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Operating Instructions Advanced Data Manager

ORSG45



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1 About this document

1.1 Document function

These Operating Instructions contain all the information that is required in the various phases of the device's life cycle: from product identification, incoming acceptance and storage, to mounting, connection, operation fundamentals 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

1.2.1 Safety symbols

A DANGER

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

WARNING

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

A CAUTION

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

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning			
	Direct current			
\sim	Alternating current			
\sim	Direct current and alternating current			
<u> </u>	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.			
Ð	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections.			
	 The ground terminals are situated inside and outside the device: Inner ground terminal: Connects the protectiv earth to the mains supply. Outer ground terminal: Connects the device to the plant grounding system. 			

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.				
i	Tip Indicates additional information.				
	Reference to documentation				
	Reference to page				
	Reference to graphic				
	Notice or individual step to be observed				
1., 2., 3	Series of steps				
ـ►	Result of a step				
?	Help in the event of a problem				
	Visual inspection				

1.2.3 Symbols for certain types of information

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 Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

PROFINET®

Registered trademark of PROFIBUS & PROFINET International, Karlsruhe, Germany

Modbus[®]

Registered trademark of SCHNEIDER AUTOMATION, INC.

EtherNet/IPTM Registered trademark of ODVA, INC.

Internet Explorer[®], ExcelTM Registered trademarks of the Microsoft Corporation

Mozilla Firefox[®] Registered trademark of Mozilla Foundation

Opera®

Registered trademark of Opera Software ASA.

Google ChromeTM

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.

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 Intended use

This device is intended 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 national regulations.

If working on and with the device with wet hands:

• Due to the increased risk of electric shock, wear suitable gloves.

2.4 Operational safety

Risk of injury!

- Operate the device only if it is in proper technical condition, free from errors and faults.
- The operator is responsible for interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:

▶ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:

- Carry out repairs on the device only if they are expressly permitted.
- Observe federal/national regulations pertaining to the repair of an electrical device.
- ► Use only original spare parts and accessories from the manufacturer.

Hazardous area

To eliminate danger to persons or the facility when the device is used in the hazardous area (e.g. explosion protection):

- Check the nameplate to verify if the device ordered can be put to its 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 desktop version (option)

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

2.7 IT security

The manufacturer only provides a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings. IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Product description

3.1 Product design

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

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

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

4 Incoming acceptance and product identification

4.1 Incoming acceptance

On receipt of the 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)
- Panel-mounted device: 2 screw fastening clips
- Version with navigator and front interfaces or DIN rail version: USB cable
- Panel-mounted device: sealing rubber towards the panel wall
- "Industrial Grade" SD card, industry standard: Panel-mounted device with navigator and front interfaces: card is located in the SD slot behind the flap on the front of the device (optional).
 Panel-mounted device with stainless steel front and touchscreen: card is located in the device and cannot be replaced or retrofitted.
 DIN rail version: card is located in the SD slot (optional).
- Analysis software on DVD (Essential, Demo or Professional version, depending on order)
- Delivery note
- Multilanguage Brief Operating Instructions, hard copy
- Ex Safety Instructions, hard copy (optional)
- 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 Fieldbus interface with MAC address (optional)
- 7 Device approvals
- 8 Degree of protection of the device
- 9 Approval in hazardous area (optional) with number of the relevant Ex documentation (XA...)
- 10 TAG name (optional); 2D-matrix code
- 11 Order code, extended order code

4.3.2 Name and address of manufacturer

Name of manufacturer:	Endress+Hauser Wetzer GmbH + Co. KG
Address of manufacturer:	Obere Wank 1, D-87484 Nesselwang
Model/type reference:	ORSG45

4.4 Storage and transport

Compliance with the permitted environmental and storage conditions is mandatory. Precise specifications are provided in the "Technical data" section.

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 Mounting

5.1 Mounting requirements

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 or in the control cabinet.

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

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

5.1.1 Installation dimensions for the panel-mounted device

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

5.1.2 Mounting location and installation dimensions for the DIN rail version

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

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



E 2 DIN rail version, dimensions in mm (in)



☑ 3 Terminal cover, DIN rail version, dimensions in mm (in)

Dimensions

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

5.2 Mounting the measuring device

5.2.1 Mounting the panel-mounted device

Mounting tool: For installation in the panel, all you need is a screwdriver.



€ 4 Panel cutout and dimensions in mm (in).

- Version with navigator and front interfaces Version with stainless steel front and touchscreen Α
- В С
- Grid dimensions of panel cutouts for multiple devices



🛃 5 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 hook the fastening clips (D) into 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 panel (torque: 100 Ncm).

5.2.2 Mounting and disassembling the DIN rail version



6 DIN rail version

1. Set the device on the top-hat rail from below.

2. Swivel the device into the end position by pushing the device gently upwards and turning it towards the carrier rail.

3. Lower the device gently to release it. The device is now engaged on the DIN rail.

Disassembly is the reverse of the assembly sequence.

5.3 Post-mounting check

Panel-mounted device:

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

DIN rail version:

Check that the device is firmly seated on the DIN rail

6 Electrical connection

6.1 Connecting requirements

WARNING

Danger! Electric voltage!

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

Danger if protective ground is disconnected

► The ground connection must be made before all other connections.

NOTICE

Cable heat load

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

Incorrect supply voltage can damage the device or cause malfunctions

 Before commissioning the device, make sure that the supply voltage matches the voltage specifications on the nameplate.

Check emergency shutdown for device

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

Protect the device from overload

- ► Provide overload protection (nominal current = 10 A) for power cable.
- Incorrect wiring may result in the device being destroyed
- ► Note terminal designation on the rear of the device.

Energy-rich transients in the case of long signal 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 Connecting 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 mm² (14 AWG) (spring terminals)
- Wire cross-section, mains: max. 2.5 mm² (13 AWG) (screw terminals)
- Wire cross-section, relays: max. 2.5 mm² (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.

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 Connections



- ☑ 7 Connections: back of device, panel version (left), DIN rail version (right)
- 6 Slot 6: Power supply with relays
- 5 Slot 5: Multifunction card or HART[®] card (channels 17-20) or digital card
- 4 Slot 4: Multifunction card or HART® card (channels 13-16)
- 3 Slot 3: Multifunction card or HART® card (channels 9-12)
- 2 Slot 2: Multifunction card or HART[®] card (channels 5-8)
- 1 Slot 1: Multifunction card or HART[®] card (channels 1-4)
- 0 Slot 0: CPU card with interfaces

6.3.2 Electrical connection, terminal assignment

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

Circuit diagram



■ 8 For connection examples of the HART[®] inputs (optional), see the Operating Instructions \rightarrow \cong 25

Supply voltage (power unit, slot 6)

Power unit type	Terminal		
		24V 24V 24V 24V 24V 24V 24V 24V	
			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)

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

1) NC = normally closed (breaker)

2) NO = normally open (maker)

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

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

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

Туре	Terminal		
		24V Out 18 18 19 1 +	A0019103
Auxiliary		24V Out -	24V Out +
voltage output, not stabilized, max. 250 mA		- 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:

Туре	Terminal YUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU						
	× ×	××××				A0019303	
	x1	x2	х3	x4	x5	х6	
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				(+)		(-)	

If a universal input is used as a frequency or pulse input, a series resistor must be used in series connection 1) with the voltage source. Example: $1.2 \text{ k}\Omega$ 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:

Туре	Terminal						
	x1 x2	x4 x6 0000 x5 x6 0000 x6 x7 x7 x7 x7 x7 x7 x7 x7 x7 x7 x7 x7 x7	x3 x3 i	Modem 2500 100 4 5 5 X X		A0024862	
	1	7	2		E	6	
	XI	XZ	CX CX	X4	CX	XU	
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)

Туре	Terminal (max. 250	erminal (max. 250 V, 3 A)						
	2222 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2							
		1	1	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)

Туре	Terminal			
	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			A0024736
Analog	015	016	025	026
output 1-2	Analog output 1 (+)	Ground, analog output 1 (-)	Analog output 2 (+)	Ground, analog output 2 (-)

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Extension of digital inputs (digital card, slot 5)

Туре	Terminal		
	X X	A A BABASSESSESS COCOCOCOCOCOCOCOCOCOCOCOCOCOCOCOCOCOC	A0024736
Digital input 7 to	D71 to DE1	GND2	GND2
14	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



- 9 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)



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

In 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

E 11 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 (supply point) 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).



12 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, slot 0)

P Use shielded signal lines for serial interfaces!

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



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

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

Option: Modbus RTU master

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

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

Option: Modbus RTU slave

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

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

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

Remote interrogation with analog or GSM/GPRS wireless modem:

Analog modem:

An analog modem for industrial use (e.g. Devolo or WESTERMO), which is connected to the RS232 interface with a special modem cable (see accessories $\rightarrow \square$ 94), is recommended.

GSM/GPRS wireless modem:

A GSM/GPRS wireless modem for industrial use (e.g. Cinterion, INSYS or WESTERMO, incl. antenna and power unit), which is connected to the RS232 interface with a special modem cable (see accessories $\rightarrow \square 94$), is recommended.

Important: the wireless modem needs a SIM card and data transfer subscription. In addition, it must be possible to deactivate the PIN prompt.

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

6.3.8 Ethernet connection (CPU card, slot 0)

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

- Standard: 10/100 Base T/TX (IEEE 802.3)
- Socket: RJ-45
- Max. cable length: 100 m
- Galvanic isolation; test 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 there are two light emitting diodes which indicate the status of the Ethernet interface.

- Yellow LED: link signal; is lit when the device is connected to a network. If this LED is not lit, communication is not possible.
- Green LED: Tx/Rx; flashes irregularly if the device is transmitting or receiving data.

Requirements with regard to a network printer

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

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

GDI printers are not supported!

Option: Ethernet Modbus TCP master

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

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

Option: Ethernet Modbus TCP slave

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

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

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

PROFIBUS-DP slave:

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

Baud rate: maximum 12 Mbit/s

EtherNet/IP adapter (slave):

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

PROFINET I/O device:

Up to 40 analog inputs and 20 (14 real + 6 virtual) digital inputs can be transmitted via PROFINET IO and stored in the device. The 2-port module for Profinet IO meets compliance class B. The integrated switch enables 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, slot 0)

Two USB-2.0 ports are available (panel version) or one USB-2.0 port is available (DIN rail version) on shielded USB-A sockets. A USB 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 Front of device (version with navigator and front interfaces)

■ 13 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. $\rightarrow \cong 42$

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

Requirements for the SD card

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

Use only the industrial grade SD cards described in the "Accessories" section of the Operating Instructions. These have been tested by the manufacturer and are guaranteed to function faultlessly in the device. $\rightarrow \cong 94$



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. $\rightarrow \cong 94$



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

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

Requirements with regard to an external USB keyboard

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

Requirements with regard to an external USB barcode reader

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

Checking the barcode reader at a PC

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

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

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

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

Requirements with regard to an external USB printer

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

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

GDI printers are not supported!

6.4 Post-connection check

Device condition and specifications	Notes
Are cables or the device damaged?	Visual inspection
Electrical connection	Notes
Does the supply voltage match the 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 device.

7 Operation options

7.1 Overview of operation options

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

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

7.2 Structure and function of the operating menu

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



7.2.1 Operating menu for operators and maintenance personnel



7.2.2 Operating menu for experts

7.2.3 Submenus and users

Certain parts of the menu are assigned to certain user roles. Each user role corresponds to typical tasks within the 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: Settings required if the USB, RS232, RS485 or Ethernet interface or the HART[®] inputs of the device are used (PC operation, serial data read-out, modem operation, etc). Application: Various application-specific settings (e.g. group settings, limit values, etc.). Once values have been set for these parameters, the measurement should generally be completely configured.

User role	Typical tasks	Menu	Content/meaning
	 Troubleshooting: Diagnosing and eliminating process errors. Interpretation of device error messages and correcting associated errors. 	"Diagnostics"	 Contains all parameters for detecting and analyzing errors: Diagnosis list All diagnosis messages are listed in chronological order. Event logbook Events such as alarm set point infringement and power failure are listed in the correct time sequence. Device information Displays important device information (e.g. serial number, firmware version, device options for hardware and software, memory information, etc.). Measured values Displays of current measured values of the device. Outputs Displays the current status of the outputs e.g. switch status of relay outputs. Simulation Various functions/signals can be simulated for test purposes here. Note: In Simulation mode, normal recording of the measured values is interrupted and the intervention is logged in the event log. HART[®] Displays the exact device information of a selected HART[®] device and the HART[®] communication signal quality. Initialize modem Initialize 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 the parameters of the device (including those that are already contained in one of the other submenus). The expert menu is protected by a code. Factory setting: 0000. This menu is structured according to the function blocks of the device: "System" submenu Contains all higher-level device parameters that do not pertain either to 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 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 for configuring application-specific settings (e.g. group settings, limit values etc.).

7.3 Measured value display and operating elements

7.3.1 Measured value display and operating elements on panelmounted device



I4 Device front (left: version with navigator and front interfaces; right: version with stainless steel front and touchscreen)

Item No.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)		
а	Slot for SD card		
b	USB B socket "Function" e.g. to connect to PC or laptop		
С	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.		
	D o 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 to the left, changes the parameter. Turning clockwise moves the bar or cursor down or to the right, changes the parameter. Press = select highlighted function, start parameter change (ENTER key).		
2	 Functions of LED indicators (according to NAMUR NE44:) Green LED (top) lit: power supply OK Red LED (bottom) flashing: maintenance required, caused by external factor (e.g. cable open circuit etc.) or a message/notification requiring acknowledgment is pending, calibration is running. 		
3	Variable "soft keys" 1-4 (from left to right)		
4	Function indicator of "soft keys"		
5	In display mode: current group name, type of analysis; In setup mode: name of the current operating item (dialog title)		
Item No.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)		
-------------	---	--	--
6	In display mode: displays current date/time In setup mode:		
7	In display mode: user ID (if function is active) In setup mode:		
8	In display mode: alternating display indicating the percentage space on the SD card or USB stick that has already been used. Status symbols are also displayed in alternation with the memory information (e.g. simulation mode, data storage active, operation lock, 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 car of counters, the type of counter is displayed as a symbol. Image: Imag		
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.		

7.3.2 Operating elements of the DIN rail version



🖻 15 Device front of the DIN rail version

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

7.4 Display representation of symbols used in operation

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

Item No.	Function	Description		
	Σ	Totalizer		
9	Channel-related symbols:			
	T	Violation of lower limit value		
	X	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).		
	М	"Maintenance required" Maintenance is required. The measured value remains valid.		
		Error, measured value not displayed. Possible causes: Sensor / input error, line break, invalid value, input signal too high/low		
8	Symbol for status signals:			
	Ô	"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.		
	м	"Maintenance required" Maintenance is required. The measured value remains valid.		
	F	Error message "Failure detected" An operating error has occurred. The measured value is no longer valid (e.g. a channel not displayed in the current group is defective).		
	2	"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

۶.	Symbol for setup
q	Symbol for diagnostics
Ð	Symbol for expert setup
\$	Symbol for user administration according to "FDA 21 CFR Part 11"
x	Back The function "Back" appears at the end of each menu/submenu. Press "Back" briefly to go up one level in the menu structure.
	Drogg and hold "Prod" (>2 and) to guit the many immediately. The devices guitches to

Press and hold "Back" (>3 sec.) to quit the menu immediately. The devices switches to Display mode.

<i>P</i>	Setup changes		
0	Power on		
٢	Power off		
\boxtimes	Limit value on		
0	Limit value off		
1	Digital on (on/off message)		
0	Digital off (on/off message)		
8	Service		
£	User administration		
	Texts saved / comments added		
OK	Acknowledging message		
×	Back		
•	Continue searching		

7.4.2 Symbols in the event logbook

7.5 Entering text and numbers (virtual keyboard)

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

The following characters are available for entering customized text:

0-9 a-z A-Z = + - * / \ ² ³ ¹/₄ ¹/₂ ³/₄ () [] < > { } I ? ! ` "' ^ % °., : _ μ & # \$ € @ § £ ¥ ~

÷	Jump one position to the left. If this symbol is selected, the cursor jumps one position to the left.
\rightarrow	Jump one position to the right. If this symbol is selected, the cursor jumps one position to the right.
́х	Delete backwards. If this symbol is selected, the character to the left of the cursor position is deleted.
х→	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.
x	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/hold function), the "soft keys" or touch control (optional) 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 →
 ^(a) 94)
- 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. Alternatively, the Web server can be operated in a point-to-point connection (Ethernet over USB) with a standard USB cable via the USB B port. $\rightarrow \square 42$

The Web server offers the following range of functions:

- Display of current and historical data and measured value curves via a standard Web browser $\rightarrow \cong 59$
- Remote access to device and diagnostic information

7.8.3 OPC server (optional)

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

The following instantaneous values can be provided:

- Analog channels
- Digital channels
- Mathematics
- Totalizer

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.

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

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

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

If no measured values are received via fieldbus, the device activates a potential-free switch contact (e.g. relay) following an adjustable timeout. The evaluation of the switching contact is the responsibility of the user.

8.1.2 Ethernet

$\textbf{Setup} \rightarrow \textbf{Advanced setup} \rightarrow \textbf{Communication} \rightarrow \textbf{Ethernet}$

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** \rightarrow **Communication** \rightarrow **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

Ports can be changed!

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

8.1.3 Web server with "Ethernet over USB" function

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

to establish a point-to-point connection. The Web server itself retains its complete range of functionality.

Important information:

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

Supported services/functions

The following services/functions are provided via the USB interface:

- Web server
- CDI TCP (port 8000)
- WebDAV server

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

Driver installation at PC end

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

1. The driver can be found under "..\Drivers\USB_ECM" on the PC analysis software DVD supplied.

2. Execute the "setup.exe" and follow the instructions.

The necessary drivers are installed.

From version V1.04.01 of the PC analysis software provided, the driver is installed automatically with the PC software.

The driver can be installed directly from the DVD without first having to copy the files to the PC.

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

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

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

The device is now ready to establish a connection.

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

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

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

The device is now ready to establish a connection.

Establishing communication

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

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

- The IP address of the Web server via USB is set permanently to http://192.168.1.212
- If the USB cable is already connected to a PC when the device starts up, there is no prompt even if the "By user input" option is selected. Instead, the previously selected functionality is used.

8.1.4 Modbus RTU/TCP slave

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

Up to 40 analog inputs and 20 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	-	
Parity:	Even/Odd/ None	-	
Stop bits:	1/2	-	
Port:	-	502	

Transfer of values

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

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

For more information about Modbus, see the supplementary documentation.

9 Commissioning

9.1 Function check

Perform the following checks prior to commissioning:

- "Post-mounting check" checklist $\rightarrow \cong 15$.
- "Post-connection check" checklist $\rightarrow \cong 31$.

9.2 Switching on the measuring device

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

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

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

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

9.3 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.** To change the set language: Press the navigator, turn the navigator to select the desired language and press the navigator to apply the change.
- 4. Use "Back" or "ESC" to quit the main menu

The operating language has been changed.



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

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

DIN rail version:

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

9.4 Configuring the measuring 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. The device can also be put into operation and configured via the PC.

Device configuration options:

- Setup directly at the device (panel-mounted device only)
- Setup via SD card or USB stick by transferring the parameters stored on it
- Setup via Web server using Ethernet or Ethernet over USB

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
- 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 and configure the new input that has been created.
- Activate relays or analog outputs (optional) in the main menu under "Setup -> Advanced setup -> Outputs"
- 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:

- 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:

- 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"
- 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
- 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. Select using the channel identifier of the HART[®] value.
- 8. Other settings for the universal input are made in the same way 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 Device setup

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

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

For a detailed overview of all the operating parameter, please refer to the Appendix of the Operating Instructions. $\rightarrow \cong 127$

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".

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

9.4.6 Setup via Web server

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

Please observe the information and communication settings for Ethernet (or Ethernet over USB) and the Web server under $\rightarrow \cong 42$.

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

ID default value: admin; Password: admin

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

Procedure for establishing a connection with the DIN rail version:



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

- 1. Set DIP switch 11 (USB-B/IP) to IP (ON)
- 2. Connect the USB and open the Web server using the Web browser (IP 192.168.1.212)

3. Configure the device under "Expert -> Communication -> Ethernet" (fixed IP address or DHCP)

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

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

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

The USB driver must be installed.

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

Procedure for establishing a connection with the DIN rail version:

Version 2: via DTM/USB

- 1. Set DIP switch 11 (USB-B/IP) to USB-B (OFF)
- 2. Connect the USB

3. Open the DTM (offline parameterization) and configure the device under "Expert -> Communication -> Ethernet" (fixed IP address or DHCP)

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

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

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

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

The USB driver must be installed.

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

Procedure for establishing a connection with the DIN rail version:

Version 3: via Ethernet

- 1. Set DIP switch 10 (Service) to ON
- 2. Connect the Ethernet cable (point-to-point connection; a crossover cable is not required)
- 3. Now configure the device via the IP address 192.168.1.212 by Web server or DTM (see version 1 and 2)

4. Following configuration, set DIP switch 10 back to OFF. It is now possible to communicate with the device via the configured IP address.



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

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

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

The USB driver must be installed.

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

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

Procedure to establish a direct connection via Ethernet (point-to-point connection): $\rightarrow \cong 59$

NOTICE

Undefined switching of outputs and relays

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

An existing device configuration ("Setup data" *.DEH) can be uploaded directly to the device via the Web server.

Procedure for uploading a new setup via the Web server:

- **1**. Establish a connection to the device via the Web server $\rightarrow \square 48$
- 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 are 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:

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

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

A detailed overview of all the operating parameters is provided in the appendix at the end of the Operating Instructions. $\rightarrow \cong 127$

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".

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) -> Safe removal" in the main menu!

Procedure for saving a setup via the Web server:

- **1**. Establish a connection to the device via the Web server $\rightarrow \triangleq 48$
- 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 are accepted, information to this effect is displayed in the Web server.

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

9.7 Simulation

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

NOTICE

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

• Do not start simulation if measured value recording must not be interrupted!

9.8 Access protection and security concept

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

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

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

The following protection options and functionalities are available:

- Protection per control input
- Protection via access code
- Protection via user roles
- Protection via user administration according to "FDA 21 CFR Part 11"
- Protection via DIP switches (DIN rail version)

Overview of access protection and security concept

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

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

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

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

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

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

9.9 HTTPS Web server setup

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



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

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

Prerequisites

Private key:

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

Certificate:

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

Certificate and private key can be created or converted using openssl

(https://www.openssl.org) for example. Contact your IT administrator to create the corresponding files.

