Historical data"** Historical data are currently shown on screen.

7.4.1 Symbols in operating menus

	Symbol for setup
	Symbol for diagnostics
	Symbol for expert setup
	Symbol for user administration according to "FDA 21 CFR Part 11"
	Back The function "Back" appears at the end of each menu/submenu. Press "Back" briefly to go up one level in the menu structure. Press and hold "Back" (>3 sec.) to quit the menu immediately. The device switches to display mode.

7.4.2 Symbols in the event logbook

	Setup changes
	Power on
	Power off
	Limit value on
	Limit value off
1	Digital on (on/off message)
0	Digital off (on/off message)
	Service
	User management
	Texts saved/comments added
OK	Acknowledging message
	Back
	Continue searching

7.5 Entering text and numbers (virtual keyboard)

A virtual keyboard is available for entering text and numbers. This is opened automatically if needed. The appropriate character is selected by turning and pressing the navigator, or by using the touchscreen or mouse.

The following characters are available for entering customized text:

0-9 a-z A-Z = + - * / \ ² ³ ¼ ½ ¾ ( ) [ ] < > { } I ? ! ` "' ^ % ° . , : _ µ & # $ € @ § £ ¥ ~

←	Jump one position to the left. If this symbol is selected, the cursor jumps one position to the left.
→	Jump one position to the right. If this symbol is selected, the cursor jumps one position to the right.
←x	Delete backwards. If this symbol is selected, the character to the left of the cursor position is deleted.
x→	Delete forwards. If this symbol is selected, the character to the right of the cursor position is deleted.
C	Delete all. If this symbol is selected, the entire entry is deleted.
	Reject entry. If this symbol is selected, the entry is rejected and you quit editing mode. The previously set text remains.
	Accept entry. If this symbol is selected, the entry is applied at the position specified by the user, and you quit editing mode.

7.6 Channel color assignment

Channel color assignment is performed in the main menu under **"Setup -> Advanced setup -> Application -> Signal groups -> Group x"**. 8 predefined colors are available per group and can be assigned to the desired channels.

7.7 Access to operating menu via local display

Using the "Navigator" (jog/shuttle dial with additional press/hold function), the "soft keys" or touch control (optional), all settings can be made directly on site at the device.

7.8 Device access via operating tools

7.8.1 Field Data Manager (FDM) analysis software (SQL database support)

The PC analysis software offers external, centralized data management with visualization for recorded data. The analysis software enables the complete archiving of all measuring point data, e.g., measured values, diagnostic events and protocols. The analysis software stores data in an SQL database. The database can be operated locally or in a network (client/server). Access is via RS232/RS485, USB or Ethernet interface (network).

Function scope:
- Export of saved data (measured values, analyses, event logbook)
- Visualization and processing of saved data (measured values, analyses, event logbook)
- Safe archiving of exported data in an SQL database

The following versions of the software are available:
- Essential version (free, with limited functionalities)
- Professional version (see Accessories → 90)
- Demo version (time-limited Professional version)

An "Essential" version of the analysis software can be downloaded free of charge at www.endress.com/ms20.

For details, see the online help in the analysis software and the Operating Instructions for the analysis software.

7.8.2 Web server

A web server is integrated into the device. This makes the current measured values of the device available in real time. Access is via an Ethernet interface from a PC in the network via the standard browser. The installation of additional software is not required. Alternatively, the web server can be operated via the USB-B interface in a point-to-point connection (Ethernet over USB) using a standard USB cable. → 42

The web server offers the following functionality:
- Display of current and historical data and measured value curves via a standard web browser → 59
- Easy configuration without additional installed software → 45
- Remote access to device and diagnostic information

7.8.3 OPC server (optional)

The OPC server makes it possible to access data on the device. These data are made available to OPC clients in real time. The OPC server meets the requirements of the OPC specifications regarding the supply of data to an OPC client. Access is via RS232/RS485, USB or Ethernet interface (network). Communication takes place using automatic device detection; the operator does not need to make any additional settings. The OPC server enables the flexible and powerful exchange of data and is easy and convenient to use.

The following instantaneous values can be provided:
- Analog channels
- Digital channels
- Mathematics
- Totalizer

For details, see Operating Instructions BA00223R

7.8.4 FieldCare/DeviceCare configuration software

Function scope

The configuration software is an FDT/DTM-based system asset management tool. It can be used to configure all intelligent field units in a plant and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Access is via USB or Ethernet interface (network).

Typical functions:
- Device configuration
- Loading and saving device data (upload/download)
- Documentation of the measuring point

Download at: www.endress.com/download

Overview of device description files (DTM)

Information and files are available free of charge at:

See online at: www.de.endress.com/fieldcare

8 System integration

8.1 Integrating the measuring instrument into the system

8.1.1 General information

The device has (optional) fieldbus interfaces for exporting process values. Measured values and statuses can also be transmitted to the device via fieldbus.

Note: Counters cannot be transferred.

Depending on the bus system, alarms and faults occurring during data transmission are displayed (e.g., status byte).

The process values are transmitted in the same units that are used to display the values on the device.

Information on compliance with FDA 21 CFR Part 11 requirements when using fieldbus systems:

If no measured values are received by fieldbus, the device activates a floating switching contact (e.g., relay) after a configurable timeout period. The evaluation of the switching contact is the responsibility of the user.

8.1.2 Ethernet

Setup → Advanced setup → Communication → Ethernet

The IP address can be entered manually (fixed IP address) or assigned automatically using DHCP.

The port for data communication is preset to 8000. The port can be changed in the **Expert** → **Communication** → **Ethernet** menu.

The following functions are implemented:
- Data communication with PC software (analysis software, configuration software, OPC server)
- Web server

The following connections are possible at the same time:
- 1x Port 8000 (configuration software, OPC server or analysis software)
- 1x Port 8002 (OPC server only)
- 1x Port 5094 (HART IP)
- 4x Modbus slave TCP
- 5x Web server

Ports can be changed.

As soon as the maximum number of connections has been reached, new connection attempts are blocked until an existing connection has been terminated.

8.1.3 Web server with "Ethernet over USB" function

To provide easy and efficient access via web server for operation, setup and commissioning, the USB-B interface can be switched to the "Ethernet over USB" mode. Ethernet communication is established here via the USB interface. This has the advantage that the Ethernet interface in the case of commissioning laptops, for example, does not need to be reconfigured (IP address, ports, etc.). Instead, a standard USB cable can be used to establish a point-to-point connection. The web server itself retains its complete range of functionality.

Important information:
- Do not connect several devices via USB to a laptop/PC at the same time.
- The PC should not be connected to the device via USB and to the network via Ethernet/RJ45 at the same time if the network uses the same address range as the device.
- Driver software (EH ECM device) must be installed on the PC.
- The "Ethernet over USB" mode is not a gateway, i.e., the Ethernet/RJ45 and USB networks are separate from each other (no two-way access).
- The USB cable should be disconnected from the device for at least 10 s before being reconnected (prevention of errors due to response time of system).
- It takes at least 10 s before the USB driver is activated by Windows and communication with the device is possible.
- Initialization of the USB interface takes place when the PC and device are connected via a USB cable.

Supported services/functions
The following services/functions are provided via the USB interface:
- Web server
- CDI TCP (port 8000)
- WebDAV server

All other services/functions are available only by Ethernet via RJ45.

Driver installation at PC end

To use the web server via USB, a driver must be installed once at the PC end.

1. Download "USB_ECM.zip" at www.endress.com
2. Execute the "setup.exe" and follow the instructions.

The necessary drivers are installed.

Changing the USB-B mode to "Ethernet over USB" (panel version)

Communication can be established only if the device has been configured accordingly.

1. Supply power to the device, restart and wait for start screen.
2. Open dropdown menu under **"Setup → Advanced setup → Communication → Function USB-B"**.
3. "Always USB" option: USB-B is always set to Standard USB.
4. "Always Ethernet over USB" option: Ethernet over USB is always set.
5. "As per user entry" option: A prompt for the mode (option) appears once a USB cable is plugged in.

The device is now ready to establish a connection.

Changing the USB-B mode to "Ethernet over USB" (DIN rail version)

Communication can be established only if the device has been configured accordingly.

- Change the position of the DIP switch (9) from "USB-B" to "IP". The device is now set to "Always Ethernet over USB".

The device is ready to establish a connection.

Establishing communication

1. Using a standard USB cable, connect the device at the USB-B interface to any of the PC's USB interfaces.
2. With "Always Ethernet over USB" function: The web server can be started immediately.
3. With "As per user prompt" function: Once the USB cable has been plugged into the device, the "Select USB function" dropdown menu appears. Then select "Ethernet over USB" on the device. The device returns the IP address.
4. Open the browser, enter http://192.168.1.212 and follow the instructions from section → 61

The device is now ready to communicate with the web server.

The IP address of the web server via USB is set permanently to http://192.168.1.212

If the USB cable is already connected to a PC when the device starts up, there is no prompt even if the "As per user entry" option is selected. Instead, the previously selected functionality is used.

8.1.4 Modbus RTU/TCP slave

The device can be connected to a Modbus system via RS485 or Ethernet interface. The general settings for the Ethernet connection are made in the **Setup** → **Advanced setup** → **Communication** → **Ethernet** menu. Modbus communication is configured in the **Setup** → **Advanced setup** → **Communication** → **Modbus Slave** menu.

Up to 40 analog inputs and 20 digital inputs can be transmitted via Modbus and stored in the device.

Menu item	RTU (RS485)	Ethernet
Device address:	**1** to 247	IP address manual or automatic
Baud rate:	9600/**19200**/38400/57600/115200	-
Parity:	Even/Odd/**None**	-
Stop bits:	**1**/2	-
Port:	-	502

Transfer of values

The actual Modbus TCP protocol is located between layer 5 to 6 in the ISO/OSI model.

To transfer a value, 3 registers of 2 bytes each (2-byte status + 4-byte float) or 5 registers of 2 bytes each (2-byte status + 8-byte double) are used.

For more information on Modbus, see the supplementary documentation.

9 Commissioning

9.1 Function check

Perform the following checks prior to commissioning:
- "Post-installation check" checklist → 16.
- "Post-connection check" checklist → 31.

9.2 Switching on the measuring instrument

After the operating voltage is applied, the green LED lights up and the device is ready for operation.

If you are commissioning the device for the first time, program the setup as described in the following sections of the Operating Instructions.

If you are commissioning a device that is already configured or preset, the device starts measuring immediately as defined in the settings. The values of the channels currently activated are shown on the display.

Remove the protective film from the display as this would otherwise affect the readability of the display.

9.3 Configuring the operating language

Factory setting: English or ordered local language

Version with stainless steel front and touchscreen or when operating with the external USB mouse:

Calling the main menu, configuring the operating language:

1. Press the "Menu" soft key at the bottom edge of the screen.
2. The main menu appears on the display with the "Sprache/Language" option.
3. To change the default language setting: press "Sprache/Language" and select the desired language from the dropdown menu.
4. Use "Back" or "ESC" to quit the main menu.

The operating language has been changed.

Version with navigator and front interfaces:

Calling the main menu, configuring the operating language:

1. Press the navigator.
2. The main menu appears on the display with the "Sprache/Language" option.
3. To change the set language: Press the navigator, turn the navigator to select the desired language and press the navigator to apply the change.
4. Use "Back" or "ESC" to quit the main menu.

The operating language has been changed.

The function "Back" appears at the end of each menu/submenu.

Press "Back" briefly to go up one level in the menu structure.

To quit the menu immediately and return to the measured value display, press and hold "Back" (>3 sec.). The changes made are accepted and saved.

DIN rail version:

The operating language can only be changed via the web server (Setup) or configuration software (DTM).

9.4 Configuring the measuring instrument (Setup menu)

Access to the setup is enabled when the device leaves the factory and can be locked in various ways, e.g., by entering a 4-digit access code or by user administration.

When locked, basic settings can be checked but not changed. The device can also be put into operation and configured via the PC.

Device configuration options:
- Setup directly at the device (panel-mounted device only)
- Setup via SD card or USB stick by transferring the parameters stored on it
- Setup via web server using Ethernet or Ethernet over USB
- Setup via FieldCare/DeviceCare configuration software

Information on configuration using FieldCare/DeviceCare configuration software
- Offline configuration: Most of the parameters are available (depending on the device configuration).
- Online configuration: Only parameters labeled "Online configuration" are available.
→ 124

9.4.1 Step-by-step: to the first measured value

Procedure and necessary settings:

1. Check the date/time in the main menu under **"Setup"** and set it if necessary.
2. Configure settings for the interfaces and communication in the main menu under **"Setup -> Advanced setup -> Communication".**
3. Create universal or digital inputs in the main menu under **"Setup -> Advanced setup -> Inputs -> Universal inputs/Digital inputs"**: **Add input: select "Universal input x"** or **"Digital input x"** with which the input signal should be detected. Then select and configure the new input that has been created.
4. Activate relays or analog outputs (optional) in the main menu under **"Setup -> Advanced setup -> Outputs"**.
5. Assign activated inputs to a group in the main menu under **"Setup -> Advanced setup -> Application -> Signal groups -> Group x"**.
6. Use "Back" or "ESC" to quit the menu. The changes made are accepted and saved.

The device is in the measured value display mode and displays the measured values.

9.4.2 Step-by-step: setting or deleting the limit values

Procedure for setting limit values:

1. Open the limit values in the main menu under **"Setup -> Advanced setup -> Application -> Limits"**.
2. Add a limit value: select **"Yes"**.

3. Select and configure **"Limit value x".**
4. Use "Back" or "ESC" to quit the menu. The changes made are accepted and saved.

The device is in the measured value display mode and displays the measured values.

Procedure for deleting limit values:

1. Open the limit values in the main menu under **"Setup -> Advanced setup -> Application -> Limits"**.
2. Delete a limit value: select **"Yes"**.
3. Select the limit value to be deleted from the list.
4. Use "Back" or "ESC" to quit the menu. The changes made are accepted and saved.

The device is in the measured value display mode and displays the measured values.

9.4.3 Step-by-step: reading HART values (optional)

Procedure for reading measured values from a HART device/sensor:

1. Make settings for HART communication (HART® master, connection attempts) under **"Setup -> Advanced setup -> Communication -> HART".**
2. Add new value to be read by selecting **"Add value -> Yes"** .
3. Open the configuration for **"Value x".**
4. Select the physical interface to which the HART device is connected **"Connection -> Channel x".**
5. Set the address of the connected device, the HART value to be read and the channel name.
6. Activate the universal input in the main menu under **"Setup -> Advanced setup -> Inputs -> Universal inputs".**
7. Select the **"HART"** signal type and assign the previously defined HART values. Make the selection using the channel name of the HART value.
8. Other settings of the universal input are the same as for standard analog inputs.
9. Assign activated inputs to a group in the main menu under **"Setup -> Advanced setup -> Application -> Signal groups -> Group x"**.
10. Use "Back" or "ESC" to quit the menu. The changes made are accepted and saved.

The device is in the measured value display mode and displays the measured values.

9.4.4 Step-by-step: HART communication between an FDT Frame Application (FieldCare) and a HART device/sensor (optional)

The RSG45 HART CommDTM enables HART communication between a PC with an FDT Frame Application and a HART device. At this point, the device acts as a gateway/modem between the PC and the HART devices that are connected to the HART input cards of the device. Communication between the PC and the device is via the TCP/IP protocol only.

Procedure for establishing a connection:

1. Start Memograph M RSG45 HART CommDTM in the FDT Frame Application.
2. Set the communication parameters, IP address of Memograph M RSG45, port for HART communication and scan range (scan range 0 for a point-to-point connection).
3. Open the **"Create network“** menu to call up the **"Select communication channel"** dialog field to select the channel.
4. Tick the check box beside the slot/channel to which one or more HART devices are connected. Select **"OK"** to confirm the menu and start the scan.

5. All the HART devices found are displayed in the FDT Frame Application and can now be called up.

Detailed help is provided with the Memograph M RSG45 HART CommDTM.

9.4.5 Device setup

In the **"Setup"** menu and in the **"Advanced setup"** submenu, you will find the **most important** settings for the device:

Parameter		Possible settings	Description
Change date/time		UTC time zone dd.mm.yyyy hh:mm:ss	Change the date and time.
Advanced setup			Advanced settings for the device, such as system settings, inputs, outputs, communication, application etc.
	System		Basic settings that are needed to operate the device (e.g., date/time, security, memory management, messages, etc.)
	Inputs		Settings for the analog and digital inputs.
	Outputs		Settings only required if outputs (e.g., relays or analog outputs) are to be used.
	Communication		Settings required if the USB, RS232/RS485 or Ethernet interface of the device is to be used (PC operation, serial data export, modem operation, etc.). The different interfaces (USB, RS232/RS485, Ethernet) can be operated in parallel. However, simultaneous use of the RS232 and RS485 interface is not possible.
	Application		Various application-specific settings (e.g., group settings, limit values etc.).

For a detailed overview of all the operating parameters, please refer to the Appendix of the Operating Instructions. → 124

9.4.6 Setup via SD card or USB stick

An existing device configuration ("Setup data" *.DEH) from another Memograph M RSG45 or from FieldCare/DeviceCare can be uploaded directly to the device.

Import new setup directly at the device: The function used to load the setup data can be found in the main menu under **"Operation -> SD card (or USB stick) -> Load setup -> Select directory -> Next"**.

In the case of the DIN rail version, the setup can only be uploaded to the device using an SD card.

9.4.7 Setup via web server

To configure the device via the web server, connect the device to a PC via Ethernet (or Ethernet over USB).

Observe instructions and communication settings for Ethernet (or Ethernet over USB) and web server at → 41.

To configure the device via a web server, you must have Administrator or Service access. ID and password administration is performed in the main menu under **"Setup -> Advanced setup -> Communication -> Ethernet -> Configuration Web server -> Authentication"**.

ID default value: admin; Password: admin

Note: Change the password during commissioning.

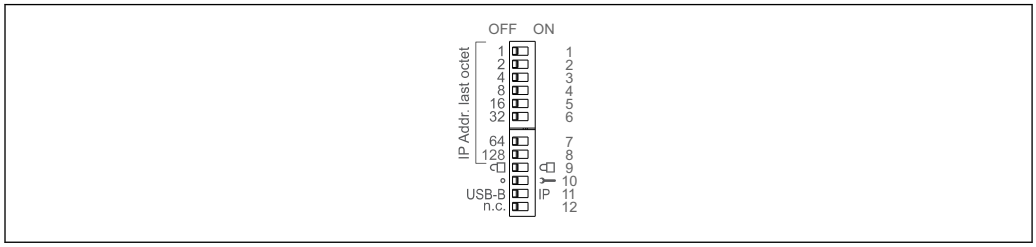
If security settings are according to "FDA 21 CFR Part 11", you must have Administrator rights to configure the device via a web server.

Establishing a connection and setup

Procedure for setting up a connection:

1. Connect the PC to the device via Ethernet (or Ethernet over USB).
2. Start the browser on the PC; enter the IP address: http://<IP address> to open the web server for the device. Note: Leading zeros in IP addresses must not be entered (e.g., enter 192.168.1.11 instead of 192.168.001.011).
3. Enter ID and password, and confirm each by clicking "OK" (see also the "Web server" section of the Operating Instructions → 61).
4. The web server shows the instantaneous value display of the device. In the web server taskbar, click **"Menu -> Setup -> Advanced setup"**.
5. Start parameter configuration.

Procedure for establishing a connection with the DIN rail version:



A0036815

Version 1: via web server/USB (requires a USB driver)

1. Set DIP switch 11 (USB-B/IP) to IP (ON).
2. Connect the USB and open the web server using the web browser (IP 192.168.1.212).
3. Configure the device under **"Expert -> Communication -> Ethernet"** (fixed IP address or DHCP).

DIP switches 10 and 11 must not be set to ON simultaneously. In this case, only Ethernet or USB may be connected.

DHCP: The IP address assigned by DHCP is determined under **"Network"** (the device must be connected via Ethernet).

If DIP switches 1 to 8 are all set to ON or OFF, software addressing is active. In all other cases hardware addressing is active. The first 3 octets are used by the software IP address (DHCP = off). The last octet must be configured via the DIP switches.

The USB driver must be installed.

If the position of DIP switch 11 (USB-B/IP) is changed, the USB cable must be disconnected from the device for at least 10 seconds.

Procedure for establishing a connection with the DIN rail version:

Version 2: via DTM/USB

1. Set DIP switch 11 (USB-B/IP) to USB-B (OFF).
2. Connect the USB.
3. Open the DTM (offline parameter configuration) and configure the device under **"Expert -> Communication -> Ethernet"** (fixed IP address or DHCP).

DIP switches 10 and 11 must not be set to ON simultaneously. In this case, only Ethernet or USB may be connected.

DHCP: The IP address assigned by DHCP can be viewed in the online configuration under **"Diagnostics -> Device information -> Ethernet"** (the device must be connected by Ethernet).

If DIP switches 1 to 8 are all set to ON or OFF, software addressing is active. In all other cases hardware addressing is active. The first 3 octets are used by the software IP address (DHCP = off). The last octet must be configured via the DIP switches.

The PC must be configured correctly (see also the procedure for "Point-to-point connection").

The USB driver must be installed.

If the position of DIP switch 11 (USB-B/IP) is changed, the USB cable must be disconnected from the device for at least 10 seconds.

Procedure for establishing a connection with the DIN rail version:

Version 3: via Ethernet

1. Set DIP switch 10 (Service) to ON.
2. Connect the Ethernet cable (point-to-point connection; a crossover cable is not required).
3. Now configure the device via the IP address 192.168.1.212 by web server or DTM (see versions 1 and 2).
4. Following configuration, set DIP switch 10 back to OFF. It is now possible to communicate with the device via the configured IP address.

DIP switches 10 and 11 must not be set to ON simultaneously. In this case, only Ethernet or USB may be connected.

With this method it is not possible to determine which DHCP address the device has received. DHCP should be disabled for this reason. Alternatively, a network administrator must determine the IP address via the MAC address.

The PC must be configured correctly (see also the procedure for "Point-to-point connection").

The USB driver must be installed.

If DIP switches 1 to 8 are all set to ON or OFF, software addressing is active. In all other cases hardware addressing is active. The first 3 octets are used by the software IP address (DHCP = off). The last octet must be configured via the DIP switches.

Continue with device configuration in accordance with the Operating Instructions for the device. The complete Setup menu, i.e., all of the parameters listed in the Operating Instructions, can also be found on the web server. After configuration, accept the setup with **"Save settings"**.

Procedure to establish a direct connection via Ethernet (point-to-point connection): → 59

NOTICE

Undefined switching of outputs and relays

▶ When configuring using a web server, the device may adopt undefined states. This may result in the undefined switching of outputs and relays.

An existing device configuration ("Setup data" *.DEH) from another Memograph M RSG45 or from FieldCare/DeviceCare can be uploaded directly to the device via the web server.

Procedure for uploading a new setup via the web server:

1. Make the connection to the device with the web server → 48.
2. Click **"Data management -> Import device settings"** in the web server taskbar.
3. Select the setup file and press **"OK"** to confirm.
4. The file is transferred, checked and accepted.
5. Once the device settings are accepted, information to this effect is displayed in the web server.

9.4.8 Setup via FieldCare/DeviceCare configuration software

To configure the device using the configuration software, connect the device to a PC via USB or Ethernet.

Download at: www.endress.com/download

Establishing a connection and setup

Continue with device configuration in accordance with the Operating Instructions for the device.

Information on configuration using FieldCare/DeviceCare configuration software
- Offline configuration: Most of the parameters are available (depending on the device configuration).
- Online configuration: Only parameters labeled "Online configuration" are available. → 124

NOTICE

Undefined switching of outputs and relays

▶ During configuration using the configuration software, the device may assume undefined states. This may result in the undefined switching of outputs and relays.

9.5 Advanced settings (Expert menu)

The Expert menu is protected by the code **"0000"**. If an access code is set up under **"Setup -> Advanced setup -> System -> Security -> Protected by -> Access code"**, this must be entered here.

If security settings are according to "FDA 21 CFR Part 11", you must be logged in as a user with Administrator rights to access the Expert menu.

The **"Expert"** menu contains **all** of the device settings:

Parameter	Possible settings	Description
Direct access	000000-000	Direct access to parameters (fast access)
System		Basic settings that are needed to operate the device (e.g., date/time, security, memory management, messages, etc.)
Inputs		Settings for the analog and digital inputs.

Parameter	Possible settings	Description
Outputs		Settings only required if outputs (e.g., relays or analog outputs) are to be used.
Communication		Settings required if the USB, RS232/RS485 or Ethernet interface of the device is to be used (PC operation, serial data export, modem operation, etc.). The different interfaces (USB, RS232/RS485, Ethernet) can be operated in parallel. However, simultaneous use of the RS232 and RS485 interface is not possible.
Application		Define various application-specific settings (e.g., group settings, limit values etc.).
Diagnostics		Device information and service functions for a quick device check.

A detailed overview of all the operating parameters is provided in the appendix at the end of the Operating Instructions. → 124

9.6 Configuration management

You can save the setup data ("Configuration") to an SD card or a USB stick, to a PC drive via the web server, and store them in a database using the configuration software. This allows additional devices to be configured very easily using the same settings.

Save setup: The function used to save the setup files can be found in the main menu under **"Operation -> SD card (or USB stick) -> Save setup"**.

CAUTION

If the SD card or USB stick is removed directly:
Risk of data loss on SD card or USB stick

- To remove the SD card or the USB stick, always select **"Operation -> SD card (or USB stick) -> Remove safely"** in the main menu.

Procedure for saving a setup via the web server:

1. Make the connection to the device with the web server. → 48
2. Click **"Data management -> Save device settings"** in the web server taskbar.
3. Select the setup file.
4. Transfer the file.
5. Verify and accept.
6. Once the device settings are accepted, information to this effect is displayed in the web server.

The function for saving the setup data must be enabled at the device for the web server under **"Setup -> Advanced setup -> Communication -> Ethernet -> Configuration Web server; Setup -> Yes"**.

9.7 Simulation

Various functions/signals can be simulated for test purposes here.

NOTICE

Selecting simulation: Simulation of the relays and the WebDAV client can be found in the main menu under "Diagnostics -> Simulation". The simulation of the measured values can be found in the main menu under "Expert -> Diagnostics -> Simulation".
Only the simulated values are recorded during simulation. The simulation is recorded in the event logbook.

▶ Do not start simulation if measured value recording must not be interrupted.

9.8 Access protection and security concept

To protect the setup from unauthorized access following commissioning, there are many options to ensure access protection to the setup settings and the user entries. Access and authorizations can be configured and assigned passwords.

Hardware protection (digital input, DIP switch) and password protection can be used redundantly.

The user of the device is responsible for access protection and the security concept. In addition to the device functions listed, user policies and procedures, in particular, must also be applied (e.g., password allocation, password sharing, physical access barriers, etc.).

The following protection options and functionalities are available:
- Protection per control input
- Protection via access code
- Protection via user roles
- Protection via user administration according to "FDA 21 CFR Part 11"
- Protection via DIP switches (DIN rail version)

Overview of access protection and security concept

Access protection	User	Setup changes	Description
Open access	-	Permitted	No protection, not recommended, all setup and system settings are accessible.
Control input	-	Permitted	Access protection via digital input (e.g., via key switch), all setup and system settings are accessible if input actuated.
Access code	-	Permitted	Access protection via access code, access authorization (distribution of access code) must be defined via (in-house) regulations and securely controlled. All setup and system settings can be accessed after entering the access code.
Password-protected user roles			Protection levels and access authorization can be defined via 3 levels of access (user roles). Access authorization (distribution of passwords) must be defined via (in-house) regulations and securely controlled.
	Administrator	Permitted	Access protection via administrator password, all setup and system settings can be accessed after entering the password.
	Service	Permitted	Access protection via service password, all setup and system settings can be accessed after entering the password, advanced functions (e.g., preset) are possible in the service mode
	Operator	Locked	All setup and system settings are locked, access to device information and display values after entering the password.
FDA 21 CFR Part 11 User Administration password-protected			Protection levels and access authorization can be defined via 5 levels of access (in accordance with FDA 21 Part 11 User Administration). Access authorization (distribution of passwords) must be defined via (in-house) regulations and securely controlled. The user logs in with his user name and the password he has been assigned. All actions are logged in a tamper-proof manner in the audit trail (logbook) in accordance with the FDA.

Access protection	User	Setup changes	Description
	Administrator	Permitted	No protection, all setup and system settings are freely accessible.
	Main user	Locked	Setup and system settings are locked. Limit value changes, data entries, confirmation of registration, etc. are allowed.
	User Level 1	Locked	Setup, limit value and system settings are locked, data entries (e.g., text), confirmation of registration, etc. are allowed.
	User Level 2	Locked	Data entries and setup, limit value and system settings are locked. Display function for device status and measured values, registration confirmation are allowed.
	User Level 3	Locked	No data entries possible, display function only for device status and measured values.
DIP switches (DIN rail device)	-	Permitted	Access protection via DIP switch at front (limited protection); protection level can be increased by additional external measures (e.g., locked control cabinet). All setup and system settings can be accessed when the DIP switch is set to "Access permitted".

In order to change any parameter, the correct code must first be entered or the device must be unlocked using the control input.

Setup lock via control input: The settings for the control input can be found in the main menu under **"Setup -> Advanced setup -> Inputs -> Digital inputs -> Digital input X -> Function: Control input; Action: Lock setup"**.

It is preferable to lock the setup using a control input.

Setting up an access code: The settings for the access code can be found in the main menu under **"Setup -> Advanced setup -> System -> Security -> Protected by -> Access code"**. Factory setting: "open access", i.e. can be changed at any time.

Make a note of the code and store in a safe place.

Setting up user roles: The settings for the user roles (operator, admin and service) are provided in the main menu under **"Setup -> Advanced setup -> System -> Security -> Protected by -> User roles"** . Factory setting: "open access", i.e. can be changed at any time.

Change the passwords during commissioning.

Make a note of the code and store in a safe place.

Setting up user administration according to "FDA 21 CFR Part 11": The settings for user administration can be found in the main menu under **"Setup -> Advanced setup -> System -> Security -> Protected by -> FDA 21 CFR Part 11"**. Factory setting: "open access", i.e. can be changed at any time.

9.9 HTTPS web server setup

To operate the HTTPS web server, an X.509 certificate and a suitable private key must be installed on the device. For security reasons, installation is via a USB stick only.

The certificate that is preinstalled on the device when delivered from the factory should not be used.

Server certificates cannot be installed via the "USB stick/import SSL certificates" function!

Requirements
Private key:
- X.509 PEM file (Base64 encoded)
- RSA key with max. 2048 bit
- May not be password-protected

Certificate:
- X.509 file (Base64 encoded PEM or binary DER format)
- V3 incl. extension required
- Signed by a certification authority (CA) or sub-certification authorities (recommended), or self-signed

Certificate and private key can be created or converted using openssl (https://www.openssl.org) for example. Contact the IT administrator to create the corresponding data.

Tip: More information on this topic is provided in our How To Videos https://www.youtube.com/endresshauser

Installation:

1. Copy the private key onto a USB stick into the root directory. File name: **key.pem.**
2. Copy the certificate onto a USB stick into the root directory. File name: **cert.pem** or **cert.der.**
3. Connect the USB stick to the device. The private key and the certificate are installed automatically. The installation is logged in the event logbook.
4. Remove the USB stick using the **"Safe removal"** function.

Notes:
- In the DIN rail version, the device will automatically copy any data not yet saved to the USB stick.
- Restart the device so the browser uses the new certificate.
- Delete the private key from the USB stick following installation.
- Keep the private key in a safe place.
- Use the private key and the certificate for one device only.
- To prevent unauthorized use, it is possible to disable the USB A port on the device. In this way, an attacker cannot replace the certificate or the private key ("Denial of Service"). Install a perimeter guard to prevent access to the device.

Checking certificates

Check the certificate via **"Main menu -> Diagnostics -> Device information -> SSL certificates"**. Select the " **Server certificate**" point under the certificate.

Replace the certificate in good time before it expires. The device will display a diagnostic message 14 days before the certificate expires.

Uninstalling certificates and the private key

Check the certificate via **"Main menu -> Diagnostics -> Device information -> SSL certificates"**. Select the " **Server certificate**" point under the certificate. Delete the certificate.

In this case, the preinstalled certificate is reused.

Using self-signed certificates

Self-signed certificates must be stored in the PC's certificate memory under "Trusted Root Certification Authorities" so that the browser does not display a warning.

Alternatively, an exception can be saved in the browser.

9.10 iTherm TrustSens Calibration Monitoring

Available in conjunction with iTHERM TrustSens TM371/TM372.

Application package :
- Up to 20 iTHERM TrustSens TM371/TM372 devices can be evaluated via the HART interface
- Self-calibration data displayed on screen or via the web server
- Generation of a calibration history
- Creation of a calibration certificate as an RTF file directly at the device
- Evaluation, analysis and further processing of the calibration data using "Field Data Manager" (FDM) analysis software

Enable the function: Self-calibration monitoring is switched on under **Expert** → **Application** → **Monitor self-calibration**.

For more information, see additional Operating Instructions → BA01887R

10 Fulfilling requirements in accordance with "FDA 21 CFR Part 11"

10.1 General information

Before applying electronic signatures the

Office of Regional Operations (HFC-100)

5600 Fishers Lane

Rockville, MD 20857

USA

is to be informed, by means of an informal letter with handwritten signature, that the company intends to use electronic documents/signatures in future. Administrators and users are to be trained according to 21 CFR 11 and must already have the requisite knowledge and/or qualifications. Commercial software used in electronic recording systems in accordance with 21 CFR 11 must be validated. The suitability of the device and associated PC software (incl. operating system) for the required application must be defined, validated and documented (e.g., in relation to data confidentiality, printing of device parameters, backup copies of the configured parameters, granting of access rights in the PC software, suitability of commercially used software such as operating system etc.).

Before the electronic signature is issued (or elements of this electronic signature, e.g., unique ID/initialization password), the identity of the person in question must be checked. The administrator must ensure and document the uniqueness of the ID and its correct assignment to the relevant person. Electronic signatures may only be used by authorized users. They must not be passed on to third parties. Administrators and users must undertake not to misuse their user IDs and passwords (including initialization passwords).

Written procedural instructions, which make individuals responsible for all actions carried out using their electronic signature, must be drawn up and observed so as to provide a deterrent mechanism for the falsification of documents and signatures.

Suitable checks of system documentation must be made (distribution, access, and use of documentation for system operation and maintenance). Revision and change control procedures must be implemented for the system documentation in which the chronological order of the development and change to system documentation is documented. The system is not intended for use in Internet applications or open systems.

NOTICE

The user is responsible for observing the following instructions to ensure compliance with FDA 21 CFR Part 11:

- The scope of application for this FDA 21 CFR Part 11 evaluation refers to the Memograph M RSG45 and the associated Field Data Manager (FDM) PC software, which have been produced and tested by the manufacturer. The overall system must be subjected to a final evaluation by the end user.
- Recordings from the device and the associated PC software in accordance with "FDA Guidance for Industry: Computerized Systems Used in Clinical Investigations: 2007" cannot be used for clinical studies.
- In order to satisfy the requirements of FDA 21 CFR Part 11 with regard to the electronic signature, the device may only be read out with the associated Field Data Manager (FDM) PC software.
- The device and the associated PC software do **not** take into account the requirements of FDA 21 CFR Part 11, §11.30 for "Open systems". Operation within the context of an open system must be excluded.
- The operator must take suitable management precautions to prevent the loss of password access data/authentication data.
- The printer must be connected correctly and its long-term operation guaranteed, even in the event of local changes (e.g., network printers).
- Due to the aging of components, the device must be calibrated at regular intervals.
- Regular maintenance must also be carried out.
- Measures must be taken to prevent the device from being moved (e.g., physical protection).
- No data will be recorded in the event of a power failure.
- The battery buffer for the backup clock is checked and, where necessary, a warning issued.
- Wireless transmission may not be used between the device and the PC software. In the case of wired transmission, operation is only permitted within the closed company network. This must be checked during the validation of the complete system.

NOTICE

The user is responsible for observing the following instructions to ensure compliance with FDA 21 CFR Part 11:

Requirements for connected hardware components:

- Associated hardware components (e.g., a PC connected to the device) are part of the system but must be provided by the user. Backup measures designed to prevent hard disk defects or a memory overrun are the responsibility of the user.
- Wired peripherals, such as a USB keyboard for the device or a keyboard for the PC, can be scanned in using "Keylogger". It is the user's responsibility to prevent the use of so-called "sniffers".

10.2 Important device settings

NOTICE

In order to satisfy the requirements from 21 CFR 11, certain device functions are required. In particular, some user administration settings must be made:

- Activate user administration and password protection according to FDA 21 CFR Part 11: In the main menu, go to **"Setup -> Advanced setup > System -> Security -> Protected by -> FDA 21 CFR Part 11"**.
- Create a user: In the main menu, go to **"User administration -> Create user account"** to create a new user.
- Make general user administration settings and define password rules: In the main menu, go to **"User administration -> General"**. Recommendation: Password valid for 60 days in order to prevent it from becoming too familiar to the user.
- Allocation of user rights: In the main menu, under **"User administration -> General -> User rights"**
- All changes to the device are automatically recorded in the event logbook. The event logbook can be opened from the main menu under **"Diagnostics -> Event logbook"**

NOTICE

The user is responsible for observing the following instructions to ensure compliance with FDA 21 CFR Part 11:

Requirements for the device:

- The device must be regarded as a closed system.
- Administrator rights are required to change the configuration. Hardware locking (terminal cover) and assignment of a digital input are necessary. Changes are documented in the event logbook/audit trail. The event logbook can be opened from the main menu under **"Diagnostics -> Event logbook".**
- User administration with ID and password must be active.
- All changes must always be documented with the user's name in the event logbook. It is essential that user administration is active for this. All users must be created accordingly under User administration.
- All settings relating to password complexity and validity period are the responsibility of the administrator.
- During commissioning, the special requirements for the admin role must be taken into account (stricter password rules). User administration can only be disabled by the administrator. Under certain circumstances the administrator may lock users out of the system or sabotage user administration.
- The initial password set by the administrator must be changed on the first login (configurable).
- If the wrong password is entered repeatedly (max. number of attempts is configurable), access is blocked and an alarm can be sent by e-mail.
- After setting up/using the device, the user must log out. Automatic logout after a configurable time must be activated.
- Communication interfaces can be blocked by the administrator. The interface for modem use must be switched off.
- Hardware locking must be performed for the device update. This ensures that only the administrator can perform a firmware update.
- Any manipulation of the time synchronization is the responsibility of the user.
- In order to prevent a loss of data, the data must be read out regularly from the memory.
- Administrator rights are required in order to delete the internal memory. A hardware lock can also be used to prevent the memory from being deleted.
- The device produces a diagnostic list in which faults are documented. The diagnostic list must be checked regularly; this can be done in the main menu under **"Diagnostics -> Diagnostic list "**.
- The error report must be checked regularly; this can be done in the main menu under **"Diagnostics -> Device information -> Error report"**.

NOTICE

The user is responsible for observing the following instructions to ensure compliance with FDA 21 CFR Part 11:

Requirements for the external memory:

- The external storage medium (SD card/USB stick) may only be removed using the function **"Operation -> SD card/USB stick -> Remove safely"**.
- In contrast to the protected data format, which features CRC16 protective measures, the stored data can be manipulated when using the open format (*.csv).
- In order to prevent unauthorized access (e.g., through theft), the external memory can also be disabled or removed.

10.3 Important settings in the Field Data Manager (FDM) PC software

NOTICE

In order to satisfy the requirements according to FDA 21 CFR Part 11, certain functions are required in the associated PC software. In particular, some user administration settings must be made.

- Use only operating systems with user administration (e.g., MS Windows® 2000/XP/ Vista/7/8).
- Create an administrator: In **"Extras -> User administration"**.
- Activate user administration and password protection according to FDA 21 CFR Part 11: Under **"Extras -> Settings -> User administration"**, select **"Activate user management"** and **"Password protection in compliance with FDA 21 CFR Part 11"**. The software applies the settings following a restart.
- Additional users can now be created under **"Extras -> User administration"** with the corresponding access roles.
- All changes made to the software are recorded in the "Audit trail". This can be opened via **"Extras -> Audit trail".**
- Where appropriate, use the high-performance automatic functions of the PC software (e.g., automatic read out, automatic backup function, automatic e-mail alert).
- **Note:** Detailed instructions can be found in the operating manual provided with the PC software.

NOTICE

The user is responsible for observing the following instructions to ensure compliance with FDA 21 CFR Part 11:

- Modem operation cannot be implemented as a closed system.
- User administration must be active in order to record the user names in the audit trail.
- The password must be changed on the first login.
- If the administrator forgets the password, a master password, which is only valid for a limited period, may be used. Access is granted to the user on request and following authorization.
- If a user does not log out, an automatic lockout (screensaver) is activated via the Windows® system setting.
- It is possible to use the Field Data Manager PC software without identification or password protection, but this is not compliant with FDA 21 CFR Part 11.
- The ending of the automatic system service must be controlled via Windows® user rights.
- Since the PC date/time is used for the audit trail, it is theoretically possible to manipulate the timestamp. This must be prevented by the user by means of Windows® user rights.
- Regular backups and preventive maintenance (e.g., by means of software updates) must be carried out.
- It is important to ensure that no data can be intercepted or manipulated during communication between the device and the database.

11 Operation

The "Operation" menu is geared towards the tasks and activities of the operator. It contains all the parameters that are needed in ongoing operation. Historical values and analyses, for example, can be displayed in the "Operation" menu and display settings can be made. Any settings made for the local display have no effect on the measurement section or the configured device parameters, however.

The device's simple operating concept and the integrated help function enables you to perform operation for many applications without the need for hard-copy operating instructions.

11.1 Displaying and modifying current Ethernet settings

To establish communication with the device via Ethernet, the following settings must be known and modified where necessary:

Display IP/MAC address (only if DHCP is enabled): For the device's IP and MAC address, see the main menu under **"Diagnostics -> Device information -> Ethernet"**.

Display/change Ethernet settings: For the device's Ethernet settings, see the main menu under **"Setup -> Advanced setup -> Communication -> Ethernet"**.

In the case of the DIN rail version: These settings can only be accessed by web server under **"Menu -> Diagnostics -> Device information -> Ethernet"**.

Procedure to establish a direct connection via Ethernet (point-to-point connection):

1. Configure the PC (depends on operating system): e.g., IP address: 192.168.1.1; subnet mask: 255.255.255.0; gateway: 192.168.1.1
2. Disable DHCP on the device.
3. Specify the communication settings on the device: e.g., IP address: 192.168.1.2; subnet mask: 255.255.255.0; gateway: 192.168.1.1

A crossover cable is not required.

11.2 Reading off the device locking status

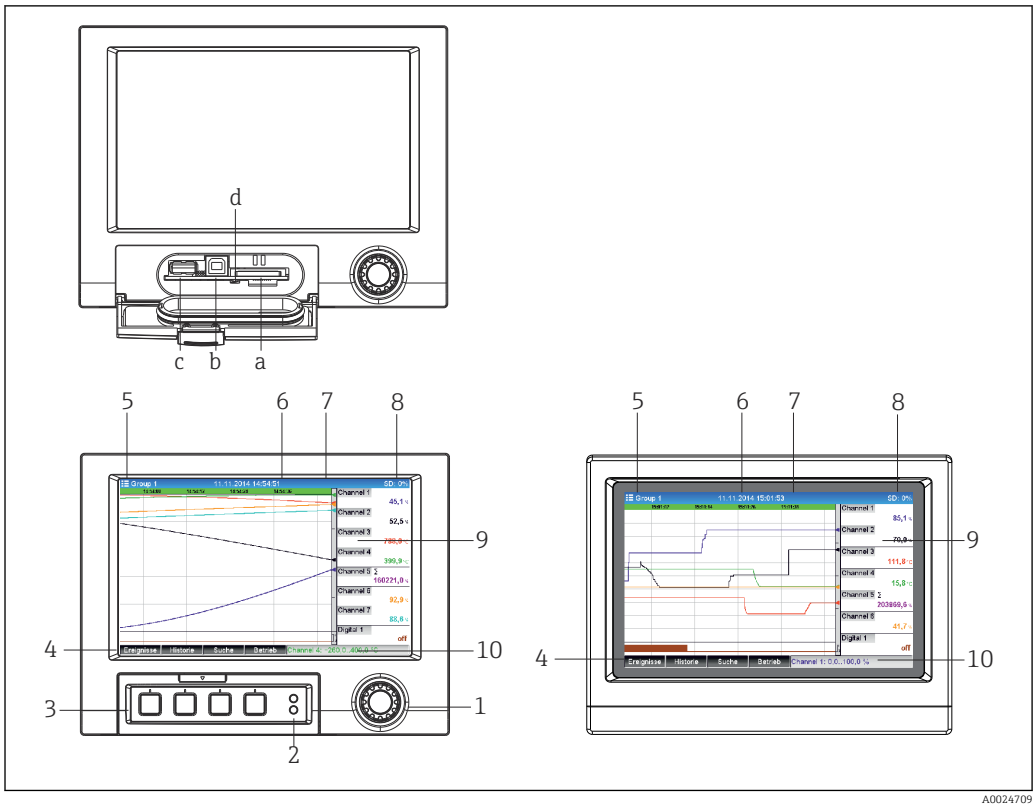
If setup is locked via a control input, a padlock symbol appears on the top right of the screen. The setup must first be unlocked via the control input before device parameters can be edited.

