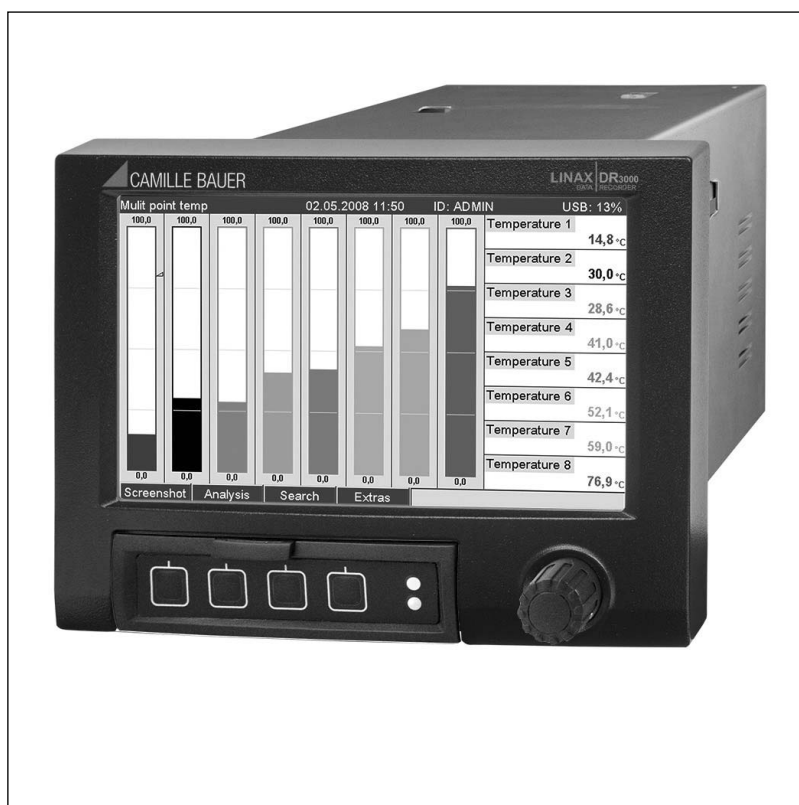# Operating Instructions
Video recorder LINAX DR3000

LINAX DR3000 Be   04.17

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Table of contents

1   Document information

1.1   Document function

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

Integrated Operating Instructions

At the push of a button, the device displays operating instructions directly on the screen. This manual complements the operating instructions in the device and explains what is not directly described in the operating instructions.

1.2   Symbols used

1.2.1   Safety symbols

Symbol	Meaning
⚠ DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
⚠ WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
⚠ CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2   Electrical symbols

Symbol	Meaning	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 ground connection** A terminal which must be connected to ground prior to establishing any other connections.	▽	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

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.
☒	**Forbidden** Procedures, processes or actions that are forbidden.
🛈	**Tip** Indicates additional information.
📖	Reference to documentation
📄	Reference to page
🖼	Reference to graphic
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
1, 2, 3,...	Item numbers
1. , 2. , 3. …	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
≈➡ A0013441	Flow direction
EX A0011187	**Hazardous area** Indicates a hazardous area.
⌀ A0011188	**Safe area (non-hazardous area)** Indicates a non-hazardous area.

1.3   Registered trademarks

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

PROFIBUS®
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

PROFINET®
Registered trademark of the PROFIBUS & PROFINET International User Organization e.V., Karlsruhe, Germany

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

EtherNet/IP™
Registered trademark of ODVA, INC.

Internet Explorer®, Excel™
Registered trademarks of the Microsoft Corporation

Mozilla Firefox®
Registered trademark of the Mozilla Foundation

Opera®
Registered trademark of Opera Software ASA.

Google Chrome™
Registered trademark of Google INC.

2 Basic safety instructions

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

ℹ 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 concerning the staff

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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
▶ Following instructions and basic conditions

The operating personnel must fulfill the following requirements:
▶ Being instructed and authorized according to the requirements of the task by the facility's owner-operator
▶ Following the instructions in these Operating Instructions

2.2 Designated use

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

- The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated. It is not permitted to convert or modify the device in any way.
- The device is designed for installation in a panel and must only be operated in an installed state.

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

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

Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.
▶ If, despite this, modifications are 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 repair of an electrical device.
▶ Use original spare parts and accessories from the manufacturer only.

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):
▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
▶ Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

2.5   Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and 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 EC directives listed in the device-specific EC Declaration of Conformity. The manufacturer confirms this by affixing the CE mark to the device.

2.6   Safety information for table 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. There is also the option of operating it in a table-mounted or field-mounted housing.

4   Incoming acceptance and product identification

4.1   Incoming acceptance

On receipt of the goods, check the following points:
- Is the packaging or the content damaged?
- Is the delivery complete? Compare the scope of delivery against the information on your order form.

4.2   Scope of delivery

The scope of delivery of the device comprises:
- Device (with terminals, as per order)
- 2 fastening clips
- Version with navigator and front interfaces: USB cable
- Sealing rubber towards control panel wall
- "Industrial Grade" SD card, industry standard:
  Version with navigator and front interfaces: card is located in the SD slot behind the flap on the front of the housing (optional).
  Version with stainless steel front and touchscreen: card is in the device and cannot be replaced or retrofitted.
- Analysis software on CD–ROM
- Multilanguage Operating Instructions on CD–ROM

4.3   Product identification

4.3.1   Nameplate

Compare the nameplate with the following diagram:
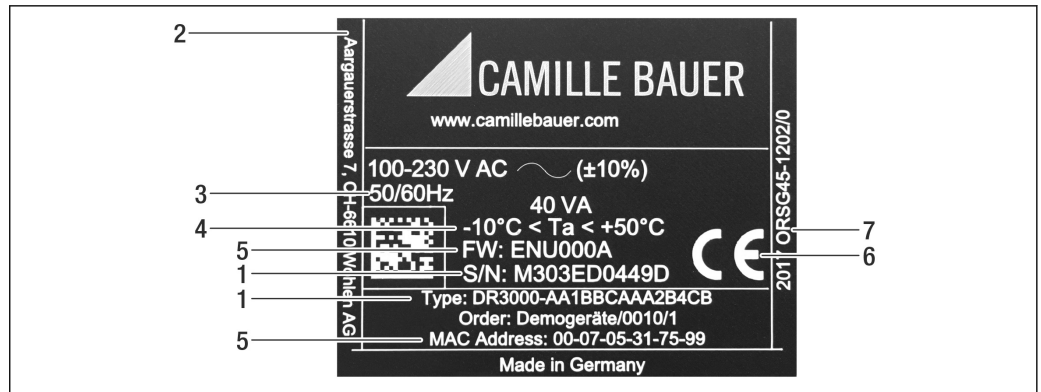
🖼 1   Device nameplate (example)

1   Device designation, serial number
2   Manufacturer details
3   Power supply, mains frequency and maximum power consumption
4   Ambient temperature range
5   Firmware version; MAC address (Ethernet)
6   Device approvals
7   Order code, extended order code

4.4   Storage and transport

Compliance with the permitted environmental and storage conditions is mandatory. For precise specifications, see the "Technical data" section of the Operating Instructions.

Please note the following:
- Pack the device so that is protected against impact for storage and transport. The original packaging provides optimum protection.
- The permitted storage temperature is −20 to +60 °C (−4 to +140 °F).

5   Installation

5.1   Installation conditions

NOTICE

Overheating due to buildup of heat in the device
▶   To avoid heat buildup, always ensure that the device is sufficiently cooled.

The device 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).

- Operating temperature range: −10 to +50 °C (14 to 122 °F)
- Climate class as per IEC 60654-1: Class B2
- Degree of protection: IP65, NEMA 4 at front / IP20 rear of housing

5.1.1   Installation 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

5.2   Mounting the measuring device

Mounting tool: For installation in the panel, all you need is a screwdriver.
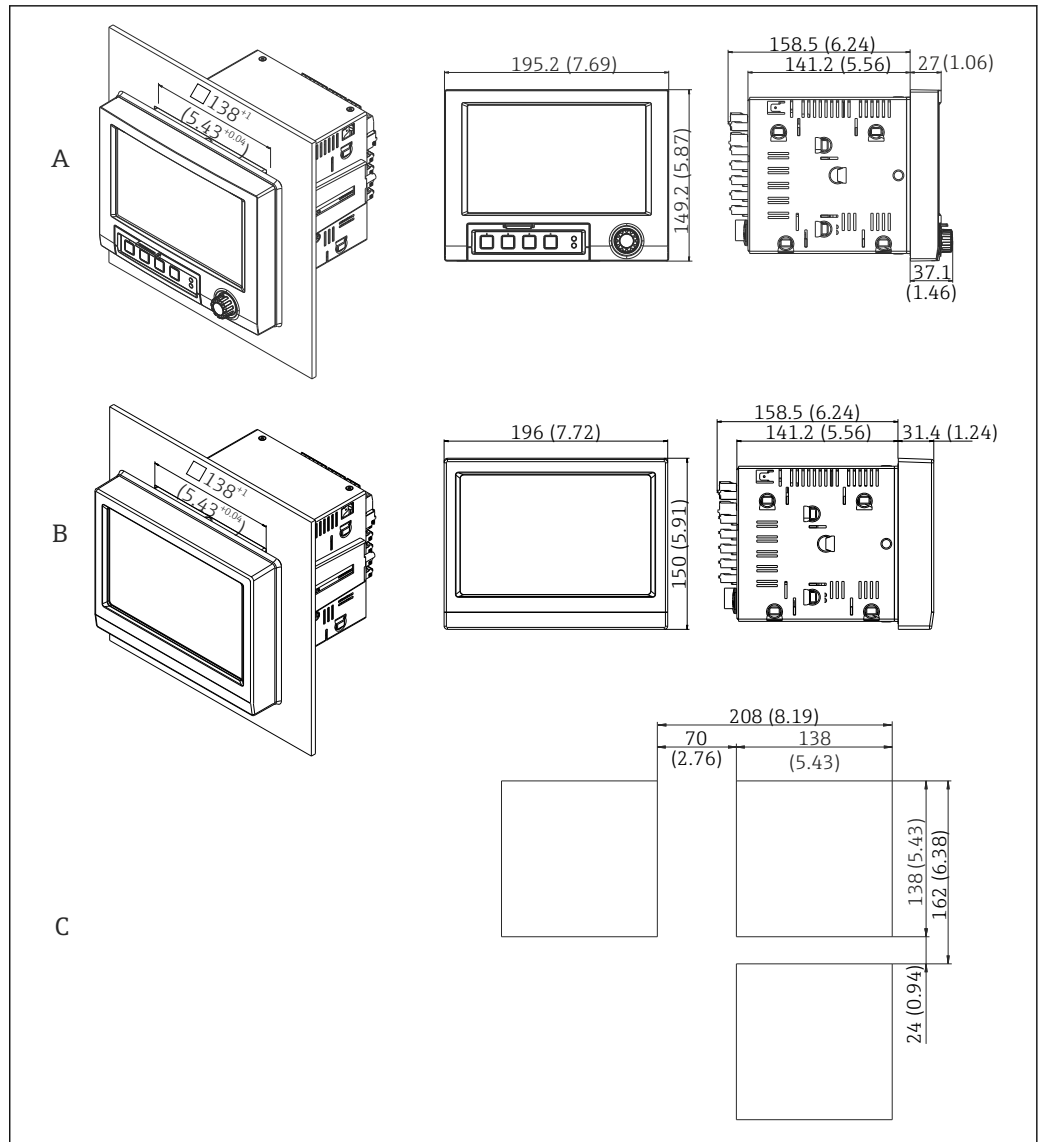
2 *Panel cutout and dimensions in mm (in).*

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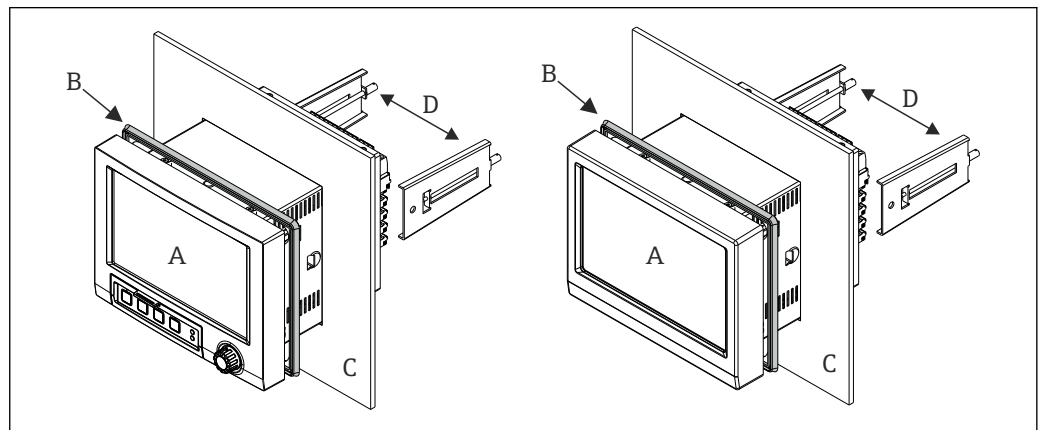
3 *Panel mounting*

1. From the rear of the device, push the sealing rubber (B) (supplied) as far as 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 hang the fastening clips (D) in the openings (1 x left, 1 x right).

4. Evenly tighten the screws on the fasting clips (D) using a screwdriver to guarantee a secure seal to the control panel (torque 100 Ncm).

5.3   Post-installation check

- 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 control panel cutout?

6   Electrical connection

6.1   Connection conditions

⚠ 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 ground connection must be made before all other connections.

NOTICE

Cable heat load
▶ Use suitable cables for temperatures of 5 ℃ (9 ℉) 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 lines.
▸ Connect a suitable overvoltage protection in series 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   Connection instructions

6.2.1   Cable specification

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. This makes the connection very quick and easy. The spring terminals are unlocked with a slotted screwdriver (size 0).

Please 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, in particular, the lines - both sensor lines and communication lines - are shielded and the shield forms as complete a cover as possible. A shielded line must be used for sensor lines that are longer than 30 m. A shield coverage of 90% is ideal. In addition, make sure not to cross sensor lines and communication lines when routing them. Connect the shield 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 supply side

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding 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.

Where applicable, national installation regulations and guidelines must be observed during the 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.

ℹ️ 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 or significantly impact signal transmission. In such cases the shielding of the signal cable is to be grounded on one side only, i.e. it may not be connected to the ground terminal of the housing. The shield that is not connected should be insulated!

6.3   Connecting the measuring device

6.3.1   Terminals on back of device
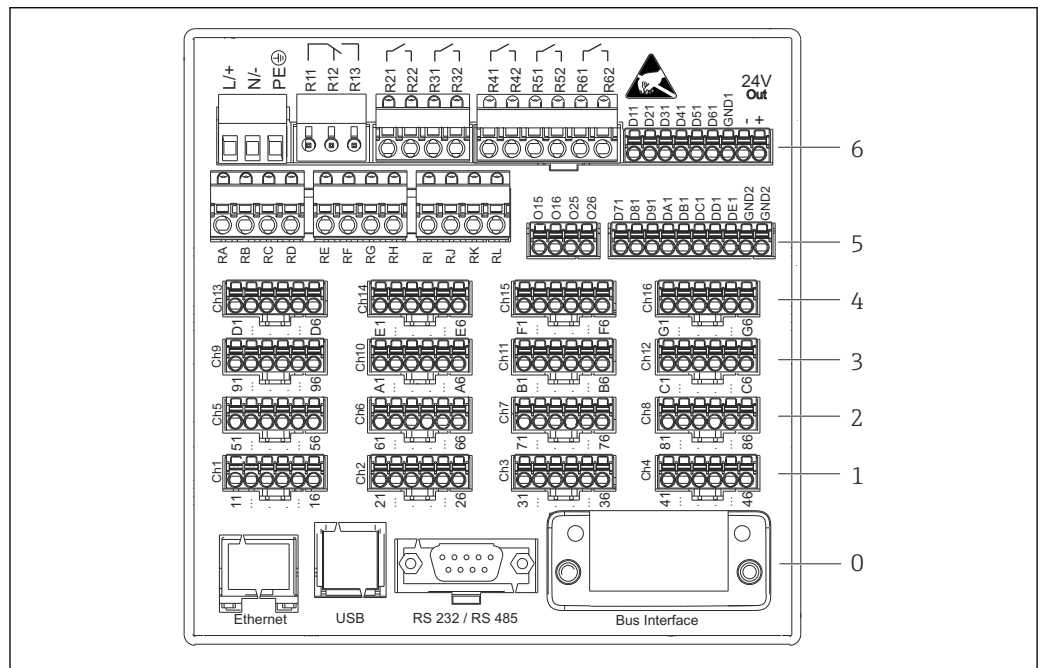
A0024605

🖼 4   *Terminals on back of device*

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

Circuit diagram

⊡ 5   For connection examples of the HART® inputs (optional), see the Operating Instructions → 📖 23

A0026669-EN

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)

ℹ 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%)

ℹ 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-

ℹ️ • 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)