Installation:

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

Notes:

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

Checking certificates

You can check the certificate via **"Main menu -> Diagnostics -> Device information -> SSL certificates"**. For this purpose, select the **"Server certificate"** point under the certificate.

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

Uninstalling certificates and the private key

You can check the certificate via "Main menu -> Diagnostics -> Device information -> SSL certificates". For this purpose, select the "Server certificate" point under the certificate. You can delete the certificate here.

In this case, the preinstalled certificate is reused.

Using self-signed certificates

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

Alternatively, an exception can be saved in the browser.

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 socalled "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 local display have no effect on the measurement section or the configured device parameters, however.

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

11.1 Reading-out and changing the Ethernet setting address

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): For the device's IP or MAC address, see the main menu under "**Diagnostics -> Device information -> Ethernet**".

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

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

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

- 1. Configure the PC (depends on operating system): e.g. IP address: 192.168.1.1; subnet mask: 255.255.255.0; gateway: 192.168.1.1
- 2. Disable DHCP on the device
- 3. 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 off the device locking status

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

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

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





11.3 Reading off measured values (display devices)

I6 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 "soft keys" 1 to 4 (from left to right)
- 4 Function indicator of the "soft keys"
- 5 Header: group name, analysis type
- 6 Header: current date/time
- 7 User ID (when function is active)
- 8 Header: alternating display indicating the percentage space on the SD card or USB stick that has already been used. The display alternates between displaying memory information and status symbols.
- 9 Area for measured value display (e.g. curve display). Display of current measured values and the status in the event of an error/alarm condition. In the case of counters, the type of counter is displayed as a symbol.
- 10 Status bar

An overview of all the symbols and icons is provided in the "Operation options" section. $\rightarrow \cong 38$

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

Information on how to rectify a problem if an error occurs is provided in the "Troubleshooting" section. → 🗎 79

11.4 Web server

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

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

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

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

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

The following web browsers are supported:

- MS Internet Explorer 11 and higher
- MS Edge
- Mozilla Firefox 52.1.0 and higher
- Opera 12.x and higher
- Google Chrome 66 and higher

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

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



The Web server is not optimized for visualization on smartphones.

When delivered, the following default values are set for the user roles in the device and Web server:

- ID: admin; password: admin
- ID: service: password: service
- ID: operator; password: operator

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

Note: Passwords should be changed during commissioning!

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

Access to the Web server via HTTP (HTML) 11.4.1

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



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

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

11.4.2 Access to the Web server via XML

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

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



H

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

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

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

</device>

Тад	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 Setup, operation and service via the Web server

Establish a connection to the Web server:

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

The startup screen of the Web server appears.

	Device name : Device tag :	Data DIN	a Manager rail unit				
	Status signal :	🗸 ОК					
Health status	Measured values	~	Menu	Data management	~	Network	
OK							
Devic	e information		Confirm n	nessages (0)		Event logbook	

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

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

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

Health status (advanced device status)

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

Measured values (choice of measured value display)

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

Menu

The menu structure displayed in the Web server corresponds largely to the menu structure in the device $\rightarrow \cong 33$

Data management

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

Network

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

Displays the current measured values and history data

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

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

Note: The browser must support HTML5.

Optional command parameters:

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

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

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

Instantaneous values

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

Temperature Control	Temp_Offset		
Calculated_Temp		Ambient_Temp	Water_Temp °C
	54,5	95,8	41,3
Delta_T_Limit			
	Deltal		

Instantaneous values as curves

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



Display functions

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

History (logged measured values)

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



Display functions

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

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

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

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

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





11.4.4 Remote control via the Web server

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

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

Enabling remote control on the device:

- 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 the data of a measuring point to be fully archived, e.g.:

- Measured values
- Diagnostic events
- Protocols

The analysis software stores data in an SQL database. The database can be operated locally or in a network (client/server). The free PostgreTMSQL database supplied on the DVD can be installed and used.



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 000000279 000000185 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 000000279 000000185 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: Cable open circuit
- 2: Input signal too high
- 3: Input signal too low
- 4: Invalid measured value

6: Error value, i.e. not the calculated value (for mathematics if an input variable is invalid)

7: Sensor/input error

9: Value uncertain

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

Dit 4. Decreasing gradien

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 ExcelTM (2007 and higher).

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

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

11.6 Changing the group

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

Version with stainless steel front and touchscreen:

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

- For the DIN rail version: The active groups can only be queried and changed via the Web server under **"Measured values -> Instantaneous values / Instantaneous values as curves / History"**. The groups are created as tabs and can be selected by mouse click.
- Only the **active** groups are displayed here. The settings for this can be made in the main menu under "Setup -> Advanced setup -> Application -> Signal groups -> Group x".

11.7 Locking operation

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

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

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

11.8 Login / logout

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

Only for active user administration (FDA 21 CFR Part 11) or role-based access protection $\rightarrow \cong 52$

11.9 Changing the password

Change the user password.

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

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

11.10 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.

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

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

- All data are copied cyclically to the rec_data_<Device name> folder if a data packet is complete or the function "Update" is activated under "Operation -> SD card/USB stick -> Update".
- The data for the selected time range that was selected under "Operation -> SD card / USB stick -> Save measured value" are copied to the rng_data_<device name> folder. Copying these data does not affect the storage of the data in the **rec data <device name>** folder.
 - Only use new, formatted SD cards that are recommended by the manufacturer (see "Accessories" $\rightarrow \square 94$).
 - During normal operation, the used memory space on the SD card or USB stick is displayed on the top right of the display ("SD: xx%" or "USB: xx%"). Dashes "--" on this display mean that no SD card is inserted.
 - The SD card must not be write-protected.
 - Prior to removing the external data carrier, select "Operation -> SD card/USB stick -> Update". The current data block is closed and saved to the external data carrier. This ensures that all the current data (up until the last save) is included on the data carrier.
 - Depending on the device configuration (see "Setup -> Advanced setup -> System -> Ext. memory -> Warning at"), an acknowledgeable message on the display notifies the user that the external data carrier has to be changed before the data carrier is 100 % full.
 - The device keeps track of which data have already been copied onto the SD card or USB stick. If the data carrier is not changed in time or if no SD card is inserted, the new external data carrier is filled with the missing data from the internal memory insofar as the data are still in the memory. As measured value acquisition/recording is assigned the highest priority, it may take several minutes in this case for the data to be copied from the internal memory to the SD card or USB stick.

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

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

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



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

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

SD card

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



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

LED at SD slot. Yellow LED lit or flashing when the device 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!

11.10.3 Functions relating to the SD card or USB stick

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

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

Remove safely:

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

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

Update:

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

P 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.

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

Process screens:

Load, export or delete process screens.

Load: Loads a process screen from the external storage medium into device memory. Export: Saves the process screen in the device onto the external storage medium to transfer it to another device.

Delete: Deletes the selected process screen from device memory.

Procedure for creating and processing process screens: $\rightarrow \square 71$

Load user administration:

Loads all settings and user accounts from the storage medium to the device. The file has the extension ".ids2".

Caution: Any existing settings/accounts are overwritten!

Save user administration:

Saves all settings and user accounts to the storage medium. The file has the extension ".ids2".

• User administration as RTF:

Saves the user administration on the storage medium in a readable format as an RTF file (rich text format).

Import SSL certificate:

Uploads an SSL certificate (X.509) to the device. Certificates are needed to establish an SSL connection in order to send e-mails in an encrypted manner for example. Certificates are available from your network administrator or provider. The following are supported: DER, CER and CRT (binary or Base64-encoded).

Only visible if an SSL certificate is provided on the SD card or USB stick.

Creating a process screen using the process picture generator

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

The DVD provided with the analysis software includes a process picture generator. Alternatively download at:

www.readwin2000.com/tools files/ProcessPictureGenerator Neutral.zip

This program allows the user 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 DVD 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. Using the **"File -> Export"** function, save the process screen ("PP_GROUP_<xx>.bmp") with the necessary INI file ("PP_GROUP_<xx>.ini") to a USB stick or an SD card. Note: The "xx" in the file name stands for the group (01 to 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 in the device:

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

Editing process screens on the device

Process screens can be edited on the device.

The following functions are possible:

- Add channels to/remove channels from the process screen
- Change the position, font size, and alignment
- Delete the process screen

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

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

Parameter	Parameter/description
"Edit" submenu	Edit the process screen currently displayed (position, font size, etc.).
"Channel 1-8" submenu	Edit the selected channel of the process screen (enable, change position/font size etc.).
	Display in the process screen Switch the channel in the process screen on or off. Note: Does not affect measured value storage/configuration. Options: No, yes; factory setting: no
	Channel ident. Specify whether the channel identifier should be displayed in addition to the measured value. The channel identifier is displayed above the measured value. Options: No, yes; factory setting: no
	Alignment Specify how the measured value should be aligned.
	For "Align left", the x-position is the left top-hand corner of the measured value. For "Align right", the x-position is the right top-hand corner of the measured value.
	Options: Align left, align right Factory setting: Align right
	x-position Selection of the x-position where the measured value is to be displayed. User entry: 0 to 799 pixels; factory setting: 10
	The point of origin (x-/y-zero point) is the top left. When the x-value is increased the text moves to the right.
	y-position Selection of the y-position where the measured value is to be displayed.
	The point of origin (x-/y-zero point) is the top left. When the y-value is increased the text moves down.
	User entry: 0 to 450 pixels; factory setting: 50 (channel 1) to 260 (channel 8)
	Font size Selection of the font size in which the measured value is to be displayed. Options: Small, medium, large, very large; factory setting: large
Accept changes	Saves the changes to the process screen in the device memory.
Delete	Deletes the selected process screen from the device memory. The device then changes to the curve display.

11.10.4 Notes on e-mail encryption

In addition to sending unencrypted e-mails, it is also possible to send encrypted e-mails via SSL (TLS). To do so, you can choose either of two ways:

- By **SMTPS**: fully encrypted via port 465. The complete connection runs over TLS. The port is 465 by default but this value can be changed in the Setup.
- Via port 25 or 587 using **STARTTLS**.

With this method the device first establishes a plain SMTP connection via port 25 and continues this connection following agreement and switchover to encryption.

The required process can be selected as follows: "Setup -> Advanced setup -> Application -> E-mail -> Server requires SSL" or under "Expert -> Application -> E-mail -> Server requires SSL".
TLS V1.0 (=SSL 3.1), V1.1 and V1.2 are supported. Older standards are not supported. The encryption method is automatically agreed with the counterparty.

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

- *.CER: DER- or Base64-encoded certificate
- *.CRT: DER- or Base64-encoded certificate
- *.DER: DER-encoded certificate



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.



11.10.5 Notes on WebDAV encryption

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

The complete connection runs over TLS. The port is 80 by default but this value can be changed in the Setup. The procedure to be used can be selected as follows: "Setup -> Advanced setup -> Application -> WebDAV Client -> Enable -> Yes (SSL)" or under "Expert -> Application -> WebDAV Client -> Enable -> Yes (SSL)".

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

A certificate must be installed in order to be able to send encrypted data. These certificates can be obtained from your WebDAV server service provider. The following file formats are supported:

- *.CER: DER- or Base64-encoded certificate
- *.CRT: DER- or Base64-encoded certificate
- *.DER: DER-encoded certificate



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.



11.10.6 SSL certificates

Importing an SSL certificate

Installing a certificate via SD card or USB stick:

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

Installing a certificate via the Web server:

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

P 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 Show data logging

For the **DIN rail version**, see $\rightarrow \square 64$

You can scroll through the saved measured values in the main menu under **"Operation -> History"**. Turn the navigator clockwise or counterclockwise to scroll back and forth between the measured value curves. Press the navigator to 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 on the screen and the 🖉 symbol in the status bar indicate that historical values are being displayed. In the instantaneous value display the color of the header is blue.

11.11.1 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

For the **DIN rail version**, see $\rightarrow \cong 64$

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

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

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

11.11.7 Historical data: Store text

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

11.12 Signal analysis

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

- Actual intermediate analysis:
 - The current (i.e. not yet completed) intermediate analysis can be displayed here.
- External analysis 1-4: Current (i.e. not yet completed) external analyses can be displayed here.
- Actual day:
 - The current (i.e. not yet completed) daily analysis can be displayed here.
- Actual week:

The current (i.e. not yet completed) weekly analysis can be displayed here.

- Actual month:
- The current (i.e. not yet completed) monthly analysis can be displayed here.
- Actual year:
 - The current (i.e. not yet completed) annual analysis can be displayed here.
- Search:

Search and display of analyses. Select which analyses the system should search for/display: Intermediate analysis, Daily analysis, Monthly analysis, Annual analysis.

11.13 Search in trace

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

For the **DIN rail version**, see $\rightarrow \square 64$

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

Н

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

11.16 Printout

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

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

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

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

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

11.18 Limit values



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

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

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

Detailed description of the limit values: $\rightarrow \cong 241$

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, with the exception of the settings for the SD card (Memory build-up, Warning and Relays). The memory is regarded as a stack memory.

Detailed description of the parameters: $\rightarrow \cong 265$

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.

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

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

ID default value: admin; Password: admin

Note: The password 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

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

12.1 General troubleshooting

WARNING

Danger! Electric voltage!

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

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

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

12.2 Troubleshooting

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

General troubleshooting procedure

- 1. Open 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 or scaled measuring ranges. To verify calculations, call up calculated auxiliary variables if necessary.
- **3.** Most errors can be rectified by performing steps 1 and 2. If the error persists follow the troubleshooting instructions in the following sections.
- 4. If this does not rectify the problem, contact the Service Department. Any time you contact the Service Department please always have the error number and the information in the main menu under "Diagnostics -> Device information" (program name, serial number etc.) to hand.

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 is made up 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. If a controller is connected, it should be switched 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. Proper maintenance efforts may prevent a possible malfunction in the future.
- **S** = **Out of specification**. The measuring point is being operated outside specifications. Operation is still possible. There is the risk of increased wear, a shorter operating life or less accurate measurements. The cause of the problem is to be found outside the measuring point.
- **C** = **Function check**. The device is in Service mode.

Diagnostic code	Message text	Description	Remedy	
F100	Sensor/input error!	Sensor/input error!	Check connections and parameters	
F101	Open circuit	Open circuit	Check connections	
F105	Invalid value!	Measured value is invalid (when calculating> NAN)	Check connections and process variables	
F201	Device fault	Device error	Contact the Service Department	
F261	Error: RAM	No access to RAM	Contact the Service Department	
F261	Error: Flash	No access to flash	Contact the Service Department	
F261	Error: SRAM	No access to SRAM	Contact the Service Department	
F261	Analog card x is out of order!	Hardware defect detected	Contact the Service Department, replace card	
F261	HART card out of order!	Hardware defect detected	Contact the Service Department, replace card	
F261	Power supply out of order!	Hardware defect detected	Contact the Service Department, replace power unit	
F261	Digital card out of order!	Hardware defect detected	Contact the Service Department, replace card	
F261	Fieldbus card out of order!	Hardware defect detected	Check contacts of Anybus card, contact the Service Department	
M262	Fieldbus module is obsolete. Please replace the hardware!	The installed fieldbus module is not approved for this firmware version.	Replace the hardware or downgrade the firmware (not recommended).	
M284	Firmware update	Firmware has been updated	No action required. Message can be acknowledged.	
M290	Internal flash reaches the end of its lifetime. Please replace device.	The internal flash memory is defective.	Replace device	
F301	Error: Cannot load setup	Setup defective	Switch the device off and then on again, re-configure, contact the Service 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		

Diagnostic code	Message text	Description	Remedy
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
F312	Analog card x is not calibrated!	Analog card x is not calibrated! The device works with default values, i.e. the measured values may be inaccurate under certain circumstances.	Contact the Service Department
M313	SRAM has been defragmented	SRAM was defragmented after firmware update	No action required. Message can be acknowledged.
F314	Error: Option code	Activation code is no longer correct (incorrect serial number/program name). Option was disabled 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 < 2.5 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 is restarted.	The device is rebooting. Causes include: • Following a firmware update • Change to device options	No action required. Message can be acknowledged.
F431	Error:Calibration	Calibration data missing	Contact the Service Department
M502	Device is locked!	Device is locked! The message appears when an attempt is made to update the firmware, for example	Check lock per digital channel
F510	Setup was corrected.	 The device has discovered that the configuration is no longer correct. All the parameters concerned have been reset to the factory default settings. Possible causes: Input cards have been removed or replaced by another type An input card is no longer working correctly A firmware update has caused compatibility problems. Note: This error message appears each time the device is restarted until at least one change has been made to the configuration. 	Check the configuration of the device. If hardware has been replaced, no other action is needed (recommendation: change the operating language so that the error message no longer appears after the next restart).
F510	User administration was corrected	The device detected that the user administration settings were no longer correct. All the parameters concerned have been reset to the factory default settings.	

Diagnostic code	Message text	Description	Remedy
M520	SMTP: Name could not be resolved (DNS)! SNTP: Name could not be resolved (DNS)!	Problem with name resolution (DNS). SMTP: e-mail SNTP: time synchronization	Check the corresponding settings
F526	 Support points not OK! Support points: x-value exists more than once Upper and lower support points are identical 	Support points entered for the linearization table are not plausible.	Check support points
M528	Setup is not compatible with this firmware	An attempt was made to load a setup which is not compatible with this firmware (e.g. another device type)	Check whether the correct file has been selected.
M530	Cannot copy setup.	An error occurred when a setup was loaded from an SD card or USB stick	Replace the SD card or USB stick Setup file defective?
		An error occurred when a setup was saved to an SD card or USB stick	
F537	EtherNet/IP: IP address conflict identified	The IP address configured for EtherNet/IP is already being used by another device	Check the IP configuration and change it as necessary
F537	EtherNet/IP: IP configuration not accepted at all or in part	At least one setting for the IP address, subnet mask and/or gateway is incorrect and has not been accepted.	Check the IP configuration and change it as necessary
S901	Input signal too small	Input signal too small	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	Limit x	Limit x has been violated	Note: Error number only occurs if e-mails are sent
M906	End limit x	Limit 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 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 value readout	The instantaneous values were not read out for a set time	
M922	No cyclic transfer	The device was not read out via fieldbus for a configurable time	Check the communication of the fieldbus. Check PLC.
M923	Error printing!	Various problems while printing, e.g.: Printer spooler is full Printer needs paper! Printer is not ready! Replace toner/ink!	Check printer status at the printer.
M924	Error accessing SD card! Error accessing USB stick! SD card is not or wrong formatted! USB stick is not or wrong formatted!	Impossible to access the removable data medium. Causes include: Memory is larger than 32 GB Invalid format (only FAT or FAT32 are permitted)	Check/replace removable data medium
M925	SD card is write-protected!	SD card is write-protected!	Remove write protection

Diagnostic code	Message text	Description	Remedy
M927	Insufficient space free on data storage medium!	An attempt was made to save to the SD card or USB stick (setup, screenshot, etc.), but not enough free memory space is available.	Use other SD card/USB stick. Delete files that are no longer needed from the SD card/USB stick
M927	Insufficient space free on data storage medium!	An attempt was made to save to the WebDAV server but not enough free memory space is available.	Use other WebDAV server. Delete files that are no longer needed from the WebDAV server.
F929	File is damaged!	The file that should be loaded is damaged/ invalid (e.g. wrong checksum).	Create file again, use other storage medium.
		 Finis message can occur in connection with the following actions, for instance: Loading setup from SD card/USB stick Firmware update Load process screens 	
M940	E-mail could not be sent! (x)	E-mail could not be sent!	Check settings/network connection
		 Optional: Error code (x) from server: e.g.: 451: Requested action aborted: local processing error 554: Transaction failed. Possible reason: email was not sent as suspected of being SPAM 1: No free buffer 2: No receiver specified 	 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 incorrectThe connection is lost	Check settings/network connection
M942	SMTP: Fault occurred (x).	An error occurred when sending an e-mail. x= error code: 0: SMTP was switched off when the mail was being sent 3: TCP/IP connection was denied 4: TCP/IP connection error 5: SMTP server denied 6: Error during authentication 7: Connection unexpectedly lost 8: Server responded with error code 9: Timeout 10: Internal protocol error	Check settings/network connection
M944	SMTP: authentication failed!		Check settings/network connection
M945	SNTP: Time was not	Time could not be synchronized via SNTP.	Check settings Check settings
	synchronized!	Possible reasons: • SNTP server temporarily unavailable • Settings not correct	 Check whether the error occurs often. If it does, choose another time server.
M945	SNTP server 1 not responding. Try server 2.	Time could not be synchronized via SNTP. Possible reasons: • SNTP server temporarily unavailable • Settings not correct	 Check settings Check whether the error occurs often. If it does, choose another time server.
M946	Screenshot could not be saved (x)!	Screenshot could not be created. Possible causes (x): 0: Error when writing 1: Insufficient free space 2: Bitmap could not be created 3: SD card/USB stick not available or not yet ready	Check/replace the SD card or USB stick
M947	Modem could not be initialized! Check the cable and modem.	The connected modem could not be initialized by the device.	Check the cable and modem.

Diagnostic code	Message text	Description	Remedy
M950	Cannot load SSL certificate.	Cannot load SSL certificate. Cause: Invalid file format File is damaged	Use a certificate with a valid file formatImport certificate to device again
F951	SSL certificate '' has expired!	Certificates have an expiry date, i.e. they must be renewed from time to time.	Install a new certificate
M952	SSL certificate '' expires on!	The device warns the user shortly before the certificate expires.	Install a new certificate
M953	x certificates have already been installed. Delete certificates that are no longer required.	The device can manage a maximum of 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 an 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 locked!	Incorrect password. User account has been locked!	Contact the administrator to unfreeze the account.
M956	Incorrect password. Your user account has been locked for 10 minutes!	An incorrect password was entered and the account is locked temporarily.	Wait until the temporary block has been disabled or contact your administrator.
M957	Wet steam alarm	Warning for wet steam alarm	Check the application (pressure, temperature inputs)
M965	SMS could not be sent!	SMS could not be sent because:The entered connection data are incorrectThere is no connection to the service provider	Check connections and communication settings
M971	No channels assigned to batch x!	The batch functionality was switched on but no channels were assigned to the batch.	Check group settings
M980	No connection to the WebDAV server	A connection to the WebDAV server could not be established because the entered connection data are incorrect or the connection has been interrupted.	Check settings/network connection
M981	WebDAV: authentication failed!		Check settings
M982	WebDAV: directory or file could not be created!	Configured directory path not available.	Create a directory manually in the WebDAV server
M983	WebDAV: Fault	An unassigned error has occurred. The error is displayed in English.	
M984	No Ethernet connection.	The device is not connected by an Ethernet cable.	Establish cable connection.
M985	The test cannot be carried out because data are currently being copied by WebDAV.		Repeat later
M988	Server certificate cannot be loaded. Invalid format.	The file must be Base64-encoded. Format: X.509 certificate V3 incl. extension	Create the certificate again according to the specifications
M989	Private key cannot be loaded. Invalid size/format.	The file must be Base64-encoded. Only RSA keys with max. 2048 bits are supported.	Create the certificate again according to the specifications
M990	Server certificate cannot be installed.	General error. Unable to read or write to file.	Check the files on the USB stick and create again if necessary. If the error persists, contact the Service Department.