Setup lock via control input: For the settings for the control input, see the main menu under **"Setup -> Advanced setup -> Inputs -> Digital inputs -> Digital input X -> Function: Control input; Action: Lock setup"**.

If setup is locked via the access code, all the operating parameters can be displayed, and can also be edited as soon as the access code is entered.

In the case of the DIN rail version: These settings can only be accessed by web server under **"Setup -> Advanced setup -> Inputs -> Digital inputs -> Digital input X -> Function: Control input; Action: Lock setup"**.

11.3 Reading off measured values (display devices)



15 *Device front (left: version with navigator and front interfaces; right: version with stainless steel front and touchscreen)*

a Slot for SD card
b USB-B socket "Function", e.g., to connect to a PC or laptop
c USB-A socket "Host", e.g., for USB memory stick, external keyboard, barcode reader or printer
d Yellow LED for read/write access to the SD card
1 Navigator: press briefly to open the main menu and confirm messages (=Enter); press for longer to open the online help
2 Green LED (top) lit: power supply present. Red LED (bottom) flashing: maintenance required
3 Programmable "soft key" buttons 1–4 (from left to right)
4 Function indicator of the "soft keys"
5 Header: group name, analysis type
6 Header: current date/time
7 User ID (when function is active)
8 Header: alternating display indicating the percentage space on the SD card or USB stick that has already been used. Status symbols are also displayed in alternation with the memory information.
9 Area for measured value display (e.g., curve display). Display of current measured values and the status in the event of an error/alarm condition. In the case of counters, the type of counter is displayed as a symbol.
10 Status bar

An overview of all the symbols and icons is provided in the "Operation options" section. → 37

If a measuring point has limit value status, the corresponding channel identifier is highlighted in red (quick detection of limit value violations). During a limit value violation and device operation, the acquisition of measured values continues uninterrupted.

Information on how to rectify a problem if an error occurs is provided in the "Troubleshooting" section. → 78

11.4 Web server

The device features an integrated web server, which enables access via Ethernet (or Ethernet over USB). The web server is used for convenient device commissioning and configuration and to visualize measured values. Access is possible from any access point when the device is connected to an Ethernet network. An appropriate IT infrastructure, security measures etc. must be implemented in accordance with the requirements of the plant. Point-to-point access via web server and Ethernet via USB is particularly well-suited for service purposes.

While the DIN rail device version can be operated and configured using the FieldCare and DeviceCare software tools, it is preferably configured and operated via the web server.

Activation of the web server in the menu **Setup** → **Advanced setup** → **Communication** → **Ethernet** → **Web server** → **Yes** or menu **Expert** → **Communication** → **Ethernet** → **Web server** → **Yes**

The web server port is preset to 80. The port can be changed in the **Expert** → **Communication** → **Ethernet** menu.

If the network is protected by a firewall, the port may need to be activated.

The following web browsers are supported:
- MS Internet Explorer 11 and higher
- MS Edge
- Mozilla Firefox 52.1.0 and higher
- Opera 12.x and higher
- Google Chrome 66 and higher

A minimum resolution of 1920x1080 (full HD) is recommended.

In order to use the full functionality of the web server, it is recommended that the latest version of the browser is used. To access the device via a web server, you must have Administrator, Service or Operator authentication → 52

The web server is not optimized for visualization on smartphones.

When delivered, the following default values are set for the user roles in the device and web server:
- ID: admin; password: admin
- ID: service; password: service
- ID: operator; password: operator

FDA role-based access protection is not predefined. Proceed as follows: perform a basic setup logged in as "admin" and then enable "FDA compliant" access protection.

Note: Passwords should be changed during commissioning!

The ID and password can be changed in the main menu under **"Setup -> Advanced setup -> Communication -> Ethernet -> Configuration Web server -> Authentication"**.

11.4.1 Access to the web server via HTTP (HTML)

When using an Internet browser, it is enough to enter the address **http://<IP address>** to display the information as HTML in the browser.

Note: Leading zeros in IP addresses must not be entered (e.g., enter 192.168.1.11 instead of 192.168.001.011).

As in the case of the display, you can alternate between the display groups in the web server. The measured values are automatically updated. In addition to the measured values, status and limit value flags are displayed.

11.4.2 Access to the web server via XML

XML format is available in addition to HTML format and contains all measured values of a group. This can be integrated into additional systems as the user wishes.

The XML file is available in ISO-8859-1 (Latin-1) coding at **http://<IP address>/values.xml** (alternative: **http://<IP address>/xml**). However, some special characters, such as the Euro symbol, cannot be displayed in this file. Texts, such as digital status, are not transmitted.

Note: Leading zeros in IP addresses must not be entered (e.g., enter 192.168.1.11 instead of 192.168.001.011).

The decimal separator is always displayed as a period in the XML file. All times are given in UTC. The time difference in minutes is noted in the following entry.

The structure of the channel values for the XML file is explained as follows:

```
<device id="AI01IV" tag="Channel 1" type="INTRN">
<v1>50.0</v1>
<u1>%</u1>
<vtime>20130506-140903</vtime>
<vstslvl1>0</vstslvl1>
<hlsts1>L</hlsts1>
<param><min>0.0</min><max>100.0</max><hh></hh><hi></hi><lo></lo><ll></ll></
param>
<tag>Channel 1</tag>
<man>Manufacturer</man>
</device>
```

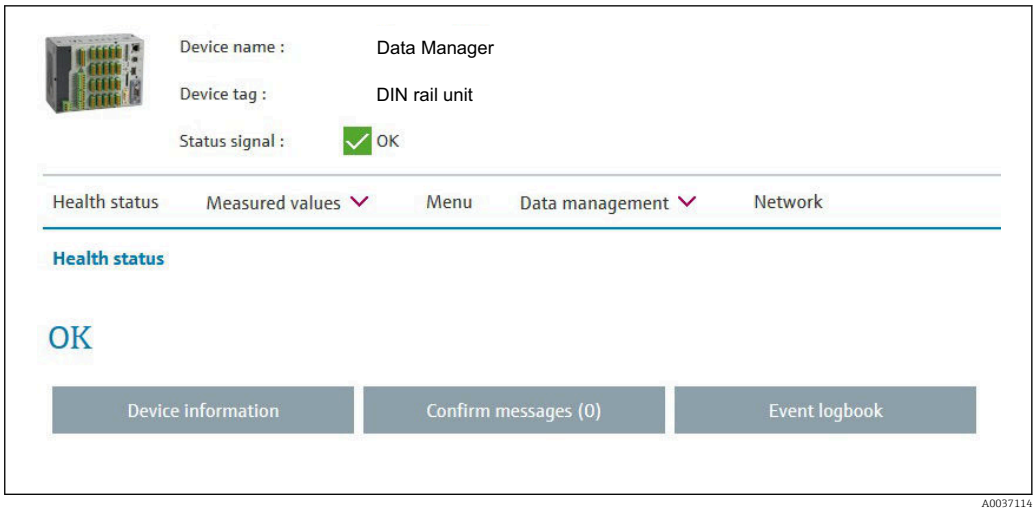
Tag	Description
device id	Unique ID of measuring point
tag	Channel identifier
type	Data type (INTRN, MODBUS)
v1	Measured value of channel as a decimal value
u1	Unit of measured value
vtime	Date and time
vstslvl1	Error level 0 = OK, 1 = warning, 2 = error
hlsts1	Limit value status H = upper limit value, L = lower limit value, LH = upper and lower limit value violation
param min max hh hi lo ll	Parameter (optional) Lower zoom Upper zoom Upper alarm limit Upper warning limit Lower warning limit Lower alarm limit
MAN	Manufacturer

11.4.3 Setup, operation and service via the web server

Establishing a connection to the web server:

1. Connect the PC to the device via Ethernet (or Ethernet over USB)
2. Start the browser on the PC
3. Enter the device's IP address in the browser **http://<ip address>**
4. Log in with the ID and password

The startup screen of the web server appears.



A0037114

General information regarding the **Device name**, **Device tag** and **Status signal** is displayed in the top section of the web server. The following functions can be accessed in the middle of the screen:

Health status – Measured values – Menu – Data management - Network.

Clicking the functions calls up the following submenus. The submenus are closed by selecting "Cancel" or by clicking "Back" several times.

Health status (advanced device status)

Function	Description
Device information	Advanced device status, Ethernet settings, hardware configuration, device options, memory information, SSL certificate
Confirm messages	Submenu to confirm system messages
Event logbook	Submenu for the event logbook

Measured values (choice of measured value display)

Function	Description
Instantaneous values	Measured values are displayed as numerical instantaneous values, the signal groups can be selected as tabs here
Instantaneous values as curves	The measured values are displayed as curves
History	Displays a history of the measured values

Menu

The menu structure displayed in the web server corresponds largely to the menu structure in the device → 32

Data management

Update functions and parameters relating to the firmware, load/save setup, save setup as RTF, import SSL certificates

Network

Displays the Ethernet parameters (IP address, subnet mask, gateway, domain)

Displays the current measured values and history data

Under **Measured values** a selection window appears for **Instantaneous values – Instantaneous values as curves – History**. Click to display the corresponding display function.

Current measured values can also be called up via the web server without logging in with the address **http://<IP address>/iv**. Device configuration is **not** possible in this case, however.

Note: The browser must support HTML5.

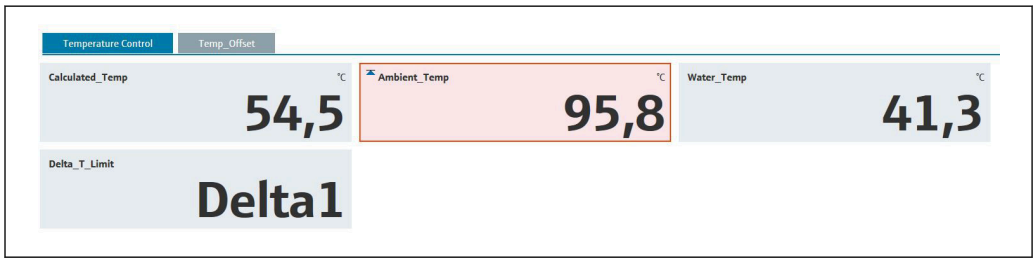
Optional command parameters:
- Syntax: http://<ip address>/iv?group=<x>&refresh=<y>
- group=<x> where x = 1 to 10
- refresh=<y> where y = 3 to 3600 in seconds

Note: Pay attention to lower and upper case if using an optional parameter.

This function can be disabled in the setup. If this function is disabled, the option to export instantaneous values to XML is also disabled for security reasons.

Instantaneous values

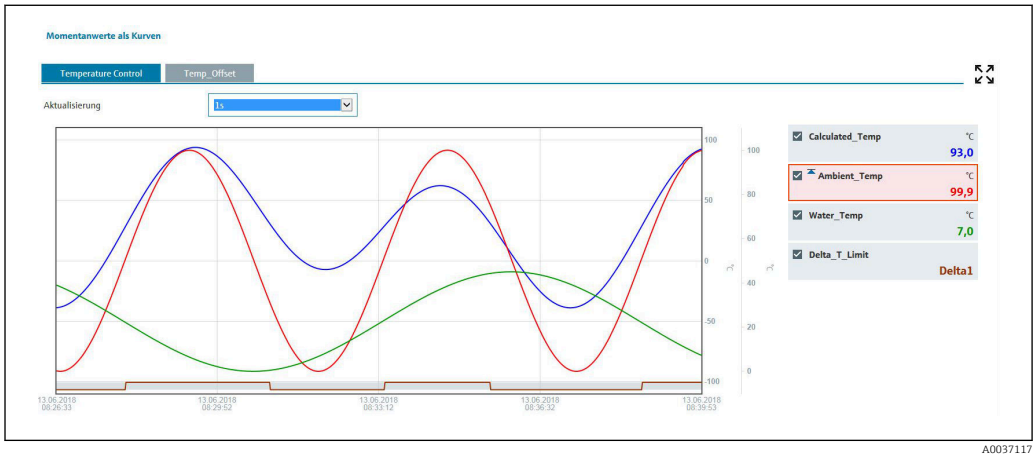
The current measured values are displayed in numerical format. Clicking the tabs displays the signal groups defined in the setup.



A0037118

Instantaneous values as curves

The current measured values are displayed as a curve and numerically over the time axis. The refresh rate can be set in a selection window. The display mode can be set to full screen. Clicking the tabs displays the signal groups defined in the setup.



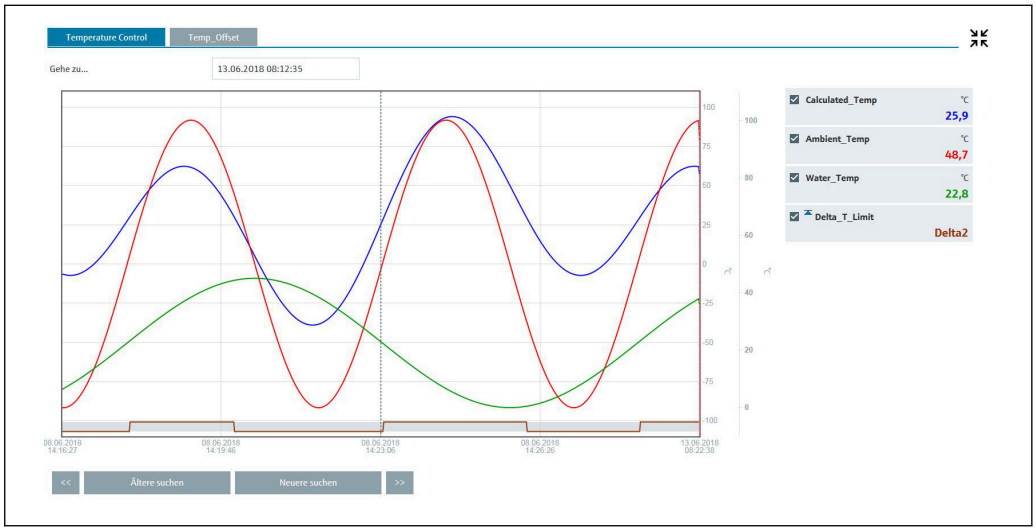
A0037117

Display functions

If the cursor is moved over one of the curves, the instantaneous value of the current point in the curve is displayed with the timestamp and unit. Channels can be displayed and hidden using the channel checkboxes in the legend.

History (logged measured values)

Clicking the **History** button loads the data previously logged. This may take a few seconds depending on the data connection (USB, Ethernet, WLAN) and the number of measuring channels. The data for each channel is loaded to display the content of one screen. The logged (history) measured values are displayed as a curve and numerically over the time axis. The display mode can be set to full screen. Clicking the tabs displays the signal groups defined in the setup.



A0037115

Display functions

If the cursor is moved over one of the curves, the instantaneous value of the current point in the curve is displayed with the timestamp and unit. Channels can be displayed and hidden using the channel checkboxes in the legend.

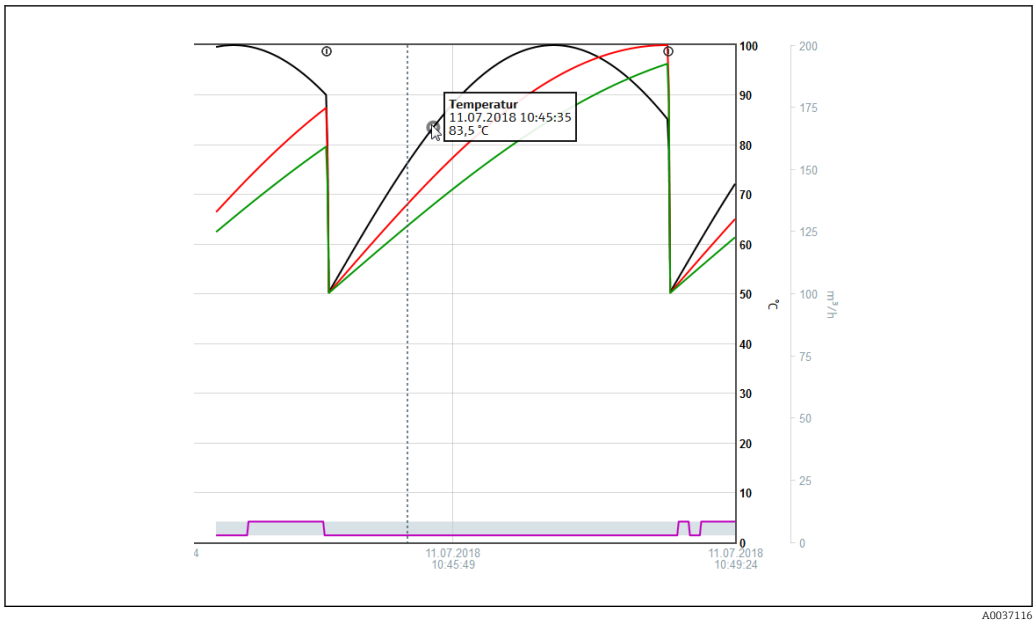
Moving the dashed cursor line along the time axis updates the numerical display of the measured values accordingly (on right).

Go to ...: Enter a point in time. The history is reloaded. If you enter a time for which no measured values are available, the next possible time where measured values are available is displayed.

Search older: The information displayed moves half a screen to the left (displays older measured values). Press the **<<** button to move the information one entire screen to the left (older measured values).

Search newer: The information displayed moves half a screen to the right (displays more recent measured values). Press the **>>** button to shift the information one entire screen to the right (more recent measured values).

Note: If no measured values were recorded for a certain range of time (e.g., as there was no power supply), this is indicated by a symbol at the top of the window. The curves jump accordingly.



A0037116

11.4.4 Remote control via the web server

This function is **not** supported by the **DIN rail version**.

The device can be remote-controlled via the web server. In the web server, the remote control function can be found under **"Measured values -> Remote control"**. Here the display shown corresponds directly to the device display. The device is operated using buttons below this display. The interval for refreshing the display can be set in the **"Refresh"** menu.

Enabling remote control on the device:

1. In the menu **Setup -> Advanced setup -> Communication -> Ethernet -> Configuration Web server -> Remote control, select "Yes"** or under
2. **Expert -> Communication -> Ethernet -> Configuration Web server -> Remote control, select "Yes"**.

11.5 Changing group

The group to be displayed can be changed in the main menu under **"Operation -> Change group"**. Alternatively, the group can also be changed by turning the navigator.

Version with stainless steel front and touchscreen:

The active groups can be changed with a horizontal "swiping" movement.

For the DIN rail version: The active groups can only be queried and changed via the web server under **"Measured values -> Instantaneous values / Instantaneous values as curves / History"**. The groups are created as tabs and can be selected by mouse click.

Only the **active** groups are displayed here. The settings for this can be made in the main menu under **"Setup -> Advanced setup -> Application -> Signal groups -> Group x"**.

11.6 Locking operation

This function is **not** supported by the **DIN rail version**.

Local operation can be blocked in the main menu under **"Operation -> Lock operation"** to prevent unintended or incorrect operation (e.g., when cleaning the device).

The device is unlocked by pressing the navigator or the OK operating key for 3 s. When using an external keyboard, the device is unlocked with the key combination "Ctrl-Alt-Del".

11.7 Logging in/logging out

Log onto the device or log off the user currently logged on.

Only for active user administration (FDA 21 CFR Part 11) or role-based access protection → 52

11.8 Changing the password

Change the user password.

The access concept (free/access code/user roles/FDA) must first be defined: **"Menu -> Expert -> System -> Security -> Protected by -> FDA 21 CFR Part 11"** → 52

The password can also be changed via the web server under **"Data management -> Change password"**.

11.9 SD card/USB stick

11.9.1 Operating principle of SD card and USB stick

Without affecting the internal memory, data packets are copied block by block (min. 1 x daily, midnight) to the SD card. Once a new SD card is inserted, the device starts saving the data automatically after 5 minutes. The use of a USB stick is only recommended if certain data ranges should be copied.

For the panel version: The USB stick is **not** used for storing the measured values continuously, i.e. it is **not** automatically updated.

Data are saved in two different folders on the storage media depending on the storage method:

- All data are copied cyclically to the **rec_data_<Device name>** folder if a data packet is complete or the function **"Update"** is activated under **"Operation -> SD card/USB stick -> Update"**.
- The data for the selected time range that was selected under **"Operation -> SD card / USB stick -> Save measured value"** are copied to the **rng_data_<device name>** folder. Copying these data does not affect the storage of the data in the **rec_data_<device name>** folder.

- Only use new, formatted SD cards that are recommended by the manufacturer (see "Accessories" → 90).
- During normal operation, the used memory space on the SD card or USB stick is displayed on the top right of the display ("SD: xx%" or "USB: xx%"). Dashes "–" on this display mean that no SD card is inserted.
- The SD card must not be write-protected.
- Prior to removing the external data carrier, select **"Operation -> SD card/USB stick -> Update"**. The current data block is closed and saved to the external data carrier. This ensures that all the current data (up until the last save) is included on the data carrier.
- Depending on the device configuration (see **"Setup –> Advanced setup –> System –> Ext. memory –> Warning at"**), an acknowledgeable message on the display notifies the user that the external data carrier has to be changed before the data carrier is 100% full.
- The device keeps track of which data have already been copied onto the SD card or USB stick. If the data carrier is not changed in time or if no SD card is inserted, the new external data carrier is filled with the missing data from the internal memory - insofar as the data are still in the memory. As measured value acquisition/recording is assigned the highest priority, it may take several minutes in this case for the data to be copied from the internal memory to the SD card or USB stick.

11.9.2 DIN rail version: function of SD card or USB stick

USB-A socket "Host", e.g., for USB memory stick or printer

If a USB stick is inserted, data that have not yet been saved are copied to the stick automatically. The red LED flashes while data are being copied to the stick.

Do not remove the USB stick when the red LED is flashing! Risk of data loss!

If an error occurs (e.g., USB stick full or defective), the red LED is lit constantly. Remove the USB stick and replace it.

SD card

Cyclic storage is completed via the "Safe SD card removal" button, the LED (d) goes out. The SD card can now be removed.

If the SD card is not removed within 5 minutes, the write cycles start again.

LED at SD slot. Yellow LED lit or flashing when the device is accessing the SD card.

Do not remove the SD card if the LED is lit or flashing! Risk of data loss!

11.9.3 Functions relating to the SD card or USB stick

These functions are **not** supported by the **DIN rail version**.

For functions to save measured data and device settings on a removable medium, see the main menu under **"Operation -> SD card / USB stick"** (only if an SD card or USB stick is provided).

Remove safely:
All internal access is terminated to ensure safe removal of the storage medium from the device. A message is displayed when the storage media can be removed. If the SD card is not removed, the device automatically starts to save data to the storage medium again after 5 minutes.

Only remove the data storage medium using this function; otherwise, data may be lost!

Update:
Measurement data not yet saved on the storage medium are now saved. This may take a moment. Measured value acquisition is running in parallel and has top priority.

Data from several devices can be saved onto one storage medium.

- **Save measured values:**
  A user-definable time range can be saved on the data storage medium.
- **Load setup:**
  Loads device settings (setup) from the storage medium onto the device.
- **Save setup:**
  All device settings (setup) are saved onto the storage medium. They can be archived or used for other devices.
- **Save setup as RTF:**
  Saves the setup on the storage medium in a readable format as an RTF file (rich text format).
  The RTF file can be opened and formatted using suitable word processing software (e.g., MS Word), making it easy to print.
- **Screenshot:**
  Save the current measured value display as a bitmap on the SD card or USB stick.
- **Update firmware:**
  Loads new firmware onto the device. Only visible if a firmware file is provided on the SD card or USB stick.

Caution: The device will restart. Save the setup and measured values beforehand on the SD card or USB stick.

- **Process screens:**
  Load, export or delete process screens.
  Load: Loads a process screen from the external storage medium into device memory.
  Export: Saves the process screen in the device onto the external storage medium to transfer it to another device.
  Delete: Deletes the selected process screen from device memory.
  Procedure for creating and processing process screens: → 70
- **Load user administration:**
  Loads all settings and user accounts from the storage medium to the device. The file has the extension ".ids2".

Caution: Any existing settings/accounts are overwritten!

- **Save user administration:**
  Saves all settings and user accounts to the storage medium. The file has the extension ".ids2".
- **User administration as RTF:**
  Saves the user administration on the storage medium in a readable format as an RTF file (rich text format).
- **Import SSL certificate:**
  Uploads an SSL certificate (X.509) to the device. Certificates are needed so that an SSL connection can be established in order to send encrypted e-mails, for instance. Certificates are available from your network administrator or provider. The following are supported: DER, CER and CRT (binary or Base64-encoded).
  Only visible if an SSL certificate is provided on the SD card or USB stick.

Loading and editing a process screen

This function is **not** supported by the **DIN rail version**.

Load the process screen in the device:

1. Plug the USB stick or the SD card containing the generated process screen into the device
2. In the main menu under **"Operation -> SD card / USB stick -> Process screen -> Group"**, select the group to which the process screen is to be assigned
3. In the main menu under **"Operation -> SD card / USB stick -> Process screen -> Load"**, select the desired process screen and upload it to the device
4. In the main menu under **"Operation -> Change display mode"**, change the display mode to **"Process screen"**.

Editing process screens on the device

Process screens can be edited on the device.

The following functions are possible:
- Add or remove channels to/from the process screen
- Change the position, font size, and alignment
- Delete the process screen

Call up the Context menu: In the measured value display, press the navigator or "Menu" for longer than 3s.

The "Process screen" submenu can be accessed in the context menu that now opens:

Parameter	Parameter/Description
"Edit" submenu	Edit the process screen currently displayed (position, font size, etc.).
"Channel 1–8" submenu	Edit the selected channel of the process screen (enable, change position/font size etc.).
	Display in the process screen Switch channel in process screen on/off. Note: Does not affect measured value storage/configuration. Options: No, yes; factory setting: no
	Channel ident. Specify whether the channel identifier should be displayed in addition to the measured value. The channel identifier is displayed above the measured value. Options: No, yes; factory setting: no
	Alignment Specify how the measured value should be aligned. For "Align left", the x-position is the left top-hand corner of the measured value. For "Align right", the x-position is the right top-hand corner of the measured value. Options: Align left, align right Factory setting: Align right

Parameter	Parameter/Description
	x-position Selection of the x-position where the measured value is to be displayed. User entry: 0 to 799 pixels; factory setting: 10 The point of origin (x-/y-zero point) is the top left. When the x-value is increased the text moves to the right.
	y-position Selection of the y-position where the measured value is to be displayed. The point of origin (x-/y-zero point) is the top left. When the y-value is increased the text moves down. User entry: 0 to 450 pixels; factory setting: 50 (channel 1) to 260 (channel 8)
	Font size Selection of the font size in which the measured value is to be displayed. Options: Small, medium, large, very large; factory setting: large
Accept changes	Saves the changes to the process screen in the device memory.
Delete	Deletes the selected process screen from the device memory. The device then changes to the curve display.

11.9.4 Notes on e-mail encryption

In addition to sending unencrypted e-mails, it is also possible to send encrypted e-mails via SSL (TLS). To do so, you can choose either of two ways:
- By **SMTPS**: fully encrypted via port 465.
  The complete connection runs over TLS. The port is 465 by default but this value can be changed in the Setup.
- Via port 25 or 587 using **STARTTLS**.
  With this method the device first establishes a plain SMTP connection via port 25 and continues this connection following agreement and switchover to encryption.

The required process can be selected as follows: **"Setup -> Advanced setup -> Application -> E-mail -> Server requires SSL"** or under **"Expert -> Application -> E-mail -> Server requires SSL"**.

TLS V1.0 (=SSL 3.1), V1.1 and V1.2 are supported. Older standards are not supported. The encryption method is automatically agreed with the counterparty.

A certificate must be installed in order to be able to send encrypted e-mails. These certificates can be obtained from your e-mail service provider. The following file formats are supported:
- *.CER: DER- or Base64-encoded certificate
- *.CRT: DER- or Base64-encoded certificate
- *.DER: DER-encoded certificate

The file name of the certificate may only contain the following characters: a–z, A–Z, 0–9, +, -, _, #, (,), !

To establish an SSL connection, the device automatically selects the certificate that best suits the counterparty from all the installed certificates. An error message is displayed if the device does not have any of the required certificates.

When e-mail encryption is enabled, no e-mails can be sent if a valid certificate is not available or if the certificate has expired.

11.9.5 Notes on WebDAV encryption

In addition to sending unencrypted data to the WebDAV server, it is also possible to send encrypted data via SSL (TLS). All data are sent in encrypted format via the SSL port of the external WebDAV server.

The complete connection runs over TLS. The port is 80 by default but this value can be changed in the Setup. The procedure to be used can be selected as follows: **"Setup ->**

Advanced setup -> Application -> WebDAV Client -> Enable -> Yes (SSL)" or under **"Expert -> Application -> WebDAV Client -> Enable -> Yes (SSL)"**.

TLS V1.0 (=SSL 3.1), V1.1 and V1.2 are supported. Older standards are not supported. The encryption method is automatically agreed with the counterparty.

A certificate must be installed in order to be able to send encrypted data. These certificates can be obtained from your WebDAV server service provider. The following file formats are supported:
- *.CER: DER- or Base64-encoded certificate
- *.CRT: DER- or Base64-encoded certificate
- *.DER: DER-encoded certificate

The file name of the certificate may only contain the following characters: a–z, A–Z, 0–9, +, -, _, #, (,), !

To establish an SSL connection, the device automatically selects the certificate that best suits the counterparty from all the installed certificates. An error message is displayed if the device does not have any of the required certificates.

When WebDAV client encryption is enabled, no data can be sent if a valid certificate is not available or if the certificate has expired.

11.9.6 SSL certificates

Importing an SSL certificate

Installing a certificate via SD card or USB stick:

1. Copy a certificate on a PC to an SD card or USB stick
2. Insert the SD card or USB stick into the device
3. In the main menu, select **"Operation -> SD card (or USB stick) -> Import SSL certificate"**
4. Select the required certificate from the list and follow the dialog on the display.

Installing a certificate via the web server:

1. On the web server, select **"Data management --> Import SSL certificate"**
2. Select the file
3. Start the process by clicking **OK**

Up to 3 certificates can be installed simultaneously.

Verifying the installed SSL certificates

The installed certificates can be verified in the main menu under **"Diagnostics -> Device information -> SSL certificates"**. The parameter list displays the most important certificate information, such as the key identifier, organization, and validity period.

Not all fields are completed on all the certificates. This is because the parties issuing the certificates do not make all the information available.

Deleting an SSL certificate

In the main menu select the certificate to be deleted under **"Diagnostics -> Device information -> SSL certificate -> Certificate"** and select **"Yes"** under **"Delete certificate"**.

Period of validity of certificates

Certificates are valid for a defined period (valid from ... to ...). The device checks the certificate validity once a day or each time the device is rebooted. 14 days before the

certificate expires the device notifies the user daily (by e-mail, screen display, entry in event logbook) that the certificate will expire shortly.

If the certificate has expired the alarm relay switches (if activated) and a message is displayed on the screen. An entry is also made in the event logbook. If a certificate is deleted all errors related to this certificate are reset.

11.10 Show data logging

For the **DIN rail version**, see → 64

You can scroll through the saved measured values in the main menu under **"Operation -> History"**. Turn the navigator clockwise or counterclockwise to scroll back and forth between the measured value curves. Press the navigator to configure other settings for historical data (e.g., change the scroll speed, time scaling or display mode) and end display of historical data.

Version with stainless steel front and touchscreen:

The measured value curves can be scrolled back and forth with a horizontal "swiping" movement.

The gray header on the screen and the symbol in the status bar indicate that historical values are being displayed. In the instantaneous value display the color of the header is blue.

11.10.1 Historical data: Change group

It is possible to change the group to be displayed in the historical data under **"Operation -> Change group"** in the data history.

11.10.2 Historical data: scroll speed

It is possible to change the scroll speed in the historical data under **"Operation -> Scroll speed"** in the data history.

The scroll speed can also be set via the soft key with the arrow symbol < or >. The speed can be changed from < (slow) to <<<< (fast) by pressing the soft key repeatedly.

11.10.3 Historical data: Time scaling

It is possible to scale the displayed time range in the historical data under **"Operation -> Time scaling"** in the data history.

Notes:
- "1:1" option: Every measured value is displayed.
- "1:n" option: Only every nth measured value is displayed (increases the displayed time range).
- No interpolation is performed, nor is the mean value determined.
- If the value for "n" is large, this can result in extended loading times.
- Time scaling does not affect the process for storing the measured value.
- The time range displayed per screen for the currently set time scaling is also displayed in the menu.

11.10.4 Historical data: Time range displayed

The displayed time range is shown in the historical data under **"Operation -> Time range displayed"** in the data history. This tells the user which time range is displayed per screen in the standard memory cycle.

If the alarm cycle differs from the standard memory cycle, this is not taken into consideration.

11.10.5 Historical data: Screenshot

The current measured value display can be saved as a bitmap to an SD card or USB stick in the historical data under **"Operation -> Screenshot"**.

11.10.6 Historical data: Change the display mode

For the **DIN rail version**, see → 64

It is possible to change the display mode of the active group in the historical data under **"Operation -> Change display mode"** in the data history.

The following display modes are possible: Curve, Curve in ranges, Waterfall, Waterfall in ranges, and Circular chart.

The various display modes have no influence on the signal recording.

11.10.7 Historical data: Store text

A predefined text can be selected or a user-defined text can be saved in the historical data under **"Operation -> Store text"**. This text is assigned to a definable point in time.

11.11 Signal analysis

The analyses saved in the device are displayed in the main menu under **"Operation -> Signal analysis"**.

- **Actual intermediate analysis:**
  The current (i.e. not yet completed) intermediate analysis can be displayed here.
- **External analysis 1–4:**
  Current (i.e. not yet completed) external analyses can be displayed here.
- **Actual day:**
  The current (i.e. not yet completed) daily analysis can be displayed here.
- **Actual week:**
  The current (i.e. not yet completed) weekly analysis can be displayed here.
- **Actual month:**
  The current (i.e. not yet completed) monthly analysis can be displayed here.
- **Actual year:**
  The current (i.e. not yet completed) annual analysis can be displayed here.
- **Search:**
  Search and display of analyses. Select which analyses the system should search for/ display: Intermediate analysis, Daily analysis, Monthly analysis, Annual analysis.

11.12 Search in trace

In the main menu, the internal memory can be searched for events or times under **"Operation -> Search in trace"**.

For the **DIN rail version**, see → 64

Search for events: The event logbook forms the basis for searches for events. To make it easier to search for specific events (e.g., setup changes), you can use the search filter to select and search for the desired events. In the standard all events are shown. In the event list displayed, it is possible to select an event and go directly to this point in the history (if still in the memory).

Search for time: When searching for a time in the past, the user can enter a date and a time to specify when the system should start displaying historical data. Once the date/time have been entered and confirmed, the display goes to the selected time in the active group.

11.13 Changing the display mode

The display mode of the active group can be changed in the main menu under **"Operation -> Change display mode"**.

The following display modes are possible: Curve, Curve in ranges, Waterfall, Waterfall in ranges, Bargraph, Digital display, Instrument display, Circular chart and Process screen.

The various display modes have no influence on the signal recording.

11.14 Store text

A predefined text can be selected, or a user-defined text can be saved, in the main menu under **"Operation -> Store text"**. This text is assigned to a definable point in time.

11.15 Printout

This function is **not** supported by the **DIN rail version**.

The device settings, user administration data, event logbook, current measured values or a screenshot of the measured value display can be printed out in the main menu under **"Operation -> Printout"**.

NOTICE

Due to technical restrictions, the printout from the device is always in English when using the following operating languages: Polish, Russian, Swedish, Czech, Japanese, and Chinese.

Printout via PC:

- The device settings or user administration can be saved in the set language in the form of an RTF file and printed out from the PC.

NOTICE

Due to technical restrictions, the event logbook cannot be printed out from the device when using the following operating languages: Polish, Russian, Swedish, Czech, Japanese, and Chinese.

Printout via PC:

- The event logbook can be printed out via the Field Data Manager (FDM) software. Alternatively, the event logbook can be saved as a CSV file and printed out from the PC.

11.16 Adjusting the brightness of the display

This function is **not** supported by the **DIN rail version**.

You can adjust the brightness of the display in the main menu under **"Operation -> Adjust brightness"**:

Parameter	Possible settings	Description
Adjust brightness	0-100 Default: **80**	Sets the brightness of the display

11.17 Limit values

This function is **not** supported by the **DIN rail version**.

It is possible to change the limit values during operation in the main menu under **"Operation -> Limits"**.

This function must be enabled beforehand in the main menu under **"Expert -> Application -> Limits -> Change limits: outside of setup also"**.

Detailed description of the limit values: → 239

11.18 WebDAV client

The function of the WebDAV client is to transmit recorded data automatically to a connected WebDAV server (e.g., NAS drive). The recorded data are sent to the connected WebDAV server cyclically every 15 minutes. The generated files correspond to the files that are automatically saved to the SD card.

The client is configured via **"Setup -> Advanced setup -> Application -> WebDAV Client"**. The settings under **"Setup -> Advanced setup -> System -> External memory"** are also used, with the exception of the settings for the SD card (Memory build-up, Warning and Relays). The memory is regarded as a stack memory.

Detailed description of the parameters: → 263

Note: With the WebDAV client, the data are transmitted to the WebDAV server in accordance with the selection made in the .CSV or "Protected format".

11.18.1 Access to the WebDAV server via HTTP (HTML)

Address entry in browser: **http://<ip-address>/webdav**

The data are updated cyclically every 15 minutes. The data are automatically updated each time a user logs in.

Note: Leading zeros in IP addresses must not be entered (e.g., enter 192.168.1.11 instead of 192.168.001.011).

Administrator or service authentication is required. ID and password administration is performed in the main menu under **"Setup -> Advanced setup -> Communication -> Ethernet -> Configuration Web server -> Authentication"**.

ID default value: admin; Password: admin

Note: The password must be changed during commissioning.

If security is activated in accordance with "FDA 21 CFR Part 11", authentication as a user with administrator rights is required in order to establish a connection.

Note: For devices with a stainless steel front and touchscreen, the data are always made available in "Protected format" via the WebDAV server.

11.19 Data analysis and visualization with the Field Data Manager software (FDM)

The analysis software offers centralized data management with visualization for recorded data.

This enables the data of a measuring point to be fully archived, e.g.:
- Measured values
- Diagnostic events
- Protocols

The analysis software stores data in an SQL database. The database can be operated locally or in a network (client/server). A free version of the Postgre™SQL database can be enabled when FDM is installed.

For details, see the online help in the analysis software and the Operating Instructions for the analysis software.

11.19.1 Structure/layout of a CSV file

The CSV files are comprised as follows:

File name (=serial number + file number + configuration number + date and start time + data type)	Description	Coding
H4000504428 0000000279 0000000185 2013-11-07 11-18-00 GROUP01.csv	Contains all the measured values of the group from the starting time indicated in the file name. An individual CSV file is created for each group.	ANSI
H4000504428 0000000279 0000000185 2013-11-07 11-30-00 ANALYSIS01.csv	Contains the signal analyses of the active channels from the starting time indicated in the file name. An individual CSV file is created for every analysis (01 - 04).	ANSI
H4000504428 0000000279 2013-11-07 11-18-34 EVENTS.csv	Contains the event logbook from the starting time indicated in the file name.	Unicode UTF-8 (see the notes in the following section)

Meaning of the values under "Status" and "Limit" when analyzing a group:

Status of the channel:
0: OK
1: Cable open circuit
2: Input signal too high
3: Input signal too low
4: Invalid measured value
6: Error value, i.e. not the calculated value (for mathematics if an input variable is invalid)
7: Sensor/input error
Bit 8: Not assigned
Bit 9: Alarm storage
Bit 10..13: Not assigned
Bit 14: Use error value
Bit 15: Not assigned

General status:
1: High speed storage is active 2: Additional hour for summer/normal time changeover Note: A combination of 1 and 2 is possible.

Status of the limit value ("Limit"):
0: OK, no limit value has been violated Bit 0: Lower limit value Bit 1: Upper limit value Bit 2: Increasing gradient Bit 4: Decreasing gradient Note: A combination is possible.

11.19.2 Importing UTF-8-encoded CSV files into spreadsheets

You might encounter problems displaying information if importing UTF-8-encoded CSV files directly into more recent versions of MS Excel™ (2007 and higher).

Importing CSV data from the event logbook ("Events") into MS Excel™ (version 2007 and higher):

1. In the menu, select **"Data -> Get external data - From text"**
2. MS Office 365 and higher: In the menu select **"Data -> From text/CSV"**
3. Select the CSV file
4. Follow the instructions in the wizard
5. Select file origin **"Unicode UTF-8"**

12 Diagnostics and troubleshooting

The following section contains an overview of possible causes of errors to provide initial assistance during troubleshooting.

12.1 General troubleshooting

⚠ WARNING

Danger! Electric voltage

▶ Do not operate the device in an open condition for error diagnosis!

Display	Cause	Remedy
No measured value display; no LED lit	No supply voltage connected	Check supply voltage of device.
	Supply voltage is applied; device or power unit is defective	Replace the power unit or device.
Diagnostic message is displayed	For a list of diagnostic messages, see the next section.	

Dead pixels: Dead pixels refer to pixels on LCD and TFT displays that are defective due to the technology or manufacturing techniques used. The TFT display used can have up to 10 dead pixels (Class III as per ISO 13406-2). These dead pixels do not entitle the user to a warranty claim.

12.2 Troubleshooting

The Diagnostics menu is used for the analysis of the device functions and offers comprehensive assistance during troubleshooting. Always proceed as follows to locate the cause of device errors or alarms.

General troubleshooting procedure

1. Open diagnostic list: lists the 30 most recent diagnostic messages. This can be used to determine which errors are currently present and whether an error has repeatedly occurred.
2. Diagnosis of current measured values: Verify the input signals by displaying the current or scaled measuring ranges. To verify calculations, call up calculated auxiliary variables if necessary.
3. Most errors can be rectified by performing steps 1 and 2. If the error persists follow the troubleshooting instructions in the following sections.
4. If this does not rectify the problem, contact the Service Department. Any time you contact the Service Department please always have the diagnostic number and the information in the main menu under **"Diagnostics -> Device information"** (program name, serial number etc.) to hand.

The contact data for your Endress+Hauser representative can be found on the Internet at www.endress.com/worldwide.

12.2.1 Device error/alarm relay

One relay can be used as an alarm relay. The selected output/relay switches if the device detects a system error (e.g., hardware defect) or a malfunction (e.g., cable open circuit). The alarm relay is assigned in the main menu under **"Setup -> Advanced setup -> System -> Fault switching -> Relay x"**. **Factory setting: Relay 1**.

This "alarm relay" switches if "F"-type or "S"-type errors occur, i.e. "M"-type or "C"-type errors do not switch the alarm relay.

12.3 Diagnostic information on the local display

The diagnostic message consists of a diagnostic code and event text.

The diagnostic code consists of the status signal as per NAMUR NE 107 and the event number.

Status signal (letter in front of event number)
- **F = Failure**. A malfunction has been detected.
  The measured value of the affected channel is no longer reliable. The cause of the malfunction is to be found in the measuring point. If a controller is connected, it should be switched to manual mode. This status signal can be assigned to an alarm relay in the advanced setup.
- **M = Maintenance required.** Action must be taken as soon as possible.
  The device still measures correctly. Immediate measures are not necessary. Proper maintenance efforts may prevent a possible malfunction in the future.
- **S = Out of specification**. The measuring point is being operated outside specifications. Operation is still possible. There is the risk of increased wear, a shorter operating life or less accurate measurements. The cause of the problem is to be found outside the measuring point.
- **C = Function check**. The device is in Service mode.

Diagnostic code	Event text	Description	Remedial action
F100	Sensor/input error!	Sensor/input error	Check connections and parameters.
F101	Cable open circuit	Cable open circuit	Check connections.
F105	Invalid value!	Measured value is invalid (when calculating --> NAN)	Check connections and process variables.
F201	Device fault	Device error	Contact the Service Department.
F261	Error: RAM	No access to RAM	Contact the Service Department.
F261	Error: Flash	No access to flash	Contact the Service Department.
F261	Error: SRAM	No access to SRAM	Contact the Service Department.
F261	Analog card x is out of order!	Hardware defect detected	Contact the Service Department, replace card.
F261	HART card out of order!	Hardware defect detected	Contact the Service Department, replace card.
F261	Power supply out of order!	Hardware defect detected	Contact the Service Department, replace power unit.
F261	Digital card out of order!	Hardware defect detected	Contact the Service Department, replace card.
F261	Fieldbus card out of order!	Hardware defect detected	Check contacts of Anybus card, contact the Service Team.
M262	Fieldbus module is obsolete. Change hardware!	The installed fieldbus module is not approved for this firmware version	Replace the hardware or downgrade the firmware (not recommended).
M284	Firmware update	Firmware has been updated	No action required. Message can be acknowledged.
M290	The internal flash memory has reached the end of its lifetime. Please replace the device.	The internal flash memory is defective	Replace device.
F301	Error: Cannot load setup	Setup defective	Switch the device off and then on again, re-configure, contact the Service Team.
M302	Setup restored from backup	Setup has been loaded from backup	Check setup.
F303	Error: Device data	Device data defective	Contact the Service Department.
M304	Backup: Device data	Device data defective. However, it was possible to continue working with the backup data	Check settings (serial number).
F307	Error: Customer preset value defective	Customer preset value defective	
F309	Error: Date/time is not set	Invalid date/time (e.g., internal battery is empty)	Device was switched off too long. The date/time must be set again. Battery needs to be replaced (contact the Service Team).
F310	Error: Cannot save setup	The setup could not be saved	Contact the Service Department.
F311	Error: Device data	The device data could not be saved	Contact the Service Department.
F312	Error: Calibration data defective	The calibration data could not be saved	Contact the Service Department.
F312	Analog card x is not calibrated!	Analog card x is not calibrated. The device works with default values, the measured values may be inaccurate under certain circumstances.	Contact the Service Department.
M313	SRAM has been defragmented	SRAM was defragmented after firmware update	No action required. Message can be acknowledged.
F314	Error: Option code	Activation code is no longer correct (incorrect serial number/program name). Option has been switched off and setup preset has been performed.	Enter new code.
M315	No IP address could be obtained from the DHCP server!	No IP address could be obtained from the DHCP server	Check the network cable.
M316	Invalid MAC address!	No or incorrect MAC address	Contact the Service Department.

