



SHD 200 Handbook

Control unit for 4...20 mA/HART[®] field devices

Electronic Revision: ER 1.0.0

The documentation is only complete when used in combination with the relevant documentation for the field device.

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1.1 Certifications

CE marking



The device meets the essential requirements of the EU directives. The CE marking indicates the conformity of the product with the union legislation applying to the product and providing for CE marking.

For full information of the EU directives and standards and the approved certifications, please refer to the EU declaration on the KROHNE website.

Other approvals and standard

- NAMUR recommendation NE 6, NE 21, NE 43, NE 53, NE 107

1.2 Software history



INFORMATION!

In the table below, "x" is a placeholder for possible multi-digit alphanumeric combinations, depending on the available version.

Changes and effect on compatibility

1	Downwards compatible changes and fault repair with no effect on operation (e.g. spelling mistakes on display)	
2- <u> </u>	Downwards compatible hardware and/or software change of interfaces:	
	H	HART®
	P	PROFIBUS
	F	Foundation Fieldbus
	M	Modbus
	X	all interfaces
3- <u> </u>	Downwards compatible hardware and/or software change of inputs and outputs:	
	I	Current output
	F, P	Frequency / pulse output
	S	Status output
	C	Control input
	CI	Current input
	X	all inputs and outputs
4	Downwards compatible changes with new functions	
5	Incompatible changes, i.e. electronic equipment must be changed.	

Release date	Electronic revision	Changes and compatibility	Documentation
04.10.2019	ER 1.0.0		MA SHD 200 R01

1.3 Intended use

**DANGER!**

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

**CAUTION!**

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

**WARNING!**

If the device is not used according to the operating conditions (refer to chapter "Technical data"), the intended protection could be affected.

**INFORMATION!**

This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

**INFORMATION!**

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The SHD 200 is a control unit for 4...20 mA/HART[®] field devices. The intended use is process control by using the relays, the second current output and the NAMUR NE 107 signalisation by LEDs for the HART[®] parameters of the connected field device. The device has been constructed for indoor and outdoor use below the maximum altitude of 2000 m / 6562 ft.

1.4 Safety instructions from the manufacturer

1.4.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

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completely against access by third parties.

We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.4.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.4.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation or operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.4.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of icons as shown below.

1.4.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



DANGER!

This warning refers to the immediate danger when working with electricity.



DANGER!

This warning refers to the immediate danger of burns caused by heat or hot surfaces.



DANGER!

This warning refers to the immediate danger when using this device in a hazardous atmosphere.



DANGER!

These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.



WARNING!

Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.



CAUTION!

Disregarding these instructions can result in damage to the device or to parts of the operator's plant.



INFORMATION!

These instructions contain important information for the handling of the device.



LEGAL NOTICE!

This note contains information on statutory directives and standards.



• **HANDLING**

This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➡ **RESULT**

This symbol refers to all important consequences of the previous actions.

1.5 Safety instructions for the operator



WARNING!

*In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.*

2.1 Scope of delivery

**INFORMATION!**

Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Do a check of the packing list to make sure that you have all the elements given in the order.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.



Figure 2-1: Example of the standard scope of delivery

- ① Ordered device
- ② Documentation

Optional accessories

- External HART® adapter
- Weather protection cover
- Wall mounting brackets

2.2 Device description

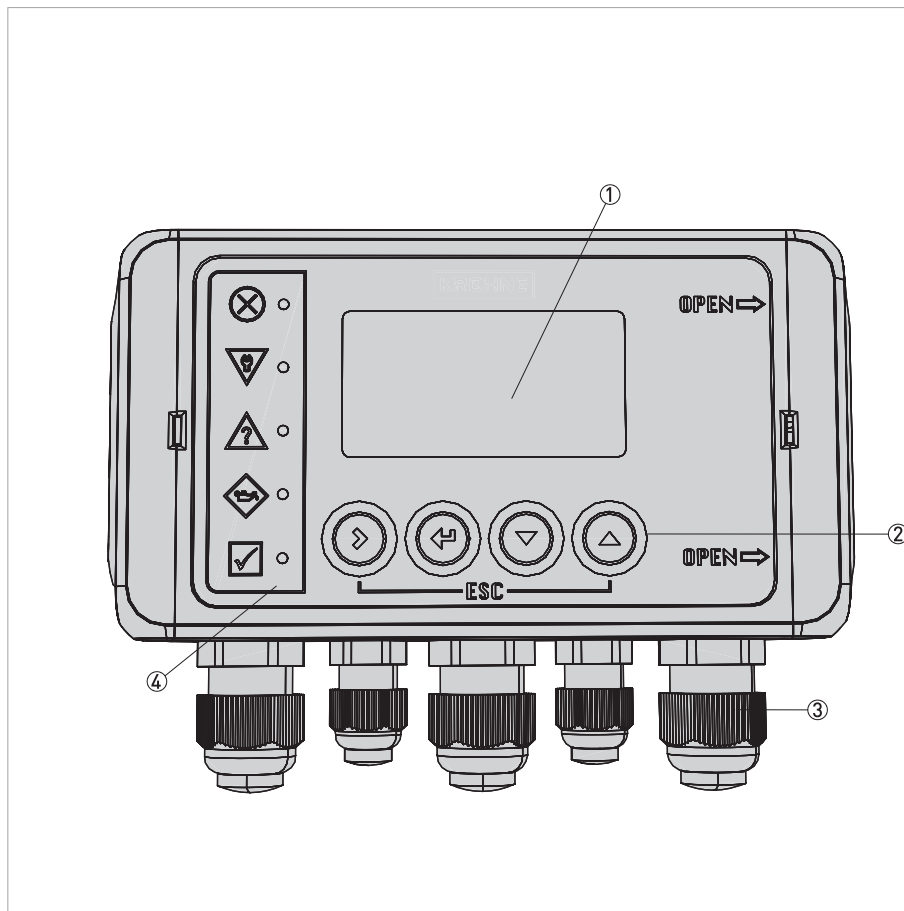


Figure 2-2: Device description

- ① Display
- ② Operation keys
- ③ Cable glands
- ④ High-brightness LEDs for NAMUR NE 107 status signalisation

This 2-wire device can be connected to field devices with HART® protocol or 4...20 mA current output. The two free programmable relays and the second current output allow process control. Different customer-specific measurement pages with up to 4 displayed values enable a detailed monitoring of the process. By using the second current output it is possible to use the backlight and high brightness LEDs for NAMUR NE 107 status signalisation. A HART® access to the field device is possible by connecting a HART® Handheld or HART® Modem to the internal or optional external HART® adapter.

2.3 Nameplate



INFORMATION!

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

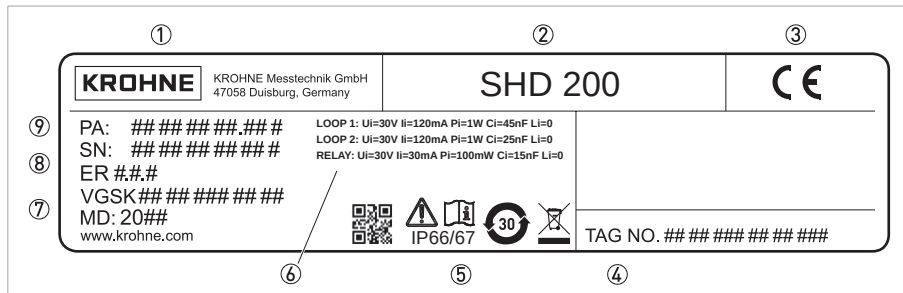


Figure 2-3: Example of a nameplate

- ① Manufacturer
- ② Device name
- ③ CE marking
- ④ TAG number
- ⑤ Data matrix code (serial number),
Observe the operation and installation instruction, Ingress protection
China RoHS,
Electronic / Electric device waste marking,
- ⑥ Power supply data,
Parameter of measuring unit
- ⑦ Order code,
Manufacturing date,
Internet address of manufacturer
- ⑧ Electronic revision,
Serial number
- ⑨ Production order

3.1 General notes on installation

**INFORMATION!**

Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Do a check of the packing list to make sure that you have all the elements given in the order.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Storage and transport

**CAUTION!**

Do not make any mechanical modifications to the device. This can result in the loss of proper functionality, as well as the rights under the device warranty.

- *Store and transport the device in a dry, dust-free environment.*
- *Store and transport the device in an environment with a temperature between -30...+70° C / -22...+158° F.*
- *The original packing is designed to protect the equipment. It has to be used if the device is transported or sent back to the manufacturer to prevent damage of the device.*

3.3 Point-to-Point connection - analogue / digital mode

Point-to-Point connection between the field device and the HART® Master.

The current output of the field device is passive.