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 fieldbus systems: The status of the value is uncertain In the case of HART®: The current value is used instead of the digital value	
M970	Multi-master collision		 Check additional master in HART[®] network (e.g. handheld) Check master settings (secondary/primary)

HART[®] error messages

12.4 Pending, current diagnostic messages

The diagnostic message that is currently active, the last diagnostic message and the last device restart are displayed in the main menu under "Diagnostics -> Actual diagnostics", "Diagnostics -> Last diagnostics" 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 alarm set point infringement and power failure are displayed in the correct time sequence. 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

Invoke simulation: for the simulation of the relays, see the main menu under "Diagnostics -> Simulation". For the simulation of the measured values, see the main menu under "Expert -> Diagnostics -> Simulation".

Only the simulated values are recorded during simulation. The simulation is recorded in the event logbook.

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

12.10.1 Test barcode reader

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

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

Only visible if a barcode reader is connected.

12.10.2 E-mail test

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



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

12.10.3 Test WebDAV client

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

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

12.10.4 Test telealarm

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

Only possible for the "Telealarm" device option. -

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

12.10.5 Test time synchronization/SNTP

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

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

Note: The test can take some time.

12.10.6 Test universal output

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

12.10.7 Relay test

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

12.11 HART[®] diagnostics

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

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

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

For further information open the online help on the device.

12.12 **PROFINET** diagnostics (option)

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

12.13 Diagnostics EtherNet/IP (option)

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

12.14 Initializing the modem

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



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.

12.15 GSM terminal

Information on the reception quality.



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



12.16 Status telealarm

Information on the status of individual alarms.

- Only possible for the "Telealarm" device option.
 - For detailed descriptions of this device option, see the associated documentation.

12.17 Resetting the measuring 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.

12.18 Clear memory

The internal memory should be cleared after commissioning so that the analysis software does not contain any unnecessary data.

12.19 Reset analysis

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

12.20 Firmware history

Overview of unit software history:

Unit software Version / date	Software changes	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	BA014340/09/01 .15
V2.01.00 / 04.2016	Extended functionality/bug fixes	V01.03.01.00 and higher	V5.00.03.00 and higher	BA014340/09/02 .16
V2.01.05 / 11.2016	Extended functionality/bug fixes	V01.03.01.01 and higher	V5.00.03.00 and higher	BA014340/09/03 .16
V2.02.00 / 11.2017	Ethernet function via USB	V1.04.00 and higher	V5.00.04.00 and higher	BA014340/09/04 .17
V2.04.00 / 09.2018	DIN rail version, Web server extension	V1.04.02 and higher	V5.00.04.01 and higher	BA014340/09/05 .18
V2.04.05 / 08.2021	Support for HTTPS server; bugfixes	V1.04.02 and higher	V5.00.04.01 and higher	BA014340/09/06 .21

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.

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

There are two ways to update the firmware:

- In the main menu under "Operation -> SD card or USB stick -> Update firmware"
- In the Web server under "Data management -> Update firmware"

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.

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



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 $\rightarrow \boxdot$ 94. Once you place your order, you will receive instructions on how to activate the option and a code which must be entered under "Main menu -> Expert -> System -> Device options -> Activation code".

13.3 Cleaning

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

14 Repair

14.1 General notes

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

Always quote the serial number of the device when ordering spare parts! Installation instructions are included with the spare part.

14.2 Spare parts

Contact the supplier where necessary.



🖻 17 Picture of spare parts, panel version

List of spare parts for panel version:

Item No.	Description
1	Power unit 24 V AC/DC for slot 6
1	Power unit 100-230 V AC (+/-10%) for slot 6
2	Housing seal
3	Digital card 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 (incl. imprint)
4	Rear panel analog + digital (incl. imprint)
5	Terminal cover can be sealed for panel-mounted housing
6	Analog card (4 channels) for slots 1-5
6	HART® card (4 channels) for slots 1-5
7	Housing fastening unit, short (1 pc)



🖻 18 Picture of spare parts, DIN rail version

List of spare parts, DIN rail version:

Item No.	Description
1	Power unit 24 V AC/DC incl. relay for slot 6
1	Power unit 100-230 V AC (+/-10%) incl. relay for slot 6
2	Connection board, reverse side (DIN rail)
3	CPU card + software with interfaces for slot 0 (2-piece)
4	Digital card extension (8x digital input + 6x relay + 2x analog output) for slot 5
5	Analog card (4 channels) for slots 1-5
5	HART® card (4 channels) for slots 1-5
6	Terminal cover can be sealed for DIN rail version

General spare parts list:

Item No.	Description
	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
	"Industrial Grade" SD card, industry standard, 1 GB
	Terminals:
	Plug-in terminal, 3-pin for mains connection "N L PE" RM5.08 – orange color at slot 6
	3-pin terminal for power supply at slot 6
	Plug-in terminal, 3-pin FKC2.5/3-ST-5.08 for relay 1 (changeover) at slot 6
	Plug-in terminal, 4-pin FMC1.5/4-ST-3.5 for digital card extension slot 5 (analog outputs)
	Plug-in terminal, 10-pin FMC1.5/10-ST-3.5 for digital card extension slot 5 (digital inputs)
	Plug-in terminal, 4-pin FKC2.5/4-ST-5.08 for relay 2+3 on slot 6 or relay 7+8 / 9+10 / 11+12 on slot 5
	Plug-in terminal, 6-pin FKC2.5/6-ST-5.08 for relay 4+5+6 at slot 6

Item No.	Description		
Plug-in terminal, 9-pin FMC1.5/9-ST-3.5 for digital inputs at slot 6			
Plug-in terminal, 6-pin FMC1.5/6-ST-3.5 for analog input at slot 1-5			

Product structure for option retrofit

Item No.	Description
	Option retrofit (please enter the serial number)
	DIN rail version: If one of the two CPU cards is replaced/removed, data may be lost and the time must be reset!
	Software: Without software application Mathematics Tele-alarm + mathematics Batch + mathematics Wastewater + RSB + 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 the option, instructions are delivered with a code that must be entered.

14.3 Return

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

- 1. Ask your supplier for information on returning the device.
- 2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

14.4 Disposal

14.4.1 IT security

Observe the following instructions before disposal:

- 1. Clear data
- 2. Reset the device
- 3. Delete/change passwords
- 4. Delete user

5. Carry out alternative or complementary measures to destroy the storage medium

14.4.2 Removing the measuring device

1. Switch off the device

2. Carry out the mounting and connection steps from the "Mounting the measuring device" and "Connecting the measuring device" sections in reverse order. Observe the safety instructions.

14.4.3 Disposing of the measuring device

X

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

15 Accessories

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

F 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 can be sealed (for panel-mounted device)

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



Description

Terminal cover can be sealed (for DIN rail version)

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



Description

Accessories for RXU10 data manager

Identifier:

Cable set RS232 for connection to PC or modem USB - RS232 converter Cable USB-A - USB-B, 1.8 m (5.9 ft)



16 Technical data

16.1 Function and system design

Measuring principle	Electronic acquisition, display, recording, analysis, remote transmission and archiving of analog and digital input signals as well as calculated values.				
	Panel version: Device with display and operating keys for installation in a panel or control cabinet door. There is also the option of operating it in a desktop housing or field housing.				
	Panel version with stainless steel front: Device with touch screen (no operating keys) for installation in a panel or a cabinet door. There is also the option of operating it in a desktop housing or field housing.				
	DIN rail version: Device without a display or operating keys for mounting on a DIN rail.				
Measuring system	Multichannel data recording system with multicolor TFT display (order option, 178 mm (7 in) screen size), internal memory, external memory (SD card and USB stick), galvanically isolated universal inputs (U, I, TC, RTD, pulse, frequency), HART® inputs, digital inputs, transmitter power supply, limit relays, digital and analog outputs, communication interfaces (USB, Ethernet, RS232/485), optionally available with Modbus, Profibus DP or PROFINET I/O or EtherNet/IP.				
	An Essential Version of the 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 via WebDAV. 				
Application packages / software options	In the standard version, the Advanced Data Manager has a variety of functions, including an end-to-end safety concept to meet the requirements of FDA 21 CFR Part 11. The following application packages are available to help users meet the requirements of their applications and save time:				
	 Mathematics Telealarm Batch management Wastewater + RSB (rain spillway basin) Energy calculation 				
	The application packages contain the standard functions and the specific package functions. The individual packages can be largely combined as the user requires. The application packages can also be activated retroactively by entering the activation code.				

Standard functions

- Signal analysis: external, 1 min to 12 h, day, week, month, year
- Web server
- User administration compliant with FDA 21 CFR Part 11
- Event 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 analysis software. At the end of the batch, batch information is automatically printed out directly at the device (USB or network printer) or is printed out via a PC with the 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.

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

Functions:

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

Energy package (water + steam)

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

By balancing the results against one another or by linking the results to other input variables (e.g. gas flow, 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.



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

TrustSens Calibration Monitoring

Available in conjunction with iTHERM TrustSens TM371 / TM372.

Dependability

Application package :

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

Reliability

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

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

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

Mathematics 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 process variables

The values of the universal and ${\rm HART}^{\circledast}$ 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

Measured variable	Measuring range	Maximum measured error of measuring range (oMR), temperature drift	Input resistance
Resistance thermometer (RTD)	Pt100: -200 to 850 °C (-328 to 1562 °F) (IEC 60751:2008, α =0.00385) Pt100: -200 to 510 °C (-328 to 950 °F) (JIS C 1604:1984, α =0.003916) Pt100: -200 to 850 °C (-328 to 1562 °F) (GOST 6651-94, α =0.00391) Pt500: -200 to 850 °C (-328 to 1562 °F) (IEC 60751:2008, α =0.00385) Pt500: -200 to 510 °C (-328 to 950 °F) (JIS C 1604:1984, α =0.003916) Pt1000: -200 to 600 °C (-328 to 1112 °F) (IEC 60751:2008, α =0.00385) Pt1000: -200 to 510 °C (-328 to 950 °F) (JIS C 1604:1984, α =0.003916)	4-wire: ±0.1% oMR 3-wire: ±(0.1% oMR + 0.8 K) 2-wire: ±(0.1% oMR + 1.5 K) Temperature drift: ±0.01%/K oMR	
	Cu50: -50 to 200 °C (-58 to 392 °F) (GOST 6651-94, α =4260) Cu50: -200 to 200 °C (-328 to 392 °F) (GOST 6651-94, α =4280) Pt50: -200 to 1100 °C (-328 to 2012 °F) (GOST 6651-94, α =0.00391) Cu100: -200 to 200 °C (-328 to 392 °F) (GOST 6651-94, α =4280)	4-wire: ±0.2% oMR 3-wire: ±(0.2% oMR + 0.8 K) 2-wire: ±(0.2% oMR + 1.5 K) Temperature drift: ±0.02%/K oMR	
	Pt46: -200 to 1100 °C (-328 to 2012 °F) (GOST 6651-94, α=0.00391) Cu53: -200 to 200 °C (-328 to 392 °F) (GOST 6651-94, α=4280)	4-wire: ±0.3% oMR 3-wire: ±(0.3% oMR + 0.8 K) 2-wire: ±(0.3% oMR + 1.5 K) Temperature drift: ±0.02%/K oMR	
Thermocoupl es (TC)	Type J (Fe-CuNi): -210 to 1200 °C (-346 to 2192 °F) (IEC 60584:2013) Type K (NiCr-Ni): -270 to 1300 °C (-454 to 2372 °F) (IEC 60584:2013) Type L (NiCr-CuNi): -200 to 800 °C (-328 to 1472 °F) (GOST R8.585:2001) Type L (Fe-CuNi): -200 to 900 °C (-328 to 1652 °F) (DIN 43710-1985) Type N (NiCrSi-NiSi): -270 to 1300 °C (-454 to 2372 °F) (IEC 60584:2013) Type T (Cu-CuNi): -270 to 400 °C (-454 to 752 °F) (IEC 60584:2013)	±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -130 °C (-202 °F) ±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -100 °C (-148 °F) ±0.1% oMR from -200 °C (-328 °F) Temperature drift: ±0.01%/K oMR	≥1 MΩ
	Type A (W5Re-W20Re): 0 to 2500 °C (32 to 4532 °F) (ASTME 988-96) Type B (Pt30Rh-Pt6Rh): 42 to 1820 °C (107.6 to 3308 °F) (IEC 60584:2013) Type C (W5Re-W26Re): 0 to 2315 °C (32 to 4199 °F) (ASTME 988-96) Type D (W3Re-W25Re): 0 to 2315 °C (32 to 4199 °F) (ASTME 988-96) Type R (Pt13Rh-Pt): -50 to 1768 °C (-58 to 3214 °F) (IEC 60584:2013) Type S (Pt10Rh-Pt): -50 to 1768 °C (-58 to 3214 °F) (IEC 60584:2013)	±0.15% oMR from 500 °C (932 °F) ±0.15% oMR from 600 °C (1112 °F) ±0.15% oMR from 500 °C (932 °F) ±0.15% oMR from 500 °C (932 °F) ±0.15% oMR from 100 °C (212 °F) ±0.15% oMR from 100 °C (212 °F) Temperature drift: ±0.01%/K oMR	≥1 MΩ
Pulse input (I) ¹⁾	Min. pulse length 40 μ s, 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	$\pm 0.02\%$ @ f <100 Hz of reading $\pm 0.01\%$ @ 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 $k\Omega$ 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	±0.1% oMR	Load: 10 Ω
	Overrange: up to 22 mA	Temperature drift: ±0.01%/K oMR	±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: \leq 3.8 mA: underrange \geq 20.5 mA: overrange \leq 3.6 mA or \geq 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: $<0.001\%/\Omega$ 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 thermometers: 1 s per channel

Data storage / save 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



Typical logging duration

Prerequisites for following tables:

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

Frequent entries in the event log reduce the memory availability!

256 MB internal memory:

Analog	Channels in groups	Storage cycle (weeks, days, hours)				
inputs		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
20	4/4/4/4/4/0/0/0/0/0	1738, 6, 4	350, 1, 3	175, 1, 14	58, 3, 2	5, 5, 22
40	4/4/4/4/4/4/4/4/4/4	869, 5, 0	175, 0, 15	87, 4, 7	29, 1, 13	2, 6, 11

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

Converter resolution

24 bit

Totalization

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

Analysis

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

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

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

Selectable functions

- Functions of the digital input: control input, ON/OFF event, pulse counter (15-digit, 64 bit), operational time, event+operation 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: $\leq 0.1\%$ of end of range value Temperature drift: $\leq 0.015\%/K$ 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

>105

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	Ethern et	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}	Galvanicall y 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 specificationCable specification, spring terminalsAll 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 mm² (14 AWG) (spring terminals)
- Wire cross-section, mains: max. 2.5 mm² (13 AWG) (screw terminals)
- Wire cross-section, relays: max. 2.5 mm² (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.

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**

	A0024605							
	21 Connections: back of device, panel version (left), DIN rail version (right)							
	6 Slot 6: Power supply with relays							
	5 Slot 5: Multifunction card or HART [®] card (channels 17-20) or digital card 4 Slot 4: Multifunction card or HART [®] card (channels 13-16)							
	3 Slot 3: Multifunction card or HART® card (channels 9-12)							
	2 Slot 2: Multifunction card or HART® card (channels 5-8)							
	1 Slot 1: Multifunction cara of HAR1® cara (channels 1-4) 0 Slot 0: CPU card with interfaces							
Supply voltage	• Extra-low voltage nower supply unit $\pm 2/4$ V AC/DC ($\pm 10\%$ ($\pm 15\%$) 50/60Hz							
Supply voltage	• Low voltage power supply unit 100 to 230 V AC (+10%) $50/60$ Hz							
	\square Overcurrent protection (rated current < 10 Å) must be installed for the power cable							
	1 overearient protection (rated current 3 10 r) must be instance for the power cubic.							
Power consumption	■ 100 to 230 V: max. 47 VA							
-	• 24 V: max. 30 VA							
	The power actually consumed depends on the individual operating state and the device							
	version (LPS, USB, brightness of screen, number of channels, etc). The active power here is							
	approx. 3 W to 25 W.							
Power supply failure	Battery-backed time and data memory. The device starts automatically following a power							
	failure.							
Electrical connection	Details about the electrical connection: $\rightarrow \bigoplus 17$							
Electrical connection, terminal assignment	All connection examples are illustrated using the panel version. The connections on the DIN rail version are identical.							
Circuit diagram



 \blacksquare 22 For connection examples of the HART[®] inputs (optional), see the Operating Instructions \rightarrow \blacksquare 25

Supply voltage (power unit, slot 6)

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

Relay (power unit, slot 6)

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

1) NC = normally closed (breaker)

2) NO = normally open (maker)

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

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

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

Туре	Terminal		
		24V Out 18 18 19 1 +	A0019103
Auxiliary		24V Out -	24V Out +
voltage output, not stabilized, max. 250 mA		- 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:

Туре	Terminal U U U U U U U U					
	x1	x2	x3	x4	x5	A0019303
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				(+)		(-)

If a universal input is used as a frequency or pulse input, a series resistor must be used in series connection 1) with the voltage source. Example: $1.2 \text{ k}\Omega$ 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:

Туре	Terminal					
	x1 x2 Chx x2	x x x x x x x x x x x x x x x x x x x	x3 ¹ → 1 → 1 → 1 → 1 → 1 → 1 → 1 → 1 → 1 →			
			1	1		A0024002
	x1	x2	х3	x4	x5	хб
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)

Туре	Terminal (max. 250	Ferminal (max. 250 V, 3 A)		
	x z z z z z z z z z z z z z z z z z z z			
		1		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)

Туре	Terminal			
	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			A0024736
Analog	015	016	025	026
output 1-2	Analog output 1 (+)	Ground, analog output 1 (-)	Analog output 2 (+)	Ground, analog output 2 (-)

Extension of digital inputs (digital card, slot 5)

	Туре	Terminal				
		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Main Main <td< th=""><th>2000 2000 2000 2000 2000 2000 2000 200</th></td<>	2000 2000 2000 2000 2000 2000 2000 200		
	Digital input 7 to	D71 to DE1	GND2	GND2		
	14	Digital input 7 to 14 (+)	Ground (-) for digital inputs 7 to 14	Ground (-) for digital inputs 7 to 14		
	If the auxiliary voltage is to be used for the digital inputs, the 24 V out - terminal of the auxiliary voltage output (power unit, slot 6) must be connected with the GND2 terminal.					
Device plug	 Panel-mounted device/DIN rail version: connected to mains via plug-in screw terminals with reverse polarity protection Desktop version (option): connected to mains via IEC connector 					
Overvoltage protection	To avoid high-energy transients on long signal cables, connect a suitable surge arrester upstream (e.g. E+H HAW562) in series upstream.					
Connection data interface,	USB interfaces:					
communication	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.

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

Reference list for USB barcode readers:

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

Ethernet interface (standard):

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

The following functions are implemented:

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

Requirements with regard to a network printer:

Network printer reference list:

HP Color LaserJet CP1515n, HP Color LaserJet Pro CP1525n, ECOSYS P6021cdn.

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

Ethernet Modbus TCP master (option):

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

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

Ethernet Modbus TCP slave (option):

Connection to SCADA systems (Modbus master).

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

Serial RS232/RS485 interface:

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

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

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

Modbus RTU master (option):

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

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

Modbus RTU slave (option):

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

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

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

Remote interrogation with analog or GSM/GPRS wireless modem:

Analog modem:

An analog modem for industrial use (e.g. Devolo or WESTERMO), which is connected to the RS232 interface with a special modem cable (see accessories $\rightarrow \textcircled{B}$ 94), is recommended.

GSM/GPRS wireless modem:

A GSM/GPRS wireless modem for industrial use (e.g. Cinterion, INSYS or WESTERMO, incl. antenna and power unit), which is connected to the RS232 interface with a special modem cable (see accessories $\rightarrow \implies$ 94), is recommended.

Important: the wireless modem needs a SIM card and data transfer subscription. In addition, it must be possible to deactivate the PIN prompt.

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

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

PROFIBUS-DP slave:

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

Baud rate: maximum 12 Mbit/s

EtherNet/IP adapter (slave):

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

PROFINET I/O device:

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

Response time Time [ms] Input Output Current, voltage, pulse Relays, OC, analog output ≤ 550 RTD Relays, OC, analog output ≤ 1150 TC 1) Relays, OC, analog output ≤ 1550 Cable open circuit detection, current input Relays, OC, analog output ≤ 1150 Sensor error RTD, TC Relays, OC, analog output ≤ 5000 Digital input Relays, OC, analog output ≤ 350 HART® input Relays, OC, analog output Non-deterministic 1) If internal measuring point temperature compensation is used, otherwise values as for voltage Reference operating 25 °C (77 °F) ±5 K **Reference temperature** conditions 120 min. Warm-up period Humidity 20 to 60 % rel. humidity Can be configured for limit values in the setup Hysteresis Long-term drift As per IEC 61298-2: max. ±0.1%/year (of measuring range) 16.6 Mounting

16.5 Performance characteristics

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

 Incation and installation dimensions
 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).



■ 23 Panel mounting and dimensions in mm (in).

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

Dimensions

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

Mounting location and installation dimensions for the DIN rail version



The device without a display is designed for DIN rail mounting. The DIN rail device is **not** approved for operation in the hazardous area.