Diagnostic code	Event text	Description	Remedial action
M317	Battery voltage < 2.5 V. Replace the battery!		Battery needs to be replaced (contact the Service Team).
F348	Firmware cannot be updated: ▪ Checksum incorrect ▪ Firmware incompatible!	Firmware update has been aborted because the firmware file is damaged or is not compatible with this device	Contact the Service Department.
M350	Measured value acquisition interrupted for calibration/ service work. Measured value acquisition restarted.	Measured value acquisition was interrupted/ reactivated for service/maintenance purposes Causes include: ▪ Calibration of inputs/outputs ▪ Firmware update	No action required. Message can be acknowledged.
M351	The device will restart.	The device is rebooting Causes include: ▪ Following a firmware update ▪ Change to device options	No action required. Message can be acknowledged.
F431	Error: Calibration	Calibration data missing	Contact the Service Department.
M502	Device is locked!	Device is locked. The message appears when an attempt is made to update the firmware, for example	Check lock per digital channel.
F510	Setup was corrected	The device has detected that the configuration is no longer correct. All the parameters affected have been reset to the factory default settings. Possible causes: ▪ Input cards have been removed or replaced by another type ▪ An input card is no longer working correctly A firmware update has caused compatibility problems. Note: This error message appears each time the device is restarted until at least one change has been made to the configuration.	Check the configuration of the device. If hardware has been replaced, no other action is needed (recommendation: change the operating language so that the error message no longer appears after the next restart).
F510	User administration was corrected	The device detected that the user administration settings were no longer correct. All the parameters affected have been reset to the factory default settings.	
M520	SMTP: Name could not be resolved (DNS)! SNTP: Name could not be resolved (DNS)!	Problem with name resolution (DNS) SMTP: e-mail SNTP: time synchronization	Check the corresponding settings.
F526	▪ Support points not OK! ▪ Support points: x-value exists more than once ▪ Upper and lower support points are identical	Support points entered for the linearization table are not plausible.	Check support points.
M528	Setup is not compatible with this firmware	An attempt was made to load a setup which is not compatible with this firmware (e.g., another device type)	Check whether the correct file has been selected.
M530	Cannot copy setup.	An error occurred when a setup was loaded from an SD card or USB stick An error occurred when a setup was saved to an SD card or USB stick	Replace the SD card or USB stick. Setup file defective?
F537	EtherNet/IP: IP address conflict identified	The IP address configured for EtherNet/IP is already being used by another device	Check the IP configuration and change it as necessary.
F537	EtherNet/IP: IP configuration not accepted at all or in part	At least one setting for the IP address, subnet mask or gateway is incorrect and has not been accepted.	Check the IP configuration and change it as necessary.

Diagnostic code	Event text	Description	Remedial action
S901	Input signal too low	Input signal too low	Check connections and parameters. Check connected sensor/transmitter.
S902	Input signal too high	Input signal too high	Check connections and parameters. Check connected sensor/transmitter.
M905	Set point x	Set point x has been violated	Note: Diagnostic number only occurs if e-mails are sent.
M906	End limit value x	Set point x no longer violated	Note: Diagnostic number only occurs if e-mails are sent.
F907	Error DP flow	Error during DP flow calculation	
F910	This software is not enabled for this device.	The current firmware is not enabled for this hardware	Contact the Service Department.
M913	DP flow: outside ISO 5167!	Error during DP flow calculation	
M914	DP flow: Density calculation	Error during DP flow calculation	
M920	Too many messages that need to be acknowledged!	There are too many messages that need to be acknowledged. Another message could not be added.	Acknowledge messages.
M921	SD card x% full.	External memory is full	Replace SD card.
M922	No cyclic measurement transfer	The instantaneous values were not read out for a set time	
M922	No cyclic transfer	The device was not read out via fieldbus for a configurable time	Check the communication of the fieldbus. Check PLC.
M923	Error printing!	Various problems while printing, e.g.: ▪ Printer spooler is full ▪ Printer needs paper! ▪ Printer is not ready ▪ Replace toner/ink	Check printer status at the printer.
M924	Error accessing SD card! Error accessing USB stick! SD card is not or wrong formatted! USB stick is not or wrong formatted!	Impossible to access the removable data medium. Causes include: Memory is larger than 32 GB Invalid format (only FAT or FAT32 are permitted)	Check/replace removable data medium.
M925	SD card is write-protected!	SD card is write-protected	Remove write protection.
M927	Insufficient space free on data storage medium!	An attempt was made to save to the SD card or USB stick (setup, screenshot, etc.), but not enough free memory space is available.	Use other SD card/USB stick. Delete files that are no longer needed from the SD card / USB stick.
M927	Insufficient space free on data storage medium!	An attempt was made to save to the WebDAV server but not enough free memory space is available.	Use other WebDAV server. Delete files that are no longer needed from the WebDAV server.
F929	File is damaged!	The file that should be loaded is damaged/ invalid (e.g., wrong checksum). This message can occur in connection with the following actions, for instance: ▪ Loading setup from SD card/USB stick ▪ Firmware update ▪ Load process screens	Create file again, use other storage medium.
M940	E-mail could not be sent! (x)	E-mail could not be sent Optional: Error code (x) from server: e.g.: ▪ 451: Requested action aborted: local processing error ▪ 554: Transaction failed. Possible reason: e-mail was not sent as suspected of being SPAM ▪ 1: No free buffer ▪ 2: No receiver specified	Check settings/network connection ▪ 451: Try again ▪ 554: Use other e-mail provider

Diagnostic code	Event text	Description	Remedial action
M941	No connection to the e-mail server!	A connection to the e-mail server could not be established because ▪ The entered connection data are incorrect ▪ The connection is lost	Check settings/network connection.
M942	SMTP: Fault occurred (x).	An error occurred when sending an e-mail x= error code: 0: SMTP was switched off when the mail was being sent 3: TCP/IP connection was denied 4: TCP/IP connection error 5: SMTP server denied 6: Error during authentication 7: Connection unexpectedly lost 8: Server responded with error code 9: Timeout 10: Internal protocol error	Check settings/network connection.
M944	SMTP: authentication failed!		Check settings/network connection.
M945	SNTP: Time was not synchronized!	Time could not be synchronized via SNTP Possible reasons: ▪ SNTP server temporarily unavailable ▪ Settings not correct	▪ Check settings. ▪ Check whether the error occurs often. If it does, choose another time server.
M945	SNTP server 1 not responding. Try server 2.	Time could not be synchronized via SNTP Possible reasons: ▪ SNTP server temporarily unavailable ▪ Settings not correct	▪ Check settings. ▪ Check whether the error occurs often. If it does, choose another time server.
M946	Screenshot could not be saved (x)!	Screenshot could not be created Possible causes (x): 0: Error when writing 1: Insufficient free space 2: Bitmap could not be created 3: SD card/USB stick not available or not yet ready	Check/replace the SD card or USB stick.
M947	Modem could not be initialized! Check the cable and modem.	The connected modem could not be initialized by the device	Check the cable and modem.
M950	Cannot load SSL certificate.	Cannot load SSL certificate. Cause: ▪ Invalid file format ▪ File is damaged	▪ Use a certificate with a valid file format. ▪ Import certificate to device again.
F951	SSL certificate '...' has expired!	Certificates have an expiry date, i.e. they must be renewed from time to time	Install a new certificate.
M952	SSL certificate '...' expires on ...!	The device warns the user shortly before the certificate expires	Install a new certificate.
M953	x certificates have already been installed. Delete certificates that are no longer required.	The device can manage max. 3 X.509 certificates	Delete a certificate that is already installed and no longer required.
M954	SSL certificate not found: key ID = ...	Unable to establish SSL connection as a suitable certificate is not installed	Install a suitable certificate.
M955	SSL connection denied!		
M956	Incorrect password. User account has been locked!	Incorrect password. User account has been locked.	Contact the administrator to unfreeze the account.
M956	Incorrect password. User account has been locked for 10 minutes!	An incorrect password was entered and the account is locked temporarily.	Wait until the temporary block has been disabled or contact your administrator.
M957	Wet steam alarm	Warning for wet steam alarm	Check the application (pressure, temperature inputs).

Diagnostic code	Event text	Description	Remedial action
M965	SMS could not be sent!	SMS could not be sent because: ▪ The entered connection data are incorrect ▪ There is no connection to the service provider	Check connections and communication settings.
M971	No channels assigned to batch x!	The batch functionality was switched on but no channels were assigned to the batch	Check group settings.
M980	No connection to the WebDAV server	A connection to the WebDAV server could not be established because the entered connection data are incorrect or the connection has been interrupted	Check settings/network connection.
M981	WebDAV: authentication failed!		Check settings.
M982	WebDAV: directory or file could not be created!	Configured directory path not available.	Create a directory manually in the WebDAV server
M983	WebDAV: Fault	An unassigned error has occurred. The error is displayed in English.	
M984	No Ethernet connection.	The device is not connected by an Ethernet cable	Establish cable connection.
M985	The test cannot be carried out because data are currently being copied by WebDAV.		Repeat later.
M988	Server certificate cannot be loaded. Invalid format.	The file must be Base64-encoded Format: X.509 certificate V3 incl. extension	Create the certificate again according to the specifications.
M989	Private key cannot be loaded. Invalid size/format.	The file must be Base64-encoded. Only RSA keys with max. 2048 bits are supported.	Create the certificate again according to the specifications.
M990	Server certificate cannot be installed.	General error. Unable to read or write to file.	Check the files on the USB stick and create again if necessary. If the error persists, contact the Service Department.

HART error messages

Diagnostic code	Event text	Description	Remedial action
M490	Channel x: Max. 5 devices may be connected per channel in Multidrop mode.	Max. 5 HART devices may be connected to the input	Use other channels.
M960	Value uncertain/ communication faulty	In the case of fieldbus systems: The status of the value is uncertain In the case of HART: The current value is used instead of the digital value	
M970	Multi-master collision		▪ Check additional master in HART network (e.g., handheld). ▪ Check master settings (secondary/primary).
M986	Unable to read out self-calibration: channel=x, device address=y	The device was unable to read out the necessary data for determining the self-calibration	Check the settings, check communication with the HART device.
M987	The device does not support self-calibration: channel=x, device address=y	The connected device was replaced during operation. This device does not support self-calibration, however	

12.4 Pending, current diagnostic messages

The diagnostic message that is currently active, the last diagnostic message and the last device restart are displayed in the main menu under **"Diagnostics -> Actual diagnostics"**, **"Diagnostics -> Last diagnostics"** and under **"Diagnostics -> Last restart"**.

12.5 Diagnostic list

The last 30 diagnostic messages are displayed in the main menu under **"Diagnostics -> Diagnosis list"** (messages with Fxxx, Sxxx or Mxxx-type error numbers).

The diagnostic list is designed as a ring memory. When the memory is full, the oldest messages are automatically overwritten without generating a message.

The following information is saved:
- Diagnostic number
- Error text
- Date/time

12.6 Event logbook

Events such as limit value violations and power failures are displayed in chronological order in the event logbook. It can be found in the main menu under **"Diagnostics -> Event logbook"**. Individual events can be selected and details displayed.

12.7 Device information

Important device information such as serial number, firmware version, device name, device options, memory information, SSL certificates etc. are displayed in the main menu under **"Diagnostics -> Device information"** .

For further information open the online help on the device.

12.8 Diagnostics of measured values

Displays the current measured values in the main menu under **"Diagnostics -> Measured values"**. The input signals can be verified here by displaying the scaled and calculated values. To verify calculations, call up calculated auxiliary variables.

12.9 Diagnostics of outputs

Displays the current states of the outputs (analog outputs, relays) in the main menu under **"Diagnostics -> Outputs"**.

12.10 Simulation

Various functions/signals can be simulated for test purposes here.

NOTICE

Invoke simulation: for the simulation of the relays, see the main menu under "Diagnostics -> Simulation". For the simulation of the measured values, see the main menu under "Expert -> Diagnostics -> Simulation".
Only the simulated values are recorded during simulation. The simulation is recorded in the event logbook.
- ▶ Do not start simulation if measured value recording must not be interrupted!

12.10.1 Test barcode reader

This function is **not** supported by the **DIN rail version**.

The function (e.g., character set) of the barcode reader can be tested in the main menu under **"Diagnostics -> Simulation -> Test barcode reader"**.

Only visible if a barcode reader is connected.

12.10.2 E-mail test

A test mail can be sent to the selected recipient in the main menu under **"Diagnostics -> Simulation -> E-mail"**.

At least one e-mail address must be set beforehand.

12.10.3 Testing the WebDAV client

A test file can be sent to the selected WebDAV server in the main menu under **"Diagnostics -> Simulation -> WebDAV Client"**.

The settings for the WebDAV server to be addressed must be set beforehand under **"Setup -> Advanced setup -> Application -> WebDAV Client"**.

12.10.4 Test telealarm

The telealarm functionality can be tested in the main menu under **"Diagnostics -> Simulation -> Test telealarm"**. During this test, alarms are simulated and triggered.

Only possible for the "Telealarm" device option.

For detailed descriptions of this device option, see the associated documentation

12.10.5 Testing time synchronization/SNTP

Time synchronization (SNTP setting) can be tested in the main menu under **"Diagnostics -> Simulation -> SNTP"**.

SNTP must be enabled beforehand in the main menu under **"Setup -> Advanced setup -> System -> Date/time set-up -> SNTP"**.

Note: The test can take some time.

12.10.6 Test universal output

The active analog and pulse outputs can be tested in the main menu under **"Diagnostics -> Simulation -> Universal output"**.

12.10.7 Relay test

The relay selected under **"Diagnostics -> Simulation -> Relay x"** can be switched manually in the main menu.

12.11 HART diagnostics

Display the device information and status of the connected HART devices/sensors in the main menu under **"Diagnostics -> HART"**.

Note: It can take several seconds until all the information regarding the device/sensor is available.

Caution: Measured value acquisition slows down as additional information has to be read out.

For further information open the online help on the device.

12.12 PROFINET diagnostics (option)

Display PROFINET diagnostics information in the main menu under **"Diagnostics -> PROFINET"**.

12.13 Diagnostics EtherNet/IP (option)

Display EtherNet/IP diagnostics information in the main menu under **"Diagnostics -> EtherNet/IP"**.

12.14 Initializing the modem

Initializes the modem connected (to automatically answer calls). The modem must support the complete AT command syntax.

- Set the baud rate in the main menu under **"Setup -> Advanced setup -> Communication -> Serial interface"** and select **"RS232"** as the interface type.
- Connect the modem to the RS232 interface of the device. Only use the modem cable, which is available as an accessory, for this purpose.

A GSM modem can only be initialized if a SIM card is inserted and the PIN is entered or the prompt to enter the PIN has been disabled.

12.15 GSM terminal

Information on the reception quality.

Only possible for the "Telealarm" device option.

For detailed descriptions of this device option, see the associated documentation.

12.16 Telealarm status

Information on the status of individual alarms.

Only possible for the "Telealarm" device option.

For detailed descriptions of this device option, see the associated documentation.

12.17 Resetting the measuring instrument

The device can be reset to the as-delivered state with a PRESET. This function should only be performed by a service technician.

The function can be found in the main menu under **"Expert -> System -> PRESET"**

PRESET is only visible under "Expert" once the service code has been entered.

Procedure for resetting the measuring instrument

The PRESET returns all parameters to the factory default setup! The internal memory content is deleted!

- ▶ Save the setup and measured values on the USB stick or SD card. Then perform a PRESET.
  - ↳ The device is reset to the factory default settings.

12.18 Clear memory

Clear internal memory after commissioning so that the analysis software does not contain any unnecessary data.

12.19 Reset analysis

The analyses should be reset after commissioning so that the analysis software does not contain any unnecessary data.

12.20 Updating the device software ("firmware")

Update the device software ("firmware") via USB stick, SD card or web server.

The function to update the firmware via the web server must be enabled under **"Expert -> Communication -> Ethernet -> Configuration Web server"**.

There are two ways to update the firmware:
- In the main menu under **"Operation -> SD card or USB stick -> Update firmware"**
- In the web server under **"Data management -> Update firmware"**

Make sure that the setup and measured values are saved beforehand on the USB stick/SD card.

Only a service technician should update the device software ("firmware").

After the firmware update, the device restarts.

If an older firmware version (< V2.04.00) is installed on the device, the internal memory must be cleared under **"Expert -> System"**.

Only install specially approved firmware versions for the "EtherNet/IP" and "PROFINET" options.

For detailed descriptions of these device options, see the associated documentation.

13 Maintenance

No special maintenance work is required for the device.

13.1 Cleaning

13.1.1 Cleaning of surfaces not in contact with the medium

- Recommendation: Use a lint-free cloth that is either dry or slightly dampened using water.
- Do not use any sharp objects or aggressive cleaning agents that corrode the surfaces (e.g. displays, housing) and seals.
- Do not use high-pressure steam.
- Observe the degree of protection of the device.

The cleaning agent used must be compatible with the materials of the device configuration. Do not use cleaning agents with concentrated mineral acids, bases or organic solvents.

14 Repair

14.1 General notes

The device has a modular design and repairs can be carried out by the customer's electrotechnical personnel. For more information on service and spare parts, contact the supplier.

14.2 Spare parts

Product spare parts that are currently available can be found online at:
www.endress.com/onlinetools

14.3 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information: https://www.endress.com
2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

14.4 Disposal

14.4.1 IT security

Observe the following instructions before disposal:

1. Delete the data
2. Reset the device

14.4.2 Removing the measuring instrument

1. Switch off the device
2. Carry out the mounting and connection steps from the "Installing the measuring instrument" and "Connecting the measuring instrument" sections in reverse order. Observe the safety instructions.

14.4.3 Disposing of the measuring instrument

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

15 Accessories

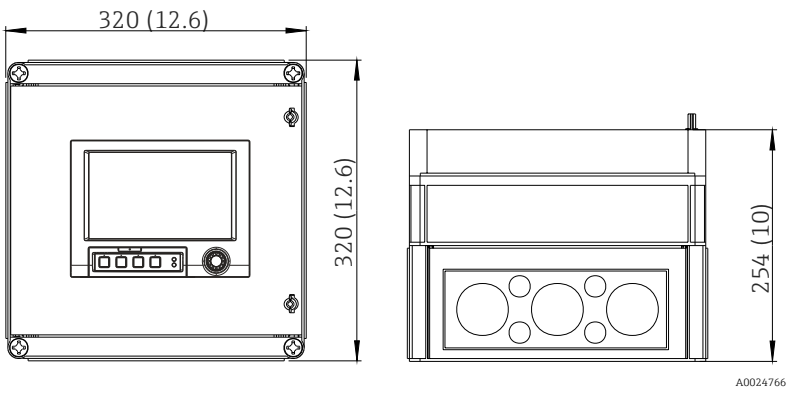
The accessories currently available for the product can be selected at www.endress.com:

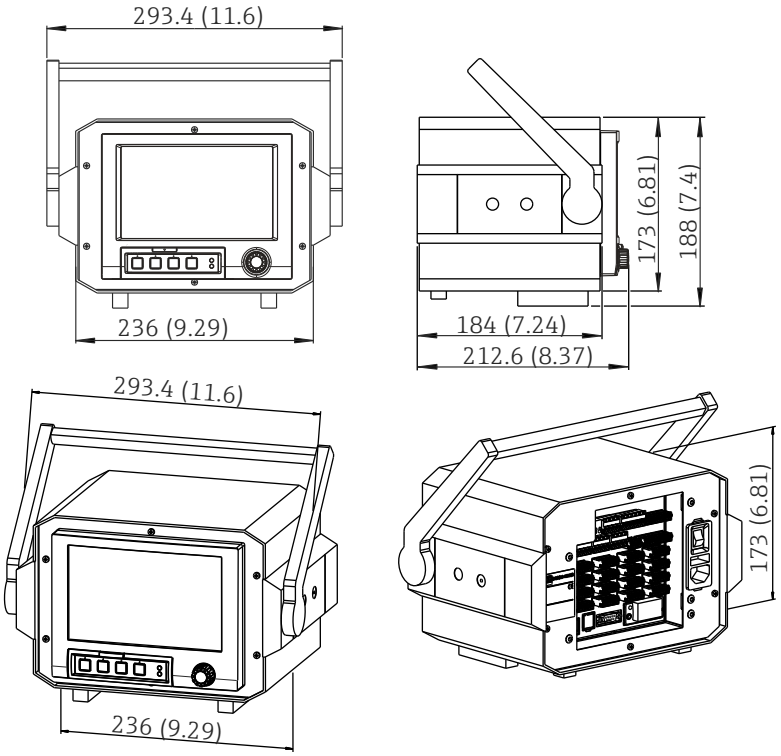
1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

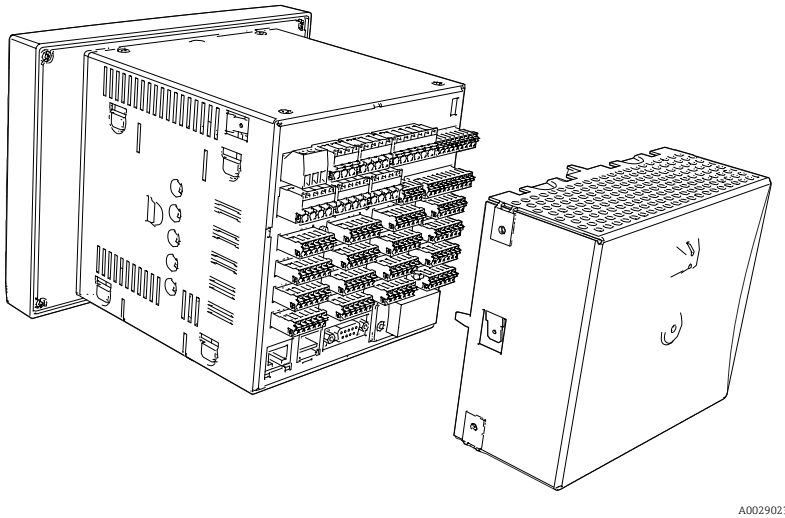
15.1 Device-specific accessories

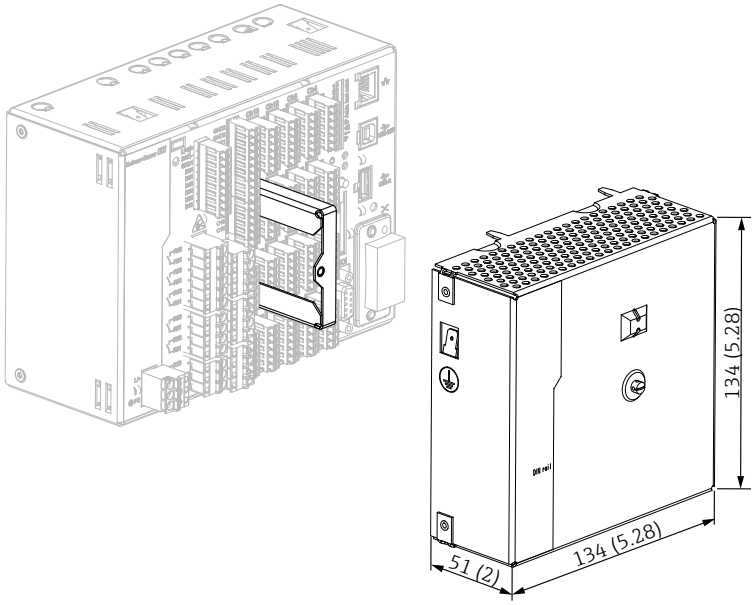
Description	Order no.
"Industrial Grade" SD card, industry standard, 1GB	71213190
Field Data Manager analysis software with SQL database support (1 x workstation license, Professional version on DVD)	MS20-A5
OPC server software (full version on CD)	RXO20-11

Description	Order no.
Accessories for RXU10 data manager	RXU10- _ _
Designation: Cable set RS232 for connection to PC or modem USB - RS232 converter Cable USB-A - USB-B, 1.8 m (5.9 ft) Configuration software "FieldCare Device Setup" + USB cable	 RXU10-B _ RXU10-E _ RXU10-F _ RXU10-G _

Description	Order no.
Field housing IP65 (for panel-mounted device)  16 *Dimensions in mm (in)*	RXU10-H _

Description	Order no.
Desktop housing (for panel-mounted device), cable with Schuko plug Desktop housing (for panel-mounted device), cable with US plug Desktop housing (for panel-mounted device), cable with Swiss plug  *17 Dimensions in mm (in)*	RXU10-I _ RXU10-J _ RXU10-K _
Version: Standard Neutral	 RXU10- _ 1 RXU10- _ 2

Description	Order no.
Terminal cover can be sealed (for panel-mounted device) An optional terminal cover is available to prevent tampering at the device terminals and terminal temperature measurement. 	XPR0011-A5

Description	Order no.
Terminal cover can be sealed (for DIN rail version) An optional terminal cover is available to prevent tampering at the device terminals and terminal temperature measurement. 	XPR0011-A8

15.2 Communication-specific accessories

Field Data Manager (FDM) analysis software MS20, MS21

- Field Data Manager (FDM) is a software which provides central data management and visualization. This enables the continuous, tamper-free archiving of process data, e.g. measured values and diagnostic events. "Live data" from connected devices is available. FDM saves the data in an SQL database.
- Supported databases: PostgreSQL (included in the delivery), Oracle or Microsoft SQL server.
- MS20 single-user license: Installing the software on a computer.
- MS21 multi-user license: Several simultaneous users, dependent on the number of available licenses.

Technical Information TI01022R

www.endress.com/ms20

www.endress.com/ms21

OPC DA server RXO20

The OPC DA server transmits process data such as instantaneous values or totalizers from connected Endress+Hauser field devices and provides them to the OPC clients in real time. These data can be visualized with OPC client software. Communication takes place via an RS232/RS485 interface or a TCP/IP connection. OPC is used in systems of various sizes in factory and process automation.

Technical Information TI00122R

www.endress.com/rxo20

15.3 Service-specific accessories

15.3.1 Software

DeviceCare SFE100
DeviceCare is an Endress+Hauser configuration tool for field devices using the following communication protocols: HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, IO/Link, Modbus, CDI and Endress+Hauser Common Data Interfaces.

Technical Information TI01134S

www.endress.com/sfe100

FieldCare SFE500
FieldCare is a configuration tool for Endress+Hauser and third-party field devices based on DTM technology.
The following communication protocols are supported: HART, WirelessHART, PROFIBUS, FOUNDATION Fieldbus, Modbus, IO-Link, EtherNet/IP, PROFINET and PROFINET APL.

Technical Information TI00028S

www.endress.com/sfe500

Netilion
With the Netilion IIoT ecosystem, Endress+Hauser enables the optimization of plant performance, digitization of workflows, sharing of knowledge and improved collaboration. Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, reliability and ultimately a more profitable plant.

www.netilion.endress.com

Field Xpert SMT50
Universal, high-performance tablet PC for device configuration.

Technical Information TI01555S

www.endress.com/smt50

Field Xpert SMT77 via WLAN
Universal, high-performance tablet PC for device configuration in Ex Zone 1 areas.

Technical Information TI01418S

www.endress.com/smt77

15.4 Online tools

Product information about the entire life cycle of the device is available at:
www.endress.com/onlinetools

15.5 System components

Surge arrester modules from the HAW product family

Surge arrester modules for DIN rail and field device mounting, for the protection of plants and measuring instruments with power supply and signal/communication lines.

More detailed information: www.endress.com

Process indicators from the RIA product family

Easily readable process indicators with various functions: loop-powered indicators for displaying 4-20 mA values, display of up to four HART variables, process indicators with control units, limit value monitoring, sensor power supply, and galvanic isolation.

Universal application thanks to international hazardous area approvals, suitable for panel mounting or field installation..

For more information, please refer to: www.endress.com

RN series active barrier

Single- or two-channel active barrier for safe separation of 0/4 to -20 mA standard signal circuits with bidirectional HART transmission. In the signal duplicator option, the input signal is transmitted to two galvanically isolated outputs. The device has one active and one passive current input; the outputs can be operated actively or passively.

For more information, please refer to: www.endress.com

15.6 Instructions for enabling a software option

Various device options can be enabled via an activation code. Available options can be ordered as an accessory and can be ordered separately.→ 90. Once you place your order, you will receive instructions on how to activate the option and a code which must be entered under **"Main menu -> Expert -> System -> Device options -> Activation code"**.

16 Technical data

16.1 Function and system design

Measuring principle	Electronic acquisition, display, recording, analysis, remote transmission and archiving of analog and digital input signals as well as calculated values. **Panel version:** Device with display and operating keys for installation in a panel or control cabinet door. Operation in a desktop or field housing is possible as an option. **Panel version with stainless steel front:** Device with touch screen (no operating keys) for installation in a panel or a cabinet door. Operation in a desktop or field housing is possible as an option. **DIN rail version:** Device without a display or operating keys for mounting on a DIN rail.
Measuring system	Multichannel data recording system with multicolor TFT display (order option, 178 mm (7 in) screen size), internal memory, external memory (SD card and USB stick), galvanically isolated universal inputs (U, I, TC, RTD, pulse, frequency), HART® inputs, digital inputs, transmitter power supply, limit relays, digital and analog outputs, communication interfaces (USB, Ethernet, RS232/485), optionally available with Modbus, Profibus DP or PROFINET I/O or EtherNet/IP. An Essential Version of the Field Data Manager (FDM) software can be downloaded at www.endress.com/ms20 for SQL-supported data analysis at the PC. The number of inputs available in the basic device can be individually increased using a maximum of 5 plug-in cards. The device supplies power directly to connected two-wire transmitters. The device is configured and operated via the navigator (jog/shuttle dial) or by touchscreen (optional) using the integrated web server and a PC, an external USB keyboard or mouse or with the FieldCare/DeviceCare configuration software. Online help supports the user during local operation. **Ex version:** ▪ The hazardous area version (Ex version) is only available in conjunction with the stainless steel front and touch control. ▪ In this version, the SD card is integrated in the device and cannot be removed. The card can be read out using the optional Field Data Manager (FDM) software via USB or Ethernet or via WebDAV.
Application packages/ software options	In the standard version, the Advanced Data Manager has a variety of functions, including an end-to-end safety concept to meet the requirements of FDA 21 CFR Part 11. The following application packages are available to help users meet the requirements of their applications and save time: ▪ Mathematics ▪ Telealarm ▪ Batch management ▪ Wastewater + RSB (rain spillway basin) ▪ Energy calculation The application packages contain the standard functions and the specific package functions. The individual packages can be largely combined as the user requires. The application packages can also be activated retroactively by entering the activation code.

Standard functions

- Signal analysis: external, 1 min to 12 h, day, week, month, year
- Web server
- User administration compliant with FDA 21 CFR Part 11
- Event logbook/audit trail
- Process screen
- Operating time counter
- Text entry/comments
- Change language
- Time synchronization
- Linearization
- Access protection through release code
- E-mail notification in event of alarms and limit violation
- Encrypted e-mail transmission via SSL (TLS)
- Operation via external USB keyboard and mouse
- External USB or network printer

Mathematics

With the mathematics package, measured values of the inputs or the results of other math channels can be linked mathematically. A formula with up to 200 characters can be created using a formula editor. Once entered, the user can then check the plausibility of the formula.

Functions:
- 12 math channels
- Mathematics functions via formula editor
- Basic arithmetic operations, relational operators, logic operations and functions

Telealarm software

The Telealarm software facilitates user mobility, allowing users to respond to events while they are on the road. E-mails or SMS messages triggered by process alarms or other important process events can be sent to several recipients simultaneously or automatically forwarded to a recipient/destination. Messages can be confirmed, relays controlled remotely and current values queried by cellular phone. The Advanced Data Manager with GSM (GPRS) or Ethernet is ideal both for environmental applications to monitor unstaffed outstations, and for tank monitoring applications.

The Telealarm software contains the mathematics package.

Functions:
- Advanced SMS/e-mail notification in the event of an alarm
- Instantaneous values queried by cellular phone
- Remote relay switching
- Alarm confirmation by SMS

Batch software

Batch management allows users to reliably record and visualize discontinuous processes. User-definable or externally controlled analysis intervals are possible for up to four batches simultaneously. Batches are assigned batch-specific values and the measured data, the start, end and duration of every batch, along with the current batch status, are displayed on the device and in the Field Data Manager software. At the end of the batch, batch information is automatically printed out directly at the device (USB or network printer) or is printed out via a PC with the Field Data Manager software.

The batch software contains the mathematics package.

Functions:
- Batch report for 4 batches simultaneously
- USB barcode reader
- Automatic batch printout
- Preset counter

Wastewater + RSB (rain spillway basin)

The water/wastewater software supports operations monitoring of the water/wastewater sewage network to obtain information about the quality and efficiency of the plant. The daily, weekly, monthly and yearly maximum and minimum value is determined per quantity channel. Infiltration water recording and the monitoring of rain spillway basins for reservoir and overflow events are also functions of this software option.

The water/wastewater software contains the mathematics package and the Telealarm software.

Functions:
- Rain spillway basin (reservoir/overflow)
- Highest and lowest values for quantities
- Highest and lowest values from ¼-hourly averages
- Determination of infiltration water

Energy package (water + steam)

The energy package allows users to calculate the mass and energy flow in water and steam applications on the basis of the flow, pressure and temperature (or temperature differential). Furthermore, energy calculations are also possible using glycol-based refrigerant media.

By balancing the results against one another or by linking the results to other input variables (e.g.,. gas flow, electrical energy), users can calculate overall balances, efficiency levels etc. These values are important indicators for the quality of the process and form the basis for process optimization and maintenance.

The internationally recognized standard IAPWS-IF 97 is used to calculate the thermodynamic state variables of water and steam.

In the energy software, it is also possible to compensate differential pressure flow measurement ("DP-Flow"). The calculation of flow based on the differential pressure method is a special form of flow measurement. Volumes or mass flow rates that are determined using the DP method require specific correction. By solving the calculation equations listed in the standard in an iterative manner, highly accurate results for DP flow measurements can be achieved. The measurement (orifice plate, nozzle, Venturi pipe) is performed in accordance with ISO5167. Flow measurement based on the dynamic pressure method uses the interrelation between differential pressure and flow.

The energy package contains the mathematics package.

Additional functions:
- 12 math channels
  (Channels 1-8: energy-specific formulas and formula editor, channels 9-12: formula editor)
- Heat quantity + mass calculation for water and steam applications
- Efficiency calculation

iTherm TrustSens Calibration Monitoring

Available in conjunction with iTHERM TrustSens TM371, TM372.

Application package :
- Up to 20 iTHERM TrustSens TM371, TM372 devices can be evaluated via the HART interface
- Self-calibration data displayed on screen or via the web server
- Generation of a calibration history
- Creation of a calibration certificate as an RTF file directly at the RSG45
- Evaluation, analysis and further processing of the calibration data using "Field Data Manager" (FDM) analysis software

Dependability

Reliability

Depending on the device version, the mean time between failures (MTBF) is between 52 years and 16 years (calculated based on SN29500 standard at 40 °C (104 °F))

Maintainability

Battery-backed time and data memory. It is advisable to have the backup battery replaced by a service technician after 10 years.

Real-time clock (RTC)

- Automatic or manual summer time changeover
- Battery buffer. It is advisable to have the backup battery replaced by a service technician after 10 years.
- Drift: <10 min./year.
- Time synchronization possible via SNTP or via digital input.

Standard diagnostic functions as per NAMUR NE 107

The diagnostic code consists of the status signal as per NAMUR NE 107 and the event number.

- Cable open circuit, short-circuit
- Incorrect wiring
- Internal device errors
- Overrange/underrange detection
- Ambient temperature out-of-range detection

Device error/alarm relay

One relay can be used as an alarm relay. The selected relay switches if the device detects a system error (e.g., hardware defect) or a malfunction (e.g., cable open circuit).

This "alarm relay" switches if the device status is "F" (Failure). If the device status is "M" (Maintenance required), the alarm relay does not switch.

Safety

Recorded data are saved in a tamper-proof format and can be exported and archived with manipulation protection using the Field Data Manager software.

16.2 Input

Measured variable

Analog universal inputs

Standard version without universal inputs. Optional multifunction cards (slot 1-5) with 4 universal inputs (4/8/12/16/20) each.

You are free to choose between the following measured variables for each universal input: U, I, RTD, TC, pulse input or frequency input.

Integration of input variable for totalization such as flow (m^3/h) in quantity (m^3).

HART® inputs

Standard version without HART® inputs. Optional HART® input cards (slot 1-5) with 4 inputs (4/8/12/16/20) each.

Both the digital HART® values and the 4 to 20 mA signal can be evaluated at every input.

The 4 HART® values (PV, SV, TV, QV) of a sensor can be evaluated and the analog HART® value (PV) can be measured via the digital HART® signal. Up to 40 digital HART® values can be recorded in total. It is possible to access the HART® sensor in the field from a PC tool (e.g., FieldCare). In this way, the sensor can be configured from the control room and the status information of the sensor can be analyzed/displayed. The Memograph M acts as a HART® Gateway.

Access to the connected sensors is only possible if the device is connected by Ethernet.

Port 5094 must be open in the firewall.

Digital inputs

Standard version: 6 digital inputs

Optional digital card (slot 5): 8 additional digital inputs, 6 additional relays and 2 analog outputs

Mathematics channels

12 math channels (optional). Mathematics functions can be freely edited via a formula editor.

Integration of calculated values for totalization.

Limit values

60 limit values (individual channel assignment)

Calculated process variables

The values of the universal and HART® inputs can be used to perform calculations in the math channels.

The results of the math channels can also be used for calculations in other math channels.

Measuring range

According to IEC 60873-1: An additional display error of ±1 digit is permitted for every measured value.

User-definable measuring ranges per universal input of the multifunction card:

Measured variable	Measuring range	Maximum measurement error of measuring range (oMR), temperature drift	Input resistance
Current (I)	0 to 20 mA; 0 to 20 mA quadratic 0 to 5 mA 4 to 20 mA; 4 to 20 mA quadratic ±20 mA Over range: up to 22 mA or -22 mA	±0.1% oMR Temperature drift: ±0.01%/K oMR	Load: 50 Ω ±1 Ω
Voltage (U) >1 V	0 to 10 V; 0 to 10 V quadratic 0 to 5 V 1 to 5 V; 1 to 5 V quadratic ±10 V ±30 V	±0.1% oMR Temperature drift: ±0.01%/K oMR	≥1 MΩ

Measured variable	Measuring range	Maximum measurement error of measuring range (oMR), temperature drift	Input resistance
Voltage (U) ≤1 V	0 to 1 V; 0 to 1 V quadratic ±1 V ±150 mV	±0.1% oMR Temperature drift: ±0.01%/K oMR	≥2.5 MΩ
Resistance thermometers (RTD)	Pt100: -200 to 850 °C (-328 to 1562 °F) (IEC 60751:2008, α=0.00385) Pt100: -200 to 510 °C (-328 to 950 °F) (JIS C 1604:1984, α=0.003916) Pt100: -200 to 850 °C (-328 to 1562 °F) (GOST 6651-94, α=0.00391) Pt500: -200 to 850 °C (-328 to 1562 °F) (IEC 60751:2008, α=0.00385) Pt500: -200 to 510 °C (-328 to 950 °F) (JIS C 1604:1984, α=0.003916) Pt1000: -200 to 600 °C (-328 to 1112 °F) (IEC 60751:2008, α=0.00385) Pt1000: -200 to 510 °C (-328 to 950 °F) (JIS C 1604:1984, α=0.003916)	4-wire: ±0.1% oMR 3-wire: ±(0.1% oMR + 0.8 K) 2-wire: ±(0.1% oMR + 1.5 K) Temperature drift: ±0.01%/K oMR	
	Cu50: -50 to 200 °C (-58 to 392 °F) (GOST 6651-94, α=4260) Cu50: -200 to 200 °C (-328 to 392 °F) (GOST 6651-94, α=4280) Pt50: -200 to 1100 °C (-328 to 2012 °F) (GOST 6651-94, α=0.00391) Cu100: -200 to 200 °C (-328 to 392 °F) (GOST 6651-94, α=4280)	4-wire: ±0.2% oMR 3-wire: ±(0.2% oMR + 0.8 K) 2-wire: ±(0.2% oMR + 1.5 K) Temperature drift: ±0.02%/K oMR	
	Pt46: -200 to 1100 °C (-328 to 2012 °F) (GOST 6651-94, α=0.00391) Cu53: -200 to 200 °C (-328 to 392 °F) (GOST 6651-94, α=4280)	4-wire: ±0.3% oMR 3-wire: ±(0.3% oMR + 0.8 K) 2-wire: ±(0.3% oMR + 1.5 K) Temperature drift: ±0.02%/K oMR	
Thermocouples (TC)	Type J (Fe-CuNi): -210 to 1200 °C (-346 to 2192 °F) (IEC 60584:2013) Type K (NiCr-Ni): -270 to 1300 °C (-454 to 2372 °F) (IEC 60584:2013) Type L (NiCr-CuNi): -200 to 800 °C (-328 to 1472 °F) (GOST R8.585:2001) Type L (Fe-CuNi): -200 to 900 °C (-328 to 1652 °F) (DIN 43710-1985) Type N (NiCrSi-NiSi): -270 to 1300 °C (-454 to 2372 °F) (IEC 60584:2013) Type T (Cu-CuNi): -270 to 400 °C (-454 to 752 °F) (IEC 60584:2013)	±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -130 °C (-202 °F) ±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -200 °C (-328 °F) Temperature drift: ±0.01%/K oMR	≥1 MΩ
	Type A (W5Re-W20Re): 0 to 2500 °C (32 to 4532 °F) (ASTME 988-96) Type B (Pt30Rh-Pt6Rh): 42 to 1820 °C (107.6 to 3308 °F) (IEC 60584:2013) Type C (W5Re-W26Re): 0 to 2315 °C (32 to 4199 °F) (ASTME 988-96) Type D (W3Re-W25Re): 0 to 2315 °C (32 to 4199 °F) (ASTME 988-96) Type R (Pt13Rh-Pt): -50 to 1768 °C (-58 to 3214 °F) (IEC 60584:2013) Type S (Pt10Rh-Pt): -50 to 1768 °C (-58 to 3214 °F) (IEC 60584:2013)	±0.15% oMR from 500 °C (932 °F) ±0.15% oMR from 600 °C (1112 °F) ±0.15% oMR from 500 °C (932 °F) ±0.15% oMR from 500 °C (932 °F) ±0.15% oMR from 100 °C (212 °F) ±0.15% oMR from 100 °C (212 °F) Temperature drift: ±0.01%/K oMR	≥1 MΩ
Pulse input (I) [1]	Min. pulse length 40 µs, max. 12.5 kHz; 0 to 7 mA = LOW; 13 to 20 mA = HIGH		Load: 50 Ω ±1 Ω
Frequency input (I) [1]	0 to 10 kHz, over range: up to 12.5 kHz; 0 to 7 mA = LOW; 13 to 20 mA = HIGH	±0.02% @ f <100 Hz of reading ±0.01% @ f ≥100 Hz of reading Temperature drift: 0.01% of measured value over the entire temperature range	

1) If a universal input is used as a frequency or pulse input, a series resistor must be used in series connection with the voltage source. Example: 1.2 kΩ series resistor at 24 V

Current measuring range of the HART® card:

Measured variable	Measuring range	Maximum measurement error of measuring range (oMR), temperature drift	Input impedance
Current (I)	4 to 20 mA Over range: up to 22 mA	±0.1% oMR Temperature drift: ±0.01%/K oMR	Load: 10 Ω ±1 Ω

Maximum load and additional input parameters of the multifunction cards

Limit values for input voltage and current as well as cable open circuit detection/line influence/temperature compensation:

Measured variable	Limit values (steady-state, without destroying input)	Cable open circuit detection/line influence/temperature compensation
Current (I)	Maximum permitted input voltage: 2.5 V Maximum permitted input current: 50 mA	4 to 20 mA range with disengageable cable open circuit monitoring to NAMUR NE43. The following error ranges apply when NAMUR NE43 monitoring is switched on: ≤3.8 mA: under range ≥20.5 mA: over range ≤ 3.6 mA or ≥ 21.0 mA: cable open circuit (display shows: – – – –)
Pulse, frequency (I)	Maximum permitted input voltage: 2.5 V Maximum permitted input current: 50 mA	No cable open circuit monitoring
Voltage (U) >1 V	Maximum permitted input voltage: 35 V	1 to 5 V range with disengageable cable open circuit monitoring: <0.8 V or >5.2 V: cable open circuit (display shows: - - - -)
Voltage (U) ≤1 V	Maximum permitted input voltage: 24 V	
Resistance thermometers (RTD)	Measuring current: ≤1 mA	Maximum barrier resistance (or resistivity): 4-wire: max. 200 Ω; 3-wire: max. 40 Ω Maximum influence of barrier resistance (or resistivity) for Pt100, Pt500 and Pt1000: 4-wire: 2 ppm/Ω, 3-wire: 20 ppm/Ω Maximum influence of barrier resistance (or resistivity) for Pt46, Pt50, Cu50, Cu53, Cu100 and Cu500: 4-wire: 6 ppm/Ω, 3-wire: 60 ppm/Ω Cable open circuit monitoring if any connection is interrupted.
Thermocouples (TC)	Maximum permitted input voltage: 24 V	Influence of resistivity: <0.001%/Ω Error, internal temperature compensation: ≤ 2 K

Maximum load and additional input parameters of the HART® cards

Limit values for input voltage and current as well as cable open circuit detection:

Measured variable	Limit values (steady-state, without destroying input)	Cable open circuit detection
Current (I)	Maximum permitted input voltage: 0.5 V Maximum permitted input current: 50 mA	4 to 20 mA range with disengageable cable open circuit monitoring to NAMUR NE43. The following error ranges apply when NAMUR NE43 monitoring is switched on: ≤3.8 mA: under range ≥20.5 mA: over range ≤ 3.6 mA or ≥ 21.0 mA: cable open circuit (display shows: – – – –)

Scan rate

Current/voltage/pulse/frequency input: 100 ms per channel

Thermocouples and resistance thermometer: 1 s per channel

Data storage/save cycle

Choose from the following for the save cycle: off / 100 ms / 1s / 2s / 3s / 4s / 5s / 10s / 15s / 20s / 30s / 1min / 2min / 3min / 4min / 5min / 10min / 15min / 30min / 1h

High-speed storage (100 ms) can be selected for up to 8 channels in Group 1 only.