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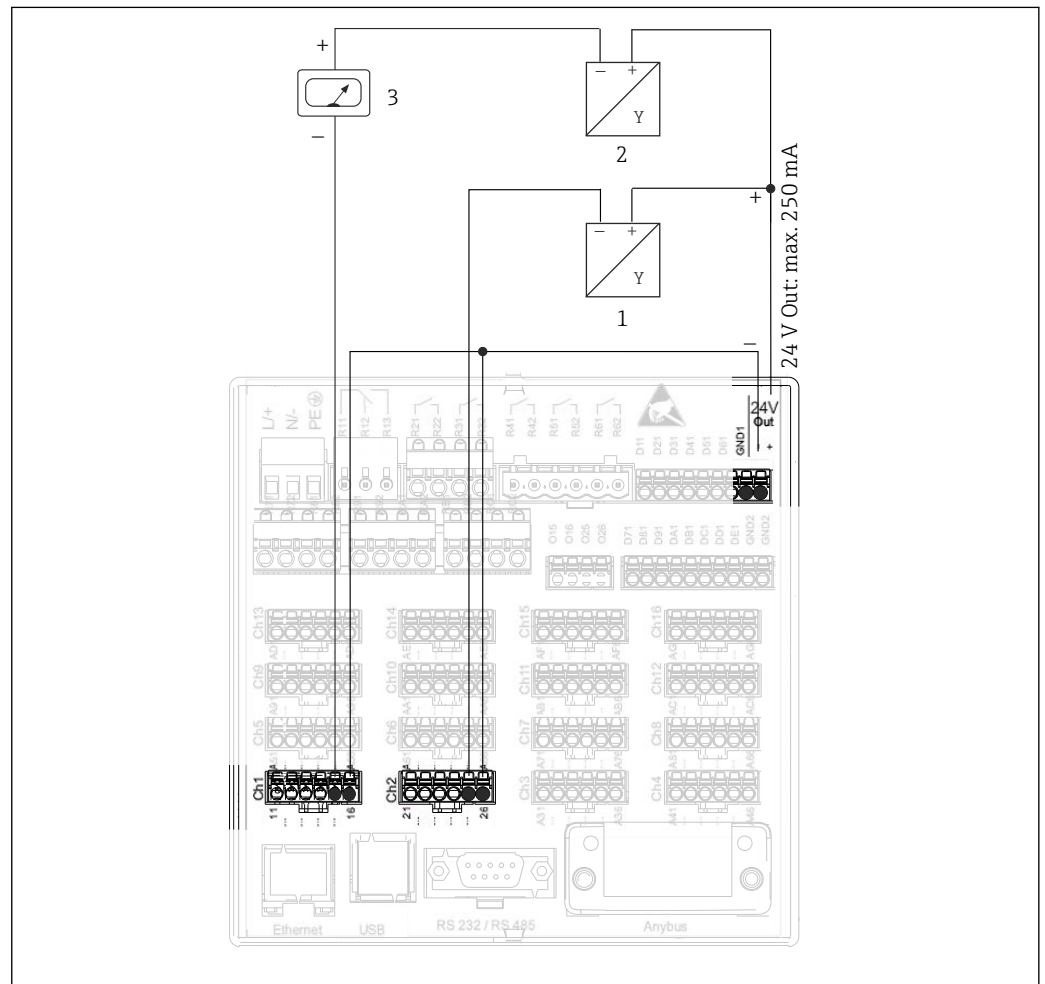
🗺 6   *Connecting the auxiliary voltage output when using as a transmitter power supply for 2-wire sensors in the current measuring range*

1   Sensor 1
2   Sensor 2
3   External indicator (optional)

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6.3.4 Connection example: Auxiliary voltage output as transmitter power supply for 4-wire sensors
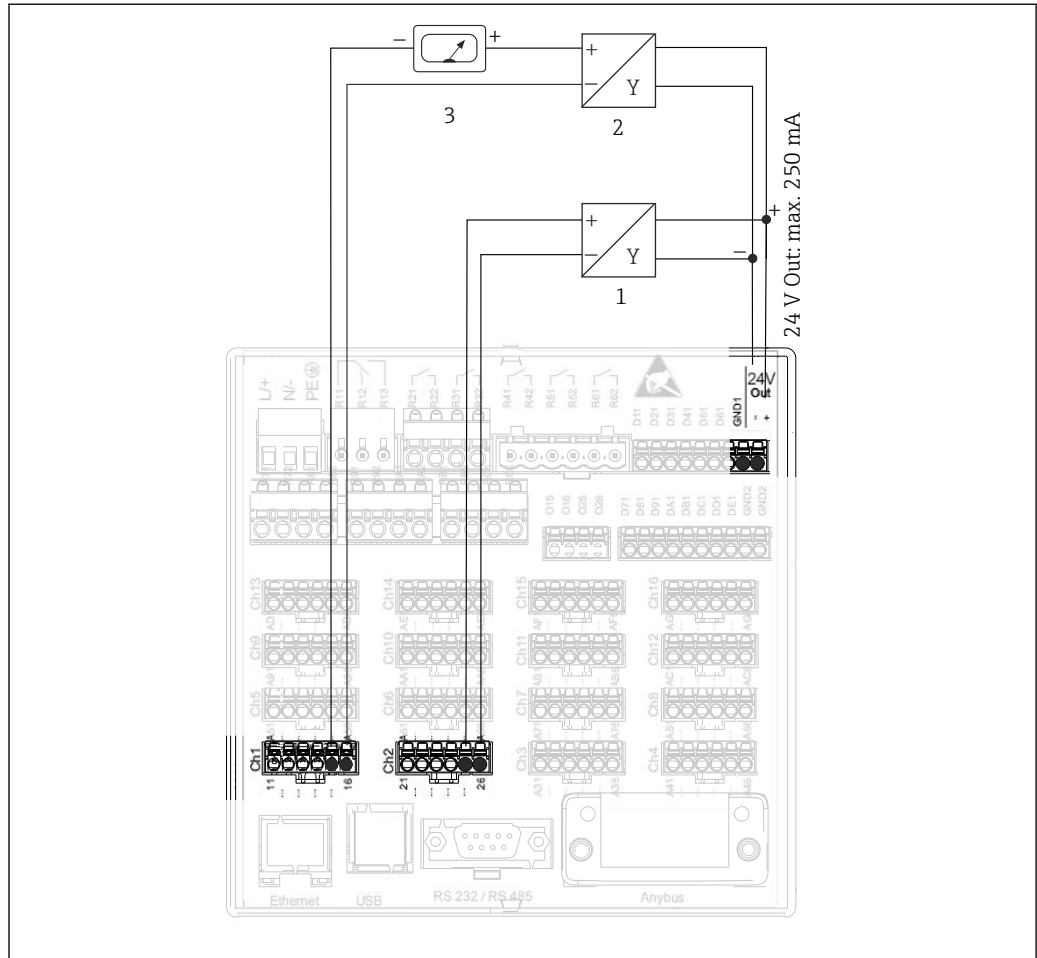
7   Connecting the auxiliary voltage output when using as a transmitter power supply for 4-wire sensors in the current measuring range

1   Sensor 1
2   Sensor 2
3   External indicator (optional)

6.3.5 Connection example: HART® input in a point-to-point connection
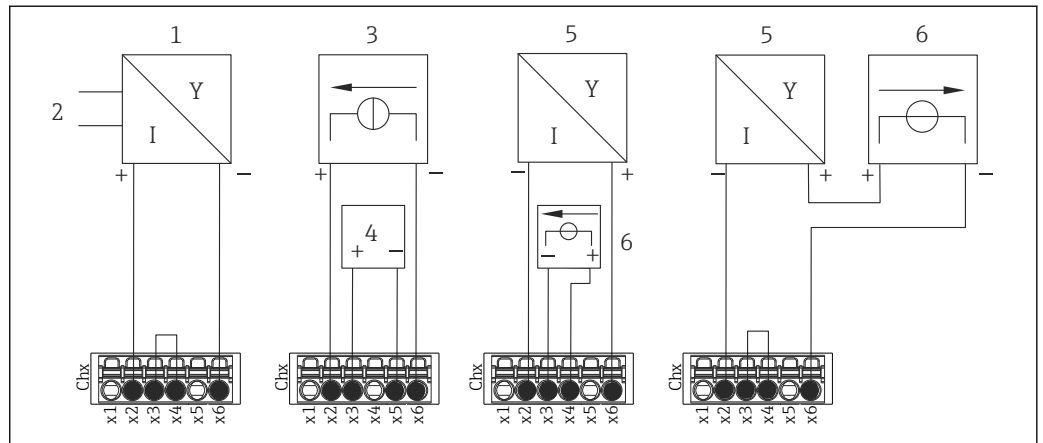
⊡ 8   *Connection example: HART® inputs in a point-to-point connection*

1   Active 4-wire sensor (slave)
2   Power supply for 4-wire sensor
3   Power supply (electricity source) for actuator
4   Actuator (e.g. adjuster 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).
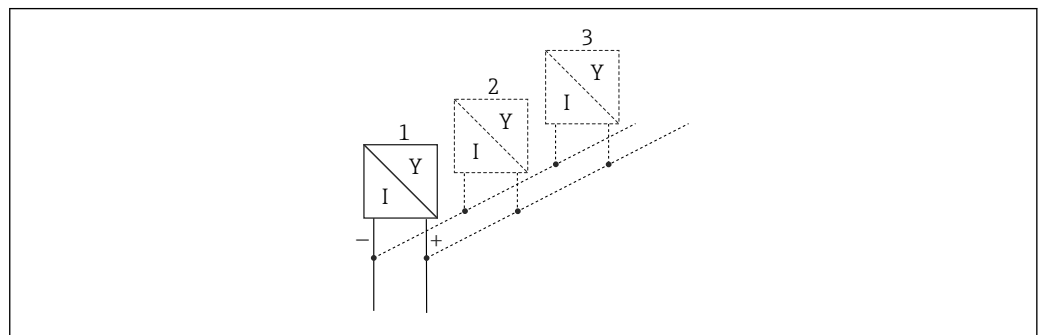
⊡ 9   *Connection example: HART® input in a Multidrop connection*

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, rear of device, slot 0)

ℹ️ Use shielded signal lines for serial interfaces!

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.

A0024732-EN
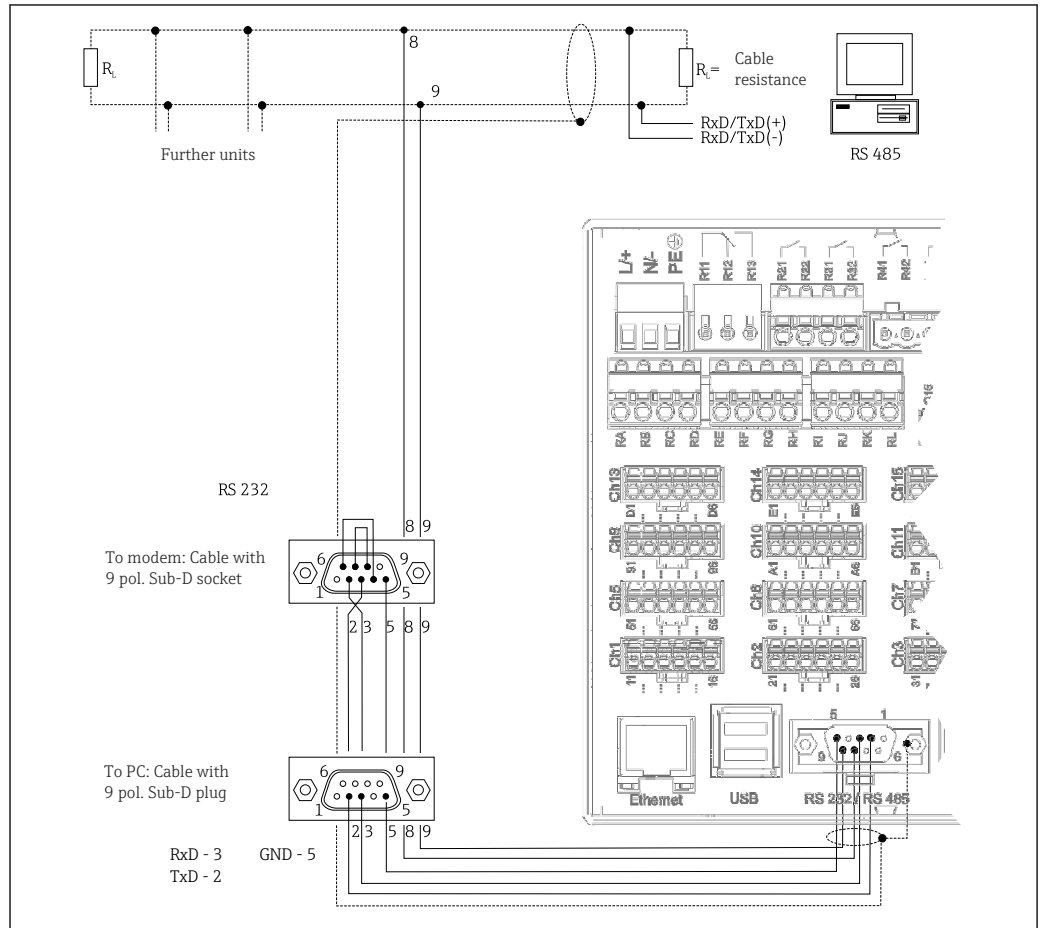
Type	Pin of the SUB-D9 socket								
	1	2	3	4	5	6	7	8	9
RS232 assignment		TxD (data output)	RxD (data input)		GND				
RS485 assignment					GND			RxD/TxD −	RxD/TxD +
Unoccupied connections should be left empty. Maximum cable length: RS232: 2 m (6.6 ft) RS485: 1000 m (3280 ft)									

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

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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), is recommended.→ 🖺 77

GSM/GPRS wireless modem:
A GSM/GPRS wireless modem (e.g. Cinterion, INSYS or WESTERMO, incl. antenna and power unit) for industrial use, which is connected to the RS232 interface with a special modem cable (see Accessories), is recommended. → 🖺 77
Important: the wireless modem needs a SIM card and data transfer subscription. In addition, it must be possible to deactivate the PIN prompt.

6.3.8   Ethernet connection (CPU card, rear of device, 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
- Galvanic isolation; testing voltage: 500 V

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

Meaning of the LEDs
Beneath the Ethernet connection (see rear of device) 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 illuminated then communication is impossible.
- 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.

ℹ️ 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, rear of device, 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 communication in line or ring topologies without an additional external switch. Connection via 2 RJ45 standard sockets.

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

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

6.3.11   Connections on front of device (only for version with navigator and front interfaces)
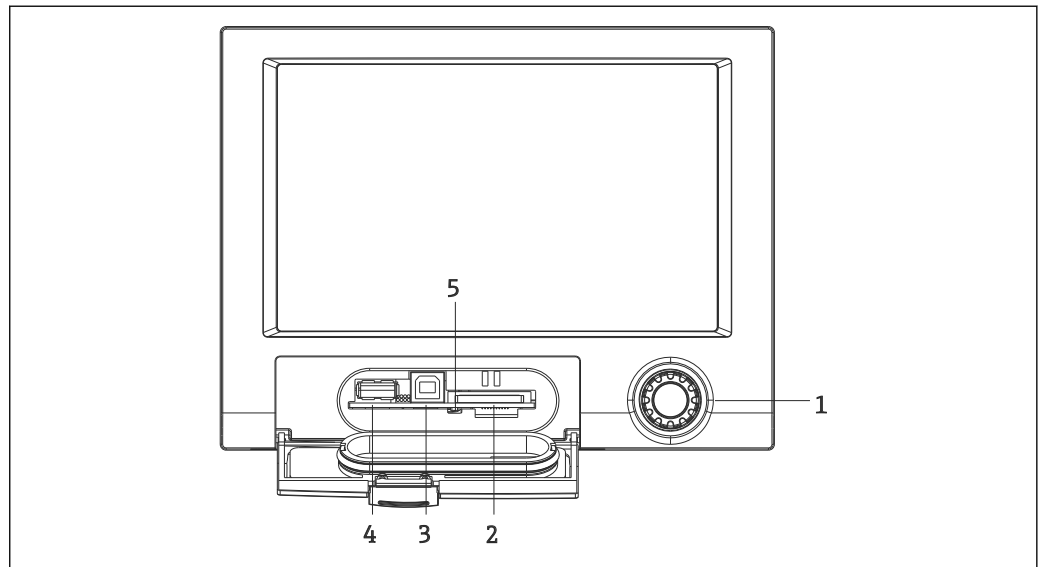
A0024737

🖼 *10   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 PC or laptop
4   USB A socket "Host" e.g. for USB memory stick, external keyboard/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 stick as a memory medium, for example, can be connected to this port. An external keyboard/mouse for device operation, a USB hub, a barcode reader or a printer (PCL5c or higher) may 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 for communication with a laptop, for example.

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

Requirements with regard to the SD card

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

ℹ️ Use only the industrial-grade SD cards described in the "Accessories" section of the Operating Instructions. These have been tested by the manufacturer and guaranteed to function faultlessly in the device. → 🖫 77

ℹ️ 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. → 🖹 77

ℹ 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.

ℹ 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 keys are not supported (e.g. Windows keys). Users can only enter characters that are available in the entry 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".

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.

ℹ️ 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 specifications 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 rear of device.

7 Operation options

7.1 Overview of operation options

The device can be operated directly onsite with the Navigator and USB keyboard/mouse or via interfaces (serial, USB, Ethernet) and operating tools (Web server).