🖸 24 DIN rail version, dimensions in mm (in).



25 Terminal cover, DIN rail version, dimensions in mm (in)

Dimensions

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

Field housing assembly and design (optional)	As an option, the panel-mounted device can be ordered ready-mounted in a field housing with IP65.
	Dimensions (B x H x D) approx.: 320 mm (12.6 in) x 320 mm (12.6 in) x 254 mm (10 in)
Desktop housing assembly and design (optional)	As an option, the panel-mounted device can be ordered ready-mounted in a desktop housing.
	Dimensions (B x H x D) approx.: 293 mm (11.5 in) x 188 mm (7.4 in) x 213 mm (8.39 in) (dimensions with bracket, feet and installed device)

16.7 Environment

Ambient temperature range	–10 to +50 °C (14 to 122 °F)		
Storage temperature	-20 to +60 °C (-4 to +140 °F)		
Humidity	5 to 85 %, non-condensing		
Climate class	To IEC 60654-1: Class B2		
Electrical safety	Class I equipment, overvoltage category II Pollution level 2		
Operating altitude	< 2 000 m (6 561 ft) above MSL		
Degree of protection	Front of panel-mounted device	IP65 / NEMA 4 (UL50 type 4)	
	Back of panel-mounted device (terminal side)	IP20	
	DIN rail version	IP20 (overall device)	
Electromagnetic compatibility	 EMC in accordance with all relevant requirements of the IEC/EN 61326 series and NAMUR NE21. For details, refer to the Declaration of Conformity. Interference immunity: as per IEC/EN 61326 series (industrial environment) / NAMUF NE21 Maximum measured error <1% of measuring range Interference emissions: as per IEC 61326-1 Class A 16.8 Mechanical construction 		

Design,	dimensions
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Information about design and dimensions $\rightarrow \square 116$

Weight

- Panel-mounted device with navigator and front interfaces (with maximum configuration): approx. 2.7 kg (5.9 lbs)
- Panel-mounted device with stainless steel front and touchscreen (with maximum configuration): approx. 3.2 kg (7 lbs)
- DIN rail version: approx. 1.8 kg (3.97 lbs)
- Desktop housing (excluding device): approx. 2.3 kg (5 lbs)
- Field housing (excluding device): approx. 4 kg (8.8 lbs)

Materials

Panel-mounted device with navigator and front interfaces	
Front frame	Zinc die cast GD-Z410, powder-coated
Display glass	Transparent Makrolon® plastic (FR clear 099) UL94-V2
Flap; jog/shuttle dial ("Navigator")	Plastic ABS UL94-V2
Membrane keypad	Polyester membrane PC-ABS UL94-V2
Intermediate frame (front towards control panel)	Plastic PA6-GF20 UL94-V2
Seal towards panel wall; seal in flap; seal towards navigator	Rubber EPDM 70 Shore A
Casing; rear panel	Galvanized sheet steel St 12 ZE

Panel-mounted device with stainless steel front and touchscreen	
Front frame	AISI 316L
Display glass	6 mm single-pane safety glass (soda-lime glass)
Intermediate frame (front towards control panel)	Plastic PA6-GF20 UL94-V2
Seal towards control panel wall	Rubber EPDM 70 Shore A
Window seal between front frame and glass	Rubber EPDM 60 Shore A
Casing; rear panel	Galvanized sheet steel St 12 ZE

DIN rail version	
Retaining bracket	EN AW 6060 T66 / AlMgSi0.5 F22
Casing; front	Galvanized sheet steel St 12 ZE

Designation	Short 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 description for local operation does not apply for the DIN rail version, as this has neither a display screen nor operating elements. The description for remote configuration applies for all versions.
	The device can be operated directly 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) Display of historical measured data in numerical format or as a curve Display of events and logbook entries Loading/saving of device configuration Device firmware update Printout of device configuration
	Integrated operating instructions The device's simple operating concept 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 on panel-mounted device
	Туре
	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 $^\circ$ 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. These groups can be given a name e.g. "Temp. boiler 1" or "Daily averages" so that they can be uniquely identified. Scales linear or logarithmic Measured value history: quick retrieval of historic data with zoom function Pre-formatted display formats, such as horizontal or vertical curves, instrument display, circular chart, process screen, bargraph or digital display.

Measured value display and operating elements

Measured value display and operating elements on panel-mounted device



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

Item No.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)
a	Slot for SD card
b	USB B socket "Function" e.g. to connect to PC or laptop
с	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 to the left, changes the parameter. Turning clockwise moves the bar or cursor down or to the right, changes the parameter. Press = select highlighted function, start parameter change (ENTER key).
2	 Functions of LED indicators (according to NAMUR NE44:) Green LED (top) lit: power supply OK Red LED (bottom) flashing: maintenance required, caused by external factor (e.g. cable open circuit etc.) or a message/notification requiring acknowledgment is pending, calibration is running.
3	Variable "soft keys" 1-4 (from left to right)
4	Function indicator of "soft keys"
5	In display mode: current group name, type of analysis; In setup mode: name of the current operating item (dialog title)
6	In display mode: displays current date/time In setup mode:

Item No.	Operating function (display mode = display of measured values) (Setup mode = operation in the Setup menu)
7	In display mode: user ID (if function is active) In setup mode:
8	In display mode: alternating display indicating the percentage space on the SD card or USB stick that has already been used. Status symbols are also displayed in alternation with the memory information (e.g. simulation mode, data storage active, operation lock, 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. 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.

Operating elements of the DIN rail version



☑ 27 Device front of the DIN rail version

Item No.	Operating function		
1	DIP switches The behavior of the Ethernet interface is configured via DIP switches (left = OFF, right = ON). For a detailed description of the DIP switch functions $\rightarrow \textcircled{B} 48$ Function of the DIP switches (1 = top, 12 = bottom):	OFF ON 1 1 2 3 2 1 2 2 3 8 1 2 2 4 8 1 2 2 4 1 2 2 6 6 6 6 4 1 2 8 1 2 7 8	
	 DIP switches 1-8: configuration of IP address in last octet (e.g. 192.168.1.212) DIP switch 9: OFF = setup change not locked ON = setup locked DIP switch 10: OFF = default / OFF ON = service addressing DIP switch 11 for the configuration of the USB-B interface: 	9 USB-8 10 USB-8	A0036815
	 OFF = USB standard ON = Ethernet via USB (Web server) DIP switch 12: not assigned The DIN rail version is supplied with the following Ethernet settings: IP address: 192.168.1.212; subnet mask: 255.255.255.0; gateway: 0.0.0.0 		
2	Ethernet interface		

Item No.	Operating function
3	USB B socket "Function" e.g. to connect to PC or laptop
4	 Functions of LED indicators (according to NAMUR NE44:) Green LED (top) lit: power supply OK Red LED (bottom) flashing: maintenance required, caused by external factor (e.g. cable open circuit etc.) or a message/notification requiring acknowledgment is pending, calibration is running.
5	Cyclic storage is completed via the "Remove SD card safely" button, the LED (d) goes out. The SD card can now be removed.
	If the SD card is not removed within 5 minutes, the write cycles start again.
6	USB A socket "Host" e.g. for USB memory stick or printer If a USB stick is inserted, data that have not yet been saved are copied to the stick automatically. The red LED on the USB socket flashes while the data are being copied to the stick.
	Do not remove the USB stick when the red LED is flashing! Risk of data loss!
	If an error occurs (e.g. USB stick full or defective), the red LED is lit constantly. Remove the USB stick and replace it.
7	LED at SD slot. Yellow LED lit or flashing when the device 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!
8	Slot for SD card
9	Anybus® interface (option)
10	Serial RS232/RS485 interface

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, or Ethernet via USB
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

For certificates and approvals valid for the device: see the data on the nameplate

CE mark	The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product 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: Degrees of protection provided by enclosures (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) Panel-mounted device: 2 screw fastening clips Version with navigator and front interfaces or DIN rail version: USB cable Panel-mounted device: sealing rubber towards the panel wall "Industrial Grade" SD card, industry standard: Panel-mounted device with navigator and front interfaces: card is located in the SD slot behind the flap on the front of the device (optional). Panel-mounted device with stainless steel front and touchscreen: card is located in the device and cannot be replaced or retrofitted. DIN rail version: card is located in the SD slot (optional). Analysis software on DVD (Essential, Demo or Professional version, depending on order) Delivery note Multilanguage Brief Operating Instructions, hard copy Ex Safety Instructions, hard copy (optional) Multilanguage Operating Instructions on CD-ROM 		
	 16.12 Supplementary documentation Standard documentation Operating Instructions for Advanced Data Manager ORSG45: BA014340 Brief Operating Instructions for Advanced Data Manager ORSG45: KA011880 		
	 Supplementary device-dependent documentation Operating Instructions for Advanced Data Manager ORSG45 with telealarm: BA014720 Operating Instructions for Advanced Data Manager ORSG45 with Modbus RTU / TCP slave: BA014730 Operating Instructions for Advanced Data Manager ORSG45 with Modbus RTU / TCP 		

- Operating Instructions for Advanced Data Manager ORSG45 with wastewater + RSB (rain spillway basin) option: BA017700
- Operating Instructions for Advanced Data Manager ORSG45 with batch software: BA016310
- Operating Instructions for Advanced Data Manager ORSG45 with energy option: BA016440
- Operating Instructions for Advanced Data Manager ORSG45 with EtherNet/IP® adapter: BA016070
- Operating Instructions for Advanced Data Manager ORSG45 with PROFIBUS[®] DP slave: BA016430
- Operating Instructions for Advanced Data Manager ORSG45 with PROFINET: BA016060
- Ex-related additional documentation:
 - ATEX II2G Ex px IIC T4 Gb, ATEX II2D Ex pD IIIC T135°C Db: XA013700

17 Appendix

17.1 Operating items in the "Expert" menu

The parameter groups for the Expert setup contain all the parameters of the operating menus: System, Input and Output Setup, Communication, Application, Diagnostics as well as other parameters that are reserved for experts only.

For most settings, the "Setup" or "Expert" menu must be quit before the settings are adopted. However settings such as the date/time are accepted immediately.

Direct access	
Navigation	$ Expert \rightarrow 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 \rightarrow System \rightarrow Language Direct access code: 010000-000
Description	Select the operating language of the device.
Selection	German, English, Spanish, French, Italian, Dutch, Polish, Portuguese, Russian, Swedish, Czech, Japanese, Chinese (Simplified), Chinese (Traditional)
Factory setting	English; or preset to customer's preferred language
Device tag	
Navigation	Expert \rightarrow System \rightarrow Device tag Direct access code: 000031-000
Description	Individual device tag
User entry	Text entry (max. 32 characters)
Factory setting	Unit 1

Appen	dix
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Temp. unit		
Navigation	Expert \rightarrow System \rightarrow 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.	
Selection	°C, °F, K	
Factory setting	°C	
Decimal separator		
Navigation	Expert \rightarrow System \rightarrow Decimal separator Direct access code: 100003-000	
Description	Select in which form the decimal separator character is to be displayed.	
Selection	Comma, point	
Factory setting	Comma	
Fault switching		
Navigation	Expert \rightarrow System \rightarrow 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.	
Selection	Not used, Relay x All the available relays are displayed.	
Factory setting	Relay 1	
Keyboard layout This function is no	ot supported by the DIN rail version .	

Navigation

Expert \rightarrow System \rightarrow Keyboard layout Direct access code: 100020/000

Description	Please select the keyboard layout. Only relevant if external keyboard is used.
Selection	Germany, Switzerland, France, USA, USA International, UK, Italy
Factory setting	Germany

Swap mouse buttons

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

Navigation		Expert \rightarrow System \rightarrow Swap mouse buttons Direct access code: 100050/000
Description	Swap	function of left and right mouse button.
Selection	No, Y	es
Factory setting	No	

Paper size	
Navigation	Expert \rightarrow System \rightarrow Paper size Direct access code: 540004/000
Description	Please select the paper size of your printer.
Selection	DIN A4, US Letter
Factory setting	DIN A4

Lock operation

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

Navigation		Expert \rightarrow System \rightarrow Lock operation Direct access code: 100060/000
Description	Local inadve the na device	operation is locked in cases of inactivity once the set time has elapsed to prevent ertent operation (e.g. when cleaning the device). The device is unlocked by pressing avigator or the OK operating key for 3 s. When using an external keyboard, the e is unlocked with the key combination "Ctrl-Alt-Del".
Selection	Never	, After 2 (5, 10, 15) minutes
Factory setting	After	5 minutes

LED mode	
Navigation	Expert \rightarrow System \rightarrow 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.
Selection	NAMUR NE 44, NAMUR NE 44+
Factory setting	NAMUR NE 44
PRESET	
Navigation	Expert \rightarrow System \rightarrow 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.
Selection	No, Factory reset, Customer setting
Clear memory	
Navigation	Expert \rightarrow System \rightarrow 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.
Selection	No, Yes
Confirm deletion	
Navigation	Expert \rightarrow System \rightarrow Confirm deletion Direct access code: 059001-000
Description	Please confirm that you want to clear the memory.

Selection	No, Yes
Factory setting	No
"Date/time setup" (subme	nu)
Navigation	Expert \rightarrow System \rightarrow Date/time setup
Description	Contains settings for date/time.
Date format	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow Date format Direct access code: 110000-000
Description	Select in which format the date is to be set and displayed.
Selection	DD.MM.YYYY, MM/DD/YYYY, YYYY-MM-DD
Factory setting	DD.MM.YYYY
Time format	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow Time format Direct access code: 110001-000
Description	Select in which format the time is to be set and displayed.
Selection	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 \rightarrow System \rightarrow Date/time setup \rightarrow Date/time \rightarrow 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 \rightarrow System \rightarrow Date/time setup \rightarrow Date/time \rightarrow Current date/time Direct access code: 120003-000	
Description	Displays the current date and the current time.	
"Change date/time" s	ubmenu	
Description	Contains parameters for changing the date/time.	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow Change date/time	
UTC time zone		
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow Date/time \rightarrow Change date/time \rightarrow UTC time zone Direct access code: 120010-000	
Description	Set your UTC time zone (UTC = universal time coordinated).	
Selection	-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 \rightarrow System \rightarrow Date/time setup \rightarrow Date/time \rightarrow Change date/time \rightarrow 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 \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover
Description	Contains settings for normal time/summer time changeover.
NT/ST changeover	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow NT/ST changeover Direct access code: 110002-000
Description	Function for summer/normal time changeover. Automatic: Changes to the local regional regulations; Manual: Changeover times can be set in the following addresses; Off: No changeover times required.
Selection	Off, Manual, Automatic
Factory setting	Automatic
NT/ST region	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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.
Selection	Europe, USA
Factory setting	Europe
Begin summer time	
Occurrence	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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.
Selection	1., 2., 3., 4., Last
Factory setting	Last

Day	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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.
Selection	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
Factory setting	Sunday
Month	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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.
Selection	January, February, March, April, May, June, July, August, September, October, November, December
Factory setting	March
Date	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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 \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow Time Direct access code: 110009-000

Description	Time at which the changeover from normal time to summer time is forwarded by one hour (format: hh:mm). Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.
User entry	Time in set time format
Factory setting	02:00

End summer time

Occurrence	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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.
Selection	1., 2., 3., 4., Last
Factory setting	Last
Day	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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.
Selection	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
Factory setting	Sunday
Month	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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.
Selection	January, February, March, April, May, June, July, August, September, October, November, December
Factory setting	October
Date	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow 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 \rightarrow System \rightarrow Date/time setup \rightarrow NT/ST changeover \rightarrow Time Direct access code: 110015-000
Description	Time at which the changeover from summer time to normal time is turned back by one hour (in the set time format). Visible for NT/ST changeover = Automatic or Manual. Only editable if NT/ST changeover = Manual.
User entry	Time in set time format
Factory setting	02:00
"SNTP" submenu	
Navigation	$ Expert \rightarrow System \rightarrow Date/time setup \rightarrow SNTP $
Description	Contains settings for time synchronization using the Simple Network Time Protocol (SNTP).
SNTP	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow 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.
Selection	No, Yes
Factory setting	No
SNTP server 1	
Navigation	Expert \rightarrow System \rightarrow Date/time setup \rightarrow SNTP server \rightarrow 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 \rightarrow System \rightarrow Date/time setup \rightarrow SNTP server \rightarrow SNTP server 2 Direct access code: 110025-000
Description	 Shows the IP address of the time server if it was automatically allocated via DHCP. Non-editable display text. An attempt is always made to synchronize the time via SNTP server 1 first (provided it is configured) DHCP must be switched on (see Communication/Ethernet). DHCP server: Option 42
"Security" submenu	
Navigation	$ Expert \rightarrow System \rightarrow Security $
Description	Contains settings that protect the device against unauthorized operation and configuration.
Protected by	
Navigation	Expert \rightarrow System \rightarrow Security \rightarrow Protected by Direct access code: 100006-000

Description	Configure how the device should be protected.
Selection	Open access, access code, FDA 21 CFR Part 11, user roles
Factory setting	Open access
Access code	
Navigation	Expert \rightarrow System \rightarrow Security \rightarrow 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 \rightarrow System \rightarrow Security \rightarrow 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 activation code has been defined. Factory default: "O" means that alarm set points can only be changed by entering the access code.
User entry	4-digit number
Factory setting	0
Lock hardware	
Navigation	Expert \rightarrow System \rightarrow Security \rightarrow Lock hardware Direct access code: 100099-000

Description	Device functions/interfaces that are not used can be switched off for security reasons.
	Fieldbus systems may also be affected in the case of Ethernet or the serial interface. Please follow the operating instructions.
Selection	 Panel version: Ethernet (all ports/services), USB A socket front, USB A socket back, USB B socket front, serial interface, SD card DIN rail version: Ethernet (all ports/services), USB A socket, USB B socket, serial interface, SD card
Factory setting	No lock
"Authentication" submenu	
Navigation	$ Expert \rightarrow System \rightarrow Security \rightarrow Authentication $
Description	Define the passwords for the various user roles to allow device access. Only visible if "Protected by" = "User roles"
Operator ID: operator Password	
Navigation	Expert \rightarrow System \rightarrow Security \rightarrow Authentication \rightarrow Password Direct access code: 470105/000
Description	Enter a password for this user account.
Selection	Text entry max. 12 characters
Factory setting	operator
Administrator ID: admin Password	
Navigation	Expert \rightarrow System \rightarrow Security \rightarrow Authentication \rightarrow Password Direct access code: 470102/000
Description	Enter a password for this user account.
Selection	Text entry max. 12 characters
Factory setting	admin

Service ID: service Password	
Navigation	Expert \rightarrow System \rightarrow Security \rightarrow Authentication \rightarrow Password Direct access code: 470101/000
Description	Enter a password for this user account.
Selection	Text entry max. 12 characters
Factory setting	service
"External memory" su	omenu
Navigation	$\Box \text{Expert} \rightarrow \text{System} \rightarrow \text{External memory}$
Description	Settings for the external data carrier, amongst other things which data is to be stored in which format on the external data carrier.
Save as	
Navigation	Expert \rightarrow System \rightarrow External memory \rightarrow Save as Direct access code: 140000-000
Description	"Protected format": All data is stored in a manipulation protected encrypted format. This data can only be visualized by the PC analysis software supplied. "Open format": Data is stored in a CSV format, this can be opened by a number of different programs (for e.g. MS Excel) (Attention: no manipulation security).
Selection	Protected format, Open format (*.csv)
	Note: For the device version with stainless steel front and touch operation, only the selection "Protected format" is possible!
Factory setting	Protected format
SD card	
Memory build-up	
Navigation	Expert \rightarrow System \rightarrow External memory \rightarrow Memory build-up Direct access code: 140001-000

Description	"Stack memory": No more data can be stored once the data carrier is full. "Ring memory": Once the data carrier is full the oldest data is deleted so that new data can be stored (First in first out (FIFO).
	The "Ring memory" setting refers only to the automatic storage of measured values. Manual save functions ("Operation -> SD card -> Update/Save measured values") are not affected.
Selection	Stack memory, Ring memory (FIFO)
	"Ring memory" can be selected only if "Save as" is set to "Protected format" (and not "CSV").
Factory setting	Stack memory
Warning at	
Navigation	Expert \rightarrow System \rightarrow External memory \rightarrow Warning at Direct access code: 140005-000
Description	Issues a warning before the data carrier is x% full. A warning is indicated on the device and this is also stored in the event buffer. A relay can also be switched.
	Only for external SD card (does not apply to USB stick)!
User entry	0 to 99%
Factory setting	90
Switches relay	
Navigation	Expert \rightarrow System \rightarrow External memory \rightarrow Switches relay Direct access code: 140006-000
Description	When the warning "Data carrier full" is displayed a relay can also be switched on.
Selection	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 \rightarrow System \rightarrow External memory \rightarrow Separator for CSV Direct access code: 140002-000
Description	Configure which separator is used by your application (e.g. in Excel = semicolon).
Selection	Comma, Semicolon
Factory setting	Semicolon
Date/time	
Navigation	Expert \rightarrow System \rightarrow External memory \rightarrow 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 is saved in CSV format files.
Selection	One column, Separate columns
Factory setting	Separate columns
Operational time	
Navigation	Expert \rightarrow System \rightarrow External memory \rightarrow Operational time Direct access code: 140004-000
Description	Please select in which format operation times will be stored/displayed.
Selection	0 seconds, 0.0000 hours, 0.00000 days, 0000h00:00
Factory setting	0000h00:00
"Messages" submenu	
Navigation	$ Expert \rightarrow System \rightarrow 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 messa	Jes

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.
-	This setting cannot be altered if the user administration system is activated (FDA 21 CFR Part 11).
Selection	Do not save, Save
Factory setting	Do not save
Switches relay	
Navigation	Expert \rightarrow System \rightarrow Messages \rightarrow 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 takes the initial state as soon as all messages have been confirmed.
Selection	Not used, Relay x All the available relays are displayed.
Factory setting	Not used
"Screensaver" submen	u ot supported by the DIN rail version .
Navigation	$ Expert \rightarrow System \rightarrow Screensaver $
Description	To increase the life span of the LCD the rear illumination can be switched off (= screensaver).
Screensaver This function is r	ot supported by the DIN rail version .
Navigation	Expert \rightarrow System \rightarrow Screensaver \rightarrow Screensaver Direct access code: 160000-000
Description	"Switched off": LCD is always switched on. "Switch on for x min.": Display goes dark after x minutes. All other functions remain in operation. Press an operating key: Illumination is switched back on. "Switched daily": Enter time span.
Selection	Switched off, On after 10 min, On after 30 min, On after 60 min, Switched daily, Control input