High-speed storage is not available in the energy package (option).

Typical logging duration

Prerequisites for following tables:
- No limit value violation / integration
- Digital input not used
- Signal analysis 1: off, 2: day, 3: month, 4: year
- No active mathematics channels

Frequent entries in the event logbook reduce the memory availability!

256 MB internal memory:

Analog inputs	Channels in groups	Save cycle (weeks, days, hours)				
		5 min	1 min	30 s	10 s	1 s
1	1/0/0/0/0/0/0/0/0/0	1796, 6, 13	362, 5, 17	181, 4, 9	60, 4, 3	6, 0, 10
4	4/0/0/0/0/0/0/0/0/0	1319, 2, 23	267, 5, 17	134, 1, 2	44, 5, 10	4, 3, 8
8	4/4/0/0/0/0/0/0/0/0	661, 4, 3	133, 6, 21	67, 0, 16	22, 2, 17	2, 1, 16
12	4/4/4/0/0/0/0/0/0/0	441, 3, 8	89, 2, 9	44, 5, 3	14, 6, 11	1, 3, 10
20	4/4/4/4/4/0/0/0/0/0	265, 0, 15	53, 4, 7	26, 5, 21	8, 6, 16	0, 6, 6
40	4/4/4/4/4/4/4/4/4/4	132, 4, 8	26, 5, 16	13, 2, 23	4, 3, 8	0, 3, 3

External memory, 1 GB SD card:

Analog inputs	Channels in groups	Save cycle (weeks, days, hours)				
		5 min	1 min	30 s	10 s	1 s
1	1/0/0/0/0/0/0/0/0/0	12825, 5, 20	2580, 4, 18	1291, 2, 5	430, 4, 14	43, 0, 12
4	4/0/0/0/0/0/0/0/0/0	8672, 5, 12	1749, 6, 13	875, 6, 13	292, 1, 8	29, 1, 14
8	4/4/0/0/0/0/0/0/0/0	4343, 1, 1	875, 1, 17	438, 0, 6	146, 0, 17	14, 4, 7
12	4/4/4/0/0/0/0/0/0/0	2896, 6, 13	583, 3, 21	292, 0, 6	97, 2, 20	9, 5, 4
20	4/4/4/4/4/0/0/0/0/0	1738, 6, 4	350, 1, 3	175, 1, 14	58, 3, 2	5, 5, 22
40	4/4/4/4/4/4/4/4/4/4	869, 5, 0	175, 0, 15	87, 4, 7	29, 1, 13	2, 6, 11

The available storage capacity of the internal and external memory can be displayed in the main menu under **"Diagnostics → Device information → Memory information"**. The storage capacity depends on the specific device set-up.

Converter resolution

24 bit

Totalization

The interim, daily, weekly, monthly and yearly value and the total value can be determined (15-digit, 64 bit).

Analysis

Recording of quantity/operating time (standard function), also a min/max/median analysis within the set time frame.

Digital inputs

Input level	Logical "0" (corresponds to -3 to +5 V), activation with logical "1" (corresponds to +12 to +30 V)
Input frequency	Max. 25 Hz

Pulse length	Min. 20 ms (pulse counter)
Pulse length	Min. 100 ms (control input, messages, operating time)
Input current	Max. 2 mA
Input voltage	Max. 30 V

Selectable functions

- Functions of the digital input: control input, ON/OFF event, pulse counter (15-digit, 64 bit), operating time, event + operating time, quantity from time, Profibus DP, EtherNet/IP, PROFINET.
- Functions of the control input: start recording, screensaver on, lock setup, time synchronization, change group, limit value monitoring on/off, individual LV on/off, block keyboard/navigator, start/stop analysis.
  Additionally for the batch software option: reset batch number, batch limit values on/off.

16.3 Output

Auxiliary voltage output

The auxiliary voltage output can be used for loop power supply or to control the digital inputs. The auxiliary voltage is short-circuit proof and galvanically isolated.

Output voltage	24 V_{DC} ±15%
Output current	Max. 250 mA

Analog and pulse outputs

Number

Optional digital card (slot 5): 2 analog outputs which can be operated as current or pulse outputs.

Analog output (current output)

- Output current: 0/4 to 20 mA with 10% over range
- Max. output voltage: approx. 16 V
- Accuracy: ≤0.1% of upper range value
- Temperature drift: ≤0.015%/K of upper range value
- Resolution: 13 Bit
- Load: 0 to 500 Ω
- Error signal as per NAMUR NE43: 3.6 mA or 21 mA can be configured

Digital output (pulse output)

- Output voltage:
  ≤5 V corresponds to LOW
  ≥12 V corresponds to HIGH
  Short-circuit proof (maximum 25 mA)
- Speed: max. 1000 pulses/s
- Pulse width: 0.5 to 1000 ms

The pulse pause is at least as long as the pulse width.

Load: ≥1 kΩ

Relay output

A mix of low voltage (230 V) and safety extra low voltage (SELV circuits) is not permitted at the connections of the relay contacts.

Alarm relay

1 alarm relay with changeover contact.

Standard relay

5 relays with NO contact, e.g., for limit value messages (can be configured as NC contact).

Optional relays

Optional digital card (slot 5): 6 additional relays with NO contact, e.g., for limit value alarms (can be configured as an NC contact).

Switching capacity

- Max. relay switching capacity: 3 A @ 30 V DC
- Max. relay switching capacity: 3 A @ 250 V AC
- Min. switching load: 300 mW

Switching cycles

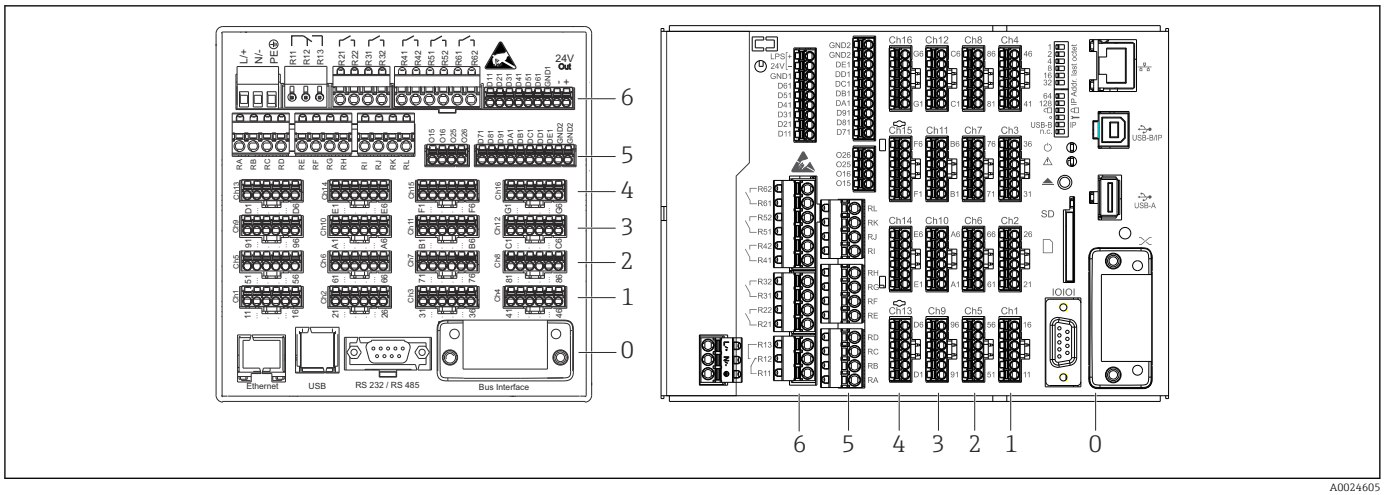
$>10^5$

Galvanic isolation

The following connections are galvanically isolated from one another:
- Current supply
- Relay outputs
- Digital inputs (isolated from other connections but not from each other)
- Analog inputs
- Analog outputs
- Ethernet
- RS232/RS485
- USB
- Auxiliary voltage output

16.4 Electrical connection

Terminal assignment

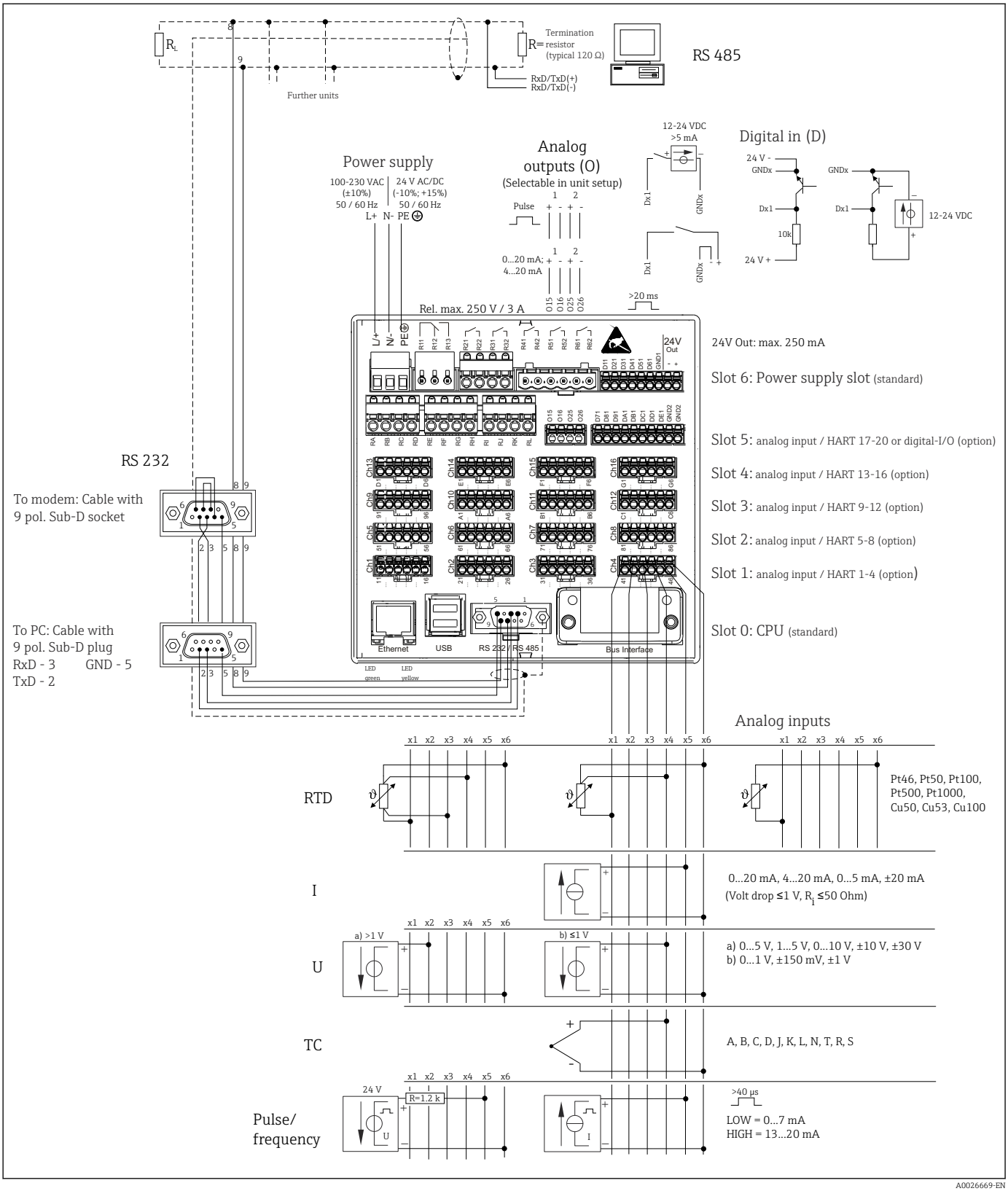


18 *Connections: back of device, panel version (left), DIN rail version (right)*

6 Slot 6: Power supply with relays
5 Slot 5: Multifunction card or HART® card (channels 17-20) or digital card
4 Slot 4: Multifunction card or HART® card (channels 13-16)
3 Slot 3: Multifunction card or HART® card (channels 9-12)
2 Slot 2: Multifunction card or HART® card (channels 5-8)
1 Slot 1: Multifunction card or HART® card (channels 1-4)
0 Slot 0: CPU card with interfaces

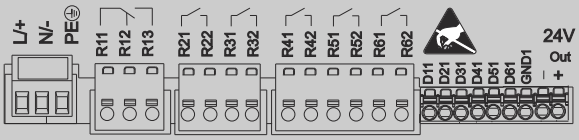
Supply voltage	▪ Extra-low voltage power supply unit ±24 V AC/DC (-10% / +15%) 50/60Hz ▪ Low voltage power supply unit 100 to 230 V AC (±10%) 50/60Hz Overcurrent protection (rated current ≤ 10 A) must be installed for the power cable.
Power consumption	▪ 100 to 230 V: max. 47 VA ▪ 24 V: max. 30 VA The power actually consumed depends on the individual operating state and the device version (LPS, USB, brightness of screen, number of channels, etc.). The active power here is approx. 3 W to 25 W.
Power supply failure	Battery-backed time and data memory. The device starts automatically following a power failure.
Electrical connection	Details about the electrical connection: → 17
Electrical connection, terminal assignment	All connection examples are illustrated using the panel version. The connections on the DIN rail version are identical.

Circuit diagram

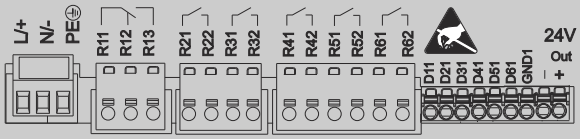


19 For connection examples of the HART® inputs (optional), see the Operating Instructions → 25

Supply voltage (power unit, slot 6)

Power unit type	Terminal		
	 A0019103		
100-230 VAC	**L+**	**N-**	**PE**
	Phase L	Zero conductor N	Ground
24 V AC/DC	**L+**	**N-**	**PE**
	Phase L or +	Zero conductor N or -	Ground

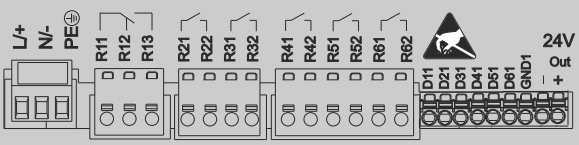
Relay (power unit, slot 6)

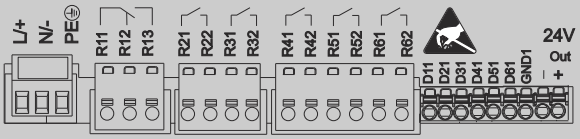
Type	Terminal (max. 250 V, 3 A)				
	 A0019103				
Alarm relay 1	**R11**	**R12**	**R13**		
	Changeover contact	Normally closed contact (NC) [1]	Normally open contact (NO) [2]		
Relay 2 to 6				**Rx1**	**Rx2**
				Switching contact	Normally open contact (NO [2])

1) NC = normally closed (breaker)
2) NO = normally open (maker)

The open or close function (= activation or deactivation of the relay coil) in a limit event can be configured in the setup: "Setup -> Advanced setup -> Outputs -> Relay -> Relay x". However, in the event of a power failure, the relay adopts its quiescent switch state regardless of the setting programmed.

Digital inputs; auxiliary voltage output (power unit, slot 6)

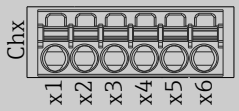
Type	Terminal			
	 A0019103			
Digital input 1 to 6	**D11 to D61**	**GND1**		
	Digital input 1 to 6 (+)	Ground (-) for digital inputs 1 to 6		

Type	Terminal			
	 A0019103			
Auxiliary voltage output, not stabilized, max. 250 mA			**24V Out -**	**24V Out +**
			- Ground	+ 24V (±15%)

If the auxiliary voltage is to be used for the digital inputs, the **24 V out -** terminal of the auxiliary voltage output must be connected with the **GND1** terminal.

Analog inputs (slot 1-5)

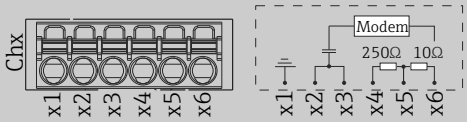
The first digit (x) of the two-digit terminal number corresponds to the associated channel:

Type	Terminal					
	 A0019303					
	x1	**x2**	**x3**	**x4**	**x5**	**x6**
Current/pulse/frequency input [1]					(+)	(-)
Voltage > 1V		(+)				(-)
Voltage ≤ 1V				(+)		(-)
Resistance thermometer RTD (2-wire)	(A)					(B)
Resistance thermometer RTD (3-wire)	(A)			b (sense)		(B)
Resistance thermometer RTD (4-wire)	(A)		a (sense)	b (sense)		(B)
Thermocouples TC				(+)		(-)

1) If a universal input is used as a frequency or pulse input, a series resistor must be used in series connection with the voltage source. Example: 1.2 kΩ series resistor at 24 V

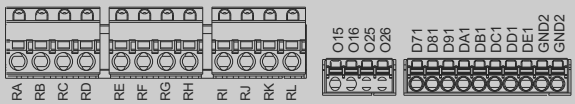
HART® inputs (slot 1-5)

The first digit (x) of the two-digit terminal number corresponds to the associated channel:

Type	Terminal					
	 A0024862					
	x1	**x2**	**x3**	**x4**	**x5**	**x6**
HART® (4 to 20 mA)	SHD	H_1	H_2	R_{com}	I+	I-

- A 250 Ω communication resistor (load) is installed on the device side between terminals x4 and x5.
- A 10 Ω resistor (shunt) is installed on the device side at the current input between terminals x5 and x6.
- Terminals x2 and x3 (H_1 and H_2) are jumpered internally.
- The internal HART® modem is located between terminals x2/x3 and x6.

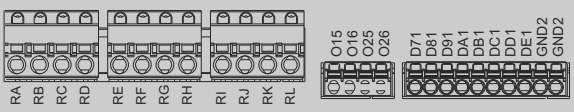
Relay extension (digital card, slot 5)

Type	Terminal (max. 250 V, 3 A)			
	 A0024736			
Relay 7, 8	**RA**	**RB**	**RC**	**RD**
Relay 9, 10	**RE**	**RF**	**RG**	**RH**
Relay 11, 12	**RI**	**RJ**	**RK**	**RL**
	Switching contact	Normally open contact ([1])	Switching contact	Normally open contact ([2])

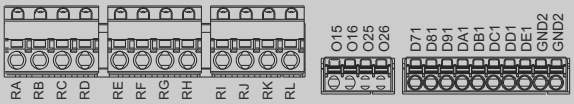
1) NO)
2) NO)

The open or close function (= activation or deactivation of the relay coil) in a limit event can be configured in the setup: "Setup -> Advanced setup -> Outputs -> Relay -> Relay x". However, in the event of a power failure, the relay adopts its quiescent switch state regardless of the setting programmed.

Analog outputs (digital card, slot 5)

Type	Terminal			
	 A0024736			
Analog output 1-2	**O15**	**O16**	**O25**	**O26**
	Analog output 1 (+)	Ground, analog output 1 (-)	Analog output 2 (+)	Ground, analog output 2 (-)

Extension of digital inputs (digital card, slot 5)

Type	Terminal		
	 A0024736		
Digital input 7 to 14	**D71 to DE1**	**GND2**	**GND2**
	Digital input 7 to 14 (+)	Ground (-) for digital inputs 7 to 14	Ground (-) for digital inputs 7 to 14

If the auxiliary voltage is to be used for the digital inputs, the **24 V out -** terminal of the auxiliary voltage output (power unit, slot 6) must be connected with the **GND2** terminal.

Device plugs

- Panel-mounted device/DIN rail version: connected to mains via plug-in screw terminals with reverse polarity protection
- Desktop version (option): connected to mains via IEC connector

Overvoltage protection

To avoid high-energy transients on long signal cables, connect a suitable surge arrester upstream (e.g., E+H HAW562) in series upstream.

Cable specifications

Cable specification, spring terminals

All connections on the rear of the device are designed as pluggable screw or spring terminal blocks with reverse polarity protection. The spring terminals are unlocked with a slotted screwdriver (size 0).

Note the following when connecting:
- Wire cross-section, auxiliary voltage output, digital I/O and analog I/O: max. 1.5 mm^2 (14 AWG) (spring terminals)
- Wire cross-section, mains: max. 2.5 mm^2 (13 AWG) (screw terminals)
- Wire cross-section, relays: max. 2.5 mm^2(13 AWG) (spring terminals)
- Stripping length: 10 mm (0.39 in)

No ferrules must be used when connecting flexible wires to spring terminals.

Shielding and grounding

Optimum electromagnetic compatibility (EMC) can only be guaranteed if the system components and the cables - both sensor and communication cables - are shielded and the shielding forms as complete a cover as possible. A shielded cable must be used for sensor cables that are longer than 30 m (100 ft). A shield coverage of 90% is ideal. Make sure that the communication cables and sensor cables do not cross when routing them. Connect the shielding as often as possible to the reference ground to ensure optimum EMC protection for the different communication protocols and the connected sensors.

To comply with requirements, three different types of shielding are possible:
- Shielding at both ends
- Shielding at one end on the supply side with capacitance termination at the device
- Shielding at one end on the feed side

The best results are achieved in installations with shielding at one end on the supply side (without capacitance termination at the device). Appropriate internal device wiring measures must be taken to allow unrestricted operation when EMC interference is present. These measures have been taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is thus guaranteed.

Observe national installation requirements and guidelines during installation. Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground.

If the shielding of the cable is grounded at more than one point in systems without potential matching, mains frequency equalizing currents can occur. These can damage the signal cable and significantly impact signal transmission. In such cases, the shield of the signal cable should be grounded on one side only and must not be connected to the ground terminal of the housing. The unconnected shield must be insulated.

Connection data interface, communication

USB interfaces:

1 x USB port type A (host) on the front of device (only for version with navigator and front interfaces)

A USB 2.0 port is available on a shielded USB-A socket at the front of the device. A USB memory stick, for example, can be connected to this port as a storage medium. An external keyboard or mouse for device operation, a USB hub, a barcode reader, or a printer (PCL5c or higher) can also be connected.

1 x USB port type B (function) on the front of device (only for version with navigator and front interfaces)

A USB 2.0 port is available on a shielded USB-B socket at the front of the device. This can be used to connect the device for communication with a laptop, for example.

2 x USB port type A (host) on the rear of the device (standard)

Two USB 2.0 ports are available on shielded USB-A sockets at the rear of the device. A USB memory stick, for example, can be connected to these ports as a storage medium. An external keyboard or mouse for device operation, a USB hub, a barcode reader, or a printer (PCL5c or higher) can also be connected.

- USB 2.0 is compatible with USB 1.1 or USB 3.0, i.e. communication is possible.
- The assignment of the USB interfaces complies with the standard such that shielded standard cables with a maximum length of 3 meters (9.8 ft) can be used here.
- The USB devices are detected by the "plug-and-play" function. If several devices of the same type are connected, only the USB device that was connected first is available.
- A maximum of 8 external USB devices (incl. USB hub) can be connected if they do not exceed the maximum load of 500 mA. If overloaded, the corresponding USB devices are automatically disabled. An active USB hub can be used for higher power ratings.

Reference list for USB printers:
HP Color LaserJet CP1515n, HP Color LaserJet Pro CP1525n, ECOSYS P6021cdn.

The printer must support PCL5c (or higher). GDI printers are not supported!

Reference list for USB barcode readers:
Datalogic Gryphon D230; Metrologic MS5100 Eclipse Series; Symbol LS2208, Datalogic Quickscan 1, Godex GS220, Honeywell Voyager 9590.

Ethernet interface (standard):

Ethernet interface on back, 10/100 Base-T, plug type RJ45. The Ethernet interface can be used to integrate the device via a hub or switch into a PC network (TCP/ IP Ethernet). A standard patch cable (e.g., CAT5E) can be used for the connection. Using DHCP, the device can be fully integrated into an existing network without the need for additional configuration. The device can be accessed from every PC in the network. Normally only the automatic assignment of the IP address must be configured at the client. When the device is started, it can automatically retrieve the IP address, subnet mask and gateway from a DHCP server. If a DHCP is not used, these settings must be made directly in the device

(depends on the specific network). Two Ethernet function LEDs are located on the rear of the device.

The following functions are implemented:
- Data communication with PC software (analysis software, configuration software, OPC server)
- Web server
- WebDAV (Web-based Distributed Authoring and Versioning) is an open standard for the provisioning of files via the HTTP protocol. The data saved on the device's SD card can be read out using a PC. A web browser or a WebDAV client can be selected as the network drive for this on the PC side.

Requirements with regard to a network printer:

Network printer reference list:
HP Color LaserJet CP1515n, HP Color LaserJet Pro CP1525n, ECOSYS P6021cdn.

The printer must support PCL5c (or higher). GDI printers are not supported!

Ethernet Modbus TCP master (option):

As a Modbus master, the device can interrogate other Modbus slaves via Ethernet. The Modbus TCP master can be operated in parallel with the Profibus DP slave, Modbus RTU/TCP slave or PROFINET I/O Device.

Up to 40 analog inputs can be transmitted via Modbus and stored in the device.

Ethernet Modbus TCP slave (option):

Connection to SCADA systems (Modbus master).

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via Modbus and stored in the device.

Serial RS232/RS485 interface:

A combined RS232/RS485 connection is available on a shielded SUB D9 socket at the rear of the device. This can be used for data transfer and to connect a modem. For communication via modem, we recommend an industrial modem with a watchdog function.

- The following baud rates are supported: 9600, 19200, 38400, 57600, 115200
- Max. line length with shielded cable: 2 m (6.6 ft) (RS232), or 1000 m (3281 ft) (RS485)

Only one interface can be used at any one time (RS232 or RS485).

Modbus RTU master (option):

As a Modbus master, the device can interrogate other Modbus slaves via RS485. The Modbus RTU master can be operated in parallel with the Profibus-DP slave, PROFINET I/O Device or Modbus TCP slave.

Up to 40 analog inputs can be transmitted via Modbus and stored in the device.

Modbus RTU slave (option):

The device can be interrogated as a Modbus slave by another Modbus master via RS485.

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via Modbus and stored in the device.

A Modbus RTU master and RTU slave cannot be operated in parallel.

Remote interrogation with analog or GSM/GPRS wireless modem:

Analog modem:
An analog modem for industrial use (e.g., Devolo or WESTERMO), which is connected to the RS232 interface with a special modem cable (see accessories → 📄 90), is recommended.

GSM/GPRS wireless modem:
A GSM/GPRS wireless modem for industrial use (e.g., Cinterion, INSYS or WESTERMO, incl. antenna and power unit), which is connected to the RS232 interface with a special modem cable (see accessories → 📄 90), is recommended.
Important: the wireless modem needs a SIM card and data transfer subscription. In addition, it must be possible to deactivate the PIN prompt.

If the web server is operated via a wireless modem, this may result in high provider costs as data are transmitted continuously.

AnyBus® interface (CPU card, slot 0, optional)

PROFIBUS–DP slave:

The device can be integrated into a fieldbus system as per the PROFIBUS–DP standard by means of the PROFIBUS-DP interface. Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via PROFIBUS-DP and stored in the device. Bidirectional communication with cyclic data transfer is possible. Connection via Sub-D socket.

Baud rate: maximum 12 Mbit/s

EtherNet/IP adapter (slave):

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via EtherNet/IP and stored in the device. The built-in module corresponds to I/O server category (Level 2). It has an integrated 2-port switch, thereby supporting EtherNet/IP communication in line or ring topologies. Connection via 2 RJ45 standard sockets.

PROFINET I/O device:

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via PROFINET IO and stored in the device. The 2-port module for PROFINET IO meets compliance class B. The integrated switch enables communication in line or ring topologies without an additional external switch. Connection via 2 RJ45 standard sockets.

16.5 Performance characteristics

Response time

Input	Output	Time [ms]
Current, voltage, pulse	Relays, OC, analog output	≤ 550
RTD	Relays, OC, analog output	≤ 1150
TC [1)]	Relays, OC, analog output	≤ 1550
Cable open circuit detection, current input	Relays, OC, analog output	≤ 1150
Sensor error RTD, TC	Relays, OC, analog output	≤ 5000
Digital input	Relays, OC, analog output	≤ 350
HART input	Relays, OC, analog output	Non-deterministic

1) If internal measuring point temperature compensation is used, otherwise values as for voltage

Reference operating conditions

Reference temperature	25 °C (77 °F) ±5 K
Warm-up period	120 min.
Humidity	20 to 60 % rel. humidity

Hysteresis

Can be configured for limit values in the setup

Long-term drift

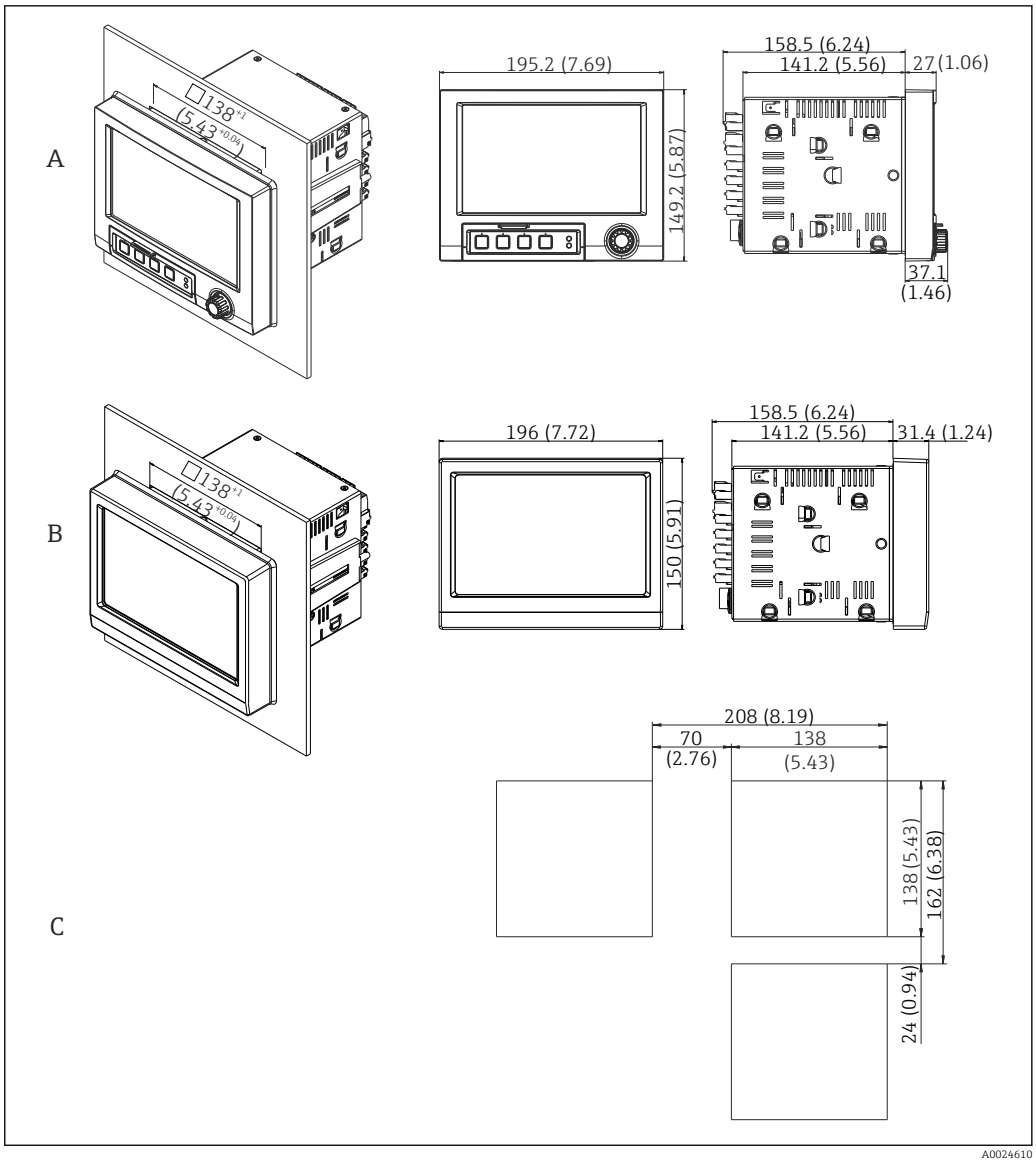
As per IEC 61298-2: max. ±0.1%/year (of measuring range)

16.6 Mounting

Panel mounting: mounting location and installation dimensions

The device with a display is designed for use in a panel.

The device must be installed in a pressurized enclosure system for operation in the hazardous area. To ensure safe installation, it is essential to follow the installation instructions for the cabinet and the installation instructions in the Ex-related Safety Instructions (XA).



20 *Panel mounting and dimensions in mm (in).*

A Version with navigator and front interfaces
B Version with stainless steel front and touchscreen
C Grid dimensions of panel cutouts for multiple devices

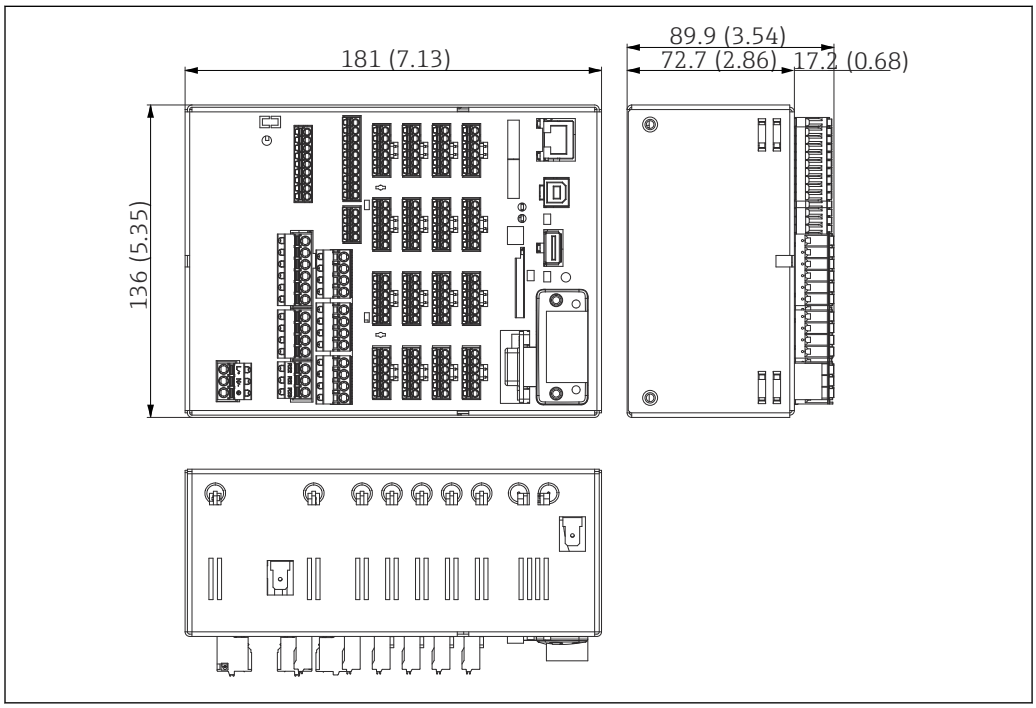
Dimensions

- Installation depth (excluding terminal cover): approx. 159 mm (6.26 in) for device incl. terminals and fastening clips.
- Installation depth including terminal cover (option): approx.198 mm (7.8 in)
- Panel cutout: 138 to 139 mm (5.43 to 5.47 in) x 138 to 139 mm (5.43 to 5.47 in)
- Panel thickness: 2 to 40 mm (0.08 to 1.58 in)
- viewing angle range: 50° in all directions from the display central axis
- A minimum distance of 12 mm (0.47 in) between the devices must be observed if aligning the devices vertically above one another or horizontally beside one another.
- The grid dimension of the panel cutouts for multiple devices must be at least 208 mm (8.19 in) horizontally and at least 162 mm (6.38 in) vertically (tolerance not considered).
- Securing to DIN 43 834

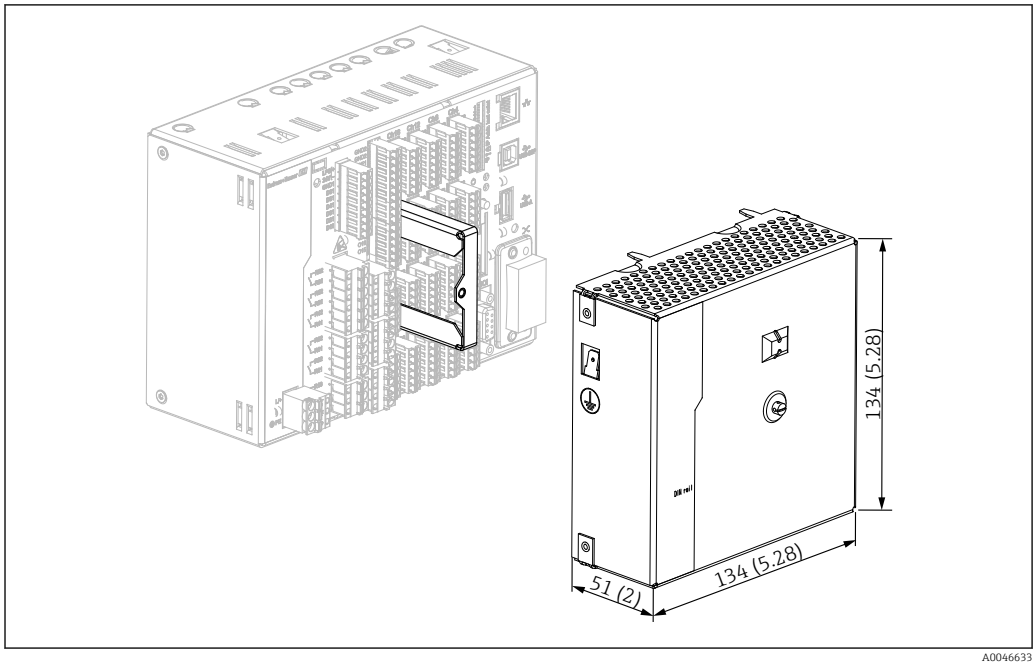
Mounting location and installation dimensions for the DIN rail version

The device without a display is designed for DIN rail mounting.

The DIN rail device is **not** approved for operation in the hazardous area.



21 *DIN rail version, dimensions in mm (in).*



22 *Terminal cover, DIN rail version, dimensions in mm (in)*

Dimensions

- Installation depth: approx. 90 mm (3.54 in) for device incl. terminals (w/o terminal cover).
- Mounted on DIN rail as per IEC 60715
- The devices can be arranged horizontally beside one another without clearance between the devices.

Field housing assembly and design (optional)	As an option, the panel-mounted device can be ordered ready-mounted in a field housing with IP65. Dimensions (B x H x D) approx.: 320 mm (12.6 in) x 320 mm (12.6 in) x 254 mm (10 in)
Desktop housing assembly and design (optional)	As an option, the panel-mounted device can be ordered ready-mounted in a desktop housing. Dimensions (B x H x D) approx.: 293 mm (11.5 in) x 188 mm (7.4 in) x 213 mm (8.39 in) (dimensions with bracket, feet and installed device)

16.7 Environment

Ambient temperature range	−10 to +50 °C (14 to 122 °F)
Storage temperature	−20 to +60 °C (−4 to +140 °F)
Relative humidity	5 to 85 %, non-condensing
Operating altitude	< 2 000 m (6 561 ft) above MSL
Climate class	To IEC 60654-1: Class B2
Electrical safety	Class I equipment, overvoltage category II Pollution degree 2
Degree of protection	**Degree of protection:** ▪ Panel-mounted device: Front: IP65, NEMA Type 4 encl. / Rear: IP20 ▪ Version with stainless steel front and touchscreen: Front: IP65, NEMA Type 4X encl. (approved by UL)/Rear: IP20 ▪ DIN rail Version: NEMA Type 1, IP20
Electromagnetic compatibility	EMC in accordance with all relevant requirements of the IEC/EN 61326 series and NAMUR NE 21. For details, refer to the Declaration of Conformity. ▪ Interference immunity: as per IEC/EN 61326 series (industrial environment)/NAMUR NE 21 Maximum measurement error <1% of measuring range ▪ Interference emissions: as per IEC 61326-1 Class A

16.8 Mechanical construction

Design and dimensions	Information about design and dimensions → 📄 114

Weight

- Panel-mounted device with navigator and front interfaces (with maximum configuration): approx. 2.7 kg (5.9 lbs)
- Panel-mounted device with stainless steel front and touchscreen (with maximum configuration): approx. 3.2 kg (7 lbs)
- DIN rail version: approx. 1.8 kg (3.97 lbs)
- Desktop housing (excluding device): approx. 2.3 kg (5 lbs)
- Field housing (excluding device): approx. 4 kg (8.8 lbs)

Materials

Panel-mounted device with navigator and front interfaces	
Front frame	Zinc die cast GD-Z410, powder-coated
Display glass	Transparent Makrolon® plastic (FR clear 099) UL94-V2
Flap; jog/shuttle dial ("Navigator")	Plastic ABS UL94-V2
Membrane keypad	Polyester membrane PC-ABS UL94-V2
Intermediate frame (front towards control panel)	Plastic PA6-GF20 UL94-V2
Seal towards panel wall; seal in flap; seal towards navigator	Rubber EPDM 70 Shore A
Casing; rear panel	Galvanized sheet steel St 12 ZE

Panel-mounted device with stainless steel front and touchscreen	
Front frame	AISI 316L
Display glass	6 mm single-pane safety glass (soda-lime glass)
Intermediate frame (front towards control panel)	Plastic PA6-GF20 UL94-V2
Seal towards control panel wall	Rubber EPDM 70 Shore A
Window seal between front frame and glass	Rubber EPDM 60 Shore A
Casing; rear panel	Galvanized sheet steel St 12 ZE

DIN rail version	
Retaining bracket	EN AW 6060 T66 / AlMgSi0.5 F22
Casing; front	Galvanized sheet steel St 12 ZE

Designation	**Short formula**	**Properties**
AISI 316L (corresponds to 1.4404 or 1.4435)	X2CrNiMo17-13-2, X2CrNiMo18-14-3	Austenitic, stainless steel High corrosion resistance in general

All materials are silicone-free.

Materials of desktop housing

- Housing half-panels: sheet steel, electrolytically plated (powder-coated)
- Side sections: aluminum extruded section (powder-coated)
- Section ends: colored polyamide
- Feet: colored polyamide, fiber-glass reinforced

Field housing materials

- Housing (front frame, door, base frame, side parts): thermoplastic polycarbonate PC
- Front panel and wall mounting: chrome-nickel stainless steel 1.4301 V2A

16.9 Display and operating elements

Operation concept

The description for local operation does not apply for the DIN rail version, as this has neither a display screen nor operating elements. The description for remote configuration applies for all versions.

The device can be operated directly on site, or via remote configuration with the PC via interfaces and operating tools (web server, configuration software).

Web server
A web server is integrated into the device. The web server offers the following range of functions:
- Easy configuration without additional installed software
- Instantaneous value display and diagnostics information
- Display of current measured value curves via web browser (remote control)
- Display of historical measured data in numerical format or as a curve
- Display of events and logbook entries
- Loading/saving of device configuration
- Device firmware update
- Printout of device configuration

Integrated Operating Instructions
Thanks to the device's simple operating concept, it is possible to commission the device for many applications without a hard copy of the Operating Instructions. The device has an integrated help function and displays operating instructions directly on the monitor.