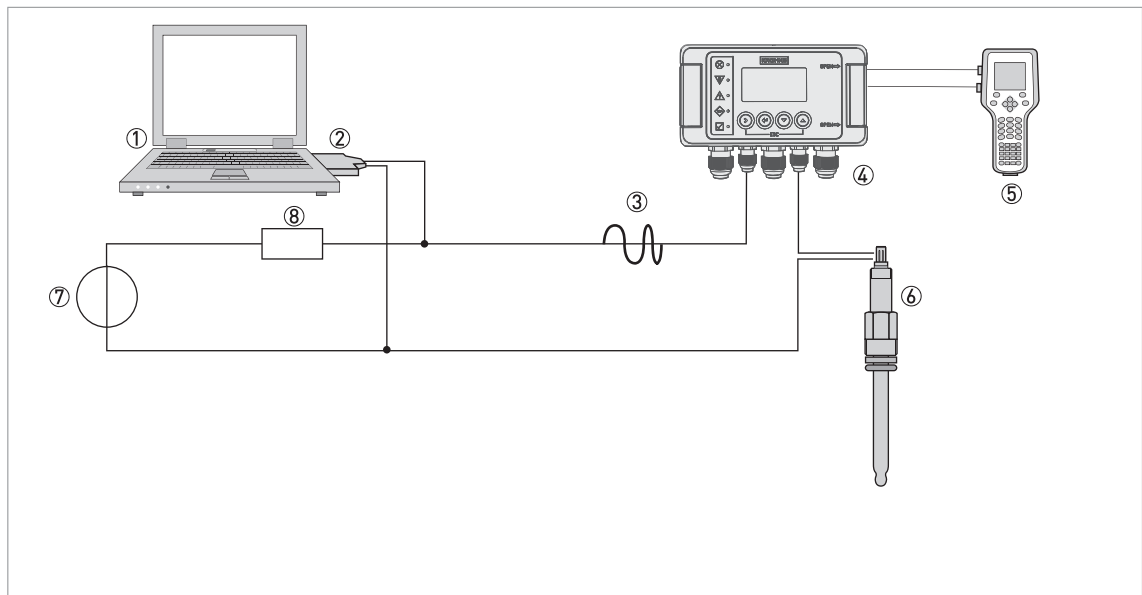


Figure 3-1: Overview point-to-point connection

- ① HART® master with e.g. PACTware™ FDT/DTM
- ② HART® modem
- ③ HART® signal
- ④ SHD 200
- ⑤ HART® master with HART® DD (for example field communicator)
- ⑥ HART® field device
- ⑦ Power supply for devices (slaves) with passive current output
- ⑧ Load $\geq 250 \Omega$ (Ohm) (only required if not used in SHD 200)

If using more than one HART® master please be aware of the correct configuration because only one Primary master and one Secondary master are allowed. Two Primary masters or two Secondary masters will cause communication errors.

Default master modes are

- SHD 200: Secondary
- HART® modem in PACTware: Primary
- HART® Field Communicator: Secondary (can't be changed in most devices)

These default master modes lead to the following use cases:

If you

- parameterise or calibrate your field device using PACTware with a HART® modem, the master mode of the SHD 200 should be "Secondary"
- parameterise or calibrate your field device with a HART® field communicator, the master mode of the SHD 200 should be "Primary"
- use PACTware with a HART® modem and a HART® field communicator at the same time, the HART® functionality of the SHD 200 must be deactivated
- use a HART® PLC, find out its master mode and adapt the master mode of the SHD 200 appropriate

3.4 Pre-installation requirements



CAUTION!

Always note the following items to ensure a proper and safe installation:

- *Make sure that there is adequate space to the sides.*
- *Protect the device from direct sunlight.*
- *The device installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the device to intense vibration.*
- *Use assembly materials and tools in compliance with the applicable occupational health and safety directives (assembly materials and tools are not part of the scope of delivery).*
- *Do not make any mechanical modifications to the device. This can result in the loss of proper functionality, as well as the rights under the device warranty.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to a electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*



CAUTION!

The device must be suitable for the temperature specified (including chemical resistance).



INFORMATION!

Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

3.5 Opening the housing



INFORMATION!

Clean and grease all threads each time you open the housing. Use only resin-free and acid-free grease. Before closing the cover, ensure that the housing gasket is properly fitted, clean and undamaged.

All installation works on the electrical connections and mounting require to open the converter housing:

Opening the housing

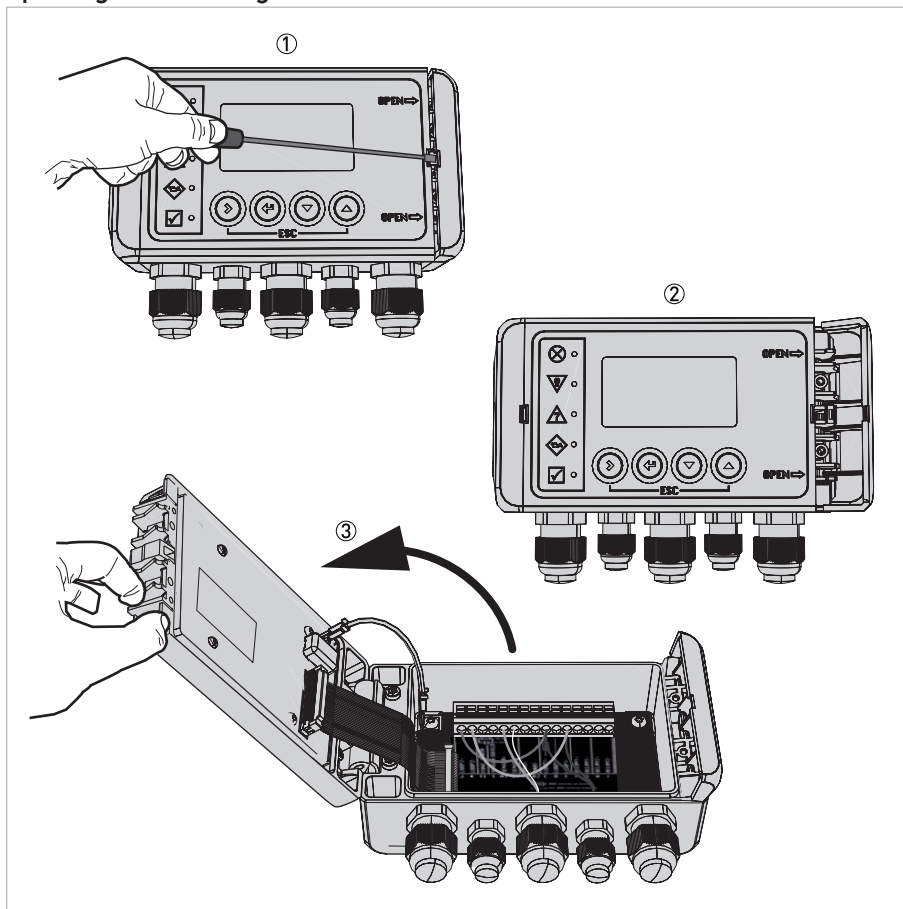


Figure 3-2: Opening the housing



- Put a small flat tool (e.g. screwdriver) into the right hinge lock and open the device ①.
- Lift up the housing ②.
- ➔ Now you have access to the electronic compartment and the possibility to mount the device on a wall.

3.6 Wall mounting



CAUTION!

Always note the following items to ensure a proper and safe installation:

- *Make sure that there is adequate space to the sides.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to a electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibration.*
- *Use assembly materials and tools in compliance with the applicable occupational health and safety directives (assembly materials and tools are not part of the scope of delivery).*



CAUTION!

Installation, assembly, start-up and maintenance may only be performed by appropriately trained personnel. The regional occupational health and safety directives must always be observed.



INFORMATION!

A mounting system with a minimum load force of 0.1 kN (for example FISCHER type UX10) suitable for the background has to be applied.

3.6.1 Housing

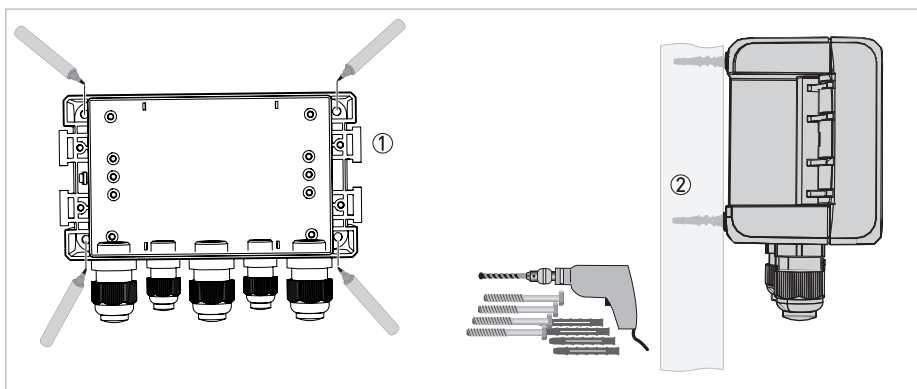


Figure 3-3: Wall mounting of the housing



- ① Mark the holes with a suitable pen ①.
- ② Drill the 4 holes and fasten the device securely to the wall ②.



INFORMATION!

For outdoor mounting, we recommend the optional weather protection cover XGSH01000 for wall and pipe mounting. For more flexibility and convenient mounting, we recommend wall mounting brackets XGSH010020.

4.1 Safety instructions

**DANGER!**

*All work on the electrical connections may only be carried out with the power disconnected.
Take note of the voltage data on the nameplate!*

**DANGER!**

Observe the national regulations for electrical installations!

**DANGER!**

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

**WARNING!**

*Observe without fail the local occupational health and safety regulations.
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

**INFORMATION!**

*Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.*

4.2 Important device-specific notes on electrical connection

**INFORMATION!**

The SHD 200 is a loop powered device and has no function if no field device is connected.

**INFORMATION!**

Use only shielded cables for connection with the control system (e.g. PLC).