Factory setting	Switched off This setting has no effect if the screensaver is controlled by a digital input.	
ON daily from		
Navigation	Expert \rightarrow System \rightarrow Screensaver \rightarrow ON daily from Direct access code: 160001-000	
Description	 Set time (hh:mm) as of when the screensaver should be switched on (e.g. shift end time). The screensaver is switched off as soon as the device is operated via onsite operation. After 1 min of inactivity it switches back on automatically. Only visible if screensaver = Switched daily 	
User entry	Time (hh:mm)	
Factory setting	20:00	
OFF daily from		
Navigation	Expert \rightarrow System \rightarrow Screensaver \rightarrow OFF daily from Direct access code: 160002-000	
Description	Set time (hh:mm) as of when the screensaver should be switched off (e.g. shift start time). Only visible if screensaver = Switched daily	
User entry	Time (hh:mm)	
Factory setting	07:00	
Alarm response		
Navigation	Expert \rightarrow System \rightarrow Screensaver \rightarrow Alarm response Direct access code: 160003-000	
Description	"Off on alarm": If limit value violations occur or status signal "Maintenance required (Mxxx)" or "Function check (Cxxx)" is active, the screensaver will be automatically deactivated. "Always on": If limit value violations occur or status signal "Maintenance required (Mxxx)" or "Function check (Cxxx)" is active, the screensaver will not be deactivated. Active messages that require acknowledgment or an active status signal "Failure	
	(Fxxx)" or "Out of specification (Sxxx)" deactivate the screensaver always.	
Selection	Off on alarm, Always on	
Factory setting	Off on alarm	
"Barcode reader" submer	1U	
-------------------------------	---	--
This function is not s	supported by the DIN rail version .	
Navigation	$ Expert \rightarrow System \rightarrow Barcode reader $	
Description	Settings for barcode reader (only relevant if a USB barcode reader is connected to the device).	
	Notes on operating a barcode reader: it must behave like a HID keyboard; texts must be terminated with a carriage return.	
Character set		
Navigation	Expert \rightarrow System \rightarrow Barcode reader \rightarrow Character set Direct access code: 100021-000	
Description	Please select the keyboard layout.	
Selection	Germany, Switzerland, France, USA, USA International, UK, Italy	
Factory setting	Germany	
Save as event		
Navigation	Expert \rightarrow System \rightarrow Barcode reader \rightarrow 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 	
Selection	No, Yes	
Factory setting	No	
Timeout sequences		
Navigation	Expert \rightarrow System \rightarrow Barcode reader \rightarrow 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 \rightarrow System \rightarrow Device options $		
Description	Hardware and software options of the device.		
Activation code			
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Activation code Direct access code: 000057-000		
Description	Here, you can enter a code to enable the device options. The options that can be retrofitted are listed 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 \rightarrow System \rightarrow Device options \rightarrow 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.		
Selection	Not assigned, Universal inputs, HART		
Slot 2			
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Slot 2 Direct access code: 990001-000		

Description	Shows hardware or software options. Cannot be edited.
	The assignment can be specified in the PC operating software for offline configuration.
Selection	Not assigned, Universal inputs, HART
Slot 3	
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Slot 3 Direct access code: 990002-000
Description	Shows hardware or software options. Cannot be edited.
	The assignment can be specified in the PC operating software for offline configuration.
Selection	Not assigned, Universal inputs, HART
Slot 4	
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Slot 4 Direct access code: 990003-000
Description	Shows hardware or software options. Cannot be edited.
	The assignment can be specified in the PC operating software for offline configuration.
Selection	Not assigned, Universal inputs, HART
Slot 5	
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Slot 5 Direct access code: 990004-000
Description	Shows hardware or software options. Cannot be edited.
	The assignment can be specified in the PC operating software for offline configuration.
Selection	Not assigned, Universal inputs, Digital inputs, HART

Communication		
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Communication Direct access code: 990006-000	
Description	Shows hardware or software options. Cannot be edited.	
Selection	USB + Ethernet, USB + Ethernet + RS232/485	
Fieldbus		
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Fieldbus Direct access code: 990005-000	
Description	Shows hardware or software options. Cannot be edited.	
Selection	Not available, Modbus Slave, Profibus DP, EtherNet/IP, PROFINET	
Modbus Master		
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Modbus Master Direct access code: 990008-000	
Description	Shows hardware or software options. Cannot be edited.	
	Detailed descriptions of this device option can be found in the associated documentation.	
Selection	No, Yes	
Application		
Navigation	Expert \rightarrow System \rightarrow Device options \rightarrow Application Direct access code: 990007-000	
Description	Shows hardware or software options. Cannot be edited.	
Selection	Standard, Maths, Telealarm, Telealarm + wastewater, Batch, Telealarm + batch, Energy, Energy + Telealarm	

17.1.2 "Inputs" submenu

Settings for the analog and digital inputs.

"Universal inputs" sub	menu	
Navigation	$ \qquad \qquad$	
Description	Settings for the connected measuring points.	
Add input		
Navigation	Expert \rightarrow System \rightarrow Inputs \rightarrow Universal inputs \rightarrow Add input Direct access code: 222000/000	
Description	Addition of an input that must be switched on and configured according to the input signal.	
Selection	No, Universal input x	
Factory setting	No	
Delete input		
Navigation	Expert \rightarrow System \rightarrow Inputs \rightarrow Universal inputs \rightarrow Delete input Direct access code: 222001/000	
Description	Delete an input configuration.	
Selection	No, Universal input x	
Factory setting	No	

"Universal input x" su	bmenu	
Navigation	$ \qquad \qquad$	
Description	View or change settings for the selected channel.	
	x = place holder for selected universal input	
Signal		
Navigation	Expert → Inputs → Universal inputs → Universal input x → Signal Direct access code: 220000-0xx Examples: Universal input 1: 220000-000; Universal input 12: 220000-011	
Description	Select the type of signal connected (current, voltage, etc.). The channel is switched off if no signal type is selected (factory default).	
Selection	Switched off, Current, Voltage, Resistance thermometer, Thermocouple, Pulse counter, Frequency input, Profibus DP (Option), Modbus Slave (option), Modbus Master (option), HART (option), EtherNet/IP (option), PROFINET (option)	
Factory setting	Switched off	
Range		
Navigation	Expert → Inputs → Universal inputs → Universal input x → Range Direct access code: 220001-0xx Examples: Universal input 1: 220001-000; Universal input 12: 220001-011	
Description	Select the input range or which resistance thermometer/thermocouple is connected. The respective terminal layout can be found in the operating manual or on the rear of the unit. Only visible if signal \neq Switched off	

Selection	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) HART (option) EtherNet/IP (option) PROFINET (option)	
Factory setting	Switched off	
Value		
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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	
Selection	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.	
Selection	Instantaneous value, Counter	
Factory setting	Instantaneous value	

Connection		
Navigation	Expert → Inputs Direct access co Examples: Univ	$a \rightarrow$ Universal inputs \rightarrow Universal input x \rightarrow Connection de: 220002-0xx ersal 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	
Selection	2-wire, 3-wire, 4-wire	
Factory setting	4-wire	
Transmission protocol		
Navigation	Expert → Inputs Direct access co Examples: Univ	→ Universal inputs → Universal input $x \rightarrow$ Transmission protocol de: 220049-0xx ersal 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	
Selection	Modbus TCP, Modbus TCP with slave address, Modbus RTU over TCP	
Factory setting	Modbus TCP	
IP address		
Navigation	Expert → Inputs Direct access co Examples: Univ	a → Universal inputs → Universal input x → IP address de: 220041-0xx ersal input 1: 220041-000; Universal input 12: 220041-011
Description	Address of Modbus slave Only visible if signal = Modbus Master	
User entry	IP address	
Factory setting	0.0.0.0	

Navigation		Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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	Num	Number (max. 5 digits)	
Factory setting	502		
Slave address			
Navigation		Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Slave address Direct access code: 220040-0xx Examples: Universal input 1: 220040-000; Universal input 12: 220040-011	
Description	Addr Only	ess of Modbus slave visible if signal = Modbus Master	
User entry	Num	Number (1 to 255)	
Factory setting	1		
Readout function			
Navigation		Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Readout function Direct access code: 220042-0xx Examples: Universal input 1: 220042-000; Universal input 12: 220042-011	
Description	Modl Only	Modbus function with which the registers are to be read out. Only visible if signal = Modbus Master	
Selection	Read	Read Input Register (3xxxxx), Read Holding Register (4xxxxx)	
Factory setting	Read Input Register (3xxxxx)		
Register address			
Navigation		Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Register address Direct access code: 220043-0xx Examples: Universal input 1: 220043-000; Universal input 12: 220043-011	
Description	Regis Only	ster address 1-65535 visible if signal = Modbus Master	

User entry	Number (1 to 65535)	
Factory setting	1	
Data type		
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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	
Selection	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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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 \neq Switched off	
User entry	Text (16 characters)	
Factory setting	Channel x	
Plot type		
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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. Dependent on the store cycle the selected data is selected, stored and displayed from the scanned values.	
Selection	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 \rightarrow current value = liters/second. Only visible if signal = "Pulse counter" and plot type = "Current value + Counter"	
Selection	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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Unit/dimension counter Direct access code: 220024-00x Examples: Universal input 1: 220024-000; Universal input 12: 220024-011	
Description	Technical unit of the count input, e.g. gal, cf, Only visible if signal = "Pulse counter" and plot type = "Current value + Counter"	
User entry	Text (max. 6 characters)	
Pulse counter		
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Pulse counter Direct access code: 220017-0xx Examples: Universal input 1: 220017-000; Universal input 12: 220017-011	

Description	Specify whether the pulse counter is a fast or slow (up to max. 25 Hz) counter. For example if the number of state changes from a relay are to be monitored then you must set "up to 25Hz". Only visible if signal = Pulse counter		
Selection	Up to 13kHz, Up to 25Hz		
Factory setting	Up to 13kHz		
Pulse value			
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Pulse value Direct access code: 220010-0xx Examples: Universal input 1: 220010-000; Universal input 12: 220010-011		
Description	Factor, that when multiplied by the input signal results in the required physical value. Example: 1 pulse equals 5 m ³ -> enter a "5". 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 $m^3/100 \rightarrow$ desired unit is $m^3 \rightarrow enter 0.01$ 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		

Selection	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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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. The zoom has no influence on the storage.	
	 The zoom can also be set outside the measuring range. The only restriction is that the start and end of the zoom may not be identical. If the signal 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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Zoom end Direct access code: 220012-0xx Examples: Universal input 1: 220012-000; Universal input 12: 220012-011	
Description	Like "Zoom start". Enter the upper value of the required range 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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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	Intern: Compensation of the voltage error by measuring the terminal temperature. Extern: Compensation of the voltage error by using an external controlled comparison measurement point. Only visible if signal = Thermocouple	
Selection	Internal, External	
Factory setting	Internal	

Comparison temp.		
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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	\Box Expert → Inputs → Universal inputs → Universal input x → Linearization		
Description	Contains settings for linearization.		
	Only current and voltage inputs can be linearized.		
Linearization			
Navigation	 Expert → Inputs → Universal inputs → Universal input x → Linearization → Linearization Direct access code: 230000-0xx Examples: Universal input 1: 230000-000; Universal input 12: 230000-011 		
Description	Specify whether this analog input should be linearized.		
Selection	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.		
	Note: The first and last point must always correspond to the start and end of the measuring range respectively.		
User entry	2 to 32		
Factory setting	2		
Dim. linearized value			
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Linearization \rightarrow 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. The zoom has no influence on the storage.	
User entry	0 to 9999999	
Factory setting	0	
Zoom end		
Navigation	 Expert → Inputs → Universal inputs → Universal input x → Linearization → Zoom end Direct access code: 230004-0xx Examples: Universal input 1: 230004-000; Universal input 12: 230004-011 	
Description	Like "Zoom start". Enter the upper value of the required range here. Example: Transmitter 0-14 pH, required section: 5-9 pH. Here: "9".	
User entry	0 to 9999999	
Factory setting	100	
Points		
Navigation	$ \qquad \qquad$	
Description	Enter the support points of the linearization table here. Note: The first and last point must always 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.	
Selection	No, Yes	
Factory setting	No	

Check table		
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Linearization \rightarrow Points \rightarrow 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.	
Selection	No, Yes	
Factory setting	No	

x-value (1 to 32)	
Navigation	 Expert → Inputs → Universal inputs → Universal input x → Linearization → Points → x-value (1 to 32) Direct access code, x-value 1: 230100-0xx Direct access code, x-value 2: 230102-0xx Examples: Universal input 1, x-value 1: 230100-000; Universal input 12, x-value 1: 230100-011
Description	x-value for the linearization (value from the device input). e.g. 10 cm corresponds to 20 liters> enter 10.
User entry	0 to 9999999
Factory setting	0

Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Linearization \rightarrow Points \rightarrow y-value (1 to 32)
	Direct access code, y-value 2: 230101-0xx
	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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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	-3.0 for slot 1+2 -3.2 for slot 3 -3.5 for slot 4+5

Range start

Target value	
Navigation	Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Target value Direct access code: 220052-0xx Examples: Universal input 1: 220052-000; Universal input 12: 220052-011
Description	Enter the lower set point here (e.g. measuring range 0°C to 100°C: 0°C). Only visible if signal = Current or Voltage
User entry	Number (max. 8 digits)
Factory setting	0
Actual value	
Navigation	 Expert → Inputs → Universal inputs → Universal input x → Meas.val. corrct. → Actual value Direct access code: 220053-0xx Examples: Universal input 1: 220053-000; Universal input 12: 220053-011
Description	Enter the lower value actually measured here (e.g. measuring range 0°C to 100°C: measured value 0.5°C). 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°C to 100°C: 100°C). Only visible if signal = Current or Voltage

User entry	umber (max. 8 digits)	
Factory setting	00	
Actual value		
Navigation] Expert → Inputs → value Direct access code: Examples: Universa	Jniversal inputs → Universal input x → Meas.val. corrct. → Actual 220056-0xx l input 1: 220056-000; Universal input 12: 220056-011
Description	nter the upper value actu easured value 100.5°C). nly visible if signal = Cur	ally measured here (e.g. measuring range 0°C to 100°C: rent or Voltage
User entry	umber (max. 8 digits)	
Factory setting	00	
"Totalization" submenu		
Navigation	$] Expert \rightarrow Inputs \rightarrow]$	Jniversal inputs \rightarrow Universal input x \rightarrow Totalization
Description	t up only required for to	talization of flow or power consumption.
Totalization		
Navigation	Expert \rightarrow Inputs \rightarrow Totalization Direct access code: Examples: Universa	Jniversal inputs → Universal input x → Totalization → 220030-0xx l input 1: 220030-000; Universal input 12: 220030-011
Description	r totalizing the analog si	gnal (e.g. flow rate in m³/h) quantities (in m³) can be calculated.
Selection	o, Yes	
Factory setting	0	
Totalization base		
Navigation	Expert \rightarrow Inputs \rightarrow Totalization base Direct access code: Examples: Universa	Jniversal inputs → Universal input x → Totalization → 220031-0xx l input 1: 220031-000; Universal input 12: 220031-011

Description	Select the required time base. Example: ml/s -> time base seconds (s); m ³ /h -> time base hours (h). Only visible if totalization = Yes
Selection	Second (s), Minute (min), Hour (h), Day (d)
Factory setting	Second (s)
Unit	
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Totalization \rightarrow 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 \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow Totalization \rightarrow 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 $l/s \rightarrow$ totalization base = second -> engineering unit required is $m^3 \rightarrow$ 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 $\rightarrow \cong 128$

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: $\leq 3.8 \text{ mA}$: under range $\geq 20.5 \text{ mA}$: over range $\leq 3.6 \text{ mA}$ or $\geq 21.0 \text{ mA}$: sensor error $\leq 2 \text{ mA}$: cable open circuit Only visible if signal = "Current" and range = "4-20 mA" or "4-20 mA squared".
Selection	Off, On

Factory setting	On
Cable open circuit	
Navigation	 Expert → Inputs → Universal inputs → Universal input x → Fault mode → Cable open circuit Direct access code: 220060-0xx Examples: Universal input 1: 220060-000; Universal input 12: 220060-011
Description	Cable open circuit detection Only visible if signal = "Voltage" and range = "1-5 V" or "1-5 V squared".
Selection	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	Os
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!
Selection	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.	
Selection	No, Yes	
Factory setting	No	
Copy settings		
Navigation	Expert \rightarrow Inputs \rightarrow Universal inputs \rightarrow Universal input x \rightarrow 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.	
Selection	Switched off, Universal input x Users can choose from all the available universal inputs.	
Factory setting	Switched off	

"Digital inputs -> Digital input x" submenu	
Navigation	$ \begin{tabular}{lllllllllllllllllllllllllllllllllll$
Description	Setting up only required if the digital inputs (e.g. events) are to be used. $\mathbf{x} = $ place holder for selected digital input

Add input	
Navigation	Expert \rightarrow System \rightarrow Digital inputs \rightarrow Add input Direct access code: 252000/000
Description	Addition of a digital input that must be configured according to the function.
Selection	No, Digital input x
Factory setting	No

Navigation	Expert \rightarrow System \rightarrow Digital inputs \rightarrow Delete input Direct access code: 252001/000	
Description	Delete an input configuration.	
Selection	No, Digital input x	
Factory setting	No	
Function		
Navigation	Expert \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow Function Direct access code: 250000-00x Examples: Digital input 1: 250000-000; Digital input 6: 250000-005	
Description	Select the required function. Digital inputs are High active; this means the described effect is achieved by a high input. Low = -3 to $+5$ V High = $+12$ to $+30$ V	
Selection	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	
Selection	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 unit 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 \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow 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	
Selection	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	
Selection	Seconds, Hours	
Factory setting	Seconds	

Pulse value		
Navigation	Expert → Inputs → Digital inputs → Digital input x → Pulse value Direct access code: 250005-00x Examples: Digital input 1: 250005-000; Digital input 6: 250005-005	
Description	Factor, that when multiplied by the input signal results in the required physical value. Examples: 1 pulse equals 5 m ³ -> enter "5" here. Only visible if function = Pulse counter	
User entry	Number (max. 8 digits)	
Factory setting	1	
1 second=/1 hour= (depends on the setting in "Input factor in")	
Navigation	Expert → Inputs → Digital inputs → Digital input x → 1 second= / 1 hour= Direct access code: 250005-00x Examples: Digital input 1: 250005-000; Digital input 6: 250005-005	
Description	Factor, that when multiplied by the operating time results in the required physical value. Examples: 1 second equals 8 l -> enter "8" here.	

	Only visible if function = Quantity from time
User entry	Number (max. 8 digits)
Factory setting	1

Time delay		
Navigation	Expert → Inputs → Digital inputs → Digital input x → Time delay Direct access code: 250017-00x Examples: Digital input 1: 250017-000; Digital input 6: 250017-005	
Description	The high signal must be active for at least the preset time before the device changes the channel from low to high. The change from high to low is always immediate. Only visible if function = Control input, On/off event, Event+operation time	
User entry	0 to 99 999 s	
Factory setting	0	

Action		
Navigation	Expert → Inputs Direct access coo Examples: Digita	→ Digital inputs → Digital input x → Action de: 250003-00x al input 1: 250003-000; Digital input 6: 250003-005
Description	Set up the function of t Only visible if function	the control input. = Control input
	Action	Description
	Start/stop recording	The device only saves data as long as a high signal is present
	Screensaver on	Switches backlighting/display off, low = off, high = on
		This function is not supported by the DIN rail version .
	Lock setup	The user can only change the setup if a low signal is present
	Time synchronization	If a high signal is applied, the device rounds the system time up or down (only for Low \rightarrow High change): 0 to 29 \rightarrow round down; 30 to 59 \rightarrow round up
	Change group (panel- mounted device only)	The display switches to the next active group in the event of a Low \rightarrow High change.
	Set point monitoring on/off	The entire set point monitoring function of the device can be switched on (for "High") or switched off (for "Low").
	Individual LV on/off	Monitoring for a selected limit value can be switched on (for "High") or switched off (for "Low").
	Block keyboard/navigator	The device can only be operated if a low signal is present. Otherwise all key activation and navigator actions are discarded.
		This function is not supported by the DIN rail version .
	Start/stop analysis 1-4	Starts/ends one of the max. 4 external analyses (the analysis runs only as long as the signal is high). Measured value acquisition for the graphic display continues. Batches are also started/ended with this function. Note: This function is not available in the case of batch and control input via a maths channel.
	Reset batch number x (option)	Resets the automatically generated batch number (1x) 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.

navigator, Start/stop analysis x, Reset batch no. x, Batch x limits on/off

Factory setting

Switched off

Group

Navigation	Expert → Inputs → Digital inputs → Digital input x → Group Direct access code: 250015-00x Examples: Digital input 1: 250015-000; Digital input 6: 250015-005	
Description	Choose the group which should be displayed in the event of a change from Low->High. Alternatively the next active group can be displayed. Only visible if function = Control input and action = Change group	
Selection	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	
Selection	Switched off, Universal input xx, Digital input xx, Math xx, Limit 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 manual! Only visible if function = Control input, On/off event, Event+operation time	
Selection	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 on the display and saved to memory. Only visible if function = Control input, On/off event, Event+operation time	
User entry	Text (max. 6 characters)	
Factory setting	On	
Description 'L'		
Navigation	Expert → Inputs → Digital inputs → Digital input x → Description 'L' Direct access code: 250008-00x Examples: Digital input 1: 250008-000; Digital input 6: 250008-005	
Description	Condition description when the digital input is not active. This text is both shown on the display and saved to memory. Only visible if function = Control input, On/off event, Event+operation time	
User entry	Text (max. 6 characters)	
Factory setting	Off	
Save event		
Navigation	Expert \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow 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	
Selection	No, Yes, only "On" message	
Factory setting	Yes	
Event message		
Navigation	Expert → Inputs → Digital inputs → Digital input x → Event message Direct access code: 250018-00x Examples: Digital input 1: 250018-000; Digital input 6: 250018-005	

Description	"Do not acknowledge": No message is shown if the digital input switches. "Acknowledge": A message window is shown on the screen which has to be acknowledged by operating a push button. Only visible if function = Control input, On/off event, Event+operation time In the case of the DIN rail version, the message can only be acknowledged via the	
	Web server!	
Selection	Do not acknowledge, Acknowledge	
Factory setting	Do not acknowledge	
Event text L->H		
Navigation	Expert \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow Event text L->H Direct access code: 250010-00x Examples: Digital input 1: 250010-000; Digital input 6: 250010-005	
Description	Description of condition change from low to high. Event text is stored (e.g. Start filling).	
	If no event text 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 \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow Event text H->L Direct access code: 250011-00x Examples: Digital input 1: 250011-000; Digital input 6: 250011-005	
Description	Description of condition change from high to low. Event text is stored (e.g. Stop filling). If no event text 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 \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow 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</ss></mm></hhhh>		
Selection	No, Yes		
Factory setting	No		
Totalizer			
Navigation	Expert \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow 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 \rightarrow Inputs \rightarrow Digital inputs \rightarrow Digital input x \rightarrow 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.		
Selection	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" sub	menu		

Navigation		Expert \rightarrow Outputs \rightarrow Universal output x
Description	Settings for the universal output selected (current or pulse output).	