Languages

The following languages can be selected in the operating menu: German, English, Spanish, French, Italian, Dutch, Swedish, Polish, Portuguese, Czech, Russian, Japanese, Chinese (Traditional), Chinese (Simplified)

Local operation

Display elements on panel-mounted device

Type

Wide-screen TFT color graphic display (optionally with touch control)

Size (diagonal screen measurement)

178 mm (7")

Resolution

Wide VGA 384,000 pixels (800 x 480 pixels)

Backlight

50,000 h half-life (= half brightness)

Number of colors

262,000 viewable colors, 256 colors used

Viewing angle

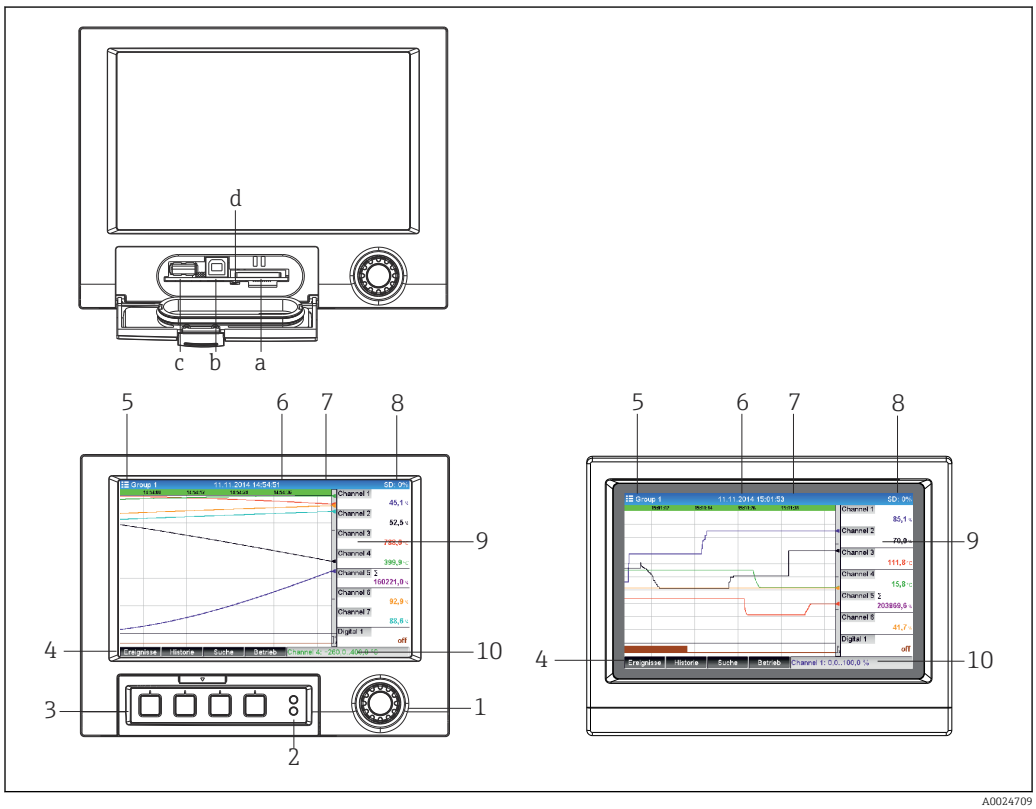
Max. viewing angle range: 50° in all directions from the display central axis

Screen displays

- Users can choose between black and white for the background color.
- Active channels can be assigned to up to 10 groups. These groups can be given a name e.g., "Temp. boiler 1" or "Daily averages" so that they can be uniquely identified.
- Scales linear or logarithmic
- Measured value history: Quick retrieval of historic data with zoom function
- Pre-formatted display formats, such as horizontal or vertical curves, instrument display, circular chart, process screen, bar graph or digital display.

Measured value display and operating elements

Measured value display and operating elements on panel-mounted device

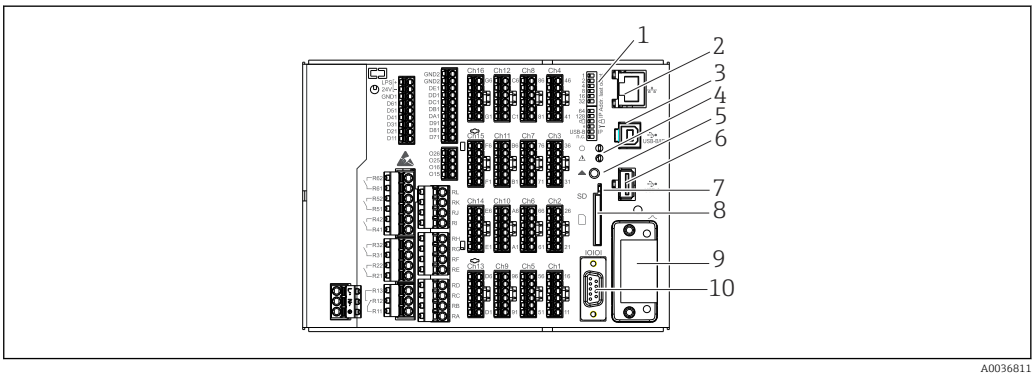


23 Device front (left: version with navigator and front interfaces; right: version with stainless steel front and touchscreen)

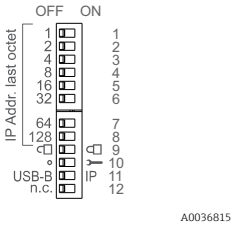
Item no.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)
a	Slot for SD card
b	USB-B socket "Function", e.g., to connect to a PC or laptop
c	USB-A socket "Host", e.g., for USB memory stick, external keyboard, barcode reader or printer
d	LED at SD slot. Yellow LED lit or flashing when the device is accessing the SD card. **Do not remove the SD card if the LED is lit or flashing! Risk of data loss!**
1	"Navigator": Jog/shuttle dial for operating with additional press/hold function. In display mode: Turn the dial to switch between the various signal groups. Press the dial to display the main menu. In setup mode and in a selection menu: Turn the dial anticlockwise to move the bar or the cursor up or to the left, changes the parameter. Turning clockwise moves the bar or cursor down or clockwise, changes parameter. Press = select highlighted function, start parameter change (ENTER key).

Item no.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)
2	Functions of LED indicators (according to NAMUR NE44:) ▪ Green LED (top) lit: power supply OK ▪ Red LED (bottom) flashing: maintenance required, caused by external factor (e.g., cable open circuit etc.), or a message/notification requiring acknowledgment is pending, calibration is running.
3	Variable "soft keys" 1-4 (from left to right)
4	Function indicator of "soft keys"
5	In display mode: current group name, type of analysis; In setup mode: name of the current operating item (dialog title)
6	In display mode: displays current date/time In setup mode: --
7	In display mode: user ID (if function is active) In setup mode: --
8	In display mode: alternating display indicating the percentage space on the SD card or USB stick that has already been used. Status symbols are also displayed in alternation with the memory information (e.g., simulation mode, data storage active, operation locked, batch active) In setup mode: the current "direct access" operating code is displayed
9	In display mode: window for measured value display (e.g., curve display). Displays the current measured values and the status in the event of an error/alarm condition. In the case of counters, the type of counter is displayed as a symbol. If a measuring point has limit value status, the corresponding channel identifier is highlighted in red (quick detection of limit value violations). During a limit value violation and device operation, the acquisition of measured values continues uninterrupted.
9	In setup mode: displays the operating menu
10	In display mode: alternating status display (e.g., set zoom range) of the analog or digital inputs in the appropriate color of the channel. In setup mode: different information is displayed here depending on the display type.

Operating elements of the DIN rail version



24 *Device front of the DIN rail version*

Item no.	Operating function
1	**DIP switches** The behavior of the Ethernet interface is configured via DIP switches (left = OFF, right = ON). For a detailed description of the DIP switch functions, see → 🖹 48 Function of the DIP switches (1 = top, 12 = bottom): ▪ DIP switches 1-8: configuration of IP address in last octet (e.g., 192.168.1.**212**) ▪ DIP switch 9: OFF = setup change not locked ON = setup locked ▪ DIP switch 10: OFF = default/OFF ON = service addressing ▪ DIP switch 11 for the configuration of the USB-B interface: OFF = USB standard ON = Ethernet over USB (web server) ▪ DIP switch 12: not assigned ℹ The DIN rail version is supplied with the following Ethernet settings: IP address: 192.168.1.212; subnet mask: 255.255.255.0; gateway: 0.0.0.0  A0036815
2	Ethernet interface
3	USB-B socket "Function", e.g., to connect to a PC or laptop
4	Functions of LED indicators (according to NAMUR NE44:) ▪ Green LED (top) lit: power supply OK ▪ Red LED (bottom) flashing: maintenance required, caused by external factor (e.g., cable open circuit etc.), or a message/notification requiring acknowledgment is pending, calibration is running.
5	Cyclic storage is completed via the "Safe SD card removal" button, the LED (d) goes out. The SD card can now be removed. ℹ If the SD card is not removed within 5 minutes, the write cycles start again.
6	USB-A socket "Host", e.g., for USB memory stick or printer If a USB stick is inserted, data that have not yet been saved are copied to the stick automatically. The red LED on the USB socket flashes while the data are being copied to the stick. ℹ **Do not remove the USB stick when the red LED is flashing! Risk of data loss!** If an error occurs (e.g., USB stick full or defective), the red LED is lit constantly. Remove the USB stick and replace it.
7	LED at SD slot. Yellow LED lit or flashing when the device is accessing the SD card. ℹ **Do not remove the SD card if the LED is lit or flashing! Risk of data loss!**
8	Slot for SD card
9	Anybus interface (option)
10	Serial RS232/RS485 interface

Remote operation

Device access via operating tools

Device configuration and measured value retrieval can also be done via interfaces. The following operating tools are available for this purpose:

Operating tool	Functions	Access via
Field Data Manager (FDM) analysis software, SQL database support	▪ Export of saved data (measured values, analyses, event logbook) ▪ Visualization and processing of saved data (measured values, analyses, event logbook) ▪ Safe archiving of exported data in an SQL database	RS232/RS485, USB, Ethernet

Web server (integrated into the device; access via browser)	▪ Display of current and historical data and measured value curves via the web browser ▪ Easy configuration without additional installed software ▪ Remote access to device and diagnostic information	Ethernet, or Ethernet over USB
OPC server (optional)	The following instantaneous values can be provided: ▪ Analog channels ▪ Digital channels ▪ Mathematics ▪ Totalizer	RS232/RS485, USB, Ethernet
"FieldCare/ DeviceCare" configuration software	▪ Device configuration ▪ Loading and saving of device configurations (upload/ download) ▪ Documentation of the measuring point	USB, Ethernet

16.10 Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

16.11 Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

17 Appendix

17.1 Operating items in the "Expert" menu

The parameter groups for the Expert setup contain all the parameters of the operating menus: System, Input and Output Setup, Communication, Application, Diagnostics as well as other parameters that are reserved for experts only.

For most settings, the "Setup" or "Expert" menu must be quit before the settings are adopted. However, settings such as the date/time are accepted immediately.

Information on configuration using FieldCare/DeviceCare configuration software
- Offline configuration: Most of the parameters are available (depending on the device configuration).
- Online configuration: Only parameters labeled "Online configuration" are available.

Direct access

Navigation Expert → Direct access

Description Direct access to active operating items (rapid access). Entering the direct access code takes you directly to the desired operating parameter. The direct access code is displayed in the Setup menu on the top right of the display (e.g., 00000-000).

Text entry (e.g., 00000-000)

17.1.1 "System" submenu

Basic settings that are needed to operate the device (e.g., date, time, etc.)

Language

Navigation Expert → System → Language
Direct access code: 010000-000

Description Select the operating language of the device

Options German, English, Spanish, French, Italian, Dutch, Polish, Portuguese, Russian, Swedish, Czech, Japanese, Chinese (Simplified), Chinese (Traditional)

Factory setting English or preset to customer's preferred language

Device tag

Navigation Expert → System → Device tag
Direct access code: 000031-000

Description Individual device tag

User entry Text entry (max. 32 characters)

Factory setting Unit 1

Temperature unit

Navigation Expert → System → Temp. unit
Direct access code: 100001-000

Description Selection of temperature unit. All directly connected thermocouples or resistance thermometers (RTD) are displayed in the preset engineering units.

Options °C, °F, K

Factory setting °C

Decimal separator

Navigation Expert → System → Decimal separator
Direct access code: 100003-000

Description Select the decimal separator to be used when displaying numbers.

Options Comma, point

Factory setting Comma

Fault switching

Navigation Expert → System → Fault switching
Direct access code: 100002-000

Description The selected output/relay switches if the device detects a system error (e.g., hardware defect) or a malfunction (e.g., cable open circuit).

Options Not used, Relay x
All the available relays are displayed.

Factory setting Relay 1

Keyboard layout

This function is **not** supported by the **DIN rail version**.

Navigation Expert → System → Keyboard layout
Direct access code: 100020/000

Description Select keyboard layout. Only relevant if external keyboard is used.

Options Germany, Switzerland, France, USA, USA International, UK, Italy

Factory setting Germany

Swap mouse buttons

This function is **not** supported by the **DIN rail version**.

Navigation Expert → System → Swap mouse buttons
Direct access code: 100050/000

Description Swap function of left and right mouse button.

Options No, Yes

Factory setting No

Paper size

Navigation Expert → System → Paper size
Direct access code: 540004/000

Description Select the paper size of the printer.

Options DIN A4, US Letter

Factory setting DIN A4

Lock operation

This function is **not** supported by the **DIN rail version**.

Navigation Expert → System → Lock operation
Direct access code: 100060/000

Description Local operation is locked in cases of inactivity once the set time has elapsed to prevent inadvertent operation (e.g., when cleaning the device). The device is unlocked by pressing the navigator or the OK operating key for 3 s. When using an external keyboard, the device is unlocked with the key combination "Ctrl-Alt-Del".

Options Never, After 2 (5, 10, 15) minutes

Factory setting After 5 minutes

LED mode

Navigation Expert → System → LED mode
Direct access code: 100005/000

Description NAMUR NE 44: Green LED -> Power supply OK. Red LED -> Measuring signal failure. Red LED flashing -> Maintenance required.
NAMUR NE 44+: As per NAMUR NE 44, with red LED in the event of a limit value violation.

Options NAMUR NE 44, NAMUR NE 44+

Factory setting NAMUR NE 44

PRESET

Navigation Expert → System → PRESET
Direct access code: 000044-000

Description Caution: Resets all the parameters to the factory settings!

Only visible/editable if the service code has been entered.

Options No, Factory reset, Customer setting

Clear memory

Navigation Expert → System → Clear memory
Direct access code: 059000-000

Description Clear internal memory

Note: In the version with stainless steel front and touchscreen the internal SD card is also cleared.

Options No, Yes

Confirm deletion

Navigation Expert → System → Confirm deletion
Direct access code: 059001-000

Description Confirm that you want to clear the memory.

Options No, Yes

Factory setting No

"Date/time setup" (submenu)

Navigation Expert → System → Date/time setup

Description Contains settings for date/time.

Date format

Navigation Expert → System → Date/time setup → Date format
Direct access code: 110000-000

Description Select the format in which the date should be displayed.

Options DD.MM.YYYY, MM/DD/YYYY, YYYY-MM-DD

Factory setting DD.MM.YYYY

Time format

Navigation Expert → System → Date/time setup → Time format
Direct access code: 110001-000

Description Select the format in which the date should be displayed
.

Options 24 hour, 12 hour AM/PM

Factory setting 24 hour

"Date/time" submenu
(Online configuration)

Navigation Expert → System → Date/time setup → Date/time

Description Contains parameters for setting the date/time.

UTC time zone
(Online configuration)

Navigation Expert → System → Date/time setup → Date/time → UTC time zone
Direct access code: 120000-000

Description Display of the current UTC time zone is on (UTC = universal time coordinated).

Current date/time
(Online configuration)

Navigation Expert → System → Date/time setup → Date/time → Current date/time
Direct access code: 120003-000

Description Displays the current date and the current time.

"Change date/time" submenu
(Online configuration)

Description Contains parameters for changing the date/time.

Navigation Expert → System → Date/time setup → Change date/time

UTC time zone
(Online configuration)

Navigation Expert → System → Date/time setup → Date/time → Change date/time → UTC time zone
Direct access code: 120010-000

Description Set your UTC time zone (UTC = universal time coordinated).

Options -12:00, -11:00: Samoa, -10:00: Hawaii, -09:30: Marquesas, -09:00: Alaska, -08:00: LA, -07:00: Denver, -06:00: Chicago, -05:00: New York, -04:00: Caracas, -03:30: St.John's, -03:00: Brasilia, -02:00: Atlantic, -01:00: Azores, +00:00: London, +01:00: Berlin, +02:00: Cairo, +03:00: Moscow, +03:30: Tehran, +04:00: Abu Dhabi, +04:30: Kabul, +05:00: Islamabad, +05:30: New Delhi, +05:45: Kathmandu, +06:00: Dhaka, +06:30: Pyinmana, +07:00: Bangkok, +08:00: Peking, +08:45, +09:00: Tokyo, +09:30: Adelaide, +10:00: Canberra, +10:30: Lord-Howe, +11:00:Solom.Isl., +11:30: Norfolk, +12:00: Auckland, +12:45: Chatham, +13:00, +14:00

Date/time
(Online configuration)

Navigation Expert → System → Date/time setup → Date/time → Change date/time → Date/time
Direct access code: 120013-000

Description Set the current date and time for the device.

User entry Date/time in set format

"NT/ST changeover" submenu

Navigation Expert → System → Date/time setup → NT/ST changeover

Description Contains settings for normal time/summer time changeover.

NT/ST changeover

Navigation Expert → System → Date/time setup → NT/ST changeover → NT/ST changeover
Direct access code: 110002-000

Description Function for summer/normal time changeover.
Automatic: Changes to the local regional regulations;
Manual: Changeover times can be set in the following addresses;
Off: No changeover times required.

Options Off, Manual, Automatic

Factory setting Automatic

NT/ST region

Navigation Expert → System → Date/time setup → NT/ST changeover → NT/ST region
Direct access code: 110003-000

Description Selects the regional settings for summer/normal time changeover.
Only visible if NT/ST changeover = Automatic.

Options Europe, USA

Factory setting Europe

Begin summer time

Occurrence

Navigation Expert → System → Date/time setup → NT/ST changeover → Occurrence
Direct access code: 110005-000

Description Day, when in the spring a change from normal to summer time occurs.
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

Options 1., 2., 3., 4., Last

Factory setting Last

Day

Navigation Expert → System → Date/time setup → NT/ST changeover → Day
Direct access code: 110006-000

Description Day, when in the spring a change from normal to summer time occurs.
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

Options Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

Factory setting Sunday

Month

Navigation Expert → System → Date/time setup → NT/ST changeover → Month
Direct access code: 110007-000

Description Month, when in the spring a change from normal to summer time occurs.
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

Options January, February, March, April, May, June, July, August, September, October, November, December

Factory setting March

Date

Navigation Expert → System → Date/time setup → NT/ST changeover → Date
Direct access code: 110008-000

Description Date next spring when a change from normal to summer time occurs.
Only visible if NT/ST changeover = Automatic or Manual. Cannot be edited.

Time

Navigation Expert → System → Date/time setup → NT/ST changeover → Time
Direct access code: 110009-000

Description Time at which the changeover from normal time to summer time is forwarded by one hour (format: hh:mm).
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

User entry Time in set time format

Factory setting 02:00

End summer time

Occurrence

Navigation Expert → System → Date/time setup → NT/ST changeover → Occurrence
Direct access code: 110011-000

Description Day, when in the autumn a change from summer to normal time occurs.
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

Options 1., 2., 3., 4., Last

Factory setting Last

Day

Navigation Expert → System → Date/time setup → NT/ST changeover → Day
Direct access code: 110012-000

Description Day, when in the autumn a change from summer to normal time occurs.
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

Options Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

Factory setting Sunday

Month

Navigation Expert → System → Date/time setup → NT/ST changeover → Month
Direct access code: 110013-000

Description Month, when in the autumn a change from summer to normal time occurs.
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

Options January, February, March, April, May, June, July, August, September, October, November, December

Factory setting October

Date

Navigation Expert → System → Date/time setup → NT/ST changeover → Date
Direct access code: 110014-000

Description Date next autumn when summer time changes back to normal time.
Only visible if NT/ST changeover = Automatic or Manual. Cannot be edited.

Time

Navigation Expert → System → Date/time setup → NT/ST changeover → Time
Direct access code: 110015-000

Description Time at which the changeover from summer time to normal time is turned back by one hour (in the set time format).
Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.

User entry Time in set time format

Factory setting 02:00

"SNTP" submenu

Navigation Expert → System → Date/time setup → SNTP

Description Contains settings for time synchronization using the Simple Network Time Protocol (SNTP).

SNTP

Navigation Expert → System → Date/time setup → SNTP
Direct access code: 110020-000

Description If switched on, time synchronization is carried out via SNTP once a day.
Note: Only possible via Ethernet.
Port 123 must be open in the firewall. The user/network administrator is responsible for the accuracy of the time server.

Options No, Yes

Factory setting No

SNTP server 1

Navigation Expert → System → Date/time setup → SNTP server → SNTP server 1
Direct access code: 110021-000

Description Please specify the address of the time server (or the IP address).
Note: The DNS server must be configured (see Communication/Ethernet).
Your administrator can provide the address where necessary.

User entry Text field

SNTP server 2

Navigation Expert → System → Date/time setup → SNTP server → SNTP server 2
Direct access code: 110025-000

Description Shows the IP address of the time server if it was automatically allocated via DHCP. Non-editable display text.

An attempt is always made to synchronize the time via SNTP server 1 first (provided it is configured)
DHCP must be switched on (see Communication/Ethernet).
DHCP server: Option 42

"Security" submenu

Navigation Expert → System → Security

Description Contains settings that protect the device against unauthorized operation and configuration.

Protected by

Navigation Expert → System → Security → Protected by
Direct access code: 100006-000

Description Configure how the device should be protected.

Options Open access, Access code, FDA 21 CFR Part 11, User roles

Factory setting Open access

Access code

Navigation Expert → System → Security → Access code
Direct access code: 100000-000

Description This code can be used to protect the setup from unauthorized access. In order to change any parameter, the correct code must be entered. Factory setting is "0", this means changes can be done at any time.
Hint: Make a note of the code and store in a safe place.
Only visible if "Protected by" = "Access code"

User entry 4-digit number

Factory setting 0

Set point code

Navigation Expert → System → Security → Set point code
Direct access code: 100030-000

Description If the unit is protected by an access code a set point code can also be defined. The user can change the limit values once the set point code is entered. All other operating positions remain locked, however.
Only visible if an activation code has been defined.
Factory default: "0" means that alarm limit values can only be changed by entering the access code.

Alarm set point code and access code should not be identical!

User entry 4-digit number

Factory setting 0

Lock hardware

Navigation Expert → System → Security → Lock hardware
Direct access code: 100099-000

Description Device functions/interfaces that are not used can be switched off for security reasons.

Fieldbus systems may also be affected in the case of Ethernet or the serial interface. Follow the operating instructions.

Options **Panel version:** Ethernet (all ports/services), USB-A socket front, USB-A socket back, USB-B socket front, serial interface, SD card
DIN rail version: Ethernet (all ports/services), USB-A socket, USB-B socket, serial interface, SD card

Factory setting No lock

"Authentication" submenu

Navigation Expert → System → Security → Authentication

Description Define a password for the relevant user role. This password allows access to device settings and functions depending on the user role in question.
Only visible if "Protected by" = "User roles"

Operator
ID: operator
Password

Navigation Expert → System → Security → Authentication → Password
Direct access code: 470105/000

Description Enter the password for the user account.

Options Text entry max. 12 characters

Factory setting operator

Administrator
ID: admin
Password

Navigation Expert → System → Security → Authentication → Password
Direct access code: 470102/000

Description Enter the password for the user account.

Options Text entry max. 12 characters

Factory setting admin

Service
ID: service
Password

Navigation Expert → System → Security → Authentication → Password
Direct access code: 470101/000

Description Enter the password for the user account.

Options Text entry max. 12 characters

Factory setting service

"External memory" submenu

Navigation Expert → System → External memory

Description Settings for the external data carrier, amongst other things which data is to be stored in which format on the external data carrier.

Save as

Navigation Expert → System → External memory → Save as
Direct access code: 140000-000

Description "Protected format": All data is stored in a manipulation-protected encrypted format. This data can only be visualized by the PC analysis software.
"Open format": Data is stored in a CSV format, this can be opened by a number of different programs (Attention: no manipulation protection).

Options Protected format, Open format (*.csv)

Note: For the device version with stainless steel front and touch operation, only the selection "Protected format" is possible!

Factory setting Protected format

SD card

Memory build-up

Navigation
Expert → System → External memory → Memory build-up
Direct access code: 140001-000

Description
"Stack memory": No more data can be stored once the data carrier is full.
"Ring memory": Once the data carrier is full, the oldest data is deleted so that new data can be stored (First in first out (FIFO)).

The "Ring memory" setting refers only to the automatic storage of measured values. Manual save functions ("Operation -> SD card -> Update/Save measured values") are not affected.

Options
Stack memory, Ring memory (FIFO)

"Ring memory" can be selected only if "Save as" is set to "Protected format" (and not "CSV").

Factory setting
Stack memory

Warning at

Navigation
Expert → System → External memory → Warning at
Direct access code: 140005-000

Description
Issues a warning before the data carrier is x% full.
A warning is indicated on the device and this is also stored in the event buffer.
A relay can also be switched.

Only for external SD card (does not apply to USB stick)!

User entry
0 to 99%

Factory setting
90

Switches relay

Navigation
Expert → System → External memory → Switches relay
Direct access code: 140006-000

Description
When the warning "Data carrier full" is displayed, a relay can also be switched on.

Options
Not used, Relay x
All the available relays are displayed.

Factory setting
Not used

CSV settings

Also configurable if "Protected format" is set.

Separator for CSV

Navigation Expert → System → External memory → Separator for CSV
Direct access code: 140002-000

Description Specify the separator used in the application (e.g., in Excel: semicolon).

Options Comma, Semicolon

Factory setting Semicolon

Date/time

Navigation Expert → System → External memory → Date/time
Direct access code: 140003-000

Description Select if the date and time should be stored in one column or two separate columns when data is saved in CSV format.

Options One column, Separate columns

Factory setting Separate columns

Operational time

Navigation Expert → System → External memory → Operational time
Direct access code: 140004-000

Description Select the format in which operating times will be stored/displayed.

Options 0 seconds, 0.0000 hours, 0.00000 days, 0000h00:00

Factory setting 0000h00:00

"Messages" submenu

Navigation Expert → System → Messages

Description Contains settings for displaying/acknowledging messages. Examples of messages include: messages triggered by limit values; messages triggered by a digital input; error messages; etc.

Acknowledging messages

Navigation Expert → System → Messages → Acknowledging messages
Direct access code: 100040-000

Description The time the message is acknowledged can be saved in the event logbook.

This setting cannot be altered if the user administration system is activated (FDA 21 CFR Part 11).

Options Do not save, Save

Factory setting Do not save

Switches relay

Navigation Expert → System → Messages → Switches relay
Direct access code: 100042-000

Description A relay can be switched as soon as a message that has to be confirmed is displayed (e.g., on/off event, device errors etc.).
The relay adopts the initial status as soon as all messages have been confirmed.

Options Not used, Relay x
All the available relays are displayed.

Factory setting Not used

"Screensaver" submenu

This function is **not** supported by the **DIN rail version**.

Navigation Expert → System → Screensaver

Description To increase the life span of the LCD, the rear illumination can be switched off (= screensaver).

Screensaver

This function is **not** supported by the **DIN rail version**.

Navigation Expert → System → Screensaver → Screensaver
Direct access code: 160000-000

Description "Switched off": LCD is always switched on
“Switch on for x min.”: Display goes dark after x minutes. All other functions remain in operation. Press an operating key: Illumination is switched back on.
"Switched daily": Enter time span.

Options Switched off, On after 10 min, On after 30 min, On after 60 min, Switched daily, Control input

Factory setting Switched off
This setting has no effect if the screensaver is controlled by a digital input.

ON daily from

Navigation Expert → System → Screensaver → ON daily from
Direct access code: 160001-000

Description Set time (hh:mm) as of when the screensaver should be switched on (e.g., shift end time).

The screensaver is switched off as soon as the device is operated via on-site operation. After 1 min of inactivity, it switches back on automatically.

Only visible if screensaver = Switched daily

User entry Time (hh:mm)

Factory setting 20:00

OFF daily from

Navigation Expert → System → Screensaver → OFF daily from
Direct access code: 160002-000

Description Set time (hh:mm) as of when the screensaver should be switched off (e.g., shift start time).
Only visible if screensaver = Switched daily

User entry Time (hh:mm)

Factory setting 07:00

Alarm response

Navigation Expert → System → Screensaver → Alarm response
Direct access code: 160003-000

Description "Off on alarm": If limit value violations occur or "Maintenance required (Mxxx)" or "Function check (Cxxx)" is active, the screensaver will be automatically deactivated.
"Always on": If limit value violations occur, or "Maintenance required (Mxxx)" or "Function check (Cxxx)" is active, the screensaver will not be deactivated.

Active messages that require acknowledgment, as well as "Failure (Fxxx)" or "Out of specification (Sxxx)" events, deactivate the screensaver always.

Options Off on alarm, Always on

Factory setting Off on alarm

"Barcode reader" submenu

This function is **not** supported by the **DIN rail version**.

Navigation Expert → System → Barcode reader

Description Settings for barcode reader (only relevant if a USB barcode reader is connected to the device).

Notes on operating a barcode reader: it must behave like a HID keyboard; texts must be terminated with a carriage return.

Character set

Navigation Expert → System → Barcode reader → Character set
Direct access code: 100021-000

Description Select keyboard layout.

Options Germany, Switzerland, France, USA, USA International, UK, Italy

Factory setting Germany

Save as event

Navigation Expert → System → Barcode reader → Save as event
Direct access code: 100022-000

Description The device can save texts read in using a barcode reader to the event logbook.

Texts are stored as events if one of the following conditions is NOT met:
- A command sequence was read in
- The dialog where batch information is input is active
- The dialog for testing the barcode reader is active
- The "Save text" function is executed

Options No, Yes

Factory setting No

Timeout sequences

Navigation Expert → System → Barcode reader → Timeout sequences
Direct access code: 100023-000

Description Specify the number of seconds after which a command sequence is canceled if the necessary data is not read in.

User entry Time in seconds (10-180)

Factory setting 30

"Device options" submenu

Navigation Expert → System → Device options

Description Hardware and software options of the device.

Activation code
(Online configuration)

Navigation Expert → System → Device options → Activation code
Direct access code: 000057-000

Description In the input field provided, enter a valid activation code to enable additional device options.
The options that can be retrofitted can be found under "spare parts"
Note: When an activation code is entered, the device is restarted in order to enable the new option.

- The activation code entered is not displayed, i.e. this parameter is always empty following a restart.
- Pay attention to case-sensitivity.

User entry Text

Slot 1
(Online configuration)

Navigation Expert → System → Device options → Slot 1
Direct access code: 990000-000

Description Shows hardware/software options.
Cannot be edited.

The assignment can be specified in the PC operating software for offline configuration.

Options Not assigned, Universal inputs, HART

Slot 2
(Online configuration)

Navigation Expert → System → Device options → Slot 2
Direct access code: 990001-000

Description Shows hardware/software options.
Cannot be edited.

The assignment can be specified in the PC operating software for offline configuration.

Options Not assigned, Universal inputs, HART

Slot 3
(Online configuration)

Navigation Expert → System → Device options → Slot 3
Direct access code: 990002-000

Description Shows hardware/software options.
Cannot be edited.

The assignment can be specified in the PC operating software for offline configuration.

Options Not assigned, Universal inputs, HART

Slot 4
(Online configuration)

Navigation Expert → System → Device options → Slot 4
Direct access code: 990003-000

Description Shows hardware/software options.
Cannot be edited.

The assignment can be specified in the PC operating software for offline configuration.

Options Not assigned, Universal inputs, HART

Slot 5
(Online configuration)

Navigation Expert → System → Device options → Slot 5
Direct access code: 990004-000

Description Shows hardware/software options.
Cannot be edited.

The assignment can be specified in the PC operating software for offline configuration.

Options Not assigned, Universal inputs, Digital inputs, HART

Communication
(Online configuration)

Navigation Expert → System → Device options → Communication
Direct access code: 990006-000

Description Shows hardware/software options.
Cannot be edited.

Options USB + Ethernet, USB + Ethernet + RS232/485

Fieldbus
(Online configuration)

Navigation Expert → System → Device options → Fieldbus
Direct access code: 990005-000

Description Shows hardware/software options.
Cannot be edited.

Options Not available, Modbus Slave, Profibus DP, EtherNet/IP, PROFINET

Modbus Master
(Online configuration)

Navigation Expert → System → Device options → Modbus Master
Direct access code: 990008-000

Description Shows hardware/software options.
Cannot be edited.

Detailed descriptions of this device option can be found in the associated documentation.

Options No, Yes

Application
(Online configuration)

Navigation Expert → System → Device options → Application
Direct access code: 990007-000

Description Shows hardware/software options.
Cannot be edited.

Options Standard, Maths, Telealarm, Telealarm + wastewater, Batch, Telealarm + batch, Energy, Energy + Telealarm

Front of housing
(Online configuration)

Navigation Expert → System → Device options → Front of housing
Direct access code: 990009-000

Description Shows hardware/software options.
Cannot be edited.

Options DIN rail; With interfaces; Stainless steel without interfaces

17.1.2 "Inputs" submenu

Settings for the analog and digital inputs.

"Universal inputs" submenu

Navigation Expert → System → Inputs → Universal inputs

Description Settings for the connected measuring points.

Add input

Navigation Expert → System → Inputs → Universal inputs → Add input
Direct access code: 222000/000

Description Addition of an input that must be switched on and configured according to the input signal.

Options No, Universal input x

Factory setting No

Delete input

Navigation Expert → System → Inputs → Universal inputs → Delete input
Direct access code: 222001/000

Description Delete an input configuration.

Options No, Universal input x

Factory setting No

"Universal input x" submenu

Navigation Expert → System → Inputs → Universal inputs → Universal input x

Description View or change settings for the selected channel.

x = place holder for selected universal input

Signal

Navigation Expert → Inputs → Universal inputs → Universal input x → Signal
Direct access code: 220000-0xx
Examples: Universal input 1: 220000-000; Universal input 12: 220000-011

Description Select the connected signal type (
current, voltage, etc.) from the list. The channel remains deactivated if no signal type is selected (factory setting).

Options Switched off, Current, Voltage, Resistance thermometer, Thermocouple, Pulse counter, Frequency input, Profibus DP (option), Modbus Slave (option), Modbus Master (option), HART (option), EtherNet/IP (option), PROFINET (option)

Factory setting Switched off

Range

Navigation Expert → Inputs → Universal inputs → Universal input x → Range
Direct access code: 220001-0xx
Examples: Universal input 1: 220001-000; Universal input 12: 220001-011

Description Select the input range or the connected resistance thermometer/thermocouple. The terminal assignment is specified in the operating manual or on the rear of the unit.
Only visible if signal ≠ Switched off

Options Switched off
Current: 4-20 mA, 0-20 mA, 0-5 mA, 0-20 mA squared, 4-20 mA squared, ±20 mA
Voltage: 0-1 V, 0-10 V, 0-5 V, 1-5 V, ±150 mV, ±1 V, ±10 V, ±30 V, 0-1 V squared, 0-10 V squared, 1-5 V squared
Resistance thermometer: Pt100 (IEC), Pt100 (JIS), Pt100 (GOST), Pt500 (IEC), Pt500 (JIS), Pt1000 (IEC), Pt1000 (JIS), Pt46 (GOST), Pt50 (GOST), Cu50 (GOST, a=4260), Cu50 (GOST, a=4280), Cu53 (GOST, a=4280), Cu100 (GOST, a=4280)
Thermocouple: Type A (W5Re-W20Re), type B (Pt30Rh-Pt6Rh), type C (W5Re-W26Re), type D (W3Re-W25Re), type J (Fe-CuNi), type K (NiCr-Ni), type L (Fe-CuNi), type L (NiCr-CuNi, GOST), type N (NiCrSi-NiSi), type R (Pt13Rh-Pt), type S (Pt10Rh-Pt), type T (Cu-CuNi)
Pulse counter
Frequency input
Profibus DP (option)
Modbus (option)
Modbus Master (option)
HART (option)
EtherNet/IP (option)
PROFINET (option)

Factory setting Switched off

Value

Navigation Expert → Inputs → Universal inputs → Universal input x → Value
Direct access code: 220023-0xx
Examples: Universal input 1: 220023-000; Universal input 12: 220023-011

Description Specify the value, which was read out digitally via HART, that should be recorded/ processed.
Only visible if signal = HART

Options Switched off, Value x
All the available values are displayed.

Factory setting Switched off

Measured value type

Navigation Expert → Inputs → Universal inputs → Universal input x → Measured value type
Direct access code: 220022-0xx
Examples: Universal input 1: 220022-000; Universal input 12: 220022-011

Description Type of measured value received.
Only visible if signal = HART or Modbus Master.

Options Instantaneous value, Counter

Factory setting Instantaneous value

Connection

Navigation Expert → Inputs → Universal inputs → Universal input x → Connection
Direct access code: 220002-0xx
Examples: Universal input 1: 220002-000; Universal input 12: 220002-011

Description Specify whether the connected resistance thermometer is operated using 2-, 3- or 4-wire technology.
Only visible if signal = Resistance thermometer

Options 2-wire, 3-wire, 4-wire

Factory setting 4-wire

Transmission protocol

Navigation Expert → Inputs → Universal inputs → Universal input x → Transmission protocol
Direct access code: 220049-0xx
Examples: Universal input 1: 220049-000; Universal input 12: 220049-011

Description Modbus TCP: Addressing Modbus TCP slaves.
Modbus TCP with slave address: Addressing gateways which use a table to link the address to the right slave.
Modbus RTU via TCP: Transmission of the pure Modbus RTU protocol with CRC sum. Used in signal converters for Ethernet -> RS485.
Only visible if signal = Modbus Master

Options Modbus TCP, Modbus TCP with slave address, Modbus RTU over TCP

Factory setting Modbus TCP

IP address

Navigation Expert → Inputs → Universal inputs → Universal input x → IP address
Direct access code: 220041-0xx
Examples: Universal input 1: 220041-000; Universal input 12: 220041-011

Description Address of Modbus slave
Only visible if signal = Modbus Master

User entry IP address

Factory setting 0.0.0.0

Port

Navigation Expert → Inputs → Universal inputs → Universal input x → Port
Direct access code: 220048-0xx
Examples: Universal input 1: 220048-000; Universal input 12: 220048-011

Description Modbus slave port
Only visible if signal = Modbus Master

User entry Number (max. 5 digits)

Factory setting 502

Slave address

Navigation Expert → Inputs → Universal inputs → Universal input x → Slave address
Direct access code: 220040-0xx
Examples: Universal input 1: 220040-000; Universal input 12: 220040-011

Description Address of Modbus slave
Only visible if signal = Modbus Master

User entry Number (1 to 255)

Factory setting 1

Readout function

Navigation Expert → Inputs → Universal inputs → Universal input x → Readout function
Direct access code: 220042-0xx
Examples: Universal input 1: 220042-000; Universal input 12: 220042-011

Description Modbus function with which the registers are to be read out.
Only visible if signal = Modbus Master

Options Read Input Register (3xxxxx), Read Holding Register (4xxxxx)

Factory setting Read Input Register (3xxxxx)

Register address

Navigation Expert → Inputs → Universal inputs → Universal input x → Register address
Direct access code: 220043-0xx
Examples: Universal input 1: 220043-000; Universal input 12: 220043-011

Description Register address 1-65535
Only visible if signal = Modbus Master

User entry Number (1 to 65535)

Factory setting 1

Data type

Navigation Expert → Inputs → Universal inputs → Universal input x → Data type
Direct access code: 220044-0xx
Examples: Universal input 1: 220044-000; Universal input 12: 220044-011

Description Describes the data type of the value received and its sequence of bytes.
Only visible if signal = Modbus Master

Options INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L, DOUBLE_B, DOUBLE_L

Factory setting FLOAT_B

Channel ident.

Navigation Expert → Inputs → Universal inputs → Universal input x → Channel ident.
Direct access code: 220003-0xx
Examples: Universal input 1: 220003-000; Universal input 12: 220003-011

Description Name of the measuring point connected to this input.
Only visible if signal ≠ Switched off

User entry Text (16 characters)

Factory setting Channel x

Plot type

Navigation Expert → Inputs → Universal inputs → Universal input x → Plot type
Direct access code: 220016-0xx
Examples: Universal input 1: 220016-000; Universal input 12: 220016-011

Description The analog inputs are scanned in a 100 ms cycle. Depending on the store cycle, the selected data is determined, saved, and displayed based on the scanned values.

Options Instantaneous value, Average, Minimum value, Maximum value, Minimum + Maximum, Counter, Current value + Counter

Factory setting Average

Time base

Navigation Expert → Inputs → Universal inputs → Universal input x → Time base
Direct access code: 220025-0xx
Examples: Universal input 1: 220025-000; Universal input 12: 220025-011

Description An instantaneous value can be determined from the counter reading with the aid of the time base, such as input liters, time base = second → instantaneous value = liters/second.
Only visible if signal = "Pulse counter" and plot type = "Current value + Counter"

Options Second (s), Minute (min), Hour (h), Day (d)

Factory setting Second (s)

Engineering unit

Navigation Expert → Inputs → Universal inputs → Universal input x → Engineering unit
Direct access code: 220004-0xx
Examples: Universal input 1: 220004-000; Universal input 12: 220004-011

Description Specify the technical (physical) unit for the measuring point connected to this input.
Only visible if signal ≠ Switched off

User entry Text (6 characters)

Unit/dimension counter

Navigation Expert → Inputs → Universal inputs → Universal input x → Unit/dimension counter
Direct access code: 220024-00x
Examples: Universal input 1: 220024-000; Universal input 12: 220024-011

Description Technical unit of the count input, e.g., liter, m^3, etc.
Only visible if signal = "Pulse counter" and plot type = "Current value + Counter"

User entry Text (max. 6 characters)

Pulse counter

Navigation Expert → Inputs → Universal inputs → Universal input x → Pulse counter
Direct access code: 220017-0xx
Examples: Universal input 1: 220017-000; Universal input 12: 220017-011

Description Specify whether the pulse counter is a fast or slow (up to max. 25 Hz) counter. When recording the number of relay switching operations, select the to 25 Hz setting to ensure correct counting.
Only visible if signal = Pulse counter

Options Up to 13kHz, Up to 25Hz

Factory setting Up to 13kHz

Pulse value

Navigation Expert → Inputs → Universal inputs → Universal input x → Pulse value
Direct access code: 220010-0xx
Examples: Universal input 1: 220010-000; Universal input 12: 220010-011

Description Factor, that when multiplied by the input signal results in the required physical value.
Example: 1 pulse equals 5 m^3 -> enter a "5" here.
Only visible if signal = Pulse counter

User entry Number, max. 8 digits

Factory setting 1

Calc. factor

Navigation Expert → Inputs → Universal inputs → Universal input x → Calc. factor
Direct access code: 220045-0xx
Examples: Universal input 1: 220045-000; Universal input 12: 220045-011

Description Factor for converting the counter (e.g., the transmitter returns $m^3/100$ -> desired unit is m^3 --> enter 0.01 as the factor)
Only visible if signal = Modbus Master

User entry Number (max. 15 digits)

Factory setting 1.0

Decimal point

Navigation Expert → Inputs → Universal inputs → Universal input x → Decimal point
Direct access code: 220005-0xx
Examples: Universal input 1: 220005-000; Universal input 12: 220005-011

Description Number of places after decimal point for the display.
Only visible if signal ≠ Switched off

Options None, One (X.Y), Two (X.YY), Three (X.YYY), Four (X.YYYY), Five (X.YYYYY)

Factory setting One (X.Y)

Start value range

Navigation Expert → Inputs → Universal inputs → Universal input x → Start value range
Direct access code: 220046-0xx
Examples: Universal input 1: 220046-000; Universal input 12: 220046-011

Description Scaling of the Modbus value
Enter a lower-range value for the scaling which corresponds to the lower range limit.
Only visible if signal = Modbus Master

User entry Number (max. 8 digits)

Factory setting 0

End value range

Navigation Expert → Inputs → Universal inputs → Universal input x → End value range
Direct access code: 220047-0xx
Examples: Universal input 1: 220047-000; Universal input 12: 220047-011

Description Scaling of the Modbus value
Enter the full scale value for scaling in the input box provided. This value corresponds to the end of the measuring range.
Only visible if signal = Modbus Master

User entry Number (max. 8 digits)

Factory setting 100

Lower frequency

Navigation Expert → Inputs → Universal inputs → Universal input x → Lower frequency
Direct access code: 220018-0xx
Examples: Universal input 1: 220018-000; Universal input 12: 220018-011

Description Configure the lower frequency that corresponds to the start of the measuring range.
Only visible if signal = Frequency input

User entry 0 to 12500 (Hz)

Factory setting 5.0 (Hz)

Range start

Navigation Expert → Inputs → Universal inputs → Universal input x → Range start
Direct access code: 220006-0xx
Examples: Universal input 1: 220006-000; Universal input 12: 220006-011

Description Transmitters convert the physical measured variable to standardized signals. Enter the start of the measuring range.

- The start and end of the measuring range may not be identical.
- The start of the measuring range can also be greater than the end (e.g., for deep wells).
- The parameter can be defined independently of the number of decimal places configured for the measured value as these are only taken into consideration for the display.