4.3 Connection diagram overview

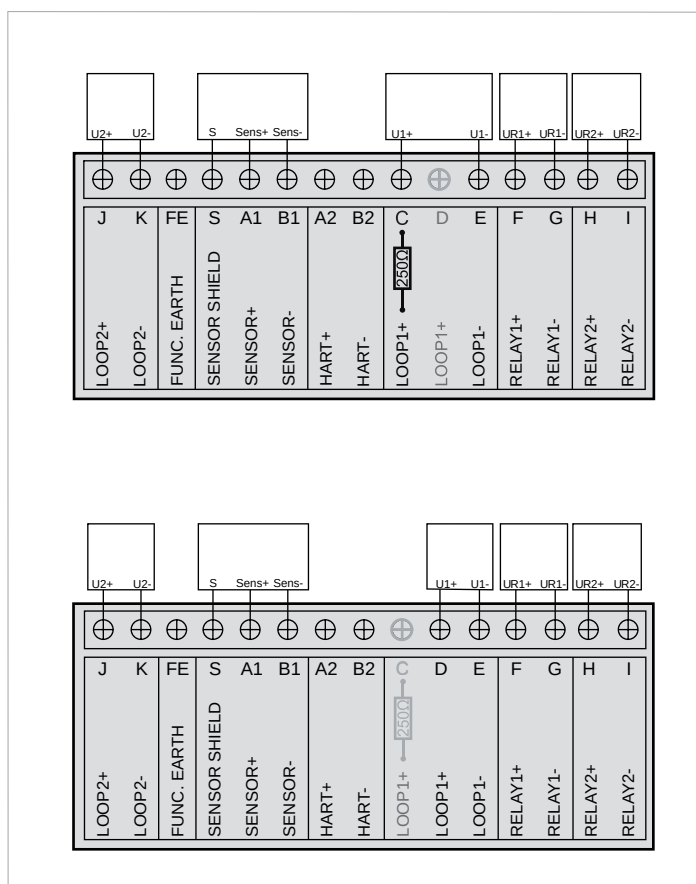


Figure 4-1: Connection diagram overview

Terminal designation	Terminal assignments
J	Loop 2+
K	Loop 2-
FE	Functional earth
S	Shield
A1	Sensor+
B1	Sensor-
A2	HART+
B2	HART-
C	Loop 1+ (HART [®] resistor on board)
D	Loop 1+ (External HART [®] resistor required)
E	Loop 1-
F	Relay 1+
G	Relay 1-
H	Relay 2+
I	Relay 2-

Table 4-1: Terminal designation with terminal assignments

**INFORMATION!**

The device is equipped with an internal HART[®] access for the NonEx-version that offers the opportunity to access the field device via HART[®] handheld or HART[®] modem.

4.4 Connecting the field device cable

**CAUTION!**

When connecting the power supply, always note the safety regulations of the current state of the art. To avoid fatal injuries, destruction or damage of the device or measuring errors, also note the following items:

- Cables may only be connected when the power is switched off.
- Always keep the housing of the device well closed if you do not perform any installation works. The function of the housing is to protect the electronic equipment from dust and moisture.
- Check the nameplate and assure that the power supply meets the voltage of the device. The device is loop powered and operates in the range of 20...30 VDC with a voltage drop < 4 VA. If the power supply is below 20 VDC the device and field device will not work. If the power supply is above 30 VDC the device and field device may be damaged/destroyed.

**CAUTION!**

Do not use the integrated 250 Ohm HART[®] resistor of the device, when using an Ex isolation amplifier of third-party with integrated 250 Ohm HART[®] resistor.

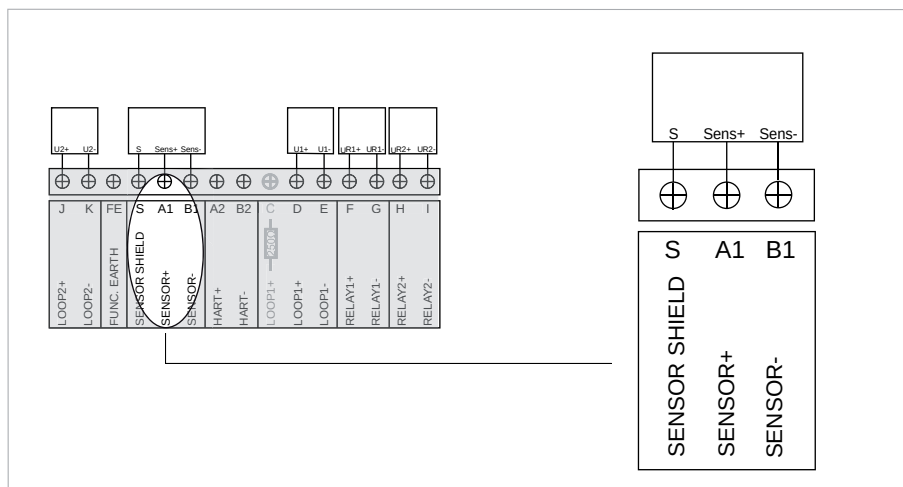


Figure 4-2: Connecting the field device cable

**INFORMATION!**

The cable glands installed by the manufacturer are designed for a cable diameter of 3...6,5 mm for M12 and 5...10 mm for M16. If you are using cables with a larger diameter than 3...6,5 mm for M12 and 5...10 mm for M16, you must replace the manufacturer's cable glands with suitable ones. The operator is responsible for the correct sealing of cable glands.

4.5 Connecting the second current output

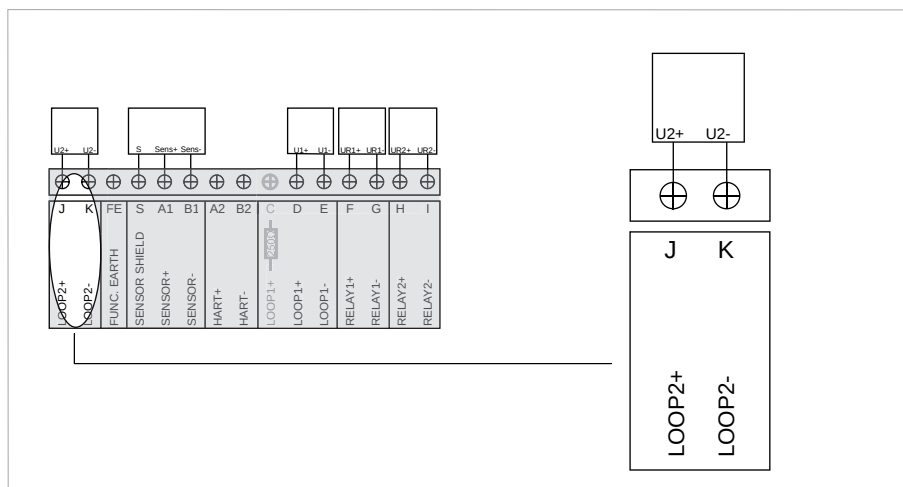


Figure 4-3: Connection of second current output

The second current output can be either used as current output for any HART® variable or as power supply for backlight and LEDs for NAMUR NE 107 signalisation if supported by field device (field device must support extended command 523: Read Condensed Status Mapping Array).

4.6 Connecting the relay outputs

The device has two solid state relays that can work as status output, system alarm or limit switch:

- The relay contacts are electrically isolated from each other and from all other circuits.
- The output stages of the status outputs / limit switches behave like relay contacts.
- Possible conditions: NO (normally open) or NC (normally closed).

Contact ratings:

- Maximum Voltage = 60 V
- Maximum Load Current = 75 mA up to 55°C and 50 mA above 55°C
- Max On resistance = 10 Ohm

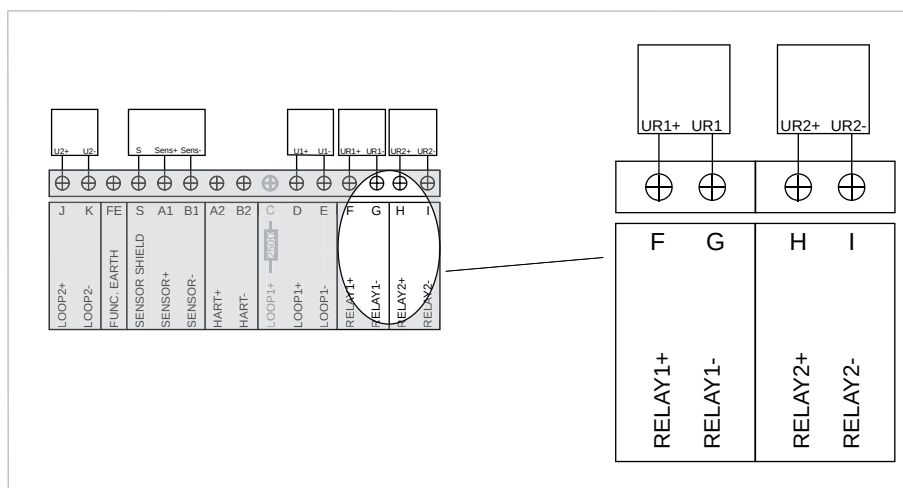


Figure 4-4: Connecting the relay outputs

4.7 Connecting the external HART adapter

The external HART[®] adapter is an optional feature that offers the opportunity to access the field device without opening the housing.

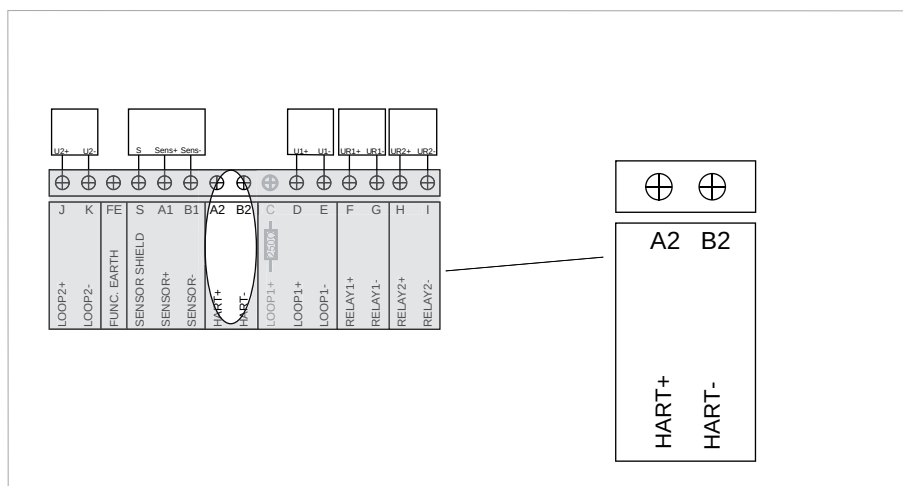


Figure 4-5: Connection of the external HART[®] adapter

- ① Open the housing.
- ② Remove the middle M16 cable gland and screw the HART[®] adapter.
- ③ Connect the HART[®] adapter to connections A2 and B2.