7.2 Structure and function of the operating menu

7.2.1 Operating menu for operators and maintenance personnel

A0024770-EN
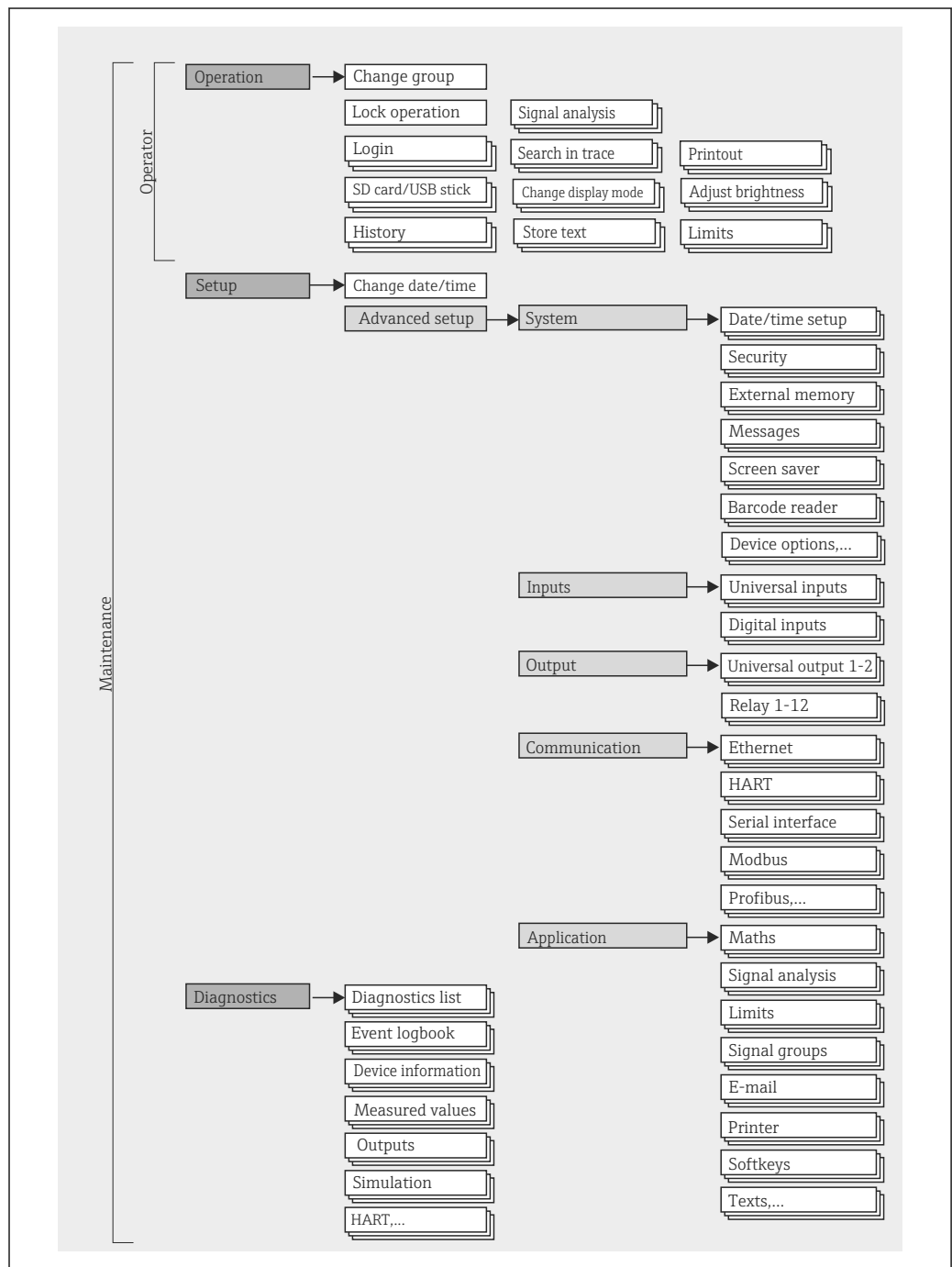
7.2.2 Operating menu for experts
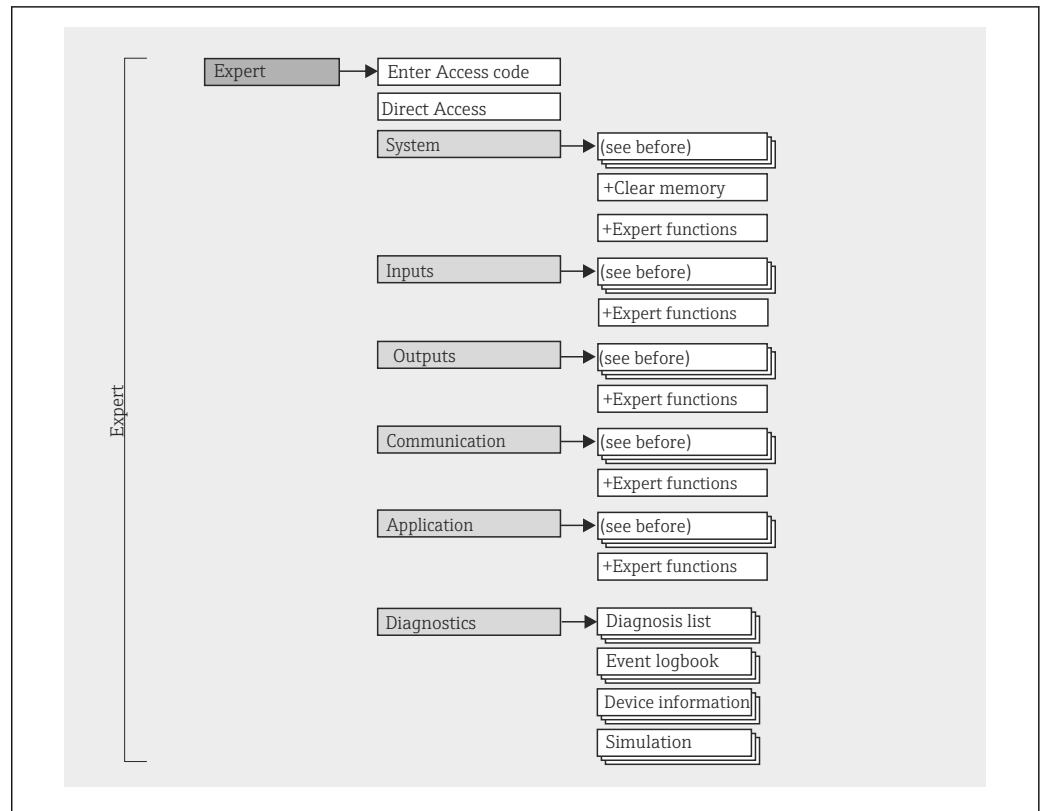
A0019596-EN

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 lifecycle 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 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:** Setup required only if outputs (e.g. relays) are to be used. – **Communication:** Setup required if you are using the USB, RS232, RS485 or Ethernet interface or the HART® inputs of the unit (PC operation, serial data read-out, modem operation, etc). – **Application:** Define different application-specific settings (e.g. group settings, limit values, etc.). Once values have been set for these parameters, the measurement should generally be completely configured.

User role	Typical tasks	Menu	Content/meaning
	Fault elimination: • Diagnosing and eliminating process errors. • Interpretation of device error messages and correcting associated errors.	"Diagnostics"	Contains all parameters for detecting and analyzing errors: • **Diagnosis list** All diagnosis 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** Display of current measured values of 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 log. • **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 function of the device: • 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 parameters of the device (including those that are already 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-order device parameters that do not concern the 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 parameters for configuring 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

⊠ *11   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 = operating in the Setup menu)
a	Slot for SD card
b	USB B socket "Function" e.g. to connect to 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 writes to the SD card or reads it. **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 or in a selection menu: turn the dial anticlockwise to move the bar or the cursor upwards or counterclockwise, 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", keys 1 to 4 (from left to right)
4	Function indicator of the "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: --

Item No.	Operating function (display mode = display of measured values) (Setup mode = operating in the Setup menu)
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). 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. ℹ️ 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: display of 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.

7.4 Display representation of symbols used in operation

Item No.	Function	Description
9	**Symbols for counters:**	
	$\Sigma 1, \Sigma 2, \Sigma 3, \Sigma 4$	Intermediate analysis 1 to 4 / external analysis 1 to 4
	ΣD	Daily analysis
	ΣW	Weekly analysis
	ΣM	Monthly analysis
	ΣY	Annual analysis
	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 is still 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).
	C	**"Function check"** The device is in Service mode.

Item No.	Function	Description
	⊓	**"Maintenance required"** Maintenance is required. The measured value is still 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 Use the "Back" function, which can be found at the bottom of each menu/submenu, to move up a level in the menu structure.

ℹ️ To quit the menu immediately, press and hold "Back" (>3 sec.) in the Navigator. The devices switches to display mode.

7.4.2 Symbols in the event logbook

⚒	Setup changes
①	Power on
⏻	Power off
⊠	Limit value on
☐	Limit value off
1	Digital on (on/off message)
0	Digital off (on/off message)
⚡	Service
♟	User administration
abc	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. Here, turn and press the navigator, or use the touchscreen or mouse, to select the appropriate character.

The following characters are available for entering free 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 the operating menu via the local display

Using the "Navigator" (jog/shuttle dial with additional press function), the soft keys or the touchscreen (option), all settings can be made directly onsite at the device.

7.8   Device access via operating tools

7.8.1   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 log)
• Visualization and processing of saved data (measured values, analyses, event log)
• Safe archiving of exported data in a SQL database

The following versions of the software are available:
• Essential version (free, with limited functionalities)
• Professional version (see accessories → 🖿 77)
• Demo version (time-limited Professional version)

An "Essential" version of the analysis software is supplied with the device.

For details, see the Operating Instructions on the analysis software DVD provided.

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.

The Web server offers the following range of functions:
- Display of current and historical data and measured value curves via a standard Web browser → 🗎 50
- Easy configuration without additional installed software → 🗎 40
- 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 momentary values can be provided:
- Analog channels
- Digital channels
- Mathematics
- Totalizer

8 System integration

8.1 Integrating the measuring device in the system

8.1.1 General notes

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.

Alarms or errors in the context of data transmission are displayed depending on the bus system (e.g. status byte).

The process values are transferred in the same devices that are used for display at the device.

ℹ️ **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, OPC server)
• Web server

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

ℹ️ 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 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. Configuration for Modbus communication is done in the **Setup** → **Advanced setup** → **Communication** → **Modbus slave** menu. Up to 12 analog inputs and 6 digital inputs can be transmitted via Modbus and stored in the device.

Menu position	RTU (RS485)	Ethernet
Device address:	**1** to 247	IP address manual or automatic
Baud rate:	9600/**19200**/38400/57600/115200	-

Menu position	RTU (RS485)	Ethernet
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.

More detailed information about Modbus is provided in the supplementary documentation.

9 Commissioning

9.1 Function check

Make sure that all post-connection checks have been carried out before putting your device into operation:
- "Post-installation check" checklist .→ 🖺 14
- "Post-connection check" checklist .→ 🖺 29

9.2 Switching on the measuring device

Once the operating voltage is applied, the display 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 Setting 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 or click 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 or click "Sprache/Language" and select the desired language from the drop-down 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. Change the default language setting: press the navigator, turn it to select the preferred language and press the navigator again to accept the setting

4. Use "Back" or "ESC" to quit the main menu

The operating language has been changed.

> Use the ✖ "Back" function, which can be found at the bottom of each menu/submenu, to move up a 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.

9.4 Configuring the measuring device (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. You can also use a PC to commission or configure your device.

Device configuration options:
- Setup directly at the device
- Setup via SD card or USB stick by transferring the parameters stored on it
- Setup via Web server using Ethernet

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. Make 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 the newly created input and configure it

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 main 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: set or delete 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 main 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 main 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: read HART® values (option)

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 identifier
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 identifier 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 main 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   Setup directly at the device

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

Parameters		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 e.g. 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 analog and digital inputs
	Outputs		Settings only required if outputs (e.g. relays or analog outputs) are to be used

Parameters		Possible settings	Description
	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.)
			ℹ 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		Configure various application-specific settings (e.g. group settings, limit values, etc.)

ℹ A detailed overview of all the operating parameters is provided in the appendix at the end of the Operating Instructions. → 🗒 106

9.4.5 Setup via SD card or USB stick

An existing device configuration ("Setup data" *.DEH) from another Data Manager 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"**.

9.4.6 Setup via Web server

To configure the device via the Web server, connect the device via Ethernet to your PC.

Please observe the information and communication settings for Ethernet and the Web server under .→ 🗒 38

ℹ 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"**.

Default value for ID: admin; Password: admin

Note: The password should be changed 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 device to the PC via Ethernet

2. Start the browser at the PC; open the Web server for the device by entering the IP address: http://<ip-address> 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"

4. The Web server shows the instantaneous value display of the device. Click **"Menu -> Setup -> Advanced setup"** in the Web server function bar

5. Starting configuration

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): → 🖺 50

> **NOTICE**
>
> **Undefined switching of outputs and relays**
>
> ‣ During configuration using a Web server, the device may assume undefined statuses! This may result in the undefined switching of outputs and relays.

An existing device configuration ("Setup data" *.DEH) 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 → 🖺 42

2. Click **"Data management -> Import device settings"** in the Web server function bar

3. Select the setup file and press **"OK"** to confirm

4. The file is transferred, checked and accepted

5. Once the device settings have been accepted, information to this effect is displayed in the Web server

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:

Parameters	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 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		Configure various application-specific settings (e.g. group settings, limit values, etc.)
Diagnosis		Device information and service functions for a swift device check

A detailed overview of all the operating parameters is provided in the appendix at the end of the Operating Instructions. → 🖺 106

9.6 Configuration management

You can save the setup data ("Configuration") to an SD card or a USB stick, or save them to a PC drive via the Web server. 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 are 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 → 🕮 42
2. Click **"Data management -> Save device settings"** in the Web server function bar
3. Select the setup file
4. Transfer the file
5. Verify and accept
6. Once the device settings have been 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 -> Web server settings; 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 Protecting settings from unauthorized access

After configuration, the setup should be protected against unauthorized access. The following options are available:
- Protection per control input
- Protection via release code
- Protection via user roles
- Protection via user administration according to "FDA 21 CFR Part 11"

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. modifications can always be made.

   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. modifications can always be made.

   The passwords should be changed 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. modifications can always be made.

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

10.1 General notes

Before applying electronic signatures the

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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 must be instructed / trained in accordance with 21 CFR 11 or must already possess the relevant knowledge or qualifications. Commercial software used in electronic recording systems in accordance with 21 CFR 11 must be validated. The suitability of the device and the associated PC software (incl. operating system) for the application in question must be specified, validated, and documented (e.g. with regard to data confidentiality, printout of the device parameters, security backup of the set parameters, assignment of access authorizations in the PC software, suitability of the software used for commercial purposes – such as operating system, etc.).

The identity of the relevant person must be verified before assigning / determining the electronic signature (or elements of this electronic signature, e.g. unique ID / initialization password). 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/open systems.

NOTICE

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

▶ The scope of application for this FDA 21 CFR Part 11 evaluation refers to the device and the associated 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 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 function guaranteed, even in the event of local changes (e.g. network printer).

▶ 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 for ensuring 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.

▶ Assign the permitted rights to users 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 for ensuring 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. The device must be locked via hardware protection (terminal cover) and a digital input assigned. 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 adjustable), 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 using the modem 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 diagnosis list in which faults are documented. The diagnosis list must be checked regularly; this can be done in the main menu under **"Diagnostics -> Diagnosis list "**.
▶ Proof testing of the error log is recommended; this is done from the main menu under **"Diagnostics -> Device information -> Error log"**.

NOTICE

The user is responsible for observing the following instructions for ensuring compliance with FDA 21 CFR Part 11:
Requirements for the external memory:
▶ The external storage medium (SD card/USB stick) must 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 analysis software (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: Create an administrator under **"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 on the DVD provided with the PC software.

NOTICE

The user is responsible for observing the following instructions for ensuring 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 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 time stamp. 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 onsite display have no effect on the measurement section or the configured device parameters.

The unit's simple control system 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 or modified where necessary:

Display IP/MAC address (only if DHCP is enabled): The device's IP or MAC address can be found in the main menu under **"Diagnostics -> Device information -> Ethernet"**.

Display/change Ethernet settings: The device's Ethernet settings can be found in the main menu under **"Setup -> Advanced setup -> Communication -> 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. Make 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 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: 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"**.

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.

11.3   Reading measured values
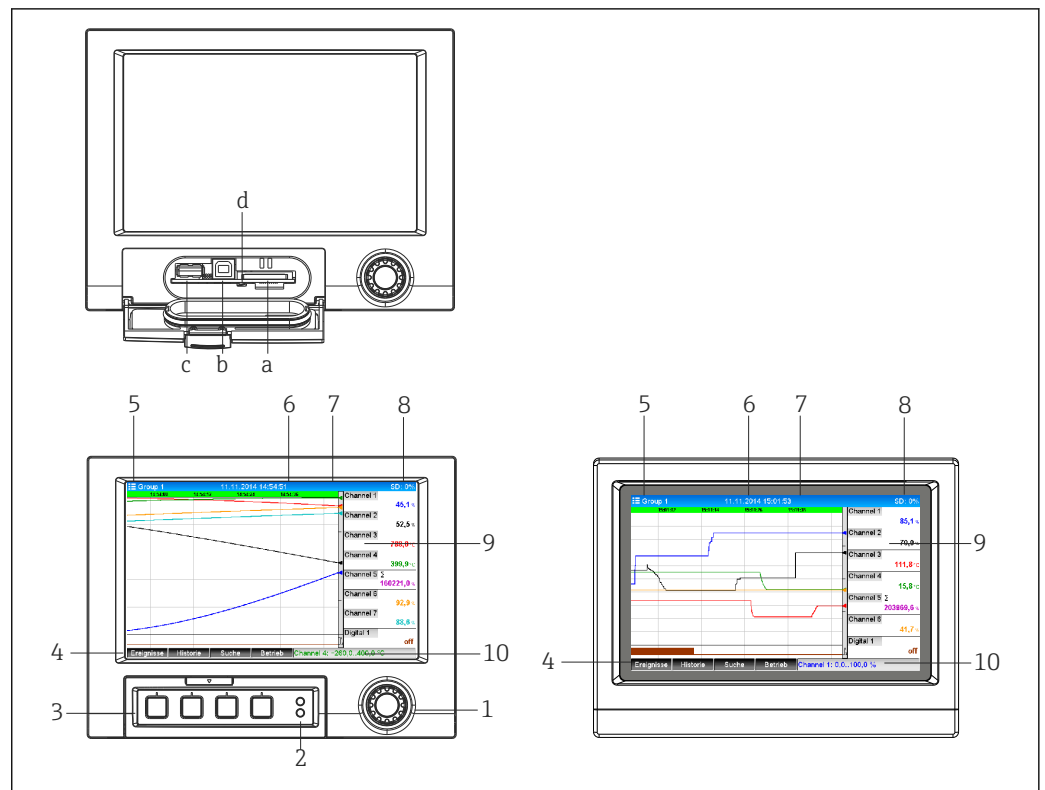
⊡ *12   Device front (left: Version with navigator and front interfaces; right: Version with stainless steel front and touchscreen)*

a   Slot for SD card
b   USB B socket "Function" e.g. to connect to 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   Variable "Softkey" keys 1-4 (from left to right)
4   Function indicator of "Softkey" 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

[i] An overview of all the symbols and icons is provided in the operating options section. → 🗏 34

[i] 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.

[i] Information on how to rectify a problem in the event of an error is provided in the "Troubleshooting" section. → 🗏 65

11.4   Reading measured values via the Web server

A Web server is integrated into the device. If the device is connected via Ethernet, it is possible to display the measured values via the Internet using a Web server.

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

ℹ️ 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
- Mozilla Firefox 15 and higher
- Opera 12.x and higher
- Google Chrome 23.x and higher

ℹ️ In order to use the full functionality of the Web server, it is recommended that the latest version of the browser is used.

ℹ️ To configure the device via a Web server, you must have Administrator or Service access. Prior to accessing the Web server, create an ID and password in the main menu under **"Setup -> Advanced setup -> Communication -> Ethernet -> Configuration Web server -> Authentication"**.

Default value for ID: admin; Password: admin

Note: The password should be changed during commissioning!

Data can be exported via the Web server in HTML or XML format.

11.4.1   Access to the Web server via HTTP (HTML)

When using an Internet browser, you just need to enter the address **http://<ip-address>** to have the HTML view displayed in the browser.

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

As on 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 statuses are not transmitted.