User entry Number (max. 8 digits)

Factory setting 0 (Depends on the input signal selected)

Upper frequency

Navigation Expert → Inputs → Universal inputs → Universal input x → Upper frequency
Direct access code: 220019-0xx
Examples: Universal input 1: 220019-000; Universal input 12: 220019-011

Description Configure the upper frequency that corresponds to the upper range limit.
Only visible if signal = Frequency input

User entry 0 to 12500 (Hz)

Factory setting 1000.0 (Hz)

Meas. range end

Navigation

Expert → Inputs → Universal inputs → Universal input x → Meas. range end
Direct access code: 220007-0xx
Examples: Universal input 1: 220007-000; Universal input 12: 220007-011

Description

Transmitters convert the physical measured variable to standardized signals. Enter the end of the measuring range.

- The start and end of the measuring range may not be identical.
- The end of the measuring range can also be smaller than the start (e.g., for deep wells).
- The parameter can be defined independently of the number of decimal places configured for the measured value as these are only taken into consideration for the display.

User entry

Number (max. 8 digits)

Factory setting

100 (Depends on the input signal selected)

Zoom start

Navigation

Expert → Inputs → Universal inputs → Universal input x → Zoom start
Direct access code: 220011-0xx
Examples: Universal input 1: 220011-000; Universal input 12: 220011-011

Description

If the whole value range is not used, enter the lower value of the required range. The zoom only affects the display and has no influence on data storage.

- The zoom can also be set outside the measuring range. The only restriction is that the start and end of the zoom may not be identical.
- If the signal/range is changed, the zoom is corrected if it no longer fits the measuring range.
- The zoom start can also be larger than the zoom end. The device will automatically rotate the values on the display.

User entry

Number (max. 8 digits)

Factory setting

0 (Depends on the input signal selected)

Zoom end

Navigation

Expert → Inputs → Universal inputs → Universal input x → Zoom end
Direct access code: 220012-0xx
Examples: Universal input 1: 220012-000; Universal input 12: 220012-011

Description

Like "Zoom start". Enter the upper value of the required range in the input box provided.

- The zoom can also be set outside the measuring range. The only restriction is that the start and end of the zoom may not be identical.
- If the signal/range is changed, the zoom is corrected if it no longer fits the measuring range.
- The zoom end can also be smaller than the zoom start. The device will automatically rotate the values on the display.

User entry Number (max. 8 digits)

Factory setting 100 (Depends on the input signal selected)

Damping

Navigation Expert → Inputs → Universal inputs → Universal input x → Damping
Direct access code: 220008-0xx
Examples: Universal input 1: 220008-000; Universal input 12: 220008-011

Description The more unwanted interference there is on the measurement signal the higher the value that should be entered here. Result: Fast changes will be damped/suppressed.
Only visible if signal = Current, Voltage, Resistance thermometer or Thermocouple

User entry 0 to 999.9 s

Factory setting Current, voltage: 0.0 s
Resistance thermometer, thermocouple: 0.2 s

Comparison point

Navigation Expert → Inputs → Universal inputs → Universal input x → Comparison point
Direct access code: 220013-0xx
Examples: Universal input 1: 220013-000; Universal input 12: 220013-011

Description Internal: Compensation of the voltage error by measuring the terminal temperature.
External: Compensation of the voltage error by using an external controlled comparison measurement point.
Only visible if signal = Thermocouple

Options Internal, External

Factory setting Internal

Comparison temp.

Navigation Expert → Inputs → Universal inputs → Universal input x → Comparison temp.
Direct access code: 220014-0xx
Examples: Universal input 1: 220014-000; Universal input 12: 220014-011

Description Settings for the external comparison temperature (only when connecting thermocouples).
Only visible if comparison point = External

User entry 0 to 9999999 (Depends on the temperature unit selected)

Factory setting 0 (Depends on the temperature unit selected)

Totalizer
(Online configuration)

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalizer
Direct access code: 220015-0xx
Examples: Universal input 1: 220015-000; Universal input 12: 220015-011

Description Initial setting for the totalizer. Useful when continuing measurements recorded to date with an (electro)-mechanical counter.
Only visible if signal = Pulse counter or Counter for Modbus Master

User entry Number (max. 15 digits)

Factory setting 0

"Linearization" submenu

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization

Description Contains settings for linearization.

Only current and voltage inputs can be linearized.

Linearization

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Linearization
Direct access code: 230000-0xx
Examples: Universal input 1: 230000-000; Universal input 12: 230000-011

Description Specify whether the selected analog input should be linearized.

Options No, Yes

Factory setting No

Number of points

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Number of points
Direct access code: 230001-0xx
Examples: Universal input 1: 230001-000; Universal input 12: 230001-011

Description Specify the number of support points that are used in the linearization table.

Note: The first/last point must always correspond to the lower/upper range limit.

User entry 2 to 32

Factory setting 2

Dim. linearized value

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Dim. linearized value
Direct access code: 230002-0xx
Examples: Universal input 1: 230002-000; Universal input 12: 230002-011

Description Unit/dimension for the linearized value.

User entry Text (max. 6 characters)

Zoom start

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Zoom start
Direct access code: 230003-0xx
Examples: Universal input 1: 230003-000; Universal input 12: 230003-011

Description If the total transmitter range is not used, enter the lower value of the required range for a higher resolution.
Example: Transmitter 0-14 pH, required range: 5-9 pH. Set "5" here. The zoom has no effect on saving.

User entry 0 to 9999999

Factory setting 0

Zoom end

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Zoom end
Direct access code: 230004-0xx
Examples: Universal input 1: 230004-000; Universal input 12: 230004-011

Description Like "Zoom start". Enter the upper value of the required range in the input box provided.
Example: Transmitter 0-14 pH, required range: 5-9 pH. Entry here: "9".

User entry 0 to 9999999

Factory setting 100

Points

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Points

Description Enter the support points for the linearization table in the input box provided.
Note: The first/last point must always correspond to the lower/upper range limit. The support points of the linearization table can only be displayed in the PC software. Use the "Edit table" switch to change the support points.

Sort table

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Points → Sort table
Direct access code: 230020-0xx
Examples: Universal input 1: 230020-000; Universal input 12: 230020-011

Description Sort the linearization table automatically to adjust the order of the support points.

Options No, Yes

Factory setting No

Check table

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Points → Check table
Direct access code: 230008-0xx
Examples: Universal input 1: 230008-000; Universal input 12: 230008-011

Description Check that the linearization table was entered correctly.

Options No, Yes

Factory setting No

x-value (1 to 32)

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Points → x-value (1 to 32)
Direct access code, x-value 1: 230100-0xx
Direct access code, x-value 2: 230102-0xx
Examples: Universal input 1, x-value 1: 230100-000; Universal input 12, x-value 1: 230100-011

Description x-value for the linearization (value from the device input). Example: If 10 cm corresponds to a volume of 20 liters, enter the value 10.

User entry 0 to 9999999

Factory setting 0

y-value (1 to 32)

Navigation Expert → Inputs → Universal inputs → Universal input x → Linearization → Points → y-value (1 to 32)
Direct access code, y-value 1: 230101-0xx
Direct access code, y-value 2: 230103-0xx
Examples: Universal input 1, y-value 1: 230101-000; Universal input 12, y-value 1: 230101-011

Description In the input box provided, enter the y-value that corresponds to the measured x-value.
Example: If 10 cm corresponds to a volume of 20 liters, enter the value 20.

User entry 0 to 9999999

Factory setting 0

"Meas.val. corrct." submenu

Navigation Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct.

Description Determining the correction values to balance measurement tolerances.

Proceed as follows:
- Measure the current value at the lower measuring range.
- Measure the current value at the upper measuring range.
- Enter the lower and upper target and actual values in each case.

Offset

Navigation Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Offset
Direct access code: 220050-0xx
Examples: Universal input 1: 220050-000; Universal input 12: 220050-011

Description The set value is added to the actual measured input signal for further use (display, storage, set point monitoring).
Only visible if signal = Resistance thermometer or Thermocouple

User entry Number (max. 8 digits)

Factory setting 0

Correction RPT

Navigation Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Correction RPT
Direct access code: 220057-0xx
Examples: Universal input 1: 220057-000; Universal input 12: 220057-011

Description Rear panel temperature correction value for this analog input (only required for thermocouples).

Only visible/editable if the service code has been entered.

User entry Number (max. 8 digits)

Factory setting -3.0 for slot 1+2
-3.2 for slot 3
-3.5 for slot 4+5

Range start

Target value

Navigation Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Target value
Direct access code: 220052-0xx
Examples: Universal input 1: 220052-000; Universal input 12: 220052-011

Description Enter the lower set point (example: measuring range 0 to 100 °C: 0 °C).
Only visible if signal = Current or Voltage

User entry Number (max. 8 digits)

Factory setting 0

Actual value

Navigation Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Actual value
Direct access code: 220053-0xx
Examples: Universal input 1: 220053-000; Universal input 12: 220053-011

Description Enter the lower value actually measured (example: measuring range 0 to 100 °C: 0.5 °C measured).
Only visible if signal = Current or Voltage

User entry Number (max. 8 digits)

Factory setting 0

Meas. range end

Target value

Navigation Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Target value
Direct access code: 220055-0xx
Examples: Universal input 1: 220055-000; Universal input 12: 220055-011

Description Enter the upper set point (example: measuring range 0 to 100 °C: 100 °C).
Only visible if signal = Current or Voltage

User entry Number (max. 8 digits)

Factory setting 100

Actual value

Navigation Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Actual value
Direct access code: 220056-0xx
Examples: Universal input 1: 220056-000; Universal input 12: 220056-011

Description Enter the upper value actually measured (example: measuring range 0 to 100 °C: 100.5 °C measured).
Only visible if signal = Current or Voltage

User entry Number (max. 8 digits)

Factory setting 100

"Totalization" submenu

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalization

Description Settings are only required if this analog measuring point is to be used for totalization (e.g., for flow calculation).

Totalization

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalization → Totalization
Direct access code: 220030-0xx
Examples: Universal input 1: 220030-000; Universal input 12: 220030-011

Description By totalizing the analog signal (e.g., flow rate in m^3/h), quantities (in m^3) can be calculated.

Options No, Yes

Factory setting No

Totalization base

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalization → Totalization base
Direct access code: 220031-0xx
Examples: Universal input 1: 220031-000; Universal input 12: 220031-011

Description Select the required time base. Example: ml/s -> time base seconds (s); m^3/h -> time base hours (h).
Only visible if totalization = Yes

Options Second (s), Minute (min), Hour (h), Day (d)

Factory setting Second (s)

Unit

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalization → Unit
Direct access code: 220032-0xx
Examples: Universal input 1: 220032-000; Universal input 12: 220032-011

Description Enter the unit for the quantity calculated by totalization (e.g., "m^3").
Only visible if totalization = Yes

User entry Text (max. 6 characters)

Low flow cut off

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalization → Low flow cut off
Direct access code: 220033-0xx
Examples: Universal input 1: 220033-000; Universal input 12: 220033-011

Description If the volume flow recorded is below the set value, these quantities are not added to the counter.
If the input is scaled from 0 to y, or if the pulse input is used, all values that are smaller than the set value are not recorded.
If the input is scaled from -x to +y, all values around the zero point (i.e., also negative values) are not recorded.
Only visible if totalization = Yes

User entry Number (max. 8 digits)

Factory setting 0

Calc. factor

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalization → Calc. factor
Direct access code: 220034-0xx
Examples: Universal input 1: 220034-000; Universal input 12: 220034-011

Description Factor for calculating the integrated value (e.g., the transmitter delivers l/s -> totalization base = second -> engineering unit required is m^3 -> enter factor 0.001)
Only visible if totalization = Yes

User entry Number (max. 8 digits)

Factory setting 1.0

Totalizer
(Online configuration)

Navigation Expert → Inputs → Universal inputs → Universal input x → Totalization → Totalizer
Direct access code: 220035-0xx
Examples: Universal input 1: 220035-000; Universal input 12: 220035-011

Description Initial setting for the totalizer. Useful when continuing measurements recorded to date with an (electro)-mechanical counter.
Only visible if totalization = Yes

User entry Number (max. 15 digits)

Factory setting 0

"Fault mode" submenu

In the event of an error the alarm relay is switched if so configured → 125

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode

Description Contains settings that define how this channel responds under fault conditions (e.g., cable open circuit, overrange).

NAMUR NE 43

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → NAMUR NE 43
Direct access code: 220060-0xx
Examples: Universal input 1: 220060-000; Universal input 12: 220060-011

Description Activate/deactivate the 4–20mA loop monitoring as per NAMUR recommendation NE 43.
The following error ranges apply when NAMUR NE 43 is switched on:
≤ 3.8 mA: under range
≥ 20.5 mA: overrange
≤ 3.6 mA or ≥ 21.0 mA: sensor error
≤ 2 mA: cable open circuit
Only visible if signal = "Current" and range = "4-20 mA" or "4-20 mA squared".

Options Off, On

Factory setting On

Cable open circuit

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → Cable open circuit
Direct access code: 220060-0xx
Examples: Universal input 1: 220060-000; Universal input 12: 220060-011

Description Cable open circuit detection
Only visible if signal = "Voltage" and range = "1-5 V" or "1-5 V squared".

Options Off, On

Factory setting On

Lower error value

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → Lower error value
Direct access code: 220065-0xx
Examples: Universal input 1: 220065-000; Universal input 12: 220065-011

Description When NE 43 is switched off, defines the value that must be undershot for the device to output an error.
Only visible if signal = "Current", range = "4-20 mA" and NAMUR NE 43 = "Off"

User entry Number (max. 8 digits); 0 to 4 mA

Factory setting 3.9mA

Upper error value

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → Upper error value
Direct access code: 220066-0xx
Examples: Universal input 1: 220066-000; Universal input 12: 220066-011

Description When NE 43 is switched off, defines the value that must be exceeded for the device to output an error.
Only visible if signal = "Current", range = "4-20 mA" and NAMUR NE 43 = "Off"

User entry Number (max. 8 digits); 20 to 22mA

Factory setting 20.8mA

Time delay

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → Time delay
Direct access code: 220064-0xx
Examples: Universal input 1: 220064-000; Universal input 12: 220064-011

Description The device does not respond (e.g., with the switching of a relay) to a cable open circuit/ underrange/overrange until this state has been active for the preset time as a minimum.
Only visible if NAMUR NE 43 = On

User entry 0 to 99 s

Factory setting 0s

On error

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → On error
Direct access code: 220061-0xx
Examples: Universal input 1: 220061-000; Universal input 12: 220061-011

Description Configure which value the device should continue working with (for calculations) if the measured value is not valid (e.g., cable open circuit).

In the event of an error value, all the dependent calculations are flagged accordingly as "error value". Counters are not flagged, however!

Options Invalid calculation, Error value

Factory setting Invalid calculation

Error value

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → Error value
Direct access code: 220062-0xx
Examples: Universal input 1: 220062-000; Universal input 12: 220062-011

Description The device continues calculating with this value in the event of an error.
Only visible if on error = Error value

User entry Number (max. 8 digits)

Factory setting 0

Save event

Navigation Expert → Inputs → Universal inputs → Universal input x → Fault mode → Save event
Direct access code: 220063-0xx
Examples: Universal input 1: 220063-000; Universal input 12: 220063-011

Description Stores a message in the event logbook when a fault occurs.

Options No, Yes

Factory setting No

Copy settings

Navigation Expert → Inputs → Universal inputs → Universal input x → Copy settings
Direct access code: 220200-0xx
Examples: Universal input 1: 220200-000; Universal input 12: 220200-011

Description Copies settings from actual channel to selected channel.

Options Switched off, Universal input x
Users can choose from all the available universal inputs.

Factory setting Switched off

"Digital inputs -> Digital input x" submenu

Navigation Expert → Inputs → Digital inputs → Digital input x

Description Settings only required if digital inputs (e.g.,events) are to be used.

x = place holder for selected digital input

Add input

Navigation Expert → System → Digital inputs → Add input
Direct access code: 252000/000

Description Addition of a digital input that must be configured according to the function.

Options No, Digital input x

Factory setting No

Delete input

Navigation Expert → System → Digital inputs → Delete input
Direct access code: 252001/000

Description Delete an input configuration.

Options No, Digital input x

Factory setting No

Function

Navigation Expert → Inputs → Digital inputs → Digital input x → Function
Direct access code: 250000-00x
Examples: Digital input 1: 250000-000; Digital input 6: 250000-005

Description Select the required function. Digital inputs are High active; this means the described effect is achieved by a high input.
Low = -3 to +5 V
High = +12 to +30 V

Options Switched off, Control input, On/off event, Pulse counter, Operational time, Event +operation time, Quantity from time, Profibus DP (option), Modbus Slave (option), EtherNet/IP (option), PROFINET (option)

Factory setting Switched off

Function

Navigation Expert → Inputs → Digital inputs → Digital input x → Function
Direct access code: 250014-00x
Examples: Digital input 1: 250014-000; Digital input 6: 250014-005

Description Specifies how the data from the fieldbus is interpreted/processed.
Only visible if function = Profibus DP, Modbus Slave, EtherNet/IP, PROFINET

Options Switched off, Control input, On/off event, Pulse counter, Operational time, Event +operation time, Quantity from time

Factory setting Switched off

Channel ident.

Navigation Expert → Inputs → Digital inputs → Digital input x → Channel ident.
Direct access code: 250001-00x
Examples: Digital input 1: 250001-000; Digital input 6: 250001-005

Description Measuring point name (e.g., "Pump") or description of the function performed with this input (e.g., "Fault message").
Only visible if function ≠ Switched off

User entry Text (max. 16 characters)

Factory setting Digital x

Engineering unit

Navigation Expert → Inputs → Digital inputs → Digital input x → Engineering unit
Direct access code: 250002-00x
Examples: Digital input 1: 250002-000; Digital input 6: 250002-005

Description Technical unit of the count input, e.g., liter, m^3, etc.
Only visible if function = Pulse counter or Quantity from time

User entry Text (max. 6 characters)

Decimal point

Navigation Expert → Inputs → Digital inputs → Digital input x → Decimal point
Direct access code: 250004-00x
Examples: Digital input 1: 250004-000; Digital input 6: 250004-005

Description Number of places after decimal point for the display.
Only visible if function = Pulse counter or Quantity from time

Options None, One (X.Y), Two (X.YY), Three (X.YYY), Four (X.YYYY), Five (X.YYYYY)

Factory setting One (X.Y)

Input factor in

Navigation Expert → Inputs → Digital inputs → Digital input x → Input factor in
Direct access code: 250019-00x
Examples: Digital input 1: 250019-000; Digital input 6: 250019-005

Description Defines if the set up factor is respective to 1 second or 1 hour.
Only visible if function = Quantity from time

Options Seconds, Hours

Factory setting Seconds

Pulse value

Navigation Expert → Inputs → Digital inputs → Digital input x → Pulse value
Direct access code: 250005-00x
Examples: Digital input 1: 250005-000; Digital input 6: 250005-005

Description Factor, that when multiplied by the input signal results in the required physical value.
Examples:
1 pulse equals 5 m^3-> enter "5" here.
Only visible if function = Pulse counter

User entry Number (max. 8 digits)

Factory setting 1

1 second=/1 hour= (depends on the setting in "Input factor in")

Navigation Expert → Inputs → Digital inputs → Digital input x → 1 second= / 1 hour=
Direct access code: 250005-00x
Examples: Digital input 1: 250005-000; Digital input 6: 250005-005

Description Factor, that when multiplied by the operating time results in the required physical value.
Examples:
1 second equals 8 l -> enter "8" here.
Only visible if function = Quantity from time

User entry Number (max. 8 digits)

Factory setting 1

Time delay

Navigation Expert → Inputs → Digital inputs → Digital input x → Time delay
Direct access code: 250017-00x
Examples: Digital input 1: 250017-000; Digital input 6: 250017-005

Description The high signal must be active for at least the preset time before the device changes the channel from low to high.
The change from high to low is always immediate.
Only visible if function = Control input, On/off event, Event+operation time

User entry 0 to 99 999 s

Factory setting 0

Action

Navigation Expert → Inputs → Digital inputs → Digital input x → Action
Direct access code: 250003-00x
Examples: Digital input 1: 250003-000; Digital input 6: 250003-005

Description Set up the function of the control input.
Only visible if function = Control input

Action	Description
Start/stop recording	The device only saves data as long as a high signal is present
Screensaver on	Switches backlighting/display off, low = off, high = on This function is **not** supported by the **DIN rail version**.
Lock setup	The user can only change the setup if a low signal is present
Time synchronization	If a high signal is applied, the device rounds the system time up or down (only for Low→ High change): 0 to 29 → round down; 30 to 59 → round up
Change group (panel-mounted device only)	The display switches to the next active group in the event of a Low→High change.
Set point monitoring on/off	The entire set point monitoring function of the device can be switched on (for "High") or switched off (for "Low").
Individual LV on/off	Monitoring for a selected limit value can be switched on (for "High") or switched off (for "Low").
Block keyboard/navigator	The device can only be operated if a low signal is present. Otherwise, all key activation and navigator actions are discarded. This function is **not** supported by the **DIN rail version**.
Start/stop analysis 1–4	Starts/ends one of the max. 4 external analyses (the analysis runs only as long as the signal is high). Measured value acquisition for the graphic display continues. Batches are also started/ended with this function. Note: This function is not available in the case of batch and control input via a maths channel.

Action	Description
Reset batch number x (option)	Resets the automatically generated batch number (1..x) to 0 (in the event of a LowHigh change).
Batch x limit values on/off (option)	Switches the limit values of batch x on/off. The limit values relating to the batch are determined based on the group settings (via the channels assigned to the batch). If a channel is assigned to several batches, the limit values for this channel are not disabled.

Options Switched off, Start/stop recording, Screensaver on, Lock setup, Time synchronization, Change group, Set point monitoring on/off, Individual LV on/off, Block keyboard/ navigator, Start/stop analysis x, Reset batch no. x, Batch x limits on/off

Factory setting Switched off

Group

Navigation Expert → Inputs → Digital inputs → Digital input x → Group
Direct access code: 250015-00x
Examples: Digital input 1: 250015-000; Digital input 6: 250015-005

Description Choose the group which should be displayed in the event of a change from Low->High. Alternatively, the next active group can be displayed.
Only visible if function = Control input and action = Change group

Options Change automatically, Group x

Factory setting Change automatically

Set point

Navigation Expert → Inputs → Digital inputs → Digital input x → Set point
Direct access code: 250016-00x
Examples: Digital input 1: 250016-000; Digital input 6: 250016-005

Description Select the set point which should be switched on or off by means of this control input.
Only visible if function = Control input and action = Individual LV on/off

Options Switched off, Universal input xx, Digital input xx, Maths xx, Set point xx, Relay xx

Factory setting Change automatically

Switches relay

Navigation Expert → Inputs → Digital inputs → Digital input x → Switches relay
Direct access code: 250006-00x
Examples: Digital input 1: 250006-000; Digital input 6: 250006-005

Description Switches the corresponding relay when the digital input is low or high. Follow the connection instructions in the user manual!
Only visible if function = Control input, On/off event, Event+operation time

Options Not used, Relay x
All the available relays are displayed.

Factory setting Not used

Description 'H'

Navigation Expert → Inputs → Digital inputs → Digital input x → Description 'H'
Direct access code: 250007-00x
Examples: Digital input 1: 250007-000; Digital input 6: 250007-005

Description Condition description when the digital input is active. This text is shown on the display and saved to memory.
Only visible if function = Control input, On/off event, Event+operation time

User entry Text (max. 6 characters)

Factory setting On

Description 'L'

Navigation Expert → Inputs → Digital inputs → Digital input x → Description 'L'
Direct access code: 250008-00x
Examples: Digital input 1: 250008-000; Digital input 6: 250008-005

Description Condition description when the digital input is not active. This text is shown on the display and saved to memory.
Only visible if function = Control input, On/off event, Event+operation time

User entry Text (max. 6 characters)

Factory setting Off

Save event

Navigation Expert → Inputs → Digital inputs → Digital input x → Save event
Direct access code: 250009-00x
Examples: Digital input 1: 250009-000; Digital input 6: 250009-005

Description Determines whether the condition change from low to high or high to low is stored in the event logbook.

Requires higher memory capacity.

Only visible if function = Control input, On/off event, Event+operation time

Options No, Yes, only "On" message

Factory setting Yes

Event message

Navigation Expert → Inputs → Digital inputs → Digital input x → Event message
Direct access code: 250018-00x
Examples: Digital input 1: 250018-000; Digital input 6: 250018-005

Description "Do not acknowledge": No message is shown if the digital input switches.
"Acknowledge": A message window is shown on the screen which has to be acknowledged by operating a push button.
Only visible if function = Control input, On/off event, Event+operation time

In the case of the DIN rail version, the message can only be acknowledged via the web server!

Options Do not acknowledge, Acknowledge

Factory setting Do not acknowledge

Event text L->H

Navigation Expert → Inputs → Digital inputs → Digital input x → Event text L->H
Direct access code: 250010-00x
Examples: Digital input 1: 250010-000; Digital input 6: 250010-005

Description Description of condition change from low to high. Event text is stored (e.g., start filling).

If no event text has been configured, the device automatically generates an event text (factory setting), e.g., Digital 1 L->H.

Only visible if function = Control input, On/off event, Event+operation time

User entry Text (max. 22 characters)

Event text H->L

Navigation Expert → Inputs → Digital inputs → Digital input x → Event text H->L
Direct access code: 250011-00x
Examples: Digital input 1: 250011-000; Digital input 6: 250011-005

Description Description of condition change from high to low. Event text is stored (e.g., stop filling).

If no event text has been configured, the device automatically generates an event text (factory setting), e.g., Digital 1 H->L.

Only visible if function = Control input, On/off event, Event+operation time

User entry Text (max. 22 characters)

Record duration

Navigation Expert → Inputs → Digital inputs → Digital input x → Record duration
Direct access code: 250012-00x
Examples: Digital input 1: 250012-000; Digital input 6: 250012-005

Description The duration between "On" and "Off" can be recorded. The duration is appended to the "Off" event text (<hhhh>h<mm>:<ss>).
Power failure times do not affect the duration. If the digital channel was "on" before the power failure and is still "on" after the power failure, the duration continues.
Only visible if function = Control input, On/off event, Event+operation time

Options No, Yes

Factory setting No

Totalizer
(Online configuration)

Navigation Expert → Inputs → Digital inputs → Digital input x → Totalizer
Direct access code: 250013-00x
Examples: Digital input 1: 250013-000; Digital input 6: 250013-005

Description Initial setting for the totalizer. Useful when continuing measurements recorded to date with an (electro)-mechanical counter.
Only visible if function = Pulse counter, Operational time, Event+operation time or Quantity from time

User entry Number (max. 15 digits)

Factory setting 0

Copy settings

Navigation Expert → Inputs → Digital inputs → Digital input x → Copy settings
Direct access code: 250200-00x
Examples: Digital input 1: 250200-000; Digital input 6: 250200-005

Description Copies settings from actual channel to selected channel.

Options No, Digital input x
Users can choose from all the available digital inputs.

Factory setting No

17.1.3 "Outputs" submenu

Settings only required if outputs (e.g., relays) are to be used.

"Universal output x" submenu

Navigation Expert → Outputs → Universal output x

Description Settings for the universal output selected (current or pulse output).

Signal

Navigation Expert → Outputs → Universal output x → Signal
Direct access code: 340000-00x
Examples: Universal output 1: 340000-000; Universal output 2: 340000-001

Description Select the output signal for this channel.

Options Switched off, 4 to 20 mA, 0 to 20 mA, pulse output

Factory setting Switched off

Reference channel

Navigation Expert → Outputs → Universal output x → Reference channel
Direct access code: 340001-00x
Examples: Universal output 1: 340001-000; Universal output 2: 340001-001

Description Select the input to which the analog output refers.

Options Switched off, Universal input x, Digital input x, Maths x, Set point x, Relay x
All active inputs are available for selection.

Factory setting Switched off

Start value

Navigation Expert → Outputs → Universal output x → Start value
Direct access code: 340003-00x
Examples: Universal output 1: 340003-000; Universal output 2: 340003-001

Description Configure which value corresponds to ¾ mA.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry Number (max. 8 characters)

Factory setting 0

Full scale value

Navigation Expert → Outputs → Universal output x → Full scale value
Direct access code: 340004-00x
Examples: Universal output 1: 340004-000; Universal output 2: 340004-001

Description Configure which value corresponds to 20 mA.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry Number (max. 8 characters)

Factory setting 100

Damping/filter

Navigation Expert → Outputs → Universal output x → Damping/filter
Direct access code: 340005-00x
Examples: Universal output 1: 340005-000; Universal output 2: 340005-001

Description Time constant of the first order low pass for the output signal. This is used to prevent strong fluctuations of the output signal.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry 0 to 999.9 s

Factory setting 0.0 s

Pulse value

Navigation Expert → Outputs → Universal output x → Pulse value
Direct access code: 340006-00x
Examples: Universal output 1: 340006-000; Universal output 2: 340006-001

Description The pulse value defines which quantity corresponds to an output pulse (e.g., 1 pulse = 5 liters).
Only visible if signal = Pulse output

User entry Number (min. 0.000001; max. 8 characters)

Factory setting 1

Pulse width

Navigation Expert → Outputs → Universal output x → Pulse width
Direct access code: 340007-00x
Examples: Universal output 1: 340007-000; Universal output 2: 340007-001

Description The pulse width limits the maximum possible output frequency of the pulse output. Define a fixed or dynamic pulse width.
Only visible if signal = Pulse output

Options User-defined, Dynamic (max. 1000ms)

Factory setting User-defined

Pulse width

Navigation Expert → Outputs → Universal output x → Pulse width
Direct access code: 340008-00x
Examples: Universal output 1: 340008-000; Universal output 2: 340008-001

Description Set the pulse width in the range 0.5 to 1 000 ms.
Only visible if signal = Pulse output

Value 0.5 to 1 000 ms

Factory setting 100 ms

"Meas.val. corrct." submenu

Navigation Expert → Outputs → Universal output x → Meas.val. corrct.

Description Correct the output current value (necessary only if the device that carries out the further processing cannot compensate for any measuring section tolerances).
Proceed as follows:
1. On the connected device, read out the displayed value in both the upper and lower measuring range.
2. Enter the lower and upper target and actual values in each case.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

Lower correction value

Target value

Navigation Expert → Outputs → Universal output x → Meas.val. corrct. → Lower correction value → Target value
Direct access code: 340021-00x
Examples: Universal output 1: 340021-000; Universal output 2: 340021-001

Description Enter the lower set point.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry Number (max. 8 characters)

Factory setting 0

Actual value

Navigation Expert → Outputs → Universal output x → Meas.val. corrct. → Lower correction value → Actual value
Direct access code: 340022-00x
Examples: Universal output 1: 340022-000; Universal output 2: 340022-001

Description Enter the lower actual value that is displayed on the connected device.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry Number (max. 8 characters)

Factory setting 0

Upper correction value

Target value

Navigation Expert → Outputs → Universal output x → Meas.val. corrct. → Upper correction value → Target value
Direct access code: 340024-00x
Examples: Universal output 1: 340024-000; Universal output 2: 340024-001

Description Enter the upper set point.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry Number (max. 8 characters)

Factory setting 100

Actual value

Navigation Expert → Outputs → Universal output x → Meas.val. corrct. → Upper correction value → Actual value
Direct access code: 340025-00x
Examples: Universal output 1: 340025-000; Universal output 2: 340025-001

Description Enter the upper actual value that is displayed on the connected device.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry Number (max. 8 characters)

Factory setting 100

"Fault mode" submenu

Navigation Expert → Outputs → Universal output x → Fault mode

Description Configure how the analog output should behave in the event of an error (e.g., if the input channel has a cable open circuit).
Only visible if signal = 4 to 20 mA or 0 to 20 mA

NAMUR NE 43

Navigation Expert → Outputs → Universal output x → Fault mode → NAMUR NE 43
Direct access code: 340015-00x
Examples: Universal output 1: 340015-000; Universal output 2: 340015-001

Description Activate/deactivate the 4 to 20 mA range output as per NAMUR recommendation NE 43.
The following error ranges apply when NAMUR NE 43 is switched on:
≤ 3.8 mA: underrange
≥ 20.5 mA: overrange
≤ 3.6 mA or ≥ 21.0 mA: cable open circuit
Only visible if signal = 4 to 20 mA or 0 to 20 mA

Options Off, On

Factory setting On

On error

Navigation Expert → Outputs → Universal output x → Fault mode → On error
Direct access code: 340016-00x
Examples: Universal output 1: 340016-000; Universal output 2: 340016-001

Description What value should the output adopt in the event of an error (e.g., cable open circuit or calculated value invalid)?
Only visible if signal = 4 to 20 mA or 0 to 20 mA

Options Invalid calculation, Error value

Factory setting Invalid calculation

Error value

Navigation Expert → Outputs → Universal output x → Fault mode → Error value
Direct access code: 340017-00x
Examples: Universal output 1: 340017-000; Universal output 2: 340017-001

Description This value is output in the event of an error. Note: Must be between 0 to 22 mA.
Only visible if signal = 4 to 20 mA or 0 to 20 mA

User entry 0 to 22 mA

Factory setting 0 mA

"Relay x" submenu

Navigation Expert → Outputs → Relay x

Description Contains settings for the selected relay

x = place holder for selected relay

Operating mode

Navigation Expert → Outputs → Relay x → Operating mode
Direct access code: 330000-00x
Examples: Relay 1:330000-000; Relay 6: 330000-005

Description Relay function:
NC contact: The relay is closed in its quiescent state (maximum safety).
NO contact: The relay is open in its quiescent state.

Options NO contact, NC contact

Factory setting NO contact

Identifier

Navigation Expert → Outputs → Relay x → Identifier
Direct access code: 330001-00x
Examples: Relay 1:330001-000; Relay 6: 330001-005

Description User-configurable relay identifier.

User entry Text (max. 16 characters)

Factory setting Relay x

Remote controlled

Navigation Expert → Outputs → Relay x → Remote controlled
Direct access code: 330002-00x
Examples: Relay 1:330002-000; Relay 6: 330002-005

Description Configure whether the relay may be controlled remotely (e.g., PC or SMS).
Only visible with the "Telealarm" option.

Options No, Yes

Factory setting No

17.1.4 "Communication" submenu

Settings required if the USB, RS232, RS485 or Ethernet interface of the device is used (PC operation, serial data read-out, modem operation, etc.).

The various interfaces can be operated in parallel.

Timeout cycl. readout

Navigation Expert → Communication → Timeout
Direct access code: 150200-000

Description Monitors whether measured values are read out cyclically via OPC or Fieldbus. Timeout is modifiable between 1 and 99 seconds. 0 seconds means that the functionality is inactivated.

User entry 0 to 99 s

Factory setting 0 s

Switches

Navigation Expert → Communication → Switches
Direct access code: 150201-000

Description After the given timeout the dedicated relay/OC is active while no readout of actual measured values are in process.

Options Not used, Relay x
All the available relays are displayed.

Factory setting Not used

Timeout fieldbus

Navigation Expert → Communication → Timeout fieldbus
Direct access code: 150210-000

Description Time within which measured values must be received via fieldbus (otherwise, an error will be set). Not relevant if only measured values are read out.

User entry 1 to 99 s

Factory setting 10 s

Function USB-B

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Communication → Function USB-B
Direct access code: 012001-000

Description Determines the operating mode of the USB interface if a cable is connected to the device.

Options Always USB
Always Ethernet over USB
By user input

Factory setting Always USB

"Ethernet" submenu

Navigation Expert → Communication → Ethernet

Description Contains settings required when using the device's Ethernet interface.

MAC address
(Online configuration)

Navigation Expert → Communication → Ethernet → MAC address
Direct access code: 150000-000

Description Displays the MAC address

DHCP

Navigation Expert → Communication → Ethernet → DHCP
Direct access code: 150002-000

Description The device can get its Ethernet settings through DHCP.
Caution: The settings determined are not displayed until after setup acceptance!

Note: The unit always gets the same IP address if the leasing time is set long enough on the DHCP server. The PC software needs the IP address determined to establish a connection!

Options No, Yes

Factory setting Yes

IP address

Navigation Expert → Communication → Ethernet → IP address
Direct access code: 150003-000

Description Enter the IP address for the device. This is assigned by the network administrator. Contact your administrator if you have any questions
Can only be edited if DHCP = No

User entry IP address

Factory setting 000.000.000.000

Subnetmask

Navigation Expert → Communication → Ethernet → Subnetmask
Direct access code: 150004-000

Description Enter the subnetmask (provided by the network administrator).
Can only be edited if DHCP = No

User entry IP address

Factory setting 255.255.255.000

Gateway

Navigation Expert → Communication → Ethernet → Gateway
Direct access code: 150005-000

Description Enter the gateway (provided by the network administrator).
Can only be edited if DHCP = No

User entry IP address

Factory setting 000.000.000.000

Domain Name System (DNS)

Navigation Expert → Communication → Ethernet → Domain Name System (DNS)
Direct access code: 150009-000

Description Enter the IP address of a DNS server (provided by the network administrator).
Needed if you wish to use the name of the email server (e.g., smtp.example.org) instead of the IP address, for example, to send emails
Can only be edited if DHCP = No

User entry IP address

Factory setting 000.000.000.000

Disable port

Navigation Expert → Communication → Ethernet → Disable port
Direct access code: 150020-000

Description Ports that are not needed can be switched off for security reasons.
CDI is the protocol that the configuration software/analysis software uses to communicate with the device.

All other ports (SNTP, SMTP, web server) are automatically disabled if the function is switched off.

Options CDI, OPC, Modbus Slave, HART IP
F

Factory setting ---- (no port disabled)

Port

Navigation Expert → Communication → Ethernet → Port
Direct access code: 150001-000

Description The system communicates with the PC software through this communication port.

If the network is protected by a firewall, this port may have to be enabled. In this case, contact the network administrator.

User entry Number (max. 5 digits)

Factory setting 8000

OPC port

Navigation Expert → Communication → Ethernet → OPC port
Direct access code: 150010-000

Description Values van be read via OPC server using this communication port.

If the network is protected by a firewall, this port may have to be enabled. In this case, contact the network administrator.

User entry Number (max. 5 digits)

Factory setting 8002

HART IP port

Navigation Expert → Communication → Ethernet → HART IP port
Direct access code: 150030-000

Description Connected HART devices can be accessed via this communication port using the communication device type manager (DTM).
Only visible if a HART card is present.

If the network is protected by a firewall, this port may have to be enabled. In this case, contact the network administrator.

The "RSG45 HART CommDTM" is required in order to access connected HART devices via the RSG45. This establishes the connection between an FDT Frame application and a HART device. The DTM for the connected device must also be installed in the FDT Frame application. The "RSG45 HART CommDTM" is available via www.endress.com/rsg45.
For additional information, see the "Operation options" section → 41

User entry Number (max. 5 digits)

Factory setting 5094

Web server

Navigation Expert → Communication → Ethernet → Web server
Direct access code: 470000-000

Description Enable or disable the web server function. The instantaneous values can only be displayed using an Internet browser when the web server is activated.

It is only possible to connect to the web server via the Ethernet interface!

Options No (web server is off), Yes (web server is active)

Factory setting Yes

"Configuration Web server" submenu

Navigation Expert → Communication → Ethernet → Configuration Web server

Description Configure the web server or specify which functionality should be possible via the web server. Only visible if web server = Yes.

Instantaneous value display is always possible once the web server is switched on.

Port

Navigation Expert → Communication → Ethernet → Configuration Web server → Port
Direct access code: 470003-000

Description The web server communicates through this communication port.

If the network is protected by a firewall, this port may have to be enabled. In this case, contact the network administrator.

User entry Number (max. 5 digits)

Factory setting 80

Setup

Navigation Expert → Communication → Ethernet → Configuration Web server → Setup
Direct access code: 470001-000

Description The device can be configured via the web server.
For security reasons it is advisable to switch off configuration via the web server after commissioning.
Contact the network administrator for questions related to IT security.

Options No, Yes

Factory setting Yes

Firmware update

Navigation Expert → Communication → Ethernet → Configuration Web server → Firmware update
Direct access code: 470002-000

Description Firmware can be updated via the web server.

Options No, Yes

Factory setting No

Remote control

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Communication → Ethernet → Configuration Web server → Remote control
Direct access code: 470004-000

Description The device can be remote-controlled via the web server.

Options No, Yes

Factory setting No

WebDAV server

Navigation Expert → Communication → Ethernet → Configuration Web server → WebDAV server
Direct access code: 470006-000

Description The SD card can be read out via the WebDAV client.

Options No, Yes

Factory setting No

Batch (option)

Navigation Expert → Communication → Ethernet → Configuration Web server → Batch
Direct access code: 470007-000

Description Batches can be controlled via the web server.

Detailed descriptions of this device option can be found in the associated documentation.

Options No, Yes

Factory setting No

Control relays (option)

Navigation Expert → Communication → Ethernet → Configuration Web server → Control relays
Direct access code: 470008-000

Description Relays can be remote-controlled via the web server.

Detailed descriptions of this device option can be found in the associated documentation.

Options No, Yes

Factory setting No

Meas. val. without login

Navigation Expert → Communication → Ethernet → Configuration Web server → Meas. val. without login
Direct access code: 470009-000

Description Allow access to current measured values without logging in.
URL: http:\\<ip>\iv

Options Yes, No

Factory setting Yes

"Authentication" submenu

Navigation Expert → Communication → Ethernet → Configuration Web server → Authentication

Description Set the passwords for the different users who can access the device via the web server.
Only relevant if the device is not protected by user administration.

	Operator	Admin	Service
Measured value display	Yes	Yes	Yes
Display instrument health status	Yes	Yes	Yes
Configuration	No	Yes	Yes
Configuration incl. service parameter	No	No	Yes

	Operator	Admin	Service
Update firmware	No	Yes	Yes
WebDAV	Yes	Yes	Yes

Change the following passwords during commissioning.

Operator

ID

Navigation Expert → Communication → Ethernet → Configuration Web server → Authentication → ID
Direct access code: 470104-000

Description ID required in order to access the device. Pay attention to case-sensitivity.
Cannot be edited.

Factory setting operator

Password

Navigation Expert → Communication → Ethernet → Configuration Web server → Authentication → Password
Direct access code: 470105-000

Description Enter the password for this user account.
Pay attention to case-sensitivity.

User entry Text (max. 12 characters)

Factory setting operator

Administrator

ID

Navigation Expert → Communication → Ethernet → Configuration Web server → Authentication → ID
Direct access code: 470101-000

Description ID required in order to access the device. Pay attention to case-sensitivity.
Cannot be edited.

Factory setting admin

Password

Navigation Expert → Communication → Ethernet → Configuration Web server → Authentication → Password
Direct access code: 470102-000

Description Enter the password for this user account.
Pay attention to case-sensitivity.

User entry Text (max. 12 characters)

Factory setting admin

Service

ID

Navigation Expert → Communication → Ethernet → Configuration Web server → Authentication → ID
Direct access code: 470107-000

Description ID required in order to access the device. Pay attention to case-sensitivity
Cannot be edited.

Factory setting service

Password

Navigation Expert → Communication → Ethernet → Configuration Web server → Authentication → Password
Direct access code: 470108-000

Description Enter the password for this user account.
Pay attention to case-sensitivity.

User entry Text (max. 12 characters)

Factory setting service

"Timeouts" submenu

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts

Description Timeouts for the web server. Only change settings if slow network connections are causing transmission problems.

The settings are only adopted if the browser has been restarted or a new tab opened.
Caution: Settings should only be changed by experts.

Connection quality

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Connection quality
Direct access code: 470200-000

Description Configuration of typical timeout values for the web server connection.

The default values can be changed if necessary.

Options Please select, Local network (LAN/WLAN), Wireless/mobile (fast connect.), Wireless/mobile (slow connect)

Factory setting Please select

Get timeout

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Get timeout
Direct access code: 470201-000

Description Maximum time to load a new page before the browser ends the connection.

User entry 5 to 999 s

Factory setting 25

Set timeout

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Set timeout
Direct access code: 470202-000

Description Maximum time to write a value or execute an action before the browser ends the connection.

User entry 5 to 999 s

Factory setting 5

Put timeout

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Put timeout
Direct access code: 470203-000

Description Maximum time to transmit files to or from the device before the browser ends the connection.

User entry 5 to 999 s

Factory setting 240

Ping interval

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Ping interval
Direct access code: 470204-000

Description Interval in which the browser checks device reachability.

The check is switched off if 0 s is set. This is for diagnostic purposes only and should not be set!

User entry 0 to 999 s

Factory setting 10

Ping timeout

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Ping timeout
Direct access code: 470205-000

Description Time in which the device must respond before the browser ends the connection.

User entry 5 to 99 s

Factory setting 15

Ping retry

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Ping retry
Direct access code: 470206-000

Description Number of retries if the device does not respond.

User entry 0 to 5

Factory setting 0

Poll timeout

Navigation Expert → Communication → Ethernet → Configuration Web server → Timeouts → Poll timeout
Direct access code: 470207-000

Description Maximum permitted time to refresh the website.

User entry 5 to 99 s

Factory setting 5

"HART" submenu

Navigation Expert → Communication → HART

Description Specify the values that should be read out via HART.

Master type

Navigation Expert → Communication → HART → Master type
Direct access code: 550010-000

Description Select HART master type, usually "Primary". Select "Secondary" if another device (e.g., a PLC) is already operating as the primary master.