Consider that the cap needs to be closed for a protection of the electronics parts.

4.8 Power supply



DANGER!

To avoid fatal injuries as well as destruction or damage of the device assure a correct installation before switching on the power. This includes:

- The device is mechanically safe, mounting and power connection comply with the regulations.
- The electrical terminal compartments must be secured, i.e. the housing has to be closed and the screws have to be tightened.
- The electrical operating data of the power supply comply with the requirements of the device.



WARNING!

Observe without fail the local occupational health and safety regulations.

Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

**CAUTION!**

When connecting the power supply, always note the safety regulations of the current state of the art. To avoid fatal injuries, destruction or damage of the device or measuring errors, also note the following items:

- Cables may only be connected when the power is switched off.
- Always keep the housing of the device well closed if you do not perform any installation works. The function of the housing is to protect the electronic equipment from dust and moisture.
- Check the nameplate and assure that the power supply meets the voltage of the device. The device is loop powered and operates in the range of 20...30 VDC with a voltage drop < 4 VA. If the power supply is below 20 VDC the device and field device will not work. If the power supply is above 30 VDC the device and field device may be damaged/destroyed.

**CAUTION!**

Do not use the integrated 250 Ohm HART[®] resistor of the device, when using an Ex isolation amplifier of third-party with integrated 250 Ohm HART[®] resistor.

The device and the field device require a minimum operating voltage of 20 VDC. The power supply is provided via the 2-wire interface (4...20 mA).

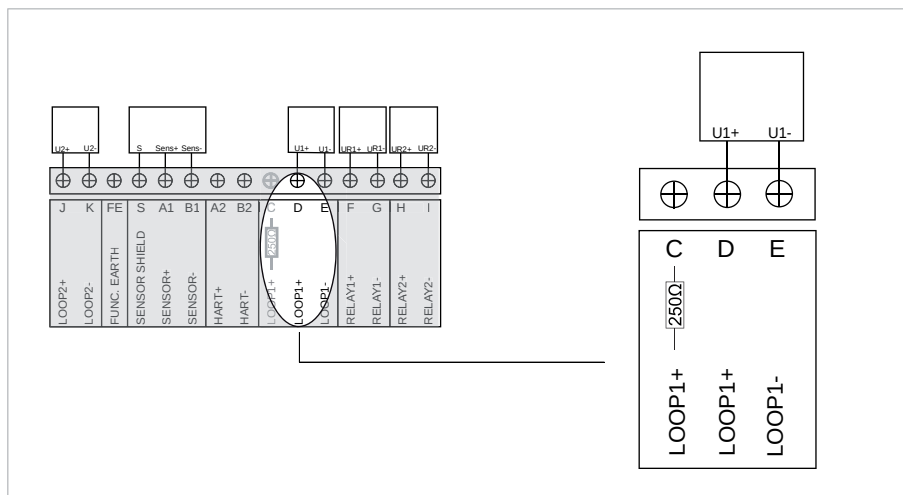


Figure 4-6: Connection of the power supply

5.1 Start-up



DANGER!

To avoid fatal injuries as well as destruction or damage of the device assure a correct installation before switching on the power. This includes:

- *The device is mechanically safe, mounting and power connection comply with the regulations.*
- *The electrical terminal compartments must be secured, i.e. the housing has to be closed and the screws have to be tightened.*
- *The electrical operating data of the power supply comply with the requirements of the device.*



CAUTION!

Do not use the integrated 250 Ohm HART® resistor of the device, when using an Ex isolation amplifiers of third-party with integrated 250 Ohm HART® resistor.



WARNING!

Observe without fail the local occupational health and safety regulations.

Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

The device and the field device require a minimum operating voltage of 20 VDC. The power supply is provided via the 2-wire interface (4...20 mA).



- Switch on the power with the help of a disconnecting device (switch, circuit breaker).
- The device performs a self test; afterwards it begins to check immediately if a field device is connected and the display shows the current value(s).

During initialisation of the device and the field device the manufacturer logo appears. The logo disappears after a few seconds once the initialisation is completed.

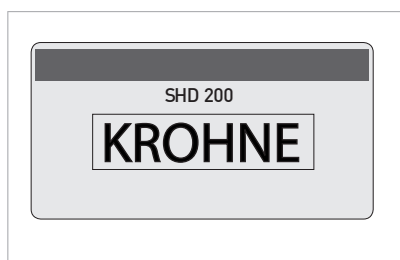


Figure 5-1: Start-up

Afterwards, the measured value appears.

During searching of a connected field device, the system shows the progress as progress bar, the current address number (e.g. "1 of 63" or "5 of 15") and the found field device.

During searching for HART® devices, it is possible to navigate through the menu by pressing >. If a HART® device is connected and cannot be found, please increase the Polling address to 0...63 (see function table of A3.2) or set a user specific range (A.3.4). To change to 4...20 mA mode, go to menu option A2.

When search was successful, the display shows the KROHNE product name of the field device.

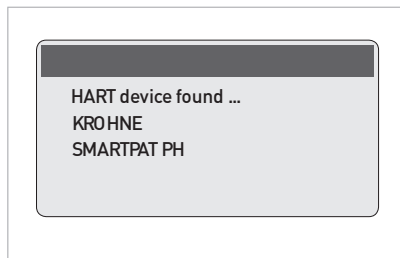


Figure 5-2:
Product name of the field device

6.1 Operating elements

The operation elements consist of the four operation keys:

Operating key	Symbol in text
	
	
	
	

The function of a key depends on the mode of the device and on the menu level:

Key	Measuring mode	Menu mode		
		Menu mode	Sub-menu or function mode	Parameter and data level
>	Switch from measuring mode to menu mode.	Access to main menu	Access to sub-menu	For numerical values: move cursor one position to the right
↶	Reset of the display	Return to measuring mode (prompt appears whether the data should be saved)	Press 1 to 3 times, return to menu mode, data saved	Return to sub-menu or function, data saved
↑ or ↓	-	Select menu	Select sub-menu or function	Use highlighted cursor to change number, unit, property
Esc: > + ↑	-	-	Return to main menu, data not saved	Return to next sub-menu or function, data not saved



INFORMATION!

- Always push the keys at right angles to the front. Touching them from the side can cause incorrect operation!
- Each time you press a key, an "□" flashes in the upper right corner of the display.
- After 5 minutes of inactivity, there is an automatic return to the measuring mode. In this case the device does not save previously changed data!

6.2 Function tables



INFORMATION!

The NAMUR NE 107 signalisation is only available if it is supported by the field device (field device must support extended command 523: Read Condensed Status Mapping Array)

A Setup

Menu level	Designation / function	Settings / descriptions
A1	Language	Available languages: Deutsch, English, Italiano, Espanol, Francais
A2	Function mode	Settings of measuring mode Options: • HART® • 4...20 mA
A3	HART® settings	Settings of HART® Master (only displayed if HART® mode is selected in A2)
A3.1	HART® master	Settings of HART® Master mode (only displayed if HART® mode is selected in A2) Options: • Primary • Secondary • Off
A3.2	Polling address range	Search range for finding of a HART® device (only displayed if HART® mode is selected in A2) Options: • 0...15 • 0...63 • User Specific Range • User Specific Address
A3.3	User specific address	User specific address for HART® devices (only displayed if HART® mode is selected in A2 and "User specific address" is selected in A3.2)
A3.3.1	User specific address	User specific address for HART® devices (only displayed if HART® mode is selected in A2 and "User specific address" is selected in A3.2) Range: 000...063
A3.4	User specific range	User specific search range for HART® devices (only displayed if HART® mode is selected in A2 and "User specific range" is selected in A3.2)
A3.4.1	First polling address	User specific search range for HART® devices (only displayed if HART® mode is selected in A2 and "User specific range" is selected in A3.2) Range: 000...063
A3.4.2	Last polling address	User specific search range for HART® devices (only displayed if HART® mode is selected in A2 and "User specific range" is selected in A3.2) Range: 000...063
A3.5	Manual hold	Activate manual hold to avoid an alarm (only displayed if HART® mode is selected in A2).
A3.5.2	Manual hold?	Activate manual hold to avoid an alarm (only displayed if HART® mode is selected in A2). Options: • Yes • No

Menu level	Designation / function	Settings / descriptions
A3.6	Field device scan	Restart search of HART® devices (only displayed if HART® mode is selected in A2)
A3.6.1	Start device scan?	Start search of HART® devices (only displayed if HART® mode is selected in A2) Options: • Yes • No
A4	Display	Configuration of measurement display
A4.1	1. Measurement page	Configuration of 1. measurement page
A4.1.1	Value	Setting of value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.1.2	Value	Settings of main value (only displayed if 4...20 mA mode is selected in A2) Options: • 4...20 mA (L1) • User
A4.2	2. Measurement page	Configuration of 2. measurement page (only displayed if HART® mode is selected in A2)
A4.2.1	Main value	Setting of main value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.2.2	Additional value	Setting of additional value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.2.3	Main value	Settings of main value (only displayed if 4...20 mA mode is selected in A2) Options: • 4...20 mA (L1) • User
A4.2.4	Additional value	Settings of additional value (only displayed if 4...20 mA mode is selected in A2) Options: • 4...20 mA (L1) • User

Menu level	Designation / function	Settings / descriptions
A4.3	3. Measurement page	Configuration of 3. measurement page (only displayed if HART® mode is selected in A2)
A4.3.1	Displayed variables	Selection of number of displayed values (only displayed if HART® mode is selected in A2) Options: • ONE • TWO • THREE • FOUR
A4.3.2	Value line one	Selection of first displayed measuring value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.3.3	Value line two	Selection of second displayed measuring value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.3.4	Value line three	Selection of third measuring value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.3.5	Value line four	Selection of fourth displayed measuring value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.4	Trend graph	Configuration of Trend graph