Signal Navigation Expert \rightarrow Outputs \rightarrow Universal output x \rightarrow 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. Selection Switched off, 4-20 mA, 0-20 mA, Pulse output Switched off Factory setting **Reference channel** Navigation Expert \rightarrow Outputs \rightarrow Universal output x \rightarrow 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. Selection Switched off, Universal input x, Digital input x, Maths x, Limit x, Relay x All active inputs are available for selection. Switched off **Factory setting** Start value Navigation Expert \rightarrow Outputs \rightarrow Universal output x \rightarrow 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. Only visible if signal = 4-20 mA or 0-20 mA. User entry Number (max. 8 characters) **Factory setting** 0 Full scale value
Navigation	Expert \rightarrow Outputs \rightarrow Universal output x \rightarrow 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. Only visible if signal = 4-20 mA or 0-20 mA.
User entry	Number (max. 8 characters)
Factory setting	100
Damping/filter	
Navigation	Expert \rightarrow Outputs \rightarrow Universal output x \rightarrow Damping/filter Direct access code: 340005-00x Examples: Universal output 1: 340005-000; Universal output 2: 340005-001
Description	Time constant of the first order low pass for the output signal. This is used to prevent strong fluctuations of the output signal. Only visible if signal = 4-20 mA or 0-20 mA.
User entry	0 to 999.9 s
Factory setting	0.0 s
Pulse value	
Navigation	Expert \rightarrow Outputs \rightarrow Universal output x \rightarrow 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 \rightarrow Outputs \rightarrow Universal output x \rightarrow 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
Selection	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 from 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 \rightarrow Outputs \rightarrow Universal output x \rightarrow Meas.val. corrct.
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: On the connected device, read out the displayed value in both the upper and lower measuring range. Enter the lower and upper target and actual value. Only visible if signal = 4-20 mA or 0-20 mA.

Lower	correction value	
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Target value	
Navigation	 Expert → Outputs → Universal output x → Meas.val. corrct. → Lower correction value → Target value Direct access code: 340021-00x Examples: Universal output 1: 340021-000; Universal output 2: 340021-001
Description	Enter the lower set point here. Only visible 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 → Meas.val. corrct. → Lower correction value → Actual value Direct access code: 340022-00x Examples: Universal output 1: 340022-000; Universal output 2: 340022-001
Description	Here, enter the lower actual value which is displayed at the connected device. Only visible 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 → Meas.val. corrct. → Upper correction value → Target value Direct access code: 340024-00x Examples: Universal output 1: 340024-000; Universal output 2: 340024-001
Description	Enter the upper set point here. Only visible 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 → Meas.val. corrct. → Upper correction value → Actual value Direct access code: 340025-00x Examples: Universal output 1: 340025-000; Universal output 2: 340025-001
Description	Here, enter the upper actual value which is displayed at the connected device. Only visible if signal = $4-20$ mA or $0-20$ mA.
User entry	Number (max. 8 characters)
Factory setting	100

"Fault mode" submenu

Navigation	Expert \rightarrow Outputs \rightarrow Universal output x \rightarrow Fault mode
Description	Configure how the analog output should behave in the event of an error (e.g. if the input channel has a cable open circuit). Only visible if signal = 4-20 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: \leq 3.8 mA: underrange \geq 20.5 mA: overrange \leq 3.6 mA or \geq 21.0 mA: cable open circuit Only visible if signal = 4-20 mA or 0-20 mA.
Selection	Off, On
Factory setting	On
On error	
Navigation	Expert → Outputs → Universal output x → Fault mode → On error Direct access code: 340016-00x Examples: Universal output 1: 340016-000; Universal output 2: 340016-001
Description	What value should the output adopt in the event of an error (e.g. cable break or calculated value invalid)? Only visible if signal = 4-20 mA or 0-20 mA.
Selection	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. Only visible if signal = $4-20$ mA or $0-20$ mA.
User entry	0 to 22 mA
Factory setting	0 mA

"Relay x" submenu	
Navigation	$ Expert \rightarrow Outputs \rightarrow Relay x $
Description	Contains setup for the selected relay
	x = place holder for selected relay
Operating mode	
Navigation	Expert \rightarrow Outputs \rightarrow Relay x \rightarrow 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.
Selection	NO contact, NC contact
Factory setting	NO contact
Identifier	
Navigation	Expert \rightarrow Outputs \rightarrow Relay x \rightarrow 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 \rightarrow Outputs \rightarrow Relay x \rightarrow Remote controlled Direct access code: 330002-00x Examples: Relay 1:330002-000; Relay 6: 330002-005
Description	Configure whether the relay may be controlled remotely (e.g. PC or SMS). Only visible with the "Telealarm" option.
Selection	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 cycl. readout	
Navigation	Expert \rightarrow Communication \rightarrow Timeout Direct access code: 150200-000
Description	Monitors whether measured values are read out cyclically via OPC or Fieldbus. Timeout is modifiable between 1 and 99 seconds. O seconds means that the functionality is inactivated.
User entry	0 to 99 s
Factory setting	0 s
Switches	
Navigation	Expert \rightarrow Communication \rightarrow 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.
Selection	Not used, Relay x All the available relays are displayed.
Factory setting	Not used
Timeout fieldbus	
Navigation	Expert \rightarrow Communication \rightarrow 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

Function USB-B

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

Navigation	Expert \rightarrow Communication \rightarrow Function USB-B Direct access code: 012001-000
Description	Determines the operating mode of the USB interface if a cable is connected to the device.
Selection	Always USB Always Ethernet over USB By user input
Factory setting	Always USB
"Ethernet" submenu	
Navigation	$ Expert \rightarrow Communication \rightarrow Ethernet $
Description	Contains the set-up required if you are using the Ethernet interface of the unit.
MAC address	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow MAC address Direct access code: 150000-000
Description	Displays the MAC address
DHCP	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow DHCP Direct access code: 150002-000
Description	 The device can get its Ethernet settings through DHCP. Caution: The settings determined are not displayed until after setup acceptance! Note: The unit always gets the same IP address if the leasing time is set long enough on the DHCP server. The PC software needs the IP address determined to establish a
Selection	connection! No, Yes
Factory setting	Yes

IP address	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow IP address Direct access code: 150003-000
Description	Please enter the IP address. (given from your network administrator). Can only be edited if DHCP = No
User entry	IP address
Factory setting	000.000.000
Subnetmask	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Subnetmask Direct access code: 150004-000
Description	Please enter the subnetmask (given from your network administrator). Can only be edited if DHCP = No
User entry	IP address
Factory setting	255.255.255.000
Gateway	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Gateway Direct access code: 150005-000
Description	Please enter the gateway (given from your network administrator). Can only be edited if DHCP = No
User entry	IP address
Factory setting	000.000.000
Domain Name Syster	n (DNS)
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Domain Name System (DNS)

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). Can only be edited if DHCP = No
User entry	IP address
Factory setting	000.000.000
Disable port	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow 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.
Selection	CDI, OPC, Modbus Slave, HART IP
Factory setting	(no port disabled)
Port	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Port Direct access code: 150001-000
Description	The system communicates with the PC software through this communication port. 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 \rightarrow Communication \rightarrow Ethernet \rightarrow OPC port Direct access code: 150010-000

Description	Values van be read via OPC server using this communication port. 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 \rightarrow Communication \rightarrow Ethernet \rightarrow 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.
	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 \rightarrow Communication \rightarrow Ethernet \rightarrow Web server Direct access code: 470000-000
Description	Switch the Web server function on or off. The instantaneous values can only be displayed using an Internet browser when the web browser is activated.
	It is only possible to connect to the Web server via the Ethernet interface!
Selection	No (Web server is off), Yes (Web server is active)
Factory setting	Yes

"Configuration Web server" submenu		
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server	
Description	Configure the Web server or specify which functionality should be possible via Web server. Only visible if Web server = Yes.	
	Instantaneous value display is always possible once the Web server is switched on.	

Port	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Port Direct access code: 470003-000
Description	The Web server communicates through this communication port.
	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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow 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.
Selection	No, Yes
Selection	

Firmware update

Navigation	Expert → Coupdate Direct acces	ommunication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Firmware is code: 470002-000
Description	Firmware can be u	pdated via Web server.
Selection	No, Yes	
Factory setting	No	

Remote control

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

Navigation		Expert → Communication → Ethernet → Configuration Web server → Remote control Direct access code: 470004-000
Description	The de	vice can be remote-controlled via the Web server.
Selection	No, Ye	S
Factory setting	No	

WebDAV server

Navigation		Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow WebDAV server Direct access code: 470006-000
Description	The SI	O card can be read out via the WebDAV client.
Selection	No, Ye	2S
Factory setting	No	

Batch (option)	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow 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.
Selection	No, Yes
Factory setting	No
Control relays (option)	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow 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. i

Selection

No, Yes

Factory setting No

Navigation		Expert → Communication → Ethernet → Configuration Web server → Meas. val. without login Direct access code: 470009-000			
Description	Allow access to current measured values without logging in. URL: http:\\ <ip>\iv</ip>				
Selection	Yes, I	No			
Factory setting	Yes				
"Authentication" submenu	l				
Navigation		Expert \rightarrow Communication \rightarrow Ethe	rnet → Configuration W	Veb server \rightarrow	Authentic
Navigation Description	Set tl serve Only	Expert \rightarrow Communication \rightarrow Ether ne passwords for the various users v er. relevant if the device is not protect	rnet → Configuration W with which the device ca ed by user administratio	Yeb server → an be accesse on.	Authentic ed via Web
Navigation Description	Set the serve Only	Expert \rightarrow Communication \rightarrow Ether ne passwords for the various users ver. relevant if the device is not protect	rnet → Configuration W with which the device ca ed by user administratio Operator	Yeb server → . an be accesse on. Admin	Authentic ed via Web Service
Navigation Description	Set tl serve Only Meas	Expert \rightarrow Communication \rightarrow Ether the passwords for the various users we for the various users we relevant if the device is not protected ured value display	rnet → Configuration W with which the device ca ed by user administratio Operator Yes	Yeb server → Ann be accesse on. Admin Yes	Authentic ed via Web Service Yes
Navigation Description	Set th serve Only Meas Displa	Expert \rightarrow Communication \rightarrow Ether the passwords for the various users wer. relevant if the device is not protect ured value display ay instrument health status	rnet → Configuration W with which the device ca ed by user administration Operator Yes Yes	Yeb server → A an be accesse on. Admin Yes Yes	Authentic ed via Web Service Yes Yes
Navigation Description	Set tl serve Only Meas Displ	Expert \rightarrow Communication \rightarrow Ether the passwords for the various users we r. relevant if the device is not protected ured value display ay instrument health status guration	rnet → Configuration W with which the device ca ed by user administratio Operator Yes Yes No	Yeb server → . an be accesse on. Admin Yes Yes Yes	Authentic ed via Web Service Yes Yes Yes
Navigation Description	Set th serve Only Meas Displ Confi	Expert \rightarrow Communication \rightarrow Ether the passwords for the various users wert. relevant if the device is not protect ured value display ay instrument health status guration guration incl. service parameter	rnet → Configuration W with which the device ca ed by user administration Operator Yes Yes No No	Yeb server → An be accessed on. Admin Yes Yes Yes Yes No	Authentica ed via Web Service Yes Yes Yes Yes
Navigation Description	Set tl serve Only Meas Displ Confi Upda	Expert \rightarrow Communication \rightarrow Ether ne passwords for the various users were relevant if the device is not protected ured value display ay instrument health status guration guration incl. service parameter te firmware	rnet → Configuration W with which the device ca ed by user administratio Operator Yes Yes No No No	Yeb server → . an be accesse on. Admin Yes Yes Yes No Yes	Authentic ed via Web Service Yes Yes Yes Yes Yes

Navigation

Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Authentication \rightarrow 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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Authentication \rightarrow 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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Authentication \rightarrow 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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Authentication \rightarrow 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	
Description	ID required in order to access the device. Pay attention to case-sensitivity. Cannot be edited.
Factory setting	service
Password	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Authentication \rightarrow 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	$ \blacksquare \text{Expert} \rightarrow \text{Communication} \rightarrow \text{Ethernet} \rightarrow \text{Configuration} \text{ Web server} \rightarrow \text{Timeouts} $
Description	Timeouts for the Web server. Settings should only be modified if slow network connections are causing transmission problems.
	The settings are only adopted if the browser has been restarted or a new tab opened. Caution: Settings should only be changed by experts.
Connection quality	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow Connection quality Direct access code: 470200-000

Description	Configuration of typical timeout values for the Web server connection. The default values can be changed if necessary.
Selection	Please select, Local network (LAN/WLAN), Wireless/mobile (fast connect.), Wireless/ mobile (slow connect)
Factory setting	Please select
Get timeout	
Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow 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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow 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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow 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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow Ping interval Direct access code: 470204-000
Description	Interval in which the browser checks device reachability.
	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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow 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 \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow Ping retry Direct access code: 470206-000
Description	Number of retries if the device does not respond.
User entry	0 to 5
	0

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Navigation	Expert \rightarrow Communication \rightarrow Ethernet \rightarrow Configuration Web server \rightarrow Timeouts \rightarrow 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 \rightarrow Communication \rightarrow HART $
Description	Specify the values that should be read out via HART.
Master type	
Navigation	Expert \rightarrow Communication \rightarrow HART \rightarrow 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.
Selection	Primary, Secondary
Factory setting	Primary

Navigation	Expert \rightarrow Communication \rightarrow HART \rightarrow 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
Fault mode	

Expert \rightarrow Communication \rightarrow HART \rightarrow 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.		
Selection	PV rendered invalid, Calculate PV based on current		
Factory setting	PV rendered invalid		
Add value			
Navigation	Expert \rightarrow Communication \rightarrow HART \rightarrow Add value Direct access code: 550300-000		
Description	A value read from a connected HART device is added.		
Selection	No, Yes		
Factory setting	No		
Delete value			
Navigation	Expert \rightarrow Communication \rightarrow HART \rightarrow Delete value Direct access code: 550301-000		
Description	Deletes a process value from the list.		
Selection	No, Value x		
Factory setting	No		
"Value x" submenu			
Navigation	$ \qquad \qquad \text{Expert} \rightarrow \text{Communication} \rightarrow \text{HART} \rightarrow \text{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 \rightarrow Communication \rightarrow HART \rightarrow Value x \rightarrow 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.
Selection	Switched off, Channel x
Factory setting	Switched off
Device address	
Navigation	Expert \rightarrow Communication \rightarrow HART \rightarrow Value x \rightarrow Device address Direct access code: 550001-0xx
Description	Enter the device address of the HART device.
	Note: The entered device address must match the address set in the HART device (polling address; HART address).
User entry	0 to 62
Factory setting	0

Process variable	
Navigation	Expert \rightarrow Communication \rightarrow HART \rightarrow Value x \rightarrow Process variable Direct access code: 550002-0xx
Description	Select the process variable that should be requested.
Selection	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 \rightarrow Communication \rightarrow HART \rightarrow Value x \rightarrow 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

Description	Contains the set-up required if you are using the RS232 or RS485 unit interface.
Туре	
Navigation	Expert \rightarrow Communication \rightarrow Serial interface \rightarrow Type Direct access code: 150100-000
Description	Configure how the serial interface is used. Pay attention to the connections.
Selection	RS232, RS485, Debug (only for service purposes)
Factory setting	RS232
Protocol	
Navigation	Expert \rightarrow Communication \rightarrow Serial interface \rightarrow Protocol Direct access code: 150105-000
Description	Define the serial interface protocol. Note: The device automatically disables incompatible settings.
Selection	PC software, Printer, Modbus Slave (only if type = RS485), Modbus Master (only if type = RS485)
Factory setting	PC software
Baud rate	
Navigation	Expert \rightarrow Communication \rightarrow Serial interface \rightarrow Baud rate Direct access code: 150101-000
Description	Transmission speed ("Baud rate") - must be the same as the settings for the PC software.
Selection	9600, 19200, 38400, 57600, 115200
Factory setting	19200
Parity	
Navigation	$ \blacksquare \text{Expert} \rightarrow \text{Communication} \rightarrow \text{Serial interface} \rightarrow \text{Parity} $

Direct access code: 150103-000

Description	Parity Only visible if protocol ≠ PC software
Selection	None, Even, Odd
Factory setting	None
Stop bits	
Navigation	Expert \rightarrow Communication \rightarrow Serial interface \rightarrow Stop bits Direct access code: 150104-000
Description	Stop bits Only visible if protocol ≠ PC software
Selection	1, 2
Factory setting	1
Device address	
Navigation	Expert \rightarrow Communication \rightarrow Serial interface \rightarrow Device address Direct access code: 150102-000
Description	Every device 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 \rightarrow Communication \rightarrow 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 \rightarrow Communication \rightarrow Modbus Slave \rightarrow Modbus Direct access code: 480000-000

Description	Specify the physical interface you wish to use.
Selection	Not used, RS485, Ethernet
Factory setting	Not used
Device address	
Navigation	Expert \rightarrow Communication \rightarrow Modbus Slave \rightarrow Device 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 \rightarrow Communication \rightarrow Modbus Slave \rightarrow 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	$ \qquad \qquad$
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

Selection	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
Selection	None, Even, Odd
Factory setting	None
Stop bits	
Navigation	Expert \rightarrow Communication \rightarrow Modbus Slave \rightarrow Serial interface \rightarrow Stop bits Direct access code: 150104-000
Description	Parity Only visible if Modbus = RS485 and parity = None
Selection	1, 2
Factory setting	1
"Modbus Master" submenu	
Navigation	Expert \rightarrow Communication \rightarrow 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.
- Selection Not used, RS485, Ethernet

Factory setting	Not used		
Scan cycle			
Navigation	Expert \rightarrow Communication \rightarrow Modbus Master \rightarrow Scan cycle Direct access code: 480053-000		
Description	Cycle time for scanning the end devices. Only visible if Modbus = RS485		
Selection	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		
Selection	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 \rightarrow Communication \rightarrow Modbus Master \rightarrow 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
Selection	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 \rightarrow Communication \rightarrow Modbus Master \rightarrow 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 600000 ms
Factory setting	10 ms
"Serial interface" submenu	
Navigation	Expert \rightarrow Communication \rightarrow Modbus Master \rightarrow Serial interface

Contains the settings required if you are using the RS485 interface of the device.

Baud rate

Description

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
Selection	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
Selection	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
Selection	1, 2
Factory setting	1

Navigation		Expert \rightarrow Communication \rightarrow Profibus DP
Description	Confi	gure the Profibus DP settings for the device. Detailed descriptions of this device option can be found in the associated documentation.

Slave address

Navigation	Expert \rightarrow Communication \rightarrow Profibus DP \rightarrow 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 \rightarrow Communication \rightarrow Profibus DP \rightarrow 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.
Selection	No, Yes
Factory setting	No
"Slot x" submenu	
Navigation	$ \qquad \qquad$
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
Navigation Description	 Expert → Communication → Profibus DP → Slot x → Master In/Out Direct access code: 480110-0xx Examples: Slot 1: 480110-000; Slot 16: 480110-015 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.
Navigation Description Selection	 Expert → Communication → Profibus DP → Slot x → Master In/Out Direct access code: 480110-0xx Examples: Slot 1: 480110-000; Slot 16: 480110-015 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. 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

Byte:	ху
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Navigation	Expert → Communication → Profibus DP → Slot x → Byte xy Direct access code, byte 04: 480111-0xx Direct access code, byte 59: 480113-0xx Direct access code, byte 1014: 480115-0xx Direct access code, byte 1519: 480117-0xx Examples: Slot 1, byte 04: 480111-000; Slot 16: 480111-015
Description	Please select the value that should be used within the module from this address offset.
Selection	Switched off, Universal input x, Digital input x, Maths x, Limit x, Relay x Note: All active inputs are available for selection.
Factory setting	Switched off
>	
Navigation	Expert \rightarrow Communication \rightarrow Profibus DP \rightarrow Slot x \rightarrow > Direct access code, byte 04>: 480112-0xx Direct access code, byte 59>: 480114-0xx Direct access code, byte 1014>: 480116-0xx Direct access code, byte 1519>: 480118-0xx Examples: Slot 1, byte 04>: 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 xy".
Selection	Not used, Instantaneous value, State, Totalizer, Total operational time
Factory setting	Not used
Bit 0.0 to 0.7	
Navigation	Expert \rightarrow Communication \rightarrow Profibus DP \rightarrow Slot x \rightarrow 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.

Selection	Switched off, Universal input x, Digital input x, Maths x, Limit 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.).

"Maths - Maths x" submenu		
Navigation		Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x
Description	Confi	guration of the mathematics channels.
	i	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.
Selection	Switched off, Formula editor Included with energy package (option): Energy calculation, mass calculation, density calculation, calculation of enthalpy, mass calculation DP-Flow
Factory setting	Switched off
Channel ident.	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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

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 $\rightarrow \cong 221$ Only visible if function = Formula editor
User entry	Formula
Application	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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.
Selection	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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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.
Selection	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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Flow Direct access code: 400101-0xx

Examples: Maths 1: 400101-000; Maths 4: 400101-003

Description	Please select a flow input. Only visible with energy package (option) and function = Energy or Mass calculation.
Selection	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.
Selection	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.
Selection	Steam, Water, Warm, Cold (depending on the selected application)
Factory setting	Steam or warm (depending on the selected application)
Pressure	
Navigation	□ Expert → Application → Maths → Maths x → Pressure

Direct access code: 400104-0xx
Examples: Maths 1: 400104-000; Maths 4: 400104-003DescriptionPlease 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.