Options Primary, Secondary

Factory setting Primary

Attempts on error

Navigation Expert → Communication → HART → Attempts on error
Direct access code: 550011-000

Description Number of attempts to establish HART communication before a communication error is issued.

User entry 0 to 99 s

Factory setting 3

Fault mode

Navigation Expert → Communication → HART → Fault mode
Direct access code: 550013-000

Description If HART communication is disrupted, the primary process variable (PV) can be calculated if a valid current is present.

This function is not possible in Multidrop mode.
Lower/upper range limit must be correctly configured.

Options PV rendered invalid, Calculate PV based on current

Factory setting PV rendered invalid

Add value

Navigation Expert → Communication → HART → Add value
Direct access code: 550300-000

Description A value read from a connected HART device is added.

Options No, Yes

Factory setting No

Delete value

Navigation Expert → Communication → HART → Delete value
Direct access code: 550301-000

Description Deletes a process value from the list.

Options No, Value x

Factory setting No

"Value x" submenu

Navigation Expert → Communication → HART → Value x

Description Specify the value that should be read out via HART.
Note: This value must then be assigned to a channel for universal inputs.

Connection

Navigation Expert → Communication → HART → Value x → Connection
Direct access code: 550000-0xx

Description Select the physical channel to which the HART device is connected and from which you wish to query the value.

Options Switched off, Channel x

Factory setting Switched off

Device address

Navigation Expert → Communication → HART → Value x → Device address
Direct access code: 550001-0xx

Description Enter the device address of the HART device.

Note: The entered device address must match the address set in the HART device (polling address; HART address).

User entry 0 to 62

Factory setting 0

Process variable

Navigation Expert → Communication → HART → Value x → Process variable
Direct access code: 550002-0xx

Description Select the process variable that should be requested.

Options Primary process variable (PV), Secondary process variable (SV), Third process variable (TV), Fourth process variable (QV)

Factory setting Primary process variable (PV)

Channel ident.

Navigation Expert → Communication → HART → Value x → Channel ident.
Direct access code: 550003-0xx

Description Designation of the measuring point connected to this input.

User entry Text (max. 16 characters)

Factory setting Value x

"Serial interface" submenu

Navigation Expert → Communication → Serial interface

Description Contains the settings required if you are using the RS232 or RS485 interface of the device.

Type

Navigation Expert → Communication → Serial interface → Type
Direct access code: 150100-000

Description Configure how the serial interface is used. Pay attention to the terminal assignment.

Options RS232, RS485, Debug (only for service purposes)

Factory setting RS232

Protocol

Navigation Expert → Communication → Serial interface → Protocol
Direct access code: 150105-000

Description Define the serial interface protocol.
Note: The device automatically disables incompatible settings.

Options PC software, Printer, Modbus Slave (only if type = RS485), Modbus Master (only if type = RS485)

Factory setting PC software

Baud rate

Navigation Expert → Communication → Serial interface → Baud rate
Direct access code: 150101-000

Description Transmission speed ("Baud rate") - must be the same as the settings for the PC software.

Options 9600, 19200, 38400, 57600, 115200

Factory setting 19200

Parity

Navigation Expert → Communication → Serial interface → Parity
Direct access code: 150103-000

Description Parity
Only visible if protocol ≠ PC software

Options None, Even, Odd

Factory setting None

Stop bits

Navigation Expert → Communication → Serial interface → Stop bits
Direct access code: 150104-000

Description Stop bits
Only visible if protocol ≠ PC software

Options 1, 2

Factory setting 1

Device address

Navigation Expert → Communication → Serial interface → Device address
Direct access code: 150102-000

Description Every device operated using RS232/RS485 must have an individual address (00-30).
Only visible if type = RS485

User entry 0 to 30

Factory setting 0

"Modbus Slave" submenu (option)

Navigation Expert → Communication → Modbus Slave

Description Configure the Modbus settings for the device.

Detailed descriptions of this device option can be found in the associated documentation.

Modbus

Navigation Expert → Communication → Modbus Slave → Modbus
Direct access code: 480000-000

Description Specify the physical interface to be used.

Options Not used, RS485, Ethernet

Factory setting Not used

Device address

Navigation Expert → Communication → Modbus Slave → Device address
Direct access code: 480001-000

Description Enter the device address at which this device can be accessed on the bus.
Only visible if Modbus = RS485

User entry 1 to 247

Factory setting 1

Port

Navigation Expert → Communication → Modbus Slave → Port
Direct access code: 480004-000

Description Port via which the Modbus protocol can be activated.
Only visible if Modbus = Ethernet

User entry Number (max. 5 digits)

Factory setting 502

"Serial interface" submenu

Navigation Expert → Communication → Modbus Slave → Serial interface

Description Contains settings for the serial interface.
Only visible if Modbus = RS485

Baud rate

Navigation Expert → Communication → Modbus Slave → Serial interface → Baud rate
Direct access code: 150101-000

Description Transmission speed ("Baud rate") - must be the same as the settings for the PC software.
Only visible if Modbus = RS485

Options 9600, 19200, 38400, 57600, 115200

Factory setting 19200

Parity

Navigation Expert → Communication → Modbus Slave → Serial interface → Parity
Direct access code: 150103-000

Description Parity
Only visible if Modbus = RS485

Options None, Even, Odd

Factory setting None

Stop bits

Navigation Expert → Communication → Modbus Slave → Serial interface → Stop bits
Direct access code: 150104-000

Description Parity
Only visible if Modbus = RS485 and parity = None

Options 1, 2

Factory setting 1

"Modbus Master" submenu

Navigation Expert → Communication → Modbus Master

Description Configure the Modbus settings for the device.

Detailed descriptions of this device option can be found in the associated documentation.

Modbus

Navigation Expert → Communication → Modbus Master → Modbus
Direct access code: 480050-000

Description Specify the physical interface to be used.

Options Not used, RS485, Ethernet

Factory setting Not used

Scan cycle

Navigation Expert → Communication → Modbus Master → Scan cycle
Direct access code: 480053-000

Description Cycle time for scanning the terminals.
Only visible if Modbus = RS485

Options Off, 1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min

Factory setting 1 s

Response timeout

Navigation Expert → Communication → Modbus Master → Response timeout
Direct access code: 480054-000

Description Time within which the system must receive a response from the terminal.
Only visible if Modbus = RS485

Options Off, 1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min

Factory setting 1 s

Register per command

Navigation Expert → Communication → Modbus Master → Register per command
Direct access code: 480055-000

Description Maximum number of registers that can be read out per command.

User entry 3 to 125

Factory setting 20

Connection attempts

Navigation Expert → Communication → Modbus Master → Connection attempts
Direct access code: 480056-000

Description Number of repeated connection attempts until a slave signals a timeout.
Only visible if Modbus = RS485

User entry 1 to 10

Factory setting 1

Command distribution

Navigation Expert → Communication → Modbus Master → Command distribution
Direct access code: 480057-000

Description Distributed over the scan cycle: The commands are uniformly distributed over the scan cycle.
At the start of the scan cycle: The commands are sent at the start of the scan cycle with a pause between commands. A new scan commences when the scan cycle ends.
Continuously: The commands are sent continuously with only a pause between commands. The scan cycle is not taken into account.
Only visible if Modbus = RS485

Options Distributed over the scan cycle, At the start of the scan cycle, Continuously

Factory setting Distributed over the scan cycle

Pause between commands

Navigation Expert → Communication → Modbus Master → Pause between commands
Direct access code: 480058-000

Description Time system waits between a response and a new command to be sent.
Only visible if Modbus = RS485

User entry 5 to 600 000 ms

Factory setting 10 ms

"Serial interface" submenu

Navigation Expert → Communication → Modbus Master → Serial interface

Description Contains the settings required if you are using the device's RS485 interface.

Baud rate

Navigation Expert → Communication → Modbus Master → Serial interface → Baud rate
Direct access code: 150101-000

Description Transmission speed ("Baud rate") - must be the same as the settings for the PC software.
Only visible if Modbus = RS485

Options 9600, 19200, 38400, 57600, 115200

Factory setting 19200

Parity

Navigation Expert → Communication → Modbus Master → Serial interface → Parity
Direct access code: 150103-000

Description Parity
Only visible if Modbus = RS485

Options None, Even, Odd

Factory setting None

Stop bits

Navigation Expert → Communication → Modbus Master → Serial interface → Stop bits
Direct access code: 150104-000

Description Parity
Only visible if Modbus = RS485 and parity = None

Options 1, 2

Factory setting 1

"Profibus DP" submenu (option)

Navigation Expert → Communication → Profibus DP

Description Configure the Profibus DP settings for the device.

Detailed descriptions of this device option can be found in the associated documentation.

Slave address

Navigation Expert → Communication → Profibus DP → Slave address
Direct access code: 480100-000

Description Enter the device address at which this device can be accessed on the bus.

User entry 1 to 125

Factory setting 1

Show status

Navigation Expert → Communication → Profibus DP → Show status
Direct access code: 480101-000

Description The status is shown on the display in addition to the measured value. Status changes are saved in the event logbook.

Options No, Yes

Factory setting No

"Slot x" submenu

Navigation Expert → Communication → Profibus DP → Slot x

Description Slot assignment of the channels.
Settings only required if the device is connected to a PLC via Profibus DP.

Master In/Out

Navigation
Expert → Communication → Profibus DP → Slot x → Master In/Out
Direct access code: 480110-0xx
Examples: Slot 1: 480110-000; Slot 16: 480110-015

Description
Selection of the modules that can be selected in the PLC.
AI/AO: Transmission of a floating point number + status.
DI/DO: Transmission of digital statuses.
AI/DI: To the PLC.
AO/DO: From the PLC.

Options
Not used, 1 AI-PA: 5 Byte, 2 AI-PA: 10 Byte, 3 AI-PA: 15 Byte, 4 AI-PA: 10 Word, 8 DI: 2 Byte, 1 AO-PA: 5 Byte, 2 AO-PA: 10 Byte, 3 AO-PA: 15 Byte, 4 AO-PA: 10 Word, 8 DO: 2 Byte

Factory setting
Not used

Byte x...y

Navigation
Expert → Communication → Profibus DP → Slot x → Byte x...y
Direct access code, byte 0..4: 480111-0xx
Direct access code, byte 5..9: 480113-0xx
Direct access code, byte 10..14: 480115-0xx
Direct access code, byte 15..19: 480117-0xx
Examples: Slot 1, byte 0..4: 480111-000; Slot 16: 480111-015

Description
Select the value that should be used within the module from this address offset.

Options
Switched off, Universal input x, Digital input x, Maths x, Set point x, Relay x
Note: All active inputs are available for selection.

Factory setting
Switched off

-->

Navigation
Expert → Communication → Profibus DP → Slot x → -->
Direct access code, byte 0..4 -->: 480112-0xx
Direct access code, byte 5..9 -->: 480114-0xx
Direct access code, byte 10..14 -->: 480116-0xx
Direct access code, byte 15..19 -->: 480118-0xx
Examples: Slot 1, byte 0..4 -->: 480112-000; Slot 16 -->: 480112-015

Description
Data type of the value to be transmitted.
Note: Item only visible if a digital input with the function Operational time, Event +operation time or Quantity from time has been selected under "Byte x..y".

Options
Not used, Instantaneous value, State, Totalizer, Total operational time

Factory setting
Not used

Bit 0.0–0.7

Navigation
Expert → Communication → Profibus DP → Slot x → Bit 0.0 ... 0.7
Direct access code, bit 0.0: 480111-0xx
Direct access code, bit 0.1: 480113-0xx
Direct access code, bit 0.2: 480115-0xx
Direct access code, bit 0.3: 480117-0xx
Direct access code, bit 0.4: 480119-0xx
Direct access code, bit 0.5: 480120-0xx
Direct access code, bit 0.6: 480121-0xx
Direct access code, bit 0.7: 480122-0xx
Examples: Slot 1, bit 0.0: 480111-000; Slot 16: 480111-015

Description
Select the value that should be used within the module from this address offset.

Options
Switched off, Universal input x, Digital input x, Maths x, Set point x, Relay x
All active inputs are available for selection.

Factory setting
Switched off

17.1.5 "Application" submenu

Define various application-specific settings (e.g., group settings, limit values etc.).

"Maths - Maths x" submenu
(Online configuration)

Navigation
Expert → Application → Maths → Maths x

Description
Configuration of the mathematics channels.

x = place holder for selected mathematics channel

Function

Navigation
Expert → Application → Maths → Maths x → Function
Direct access code: 400000-000
Examples: Maths 1: 400000-000; Maths 4: 400000-003

Description
Switch mathematics channel on or off.

Options
Switched off, Formula editor
Included with energy package (option): Energy calculation, mass calculation, density calculation, calculation of enthalpy, mass calculation DP flow

Factory setting
Switched off

Channel ident.

Navigation Expert → Application → Maths → Maths x → Channel ident.
Direct access code: 400001-000
Examples: Maths 1: 400001-000; Maths 4: 400001-003

Description Measuring point name (e.g., "Pump") or description of the function performed with this input (e.g., "Fault message").

User entry Text (max. 16 characters)

Factory setting Maths x

Formula

Navigation Expert → Application → Maths → Maths x → Formula
Direct access code: 400002-000
Examples: Maths 1: 400002-000; Maths 4: 400002-003

Description Enter the desired calculation formula.
The formula can be any combination of arithmetic calculations and logical operations.
Analog, digital or already active mathematics channels can be used.
Description of formula editor → 218
Only visible if function = Formula editor

User entry Formula

Application

Navigation Expert → Application → Maths → Maths x → Application
Direct access code: 400100-0xx
Examples: Maths 1: 400100-000; Maths 4: 400100-003

Description Select application.
Only visible with energy package (option) and selected energy function.

Options Water heat quantity, Water heat difference, Steam heat quantity, Steam heat difference, Water/glycol heat difference, Water DP flow, Steam DP flow, Liquids DP flow, Gas DP flow

Factory setting Water heat quantity or Water DP flow (depends on selected function)

Device type

Navigation Expert → Application → Maths → Maths x → Device type
Direct access code: 400122-0xx
Examples: Maths 1: 400122-000; Maths 4: 400122-003

Description Configure the transmitter type used.
Only visible with energy package (option) and function = Mass calculation DP flow.

Options Orifice (corner), Orifice (D/D2), Orifice (flange), Nozzle (ISA1932), Nozzle (l.radius), Venturi nozzle, Venturi tbe, cast, Venturi tbe, bear., Venturi tbe, steel, V-cone, Pitot tube, Gilflo

Factory setting Orifice (corner)

Flow

Navigation Expert → Application → Maths → Maths x → Flow
Direct access code: 400101-0xx
Examples: Maths 1: 400101-000; Maths 4: 400101-003

Description Select the flow input.
Only visible with energy package (option) and function = Energy or Mass calculation.

Options Switched off, Universal input x, Maths x
All active inputs are available for selection.

Factory setting Switched off

Engineering unit

Navigation Expert → Application → Maths → Maths x → Engineering unit
Direct access code: 400102-0xx
Examples: Maths 1: 400102-000; Maths 4: 400102-003

Description Select the unit that was used for scaling the selected flow input.
Only visible with energy package (option) and selected flow input.

Options m^3/h, l/h, ft^3/m, ft^3/h, gpm, gal/h, kg/h, t/h, ton/h, lb/h

Factory setting m^3/h

Flow installation point

Navigation Expert → Application → Maths → Maths x → Flow installation point
Direct access code: 400103-0xx
Examples: Maths 1: 400103-000; Maths 4: 400103-003

Description Specify where the flow sensor is installed. This is important so that the correct temperature is used for density calculation.
Only visible with energy package (option) and active flow input.

Options Steam, Water, Warm, Cold (depending on the selected application)

Factory setting Steam/warm (depends on selected application)

Pressure

Navigation Expert → Application → Maths → Maths x → Pressure
Direct access code: 400104-0xx
Examples: Maths 1: 400104-000; Maths 4: 400104-003

Description Select the pressure input. If you select "deactivated", the saturated steam condition is calculated based on the temperature.
Only visible with energy package (option) and selected steam application.

Options Switched off, Universal input x, Maths x
All active inputs are available for selection.

Factory setting Switched off

Engineering unit

Navigation Expert → Application → Maths → Maths x → Engineering unit
Direct access code: 400105-0xx
Examples: Maths 1: 400105-000; Maths 4: 400105-003

Description Select the unit that was used for scaling the selected pressure input.
Only visible with energy package (option) and selected steam application.
Only visible with energy packet (option) and active pressure input.

Options bar (a), psi (a), MPa (a), inH20 (a), bar (g), psi (g), MPa (g), inH20 (g)

Factory setting bar (a)

Temperature (water/steam/warm)

Navigation Expert → Application → Maths → Maths x → Temperature (water/steam/warm)
Direct access code: 400106-0xx
Examples: Maths 1: 400106-000; Maths 4: 400106-003

Description Select the temperature input used to measure the warm side (temperature in the steam line). In steam applications, if you select "deactivated" the saturated steam condition is calculated based on the temperature.
Only visible with energy package (option) and selected energy function.

Options Switched off, Universal input x, Maths x
All active inputs are available for selection.

Factory setting Switched off

Temperature (steam/cold)

Navigation Expert → Application → Maths → Maths x → Temperature (steam/cold)
Direct access code: 400107-0xx
Examples: Maths 1: 400107-000; Maths 4: 400107-003

Description Select the temperature input used to measure the cold side (temperature in the condensate line).
Only visible with energy package (option) and selected heat difference measurement.

Options Switched off, Universal input x, Maths x
All active inputs are available for selection.

Factory setting Switched off

Engineering unit

Navigation Expert → Application → Maths → Maths x → Engineering unit
Direct access code: 400108-0xx
Examples: Maths 1: 400108-000; Maths 4: 400108-003

Description Select the unit that was used for scaling the selected pressure input.
Only visible with energy package (option) and selected energy function.

Options °C, °F, K

Factory setting °C

Medium

Navigation Expert → Application → Maths → Maths x → Medium
Direct access code: 400110-0xx
Examples: Maths 1: 400110-000; Maths 4: 400110-003

Description Select a cooling medium. If the medium used is not in the list, select ethylene glycol/ propylene glycol.
Only visible with energy package (option) and application = Water/glycol heat difference.

Options Ethylene glycol, Antifrogen N, Glykosol N, Propylene glycol

Factory setting Ethylene-glycol

Water/glycol concentration

Navigation Expert → Application → Maths → Maths x → Water/glycol concentration
Direct access code: 400109-0xx
Examples: Maths 1: 400109-000; Maths 4: 400109-003

Description Concentration of the water/glycol mixture in vol % (0-60 %).
Only visible with energy package (option) and application = Water/glycol heat difference.

User entry 0 to 60 %

Factory setting 20 %

The result is

Navigation Expert → Application → Maths → Maths x → The result is
Direct access code: 400003-000
Examples: Maths 1: 400003-000; Maths 4: 400003-003

Description Configure which data type the calculation returns. This setting affects how the channel saves and is displayed.
If you add 2 analog channels, for example, the result is an "instantaneous value".
If 2 channels are linked logically, (digital 1 AND digital 2), the result is a "state" (on/off).
Instantaneous value: If, for example, two analog channels are added (AI(1;1)+AI(1;2)), the result is an instantaneous value.
State: The state/status of an individual analog input can be output as the result. A relay can also be actuated as a result.
Counter: If, for example, two counters from digital inputs are added (DI(3;1)+DI(3;5)), the result is a counter.
Operating time from status: The status (logical "1" or "0") of one or more digital inputs that are connected by addition can be analyzed. If the result of the calculation is not equal to 0, the counter for the operating time starts. The time is increased by 0.1 s every 100 ms.
Operating time from total: If several digital inputs that are configured as "operational time" are added together, the result is the total of all the individual operating times.
Control input: The function corresponds to a digital input that has been configured as a control input.

Options Instantaneous value, State, Counter, Operating time from status, Operating time from total, Control input, Efficiency

Factory setting Instantaneous value

Plot type

Navigation
Expert → Application → Maths → Maths x → Plot type
Direct access code: 400015-000
Examples: Maths 1: 400015-000; Maths 4: 400015-003

Description
The mathematics channels are recalculated every 100 ms.
Depending on the save cycle, the selected data is determined/saved from the calculated values.

Options
Instantaneous value, Average, Minimum value, Maximum value, Minimum + Maximum, Counter, Current value + Counter

Factory setting
Average

Engineering unit

Navigation
Expert → Application → Maths → Maths x → Engineering unit
Direct access code: 400004-000
Examples: Maths 1: 400004-000; Maths 4: 400004-003

Description
Unit of the calculated value.
Only visible if the result is = Instantaneous value, Counter or Efficiency

User entry
Text (max. 6 characters)

Engineering unit

Navigation
Expert → Application → Maths → Maths x → Engineering unit
Direct access code: 400111-000
Examples: Maths 1: 400111-000; Maths 4: 400111-003

Description
Unit of the calculated value.
Only visible with energy package (option) and selected energy function.

Options
kW, MW, GJ/h, kBtu/m, kBtu/h, MBtu/h, ther/m, ther/h, ton, RT, kg/h, t/h, lbs/h, ton/h, kg/m^3, lb/ft^3, kJ/kg, Btu/lb

Factory setting
(Depends on the selected function)

Decimal point

Navigation Expert → Application → Maths → Maths x → Decimal point
Direct access code: 400005-000
Examples: Maths 1: 400005-000; Maths 4: 400005-003

Description Number of places after decimal point for the display.
Only visible if function = Formula editor, Energy calculation, Mass calculation, Density calculation, Calculation of enthalpy and the result is = Instantaneous value, Counter or Efficiency.

Options None, One (X.Y), Two (X.YY), Three (X.YYY), Four (X.YYYY), Five (X.YYYYY)

Factory setting One (X.Y)

Action

Navigation Expert → Application → Maths → Maths x → Action
Direct access code: 400006-000
Examples: Maths 1: 400006-000; Maths 4: 400006-003

Description Set up the function of the control input.
Only visible if the result is = Control input

Action	Description
Start/stop recording	The device only saves data as long as a high signal is present
Screensaver on	Switches backlighting/display off, low = off, high = on
Lock setup	The user can only change the setup if a low signal is present
Time synchronization	If a high signal is applied, the device rounds the system time up/down (only for Low→ High change): 0 to 29 → round down; 30 to 59 → round up
Change group	The display switches to the next active group in the event of a Low→High change.
Set point monitoring on/off	The entire set point monitoring function of the device can be switched on (for "High") or switched off (for "Low").
Individual LV on/off	Monitoring for a selected limit value can be switched on (for "High") or switched off (for "Low").
Block keyboard/navigator	The device can only be operated if a low signal is present. Otherwise, all key activation and navigator actions are discarded.
Start/stop analysis 1–4	Starts/ends one of the max. 4 external analyses (the analysis runs only as long as the signal is high). Measured value acquisition for the graphic display continues. Batches are also started/ended with this function. Note: This function is not available in the case of batch and control input via a maths channel.
Reset batch number x (option)	Resets the automatically generated batch number (1..x) to 0 (in the event of a LowHigh change).
Batch x limit values on/off (option)	Switches the limit values of batch x on/off. The limit values relating to the batch are determined based on the group settings (via the channels assigned to the batch). If a channel is assigned to several batches, the limit values for this channel are not disabled.

Options Switched off, Start/stop recording, Screensaver on, Lock setup, Time synchronization, Change group, Set point monitoring on/off, Individual LV on/off, Block keyboard/ navigator, Start/stop analysis x, Reset batch no. x, Batch x limits on/off

Factory setting Switched off

Set point

Navigation Expert → Application → Maths → Maths x → Set point
Direct access code: 400019-000
Examples: Maths 1: 400019-000; Maths 4: 400019-003

Description Select the limit value which should be switched on/off by means of this control input.
Only visible if action = Individual LV on/off

Options Switched off, Set point x

Factory setting Switched off

Switches relay

Navigation Expert → Application → Maths → Maths x → Switches relay
Direct access code: 400007-000
Examples: Maths 1: 400007-000; Maths 4: 400007-003

Description Switches the relevant relay when the digital input is low/high.
Only visible if the result is = Control input or State

Options Not used, Relay x
All the available relays are displayed.

Factory setting Not used

Description 'H'

Navigation Expert → Application → Maths → Maths x → Description 'H'
Direct access code: 400008-00x
Examples: Maths 1: 400008-000; Maths 4: 400008-003

Description Condition description when the digital input is active. This text is shown on the display and saved to memory.
Only visible if the result is = Control input or State

User entry Text (max. 6 characters)

Factory setting On

Description 'L'

Navigation Expert → Application → Maths → Maths x → Description 'L'
Direct access code: 400009-00x
Examples: Maths 1: 400009-000; Maths 4: 400009-003

Description Condition description when the digital input is not active. This text is shown on the display and saved to memory.
Only visible if the result is = Control input or State

User entry Text (max. 6 characters)

Factory setting Off

Save event

Navigation Expert → Application → Maths → Maths x → Save event
Direct access code: 400010-00x
Examples: Maths 1: 400010-000; Maths 4: 400010-003

Description Determines whether the condition change from low to high or high to low is stored in the event logbook.

Requires higher memory capacity.

Only visible if the result is = Control input or State

Options No, Yes, only "On" message

Factory setting Yes

Event message

Navigation Expert → Application → Maths → Maths x → Event message
Direct access code: 400018-00x
Examples: Maths 1: 400018-000; Maths 4: 400018-003

Description "Do not acknowledge": No message is shown if the state of the mathematics channel changes.
"Acknowledge": A message window is shown on the screen which has to be acknowledged by operating a push button.
Only visible if the result is = Control input or State

Note: In the case of the DIN rail version, the message can only be acknowledged via the web server!

Options Do not acknowledge, Acknowledge

Factory setting Do not acknowledge

Event text L->H

Navigation Expert → Application → Maths → Maths x → Event text L->H
Direct access code: 400011-00x
Examples: Maths 1: 400011-000; Maths 4: 400011-003

Description Description of condition change from low to high. Event text is stored (e.g., start filling).
Only visible if the result is = Control input or State

User entry Text (max. 22 characters)

Event text H->L

Navigation Expert → Application → Maths → Maths x → Event text H->L
Direct access code: 400012-00x
Examples: Maths 1: 400012-000; Maths 4: 400012-003

Description Description of condition change from high to low. Event text is stored (e.g., stop filling).
Only visible if the result is = Control input or State

User entry Text (max. 22 characters)

Record duration

Navigation Expert → Application → Maths → Maths x → Record duration
Direct access code: 400013-00x
Examples: Maths 1: 400013-000; Maths 4: 400013-003

Description The duration between "On" and "Off" can be recorded. The duration is appended to the "Off" event text (<hhhh>h<mm>:<ss>).
Power failure times do not affect the duration. If the digital channel was "on" before the power failure and is still "on" after the power failure, the duration continues.
Only visible if the result is = Control input or State

Options No, Yes

Factory setting No

Zoom start

Navigation Expert → Application → Maths → Maths x → Zoom start
Direct access code: 400016-00x
Examples: Maths 1: 400016-000; Maths 4: 400016-003

Description If the whole value range is not used, you can configure the lower value of the required range here. The zoom has no effect on saving.
Only visible if the result is = Instantaneous value

User entry Number (max. 8 digits)

Factory setting 0

Zoom end

Navigation Expert → Application → Maths → Maths x → Zoom end
Direct access code: 400017-00x
Examples: Maths 1: 400017-000; Maths 4: 400017-003

Description Like "Zoom start". Enter the upper value of the required range.
Only visible if the result is = Instantaneous value

User entry Number (max. 8 digits)

Factory setting 100

Totalizer
(Online configuration)

Navigation Expert → Application → Maths → Maths x → Totalizer
Direct access code: 400014-00x
Examples: Maths 1: 400014-000; Maths 4: 400014-003

Description Initial setting for the totalizer. Useful when continuing measurements recorded to date with an (electro)-mechanical counter.
Only visible if the result is = Counter, Operating time from status or Operating time from total

User entry Number (max. 15 digits)

Factory setting 0

Formula editor

Enter the desired calculation formula.

The formula can be any combination of arithmetic calculations and logical operations.

Analog, digital or already active mathematics channels can be used.

Formula editor

Navigation

Expert → Application → Maths → Maths x → Formula
Direct access code: 400002-000

x = place holder for selected mathematics channel

A text field with the formula currently used appears. If the field is empty a formula has not yet been defined for the mathematics channel.

Description

Individual channels can be mathematically linked and calculated with functions. The mathematics channels calculated in this way are treated as "real" channels, regardless of whether they are connected conventionally or via fieldbus. Enter the desired calculation formula.
The formula can be any combination of arithmetic calculations and logical operations. Analog and digital channels can be used, as can mathematics channels that are already active.
A formula with up to 200 characters can be created using this editor. If the formula is finished, click OK to close the editor and accept the formula entered. The common entry and arithmetic operators and inputs are described in detail in the following sections.

Inputs

Inputs are described in the formula using the following syntax:

Input type (signal type; channel number)

Type of input	Description
AI	Analog inputs
DI	Digital inputs
MI	Mathematics inputs

Signal type	Description
1	Instantaneous value (measured value)
2	State
3	Counter/operating time
5	Validity: The validity of an analog channel or a mathematics channel is relayed. The relayed value of the function is 0 in the event of: ▪ Cable open circuit ▪ Invalid measured value ▪ Sensor error ▪ Input signal too high/low ▪ Error value The relayed value of the function is 1 in the event of: Measured value OK, even if the limit value is breached
6	Delta count
7 to 10	Analysis 1 to 4

Signal type	Description
11	Totalizer
12	Duration

Not all signal types are available for each input type. These depend on the respective device options.

Channel number:

Analog channel 1 = 1, analog channel 2 = 2, digital channel 1 = 1, ...

Examples:

DI(2;4)	State of digital channel 4
AI(1;1)	Instantaneous value of analog channel 1

Status of a limit value:

LMT (type, limit number)

Type	Description
1	"Instantaneous value": Currently set limit value
2	"State": The function returns the status of a limit value The result is 1 if the limit value is violated. The result is 0 if ▪ The limit value is not violated ▪ The limit value is not switched on ▪ Limit value monitoring is switched off (e.g., per control input)

Examples:

LMT (1;1)	Instantaneous value of limit value 1
LMT (2;3)	State of limit value 3

Priority of operators/functions

The formula is processed based on universally applicable mathematics rules:
- Parentheses first
- Exponents before multiplication or division
- Multiplication or division before addition or subtraction
- Calculate from left to right

Operators

Arithmetic operators:

Operator	Function
+	Addition
-	Subtraction negative sign
*	Multiplication
/	Division
%	Modulo (remainder of division x/y), see function "mod"
^	x to the power of y

Relational operators:

Operator	Function
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to
=	Equal to
<>	Not equal to

Logical operators:

Function	Syntax	Description	Example
||	Value1 || Value2	Logical "or" (see also function "or")	DI(2;1) || DI(2;2)
&&	Value1 && Value2	Logical "and" (see also function "and")	DI(2;1) && DI(2;2)

Functions

Standard functions:

Function	Syntax	Description	Example
ln	ln(number)	Returns the natural logarithm of a number. Natural logarithms are based on a constant e (2.71828182845904). For values ≤ 0, the result is undefined. The device continues with 0	ln(86) = 4.454347
log	log(number)	Calculates the logarithm of the argument for base 10. For values ≤ 0 the result is undefined. The device continues with 0.	log(10) = 1
exp	exp(number)	Exponentiates the base e with the number defined as the argument. The constant e is the basis of the natural logarithm and has the value 2.71828182845904.	exp(2.00) = 7.389056
abs	abs(number)	Returns the absolute value of a number. The absolute value of a number is the number without its algebraic sign.	abs(-1.23) = 1.23
pi	pi()	Returns the value of the number PI (3.14159265358979323846264)	
sqrt	sqrt(number)	sqrt calculates the positive square root of the argument "Number". The result is undefined for negative values. The device continues with 0.	sqrt(4) = 2

Function	Syntax	Description	Example
mod	mod(number; divisor)	Returns the remainder of a division. The result has the same algebraic sign as the divisor. If the divisor has the value 0, the result is undefined. The device continues with 0.	mod(5;2) = 1
rnd	rnd(number; number_digits)	Rounds a number to a certain number of decimal places. "Number" is the number to which you wish to round up/down. "Number_digits" indicates to how many decimal places you wish to round the number up/down. **Notes:** ▪ If "Number_digits" is greater than 0 (zero), the number is rounded to the specified number of decimal places. ▪ If "Number_digits" is equal to 0, the number is rounded to the next whole number. ▪ If "Number_digits" is less than 0, the part of the number to the left of the decimal separator is rounded.	rnd(2.15;1) = 2.2 rnd(2.149;1) = 2.1 rnd(-1.475;2) = -1.48 rnd(-1.473;2) = -1.47 rnd(21.5;-1) = 20 rnd(5.5;-2) = 10 rnd(5.5;-3) = 0

Trigonometric functions:

Function	Syntax	Description	Example
rad	rad(number)	Conversion from degrees to radian	rad(270) = 4.712389
degrees	degrees (number)	Conversion from radian to degrees	degrees(pi()) = 180

The following functions expect an angle in the radian as the argument. If the angle lies in the degree, it must be converted to the radian by multiplying it with pi()/180. Alternatively, the function "rad" can be used:

Function	Syntax	Description	Example
sin	sin(number)	Returns the sine of a number	sin(pi()) -> sine of pi radian sin(30*pi()/180) -> sine of 30 degrees (0.5)
cos	cos(number)	Conversion from radian to degrees	degrees(pi()) = 180
tan	tan(number)	Returns the tangent of the argument	tan(0.785) = 0.99920

With the following functions the returned angle is specified in radian with a value between −pi/2 and +pi/2. If the result is to be expressed in degrees, the respective result must be multiplied by 180/pi() or the "Degrees" function used:

Function	Syntax	Description	Example
asin	asin(number)	Returns the arc sine or inverse sine of a number (inverse function). The arc sine expects a real argument in the range of -1 to +1. In the event of values outside this range, the device continues with 0.	arcsin(-0.5) = -0.5236 arcsin(-0.5)*180/pi() = -30°
acos	acos(number)	Returns the arc cosine or inverse cosine of a number (inverse function). The arc cosine expects a real argument in the range from -1 to +1. In the event of values outside this range, the device continues with 0.	arccos(-0.5) = 2.094395
atan	atan(number)	Returns the arc tangent or inverse tangent of a number (inverse function).	atan(1) = 0.785398

Logical functions:

Function	Syntax	Description	Example
if	if(check; then_value; otherwise_value)	"Check" is any value or expression; the result can be TRUE or FALSE. This argument can adopt any comparison calculation operator. "Then_value" is the value returned if "Check" is TRUE. "Otherwise_value" is the value returned if "Check" is FALSE.	if(x>10;1;0) If value x is greater than 10 the function returns 1, otherwise 0
or	or(true1;true2)	Returns TRUE if an argument is TRUE. Returns FALSE if all arguments are FALSE. Note: See also operator "||"	or(2>1;3>2) = true or(2<1;3>2) = true or(2<1;3<2) = false
and	and(true1;true2)	Returns TRUE if both arguments are TRUE. If one of the arguments is FALSE, this function returns the value FALSE Note: See also operator "&&"	and(2>1;3>2) = true and(2<1;3<2) = false
not	not(truth value)	Inverts the value of an argument. NOT can be used to specify that a value does not match a specific value.	not(false) = true

XX in the following functions stands for one of the inputs described under → 🖹 219. Range functions can only ever be executed via one input type.

Range functions:

Function	Syntax	Description	Example
sumXX	sumXX(Type;From;To)	Totals the values for the specified range of input signals. "Type": Signal type (see → 🖹 219)) "From": Channel number from which the values should be totaled (1 = channel 1) "To": Channel number to which the values should be totaled (1 = channel 1)	sumXX (1;2;5) = sum of all instantaneous values from channels 2 to 5
avgXX	avgXX(Type;From;To)	Calculates the average for the specified range of input signals.	avgXX(1;1;6)
minXX	minXX(Type;From;To)	Returns the minimum value for the specified range of input signals.	minXX(1;1;6)
maxXX	maxXX(Type;From;To)	Returns the maximum value for the specified range of input signals.	maxXX (1;1;6)

Date/time functions:

Function	Syntax	Description	Example
dow	dow()	Returns the current day of the week as a number between 1 and 7.	Sunday = 1 Monday = 2 Tuesday = 3 Wednesday = 4 Thursday = 5 Friday = 6 Saturday = 7
time	time()	Returns the current time in seconds.	00:00 = 0 s 12:00 = 43,200 s 23:59:59 = 86,399 s

Decimal separator

Both the decimal point and the decimal comma can be used in the formula editor. Thousand separators are not supported.

Check whether formula is valid or malfunctions

A formula is invalid if:
- The channels used are not switched on or are in the wrong operating mode (is not verified during formula entry as the channel could be switched on subsequently)
- It contains invalid characters/formulas/functions/operators
- Syntax errors (e.g., wrong number of parameters) occur in the formulas
- There are incorrect parentheses in the formula (number of open parentheses unequal to number of closed parentheses)
- Division is by zero
- A channel refers to itself (infinite recursion)

Invalid formulas are deactivated when the setup is accepted or the device is started.

Undetectable errors: wherever possible, errors in the formula are reported immediately during input. However, given the possible complexity of the formula entered (e.g., nested formulas), it is not possible to detect every error.

"DP flow" submenu (option "Energy package")

Navigation Expert → Application → Maths → Maths x → DP flow

Description Configuration of a flow measurement following the differential pressure process.
Only visible if function = Mass calculation DP flow

Differential pressure

Navigation Expert → Application → Maths → Maths x → DP flow → Differential pressure
Direct access code: 400115-00x
Examples: Maths 1: 400115-000; Maths 4: 400115-003

Description Select differential pressure input.

Options Switched off, Universal input x, Digital input x, Maths x
All active inputs are available for selection.

Factory setting Switched off

DP unit

Navigation Expert → Application → Maths → Maths x → DP flow → DP unit
Direct access code: 400116-00x
Examples: Maths 1: 400116-000; Maths 4: 400116-003

Description Unit of the differential pressure.

Options mbar, inH2O

Factory setting mbar

Diameter unit

Navigation Expert → Application → Maths → Maths x → DP flow → Diameter unit
Direct access code: 400118-00x
Examples: Maths 1: 400118-000; Maths 4: 400118-003

Description Unit of the internal diameter of the pipe.

Options mm, Inch

Factory setting mm

D at 20 °C

Navigation Expert → Application → Maths → Maths x → DP flow → D at 20 °C
Direct access code: 400119-00x
Examples: Maths 1: 400119-000; Maths 4: 400119-003

Description Internal pipe diameter (D) under design conditions at 20 °C/68 °F.

User entry Number (max. 8 characters)

Factory setting 100 (mm or inches)

d at 20 °C

Navigation Expert → Application → Maths → Maths x → DP flow → d at 20 °C
Direct access code: 400120-00x
Examples: Maths 1: 400120-000; Maths 4: 400120-003

Description Internal pipe diameter of the throttle (d) under design conditions at 20 °C/68 °F.

User entry Number (max. 8 characters)

Factory setting 70 (mm or inches)

K-factor

Navigation Expert → Application → Maths → Maths x → DP flow → K-factor
Direct access code: 400121-00x
Examples: Maths 1: 400121-000; Maths 4: 400121-003

Description Set the K-factor (blockage factor) for the pitot tube (see nameplate on the probe).
Only visible if type = Pitot tube

User entry Number (max. 8 characters)

Factory setting 0.6

Pipe material

Navigation Expert → Application → Maths → Maths x → DP flow → Pipe material
Direct access code: 400127-00x
Examples: Maths 1: 400127-000; Maths 4: 400127-003

Description Material of the pipe.

Options C-steel, stainless steel, 1.5415 / A182F1, 1.7335 / A182F12, 1.7380 / A182F22, 1.4922, 1.4401 / 316, 1.4404 / 316L, 1.4571 / 316Ti

Factory setting C-steel

Density

Navigation Expert → Application → Maths → Maths x → DP flow → Density
Direct access code: 400123-00x
Examples: Maths 1: 400123-000; Maths 4: 400123-003

Description Select the density input or mathematics channel, in which the density is calculated.
Only visible if application = Liquids DP Flow or Gas DP Flow

Options Switched off, Universal input x, Digital input x, Maths x
All active inputs are available for selection.

Factory setting Switched off

Density unit

Navigation Expert → Application → Maths → Maths x → DP flow → Density unit
Direct access code: 400124-00x
Examples: Maths 1: 400124-000; Maths 4: 400124-003

Description Select the density unit.
Only visible if application = Liquids DP Flow or Gas DP Flow

Options kg/m^3, lb/ft^3

Factory setting kg/m^3

Design density

Navigation Expert → Application → Maths → Maths x → DP flow → Design density
Direct access code: 400125-00x
Examples: Maths 1: 400125-000; Maths 4: 400125-003

Description Density under design conditions (at design pressure/temperature).
Only visible if type = V-Cone or Gilflo

User entry Number (max. 8 characters)

Factory setting 1000 (kg/m^3 or lb/ft^3)

Isentropic exponent

Navigation Expert → Application → Maths → Maths x → DP flow → Isentropic exponent
Direct access code: 400128-00x
Examples: Maths 1: 400128-000; Maths 4: 400128-003

Description Input of the kappa isentropic exponent. (Required in order to calculate the expansion number).
Only visible if application = Gas DP flow

User entry Number (max. 8 characters)

Factory setting 1.2

"Viscosity" submenu

Navigation Expert → Application → Maths → Maths x → DP flow → Viscosity

Description Input of the viscosity at two support points. (Needed to calculate the Reynolds number and flow coefficient).
Only visible if application = Liquids DP flow or Gas DP flow

Point 1

Temperature

Navigation Expert → Application → Maths → Maths x → DP flow → Viscosity → Temperature
Direct access code: 400130-00x
Examples: Maths 1: 400130-000; Maths 4: 400130-003

Description Temperature

User entry Number (max. 8 characters)

Factory setting 0

Viscosity

Navigation Expert → Application → Maths → Maths x → DP flow → Viscosity → Viscosity
Direct access code: 400131-00x
Examples: Maths 1: 400131-000; Maths 4: 400131-003

Description Viscosity at the specified temperature.

User entry Number (max. 8 characters)

Factory setting 1 cp

Point 2

Temperature

Navigation Expert → Application → Maths → Maths x → DP flow → Viscosity → Temperature
Direct access code: 400135-00x
Examples: Maths 1: 400135-000; Maths 4: 400135-003

Description Temperature

User entry Number (max. 8 characters)

Factory setting 100

Viscosity

Navigation Expert → Application → Maths → Maths x → DP flow → Viscosity → Viscosity
Direct access code: 400136-00x
Examples: Maths 1: 400136-000; Maths 4: 400136-003

Description Viscosity at the specified temperature.

User entry Number (max. 8 characters)

Factory setting 0.3 cp

"Totalization" submenu

Navigation Expert → Application → Maths → Maths x → Totalization

Description Settings only needed if the calculated value (e.g., for quantity calculation) should be integrated. Analysis time frames, see "Signal analysis".

Totalization

Navigation Expert → Application → Maths → Maths x → Totalization → Totalization
Direct access code: 400050-00x
Examples: Maths 1: 400050-000; Maths 4: 400050-003

Description Totalization allows the volume (in m^3) to be calculated from an analog signal (e.g., flow rate in m^3/h).

Options No, Yes

Factory setting No

Totalization base

Navigation Expert → Application → Maths → Maths x → Totalization → Totalization base
Direct access code: 400051-00x
Examples: Maths 1: 400051-000; Maths 4: 400051-003

Description Select the required time base. Example: ml/s -> time base seconds (s); m^3/h -> time base hours (h).
Only visible if totalization = Yes

Options Second (s), Minute (min), Hour (h), Day (d)

Factory setting Second (s)

Unit

Navigation Expert → Application → Maths → Maths x → Totalization → Unit
Direct access code: 400052-00x
Examples: Maths 1: 400052-000; Maths 4: 400052-003

Description Enter the unit for the quantity calculated by totalization (e.g., "m^3").
Only visible if totalization = Yes

User entry Text (max. 6 characters)

Total. eng. unit (option "Energy package")

Navigation Expert → Application → Maths → Maths x → Totalization → Total. eng. unit
Direct access code: 400112-00x
Examples: Maths 1: 400112-000; Maths 4: 400112-003

Description Enter the unit for the quantity determined by totalization.
Only visible if function = Energy or Mass calculation and totalization = Yes

Options kWh, MWh, MJ, GJ, kBtu, MBtu, tonh, therm, kg, t, lbs, ton

Low flow cut off

Navigation Expert → Application → Maths → Maths x → Totalization → Low flow cut off
Direct access code: 400053-00x
Examples: Maths 1: 400053-000; Maths 4: 400053-003

Description If the volume flow recorded is below the set value, these quantities are not added to the counter.
If the input is scaled from 0 to y, or if the pulse input is used, all values that are smaller than the set value are not recorded.
If the input is scaled from -x to +y, all values around the zero point (i.e., also negative values) are not recorded.
Only visible if totalization = Yes

User entry Number (max. 8 digits)

Factory setting 0

Calc. factor

Navigation Expert → Application → Maths → Maths x → Totalization → Calc. factor
Direct access code: 400054-00x
Examples: Maths 1: 400054-000; Maths 4: 400054-003

Description Factor for calculating the integrated value (e.g., the transmitter delivers l/s -> totalization base = second -> engineering unit required is m^3 --> enter factor 0.001)
Only visible if totalization = Yes

User entry Number (max. 8 digits)

Factory setting 1.0

Totalizer
(Online configuration)

Navigation Expert → Application → Maths → Maths x → Totalization → Totalizer
Direct access code: 400055-00x
Examples: Maths 1: 400055-000; Maths 4: 400055-003

Description Initial setting for the totalizer. Useful when continuing measurements recorded to date with an (electro)-mechanical counter.
Only visible if totalization = Yes

User entry Number (max. 15 digits)

Factory setting 0

"Linearization" submenu

Navigation Expert → Application → Maths → Maths x → Linearization

Description Linearization settings.
Only visible if function = Formula editor

Linearization

Navigation Expert → Application → Maths → Maths x → Linearization → Linearization
Direct access code: 400301-00x
Examples: Maths 1: 400301-000; Maths 4: 400301-003

Description Specify whether this input should be linearized.