Menu level	Designation / function	Settings / descriptions
A4.4.1	Value	Selection of displayed value (only displayed if HART® mode is selected in A2) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A4.4.2	Value	Selection of displayed value (only displayed if 4...20 mA mode is selected in A2) Options: • 4...20 mA (L1) • User
A4.4.3	Select range	Adjustment of displayed measuring range (only displayed if HART® mode is selected in A2) Options: • Automatic • Manual
A4.4.4	Select range	Adjustment of displayed measuring range (only displayed if 4...20 mA mode is selected in A2) Options: • Automatic • Manual
A4.4.5	Lower range value	Definition of lower range value (only displayed if HART® mode is selected in A2 and Manual is selected in A4.4.3)
A4.4.6	Lower range value	Definition of lower range value (only displayed if 4...20 mA mode is selected in A2 and Manual is selected in A4.4.4)
A4.4.7	Upper range value	Definition of upper range value (only displayed if HART® mode is selected in A2 and Manual is selected in A4.4.3)
A4.4.8	Upper range value	Definition of upper range value (only displayed if 4...20 mA mode is selected in A2 and Manual is selected in A4.4.4)
A4.4.9	Show lim. line relay 1	Display of limit line for relay 1 (only displayed if HART® mode is selected in A2) Options: • Yes • No
A4.4.10	Show lim. line relay 1	Display of limit line for relay 1 (only displayed if 4...20 mA mode is selected in A2) Options: • Yes • No
A4.4.11	Show lim. line relay 2	Display of limit line for relay 2 (only displayed if HART® mode is selected in A2) Options: • Yes • No

Menu level	Designation / function	Settings / descriptions
A4.4.12	Show lim. line relay 2	Display of limit line for relay 2 (only displayed if 4...20 mA mode is selected in A2) Options: • Yes • No
A4.4.13	Timescale	Scaling of time axis. Range: 2...3600 seconds
A4.5	Number format	Configuration of the number format of each measuring value
A4.5.1	Digits PV	Settings of digits for PV (only displayed if HART® mode is selected in A2) Range: 002...006
A4.5.2	Decimals PV	Settings of decimals for PV (only displayed if HART® mode is selected in A2) Options: • Automatic • #N.XXXX • #N.XXX • #N.XX • #N.X
A4.5.3	Digits SV	Settings of digits for SV (only displayed if HART® mode is selected in A2) Range: 002...006
A4.5.4	Decimals SV	Settings of decimals for SV (only displayed if HART® mode is selected in A2) Options: • Automatic • #N.XXXX • #N.XXX • #N.XX • #N.X
A4.5.5	Digits TV	Settings of digits for TV (only displayed if HART® mode is selected in A2) Range: 002...006
A4.5.6	Decimals TV	Settings of decimals for TV (only displayed if HART® mode is selected in A2) Options: • Automatic • #N.XXXX • #N.XXX • #N.XX • #N.X
A4.5.7	Digits QV	Settings of digits for QV (only displayed if HART® mode is selected in A2) Range: 002...006
A4.5.8	Decimals QV	Settings of decimals for QV (only displayed if HART® mode is selected in A2) Options: • Automatic • #N.XXXX • #N.XXX • #N.XX • #N.X

Menu level	Designation / function	Settings / descriptions
A4.5.9	Digits 4...20 mA L1	Settings of digits for 4...20 mA L1 (only displayed if HART® mode is selected in A2) Range: 002...006
A4.5.10	Decimals 4...20 mA L1	Settings of decimals for 4...20 mA L1 (only displayed if HART® mode is selected in A2) Options: • Automatic • #N.XXXX • #N.XXX • #N.XX • #N.X
A4.5.11	Digits 4...20 mA L2	Settings of digits for 4...20 mA L1 (only displayed if HART® mode is selected in A2) Range: 002...006
A4.5.12	Decimals 4...20 mA L2	Settings of decimals for 4...20 mA L1 (only displayed if HART® mode is selected in A2) Options: • Automatic • #N.XXXX • #N.XXX • #N.XX • #N.X
A4.5.13	Digits user variable	Settings of digits for user variable (only displayed if 4...20 mA mode is selected in A2) Range: 002...006
A4.5.14	Decimals user variable	Settings of decimals for user variable (only displayed if 4...20 mA mode is selected in A2) Options: • Automatic • #N.XXXX • #N.XXX • #N.XX • #N.X
A4.6	Illumination settings	Illumination Settings (only displayed if HART® mode is selected in A2 and Current output or Power supply is selected in A5.3.1).
A4.6.1	Backlight	Settings of backlight (only displayed if HART® mode is selected in A2 and Current output or Power supply is selected in A5.3.1). Options: • On • Off • Timer
A4.6.2	Timer	Holding time of backlight without key activation (only displayed if HART® mode is selected in A2 , Current output or Power supply is selected in A5.3.1 and Timer is selected in A4.6.1). Range: 0.0000...60.000 seconds

Menu level	Designation / function	Settings / descriptions
A4.6.3	Status LEDs	Status LEDs for NAMUR NE 107 (only displayed if HART® mode is selected in A2 and Current output or Power supply is selected in A5.3.1). Options: • On • Off
A4.7	Illumination settings	Illumination Settings (only displayed if 4...20 mA mode is selected in A2 and Current output or Power supply is selected in A5.3.2).
A4.7.1	Backlight	Settings of backlight (only displayed if 4...20 mA mode is selected in A2 and Current output or Power supply is selected in A5.3.2). Options: • On • Off • Timer
A4.7.2	Timer	Holding time of backlight without key activation (only displayed if 4...20 mA mode is selected in A2 , Current output or Power supply is selected in A5.3.2 and Timer is selected in A4.7.1). Range: 0.0000...60.000 seconds
A4.7.3	Status LEDs	Status LEDs for NAMUR NE 107 (only displayed if 4...20 mA mode is selected in A2 and Current output or Power supply is selected in A5.3.2). Options: • On • Off
A4.8	Contrast	Contrast of display. Range: -10...+10
A5	I/O	Settings of Loops and Relays
A5.1	Loop 1	Settings of Loop 1 (only displayed if 4...20 mA mode is selected in A2)
A5.1.1	Unit	Unit of displayed measuring value (only displayed if 4...20 mA mode is selected in A2)
A5.1.1.1	Unit type select	Selection of predefined units (only displayed if 4...20 mA mode is selected in A2) Units: • Temperature • Pressure • Volumetric Flow • Velocity • Volume • Length • Mass • Mass Flow • Density • Viscosity • Analytical • Conductance • Resistance • Custom Unit
A5.1.1.2	Custom unit edit	Setting of user-defined units (only displayed if 4...20 mA mode is selected in A2 and Custom unit is selected in 5.1.1.1)
A5.1.1.3	Temperature	Units: • °C • °F • °Ra • K

Menu level	Designation / function	Settings / descriptions
A5.1.1.4	Pressure	Units: • atm • bar • mbar • Pa • Pa_a • kPa • MPa • lb/ft² • psi • psi_a • torr • g/cm² • kg/cm² • kg/m²
A5.1.1.5	Volume flow	Value(s): m ³ /s, m ³ /min, m ³ /h, m ³ /d, L/s, L/min, L/h, ft ³ /s, ft ³ /min, ft ³ /h, ft ³ /d, gal/s, gal/min, gal/h, gal/d, IG/s, IG/min, IG/h, IG/d, bbl/s, bbl/min, bbl/h, bbl/d, Nm ³ /s, Nm ³ /min, Nm ³ /h, Nm ³ /d, NL/s, NL/min, NL/h, NL/d, Sm ³ /s, Sm ³ /min, Sm ³ /h, Sm ³ /d, SL/s, SL/min, SL/h, SL/d, Sft ³ /s, Sft ³ /min, Sft ³ /h, Sft ³ /d
A5.1.1.6	Velocity	Units: • m/s • m/h • in/s • in/min • ft/s • ft/min
A5.1.1.7	Volume	Units: • m³ • L • hL • in³ • ft³ • gal • IG • bbl • Nm³ • NL • Sft³ • Sm³ • SL
A5.1.1.8	Length	Units: • m • mm • in
A5.1.1.9	Mass	Units: • g • kg • T • lb • oz

Menu level	Designation / function	Settings / descriptions
A5.1.1.10	Mass flow	Units: • g/s • g/min • g/h • kg/s • kg/min • kg/h • kg/d • t/min • t/h • t/d • lb/s • lb/min • lb/h • lb/d
A5.1.1.11	Density	Units: • g/ml • g/L • g/cm³ • kg/m³ • kg/L • lb/gal • lb/in³ • lb/ft³
A5.1.1.12	Viscosity	Units: • cP • cSt • Pa*s
A5.1.1.13	Analytical	Units: • % • pH • °P • %LEL
A5.1.1.14	Conductance	Units: • µS • mS/cm • µS/cm
A5.1.1.15	Resistance	Units: • Ohm • kOhm • MOhm • Ohm/cm • kOhm/cm • MOhm/cm
A5.1.2	Custom unit delete	Delete of custom unit (only displayed if 4...20 mA mode is selected in A2 and Customer unit edit is selected in A5.1.1).
A5.1.2.1	Delete custom unit ?	Delete custom unit? (only displayed if 4...20 mA mode is selected in A2 and Customer unit edit is selected in A5.1.1).
A5.1.3	Lower range value	Measuring value for 4 mA (only displayed if 4...20 mA mode is selected in A2)
A5.1.4	Upper range value	Measuring value for 20 mA (only displayed if 4...20 mA mode is selected in A2)
A5.1.5	Enable extended range	Enabling of the extended measuring range (only displayed if 4...20 mA mode is selected in A2)