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

ℹ️ The decimal separator is always displayed as a point in the XML file. Also, 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>
```

Day	Description
device id	Unique ID of measuring point
tag	Channel ident.
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   Remote control via the Web server

Remote control of the device is possible via Web server. In the Web server, remote control 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   Data analysis and visualization using analysis software provided

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

This enables all measuring point data to be completely 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). You can install and use the free Postgre™SQL database provided on the DVD.

For details, see the Operating Instructions on the analysis software DVD provided.

11.5.1   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 log 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: 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 also 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 also possible.

11.5.2   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. Select the menu **"Data -> Get external data - From text"**

2. Select the CSV file

3. Follow the instructions in the wizard

4. Select file origin **"Unicode UTF-8"**

11.6   Change 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.

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"**.

11.7   Block keyboard/navigator

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".

11.8   Log on/log out

Log onto the device, or log out the user currently logged on.

Only when user administration is active (FDA 21 CFR Part 11) or in the case of role-based access protection.

11.9   Change password

Change your user password.

Only when user administration is active (FDA 21 CFR Part 11).

11.10   SD card/USB stick

11.10.1 Function of SD card or USB stick

Without affecting the internal memory, data packets are copied block by block (min. 1 x daily, midnight) to the SD card. Tests are also made to determine whether the data have been written without any errors. 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. The USB stick is **not** used for storing the measured values continuously, i.e. this 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 time range selected under **"Operation -> SD card/USB stick -> Save measured value"** is copied to the **rng_data_<Device name>** folder. The copying of this data has no effect on the saving of data in the **rec_data_<Device name>** folder.

- Only use new, formatted SD cards recommended by the manufacturer (see "Accessories").→ 🖹 77
  - 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 current data (until the last save) is included on it.
  - Depending on the configuration of the unit (see **"Setup –> Advanced setup –> System –> Ext. memory –> Warning at"**), an acknowledgeable message on the display informs you 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. Should you ever forget to change the data carrier in time (or if no SD card has been inserted), the new external data carrier is filled with the missing data from the internal memory - as long as the data are still available there. 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.

11.10.2 Functions relating to the SD card or USB stick

You can find functions to save measured data and device settings on a removable medium in 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. You are notified when it is safe to remove the data storage medium. 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. Please be patient! 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), allowing printouts to be easily made.
- **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-related graphic:**
Load, export or delete process screen.
Load: Loads a process screen from the external storage medium to the device memory.
Export: Saves the current process screen in the device to the external storage medium so that it can be transferred to another device.
Delete: Deletes the selected process screen from the device memory.
Procedure for creating and editing process pictures: . → 🖺 57
- **Load user administration:**
Loads all settings and user accounts from the storage medium to the device. The file has the extension ".ids2".

> Attention: All existing settings/accounts will be 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. The following are supported: DER, CER and CRT (binary or Base64-encoded).
Visible only if there is an SSL certificate on the SD card or USB stick.

Creating a process-related graphic with the process picture generator

> The CD provided with the analysis software includes a process picture generator.

This program is used to generate a process screen quickly and easily.

Start the process picture generator and create the first project:

1. Copy the entire "ProcessPictureGenerator" directory from the CD to a local directory on the PC

2. Alternatively, unzip the downloaded ZIP file in a local directory on the PC

3. Double-click on the "FieldDiagramer.exe" application it contains

4. The process picture generator is started and a new project is created

5. Select all fields required for the project such as project name, device type, etc. as well as the background picture

6. Edit the process screen accordingly

7. Use the function **"File -> Save"** to save the current project

8. Use the function **"File -> Export"** to save the process screen ("PP_GROUP_<xx>.bmp") with the required INI file ("PP_GROUP_<xx>.ini") to a USB stick or an SD card. Note: The "xx" in the file name stands for the respective group (01-10)

9. Remove the USB stick or SD card from the PC

Further help can be called directly from the help menu of the process picture generator.

Load the process screen into the device:

1. Insert the USB stick or SD card with the generated process-related graphic into the device

2. In the main menu go to **"Operation -> SD card/USB stick -> Process-related graphic -> Group"** and select the group to which the process screen should be assigned

3. In the main menu go to **"Operation -> SD card/USB stick -> Process-related graphic -> Load"**, select the desired process screen, and load it into the device

4. In the main menu go to **"Operation -> Change display mode"** and change the display mode to **"Process-related graphic"**

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.

In the context menu that is now open the "Process-related graphic" submenu can be selected:

Parameters	Parameter/description
"Edit" submenu	Here you can edit the currently displayed process screen (position, font size, etc.).
"Channel 1-8" submenu	Here you can edit the selected channel of the process screen (activate, change position/ font size, etc.).
	Display in the process screen Switch the channel in the process screen on or off. Note: Does not affect the saving of measured values/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. ⊡ If "Align left" is selected, the x position is the top, left corner of the measured value. If "Align right" is selected, the x position is the top, right corner of the measured value. Options: Left-aligned, right-aligned. Factory setting: Right-aligned.

Parameters	Parameter/description
	x-position Select the x-position at which the measured value should be displayed. Input: 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 Select the y-position at which the measured value should be displayed. 🛈 The point of origin (x-/y-zero point) is the top left. When the y-value is increased the text moves down. Input: 0 to 450 pixels; factory setting: 50 (channel 1) to 260 (channel 8).
	Font size Select the font size in which the measured value should 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.

11.10.3 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"**.

Only TLS V1.0 (= SSL 3.1) or TLS V1.1 is 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.

11.10.4 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)"**.

Only TLS V1.0 (= SSL 3.1) or TLS V1.1 is 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.

11.10.5 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

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 most important certificate information, e.g. subject key ID, organization and validity period, are displayed in the parameter list.

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 log) 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 log. If a certificate is deleted all errors related to this certificate are reset.

11.11   Showing measured values history

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 make other settings for the historical data display (e.g. scroll speed, time scaling or change display mode) or to quit the historical data function.

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 in the display 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.

11.11.1   Historical data: changing a group

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

11.11.2   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.

11.11.3   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.

11.11.4   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.

11.11.5   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"**.

11.11.6 Historical data: Change the display mode

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.

11.11.7 Historical data: Store text

You can store a text predefined in the list or a text of your own. This text is assigned to a definable point in time.

A predefined text can be selected or a user-defined text can be saved in the historical data under **"Operation -> Store text"**.

11.12 Signal analysis

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

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

11.13 Search in trace

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

Search for events: The event logbook forms the basis for searches for events. To search more easily for certain events (e.g. setup changes), the search filter can be used 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.

11.14 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.

11.15 Store text

You can store a text predefined in the list or a text of your own. This text is assigned to a definable point in time.

A predefined text can be selected, or a user-defined text can be saved, in the main menu under **"Operation -> Store text"**.

11.16 Printout

The device settings, user administration data, event log, 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 log 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 log can be printed out via the analysis software. Alternatively the event log can be saved as a CSV file and printed out from the PC.

11.17 Adjusting the brightness of the display

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

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

11.18 Limit values

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 set points: Outside of setup also"**.

Detailed description of the limit values: → 🗎 218

11.19   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 for this, with the exception of the SD card settings (memory build-up, warning, and relay). The memory is regarded as a stack memory.

Detailed description of the parameters: → 🖹 242

ℹ️ 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".

11.19.1 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.

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

ℹ️ 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"**.

Default value for ID: admin; Password: admin

Note: The password should 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.

12   Diagnostics and troubleshooting

To help you troubleshoot, the following section is designed to provide an overview of possible causes of errors and initial remedial measures.

12.1   General troubleshooting

⚠️ **WARNING**

Danger! Electric voltage!

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

Display	Cause	Solution
No measured value display; no LED lit	No supply voltage connected	Check the supply voltage of the device
	Supply voltage is applied; device or power unit is defective	The power unit or the device must be replaced
Diagnostic message is displayed	The list of diagnostic messages is provided in the following section	

ℹ️ **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 the device errors or alarms.

General troubleshooting procedure

1. Open diagnosis 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 measured values or the 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 error number and the information in the main menu under **"Diagnostics -> Device information"** (program name, serial number etc.) ready.

12.2.1   Device error/alarm relay

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

The diagnostic code consists of the error category as per Namur NE 107 and the message number.

Error category (letter in front of the message 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. Any control system connected should be set to manual mode. An alarm relay can be assigned to this error category 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. However, proper maintenance efforts would prevent a possible malfunction in the future.
- **S = Out of specification**. The measuring point is being operated outside specifications. Operation is still possible. However, you run the risk of increased wear, shorter operating life or lower measurement accuracy. The cause of the problem is to be found outside the measuring point.
- **C = Function check**. The device is in Service mode.

Diagnostic code	Message text	Description	Remedy
F100	Sensor/input error	Sensor/input error	Check connections and parameters
F101	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 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 Department
M284	Firmware update	Firmware has been updated	No action required. Message can be acknowledged
F301	Error: Cannot load setup	Setup defective	Switch the device off and then on again, re-configure, contact the Service Department if necessary
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 (e.g. 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 might need to be replaced (contact the Service Department)
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

Diagnostic code	Message text	Description	Remedy
F312	Analog card x is not calibrated!	Analog card x is not calibrated! The device works with default values, i.e. the measured values could possibly 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
M317	Battery voltage < 2 V. Please replace battery!		Battery needs to be replaced (contact the Service Department)
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 of 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 detected that the configuration was 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	Please 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

Diagnostic code	Message text	Description	Remedy
F526	• Support points not OK • Support points: x-value exists more than once • Upper and lower support points are identical	The support points for the specified 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?
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: Error number only occurs if e-mails are sent
M906	End limit value x	Set point x no longer violated	Note: Error 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 of 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 in printing	Various problems while printing, e.g.: • Printer spooler is full • Printer out of paper • Printer not ready • Please replace the toner/ink	Check the printer status on 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 the data onto the WebDAV server, but there was not sufficient memory available	Use other WebDAV server. Delete files no longer required from the WebDAV server

Diagnostic code	Message text	Description	Remedy
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 Loading process-related graphics	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
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 has been disconnected	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 ready	Check/replace the SD card or USB stick
M947	Modem could not be initialized! Please check the cable and modem	The connected modem could not be initialized by the device	Please check the cable and modem
M950	Unable to load SSL certificate	Unable to 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

Diagnostic code	Message text	Description	Remedy
M953	x certificates have already been installed. First of all, please 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. Your user account has been deactivated	Incorrect password. User account has been deactivated	Please contact your administrator to reactivate your account
M956	Incorrect password. Your user account has been deactivated for 10 minutes	An incorrect password was entered and the account has been temporarily blocked	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)
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 has been activated but no channels have been 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 disconnected	Check settings/network connection
M981	WebDAV: Authentication failed		Check settings
M982	WebDAV: Directory or file could not be created	Set directory path does not exist	Create a directory manually in the WebDAV server
M983	WebDAV: Fault	An unassigned error has occurred. The error is displayed in English	

HART® error messages

Diagnostic code	Message text	Description	Remedy
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 fieldbuses: 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 the HART® network (e.g. handheld) • Check master settings (secondary/primary)

12.4   Pending, current diagnostic messages

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

12.5   Diagnosis 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 diagnosis list is designed as a ring memory, i.e. when the memory is full the oldest messages are automatically overwritten (no message).

The following information is saved:
• Error 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, e.g. 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 if necessary.

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

Selecting simulation: Simulation of the relays 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!

12.10.1 Test barcode reader

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 when 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"**.

ℹ️ At least one e-mail address must be set beforehand. A message is provided on the device to confirm if the email was sent or not.

12.10.3 Test WebDAV Client

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

ℹ️ 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.

ℹ️ Only possible with the "Tele-Alarm" device option.

Detailed descriptions of this device option can be found in the associated documentation.

12.10.5 Test time synchronization/SNTP

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

ℹ️ 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. A message is provided on the device once the test has finished.

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

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

Attention: Measured value acquisition will be slower because additional information needs to be read.

ℹ️ For further information open the online help on the device.

12.12   PROFINET diagnostics (option)

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

12.13   Initialize 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. For this purpose only use the modem cable, which is available as an accessory.

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.

12.14   GSM terminal

Information on the reception quality.

Only possible with the "Tele-Alarm" device option.

Detailed descriptions of this device option can be found in the associated documentation.

12.15   Status telealarm

Information on the status of individual alarms.

Only possible with the "Tele-Alarm" device option.

Detailed descriptions of this device option can be found in the associated documentation.

12.16   Resetting the measuring device

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 device

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.

12.17   Firmware history

Overview of unit software history:

Unit software version/date	Software modification	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	BA01434O/ 09/01.15
V2.01.00/04.2016	Extended functionality/bug fixes	V01.03.01.00 and higher	V5.00.03.00 and higher	BA01434O/ 09/02.16
V2.01.05/11.2016	Extended functionality/bug fixes	V01.03.01.01 and higher	V5.00.03.00 and higher	BA01434O/ 09/03.16

13   Maintenance

No special maintenance work is required for the device.

13.1   Updating the device software ("firmware")

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

You can access this function in the main menu under **"Operation -> SD card or USB stick -> Update firmware"**.

[i] It is advisable to save the setup and measured values beforehand on the SD card or USB stick.