Options No, Yes

Factory setting No

Number of points

Navigation Expert → Application → Maths → Maths x → Linearization → Number of points
Direct access code: 400302-00x
Examples: Maths 1: 400302-000; Maths 4: 400302-003

Description Specify how many support points the linearization table has.
Note: The first/last point must always correspond to the lower/upper range limit.

User entry 2 to 32

Factory setting 2

Dim. linearized value

Navigation Expert → Application → Maths → Maths x → Linearization → Dim. linearized value
Direct access code: 400303-00x
Examples: Maths 1: 400303-000; Maths 4: 400303-003

Description Unit/dimension for the linearized value.
Note: The first/last point must always correspond to the lower/upper range limit.

User entry Text (max. 6 characters)

Zoom start

Navigation Expert → Application → Maths → Maths x → Linearization → Zoom start
Direct access code: 400304-00x
Examples: Maths 1: 400304-000; Maths 4: 400304-003

Description If the total transmitter range is not used, the lower value of the required range can be specified (higher resolution).
Example: Transmitter 0-14 pH, required range: 5-9 pH. Set "5". The zoom has no effect on saving.

User entry Number (max. 8 characters)

Factory setting 0

Zoom end

Navigation Expert → Application → Maths → Maths x → Linearization → Zoom end
Direct access code: 400305-00x
Examples: Maths 1: 400305-000; Maths 4: 400305-003

Description Like "Zoom start". Enter the upper value of the required range.
Example: Transmitter 0-14 pH, required range: 5-9 pH. Entry here: "9".

User entry Number (max. 8 characters)

Factory setting 100

"Points" submenu

Navigation Expert → Application → Maths → Maths x → Linearization → Points

Description Enter the support points for the linearization table.
Note: The first/last point must always correspond to the lower/upper range limit. The support points can only be viewed in the PC software here. Use the "Edit table" switch to change the support points.

Check table

Navigation Expert → Application → Maths → Maths x → Linearization → Points → Check table
Direct access code: 400306-00x
Examples: Maths 1: 400306-000; Maths 4: 400306-003

Description Check whether the linearization table has been entered correctly.

Options No, Yes

Factory setting No

Sort table

Navigation Expert → Application → Maths → Maths x → Linearization → Points → Sort table
Direct access code: 400307-00x
Examples: Maths 1: 400307-000; Maths 4: 400307-003

Description Sort the linearization table.

Options No, Yes

Factory setting No

x-value (1 to 32)

Navigation Expert → Application → Maths → Maths x → Linearization → Points → x-value (1 to 32)
Direct access code, x-value 1: 400310-00x
Direct access code, x-value 2: 400312-00x
Examples: Maths 1, x-value 1: 400310-000; Maths 4: 400310-003

Description x-value for the linearization (value from the device input). Example: 10 cm corresponds to 20 liters --> enter 10.

User entry Number (max. 8 characters)

Factory setting 0

y-value (1 to 32)

Navigation Expert → Application → Maths → Maths x → Linearization → Points → y-value (1 to 32)
Direct access code, y-value 1: 400311-00x
Direct access code, y-value 2: 400313-00x
Examples: Maths 1, y-value 1: 400311-000; Maths 4: 400311-003

Description Enter the y value corresponding to the measured x-value.
Example: 10 cm corresponds to 20 liters --> enter 20.

User entry Number (max. 8 characters)

Factory setting 0

"Fault mode" submenu

Navigation Expert → Application → Maths → Maths x → Fault mode

Description Contains settings that define how this channel is to react under fault conditions (e.g., if an input channel has a cable open circuit or there is division by 0).

Wet steam alarm

Navigation Expert → Application → Maths → Maths x → Fault mode → Wet steam alarm
Direct access code: 400113-00x
Examples: Maths 1: 400113-000; Maths 4: 400113-003

Description Condensation of steam! Process temperature = saturated steam temperature = condensate temperature.
Only visible if application = Steam heat quantity or Steam heat difference

Options Counter stop, Saturated steam calculation

Factory setting Counter stop

On error

Navigation Expert → Application → Maths → Maths x → Fault mode → On error
Direct access code: 400060-00x
Examples: Maths 1: 400060-000; Maths 4: 400060-003

Description Configure which value the device should continue working with (for calculations) if the measured value is not valid (e.g., cable open circuit).

Options Invalid calculation, Error value

Factory setting Invalid calculation

Error value

Navigation Expert → Application → Maths → Maths x → Fault mode → Error value
Direct access code: 400061-00x
Examples: Maths 1: 400061-000; Maths 4: 400061-003

Description The device continues calculating with this value in the event of an error.
Only visible if on error = Error value

User entry Number (max. 8 digits)

Factory setting 0

Copy settings

Navigation Expert → Application → Maths → Maths x → Copy settings
Direct access code: 400200-00x
Examples: Maths 1: 400200-000; Maths 4: 400200-003

Description Copies settings from actual channel to selected channel.

Options No, In maths. channel x
Users can choose from all the available maths channels.

Factory setting No

"Signal analysis" submenu

Navigation Expert → Application → Signal analysis

Description Contains settings for signal analysis (saving).

Analysis x

Navigation Expert → Application → Signal analysis → Analysis x
Direct access code: 44000x-000
Examples: Analysis 1: 440000-000; Analysis 4: 440003-000

Description For the set timeframe, determines the minimum, maximum and average values, quantities and operating times.

If the "Controlled externally" option is to be used, a digital input or a maths channel must be set to "Function = Control input" and "Action = Start/stop analysis x".

Options Switched off, Controlled externally, 1min, 2min, 3min, 4min, 5min, 10min, 15min, 30min, 1h, 2h, 3h, 4h, 6h, 8h, 12h
Daily analysis, Weekly analysis, Monthly analysis, Annual analysis

Factory setting Switched off

Synchron. time

Navigation Expert → Application → Signal analysis → Synchron. time
Direct access code: 440004-000

Description Time for completing the signal analysis.
If, for example, 07:00 is entered, then the daily analysis will run from 07:00 on one day until 07:00 on the following day.

User entry Time

Factory setting 00:00

Week starting on

Navigation Expert → Application → Signal analysis → Week starting on
Direct access code: 440005-000

Description Configure what day the weekly analysis should start.
Only visible if at least one analysis = Weekly analysis

Options Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

Factory setting Monday

Alarm statistics ("Telealarm" option)

Navigation Expert → Application → Signal analysis → Alarm statistics
Direct access code: 440006-000

Description The following data can be determined via the signal analysis cycles (e.g., daily analysis):
- How often was the set point violated
- How long was the set point violated

Options No, Yes

Factory setting No

Group days ("Telealarm" option)

Navigation Expert → Application → Signal analysis → Group days
Direct access code: 440008-000

Description Specify how the frequency should be determined for weekly, monthly, or annual reports.
"No": Each individual limit value violation is counted.
"Yes": The number of days within the analysis cycle in which at least one alarm took place (e.g., required for the number of overflows in a storm overflow tank).

Options No, Yes

Factory setting No

Reset to zero
(Online configuration)

Navigation Expert → Application → Signal analysis → Reset to zero
Direct access code: 440007-000

Description Reset analysis.
Note: Should only be executed after the device has adopted the setup.

Options Please select, Analysis x, Totalizer, All

Factory setting Please select

Reset channel
(Online configuration)

Navigation Expert → Application → Signal analysis → Reset channel
Direct access code: 440010-000

Description Reset analysis of a single channel.
Note: Should only be executed after the device has adopted the setup.

Options Please select, Universal input x, Digital input x, Maths x, Set point x, Relay x
All active inputs are available for selection.

Factory setting Please select

"Automatic printout" submenu

Navigation Expert → Application → Signal analysis → Automatic printout

Description Specify whether an automatic print-out should follow at the end of an evaluation.

The printout is only made if a USB printer is connected to the device or a network printer is available.
For supported printers, please refer to the Operating Instructions.
If the Batch option is selected, the printout is configured in the Batch mode/Print menu.

Analysis x

Navigation Expert → Application → Signal analysis → Automatic printout → Analysis x
Direct access code, analysis 1: 440020-000
Direct access code, analysis 2: 440021-000
Direct access code, analysis 3: 440022-000
Direct access code, analysis 4: 440023-000

Description Specify whether an automatic print-out should follow at the end of an evaluation.

The print-out is only made if a USB printer is connected to the device!
For supported printers, please refer to the Operating Instructions.
If the Batch option is selected, the printout is configured in the Batch mode/Print menu.

Options No, Yes

Factory setting No

"Limits" submenu

Navigation Expert → Application → Limits

Description Limit values can monitor the measured values. In the event of an alarm violation relays can be switched, for example.

Add limit value

Navigation Expert → Application → Limits → Add limit value
Direct access code: 450300-000

Description Add a new limit value.

Options No, Yes

Factory setting No

Delete limit value

Navigation Expert → Application → Limits → Delete limit value
Direct access code: 450301-000

Description Delete a limit value from the list.

Options No, limit value x

Factory setting No

Change set points

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Limits → Change set points
Direct access code: 450100-000

Description Specify where the limit values can be changed. If you select "Outside of setup also", you can change limit values in the "Operation" menu as well as in "Setup". This allows you to adjust your limit values to the process even if setup is locked.
Note: This function should be protected by the limit value code.

Options Only in setup, Outside of setup also

Factory setting Only in setup

"Limit x" submenu

Navigation Expert → Application → Limits → Limit x

Description View or change the settings for the selected limit value.

x = place holder for selected limit value

Channel/value

Navigation Expert → Application → Limits → Limit x → Channel/value
Direct access code: 450000-0xx
Examples: Limit 1: 450000-000; Limit 30: 450000-029

Description Select which input/calculated value the limit value refers to.

Options Switched off, Universal input x, Digital input x, Maths x, Set point x

Factory setting Switched off

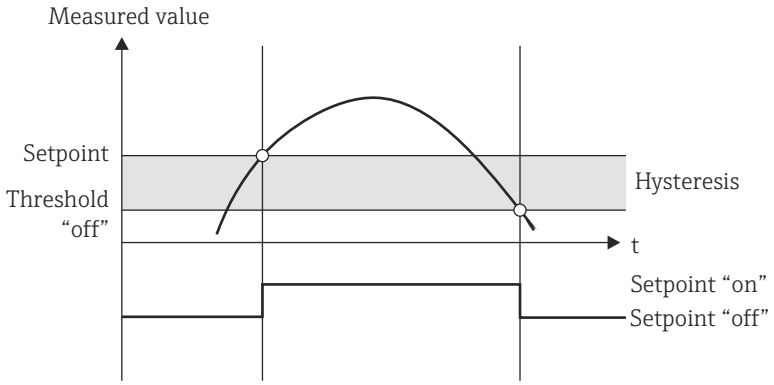
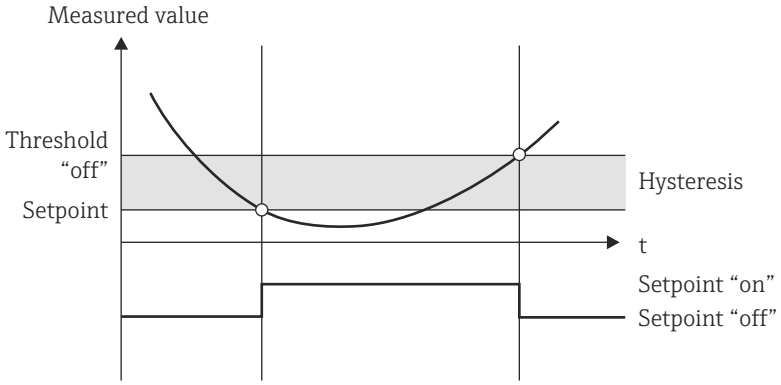
Type

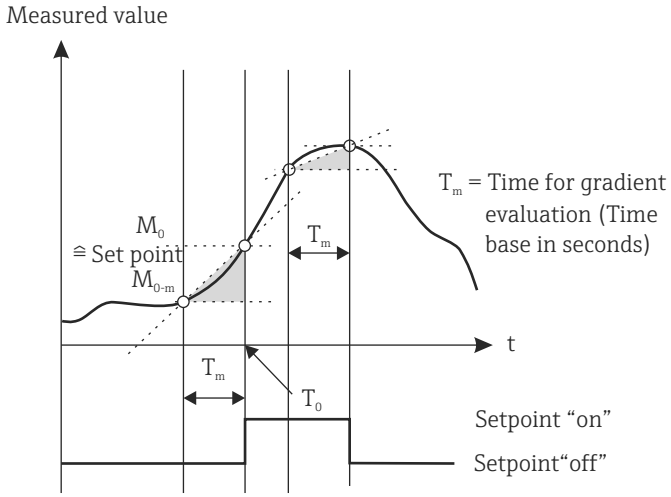
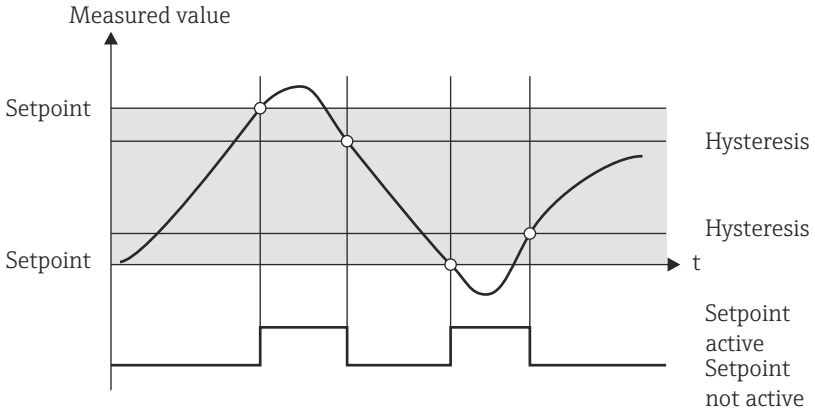
Navigation Expert → Application → Limits → Limit x → Type
Direct access code: 450001-0xx
Examples: Limit 1: 450001-000; Limit 30: 450001-029

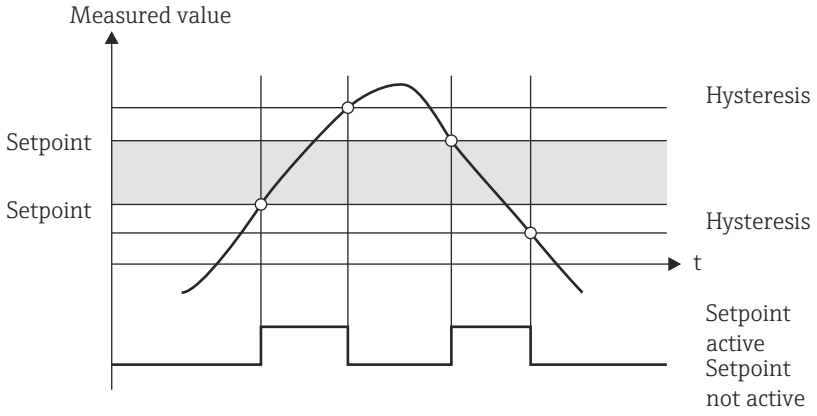
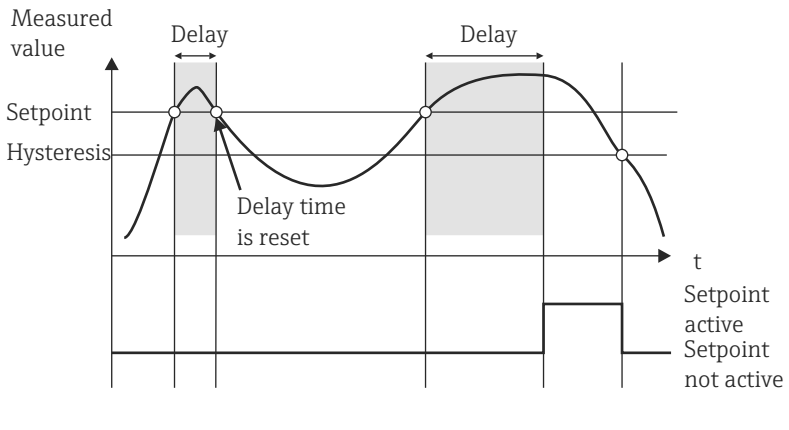
Description Type of limit value (depends on the input variable).

Options Switched off, Upper set point, Lower set point, Analysis x, Gradient dy/dt, Analysis x frequency, Analysis x duration, Inband, Outband

Description of the individual set point types

Set point type/function	Description
Hysteresis	For every set point, the switch point can be controlled via a hysteresis. The hysteresis is set as an absolute value (only positive values) in the unit of the respective channel (e.g., upper set point = 100 m, hysteresis = 1 m: set point on = 100 m, set point off = 99 m)
Upper set point	The limit value is active if the value exceeds the configured value. The limit value is switched off if the limit value, including hysteresis, is undershot.  A0010187-EN
Lower set point	The limit is active if the value drops below the configured value. The limit value is switched off if the limit value, including hysteresis, is exceeded.  A0010186-EN

Set point type/function	Description
Gradient dy/dt	The "Gradient" operating mode is used to monitor the temporal change of the input signal. The alarm is triggered if the measured value reaches or exceeds the preset value. If a positive value is set, the limit value is monitored from increasing gradients. In the case of negative values, the decreasing gradient is monitored. The alarm is canceled when the gradient drops below the preset value. A hysteresis is not possible in the Gradient operating mode. The alarm can be suppressed for the set time delay (unit: seconds s) in order to decrease the sensitivity. 
Inband	The limit value is violated as soon as the measured value to be checked exceeds or drops below a preset maximum or minimum respectively. The hysteresis must be monitored on the inside of the band. For the limit value to no longer be violated, the value must lie within the hysteresis range. 

Set point type/function	Description
Outband	The limit value is violated as soon as the measured value to be checked lies within a preset band between minimum and maximum. The hysteresis must be monitored on the outside of the band. For the limit value to no longer be violated, the value must lie outside of the hysteresis range. 
Special case: Hysteresis and delay for one limit value	In the special case where the hysteresis and limit value delay are activated, a limit value is switched according to the following principle. If the hysteresis and the limit value delay are activated, the delay becomes active when a limit value is exceeded and measures the time since the start of limit value overshoot. If the measured value falls below the limit value, the delay is reset. This also occurs if the measured value falls below the limit value, but continues to be higher than the set hysteresis value. When the limit value is exceeded again, the time delay becomes active again and starts measuring from 0. 

Factory setting Switched off

Identifier

Navigation Expert → Application → Limits → Limit x → Identifier
Direct access code: 450015-0xx
Examples: Limit 1: 450015-000; Limit 30: 450015-029

Description Name of the limit for identification purposes.

User entry Text (max. 16 characters)

Factory setting Limit x

Set point

Navigation Expert → Application → Limits → Limit x → Set point
Direct access code: 450003-0xx
Examples: Limit 1: 450003-000; Limit 30: 450003-029

Description Limit value in the set process unit, e.g., in °C, m^3/h

User entry Number (max. 10 digits)

Factory setting 0

Set point 2

Navigation Expert → Application → Limits → Limit x → Set point 2
Direct access code: 450017-0xx
Examples: Limit 1: 450017-000; Limit 30: 450017-029

Description Enter the upper limit value for the band.
Only visible if type = Inband or Outband

User entry Number (max. 8 digits)

Factory setting 0

Time span dt

Navigation Expert → Application → Limits → Limit x → Time span dt
Direct access code: 450014-0xx
Examples: Limit 1: 450014-000; Limit 30: 450014-029

Description Time span within which the signal must change by the specified value before it is recognized as a set point.
Note: max. 60 seconds.
Only visible if type = Gradient dy/dt

User entry 0 to 60 s

Factory setting 60 s

Hysteresis (abs.)

Navigation Expert → Application → Limits → Limit x → Hysteresis (abs.)
Direct access code: 450004-0xx
Examples: Limit 1: 450004-000; Limit 30: 450004-029

Description The alarm condition is only canceled when the signal has changed into the normal operation range by the preset value.

User entry Number (max. 8 digits)

Factory setting 0

Time delay

Navigation Expert → Application → Limits → Limit x → Time delay
Direct access code: 450005-0xx
Examples: Limit 1: 450005-000; Limit 30: 450005-029

Description In order to be interpreted as a limit value, the signal must exceed or undercut the preset value by at least the configured time.

User entry 0 to 99999 s

Factory setting 0 s

Switches

Navigation Expert → Application → Limits → Limit x → Switches
Direct access code: 450006-0xx
Examples: Limit 1: 450006-000; Limit 30: 450006-029

Description Switches the appropriate output in the limit value state.

Options Not used, Relay x

Factory setting Not used

LV messages

Navigation Expert → Application → Limits → Limit x → LV messages
Direct access code: 450007-0xx
Examples: Limit 1: 450007-000; Limit 30: 450007-029

Description "Do not acknowledge": Alarm condition is signaled by highlighting the tag name in red (no message is output).
"Acknowledge": In the event of an alarm, a message is also displayed. This message then has to be acknowledged.

Note: In the case of the DIN rail version, the message can only be acknowledged via the web server!

Options Do not acknowledge, Acknowledge

Factory setting Do not acknowledge

Save event

Navigation Expert → Application → Limits → Limit x → Save event
Direct access code: 450008-0xx
Examples: Limit 1: 450008-000; Limit 30: 450008-029

Description Stores a message in the event logbook on limit value violation.

Options No, Yes, only "On" message

Factory setting Yes

Event text LV on

Navigation Expert → Application → Limits → Limit x → Event text LV on
Direct access code: 450009-0xx
Examples: Limit 1: 450009-000; Limit 30: 450009-029

Description This text (including date and time) is shown on the display and stored in the event logbook.
Only available if "LV messages" is set to "Acknowledge" or "Save event" is set to "Yes".
If no text is entered, the device generates its own text (e.g., Analog 1 > 100%).

User entry Text (max. 22 characters)

Event text LV off

Navigation Expert → Application → Limits → Limit x → Event text LV off
Direct access code: 450010-0xx
Examples: Limit 1: 450010-000; Limit 30: 450010-029

Description The same as "Event text LV on", but on return from alarm to normal condition.

User entry Text (max. 22 characters)

Record duration of LV on

Navigation
Expert → Application → Limits → Limit x → Record duration of LV on
Direct access code: 450011-0xx
Examples: Limit 1: 450011-000; Limit 30: 450011-029

Description
The duration of a limit value violation can be recorded. The duration is appended to the "Event text LV off" (format: <hhhh>h<mm>:<ss>).
Power failure times do not affect the duration. If the set point was violated before the power failure and is still violated after the power failure, the duration continues.

Options
No, Yes

Factory setting
No

Reset relay

Navigation
Expert → Application → Limits → Limit x → Reset relay
Direct access code: 450016-0xx
Examples: Limit 1: 450016-000; Limit 30: 450016-029

Description
If LV no longer violated: the relay is switched as long as the set point is violated.
After acknowledging message: even if the set point is no longer violated, the relay remains switched until the message has been acknowledged. If the set point is still violated when the message is acknowledged, the relay stays switched until the set point is no longer violated.
Up to message acknowledgment: the relay remains active until the message is acknowledged or the set point is no longer active.

Options
If LV no longer violated, After acknowledging message, Up to message acknowledgment

Factory setting
If LV no longer violated

Save cycle

Navigation
Expert → Application → Limits → Limit x → Save cycle
Direct access code: 450012-0xx
Examples: Limit 1: 450012-000; Limit 30: 450012-029

Description
Normal: Save in normal store cycle.
Alarm cycle: Fast storage during an alarm violation, e.g., every second. Caution: Requires higher memory capacity!

- The save cycle is set under signal groups .
- In the event of an alarm violation, all the groups are saved in the alarm cycle.

Options
Normal, Alarm cycle

Factory setting Normal

Draw help line

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Limits → Limit x → Draw help line
Direct access code: 450013-0xx
Examples: Limit 1: 450013-000; Limit 30: 450013-029

Description The user can configure whether this set point should be displayed in the graphic as a help line (in the color of the channel).
Note: 4 lines can be shown per channel in a single group.

Options No, Yes

Factory setting No

Copy settings

Navigation Expert → Application → Limits → Limit x → Copy settings
Direct access code: 450200-0xx
Examples: Limit 1: 450200-000; Limit 30: 450200-029

Description Copies settings from actual channel to selected channel.

Options No, in limit x (all the limit values are displayed)

Factory setting No

"Batch mode" submenu (option)

Navigation Expert → Application → Batch mode

Description Contains settings for the batch mode.

Detailed descriptions of this device option can be found in the associated documentation.

"Signal groups" submenu

Navigation Expert → Application → Signal groups

Description Group the analog, digital and/or mathematics channels such that you can call up important information during operation (e.g., temperatures, signals in plant unit 1)

- Maximum 8 channels per group!
- High speed storage (100ms) is only available in group 1.

"Group x" submenu

Navigation Expert → Application → Signal groups → Group x

Description x = place holder for selected group

General settings for displaying the measured value and saving data.

Identifier

Navigation Expert → Application → Signal groups → Group x → Identifier
Direct access code: 460000-0xx
Examples: Group 1: 460000-000; Group 4: 460000-003

Description Enter a name for these groups

User entry Text (max. 20 characters)

Factory setting Group x

Save cycle

Navigation Expert → Application → Signal groups → Group x → Save cycle
Direct access code: 460001-0xx
Examples: Group 1: 460001-000; Group 4: 460001-003

Description Configure the save cycle with which this group should be saved in normal conditions (see also set point / save cycle).

The save cycle is independent of the measured value display (see Operating Instructions).

Options Off, 100ms (only for group 1), 1s, 2s, 3s, 4s, 5s, 10s, 15s, 20s, 30s, 1min, 2min, 3min, 4min, 5min, 10min, 15min, 30min, 1h

Factory setting 1min

Alarm cycle

Navigation Expert → Application → Signal groups → Group x → Alarm cycle
Direct access code: 460002-0xx
Examples: Group 1: 460002-000; Group 4: 460002-003

Description Configure the save cycle with which this group should be saved in an alarm condition (limit value violation).
Caution: Requires higher memory capacity

Options Off, 100ms (only for group 1), 1s, 2s, 3s, 4s, 5s, 10s, 15s, 20s, 30s, 1min, 2min, 3min, 4min, 5min, 10min, 15min, 30min, 1h

Factory setting 1min

Display blue

Navigation Expert → Application → Signal groups → Group x → Display blue
Direct access code: 460003-00x
Examples: Group 1: 460003-000; Group 4: 460003-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460004-00x
Examples: Group 1: 460004-000; Group 4: 460004-003

Description Select which data from the selected channel should be displayed.

If the "Everything" option is selected, the device switches cyclically between the various values of the channel (instantaneous value, analysis 1 etc.)

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Display black

Navigation Expert → Application → Signal groups → Group x → Display black
Direct access code: 460005-00x
Examples: Group 1: 460005-000; Group 4: 460005-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460006-0xx
Examples: Group 1: 460006-000; Group 4: 460006-003

Description Select which data from the selected channel should be displayed.

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Display red

Navigation Expert → Application → Signal groups → Group x → Display red
Direct access code: 460007-00x
Examples: Group 1: 460007-000; Group 4: 460007-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460008-0xx
Examples: Group 1: 460008-000; Group 4: 460008-003

Description Select which data from the selected channel should be displayed.

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Display green

Navigation Expert → Application → Signal groups → Group x → Display green
Direct access code: 460009-00x
Examples: Group 1: 460009-000; Group 4: 460009-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460010-0xx
Examples: Group 1: 460010-000; Group 4: 460010-003

Description Select which data from the selected channel should be displayed.

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Display violet

Navigation Expert → Application → Signal groups → Group x → Display violet
Direct access code: 460011-00x
Examples: Group 1: 460011-000; Group 4: 460011-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460012-0xx
Examples: Group 1: 460012-000; Group 4: 460012-003

Description Select which data from the selected channel should be displayed.

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Display orange

Navigation Expert → Application → Signal groups → Group x → Display orange
Direct access code: 460013-00x
Examples: Group 1: 460013-000; Group 4: 460013-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460014-0xx
Examples: Group 1: 460014-000; Group 4: 460014-003

Description Select which data from the selected channel should be displayed.

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Display cyan

Navigation Expert → Application → Signal groups → Group x → Display cyan
Direct access code: 460015-00x
Examples: Group 1: 460015-000; Group 4: 460015-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460016-0xx
Examples: Group 1: 460016-000; Group 4: 460016-003

Description Select which data from the selected channel should be displayed.

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Display brown

Navigation Expert → Application → Signal groups → Group x → Display brown
Direct access code: 460017-00x
Examples: Group 1: 460017-000; Group 4: 460017-003

Description Choose which input/calculated variable is to be displayed in this group.

Options Switched off, Universal input x, Digital input x, Maths x

Factory setting Switched off

Display

Navigation Expert → Application → Signal groups → Group x → Display
Direct access code: 460018-0xx
Examples: Group 1: 460018-000; Group 4: 460018-003

Description Select which data from the selected channel should be displayed.

Options Instantaneous value/state, Analysis x, Totalizer, Everything

Factory setting Instantaneous value/state

Grid divisions

Navigation Expert → Application → Signal groups → Group x → Grid divisions
Direct access code: 460019-0xx
Examples: Group 1: 460019-000; Group 4: 460019-003

Description Indicates the number of lines ("amplitude grid") that should be displayed. Example: display of 0 to 100%: select 10 divisions, display 0 to 14pH: select 14 divisions.

Options Logarithmic, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Factory setting 10

Min. decade

Navigation Expert → Application → Signal groups → Group x → Min. decade
Direct access code: 460020-0xx
Examples: Group 1: 460020-000; Group 4: 460020-003

Description Set the decade from which the display should be split.

Options 1, 10, 100, 1000, 10000, 100000, 1000000, 10000000

Factory setting 1

Max. decade

Navigation Expert → Application → Signal groups → Group x → Max. decade
Direct access code: 460021-0xx
Examples: Group 1: 460021-000; Group 4: 460021-003

Description Set the decade up to which the display should be split.

Options 1, 10, 100, 1000, 10000, 100000, 1000000, 10000000

Factory setting 10000

Curve display

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Signal groups → Group x v Curve display
Direct access code: 460022-0xx
Examples: Group 1: 460022-000; Group 4: 460022-003

Description The instantaneous values are displayed as standard for the measured value curves. Alternatively, this instantaneous value display can also be disabled which means that more data can be shown on the display as a result.

Options No instantaneous values, With instantaneous values

Factory setting With instantaneous values

Curve display

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Signal groups → Group x → Curve display
Direct access code: 460023-0xx
Examples: Group 1: 460023-000; Group 4: 460023-003

Description Configure the background color for the curve display.

Options White background, Black background

Factory setting White background

Zoom

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Signal groups → Group x → Zoom
Direct access code: 460028-0xx
Examples: Group 1: 460028-000; Group 4: 460028-003

Description Defines the zoom that is shown in "Curves" or "Waterfall" display mode. This setting does not affect other display modes (e.g., Curves in range, Bargraph, etc.).

Options Do not display, Scroll display, Display blue, Display black, Display red, Display green, Display violet, Display orange, Display cyan, Display brown

Factory setting Do not display

Bar graph

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Signal groups → Group x → Bargraph
Direct access code: 460024-0xx
Examples: Group 1: 460024-000; Group 4: 460024-003

Description Configure the direction in which the bar graphs should be drawn.

Options Vertical (bottom->top), Vertical (top->bottom), Horizontal (left->right), Horizontal (right->left), Centered/vertical, Centered/horizontal

Factory setting Vertical (bottom->top)

Batch assignment (option)

Navigation Expert → Application → Signal groups → Group x → Batch assignment
Direct access code: 460025-0xx
Examples: Group 1: 460025-000; Group 4: 460025-003

Description Configure what batch this group belongs to.

- Channels can be assigned to multiple batches/groups.
- Only relevant for batch printout.

Options Do not assign any batch, Assign all batches, Batch x

Factory setting Assign all batches

Save group (Batch option)

Navigation Expert → Application → Signal groups → Group x → Save group
Direct access code: 460026-0xx
Examples: Group 1: 460026-000; Group 4: 460026-003

Description The group will always be saved or only when the allocated batch is active.

Options Only when batch is active, Always

Factory setting Always

"Circular chart" submenu

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Signal groups → Group x → Circular chart

Description Contains settings for the circular chart.

1 revolution =

Navigation Expert → Application → Signal groups → Group x → Circular chart → 1 revolution =
Direct access code: 460027-0xx
Examples: Group 1: 460027-000; Group 4: 460027-003

Description Configure how long it takes for the circular chart to be written to once completely (one complete revolution).
Note: The device only ever shows 1/4 of the circular chart.

Options 1 hour , x hours , 1 day, x days

Factory setting 1 hour

"E-mail" submenu

Navigation Expert → Application → E-mail

In the case of the "Telealarm" option under
Expert → Application → Telealarm → General → Setup e-mail

Description Contains settings that are required if alarms are to be sent by e-mail.

Test the e-mail settings under Diagnostics → Simulation → E-mail.

SMTP host

Navigation Expert → Application → E-mail → SMTP host
Direct access code: 510062-000

Description Enter the SMTP host here. If necessary, contact your network administrator or e-mail provider.

User entry Text (max. 40 characters)

Server requires SSL

Navigation Expert → Application → E-mail → Server requires SSL
Direct access code: 510061-000

Description Specify whether the e-mail server requires a secure connection (SSL).
STARTTLS: Runs on the same TCP port as unencrypted SMTP (port 25 or 587).
SMTPS: Completely encrypted with own TCP port (465).
If necessary, contact your network administrator or e-mail provider.

Options No, Yes (SMTPS), Yes (STARTTLS)

Factory setting No

Port

Navigation Expert → Application → E-mail → Port
Direct access code: 510063-000

Description Enter the SMTP host here. If necessary, contact your network administrator or e-mail provider.

User entry Number (max. 4 digits)

Factory setting 25

Sender

Navigation Expert → Application → E-mail → Sender
Direct access code: 510064-000

Description Enter the e-mail address of the device here (appears as the sender of the e-mail). If necessary, contact your network administrator or e-mail provider.

If a valid e-mail address is not configured this might cause e-mail transmission problems, depending on the particular provider.

User entry Text (max. 60 characters)

User name

Navigation Expert → Application → E-mail → User name
Direct access code: 510066-000

Description Specify the user name of the e-mail account. If necessary, contact your network administrator or e-mail provider.

User entry Text (max. 60 characters)

Password

Navigation Expert → Application → E-mail → Password
Direct access code: 510067-000

Description Enter the password for authentication. If necessary, contact your network administrator or e-mail provider.

User entry Text (max. 22 characters)

"E-mail addresses" submenu

Navigation Expert → Application → E-mail → E-mail addresses

Description Enter all the e-mail addresses to which a message should be sent in the event of an alarm.

Assignment to the alarms is performed later on.

E-mail address x

Navigation Expert → Application → E-mail → E-mail addresses → E-mail address x
Direct access code:
E-mail address 1: 510080-000
to
E-mail address 5: 510084-000

Description Enter an e-mail address to which a message should be sent.

Assignment to the alarms is performed later on.

User entry Text (max. 60 characters)

"Limit value violations" submenu

Navigation Expert → Application → E-mail → Limit value violations

Description Specify who should receive e-mails when limit value violations occur (both on and off messages).

Only for limit values where "Save event" is set to "Yes".

Recipient x

Navigation Expert → Application → E-mail → Limit value violations → Recipient x
Direct access code:
Recipient 1: 510110-000; Recipient 2: 510111-000

Description Select who should receive the e-mail.

Options Not used, E-mail address x

Factory setting Not used

"On/off messages" submenu

Navigation Expert → Application → E-mail → On/off messages

Description Specify who should receive e-mails when "on"/"off" events occur (for digital inputs or maths channels).

Only for inputs where "Save event" is set to "Yes".

Recipient x

Navigation Expert → Application → E-mail → On/off messages → Recipient x
Direct access code:
Recipient 1: 510115-000; Recipient 2: 510116-000

Description Select who should receive the e-mail.

Options Not used, E-mail address x

Factory setting Not used

"Errors (Fxxx/Sxxx)" submenu

Navigation Expert → Application → E-mail → Errors (Fxxx/Sxxx)

Description Specify who should receive e-mails when errors occur (Fxxx and Sxxx messages).

Recipient x

Navigation Expert → Application → E-mail → Errors → Recipient x
Direct access code:
Recipient 1: 510120-000; Recipient 2: 510121-000

Description Select who should receive the e-mail.

Options Not used, E-mail address x

Factory setting Not used

"Maintenance required" (submenu)

Navigation Expert → Application → E-mail → Maintenance required

Description Specify who should receive e-mails when maintenance is required (Mxxx messages).

Recipient x

Navigation Expert → Application → E-mail → Maintenance required → Recipient x
Direct access code:
Recipient 1: 510130-000; Recipient 2: 510131-000

Description Select who should receive the e-mail.

Options Not used, E-mail address x

Factory setting Not used

"Printer" submenu

Navigation Expert → Application → Printer

Description Contains printer settings.

Only relevant if a printer is directly connected to the device.

Parameter	Description	Direct access code
Printer	Select which printer is to be used. For supported printers, please refer to the Operating Instructions.	540000-000
IP address	Enter the IP address of the network printer here. Where necessary, contact the network administrator to find out the IP address. Note: A DNS name may also be used.	540001-000
Port	Enter the port of the network printer (information from the network administrator). Note: Port 9100 is usually used.	540002-000
Color printer	Set whether a black/white or a color printer is used.	540003-000
Paper size	Select the paper size of the printer.	540004-000
Print direction	Select the print direction according to the properties of the printer used.	540006-000
Characters/ line	Specify the maximum number of characters per line here.	540007-000
Blank rows at the end	Enter the number of blank lines required at the end of the printout to make it easier to tear off.	540008-000
Fault switches	You can switch a relay if an error occurs during printing. The relay remains switched until the printer is ready again or the device is restarted.	540005-000
"Serial interface" submenu	Settings required if the RS232 or RS485 interface of the device is used.	150101-000 150103-000

"Softkeys" submenu

This function is **not** supported by the **DIN rail version**.

Navigation Expert → Application → Softkeys

Description Configure the functions that are assigned to the soft keys of the device.

Softkey 1–3

Navigation Expert → Application → Softkeys → Softkey x
Direct access code, softkey 1: 520000-000
Direct access code, softkey 2: 520001-000
Direct access code, softkey 3: 520002-000

Description Specify the function to be assigned to this softkey.

Options Not used, Safe SD card removal, Remove USB stick safely, Printout, Enter batch info, Event logbook / audit trail, Historic measured values, Log onto device, Log out from device, Screenshot, Search in trace, Show analyses, Change set point, Next group, Operation

Factory setting

Softkey 1: Event logbook/audit trail
Softkey 2: Historic measured values
Softkey 3: Search in trace

"Texts" submenu

Navigation

Expert → Application → Texts

Description

Settings only needed if you want to save text for subsequent reporting. Here, configure the text that can be saved in the event logbook during operation.

Text 1–30

Navigation

Expert → Application → Texts → Text x
Direct access code, text 1: 530000-000
to
Direct access code, text 30: 530029-000

Description

Create or edit text.

User entry

Text (max. 22 characters)

"Wastewater" submenu (option)

Navigation

Expert → Application → Wastewater

Description

Contains settings for using the device in the wastewater sector.

Detailed descriptions of this device option can be found in the associated documentation.

"Telealarm" submenu (option)

Navigation

Expert → Application → Telealarm

Description

Contains settings for alerts via a modem connected to the device or by e-mail.

Detailed descriptions of this device option can be found in the associated documentation.

"WebDAV Client" submenu

Navigation

Expert → Application → WebDAV Client

Description

All recorded data is transferred to an external WebDAV server (e.g., NAS). The format can be specified or selected via **"Setup → Advanced setup → System → External memory -> Save as"**.

Parameter	Description	Direct access code
Enable	Switch WebDAV Client functionality on/off. When active, the device copies the saved measured values automatically to the configured server. Only possible using the Ethernet interface! **Options:** No, Yes, Yes (SSL) **Factory setting:** No	472000-000
IP address	Enter the IP address of the WebDAV server. A DNS name can also be used. **User entry:** IP address **Factory setting:** 0.0.0.0	472001-000
Port	This communication port is used to communicate with the WebDAV Server. If the network is protected by a firewall, this port may have to be enabled. In this case, contact the network administrator. **User entry:** Numbers (max. 5 digits) **Factory setting:** 80	472002-000
User name	Input of the user name that can access the WebDAV server. **User entry:** Text (max. 20 characters)	472004-000
Password	Password for accessing the WebDAV server. **User entry:** Text (max. 20 characters)	472007-000
Directory	Enter the directory in which the data should be saved. **User entry:** Text (max. 120 characters)	472005-000
Save as	"Protected format": All data is stored in a manipulation-protected encrypted format. This data can only be visualized by the PC analysis software. "Open format": Data is stored in a CSV format, this can be opened by a number of different programs (Attention: no manipulation protection). **Options:** Protected format, Open format (*.csv) **Factory setting:** Protected format	472010-000

Test the WebDAV client settings under **"Diagnostics → Simulation → WebDAV client"**.

17.1.6 "Diagnostics" submenu

Device information and service functions for a quick device check.

Only some of the diagnostic functions are available under Expert → Diagnostics! For other functions, see the Main menu → Diagnostics

Actual diagnostics
(Online configuration)

Navigation

Expert → Diagnostics → Actual diagnostics
Direct access code: 050000-000

Description

Displays the current diagnostic message.

Last diagnostics
(Online configuration)

Navigation Expert → Diagnostics → Last diagnostics
Direct access code: 050005-000

Description Displays the last diagnostic message.

Last restart
(Online configuration)

Navigation Expert → Diagnostics → Last restart
Direct access code: 050010-000

Description Information as to when the device was last restarted (e.g., due to a power failure).

"Event logbook" submenu

Navigation Expert → Diagnostics → Event logbook

Description Events such as a limit value violation and power failure are listed in the correct time sequence.

"Device information" submenu
(Online configuration)

Navigation Expert → Diagnostics → Device information

Description Displays important device information.

Device tag

Navigation Expert → Diagnostics → Device information → Device tag
Direct access code: 000031-000

Description Individual device tag name/unit identifier (max. 32 characters).

Serial number
(Online configuration)

Navigation Expert → Diagnostics → Device information → Serial number
Direct access code: 000027-000

Description Individual serial number of the device. Provide these details when ordering spare parts or asking any questions about the unit.

Order code
(Online configuration)

Navigation Expert → Diagnostics → Device information → Order code
Direct access code: 000029-000

Description Displays the order code.
The order code indicates the attribute of all the features of the product structure for the device and thus uniquely identifies the device. It can also be found on the nameplate.

Useful applications of the order code
- To order an identical replacement device.
- To check the ordered device features using the delivery note.

Firmware version
(Online configuration)

Navigation Expert → Diagnostics → Device information → Firmware version
Direct access code: 000026-000

Description Displays the installed firmware version of the device. Please specify these details if you have any questions about the device.

ENP version
(Online configuration)

Navigation Expert → Diagnostics → Device information → ENP version
Direct access code: 000032-000

Description Displays the version of the electronic nameplate. Please specify these details if you have any questions about the device.

ENP device name
(Online configuration)

Navigation Expert → Diagnostics → Device information → ENP device name
Direct access code: 000020-000

Description Displays the ENP device name (electronic name plate). Please specify these details if you have any questions about the device.

Device name
(Online configuration)

Navigation Expert → Diagnostics → Device information → Device name
Direct access code: 000021-000

Description Displays the device name. Please specify these details if you have any questions about the device.

Manufacturer ID
(Online configuration)

Navigation Expert → Diagnostics → Device information → Manufacturer ID
Direct access code: 000022-000

Description Displays the manufacturer ID. Please specify these details if you have any questions about the device.

Manufacturer name
(Online configuration)

Navigation Expert → Diagnostics → Device information → Manufacturer name
Direct access code: 000023-000

Description Displays the manufacturer name. Please specify these details if you have any questions about the device.

Firmware
(Online configuration)

Navigation Expert → Diagnostics → Device information → Firmware
Direct access code: 009998-000

Description Displays the installed firmware of the device. Please specify these details if you have any questions about the device.

"Simulation" submenu

Navigation Expert → Diagnostics → Simulation

Description Settings for simulation mode.

Operating mode

Navigation Expert → Diagnostics → Simulation → Operating mode
Direct access code: 010010-000

Description Normal operation: Unit plots the signals from the connected measurement points.
Simulation: Instead of operating with the real measurement points the signals are simulated (using the actual settings).

Options Normal operation, Simulation

Factory setting Normal operation

Index

N

O

P

R

S

T

U

V

W

X

Y

Z

www.addresses.endress.com

Endress+Hauser

People for Process Automation