Menu level	Designation / function	Settings / descriptions
A5.1.6	Trimming 4 mA	Trimming of the 4 mA value (only displayed if 4...20 mA mode is selected in A2)
A5.1.7	Trimming 20 mA	Trimming of the 20 mA value (only displayed if 4...20 mA mode is selected in A2)
A5.2	Loop 1	Settings for Loop 1 (only displayed if HART® mode is selected in A2)
A5.2.1	Loop current settings	Configuration of the field device's 4...20 mA Signal by HART® (only displayed if HART® mode is selected in A2)
A5.2.1.2	Lower range value	Configuration of the field device's 4 mA Signal by HART® (only displayed if HART® mode is selected in A2)
A5.2.1.3	Upper range value	Configuration of the field device's 20 mA Signal by HART® (only displayed if HART® mode is selected in A2)
A5.2.2	Loop monitoring	Comparative measurement between measured current and current transmitted by HART® (only displayed if HART® mode is selected in A2)
A5.2.2.1	Activate monitoring	Activation of monitoring (only displayed if HART® mode is selected in A2) Options: • Yes • No
A5.2.2.2	Max. deviation	Maximal permitted deviation (only displayed if HART® mode is selected in A2 and monitoring is activated in A5.2.2.1) Range: 100.00 ⁻³ ...1.000 mA
A5.2.2.3	Reaction time	Time of deviation, till error message displays (only displayed if HART® mode is selected in A2 and monitoring is activated in A5.2.2.1)
A5.3	Loop 2	Setting for Loop 2
A5.3.1	Mode	Operating mode of 2. current output (only displayed if HART® mode is selected in A2) Options: • Off • Power Supply • Current Output
A5.3.2	Mode	Operating mode of 2. current output (only displayed if 4...20 mA mode is selected in A2) Options: • Off • Power Supply
A5.3.3	Variable selection	Selection of displayed value (only displayed if HART® mode is selected in A2 and Current Output is selected in A5.3.1) Options: • 4...20 mA (L1) • PV • SV • TV • QV
A5.3.4	Lower range value	Definition of the lower range value (only displayed if HART® mode is selected in A2 and Current Output is selected in A5.3.1)
A5.3.5	Upper range value	Definition of the upper range value (only displayed if HART® mode is selected in A2 and Current Output is selected in A5.3.1)

Menu level	Designation / function	Settings / descriptions
A5.3.6	Lower ext. range	Definition of the lower ext. range (only displayed if HART® mode is selected in A2) Range: 3.8000...20.500
A5.3.7	Upper ext. range	Definition of the upper ext. range (only displayed if HART® mode is selected in A2) Range: 3.8000...20.500
A5.3.8	Error function	This function describes, if a lower (3.5 mA) or an upper (21.5 mA) error value is displayed (only displayed if HART® mode is selected in A2) Options: • Hold value • High error current • Low error current
A5.3.9	Low error current	Low error current (only displayed if HART® mode is selected in A2 and Low error current is selected in A5.3.8)
A5.3.10	High error current	High error current (only displayed if HART® mode is selected in A2 and High error current is selected in A5.3.8)
A5.3.11	Trimming 4 mA	Trimming 4 mA (only displayed if HART® mode is selected in A2 and Current Output is selected in A5.3.1)
A5.3.11.2	4 mA Trimming	4 mA Trimming (only displayed if HART® mode is selected in A2 and Current Output is selected in A5.3.1)
A5.3.12	Trimming 20 mA	Trimming 20 mA (only displayed if HART® mode is selected in A2 and Current Output is selected in A5.3.1)
A5.3.12.2	20 mA Trimming	20 mA Trimming (only displayed if HART® mode is selected in A2 and Current Output is selected in A5.3.1)
A5.4	Relay 1	Settings for Relay 1
A5.4.1	Mode	Operating mode of the relays (only displayed if HART® mode is selected in A2) Options: • Off • Limit Switch (Band) • Limit Switch (Thres.) • Field Device Status • USP<645> • System Alarm • Loop 1 Error Current
A5.4.2	Mode	Current mode of the relays (only displayed if 4...20 mA mode is selected in A2) Options: • Off • Limit Switch (Band) • Limit Switch (Thres.) • Loop 1 Error Current
A5.4.3	Invert	Inversion of the relay (only displayed if HART® mode is selected in A2) Options: • Yes • No

Menu level	Designation / function	Settings / descriptions
A5.4.4	Invert	Inversion of the relay (only displayed if 4...20 mA mode is selected in A2) Options: • Yes • No
A5.4.5	Set variable	Settings of the variable that is relating to the relay (only displayed if HART® mode is selected in A2 and Limit Switch (Band) or Limit Switch (Thres.) is selected in A5.4.1) Options: • PV • SV • TV • QV • 4...20 mA (L1) • 4...20 mA (L2)
A5.4.6	Set variable	Settings of the variable that is relating to the relay (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) or Limit Switch (Thres.) is selected in A5.4.1) Options: • 4...20mA (L1) • User
A5.4.7	Set low alarm	Settings of the lower switching threshold (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.4.1)
A5.4.8	Set low alarm	Settings of the lower switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.4.2)
A5.4.9	Set Low Alarm Hyst.	Settings of the lower hysteresis value (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.4.1)
A5.4.10	Set Low Alarm Hyst.	Settings of the lower switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.4.2)
A5.4.11	Set High Alarm	Settings of the upper switching threshold (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.4.1)
A5.4.12	Set High Alarm	Settings of the upper switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.4.2)
A5.4.13	Set high alarm hyst.	Settings of the upper hysteresis value (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.4.1)
A5.4.14	Set high alarm hyst.	Settings of the upper hysteresis value (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.4.2)
A5.4.15	Set threshold	Settings of the switching threshold (only displayed if HART® mode is selected in A2 and Limit Switch (Thres.) is selected in A5.4.1)
A5.4.16	Set threshold	Settings of the switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Thres.) is selected in A5.4.2)
A5.4.17	Set hysteresis	Settings of the hysteresis value (only displayed if HART® mode is selected in A2 and Limit Switch (Thres.) is selected in A5.4.1)
A5.4.18	Set hysteresis	Settings of the hysteresis value (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Thres.) is selected in A5.4.2)
A5.4.19	Set characteristic	Settings of the direction of excess, on which the relay should switch (only displayed if HART® mode is selected in A2 and Limit Switch (Thres.) is selected in A5.4.2) Options: • Overrun • Underrun

Menu level	Designation / function	Settings / descriptions
A5.4.20	Set characteristic	Settings of the direction of excess, on which the relay should switch (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Thres.) is selected in A5.4.2) Options: • Overrun • Underrun
A5.4.21	Field device status	Selection of the NAMUR-Status of the field device, at which the relay switches (only displayed if HART® mode is selected in A2 and Field device status is selected in A5.4.1) Options: • Maintenance req. • Out of specification • Check function • Failure
A5.4.23	Set factor USP<645>	Settings for the factor for USP<645> (only displayed if HART® mode is selected in A2 and USP<645> is selected in A5.4.1) Range: 0.0000...100.00
A5.4.24	Loop 1 error current	Settings of the Loop 1 error current, at which the relay switches (only displayed if HART® mode is selected in A2 and Loop 1 error current is selected in A5.4.1) Options: • High • Low • Both
A5.4.25	Loop 1 error current	Settings of the Loop 1 error current, at which the relay switches (only displayed if 4...20 mA mode is selected in A2 and Loop 1 error current is selected in A5.4.2) Options: • High • Low • Both
A5.5	Relay 2	Settings for Relay 2
A5.5.1	Mode	Operating mode of the relays (only displayed if HART® mode is selected in A2) Options: • Off • Limit switch (Band) • Limit switch (Thres.) • Field device status settings • USP<645> • System alarm • Loop 1 error current
A5.5.2	Mode	Current mode of the relays (only displayed if 4...20 mA mode is selected in A2) Options: • Off • Limit switch (Band) • Limit switch (Thres.) • Loop 1 error current
A5.5.3	Invert	Inversion of the relay (only displayed if HART® mode is selected in A2)

Menu level	Designation / function	Settings / descriptions
A5.5.4	Invert	Inversion of the relay (only displayed if 4...20 mA mode is selected in A2)
A5.5.5	Set Variable	Settings of the variable that is relating to the relay (only displayed if HART® mode is selected in A2 and Limit Switch (Band) or Limit Switch (Thres.) is selected in A5.5.1) Options: • 4...20 mA L1 • 4...20 mA L2 • PV • SV • TV • QV
A5.5.6	Set Variable	Settings of the variable that is relating to the relay (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) or Limit Switch (Thres.) is selected in A5.5.2) Options: • 4...20 mA L1 • User
A5.5.7	Set low alarm	Settings of the lower switching threshold (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.5.1)
A5.5.8	Set low alarm	Settings of the lower switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.5.2)
A5.5.9	Set low alarm hyst.	Settings of the lower hysteresis value (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.5.1)
A5.5.10	Set low alarm hyst.	Settings of the lower switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.5.2)
A5.5.11	Set high alarm	Settings of the upper switching threshold (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.5.1)
A5.5.12	Set high alarm	Settings of the upper switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.5.2)
A5.5.13	Set high alarm hyst.	Settings of the upper hysteresis value (only displayed if HART® mode is selected in A2 and Limit Switch (Band) is selected in A5.5.1)
A5.5.14	Set high alarm hyst.	Settings of the upper hysteresis value (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Band) is selected in A5.5.2)
A5.5.15	Set threshold	Settings of the switching threshold (only displayed if HART® mode is selected in A2 and Limit Switch (Thres.) is selected in A5.5.1)
A5.5.16	Set threshold	Settings of the switching threshold (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Thres.) is selected in A5.5.2)
A5.5.17	Set hysteresis	Settings of the hysteresis value (only displayed if HART® mode is selected in A2 and Limit Switch (Thres.) is selected in A5.5.1)
A5.5.18	Set hysteresis	Settings of the hysteresis value (only displayed if 4...20 mA mode is selected in A2 and Limit Switch (Thres.) is selected in A5.5.2)
A5.5.19	Set characteristic	Settings of the direction of excess, on which the relay should switch (only displayed if HART® mode is selected in A2 and Limit switch (Thres.) is selected in A5.5.1)
A5.5.20	Set characteristic	Settings of the direction of excess, on which the relay should switch (only displayed if 4...20 mA mode is selected in A2 and Limit switch (Thres.) is selected in A5.5.2)