The device software ("firmware") should only be updated by a service technician.

The device will restart following the firmware update.

[i] Only special, approved firmware versions may be installed for the "EtherNet/IP" and "PROFINET" options. Detailed descriptions of these device options can be found in the associated documentation.

13.2   Instructions for enabling a software option

Various device options can be enabled via an activation code. Available device options can be ordered as an accessory . → 🖺 77Once you place your order, you receive instructions on how to activate the option and a code which you must enter under **"Main menu -> Expert -> System -> Device options -> Activation code"**.

13.3   Cleaning

The front of the housing can be cleaned with a clean dry or damp cloth.

14 Repairs

14.1 General notes

ℹ Repairs that are not described in these Operating Instructions must only be carried out directly by the manufacturer or by the service department.

ℹ If ordering spare parts, please specify the serial number of the unit! Installation instructions are included with the spare part.

14.2 Spare parts

ℹ If necessary, contact your supplier.
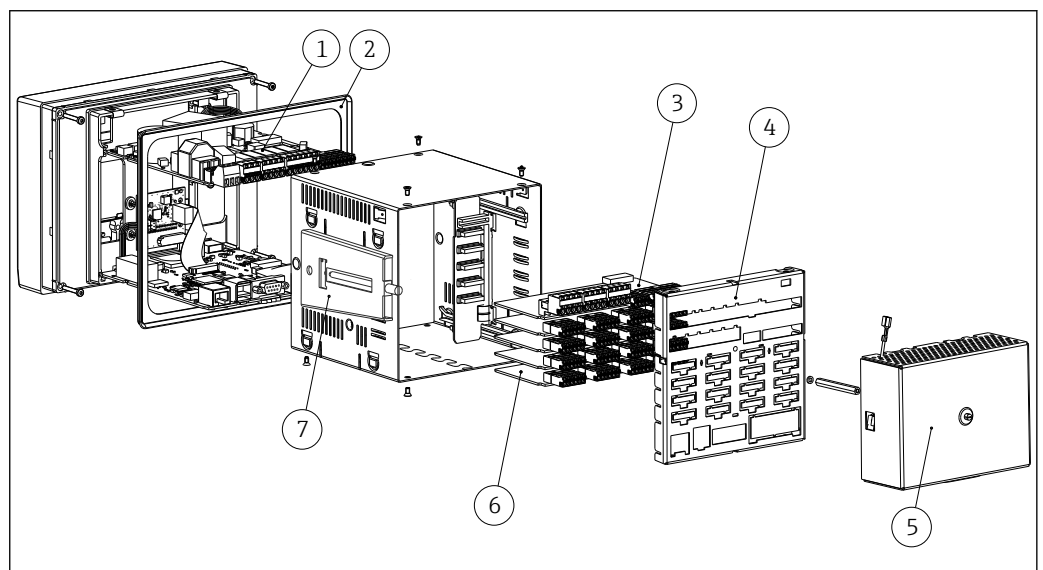
🖾 13   *Spare parts diagram*

Spare parts list:

Item No.	Description
1	Power supply 24 V AC/DC for Slot 6
1	Power supply 100-230 V AC (+/-10%) for slot 6
2	Seal housing
3	Digital board extension (8x digital inputs + 6x relays + 2x analog outputs) for slot 5 (rear panel must also be ordered with the extension)
4	Rear panel analog inputs
4	Rear panel analog + digital inputs
5	Terminal cover lead sealable
6	Analog board (4 channels) for slots 1-5
6	HART® card (4 channels) for slots 1-5
7	Jack screw short (1 piece)
	RS232/RS485 adapter set, DIN rail, 230 V AC, galvanic isolation + interface cable for PC/modem
	RS232/RS485 adapter set, DIN rail, 150 V AC, galvanic isolation + interface cable for PC/modem
	SD card "Industrial Grade" industry standard, 1 GB

Item No.	Description
3	**Terminals:**
	Terminal plug 3 pole for mains connection "N L PE" RM5.08 – orange color at slot 6
	Terminal plug 3 pole for power supply at slot 6
	Terminal plug-in 3 pole FKC2,5/3-ST-5,08 for relay 1 (changeover) at slot 6
	Terminal plug-in 4 pole FMC1,5/4-ST-3,5 for digital board extension, slot 5 (analog outputs)
	Terminal plug-in 10 pole FMC1,5/10-ST-3,5 for digital board extension, slot 5 (digital inputs)
	Terminal plug-in 4-pole FKC2.5/4-ST-5.08 for relay 2+3 on slot 6 or relay 7+8 / 9+10 / 11+12 on slot 5
	Terminal plug-in 6 pole FKC2,5/6-ST-5,08 for relays 4+5+6 at slot 6
	Terminal plug-in 9 pole FMC1,5/9-ST-3,5 for digital inputs at slot 6
	Terminal plug-in 6 pole FMC1,5/6-ST-3,5 for analog input at slots 1-5

Product structure for option retrofit

Item No.	Description
	Option retrofit (please enter the serial number)
	Software: Without software application Mathematics Tele-Alarm + mathematics Batch + mathematics Wastewater + stormwater overflow tank + Tele-Alarm + mathematics Energy software, water + steam + mathematics Tele-Alarm + energy software + water + steam + mathematics
	Communication Master functionality: None Standard + Modbus RTU/TCP master, max. 40 x analog
	Communication Slave functionality: None Standard + Modbus RTU/TCP slave, max. 40 x analog
	Option: Standard

The software option can be enabled directly on the device. After ordering you will receive instructions and a code that you must enter.

14.3 Return

The measuring device must be returned if repairs or a factory calibration are required, or if the wrong measuring device has been ordered or delivered. According to legal regulations, the manufacturer is required to follow certain procedures when handling returned products that are in contact with medium.

To ensure swift, safe and professional device returns: Contact your supplier for the return procedure and conditions.

14.4 Disposal
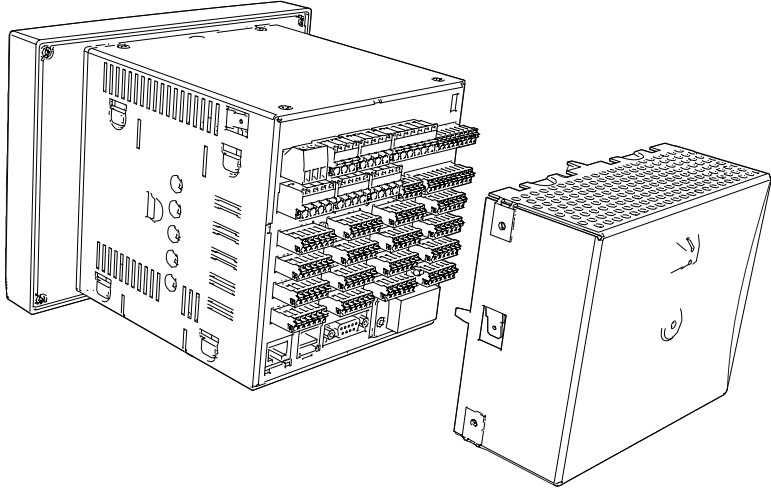
The device contains electronic components and must therefore be disposed of as electronic waste. Please pay particular attention to the national disposal regulations in your country.

15   Accessories
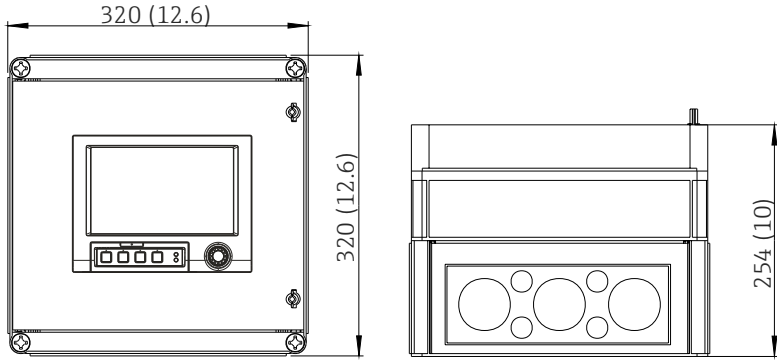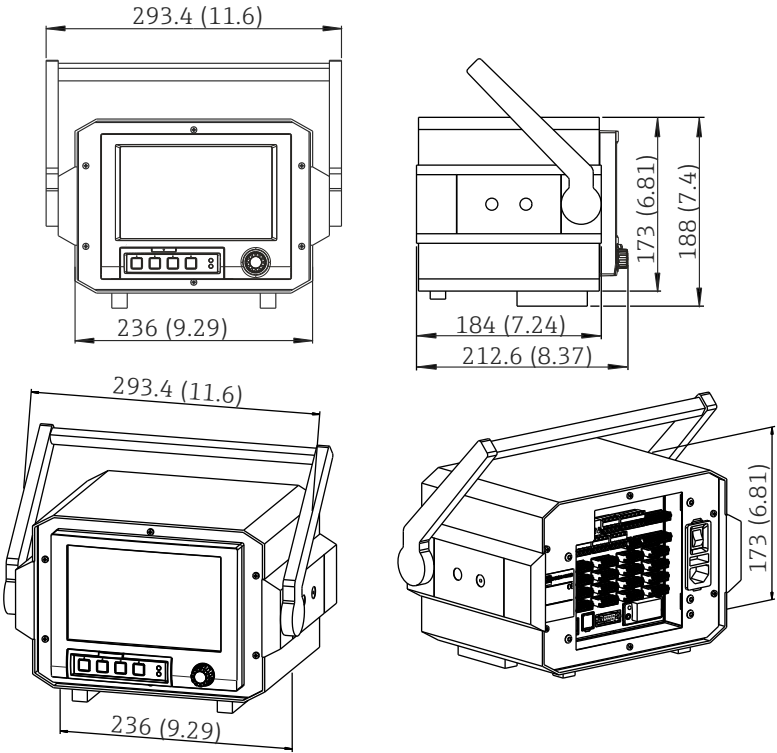
ℹ Always quote the serial number of the device when ordering accessories! Installation instructions are provided with the accessory!

ℹ Contact the supplier where necessary.

15.1   Device-specific accessories

Description
"Industrial Grade" SD card, industry standard, 1GB
Analysis software with SQL database support (1 x workstation license, Professional version)
OPC server software (full version on CD)

Description
Terminal cover lead sealable An optional terminal cover is available to prevent tampering at the device terminals and terminal temperature measurement.

A0029023

Description
Accessories for RXU10 data manager
Designation: Cable set RS232 for connection to PC or modem USB - RS232 converter Cable USB-A - USB-B, 1.8 m (5.9 ft)

Description
Field housing IP65 ☒ *14   Dimensions in mm (in)*
Desktop housing, cable with Schuko plug Desktop housing, cable with US plug Desktop housing, cable with Swiss plug ☒ *15   Dimensions in mm (in)*

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.
	The device is intended for installation in a panel or cabinet door. There is also the option of operating it in a desktop housing or field housing.

Measuring system	Multichannel data recording system with multicolor TFT display (178 mm / 7" 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 analysis software is included 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, or via an external USB keyboard or mouse. 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 analysis software supplied via USB or Ethernet, or by 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 log/audit trail
- Process screen
- Operation 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 PC evaluation software. At the end of the batch, a batch print-out is automatically started directly at the device (USB or network printer) or is printed out at a PC with the analysis 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.

ℹ️ 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 difference) input variables. 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, electr. 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.

ℹ️ 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

Dependability	**Reliability**

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℃)

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 is made up of the error category as per Namur NE 107 and the message 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 analysis software.

16.2 Input

Measured variables

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 e.g. 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. In this way, the sensor can be configured from the control room and the status information of the sensor can be analyzed/displayed. The Advanced Data Manager 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

Math channels

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

Integration of calculated values e.g. for totalization.

Limit values

60 limit values (individual channel assignment)

Calculated values

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 measured 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 Overrange: 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
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 thermometer (RTD)	Pt100: -200 to 850 ℃ (-328 to 1562 ℉) (IEC 60751:2008, α=0.00385) Pt100: -200 to 510 ℃ (-328 to 950 ℉) (JIS C 1604:1984, α=0.003916) Pt100: -200 to 850 ℃ (-328 to 1562 ℉) (GOST 6651-94, α=0.00391) Pt500: -200 to 850 ℃ (-328 to 1562 ℉) (IEC 60751:2008, α=0.00385) Pt500: -200 to 510 ℃ (-328 to 950 ℉) (JIS C 1604:1984, α=0.003916) Pt1000: -200 to 600 ℃ (-328 to 1112 ℉) (IEC 60751:2008, α=0.00385) Pt1000: -200 to 510 ℃ (-328 to 950 ℉) (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 ℃ (-58 to 392 ℉) (GOST 6651-94, α=4260) Cu50: -200 to 200 ℃ (-328 to 392 ℉) (GOST 6651-94, α=4280) Pt50: -200 to 1100 ℃ (-328 to 2012 ℉) (GOST 6651-94, α=0.00391) Cu100: -200 to 200 ℃ (-328 to 392 ℉) (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 ℃ (-328 to 2012 ℉) (GOST 6651-94, α=0.00391) Cu53: -200 to 200 ℃ (-328 to 392 ℉) (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 ℃ (-346 to 2192 ℉) (IEC 60584:2013) Type K (NiCr-Ni): -270 to 1300 ℃ (-454 to 2372 ℉) (IEC 60584:2013) Type L (NiCr-CuNi): -200 to 800 ℃ (-328 to 1472 ℉) (GOST R8.585:2001) Type L (Fe-CuNi): -200 to 900 ℃ (-328 to 1652 ℉) (DIN 43710-1985) Type N (NiCrSi-NiSi): -270 to 1300 ℃ (-454 to 2372 ℉) (IEC 60584:2013) Type T (Cu-CuNi): -270 to 400 ℃ (-454 to 752 ℉) (IEC 60584:2013)	±0.1% oMR from -100 ℃ (-148 ℉) ±0.1% oMR from -130 ℃ (-202 ℉) ±0.1% oMR from -100 ℃ (-148 ℉) ±0.1% oMR from -100 ℃ (-148 ℉) ±0.1% oMR from -100 ℃ (-148 ℉) ±0.1% oMR from -200 ℃ (-328 ℉) Temperature drift: ±0.01%/K oMR	≥1 MΩ

Measured variable	Measuring range	Maximum measured error of measuring range (oMR), temperature drift	Input resistance
	Type A (W5Re-W20Re): 0 to 2500 ℃ (32 to 4532 ℉) (ASTME 988-96) Type B (Pt30Rh-Pt6Rh): 42 to 1820 ℃ (107.6 to 3308 ℉) (IEC 60584:2013) Type C (W5Re-W26Re): 0 to 2315 ℃ (32 to 4199 ℉) (ASTME 988-96) Type D (W3Re-W25Re): 0 to 2315 ℃ (32 to 4199 ℉) (ASTME 988-96) Type R (Pt13Rh-Pt): -50 to 1768 ℃ (-58 to 3214 ℉) (IEC 60584:2013) Type S (Pt10Rh-Pt): -50 to 1768 ℃ (-58 to 3214 ℉) (IEC 60584:2013)	±0.15% oMR from 500 ℃ (932 ℉) ±0.15% oMR from 600 ℃ (1112 ℉) ±0.15% oMR from 500 ℃ (932 ℉) ±0.15% oMR from 500 ℃ (932 ℉) ±0.15% oMR from 100 ℃ (212 ℉) ±0.15% oMR from 100 ℃ (212 ℉) 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, overrange: 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 measured error of measuring range (oMR), temperature drift	Input impedance
Current (I)	4 to 20 mA Overrange: 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: underrange ≥20.5 mA: overrange ≤ 3.6 mA or ≥ 21.0 mA: 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 thermometer (RTD)	Measuring current: ≤1 mA	Maximum barrier resistance (or line resistance): 4-wire: max. 200 Ω; 3-wire: max. 40 Ω Maximum influence of barrier resistance (or line resistance) for Pt100, Pt500 and Pt1000: 4-wire: 2 ppm/Ω, 3-wire: 20 ppm/Ω Maximum influence of barrier resistance (or line resistance) 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 line resistance: <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: underrange ≥20.5 mA: overrange ≤ 3.6 mA or ≥ 21.0 mA: open circuit (display shows: – – – –)

Scan rate

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

Thermocouples and resistance temperature detector: 1 s per channel

Data storage / memory cycle

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

ℹ️ Highspeed storage (100 ms) can be selected for up to 8 channels in Group 1 only.

Highspeed storage is not available in the energy package (option).

Typical recording length

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 math channels

ℹ️ Frequent entries in the event log reduce the memory availability!

256 MB internal memory:

Analog inputs	Channels in groups	Storage 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	Storage 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

Analog inputs	Channels in groups	Storage cycle (weeks, days, hours)				
		5 min	1 min	30 s	10 s	1 s
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 value, daily value, weekly value, monthly value, annual value and overall value can be determined (13-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 message, pulse counter (13-digit, 64-bit), operating time, message+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% overrange

Max. output voltage: approx. 16 V

Accuracy: ≤0.1% of end of range value

Temperature drift: ≤0.015%/K of end of 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 outputs	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).

Relay 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	*All inputs and outputs are galvanically isolated from each other and designed for the following test voltages:*

	Relay	Digital in	Analog in/ HART®	Analog out	Ethernet	RS232/ RS485	USB	Auxiliary voltage output
Relay	500 V_{DC}	2 kV$_{DC}$	2 kV$_{DC}$	2 kV$_{DC}$	2 kV$_{DC}$	2 kV$_{DC}$	2 kV$_{DC}$	2 kV$_{DC}$
Digital in	2 kV$_{DC}$	500 V_{DC} but: [1]	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}
Analog in/HART®	2 kV$_{DC}$	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}
Analog out	2 kV$_{DC}$	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}
Ethernet	2 kV$_{DC}$	500 V_{DC}	500 V_{DC}	500 V_{DC}	-	500 V_{DC}	500 V_{DC}	500 V_{DC}
RS232/ RS485	2 kV$_{DC}$	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	-	500 V_{DC}	500 V_{DC}
USB	2 kV$_{DC}$	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	Galvanically connected	500 V_{DC}
Auxiliary voltage output	2 kV$_{DC}$	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	500 V_{DC}	-

1) Test voltage applies between inputs on power unit (terminals D11 to D61) to inputs on optional digital card (terminals D71 to DE1). The inputs are galvanically connected on the same plug-in connector.

Cable specification	**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. This makes the connection very quick and easy. The spring terminals are unlocked with a slotted screwdriver (size 0).

Please 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, in particular, the lines - both sensor lines and communication lines - are shielded and the shield forms as complete a cover as possible. A shielded line must be used for sensor lines that are longer than 30 m. A shield coverage of 90% is ideal. In addition, make sure not to cross sensor lines and communication lines when routing them. Connect the shield 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 supply side

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding 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.

Where applicable, national installation regulations and guidelines must be observed during the 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.

ℹ️ 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 or significantly impact signal transmission. In such cases the shielding of the signal cable is to be grounded on one side only, i.e. it may not be connected to the ground terminal of the housing. The shield that is not connected should be insulated!

16.4   Power supply

Terminals on back of device
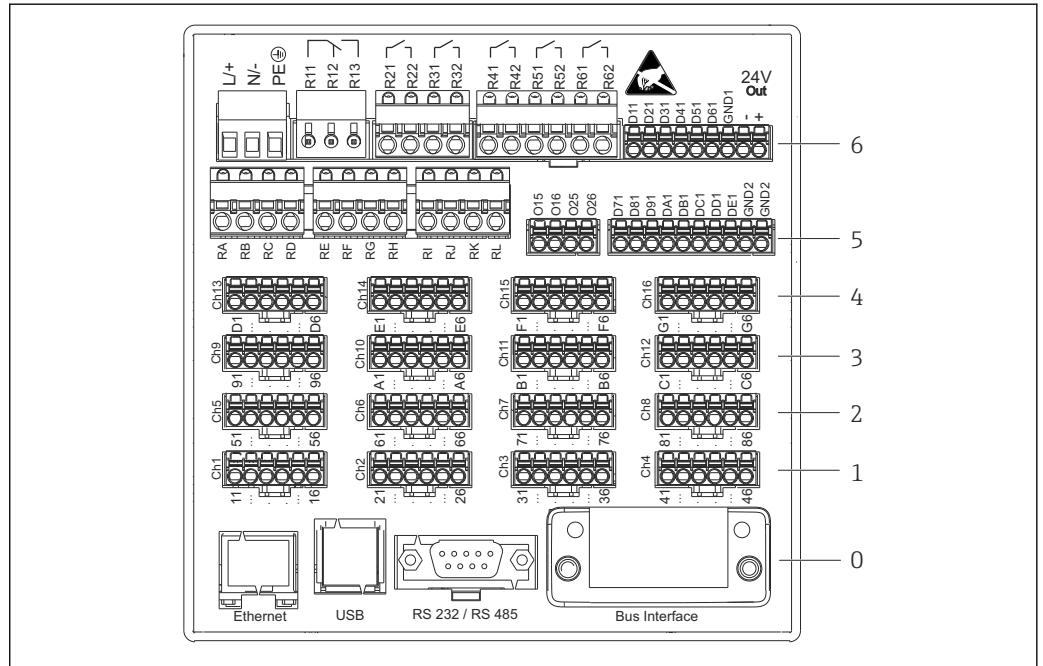
A0024605

🖼 *16   Terminals on back of device*

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

ℹ️ Overcurrent protection (rated current ≤ 10 A) must be installed for the power cable.

Power consumption
- 100 to 230 V: max. 40 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: → 🖹 16
Electrical connection, terminal assignment	**Circuit diagram**
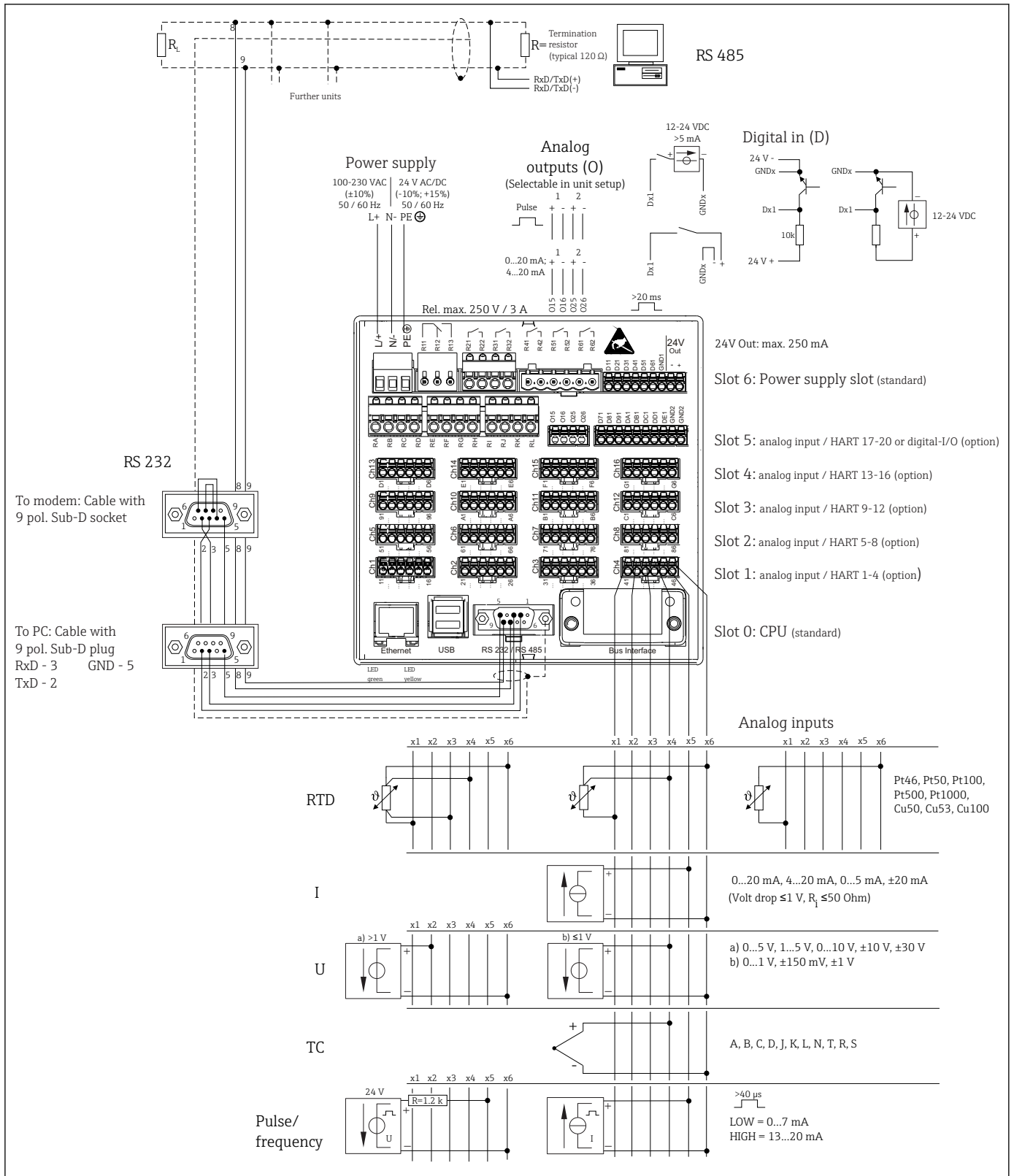
A0026669-EN

🖼 *17   For connection examples of the HART® inputs (optional), see the Operating Instructions → 📖 23*

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)

ℹ 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			
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					
	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.

Connector	• Panel-mounted device: 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.
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 stick as a memory medium, for example, can be connected to this port. An external keyboard/mouse for device operation, a USB hub, a barcode reader or a printer (PCL5c or higher) may 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 stick as a memory medium, for example, can be connected to these ports. An external keyboard/mouse for device operation, a USB hub, a barcode reader or a printer (PCL5c or higher) may 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.

ℹ️ 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 (depending on the specific network) these settings must be made directly in the device. Two Ethernet function LEDs are located on the rear of the device.

The following functions are implemented:
• Data communication with PC software (analysis 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 dedicated WebDAV client can be selected as network drive on the PC for this purpose.

Requirements with regard to a network printer

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

ℹ️ 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. cable length with a shielded cable: 2 m (6.6 ft) (RS232), or 1000 m (3281 ft) (RS485)

ℹ️ 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), is recommended.→ 🔲 77

GSM/GPRS wireless modem:
A GSM/GPRS wireless modem (e.g. Cinterion, INSYS or WESTERMO, incl. antenna and power unit) for industrial use, which is connected to the RS232 interface with a special modem cable (see Accessories), is recommended. → 🔲 77
Important: the wireless modem needs a SIM card and data transfer subscription. In addition, it must be possible to deactivate the PIN prompt.

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

Input	Output	Time [ms]
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 ℃ (77 ℉) ±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   Installation

Panel mounting: mounting location and installation dimensions

The device 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).
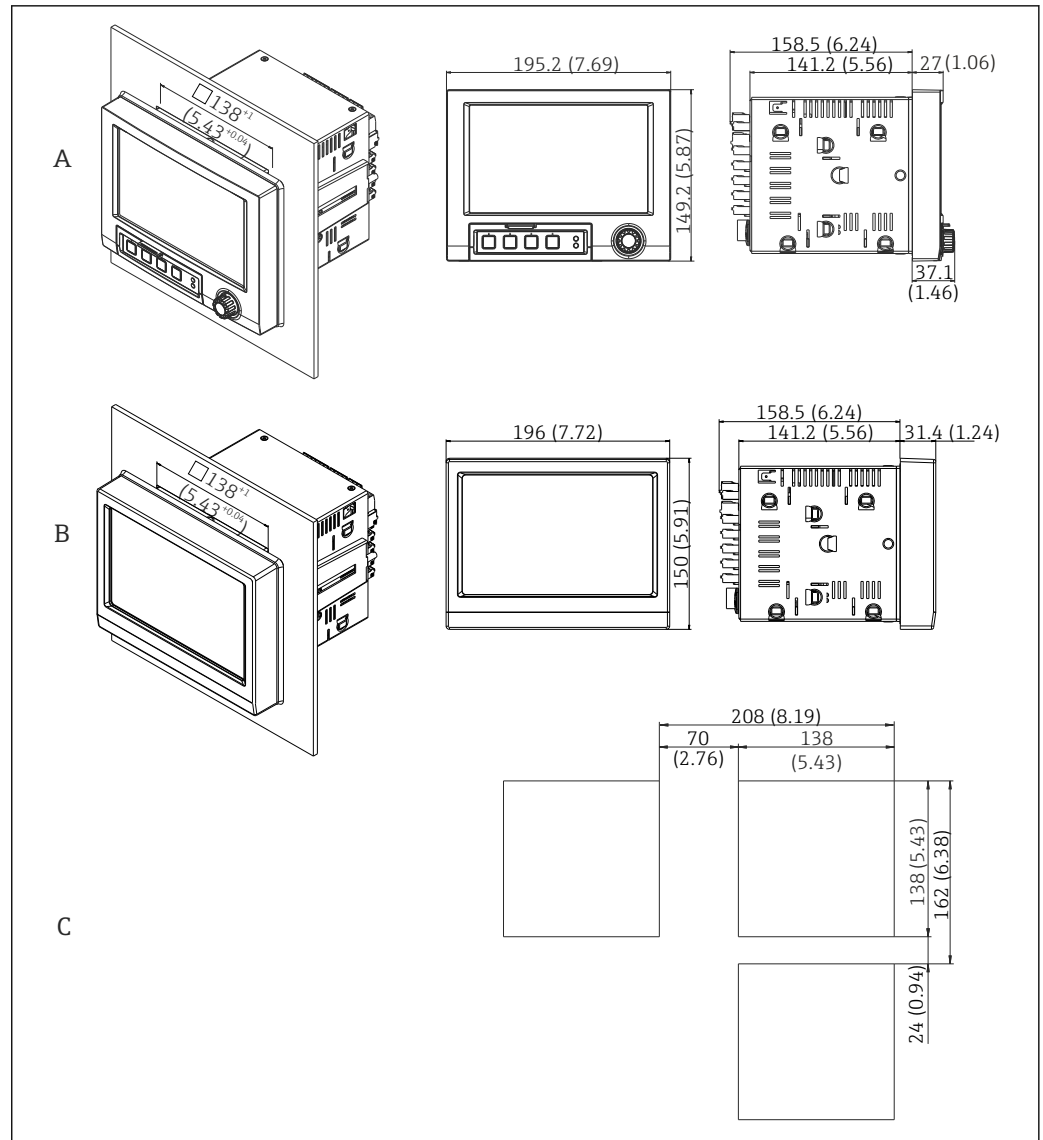
18   Panel mounting and dimensions in mm (in).

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

Installation 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

Field housing assembly and design (optional)	As an option, the 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 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 ℃ (14 to 122 ℉)

Storage temperature	−20 to +60 ℃ (−4 to +140 ℉)

Humidity	5 to 85 %, not condensating

Climate class	To IEC 60654-1: Class B2

Electrical safety	Class I equipment, overvoltage category II Pollution level 2

Altitude	< 2 000 m (6 561 ft) above MSL

Degree of protection	**Front**	IP65 / NEMA 4 (not assessed by UL)
	Rear	IP20

Electromagnetic compatibility	EMC to all relevant requirements of the IEC/EN 61326- series and NAMUR NE21. For details see declaration of conformity. • Interference immunity: as per IEC/EN 61326 series (industrial environment) / NAMUR NE21 Maximum measured error <1% of measuring range • Interference emissions: as per IEC 61326-1 Class A

16.8 Mechanical construction

Design, dimensions	Information about design and dimensions → 🖺 98

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) • Desktop housing (excluding device): approx. 2.3 kg (5 lbs) • Field housing (excluding device): approx. 4 kg (8.8 lbs)

Materials	**Version with navigator and front interfaces**	
	Front frame	Zinc die cast GD-Z410, powder-coated
	Display glass	Transparent Makrolon® plastic (FR clear 099) UL94-V2

Version with navigator and front interfaces	
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

Version 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

Designation	Short form	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

Operating concept

The device can be operated directly onsite, or via remote configuration with the PC via interfaces and operating tools (Web server).

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)
- Loading/saving of device configuration
- Device firmware update
- Printout of device configuration

Integrated operating instructions
The device's simple control system enables you to perform commissioning for many applications without the need for hardcopy operating instructions. The device has an integrated help function and displays operating instructions directly on screen.

Local operation | **Display elements**

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 value time (= 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 display

- Users can choose between black or white for the background color
- Active channels can be assigned to up to 10 groups. To clearly identify these groups, they can be assigned a name, such as "temp. boiler 1" or "daily averages".
- Scales linear or logarithmic
- Measured value history: quick retrieval of historic data with zoom function
- Preformatted display formats, such as horizontal or vertical curves, instrument display, circular chart, process screen, bargraph or digital display.

Measured value display and operating elements

19 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 = operating in the Setup menu)
a	Slot for SD card
b	USB B socket "Function" e.g. to connect to 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 writes to the SD card or reads it. **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 or in a selection menu: turn the dial anticlockwise to move the bar or the cursor upwards or counterclockwise, 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", keys 1 to 4 (from left to right)
4	Function indicator of the "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: --

Item No.	Operating function (display mode = display of measured values) (Setup mode = operating in the Setup menu)
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). 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. ℹ️ 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: display of 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.