Selection	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.
Selection	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). If "Switched off" is selected the pressure input is used to calculate the saturated steam conditions (only for steam applications). Only visible with energy package (option) and selected energy function.
Selection	Switched off, Universal input x, Maths x All active inputs are available for selection.
Factory setting	Switched off

Temperature	(steam/cold)
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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.
Selection	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.
Selection	°C, °F, K
Factory setting	°C
Medium	
Navigation	Expert → Application → Maths → Maths x → Medium Direct access code: 400110-0xx Examples: Maths 1: 400110-000; Maths 4: 400110-003
Description	Select a cooling medium. If the medium used is not in list, select ethylene glycol or propylene glycol. Only visible with energy package (option) and application = Water/glycol heat difference.
Selection	Ethylene-glycol, Antifrogen N, Glykosol N, Propylene-glycol
Factory setting	Ethylene-glycol

Water/glycol concentration Navigation Expert → Application → Maths → Maths x → Water/glycol concentration Direct access code: 400109-0xx Examples: Maths 1: 400109-000; Maths 4: 400109-003 Description Concentration of the water/glycol mixture in vol % (0-60 %). Only visible with energy package (option) and application = Water/glycol heat difference. User entry 0 to 60 % Factory setting 20 %

The result is

Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow The result is Direct access code: 400003-000 Examples: Maths 1: 400003-000: Maths 4: 400003-003
	Examples. Maths 1. 400005 000, Maths 4. 400005 005
Description	Configure which data type the calculation returns. This setting affects how the channel saves and is displayed.
	If you add 2 analog channels, for example, the result is an "instantaneous value". If 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.
Selection	Instantaneous value, State, Counter, Operating time from status, Operating time from total, Control input, Efficiency
Factory setting	Instantaneous value
Plot type	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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.
Selection	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.
Selection	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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Decimal point Direct access code: 400005-000 Examples: Maths 1: 400005-000; Maths 4: 400005-003
Description	Number of places after decimal point for the display. Only visible if function = Formula editor, Energy calculation, Mass calculation, Density calculation, Calculation of enthalpy and the result is = Instantaneous value, Counter or Efficiency.
Selection	None, One (X.Y), Two (X.YY), Three (X.YYY), Four (X.YYYY), Five (X.YYYYY)
Factory setting	One (X.Y)
Action	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Action Direct access code: 400006-000 Examples: Maths 1: 400006-000; Maths 4: 400006-003
Description	Set up the function of the control input. Only visible if the result is = Control input
Action	Description
---	---
Start/stop recording	The device only saves data as long as a high signal is present
Screensaver on	Switches backlighting/display off, low = off, high = on
Lock setup	The user can only change the setup if a low signal is present
Time synchronization	If a high signal is applied, the device rounds the system time up or down (only for Low \rightarrow High change): 0 to 29 \rightarrow round down; 30 to 59 \rightarrow round up
Change the group	The display switches to the next active group in the event of a Low \rightarrow High change.
Set point monitoring on/off	The entire set point monitoring function of the device can be switched on (for "High") or switched off (for "Low").
Individual LV on/off	Monitoring for a selected limit value can be switched on (for "High") or switched off (for "Low").
Block keyboard/navigator	The device can only be operated if a low signal is present. Otherwise all key activation and navigator actions are discarded.
Start/stop analysis 1-4	Starts/ends one of the max. 4 external analyses (the analysis runs only as long as the signal is high). Measured value acquisition for the graphic display continues. Batches are also started/ended with this function. Note: This function is not available in the case of batch and control input via a maths channel.
Reset batch number x (option)	Resets the automatically generated batch number (1x) 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.

Selection

Switched off, Start/stop recording, Screensaver on, Lock setup, Time synchronization, Change group, Set point monitoring on/off, Individual LV on/off, Block keyboard/ navigator, Start/stop analysis x, Reset batch no. x, Batch x limits on/off

Factory setting

Switched off

Set point	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ 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
Selection	Switched off, Limit x
Factory setting	Switched off

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
Selection	Not used, Relay x All the available relays are displayed.
Factory setting	Not used
Description 'H'	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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 on the display and saved to memory. Only visible if the result is = Control input or State
User entry	Text (max. 6 characters)
Factory setting	On
Description 'L'	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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 on the display and saved to memory. Only visible if the result is = Control input or State
User entry	Text (max. 6 characters)
Factory setting	Off
Save event	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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.
	Requires higher memory capacity.
	Only visible if the result is = Control input or State
Selection	No, Yes, only "On" message
Factory setting	Yes
Event message	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Event message Direct access code: 400018-00x Examples: Maths 1: 400018-000; Maths 4: 400018-003
Description	"Do not acknowledge": No message is shown if the state of the mathematics channel changes. "Acknowledge": A message window is shown on the screen which has to be acknowledged by operating a push button. Only visible if the result is = Control input or State
	Note: In the case of the DIN rail version, the message can only be acknowledged via the Web server!
Selection	Do not acknowledge, Acknowledge
Factory setting	Do not acknowledge
Event text L->H	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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</ss></mm></hhhh>
Selection	No, Yes
Factory setting	No
Zoom start	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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. The zoom has no influence on the storage. Only visible if the result is = Instantaneous value
User entry	Number (max. 8 digits)
Factory setting	0
Zoom end	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Zoom end Direct access code: 400017-00x Examples: Maths 1: 400017-000; Maths 4: 400017-003
Description	Like "Zoom start". Enter the upper value of the required range here. Only visible if the result is = Instantaneous value
User entry	Number (max. 8 digits)

Factory setting 100

Totalizer	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ 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.

Formula editor	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Formula Direct access code: 400002-000
	1 x = place holder for selected mathematics channel
	A text field with the formula currently used appears. If the field is empty a formula has not yet been defined for the mathematics channel.
Description	Individual channels can be mathematically linked and calculated with functions. The mathematics channels calculated in this way are treated as "real" channels, regardless of whether they are connected conventionally or via fieldbus. Enter the desired calculation formula.
	The formula can be any combination of arithmetic calculations and logical operations. Analog and digital channels can be used, as can mathematics channels that are already active
	A formula with up to 200 characters can be created using this editor. If the formula is finished, click OK to close the editor and accept the formula entered. The common entry and arithmetic operators and inputs are described in detail in the following sections.
	Inputs
	Inputs are described in the formula using the following syntax:

Input type (signal type;channel number)

Type of input	Description
AI	Analog inputs
DI	Digital inputs
MI	Mathematics inputs

Signal type	Description
1	Instantaneous value (measured value)
2	State
3	Counter/operational time
5	Validity: The validity of an analog channel or a mathematics channel is relayed.
	The relayed value of the function is 0 in the event of: • Open circuit • Invalid measured value • Sensor error • Input signal too high/low • Error value
	The relayed value of the function is 1 in the event of: Measured value OK, even if the limit value is breached
6	Delta count
7 to 10	Analysis 1 to 4
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)

Туре	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
1	Division
%	Modulo (remainder of division x/y), see function "mod"
^	x to the power of y

Relational operators:

Operator	Function
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to
=	Equals
<>	Not equal to

Logical operators:

Functi on	Syntax	Description	Example
	Value1 Value2	Logical "or" (see also function "or")	DI(2;1) DI(2;2)
&&	Value1 && Value2	Logical "and" (see also function "and")	DI(2;1) && DI(2;2)

Functions

Standard functions:

Functi on	Syntax	Description	Example
In	ln(number)	Returns the natural logarithm of a number. Natural logarithms are based on a constant e (2.71828182845904). For values ≤ 0 the result is undefined. The device continues with 0	ln(86) = 4.454347
log	log(number)	Calculates the logarithm of the argument for base 10. For values ≤ 0 the result is undefined. The device continues with 0.	log(10) = 1
exp	exp(number)	Exponentiates the base e with the number defined as the argument. The constant e is the basis of the natural logarithm and has the value 2.71828182845904.	exp(2.00) = 7.389056
abs	abs(number)	Returns the absolute value of a number. The absolute value of a number is the number without its algebraic sign.	abs(-1.23) = 1.23
pi	pi()	Returns the value of the number PI (3.14159265358979323846264)	
sqrt	sqrt(number)	sqrt calculates the positive square root of the argument "Number". The result is undefined for negative values. The device continues with 0.	sqrt(4) = 2
mod	mod(number; divisor)	Returns the remainder of a division. The result has the same algebraic sign as the divisor. If the divisor has the value 0, the result is undefined. The device continues with 0.	mod(5;2) = 1
rnd	rnd(number; number_digits)	 Rounds a number to a certain number of decimal places. "Number" is the number to which you wish to round up/down. "Number_digits" indicates to how many decimal places you wish to round the number up/down. Notes: If "Number_digits" is greater than 0 (zero), the number is rounded to the specified number of decimal places. If "Number_digits" is equal to 0, the number is rounded to the next whole number. If "Number_digits" is less than 0, the part of the number to the left of the decimal separator is rounded. 	rnd(2.15;1) = 2.2 rnd(2.149;1) = 2.1 rnd(-1.475;2) = -1.48 rnd(-1.473;2) = -1.47 rnd(21.5;-1) = 20 rnd(5.5;-2) = 10 rnd(5.5;-3) = 0

Trigonometric functions:

Functi on	Syntax	Description	Example
rad	rad(number)	Conversion from degrees to radian	rad(270) = 4.712389
degree s	degrees (number)	Conversion from radian to degrees	grad(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:

Functi on	Syntax	Description	Example
sin	sin(number)	Returns the sine of a number	sin(pi()) -> sine of pi radian sin(30*pi()/180) -> sine of 30 degrees (0.5)
cos	cos(number)	Conversion from radian to degrees	grad(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:

Functi on	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 event of values outside this range, the device continues with 0.	arcsin(-0.5) = - 0.5236 arcsin(-0.5)*180/ pi() = -30°
acos	acos(number)	Returns the arc cosine or inverse cosine of a number (inverse function). The arc cosine expects a real argument in the range from -1 to +1. In the event of values outside this range, the device continues with 0.	arccos(-0.5) = 2.094395
atan	atan(number)	Returns the arc tangent or inverse tangent of a number (inverse function).	atan(1) = 0.785398

Logical functions:

Functi on	Syntax	Description	Example
if	if(check; then_value; otherwise_value)	"Check" is any value or expression; the result can be TRUE or FALSE. This argument can adopt any comparison calculation operator. "Then_value" is the value returned if "Check" is TRUE. "Otherwise_value" is the value returned if "Check" is FALSE.	if(x>10;1;0) If value x is greater than 10 the function returns 1, otherwise 0
or	or(true1;true2)	Returns TRUE if an argument is TRUE. Returns FALSE if all arguments are FALSE. Note: See also operator " "	or(2>1;3>2) = true or(2<1;3>2) = true or(2<1;3<2) = false
and	and(true1;true2)	Returns TRUE if both arguments are TRUE. If one of the arguments is FALSE, this function returns the value FALSE Note: See also operator "&&"	and(2>1;3>2) = true and(2<1;3<2) = false
not	not(truth value)	Inverts the value of an argument. NOT can be used to specify that a value does not match a specific value.	not(false) = true

XX in the following functions stands for one of the inputs described under $\rightarrow \cong 221$. Range functions can only ever be executed via one input type.

Range functions:

Functi on	Syntax	Description	Example
sumX X	sumXX(Type;Fro m;To)	Totals the values for the specified range of input signals. "Type": Signal type (see $\rightarrow \textcircled{221}$) "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;Fro m;To)	Calculates the average for the specified range of input signals.	avgXX(1;1;6)
minXX	minXX(Type;Fro m;To)	Returns the minimum value for the specified range of input signals.	minXX(1;1;6)
maxX X	maxXX(Type;Fro m;To)	Returns the maximum value for the specified range of input signals.	maxXX (1;1;6)

Date/time functions:

Functi on	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.

Navigation	$ Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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.
Selection	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.
Selection	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.
Selection	mm, Inch
Factory setting	mm

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

d at 20 °C

Navigation	 Expert → Application → Maths → Maths x → DP-Flow → d at 20°C Direct access code: 400120-00x Examples: Maths 1: 400120-000; Maths 4: 400120-003
Description	Internal pipe diameter of the throttle (d) under design conditions at 20 $^\circ$ C/68 $^\circ$ F.
User entry	Number (max. 8 characters)
Factory setting	70 (mm or inches)

K-factor	
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ DP-Flow \rightarrow K-factor Direct access code: 400121-00x Examples: Maths 1: 400121-000; Maths 4: 400121-003
Description	Set the K-factor (blockage factor) for the pitot tube (see nameplate on the probe). Only visible if type = Pitot tube
User entry	Number (max. 8 characters)
Factory setting	0.6

Pipe material

Navigation		Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow DP-Flow \rightarrow Pipe material Direct access code: 400127-00x Examples: Maths 1: 400127-000; Maths 4: 400127-003
Description	Mater	ial of the pipe.
Selection	C-stee 1.4922	l, stainless steel, 1.5415 / A182F1, 1.7335 / A182F12, 1.7380 / A182F22, 2, 1.4401 / 316, 1.4404 / 316L, 1.4571 / 316Ti

Factory setting C-steel

Density		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ DP-Flow \rightarrow 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 = DP-Flow liquids or DP-Flow gas	
election	Switched off, Universal input x, Digital input x, Maths x All active inputs are available for selection.	
actory setting	Switched off	
Density unit		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ DP-Flow \rightarrow 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 = DP-Flow liquids or DP-Flow gas	
Selection	kg/m³, lb/ft³	
Factory setting	kg/m ³	
Design density		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ DP-Flow \rightarrow Design density Direct access code: 400125-00x Examples: Maths 1: 400125-000; Maths 4: 400125-003	
Description	Density under design conditions (at design pressure/temperature). Only visible if type = V-Cone or Gilflo	
Jser entry	Number (max. 8 characters)	
Factory setting	1000 (kg/m ³ or lb/ft ³)	

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 = DP-Flow gas	
User entry	Number (max. 8 characters)	
Factory setting	1,2	

"Viscosity" submenu		
Navigation	$ \blacksquare \text{Expert} \rightarrow \text{Application} \rightarrow \text{Maths} \rightarrow \text{Maths x} \rightarrow \text{DP-Flow} \rightarrow \text{Viscosity} $	
Description	Input of the viscosity at two support points. (Needed to calculate the Reynolds number and flow coefficient). Only visible if application = DP-Flow liquids or DP-Flow gas	
Point 1		
Temperature		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow DP-Flow \rightarrow Viscosity \rightarrow 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow DP-Flow \rightarrow Viscosity \rightarrow Viscosity Direct access code: 400131-00x Examples: Maths 1: 400131-000; Maths 4: 400131-003	
Description	Viscosity at the specified temperature.	
User entry	Number (max. 8 characters)	
Factory setting	1 cp	

Point 2			
Temperature			
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ DP-Flow \rightarrow Viscosity \rightarrow 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow DP-Flow \rightarrow Viscosity \rightarrow 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 ср		
"Totalization" submenu			
Navigation	$ \qquad \qquad$		
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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Totalization \rightarrow 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.		
Selection	No, Yes		

Factory setting	No		
Totalization base			
Navigation	Expert → Application → Maths → Maths x → Totalization → Totalization base Direct access code: 400051-00x Examples: Maths 1: 400051-000; Maths 4: 400051-003		
Description	Select the required time base. Example: ml/s -> time base seconds (s); m ³ /h -> time base hours (h). Only visible if totalization = Yes		
Selection	Second (s), Minute (min), Hour (h), Day (d)		
Factory setting	Second (s)		
Unit			
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Totalization \rightarrow 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		
Selection	kWh, MWh, MJ, GJ, kBtu, MBtu, tonh, therm, kg, t, lbs, ton		
Low flow cut off			
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Totalization \rightarrow 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Totalization \rightarrow 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Totalization \rightarrow 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	$ \qquad \qquad \text{Expert} \rightarrow \text{Application} \rightarrow \text{Maths} \rightarrow \text{Maths} \text{ x} \rightarrow \text{Linearization} $		

DescriptionLinearization settings.Only visible if function = Formula editor

Linearization			
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Linearization \rightarrow Linearization Direct access code: 400301-00x Examples: Maths 1: 400301-000; Maths 4: 400301-003		
Description	Specify whether this input should be linearized.		
Selection	No, Yes		
Factory setting	No		
Number of points			
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Linearization \rightarrow 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 must always correspond to the start and end of the measuring range respectively.		
User entry	2 to 32		
Factory setting	2		
Dim. linearized value			
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Linearization \rightarrow 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 must always correspond to the start and end of the measuring range respectively.		
User entry	Text (max. 6 characters)		
Zoom start			
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ Linearization \rightarrow 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. The zoom has no influence on the storage.	
User entry	Number (max. 8 characters)	
Factory setting	0	
Zoom end		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Linearization \rightarrow Zoom end Direct access code: 400305-00x Examples: Maths 1: 400305-000; Maths 4: 400305-003	
Description	Like "Zoom start". Enter the upper value of the required range here. Example: Transmitter 0-14 pH, required section: 5-9 pH. Here: "9".	
User entry	Number (max. 8 characters)	
Factory setting	100	
"Points" submenu		
Navigation	$ \blacksquare \text{Expert} \rightarrow \text{Application} \rightarrow \text{Maths} \rightarrow \text{Maths } x \rightarrow \text{Linearization} \rightarrow \text{Points} $	
Description	Enter the support points of the linearization table here. Note: The first and last point must always 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Linearization \rightarrow Points \rightarrow 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.	
Selection	No, Yes	
Factory setting	No	

Sort table

Navigation		Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Linearization \rightarrow Points \rightarrow Sort table Direct access code: 400307-00x Examples: Maths 1: 400307-000; Maths 4: 400307-003
Description	You ca	an sort the linearization table here.
Selection	No, Ye	2S
Factory setting	No	

x-value (1 to 32)

Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths $x \rightarrow$ Linearization \rightarrow Points \rightarrow x-value (1 to 32) Direct access code, x-value 1: 400310-00x Direct access code, x-value 2: 400312-00x Examples: Maths 1, x-value 1: 400310-000; Maths 4: 400310-003
Description	x-value for the linearization (value from the device input). e.g. 10 cm corresponds to 20 liters> enter 10.
User entry	Number (max. 8 characters)
Factory setting	0

y-value (1 to 32)		
Navigation	 Expert → Application → Maths → Maths x → Linearization → Points → y-value (1 to 32) Direct access code, y-value 1: 400311-00x Direct access code, y-value 2: 400313-00x Examples: Maths 1, y-value 1: 400311-000; Maths 4: 400311-003 	
Description	Enter the y-value 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Fault mode
Description	Cont inpu	ains settings that define how this channel is to react under fault conditions (e.g. if an t channel has a cable open circuit or there is division by 0).

Wet steam alarm		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Fault mode \rightarrow 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	
Selection	Counter stop, Saturated steam calculation	
Factory setting	Counter stop	
On error		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Fault mode \rightarrow 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).	
Selection	Invalid calculation, Error value	
Factory setting	Invalid calculation	
Error value		
Navigation	Expert \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow Fault mode \rightarrow 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 \rightarrow Application \rightarrow Maths \rightarrow Maths x \rightarrow 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.
Selection	No, In maths. channel x Users can choose from all the available maths channels.
Factory setting	No

"Signal analysis" subm	enu	
Navigation	$ \qquad \qquad$	
Description	Contains settings for signal analysis (saving).	
Analysis x		
Navigation	Expert \rightarrow Application \rightarrow Signal analysis \rightarrow 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.	
	If the "Controlled externally" option is to be used, a digital input or a maths channel must be set to "Function = Control input" and "Action = Start/stop analysis x".	
Selection	Switched off, Controlled externally, 1min, 2min, 3min, 4min, 5min, 10min, 15min, 30min, 1h, 2h, 3h, 4h, 6h, 8h, 12h Daily analysis, Weekly analysis, Monthly analysis, Annual analysis	
Factory setting	Switched off	
Synchron. time		
Navigation	Expert \rightarrow Application \rightarrow Signal analysis \rightarrow 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 of the actual day until 07:00 of the following day.	
User entry	Time	

Factory setting

00:00

Week starting on		
Navigation	Expert \rightarrow Application \rightarrow Signal analysis \rightarrow 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	
Selection	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday	
Factory setting	Monday	
Alarm statistics ("Tel	ealarm" option)	
Navigation	Expert → Application → Signal analysis → Alarm statistics Direct access code: 440006-000	
Description	The following data can be determined via the signal analysis cycles (e.g. daily analysis): How often was the set point violated How long was the set point violated 	
Selection	No, Yes	
Factory setting	No	
Group days ("Teleala	rm" option)	
Navigation	Expert → Application → Signal analysis → Group days Direct access code: 440008-000	
Description	Set up 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 alarm took place (e.g. required for the number of overflows in a storm overflow tank).	
Selection	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.
Selection	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.

Selection	Please select, Universal input x, Digital input x, Maths x, Limit x, Relay x All active inputs are available for selection.
Factory setting	Please select

"Automatic printout	" submenu
Navigation	$ \qquad \qquad$
Description	Specify whether an automatic print-out should follow at the end of an evaluation.
	The printout is only made if a USB printer is connected to the device or a network printer is available. For supported printers please refer to the Operating Instructions. If the Batch option is selected, the printout is configured in the Batch mode/Print menu.
Analysis x	
Navigation	Expert → Application → Signal analysis → Automatic printout → Analysis x Direct access code, analysis 1: 440020-000 Direct access code, analysis 2: 440021-000 Direct access code, analysis 3: 440022-000 Direct access code, analysis 4: 440023-000
Description	Specify whether an automatic print-out should follow at the end of an evaluation.
	The print-out is only made if a USB printer is connected to the device! For supported printers please refer to the Operating Instructions. If the Batch option is selected, the printout is configured in the Batch mode/Print menu.
Selection	No, Yes

Factory setting	No
"Limits" submenu	
Navigation	$\Box \text{Expert} \rightarrow \text{Application} \rightarrow \text{Limits}$
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 \rightarrow Application \rightarrow Limits \rightarrow Add limit value Direct access code: 450300-000
Description	Adding a new limit value.
Selection	No, Yes
Factory setting	No
Delete limit value	
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Delete limit value Direct access code: 450301-000
Description	Deleting a limit value from the list.
Selection	No, Limit value x
Factory setting	No
Change limits This function is no	ot supported by the DIN rail version .

Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Change limits 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.
Selection	Only in setup, Outside of setup also

Factory setting	Only in setup
"Limit x" submenu	
Navigation	$ \qquad \qquad \text{Expert} \rightarrow \text{Application} \rightarrow \text{Limits} \rightarrow \text{Limit x} $
Description	View or change the setup for the selected alarm set point. x = place holder for selected limit value
Channel/value	
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Channel/value Direct access code: 450000-0xx Examples: Limit 1: 450000-000; Limit 30: 450000-029
Description	Select which input/calculated value the limit value refers to.
Selection	Switched off, Universal input x, Digital input x, Maths x, Limit x
Factory setting	Switched off
Туре	
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Type Direct access code: 450001-0xx Examples: Limit 1: 450001-000; Limit 30: 450001-029
Description	Type of limit value (depends on the input variable).
Selection	Switched off, Upper set point, Lower set point, Analysis x, Gradient dy/dt, Analysis x frequency, Analysis x duration, Inband, Outband

Description of the individual set point types

Set point type/function	Description
Hysteresis	For every set point, the switch point can be controlled via a hysteresis. The hysteresis is set as an absolute value (only positive values) in the unit of the respective channel (e.g. upper set point = 100 m, hysteresis = 1 m: set point on = 100 m, set point off = 99 m)
Upper set point	The limit value is active if the value exceeds the configured value. The limit value is switched off if the limit value, including hysteresis, is undershot. Measured value Setpoint Threshold "off" Hysteresis t Setpoint "on" Setpoint "off"
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.
	Measured value Threshold "off" Setpoint Threshold "off" Setpoint Threshold "off" Setpoint Threshold "off" Setpoint Threshold "off" Setpoint Threshold "off" Setpoint Threshold "off" Setpoint Threshold "off" Setpoint Threshold "off" Setpoint Threshold "Setpoint" Setpoint "Setpoint" Setpoint "Setpoint" Setpoint "Setpoint" Setpoint "Setpoint" "Setpoint" Setpoint "Setpoint" "S

Set point type/function	Description
Gradient dy/dt	The "Gradient" operating mode is used to monitor the temporal change of the input signal. The alarm is triggered if the measured value reaches or exceeds the preset value. If a positive value is set, the limit value is monitored from increasing gradients. In the case of negative values the decreasing gradient is monitored. The alarm is canceled when the gradient drops below the preset value. A hysteresis is not possible in the Gradient operating mode. The alarm can be suppressed for the set time delay (unit: seconds s) in order to decrease the sensitivity.
	Measured value
	M_{0} $\stackrel{M_{0}}{=} Set point$ $M_{0.m}$ T_{m} $Setpoint "on"$ $Setpoint "off"$ $A000108-EN$
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.
	Measured value
	Setpoint Hysteresis
	Setpoint Hysteresis
	active
	Setpoint not active
	A0010192-EN



Description Name of the limit for identification purposes.

- User entry Text (max. 16 characters)
- Factory setting Limit x

Set point		
Navigation	 Expert → Application → Limits → Limit x → Set point Direct access code: 450003-0xx Examples: Limit 1: 450003-000; Limit 30: 450003-029 	
Description	Limit value in the set process unit, e.g. in °C, m³/h	
User entry	Number (max. 10 digits)	
Factory setting	0	
Set point 2		
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Set point 2 Direct access code: 450017-0xx Examples: Limit 1: 450017-000; Limit 30: 450017-029	
Description	Enter the upper limit value for the band. Only visible if type = Inband or Outband	
User entry	Number (max. 8 digits)	
Factory setting	0	
Time span dt		
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Time span dt Direct access code: 450014-0xx Examples: Limit 1: 450014-000; Limit 30: 450014-029	
Description	Time span within which the signal must change by the specified value before it is recognized as a set point. Note: max. 60 seconds. Only visible if type = Gradient dy/dt	
User entry	0 to 60 s	

Hysteresis (abs.)

Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Hysteresis (abs.) Direct access code: 450004-0xx Examples: Limit 1: 450004-000; Limit 30: 450004-029
Description	The alarm condition is only canceled when the signal has changed into the normal operation range by the preset value.
User entry	Number (max. 8 digits)
Factory setting	0
Time delay	
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Time delay Direct access code: 450005-0xx Examples: Limit 1: 450005-000; Limit 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 \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Switches Direct access code: 450006-0xx Examples: Limit 1: 450006-000; Limit 30: 450006-029
Description	Switches the appropriate output in the limit value state.
Selection	Not used, Relay x
Factory setting	Not used
LV messages	
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow LV messages Direct access code: 450007-0xx Examples: Limit 1: 450007-000; Limit 30: 450007-029

Description	"Do not acknowledge": Alarm condition is signaled by highlighting the tag name in red (no message is output). "Acknowledge": In the event of an alarm, a message is also displayed. This message then has to be acknowledged.	
	Note: In the case of the DIN rail version, the message can only be acknowledged via the Web server!	
Selection	Do not acknowledge, Acknowledge	
Factory setting	Do not acknowledge	
Save event		
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Save event Direct access code: 450008-0xx Examples: Limit 1: 450008-000; Limit 30: 450008-029	
Description	Stores a message in the event log on limit value violation.	
Selection	No, Yes, only "On" message	
Factory setting	Yes	
Event text LV on		
Navigation	Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Event text LV on Direct access code: 450009-0xx Examples: Limit 1: 450009-000; Limit 30: 450009-029	
Description	This text (including date and time) is shown on the display and/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 \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Event text LV off Direct access code: 450010-0xx Examples: Limit 1: 450010-000; Limit 30: 450010-029	
Description	The same as "Event text LV on", but on return from alarm to normal condition.	
User entry	Text (max. 22 characters)	

Record duration of LV on		
Navigation		Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Record duration of LV on Direct access code: 450011-0xx Examples: Limit 1: 450011-000; Limit 30: 450011-029
Description	The d "Limit Powe powe	luration of a set point violation can be recorded. The duration is appended to the t value off" event text (format: <hhhh>h<mm>:<ss>). r failure times do not affect the duration. If the set point was violated before the r failure and is still violated after the power failure, the duration continues.</ss></mm></hhhh>
Selection	No, Y	es
Factory setting	No	
Reset relay		
Navigation		Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Reset relay Direct access code: 450016-0xx Examples: Limit 1: 450016-000; Limit 30: 450016-029
Description	If LV no longer violated: the relay is switched as long as the set point is violated. After acknowledging message: even if the set point is no longer violated, the relay remains switched until the message has been acknowledged. If the set point is still violated when the message is acknowledged, the relay stays switched until the set point is no longer violated. Up to message acknowledgment: the relay remains active until the message is acknowledged or the set point is no longer active.	
Selection	If LV	no longer violated, After acknowledging message, Up to message acknowledgment
Factory setting	If LV	no longer violated
Save cycle		
Navigation		Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Save cycle Direct access code: 450012-0xx Examples: Limit 1: 450012-000; Limit 30: 450012-029
Description	Norm Alarn highe	nal: Save in normal store cycle. n cycle: Fast storage during an alarm violation, e.g. every second. Caution: Requires er memory capacity!
	i	 The save cycle is set under signal groups . In the event of an alarm violation, all the groups are saved in the alarm cycle.
Selection	Norm	al, Alarm cycle

Factory setting Normal Draw help line This function is **not** supported by the **DIN rail version**. 1 Navigation Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Draw help line Direct access code: 450013-0xx Examples: Limit 1: 450013-000; Limit 30: 450013-029 Description The user can configure whether this set point should be displayed in the graphic as a help line (in the color of the channel). Note: 4 lines can be shown per channel in a single group. Selection No, Yes **Factory setting** No Copy settings Navigation Expert \rightarrow Application \rightarrow Limits \rightarrow Limit x \rightarrow Copy settings Direct access code: 450200-0xx Examples: Limit 1: 450200-000; Limit 30: 450200-029 Description Copies settings from actual channel to selected channel. Selection No, In limit x (all the limit values are displayed) **Factory setting** No "Batch mode" submenu (option) Navigation Expert \rightarrow Application \rightarrow Batch mode Description Contains settings for the batch mode. Detailed descriptions of this device option can be found in the associated H documentation. "Signal groups" submenu Navigation Expert \rightarrow Application \rightarrow Signal groups

Description	Group the analog, digital and/or mathematics channels such that you can call up important information during operation (e.g. temperatures, signals in plant unit 1).		
	 Maximum 8 channels per group! High speed storage (100ms) is only available in group 1. 		
"Group x" submenu			
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x		
Description	x = place holder for selected group		
	General settings for displaying the measured value and saving data.		
Identifier			
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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).		
Selection	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		
Description Selection Factory setting	 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). Off, 100ms (only for group 1), 1s, 2s, 3s, 4s, 5s, 10s, 15s, 20s, 30s, 1min, 2min, 3min, 4min, 5min, 10min, 15min, 30min, 1h 1min 		

Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Alarm cycle Direct access code: 460002-0xx Examples: Group 1: 460002-000; Group 4: 460002-003	
Description	Configure the save cycle with which this group should be saved in an alarm condition (limit value violation). Caution: Requires higher memory capacity.	
Selection	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 \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Display blue Direct access code: 460003-00x Examples: Group 1: 460003-000; Group 4: 460003-003	
Description	Choose which input/calculated variable should be displayed in this group.	
Selection	Switched off, Universal input x, Digital input x, Maths x	
Factory setting	Switched off	
Display		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.	
	If the "Everything" option is selected, the device switches cyclically between the various values of the channel (instantaneous value, analysis 1 etc.)	
Selection	Instantaneous value/state, Analysis x, Totalizer, Everything	
Factory setting	Instantaneous value/state	
Display black		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Display black Direct access code: 460005-00x Examples: Group 1: 460005-000; Group 4: 460005-003	
Description	Choose which input/calculated variable should be displayed in this group.	
Selection	Switched off, Universal input x, Digital input x, Maths x	
-----------------	--	--
Factory setting	Switched off	
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.	
Selection	Instantaneous value/state, Analysis x, Totalizer, Everything	
Factory setting	Instantaneous value/state	
Display red		
Navigation	Expert → Application → Signal groups → Group x → Display red Direct access code: 460007-00x Examples: Group 1: 460007-000; Group 4: 460007-003	
Description	Choose which input/calculated variable should be displayed in this group.	
Selection	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.	
Selection	Instantaneous value/state, Analysis x, Totalizer, Everything	
Factory setting	Instantaneous value/state	

Display green

Navigation		Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Display green Direct access code: 460009-00x Examples: Group 1: 460009-000; Group 4: 460009-003
Description	Choos	e which input/calculated variable should be displayed in this group.
Selection	Switch	ned off, Universal input x, Digital input x, Maths x
Factory setting	Switch	ned off

Display	
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.
Selection	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.
Selection	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.
Selection	Instantaneous value/state, Analysis x, Totalizer, Everything
Factory setting	Instantaneous value/state

Display orange		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Display orange Direct access code: 460013-00x Examples: Group 1: 460013-000; Group 4: 460013-003	
Description	Choose which input/calculated variable should be displayed in this group.	
Selection	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.	
Selection	Instantaneous value/state, Analysis x, Totalizer, Everything	
Factory setting	Instantaneous value/state	
Display cyan		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Display cyan Direct access code: 460015-00x Examples: Group 1: 460015-000; Group 4: 460015-003	
Description	Choose which input/calculated variable should be displayed in this group.	
Selection	Switched off, Universal input x, Digital input x, Maths x	
Factory setting	Switched off	
Display		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.	

Selection	Instantaneous value/state, Analysis x, Totalizer, Everything	
Factory setting	Instantaneous value/state	
Display brown		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Display brown Direct access code: 460017-00x Examples: Group 1: 460017-000; Group 4: 460017-003	
Description	Choose which input/calculated variable should be displayed in this group.	
Selection	Switched off, Universal input x, Digital input x, Maths x	
Factory setting	Switched off	
Display		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.	
Selection	Instantaneous value/state, Analysis x, Totalizer, Everything	
Factory setting	Instantaneous value/state	
Grid divisions		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.	
Selection	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

XT • . .		
Navigation		Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Min. decade Direct access code: 460020-0xx Examples: Group 1: 460020-000; Group 4: 460020-003
Description	Set th	e decade from which the display should be split.
Selection	1, 10	100, 1000, 10000, 1000000, 10000000
Factory setting	1	
Max. decade		
Novigation		Expert λ Application λ Signal groups λ Croup μ λ May 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.
Selection	1, 10, 100, 1000, 10000, 100000, 1000000, 10000000
Factory setting	10000

Curve display

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

Navigation	 Expert → Application → Signal groups → Group x v Curve display Direct access code: 460022-0xx Examples: Group 1: 460022-000; Group 4: 460022-003
Description	The instantaneous values are displayed as standard for the measured value curves. Alternatively, this current value display can also be disabled which means that more data can be shown on the display as a result.
Selection	No instantaneous values, With instantaneous values
Factory setting	With instantaneous values

Curve display

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

Navigation

Expert → Application → Signal groups → Group x → Curve display Direct access code: 460023-0xx Examples: Group 1: 460023-000; Group 4: 460023-003

Description	Configure the background color for the curve display.
Selection	White background, Black background
Factory setting	White background

Zoom

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

Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.).
Selection	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

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

Navigation	Expert → Application → Signal groups → Group x → Bargraph Direct access code: 460024-0xx Examples: Group 1: 460024-000; Group 4: 460024-003
Description	Configure the direction in which the bar graphs should be drawn.
Selection	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 \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Batch assignment Direct access code: 460025-0xx Examples: Group 1: 460025-000; Group 4: 460025-003

Description	 Configure what batch this group belongs to. Channels can be assigned to multiple batches/groups. Only relevant for batch printout.
Selection	Do not assign any batch, Assign all batches, Batch x
Factory setting	Assign all batches

Save group (Batch option)		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow 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.	
Selection	Only when batch is active, Always	
Factory setting	Always	

"Circular chart" submenu		
This function is not supported by the DIN rail version .		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Circular chart	
Description	Contains settings for the circular chart.	
1 revolution =		
Navigation	Expert \rightarrow Application \rightarrow Signal groups \rightarrow Group x \rightarrow Circular chart \rightarrow 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.	
Selection	1 hour , x hours , 1 day, x days	
Factory setting	1 hour	

"E-mail" submenu

Navigation	Expert \rightarrow Application \rightarrow E-mail In the case of the "Telealarm" option under Expert \rightarrow Application \rightarrow Telealarm \rightarrow General \rightarrow Setup e-mail
Description	Contains settings required if alarms are to be transmitted by e-mail. Test the e-mail settings under Diagnostics \rightarrow Simulation \rightarrow E-mail.
SMTP host	
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow 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 \rightarrow Application \rightarrow E-mail \rightarrow 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.
Selection	No, Yes (SMTPS), Yes (STARTTLS)
Factory setting	No
Port	
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow 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 \rightarrow Application \rightarrow E-mail \rightarrow 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.
	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 \rightarrow Application \rightarrow E-mail \rightarrow 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 \rightarrow Application \rightarrow E-mail \rightarrow 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" s	submenu
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow 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 \rightarrow Application \rightarrow E-mail \rightarrow Limit value violations	
Description	Specify who should receive e-mails when limit value violations occur (both on and off messages).	
	Only for limit values where "Save message" is set to "Yes".	
Recipient x		
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow Limit value violations \rightarrow Recipient x Direct access code: Recipient 1: 510110-000; Recipient 2: 510111-000	
Description	Select who should receive the e-mail.	
Selection	Not used, E-mail address x	
Factory setting	Not used	
"On/off messages" su	bmenu	
Navigation	$ Expert \rightarrow Application \rightarrow E-mail \rightarrow On/off messages $	

Specify who should receive e-mails when "on"/"off" messages occur (for digital inputs or maths channels).

Only for inputs where "Save event" is set to "Yes".

Recipient x

Navigation

Description

Description	Select who should receive the e-mail.	
Selection	Not used, E-mail address x	
Factory setting	Not used	
"Errors (Fxxx/Sxxx)" submer	ıu	
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow Errors (Fxxx/Sxxx)	
Description	Specify who should receive e-mails when errors occur (Fxxx and Sxxx messages).	
Recipient x		
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow Errors \rightarrow Recipient x Direct access code: Recipient 1: 510120-000; Recipient 2: 510121-000	
Description	Select who should receive the e-mail.	
Selection	Not used, E-mail address x	
Factory setting	Not used	
"Maintenance required" (sul	omenu)	
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow Maintenance required	
Description	Specify who should receive e-mails when maintenance is required (Mxxx messages).	
Recipient x		
Navigation	Expert \rightarrow Application \rightarrow E-mail \rightarrow Maintenance required \rightarrow Recipient x Direct access code: Recipient 1: 510130-000; Recipient 2: 510131-000	
Description	Select who should receive the e-mail.	
Selection	Not used, E-mail address x	
Factory setting	Not used	

```
"Printer" submenu
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Navigation

Description

Contains printer settings.

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

Parameter	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
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

This function is not supported by the DIN rail version .		
Navigation	$ Expert \rightarrow Application \rightarrow 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.	
Selection	Not used, Safe SD card removal, Remove USB stick safely, Printout, Enter batch info, Event log / audit trail, Historic measured values, Log onto device, Log out from device, Screenshot, Search in trace, Show analyses, Change set point, Next group, Operation	

Factory setting	Softkey 1: Event log/audit trail Softkey 2: Historic measured values Softkey 3: Search in trace
"Texts" submenu	
Navigation	$ Expert \rightarrow Application \rightarrow 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 \rightarrow Application \rightarrow Texts \rightarrow 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" subm	enu (option)	
Navigation		Expert \rightarrow Application \rightarrow Wastewater
Description	Cont	ains settings for using the device in the wastewater sector.
	i	Detailed descriptions of this device option can be found in the associated documentation.

"Telealarm" submenu (o	pption)
Navigation	$\Box \text{Expert} \rightarrow \text{Application} \rightarrow \text{Telealarm}$
Description	Contains settings for alerts via a modem connected to the device or by e-mail. Detailed descriptions of this device option can be found in the associated documentation.

"WebDAV Client" submenu

Navigation

Description

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

Parameter	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.	472000-000
	Only possible using the Ethernet interface!	
	Options: No, Yes, Yes (SSL) Factory setting: No	
IP address	Enter the IP address of the WebDAV server here.	472001-000
	A DNS name can also be used.	
	User entry: IP address Factory setting: 0.0.0.0	
Port	This communication port is used to communicate with the WebDAV Server.	472002-000
	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: Numbers (max. 5 digits) Factory setting: 80	
User name	Input of the user name that can access the WebDAV server. User entry: Text (max. 20 characters)	472004-000
Password	Password for accessing the WebDAV server. User entry: Text (max. 20 characters)	472007-000
Directory	Enter the directory in which the data should be saved. User entry: Text (max. 120 characters)	472005-000
Save as	"Protected format": All data is stored in a manipulation protected encrypted format. This data can only be visualized by the PC analysis software supplied. "Open format": Data is stored in a CSV format, this can be opened by a number of different programs (for e.g. MS Excel) (Attention: no manipulation security). Options: Protected format, Open format (*.csv) Factory setting: Protected format	472010-000

Test the WebDAV client settings under "Diagnostics \rightarrow Simulation \rightarrow WebDAV client".

17.1.6 "Diagnostics" submenu

Device information and service functions for a quick device check.



 Actual diagnostics

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

 Description
 Displays the current diagnosis message.

Last diagnostics		
Navigation		Expert \rightarrow Diagnostics \rightarrow Last diagnostics Direct access code: 050005-000
Description	Disp	lays the last diagnosis message.
Last restart		
Navigation		Expert → Diagnostics → Last restart Direct access code: 050010-000
Description	Info	rmation as to when the device was last restarted (e.g. due to a power failure).
"Event log" submenu		
Navigation		Expert \rightarrow Diagnostics \rightarrow Event log
Description	Even time	its such as alarm set point infringement and power failure are listed in the correct sequence.
"Device information" sub	omenu	
Navigation		Expert \rightarrow Diagnostics \rightarrow Device information
Description	Disp	lays important device information.
Device tag		
Navigation		Expert \rightarrow Diagnostics \rightarrow Device information \rightarrow Device tag Direct access code: 000031-000
Description	Indiv	<i>r</i> idual device tag name/unit identifier (max. 32 characters).
Serial number		
Navigation		Expert \rightarrow Diagnostics \rightarrow Device information \rightarrow Serial number Direct access code: 000027-000
Description	Indiv parts	<i>r</i> idual serial number of the device. Please provide these details when ordering spare s or asking any questions about the unit.

Order code	
Navigation	Expert \rightarrow Diagnostics \rightarrow Device information \rightarrow 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 replacement device. To check the ordered device features using the delivery note.
Firmware version	
Navigation	Expert \rightarrow Diagnostics \rightarrow Device information \rightarrow 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 \rightarrow Diagnostics \rightarrow Device information \rightarrow 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 \rightarrow Diagnostics \rightarrow Device information \rightarrow 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 \rightarrow Diagnostics \rightarrow Device information \rightarrow Device name Direct access code: 000021-000
Description	Displ	ays the device name. Please send these details with any questions about the unit.
Manufacturer ID		
Navigation		Expert \rightarrow Diagnostics \rightarrow Device information \rightarrow Manufacturer ID Direct access code: 000022-000
Description	Displ	ays the manufacturer ID. Please send these details with any questions about the unit.
Manufacturer name		
Navigation		Expert \rightarrow Diagnostics \rightarrow Device information \rightarrow Manufacturer name Direct access code: 000023-000
Description	Displ unit.	ays the manufacturer name. Please send these details with any questions about the
Firmware		
Navigation		Expert \rightarrow Diagnostics \rightarrow Device information \rightarrow Firmware Direct access code: 009998-000
Description	Displ abou	ays the installed firmware of the device. Please send these details with any questions t the unit.
"Simulation" submenu		
Navigation		Expert \rightarrow Diagnostics \rightarrow Simulation
Description	Settii	ngs for simulation mode.
Operating mode		
Navigation		Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow 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).
Selection	Normal operation, Simulation
Factory setting	Normal operation

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