Menu level	Designation / function	Settings / descriptions
A5.5.21	Field device status settings	Selection of the NAMUR-Status of the field device, at which the relay switches (Only displayed if HART® mode is selected in A2 and Field device status is selected in A5.5.1) Options: • Maintenance req. • Out of specification • Check function • Failure
A5.5.23	Set Factor USP<645>	Settings for the factor for USP<645> (only displayed if HART® mode is selected in A2 and USP<645> is selected in A5.5.1) Range: 0.0000... 100.00
A5.5.24	Loop 1 Error Current	Settings of the Loop 1 error current, at which the relay switches (only displayed if HART® mode is selected in A2 and Loop 1 error current is selected in A5.5.1) Options: • High • Low • Both
A5.5.25	Loop 1 Error Current	Settings of the Loop 1 error current, at which the relay switches (only displayed if 4...20 mA mode is selected in A2 and Loop 1 error current is selected in A5.5.2) Options: • High • Low • Both
A6	Device	Information about device, attached field device and security settings
A6.1	Information	Information of the device
A6.1.1	Display	Information of the display
A6.1.1.1	Serial Number	Serial Number
A6.1.1.2	Device name	Device name
A6.1.1.3	Electronic revision	Electronic Revision
A6.1.1.4	Software version	Software version
A6.1.1.5	Electronic sn main	Electronic sn main
A6.1.1.6	Electronic sn supp	Electronic sn supp
A6.1.1.7	Production date	Production date
A6.1.1.8	Calibration date	Calibration date
A6.1.2	Field device	Information of the field device (Only displayed if HART® mode is selected in A2)
A6.1.2.1	TAG	TAG (Only displayed if HART® mode is selected in A2)
A6.1.2.2	HART ID	HART ID (Only displayed if HART® mode is selected in A2)
A6.1.2.3	Device Type Code	Device Type Code (Only displayed if HART® mode is selected in A2)
A6.1.2.4	Manufacturer	Manufacturer (Only displayed if HART® mode is selected in A2)
A6.1.2.5	HART Revision	HART Revision (Only displayed if HART® mode is selected in A2)

Menu level	Designation / function	Settings / descriptions
A6.1.2.6	Polling address	Polling Address (Only displayed if HART® mode is selected in A2)
A6.1.2.7	4 mA Setting	4 mA Setting (Only displayed if HART® mode is selected in A2)
A6.1.2.8	20 mA Setting	20 mA Setting (Only displayed if HART® mode is selected in A2)
A6.2.	Security	Security settings for access on the device
A6.2.1.	Login	Login in the system as designated user
A6.2.2.	Change password	Change of password
A6.2.3.	Reset password	Reset of password
B	Test	Simulation menu
B1	System	Simulation of process variables
B1.1	PV	Simulation of PV
B1.2	SV	Simulation of SV
B1.3	TV	Simulation of TV
B1.4	QV	Simulation of QV
B2	Loop 2	Simulation of Loop 2 (only displayed if Loop 2 is activated in A5.3.1 in HART® mode or A5.3.2 in 4...20 mA mode)
B2.1	Current value	Simulation of current value
B3	Relays	Simulation of the relays
B3.1	Relay 1	Simulation of relay 1
B3.2	Relay 2	Simulation of relay 2

6.3 Menu mode

The menu mode consists of four main menus with a couple of different sub-levels. Altogether there are the following levels:

- Main menu levels
- First and second submenu levels
- Parameter level

6.3.1 Menu mode structure

Mainmenu	Submenu	
A Setup	A1 Language	
	A2 Function mode	
	A3 HART settings	A3.1 HART Master
		A3.2 Polling address range
		A3.3 User specific address
		A3.4 User specific range
		A3.5 Manual hold
		A3.6 Field device scan
	A4 Display	A4.1 1.Measurement page
		A4.2 2.Measurement page
		A4.3 3.Measurement page
		A4.4 Trend graph
		A4.5 Number format
		A4.6 Illumination settings (settings depend on mode)
		A4.7 Illumination settings (settings depend on mode)
		A4.8 Contrast
	A5 I/O	A5.1 Loop 1 (settings depend on mode)
		A5.2 Loop 1 (settings depend on mode)
		A5.3 Loop 2
		A5.4 Relay 1
		A5.5 Relay 2
	A6 Device	A6.1 Information
		A6.2 Security
B Test	B1 System	B1.1 PV
		B1.2 SV
		B1.3 TV
		B1.4 QV
	B2 Loop 2	B2.1 Current value
	B3 Relay	B3.1 Relay 1
		B3.2 Relay 2
C Service	This menu is password protected and contains functions to be used by service personnel only.	

Table 6-1: Menu mode structure

6.3.2 Status messages and diagnostic information

The diagnostic messages are displayed in accordance with NAMUR standard NE 107.



INFORMATION!

As status message always the name of the relevant status group and the status symbol is displayed.



INFORMATION!

The NAMUR NE 107 signalisation is only available if it is supported by the field device (field device must support extended command 523: Read Condensed Status Mapping Array)

Each status message (= status signal) has a specific symbol, determined by NAMUR, which is displayed with the message. The length of each message is limited to one line.

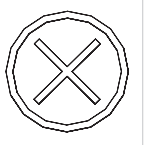
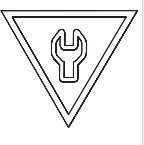
Symbol	Status signal	Description and consequence
	Failure	No measurement possible.
	Function check	A test function is active; The displayed or transferred measured value does not correspond to the actual measured value.
	Out of specification	Measurements are available but are no longer sufficiently accurate and should be checked.
	Maintenance required	Measurements are still accurate but this could soon change.
	Diagnosis OK	No direct influence on the measurements.

Table 6-2: NAMUR NE 107 signalisation

Error category according to NAMUR NE 107	Error group	Error message	Description	Action
Failure	Sensor	Device malfunction	The field device reports device malfunction (2nd status byte)	Check field device and replace it if necessary.
		Access restricted	The field device reports the command error: access restricted	Check field device configuration.
		Device Busy	The field device is busy	Repeat your request.
		Device write protected	The field device is in write protection mode	Check field device configuration.
		General command error	Report for all command error not explicitly handled	Check field device.
		HART communication failure	HART® communication failed	Check field device and cable connections and replace field device if necessary.
		Loop 1 low alarm current	Alarm current on loop 1 (≤ 3.5 mA)	Check field device and replace it if necessary.
		Loop 1 high alarm current	Alarm current on loop 1 (≥ 20.5 mA)	Check field device and replace it if necessary.
		Current mon. deviation high	Current monitoring max. deviation time span reached	Check field device and replace it if necessary.
	Electronics	ADC Failure	No ADC Ready signal was received before the timeout expired.	Check field device and replace it if necessary.
		Critical power failure	The HART® device reports a critical power failure (6th byte of cmd 48)	Check field device and replace it if necessary.
		NV memory defect	The field device connected via HART reports a defect NV memory (8th byte of cmd 48)	Check field device and replace it if necessary.
		RAM memory defect	The field device connected via HART® reports a defect volatile memory (8th byte of cmd 48)	Check field device and replace it if necessary.
		Wdog reset executed	The field device connected via HART® reports an executed watchdog reset (8th byte of cmd 48)	Check field device and replace it if necessary.
		Electronic defect	The field device connected via HART® reports an electronic defect (8th byte of cmd 48)	Check field device and replace it if necessary.

Error category according to NAMUR NE 107	Error group	Error message	Description	Action
Failure	Configuration	USP<645>: Temp wrong unit	Process input for temperature has wrong unit code	Change configuration of tertiary variable.
		USP<645>: Cond wrong unit	Process input for conductivity has wrong unit code	Change configuration of primary variable.
	Process	USP<645>: Temp too high	Input temperature > 100°C	Decrease process temperature according to USP<645> specification.
		USP<645>: Temp too low	Input temperature < 0°C	Increase process temperature according to USP<645> specification.
		USP<645>: Cond too high	Input conductivity > 3.1 µS/cm	Decrease process conductivity according to USP<645> specification.
		USP<645>: Cond too low	Input conductivity < 0.6 µS/cm	Increase process conductivity according to USP<645> specification.
		USP<645>: Cond. out of tolerance	Water quality / cond. out of tolerance	Check process conditions.
Check function	Configuration	Loop current fixed	The HART® device reports loop current fixed (2nd status byte)	Remove manual hold function.
		SV analog ch fixed	The field device connected via HART® reports the secondary variable analog channel is fixed (13th byte of cmd 48)	Remove manual hold function.
		TV analog ch fixed	The field device connected via HART® reports the tertiary variable analog channel is fixed (13th byte of cmd 48)	Remove manual hold function.
		QV analog ch fixed	The field device connected via HART® reports the quaternary variable analog channel is fixed (13th byte of cmd 48)	Remove manual hold function.
		Dev var simulation active	The field device connected via HART® reports simulation mode on one or more dev variables (8th byte of cmd 48)	Check field device configuration.
		Discrete var sim active	The field device connected via HART reports an active simulation mode for one or more discrete vars (9th byte of cmd 48)	Check field device configuration.