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)

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
Analysis software, SQL database support (included in the delivery)	• Export of saved data (measured values, analyses, event log) • Visualization and processing of saved data (measured values, analyses, event log) • Safe archiving of exported data in a 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
OPC server (optional)	The following momentary values can be provided: • Analog channels • Digital channels • Mathematics • Totalizer	RS232/RS485, USB, Ethernet

16.10   Certificates and approvals

CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied. Confirms successful testing of the device by affixing to it the CE mark.

Electronic recording/ electronic signature

FDA 21 CFR Part 11

The device meets the requirements of the "Food and Drug Administration" for electronic recording/electronic signature.

Certifications	• HART® certification (HCF) • PROFINET certification • EtherNet/IP certification
Other standards and guidelines	• IEC 60529: Degree of protection provided by housing (IP code) • IEC/EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use • IEC/EN 61326 Series: Electromagnetic compatibility (EMC requirements)

16.11   Ordering information

The hazardous area version (Ex version) is only available in conjunction with the stainless steel front and touch control.

Scope of delivery	The scope of delivery of the device comprises: • Device (with terminals, as per order) • 2 fastening clips • Version with navigator and front interfaces: USB cable • Sealing rubber towards control panel wall • Optional: "Industrial Grade" SD card, industry standard: Version with navigator and front interfaces: card is located in the SD slot behind the flap on the front of the housing (optional). Version with stainless steel front and touchscreen: card is in the device and cannot be replaced or retrofitted. • Analysis software on CD–ROM • Operating Instructions on CD–ROM

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.

ℹ️ 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.

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 unit operating language.
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

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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

Temp. 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   ℃, ℉, K

Factory setting   ℃

Decimal separator

Navigation	▤	Expert → System → Decimal separator
		Direct access code: 100003-000

Description   Select in which form the decimal separator character is to be displayed.

Options   Comma, point

Factory setting   Comma

Fault switching

Navigation	▤	Expert → System → Fault switching
		Direct access code: 100002-000

Description   If the device detects a system error (e.g. hardware defect) or a fault (e.g. cable open circuit), the selected output switches.

Options   Not used, Relay x
                         All the available relays are displayed

Factory setting   Relay 1

Keyboard layout

Navigation	▤	Expert → System → Keyboard layout
		Direct access code: 100020/000

Description   Please select the keyboard layout. Only relevant if external keyboard is used.

Options	Germany, Switzerland, France, USA, USA International, UK, Italy

Factory setting	Germany

Swap mouse buttons

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	Please select the paper size of your printer.

Options	DIN A4, US Letter

Factory setting	DIN A4

Lock operation

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	Delete internal memory. 🛈 Note: In the version with stainless steel front and touchscreen the internal SD card is also cleared.

Options	No, Yes

"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 in which format the date is to be set and 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 in which format the time is to be set and displayed.
Options	24 hour, 12 hour AM/PM
Factory setting	24 hour

"Date/time" submenu

Navigation	▤ Expert → System → Date/time setup → Date/time
Description	Contains parameters for setting the date/time.

UTC time zone

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

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

Description	Contains parameters for changing the date/time.
Navigation	▤ Expert → System → Date/time setup → Change date/time

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UTC time zone

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

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 unit here.

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: Changeover according to applicable directives for the selected region;
                                   Manual: Set changeover times in the next items;
                                   Off: No time changeover.

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		1st, 2nd, 3rd, 4th, 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   Point of time when the time is moved forward by 1 hour on the day of the changeover from normal time to summer time (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

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	1st, 2nd, 3rd, 4th, 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		Point of time when the time is moved back by 1 hour on the day of the changeover from summer time to normal time (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.

> ℹ 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 unit 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	Using this code, setup access can be protected from unauthorized persons. In order to change any parameter the correct code must be entered. Factory setting: "0", i.e. changes can be made 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 set points once the set point code is entered. All other operating positions remain locked, however. Only visible if an access code has been defined. Factory default: "0" means that alarm set points can only be changed by entering the access code. ℹ 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. ℹ Fieldbuses may also be affected in the case of Ethernet or the serial interface. Please follow the operating instructions.

Options	Ethernet (all ports/services), USB A socket front, USB A socket back, USB B socket front, Serial interface, SD card

Factory setting	No lock

"Authentication" submenu

Navigation	⌨	Expert → System → Security → Authentication

Description	Define the passwords for the various user roles to allow device access. Visible only if "Protected by" = "User roles".

Operator
ID: operator
Password

Navigation	⌨	Expert → System → Security → Authentication → Password Direct access code: 470105/000

Description	Enter a password for this 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 a password for this 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 a password for this user account.
Options		Text entry max. 12 characters
Factory setting		service

"External memory" submenu

Navigation	▯	Expert → System → External memory
Description		Contains settings for the external data carrier, amongst other things which data are 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 are stored in a manipulation protected encrypted format. They can be interpreted only by the PC analysis software provided. "Open format": data are stored in a CSV format, this can be opened by a number of different programs (e.g. MS Excel) (Attention: no manipulation security).

Options	Protected format, Open format (*.csv)
	ℹ 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 are deleted so that new data can be stored (First in first out (FIFO).
	ℹ 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)
	ℹ "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.
	ℹ 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	Configure which separator is used by your 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	Please select if the date and time should be stored in one column or separate columns when data are saved in CSV format files.
Options	One column, Separate columns
Factory setting	Separate columns

Operating time

Navigation	Expert → System → External memory → Operating time Direct access code: 140004-000
Description	Please select in which format operation 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 set-points; 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 events list.

ℹ️ 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 message, device errors etc.).
The relay assumes 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

"Screen saver" submenu

Navigation	🖳	Expert → System → Screensaver

Description	To increase the life span of the LCDs the backlight can be switched off (= screen saver).

Screen saver

Navigation	▤ Expert → System → Screen saver → Screen saver 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. "Switch 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 screen saver is controlled by a digital input→ ◫ 153

ON daily from

Navigation	▤ Expert → System → Screen saver → 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). ℹ️ The screen saver is switched off as soon as the device is operated via onsite operation. After 1 min of inactivity it switches back on automatically. Only visible if screen saver = switched daily
User entry	Time (hh:mm)
Factory setting	20:00

OFF daily from

Navigation	▤ Expert → System → Screen saver → 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 screen saver = switched daily.
User entry	Time (hh:mm)
Factory setting	07:00

Alarm response

Navigation	▣	Expert → System → Screen saver → Alarm response Direct access code: 160003-000

| Description | | "Off on alarm": If limit value violations occur or status signal "Maintenance required (*Mxxx*)" or "Check function (*Cxxx*)" is active, the screensaver will be automatically deactivated.
"Always on": If limit value violations occur or status signal "Maintenance required (*Mxxx*)" or "Check function (*Cxxx*)" is active, the screensaver will not be deactivated. |

> ℹ Active messages that require acknowledgment or an active status signal "Failure (*Fxxx*)" or "Out of specification (*Sxxx*)" deactivate the screensaver always.

Options	Off on alarm, Always on

Factory setting	Off on alarm

"Barcode reader" submenu

Navigation	▣	Expert → System → Barcode reader

| Description | | Settings for barcode reader (only relevant if a USB barcode reader is connected to the device). |

> ℹ 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	Please select the 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 in the events list. |

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 are 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

Navigation   Expert → System → Device options → Activation code
Direct access code: 000057-000

Description   Here, you can enter a code to enable the device options.
Options that can be upgraded 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

Navigation   Expert → System → Device options → Slot 1
Direct access code: 990000-000

Description   Shows hardware or 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

Navigation	▤	Expert → System → Device options → Slot 2
		Direct access code: 990001-000

Description	Shows hardware or software options.
	Cannot be edited.

ℹ The assignment can be specified in the PC operating software for offline configuration.

Options	Not assigned, Universal inputs, HART

Slot 3

Navigation	▤	Expert → System → Device options → Slot 3
		Direct access code: 990002-000

Description	Shows hardware or software options.
	Cannot be edited.

ℹ The assignment can be specified in the PC operating software for offline configuration.

Options	Not assigned, Universal inputs, HART

Slot 4

Navigation	▤	Expert → System → Device options → Slot 4
		Direct access code: 990003-000

Description	Shows hardware or software options.
	Cannot be edited.

ℹ The assignment can be specified in the PC operating software for offline configuration.

Options	Not assigned, Universal inputs, HART

Slot 5

Navigation		Expert → System → Device options → Slot 5
		Direct access code: 990004-000

Description	Shows hardware or software options.
	Cannot be edited.

ℹ The assignment can be specified in the PC operating software for offline configuration.

Options	Not assigned, Universal inputs, Digital inputs, HART

Communication

Navigation		Expert → System → Device options → Communication
		Direct access code: 990006-000

Description	Shows hardware or software options.
	Cannot be edited.

Options	USB + Ethernet, USB + Ethernet + RS232/485

Fieldbus

Navigation		Expert → System → Device options → Fieldbus
		Direct access code: 990005-000

Description	Shows hardware or software options.
	Cannot be edited.

Options	Not available, Modbus Slave, Profibus DP, EtherNet/IP, PROFINET

Modbus Master

Navigation		Expert → System → Device options → Modbus Master
		Direct access code: 990008-000

Description	Shows hardware or software options.
	Cannot be edited.

ℹ Detailed descriptions of this device option can be found in the associated documentation.

Options	No, Yes

Application

Navigation	Expert → System → Device options → Application Direct access code: 990007-000
Description	Shows hardware or software options. Cannot be edited.
Options	Standard, Mathematics, Tele-Alarm, Tele-Alarm + wastewater, Batch, Tele-Alarm + batch, Energy, Energy + Tele-Alarm

Front of housing

Navigation	Expert → System → Device options → Front of housing Direct access code: 990009-000
Description	Shows hardware or software options. Cannot be edited.
Options	With interfaces, stainless steel without interfaces

17.1.2 "Inputs" submenu

Settings for 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. ℹ️ 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 type of signal connected (current, voltage, etc.). The channel is switched off if no signal type is selected (factory default).
Options	Switched off, Current, Voltage, Resistance thermometer (RTD), 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 which resistance thermometer/thermocouple is connected. The respective terminal layout can be found in the Operating Instructions 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 RTDs are connected as 2-, 3- or 4-wire systems.
		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 the 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 the 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 100ms cycle. Depending on the memory cycle, the selected data are 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		A current value can be determined from the counter reading with the aid of the time base e.g. input liters, time base = second → current 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 units of the count input, e.g. gal, cf. 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	Please check if the pulse counter used is a fast or slow (up to a max. 25 Hz) counter. For example if the number of state changes from a relay are to be monitored then you must set up "up to 25Hz". 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 "5". 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 Here, enter the lower-range value for the scale which corresponds to the start of the measuring range. 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 Here, enter the upper-range value for the scale which 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 here. • The start and end of the measuring range may not be identical. • The start of the measuring range can also be larger 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 end of the measuring range. 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 here. • 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, you can configure the lower value of the required section here. Zooming does not affect the save function.

> • 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 or the 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". However, enter the upper value of the required range here.

> • 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 or the 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

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.

ℹ️ 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 this 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 how many support points your linearization table has.

ℹ️ Note: The first and last point always has to correspond to the start and end of the measuring range respectively.

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, you can enter the lower value of the required section here (higher resolution). Example: Transmitter 0-14 pH, required section: 5-9 pH. Set "5" here. Zooming does not affect the save function.
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". However, enter the upper value of the required range here. Example: Transmitter 0-14 pH, required section: 5-9 pH. Input 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 of the linearization table here. Note: The first and last point always has to correspond to the start and end of the measuring range respectively. The support points can only be viewed in the PC software here. To change the support points use the "Edit table" switch.

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		You can sort the linearization table here.
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		Here you can check whether the linearization table has been entered correctly.
Options		No, Yes
Factory setting		No

---

x-value (1-32)

Navigation	⌨	Expert → Inputs → Universal inputs → Universal input x → Linearization → Points → x-value (1-32) 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). e.g. 10 cm corresponds to 20 liters --> enter 10.
User entry		0 to 9999999
Factory setting		0

---

y-value (1-32)

Navigation	⌨	Expert → Inputs → Universal inputs → Universal input x → Linearization → Support points → y-value (1-32) 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	Enter the y-value that the measured x-value corresponds to e.g. 10 cm corresponds to 20 liters --> enter 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 measurement range.
- Measure the current value at the upper measurement range.
- Enter the lower and upper target and actual value.

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	This offset is only effective on the analog input signal (no maths/bus channels). 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	-0.1

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 here (e.g. measuring range 0℃ to 100℃: 0℃). 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 here (e.g. measuring range 0℃ to 100℃: measured value 0.5℃). 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 here (e.g. measuring range 0℃ to 100℃: 100℃). 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 here (e.g. measuring range 0℃ to 100℃: measured value 100.5℃). 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	Set up only required for totalization of flow or power consumption.

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 m³/h) quantities (in m³) 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); m³/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 calculated quantity (e.g. "m³"). 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 (e.g. 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

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 → 🖺 107

Navigation	Expert → Inputs → Universal inputs → Universal input x → Fault mode
Description	Contains settings that define how this channel is to react under fault conditions (e.g. cable open circuit, over range).

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 NE43 is switched on: ≤ 3.8 mA: under range ≥ 20.5 mA: over range ≤ 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 circ.

Navigation	Expert → Inputs → Universal inputs → Universal input x → Fault mode → Cable open circ. 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 NE43 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 NE43 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 only reacts (e.g. Relay switch) when this condition, open circuit/under range/ over range, has been operational for the preset time.
		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 what 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 log 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

Submenu "Digital inputs -> Digital input x"

Navigation		Expert → Inputs → Digital inputs → Digital input x
Description		Setting up only required if the digital inputs (e.g. events) are to be used.

> ℹ️ 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 +5V
	High = +12 to +30V.

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.
	Visible only 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	Measurement point name (e.g. "Pump") or description of the function of 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 units of the count input, e.g. gal, cf. 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". Only visible if function = pulse counter.
User entry		Number (max. 8 digits)
Factory setting		1

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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". 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 backlight/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 or down (only for low→high change) to the nearest minute: 0 to 29 → Round down; 30 to 59 → round up.
Change group	When switching low→high the display switches to the next active group.
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	The monitoring of a selected limit value can be switched on (high) or off (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 limits of batch x on/off. The limits 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 limits for this channel are not disabled.

Options   Switched off, Start/stop recording, Screen saver 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	Select which group should be displayed in the event of a Low->High flank change. 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, Math 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 respective relay when the digital input is low or high. Please take note of the connection hints in the Operating Instructions! 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 both shown in 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 both shown in 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 log.

> 🛈 Requires higher memory capacity.

Only visible if function = control input, on/off event, event+operation time.

Options	No, Yes
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.
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).

                        ℹ   If no event text is set, the device generates an automatic 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).

                        ℹ   If no event text is set, the device generates an automatic 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	
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

Setting up 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, 4-20 mA, 0-20 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 what value corresponds to 0/4 mA. Visible only if signal = 4-20 mA or 0-20 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 what value corresponds to 20 mA. Visible only if signal = 4-20 mA or 0-20 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. Visible only if signal = 4-20 mA or 0-20 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 specifies what quantity an output pulse corresponds to (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	You can set the pulse width in the range of 0.5 to 1000 ms here. Only visible if signal = pulse output.

Value	0.5 to 1000 ms

Factory setting	100 ms

"Meas. val. corrct" submenu

Navigation	▣	Expert → Outputs → Universal output x → Measured value correction

Description	Here, you can correct the output current value (necessary only if the device that carries out the further processing cannot compensate for any measurement 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 value. Visible only if signal = 4-20 mA or 0-20 mA.

Lower correction value

Target value

Navigation	▣	Expert → Outputs → Universal output x → Measured value correction → 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 here. Visible only if signal = 4-20 mA or 0-20 mA.

User entry	Number (max. 8 characters)

Factory setting	0

Actual value

Navigation	▣	Expert → Outputs → Universal output x → Measured value correction → Lower correction value → Actual value Direct access code: 340022-00x Examples: Universal output 1: 340022-000; Universal output 2: 340022-001

Description	Here, enter the lower actual value which is displayed at the connected device. Visible only if signal = 4-20 mA or 0-20 mA.

User entry	Number (max. 8 characters)
Factory setting	0

Upper correction value

Target value

Navigation	🖳	Expert → Outputs → Universal output x → Measured value correction → 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 here. Visible only if signal = 4-20 mA or 0-20 mA.
User entry		Number (max. 8 characters)
Factory setting		100

Actual value

Navigation	🖳	Expert → Outputs → Universal output x → Measured value correction → Upper correction value → Actual value Direct access code: 340025-00x Examples: Universal output 1: 340025-000; Universal output 2: 340025-001
Description		Here, enter the upper actual value which is displayed at the connected device. Visible only if signal = 4-20 mA or 0-20 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). Visible only if signal = 4-20 mA or 0-20 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 4-20 mA loop output as per NAMUR recommendation NE 43. The following error ranges apply when NAMUR NE43 is switched on: ≤3.8 mA: underrange ≥20.5 mA: overrange ≤ 3.6 mA or ≥ 21.0 mA: Cable open circuit Visible only if signal = 4-20 mA or 0-20 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 assume in the event of an error (e.g. cable open circuit or calculated value invalid)? Visible only if signal = 4-20 mA or 0-20 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 and 22 mA. Visible only if signal = 4-20 mA or 0-20 mA.
User entry	0 to 22 mA
Factory setting	0 mA

"Relay x" submenu

Navigation	▤ Expert → Outputs → Relay x
Description	Contains setup for the selected relay. ℹ 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	Closing, Opening

Factory setting	Closing

Identifier

Navigation	⊟	Expert → Outputs → Relay x → Identifier

Direct access code: 330001-00x
Examples: Relay 1:330001-000; Relay 6: 330001-005

Description	Presettable 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 option "Tele-Alarm".

Options	No, Yes

Factory setting	No

17.1.4   "Communication" submenu

Set-up required if you are using the USB, RS232, RS485 or Ethernet interface of the unit
(PC operation, serial data read-out, modem operation, etc.).

The various interfaces can be operated in parallel.

Timeout

Navigation	▣	Expert → Communication → Timeout Direct access code: 150200-000
Description		Timeout is modifiable between 1 and 99 seconds. 0 seconds means that the functionality is inactivated.
User entry		0 to 99s
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 99s
Factory setting		10 s

"Ethernet" submenu

Navigation	▣	Expert → Communication → Ethernet
Description		Contains the set-up required if you are using the Ethernet interface of the unit.

MAC-address

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! ℹ️ 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	Please enter the IP address (given from your network administrator). Please talk to your network administrator about this. Only editable if DHCP = no.
User entry	IP address
Factory setting	000.000.000.000

Subnet mask

Navigation	🖳 Expert → Communication → Ethernet → Subnet mask Direct access code: 150004-000
Description	Please enter the subnet mask (given from your network administrator). Only editable 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	Please enter the Gateway (given from your network administrator). Only editable 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	Please enter the IP-address of the DNS server (you can get this from your network administrator). Is needed if you wish to send e-mails and want to use the e-mail server name instead of the IP address (e.g. smtp.example.org). Only editable 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	You can disable unused ports for security reasons. CDI is the protocol that the configuration software or reporting software uses to communicate with the device. All other ports (e.g. SNTP, SMTP, Web server) are automatically disabled if the function is switched off.
Options	CDI, OPC, Modbus Slave, HART IP
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.

ℹ️ If your network is protected by a firewall, this port may have to be enabled. Please contact your network administrator if this is the case.

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.

ℹ️ If your network is protected by a firewall, this port may have to be enabled. Please contact your network administrator if this is the case.

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.

ℹ️ Note: If your network is protected by a firewall, this port will have to be enabled. Please contact your network administrator if this is the case.

User entry Number (max. 5 digits)

Factory setting 5094

Web server

| Navigation | 🖳 | Expert → Communication → Ethernet → Web server
Direct access code: 470000-000 |
|---|---|---|

Description   Switch the Web server functionality on/off. The instantaneous values can only be
                                  displayed using an Internet browser when the web browser is activated.

                                  ℹ️   A connection to the Web server can only be established 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 Web server.
                                  Only visible if Web server = yes.

                                  ℹ️   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.

                                  ℹ️   If your network is protected by a firewall, this port may have to be enabled.
                                       Please contact your network administrator if this is the case.

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 Web server.
                                  For security reasons it is advisable to switch off configuration via the Web server after
                                  commissioning.
                                  With regard to IT security please contact your network administrator if necessary.

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 Web server.

Options	No, Yes

Factory setting	No

Remote control

Navigation	⊟	Expert → Communication → Ethernet → Configuration Web server → Remote control
		Direct access code: 470004-000

Description	Remote control of the device is possible via 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 via a 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

"Authentication" submenu

Navigation   ▣   Expert → Communication → Ethernet → Configuration Web server → Authentication

Description   Set the passwords for the various users with which the device can be accessed via 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
Update firmware	No	Yes	Yes
WebDAV	Yes	Yes	Yes

                         ⓘ   Note: The following passwords should be changed 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 a 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 a 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 a 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. Settings should only be modified if slow network connections are causing transmission problems. ℹ 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.

ℹ 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 9999 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.
	ℹ	The check is switched off if 0s 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 999 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 999 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 the 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 |

| Factory setting | 3 |

Failure 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.
> Start/end of measuring range 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

Unit address

Navigation	Expert → Communication → HART → Value x → Device address Direct access code: 550001-0xx
Description	Enter the device address of the HART device. ℹ 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 set-up required if you are using the RS232 or RS485 unit interface.

Type

Navigation	⊟ Expert → Communication → Serial interface → Type Direct access code: 150100-000
Description	Configure how the serial interface is used. Pay attention to the connections.
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

Unit address

Navigation	☐ Expert → Communication → Serial interface → Unit address Direct access code: 150102-000
Description	Every unit operating 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 you wish to use.
Options	Not used, RS485, Ethernet
Factory setting	Not used

Unit address

Navigation	▣ Expert → Communication → Modbus Slave → Unit address Direct access code: 480001-000
Description	Enter the device address where it should be possible to reach this device in 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 you wish to use.

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 end devices.
                                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 end device.
                                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 RS485 interface of the device.

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 where it should be possible to reach this device in 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 log.

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 you wish to connect the device 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	Please 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	Please 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

Configure various application-specific settings (e.g. group settings, limit values, etc.).

Submenu "Maths - Maths x"

Navigation	⬚	Expert → Application → Maths → Maths x

Description	Configuration of the mathematics channels.
	ℹ️ 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 the mathematics channel on or off.

Options	Switched off, Formula editor
	Included with energy package (option): Energy calculation, mass calculation, density calculation, calculation of heat quantity, DP flow mass calculation

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	Measurement point name (e.g. "Pump") or description of the function of 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 → 🖺 198 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	Please 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	Please select a flow input. Visible only 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	Please select the unit you would like to use for scaling the selected flow input. Only visible with energy package (option) and selected flow input.
Options	m³/h, l/h, ft³/m, ft³/h, gpm, gal/h, kg/h, t/h, ton/h, lb/h
Factory setting	m³/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	Please 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 or 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	Please select a pressure input. If you select "deactivated" the temperature input is used to calculate the saturated steam conditions. 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	Please select the unit 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	Please select the temperature input used to measure the warm side (or steam line). In steam applications, if you select "deactivated" the pressure is used to calculate the saturated steam conditions.
	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	Please select the temperature input used to measure the cold side (or 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	Please select the unit used for scaling the selected temperature sensors. Only visible with energy package (option) and selected energy function.
Options	℃, ℉, K
Factory setting	℃

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 list, select ethylene glycol or 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 concentrat.

Navigation	▱ Expert → Application → Maths → Maths x → Water/Glycol concentrat. 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 a "current value". If you logically link 2 channels, for example, (digital 1 AND digital 2), the result is a "state" (on/off). Instantaneous value: If, for example, 2 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, 2 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 are 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/m³, lb/ft³, 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 heat quantity 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 backlight/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 or down (only for low→high change) to the nearest minute: 0 to 29 → Round down; 30 to 59 → round up.
Change group	When switching low→high the display switches to the next active group.
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	The monitoring of a selected limit value can be switched on (high) or off (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 limits of batch x on/off. The limits 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 limits for this channel are not disabled.

Options   Switched off, Start/stop recording, Screen saver 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 set point which should be switched on or 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

Appendix

| Navigation | 🖳 | Expert → Application → Maths → Maths x → Switches relay |
| Direct access code: 400007-000 |
| Examples: Maths 1: 400007-000; Maths 4: 400007-003 |

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 respective relay when the digital input is low or 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 both shown in 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 both shown in 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 log.

    ℹ Requires higher memory capacity.

    Only visible if the result is = control input or state.

Options	No, Yes
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.
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 section here. Zooming does not affect the save function. 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". However, enter the upper value of the required range here. Only visible if the result is = instantaneous value.
User entry	Number (max. 8 digits)
Factory setting	100

Totalizer	
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 ℹ x = place holder for selected mathematics channel ℹ 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/operational time
5	Validity: The validity of an analog or maths channel is returned. The relayed value of the function is 0 in the event of: • 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...10	Analysis 1..4
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 • Limits 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 high 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
||	Value 1 || Value 2	Logical "or" (see also function "or")	DI(2;1) || DI(2;2)
&&	Value 1 && Value 2	Logical "and" (see also function "and")	DI(2;1) && DI(2;2)

Functions

Standard functions:

Function	Syntax	Description	Example
In the	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 specified as the argument. The constant e is the basis for the natural logarithm and has the value 2.71828182845904.	exp(2.00) = 7.389056

Function	Syntax	Description	Example
abs	abs(number)	Returns the absolute value of a number. The absolute value of a number is the number without its 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". In the case of negative values the result is undefined. The device continues with 0.	sqrt(4) = 2
mod	mod(number; divisor)	Returns the remainder of a division. The result has the same 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. ℹ 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 of degrees to radian	rad(270) = 4.712389
Degrees	Degrees (number)	Conversion of 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 of 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 from -1 to +1. In the case of values outside of 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). Arc cosine expects a real argument in the range from -1 to +1. In the case of values outside of 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 use any comparative 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 if a value does not match a certain other value.	not(false) = true

The XX in the following functions stands for one of the inputs described under → 🖹 198. Range functions can only ever be executed with one input type.

Range functions:

Function	Syntax	Description	Example
sumXX	sumXX(Type;From;To)	Totals the values for the specified input signal range. "Type": Signal type (see → 🖹 198)) "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 channel 2 to 5
avgXX	avgXX(Type;From;To)	Calculates the average for the specified input signal range.	avgXX(1;1;6)
minXX	minXX(Type;From;To)	Returns the lowest value for the specified input signal range.	minXX(1;1;6)
maxXX	maxXX(Type;From;To)	Returns the highest value for the specified input signal range.	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 Please 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 ℃

Navigation	Expert → Application → Maths → Maths x → DP flow → D at 20 ℃ Direct access code: 400119-00x Examples: Maths 1: 400119-000; Maths 4: 400119-003
Description	Internal pipe diameter (D) under design conditions at 20 ℃/68 ℉.
User entry	Number (max. 8 characters)
Factory setting	100 (mm or inches)

---

d at 20 ℃

Navigation	▣	Expert → Application → Maths → Maths x → DP flow → d at 20 ℃ 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 ℃/68 ℉.
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 Device 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		Carbon 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		Please select 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	Please select the density unit.
	Only visible if application = Liquids DP flow or Gas DP flow.

Options	kg/m³, lb/ft³

Factory setting	kg/m³

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 design = V-cone or Gilflo.

User entry	Number (max. 8 characters)

Factory setting	1000 (kg/m³ or lb/ft³)

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.

Support 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

Support 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		By totalizing the analog signal (e.g. flow rate in m³/h) quantities (in m³) can be calculated.
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); m³/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 calculated quantity (e.g. "m³").
	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	Select the unit of the quantity determined by means of totalization here.
	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 (e.g. 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

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 your linearization table has. Note: The first and last point always has to correspond to the start and end of the measuring range respectively.
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 and last point always has to correspond to the start and end of the measuring range respectively.
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, you can enter the lower value of the required section here (higher resolution). Example: Transmitter 0-14 pH, required section: 5-9 pH. Set "5" here. Zooming does not affect the save function.
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". However, enter the upper value of the required range here. Example: Transmitter 0-14 pH, required section: 5-9 pH. Input 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 of the linearization table here. Note: The first and last point always has to correspond to the start and end of the measuring range respectively. The support points can only be viewed in the PC software here. To change the support points use the "Edit table" switch.

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	Here you can 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		You can sort the linearization table here.
Options		No, Yes
Factory setting		No

x-value (1-32)

Navigation	⊟	Expert → Application → Maths → Maths x → Linearization → Points → x-value (1-32) 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). e.g. 10 cm corresponds to 20 liters --> enter 10.
User entry		Number (max. 8 characters)
Factory setting		0

y-value (1-32)

Navigation	⊟	Expert → Application → Maths → Maths x → Linearization → Points → y-value (1-32) 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 that the measured x-value corresponds to e.g. 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 specify how this channel is to behave in the event of an error (e.g. if an input channel has a cable open circuit or there is division by 0).

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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 what 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 time frame, determines the minimum, maximum and average value or quantities and operating times.

ℹ If the "Externally controlled" 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, Externally controlled, 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 set up then the daily analysis will run from 07:00 on the current 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 (option "Tele-Alarm")

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 (option "Tele-Alarm")

Navigation	▣	Expert → Application → Signal analysis → Group days Direct access code: 440008-000
Description		Set how often the weekly- monthly- or yearly analysis are to be calculated. "No": each individual alarm is counted. "Yes": The number of days within the analysis cycle in which at least one limit value violation took place (e.g. required for the number of overflows in a storm overflow tank).
Options		No, Yes
Factory setting		No

Reset to zero

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 taken over the setup.
Options	Please select, Analysis x, Totalizer, All
Factory setting	Please select

Reset channel

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 taken over 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

"Autom. printout" submenu

Navigation	▣ Expert → Application → Signal analysis → Autom. printout
Description	Specify whether an automatic print-out should follow at the end of an evaluation.
	ℹ 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 → Autom. 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.
	ℹ 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. A relay, for example, can be switched if a limit value is violated.

Add limit value

Navigation	⊟	Expert → Application → Limits → Add limit value Direct access code: 450300-000

Description	Adding 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	Deleting a limit value from the list.

Options	No, limit value x

Factory setting	No

Change set points

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 can/should be protected by the limit value code.

Options	Only in setup, Outside of setup also

Factory setting	Only in setup

"Set point x" submenu

Navigation	▣	Expert → Application → Limits → Limit x
Description		View or change the setup for the selected alarm set point.
	ℹ	x = place holder for selected limit value
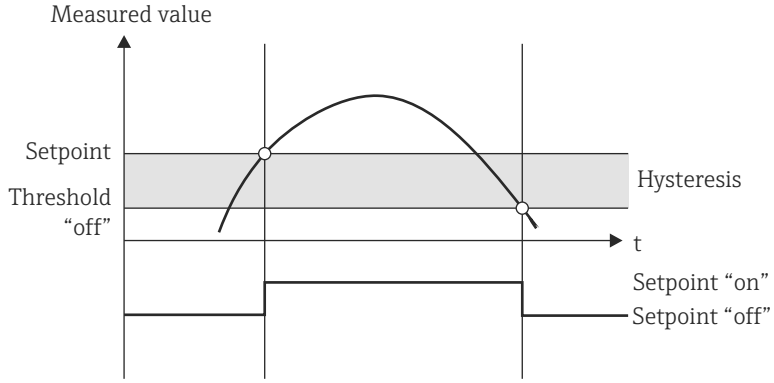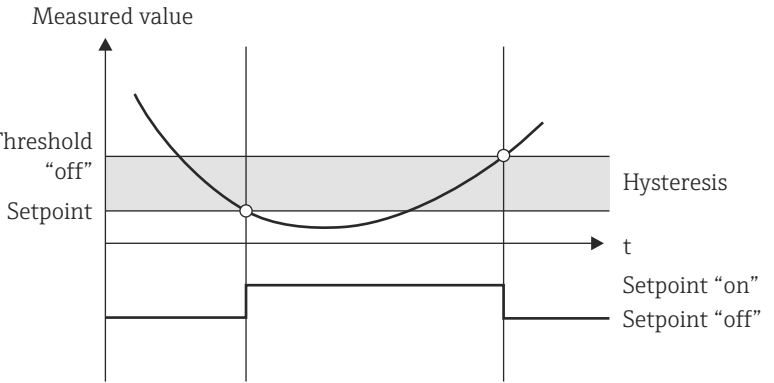
Channel/value
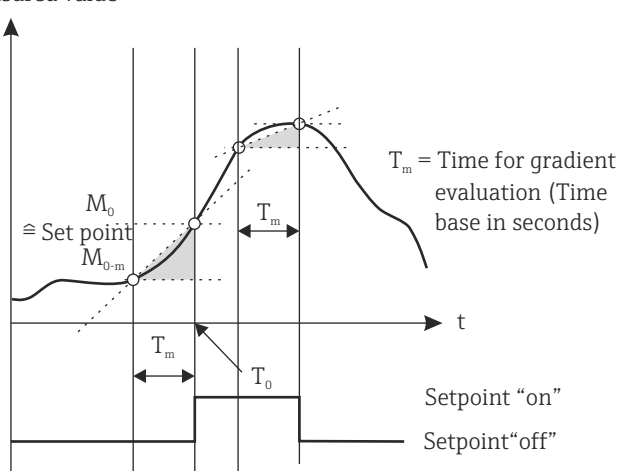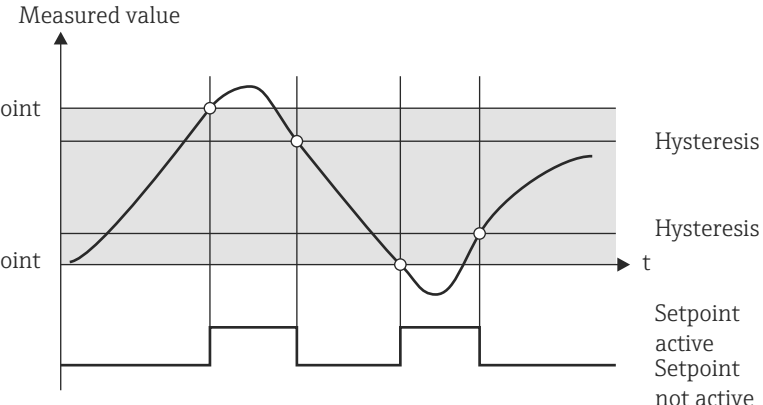
Navigation	▣	Expert → Application → Limits → Limit x → Channel/value Direct access code: 450000-0xx Examples: Set point 1: 450000-000; Set point 30: 450000-029
Description		Select which input/calculated value the limit value refers to.
Options		Switched off, Universal input x, Digital input x, Maths x, Set point x
Factory setting		Switched off
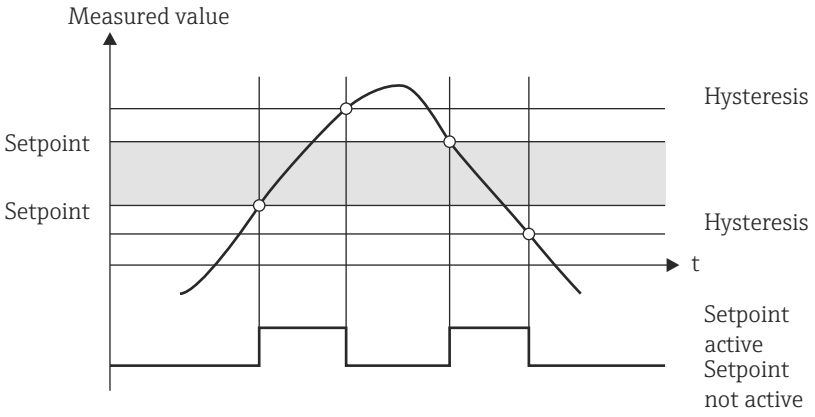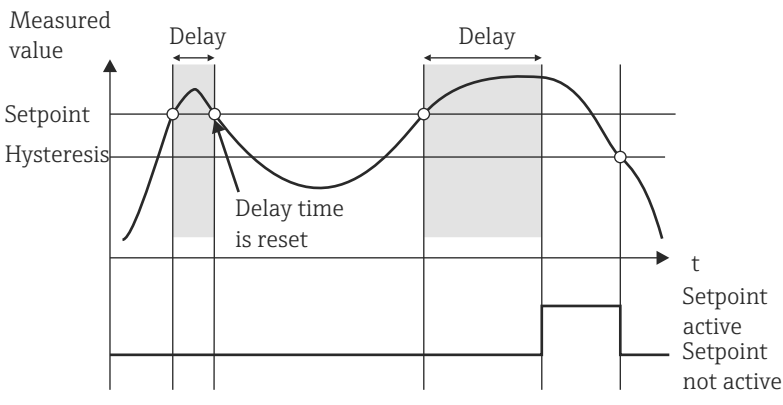
Type

Navigation	▣	Expert → Application → Limits → Limit x → Type Direct access code: 450001-0xx Examples: Set point 1: 450001-000; Set point 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 (positive values only) 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 has been set, the limit value is monitored on 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. A0010188-EN
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. A0010192-EN

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. A0010189-EN
Special case: Hysteresis and delay for one limit value	In the special case that hysteresis and limit value delay are activated, one limit value is switched according to the following principle. If hysteresis and limit value delay are activated, the delay becomes active when a limit value is exceeded and measures the time from which the value is exceeded. 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 once more becomes active and starts measuring from 0. A0010193-EN

Factory setting   Switched off

Identifier

Navigation   Expert → Application → Limits → Limit x → Identifier
Direct access code: 450015-0xx
Examples: Set point 1: 450015-000; Set point 30: 450015-029

Description   Name of the set point 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: Set point 1: 450003-000; Set point 30: 450003-029
Description		Limit value in the set process unit, e.g. in ℃, m³/h.
User entry		Number (max. 10 digits)
Factory setting		0

Set point 2

Navigation	▣	Expert → Application → Limits → Limit x → Limit 2 Direct access code: 450017-0xx Examples: Set point 1: 450017-000; Set point 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: Set point 1: 450014-000; Set point 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: Set point 1: 450004-000; Set point 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: Set point 1: 450005-000; Set point 30: 450005-029
Description		In order to be interpreted as an alarm the signal must exceed or undercut the preset value by at least the time set up.
User entry		0 to 99999 s
Factory setting		0 s

Switches

Navigation		Expert → Application → Limits → Limit x → Switches Direct access code: 450006-0xx Examples: Set point 1: 450006-000; Set point 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: Set point 1: 450007-000; Set point 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.

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: Set point 1: 450008-000; Set point 30: 450008-029
Description	Stores a message in the event log on limit value violation.
Options	No, Yes
Factory setting	Yes

Event text LV on

Navigation	⌨ Expert → Application → Limits → Limit x → Event text LV on Direct access code: 450009-0xx Examples: Set point 1: 450009-000; Set point 30: 450009-029
Description	This text (including date and time) is shown on the display and/or stored in the event log. Only available if "LV messages" is set to "Acknowledge" or "Save message" 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: Set point 1: 450010-000; Set point 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: Set point 1: 450011-000; Set point 30: 450011-029
Description	The duration of a set point violation can be recorded. The duration is appended to the "limit value off" event text (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: Set point 1: 450016-000; Set point 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: Set point 1: 450012-000; Set point 30: 450012-029
Description	Normal: Save in normal store cycle. Alarm cycle: Fast storage during an alarm violation, e.g. every second. Attention: Requires higher memory capacity. • The save cycle is set under signal groups .→ 🖺 228 • 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

Navigation	⊟ Expert → Application → Limits → Limit x → Draw help line Direct access code: 450013-0xx Examples: Set point 1: 450013-000; Set point 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: Set point 1: 450200-000; Set point 30: 450200-029
Description	Copies settings from actual channel to selected channel.
Options	No, in limit x (all the limits are displayed)
Factory setting	No

"Batch mode" submenu (option)

Navigation	⊟ Expert → Application → Batch mode
Description	Contains settings for the batch mode. ℹ 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 at the press of a button during operation (e.g. temperatures, signals in plant unit 1). ℹ • 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.

Various general settings for measured value display of the device.

 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 (set point violation).
Attention: 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/calculate variable should 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		Please select which data from the selected channel should be displayed. ℹ️ 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/calculate variable should 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		Please 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/calculate variable should 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		Please 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/calculate variable should 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		Please 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 should 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		Please 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/calculate variable should 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   Please 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/calculate variable should 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   Please 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/calculate variable should 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		Please 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

Navigation	▣	Expert → Application → Signal groups → Group x → 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 current 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

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	
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, Bar graph 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

Bargraph	
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. ℹ️ ▪ 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

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
		ℹ With Tele-Alarm option under Expert → Application → Tele-Alarm → General → E-mail setup
Description		Contains settings required if alarms are to be transmitted by e-mail.
		ℹ 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 your 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 your SMTP port 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 (this text appears as the sender of the e-mail).
	If necessary, contact your network administrator or e-mail provider.

ℹ️ 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	Configure the user name of the e-mail account here. 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 here. 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	Here, enter all the e-mail addresses messages should be sent to 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
	...
	E-mail address 5: 510084-000

Description	Here, enter an e-mail address a message should be sent to.
	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).
	ℹ️ Only for limit values where "Save message" 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" messages occur (for digital inputs or maths channels).
	ℹ️ Only for inputs where "Save message" 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.

                  ℹ️   Only relevant if a printer is directly connected to the device.

Parameters	Description	Direct access code
Printer	Please select the printer you wish to use. For supported printers please refer to the Operating Instructions.	540000-000
IP address	Enter the IP address of the network printer here. If you do not know the IP address, contact your network administrator. Note: A DNS name may also be used.	540001-000
Port	Please enter the port of your network printer (available from your network administrator). Note: Port 9100 is usually used.	540002-000
Color printer	Please specify whether you are using a black and white or color printer.	540003-000
Paper size	Please select the paper size of your printer.	540004-000
Print direction	Select the print direction as per the properties of the printer used.	540006-000

Parameters	Description	Direct access code
Characters/ line	Enter 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 the printout. The relay remains switched until the printer is ready again or the device is restarted.	540005-000
"Serial interface" submenu	Settings required if you are using the RS232 or RS485 interface of the device.	150101-000 150103-000

"Softkeys" submenu

Navigation   Expert → Application → Softkeys

Description   You can configure the functions that are assigned to the softkeys 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 assigned, Safe SD Card removal, Remove USB stick safely, Printout, Enter batch info, Event log/audit trail, Historic measured values, Log on to the device (login), Log out of the device (logout), Screenshot, Search in trace, Show analyses, Change set point, Next group, Operation

Factory setting   Softkey 1: Event log/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 log during operation.

Text 1-30

Navigation	⊟	Expert → Application → Texts → Text x
		Direct access code, text 1: 530000-000
		...
		Direct access code, text 30: 530029-000

Description	Generate or change the 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.

ℹ️ Detailed descriptions of this device option can be found in the associated documentation.

"Tele-Alarm" submenu (option)

Navigation	⊟	Expert → Application → Tele-Alarm

Description   Contains settings for alerts via a modem connected to the device or by e-mail.

ℹ️ 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 are transmitted to an external WebDAV server (e.g. NAS). The format can be specified or selected via **"Setup → Advanced setup → System → External memory -> Save as"**.

Parameters	Description	Direct access code
Enable	Switch the WebDAV Client functionality on/off. When active, the device copies the saved measured values automatically to the configured server. ℹ️ Only possible using the Ethernet interface! **Selection:** No, Yes, Yes (SSL) **Factory setting:** No	472000-000
IP address	Enter the IP address of the WebDAV server here. ℹ️ A DNS name can also be used. **Entry:** IP address **Factory setting:** 0.0.0.0	472001-000

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Parameters	Description	Direct access code
Port	This communication port is used to communicate with the WebDAV Server. ℹ If your network is protected by a firewall, this port may have to be enabled. Please contact your network administrator if this is the case. **Entry:** Numbers (max. 5 digits) **Factory setting:** 80	472002-000
User name	Input of the user name that can access the WebDAV server. **Entry:** Text (max. 20 characters)	472004-000
Password	Password for accessing the WebDAV server. **Entry:** Text (max. 20 characters)	472007-000
Directory	Enter the directory in which the data should be saved. **Entry:** Text (max. 120 characters)	472005-000
Save as	"Protected format": All data are stored in a manipulation protected encrypted format. They can be interpreted only by the PC analysis software provided. "Open format": data are stored in a CSV format, this can be opened by a number of different programs (e.g. MS Excel) (Attention: no manipulation security). **Selection:** protected format, open format (*.csv) **Factory setting:** protected format	472010-000

ℹ Test of WebDAV Client settings under **"Diagnostics → Simulation → WebDAV Client"**.

17.1.6 "Diagnostics" submenu

Device information and service functions for a swift device check.

ℹ Only some of the diagnostic functions are available under Expert → Diagnostics. For other functions, see Main menu → Diagnostics.

Actual diagnostics

Navigation   ▭   Expert → Diagnostics → Actual diagnostics
                               Direct access code: 050000-000

Description   Displays the current diagnosis message.

Last diagnostics

Navigation   ▭   Expert → Diagnostics → Last diagnostics
                               Direct access code: 050005-000

Description   Displays the last diagnosis message.

Last restart

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).

"Diagnosis list" submenu

Navigation	⊟	Expert → Diagnostics → Diagnosis list
Description		All diagnosis messages are listed in chronological order.

"Event logbook" submenu

Navigation	⊟	Expert → Diagnostics → Event logbook
Description		Events such as alarm set point infringement and power failure are listed in the correct time sequence.

"Device information" submenu

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

Navigation	⊟	Expert → Diagnostics → Device information → Serial number Direct access code: 000027-000
Description		Individual serial number of the device. Please provide these details when ordering spare parts or asking any questions about the unit.

Order code

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.

> **Uses of the order code**
> • To order an identical spare device.
> • To check the ordered device features using the delivery note.

Firmware Version

Navigation		Expert → Diagnostics → Device information → Firmware Version
		Direct access code: 000026-000

Description	Displays the installed firmware version of the device. Please send these details with any questions about the unit.

ENP version

Navigation		Expert → Diagnostics → Device information → ENP version
		Direct access code: 000032-000

Description	Displays the version of the electronic nameplate. Please send these details with any questions about the unit.

ENP device name

Navigation		Expert → Diagnostics → Device information → ENP device name
		Direct access code: 000020-000

Description	Displays the ENP device name (electronic name plate). Please send these details with any questions about the unit.

Device name

Navigation		Expert → Diagnostics → Device information → Device name
		Direct access code: 000021-000

Description	Displays the device name. Please send these details with any questions about the unit.

Manufacturer ID

Navigation   ⊟   Expert → Diagnostics → Device information → Manufacturer ID
                               Direct access code: 000022-000

Description   Displays the manufacturer ID. Please send these details with any questions about the unit.

Manufacturer name

Navigation   ⊟   Expert → Diagnostics → Device information → Manufacturer name
                               Direct access code: 000023-000

Description   Displays the manufacturer name. Please send these details with any questions about the
                               unit.

Firmware

Navigation   ⊟   Expert → Diagnostics → Device information → Firmware
                               Direct access code: 009998-000

Description   Displays the installed firmware of the device. Please send these details with any questions
                               about the unit.

"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

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