Error category according to NAMUR NE 107	Error group	Error message	Description	Action
Out of specification	Sensor	Device variable alert	This bit is set if any Device Variable is in an Alarm or Warning State.	Check field device configuration.
		pH > pH max	pH > pH Max.	Check field device.
		pH < pH min	pH < pH Min.	Check field device.
		Temp > Temp max	Temp. > Temp. Max.	Check field device.
		Temp < Temp min	Temp. < Temp. Min.	Check field device.
		ORP > ORP max	ORP > ORP Max.	Check field device.
		ORP < ORP min	ORP < ORP Min.	Check field device.
		Cond > Cond max	Conductivity > Max. conductivity	Check field device.
		Cond < Cond min	Conductivity < Min. conductivity	Check field device.
		Resist > Resist max	Resistance > Max. resistivity	Check field device.
		Resist < Resist min	Resistance < Min. resistivity	Check field device.
	Electronics	Pwr supply cond out of range	The field device connected via HART® reports that the power supply is out of its allowed range (8th byte of cmd 48)	Check field device.
		Env conditions out of range	The field device connected via HART® reports that the environmental conditions are out of its allowed range (8th byte of cmd 48)	Check process conditions.
	Configuration	Loop current saturated	The HART® device reports loop current saturated (2nd status byte)	Check field device configuration of 4 and 20 mA values.
		SV analog ch saturated	The field device connected via HART reports the second variable analog channel is saturated (10th byte of cmd 48)	Check field device configuration.
		TV analog ch saturated	The field device connected via HART® reports the tertiary variable analog channel is saturated (10th byte of cmd 48)	Check field device configuration.
		QV analog ch saturated	The field device connected via HART® reports the quaternary variable analog channel is saturated (10th byte of cmd 48)	Check field device configuration.
		Status simulation active	The field device connected via HART® reports an active status simulation (9th byte of cmd 48)	Check field device configuration.

Error category according to NAMUR NE 107	Error group	Error message	Description	Action
Out of specification	Process	L2 under-saturation	The measurement value is out of range. The current is limited by the lower limit of the current output.	Check SHD 200 Loop 2 configuration of 4 and 20 mA.
		L2 over-saturation	The measurement value is out of range. The current is limited by the upper limit of the current output.	Check SHD 200 Loop 2 configuration of 4 and 20 mA.
		Non Primary vars out of limits	The HART® device reports non PV out of limits (2nd status byte)	Check field device configuration.
		Primary vars out of limits	The HART® device reports pv out of limits (2nd status byte)	Check field device configuration.
Maintenance required	Sensor	Slope <- 65mV/pH	Slope < -65mV/Ph	Calibrate field device. If slope is still <-65 mV, replace the field device.
		Slope >- 50mV/pH	Slope > -50mV/Ph	Calibrate field device. If slope is still >-50 mV, replace the field device.
		Offset <-99mV	Offset < -99mV	Calibrate field device. If offset is still <-99 mV, replace the field device.
		Offset >+99mV	Offset > +99mV	Calibrate field device. If offset is still >+99 mV, replace the field device.
		Maintenance interval exp.	Maintenance interval expired	Calibrate field device.
		Calib data range	Calibration data out of range	Repeat calibration. If error message appears again, replace the field device.
	Electronics	Supply maintenance req	The field device connected via HART® reports that the power supply needs maintenance (9th byte of cmd 48)	Check field device.
	Configuration	Duplicate master detected	The field device connected via HART® reports that a duplicate master was detected (11th byte of cmd 48)	Set one HART® Master to "Secondary". Only two masters are maximum possible.
		Sub-device mismatch	The field device connected via HART® reports that a device is connected which doesn't match to the configuration (11th byte of cmd 48)	Check configuration of field device.
		Sub-device duplicate ID	The field device connected via HART® reports that a duplicate unique ID /long tag device has been detected(11th byte of cmd 48)	Check HART® configuration of the field device.

Error category according to NAMUR NE 107	Error group	Error message	Description	Action
Information		L2 not powered	This info message indicated that the second loop L2 is enabled but not powered	Power Loop 2 or switch off Loop 2 (HART® 5.3.1 / 4...20 mA 5.3.2).
		HART com-disabled	HART communication disabled info	Check HART communication.
		Current monitoring active	Current monitoring activated	

Table 6-3: Status messages and diagnostic information

6.4 Setup

Equipment Start-Up

In general, the device offers two modes. In menu **A2** (Function mode) you can choose between the 4...20 mA mode or the HART® mode. You can either connect a digital field device in HART® mode via a HART® protocol or an analog 4...20 mA field device in 4...20 mA mode. The HART® mode is the standard configuration. When the power is switched on, the device starts searching a HART® capable device.

6.4.1 Configuration of measurement page

The device offers the opportunity to choose between five measurement pages. You can configure them after connecting the field device and switch by pressing ▼ or ▲.

1. Measurement page

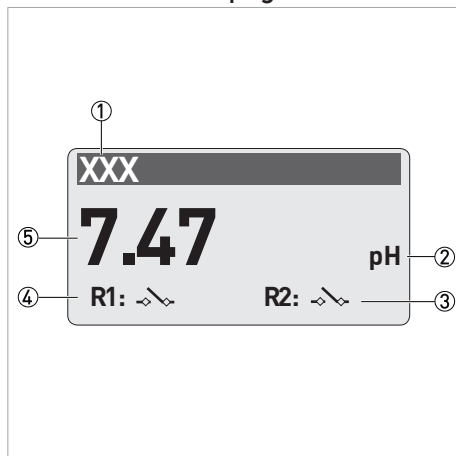


Figure 6-1: 1. Measurement page

- ① TAG
- ② Measuring unit
- ③ Relay 2 status
- ④ Relay 1 status
- ⑤ Measuring value

The 1. Measurement page shows one large value with the corresponding unit.

In HART® mode, you can choose in menu option **A4.1** if the PV, SV, TV, QV, 4...20 mA (L1) or 4...20 mA (L2) value is displayed. For the definition of the HART® dynamic variables, please look into the manual of the connected field device.

For the 4...20 mA mode, you can choose in menu option **A4.1** between 4...20 mA (L1) value and a user specific value. If the user has not defined a conversion of the measured current, the system shows the measured current in "mA" in big letters on the display.

2. Measurement page

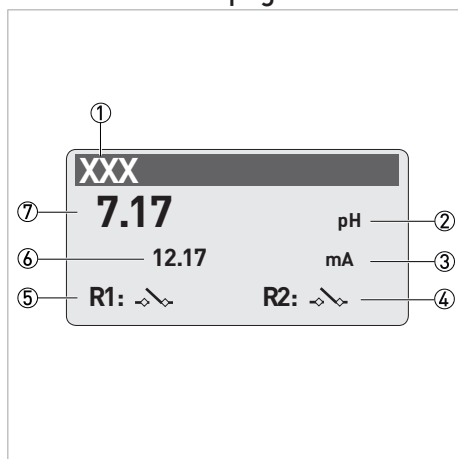


Figure 6-2: 2. Measurement page

- ① TAG
- ② Measuring unit first value
- ③ Measuring unit second value
- ④ Relay 2 status
- ⑤ Relay 1 status
- ⑥ 2. Measuring value
- ⑦ 1. Measuring value

This 2. measurement page shows two values with the corresponding unit.

For the displayed values you can choose between PV, SV, TV, QV, 4...20 mA (L1) in HART® mode in menu option **A4.2** and 4...20 mA or a user specific value in 4...20 mA mode. Those options are for both variables.

3. Measurement page

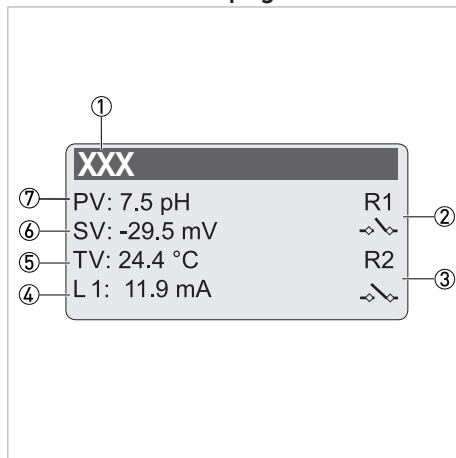


Figure 6-3: 3. Measurement page

- ① TAG
- ② Relay 1 status
- ③ Relay 2 status
- ④ 4. Measuring value
- ⑤ 3. Measuring value
- ⑥ 2. Measuring value
- ⑦ 1. Measuring value

This 3. Measurement page is only available if HART® mode is selected in **A2**. It shows up to four values with the corresponding unit.

The number of values is freely configurable. The status of the relays is displayed on the right side in this case.

Go to menu option **A4.3** to choose between the parameters PV, SV, TV, QV, 4...20 mA (L1) and 4...20 mA (L2) for each value.

Trend graph

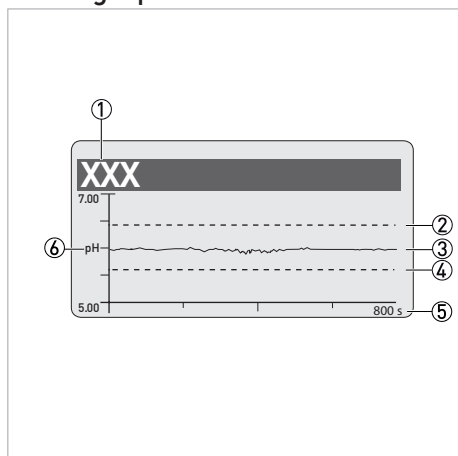


Figure 6-4: Trend graph

- ① TAG
- ② Limit line (for example relay 1)
- ③ Trend graph
- ④ Limit line (for example relay 2)
- ⑤ Span
- ⑥ Measuring unit

The trend graph shows a graph of the measured values (y-axis) for a predefined time period (x-axis).

Go to menu option **A4.4** to set the variable which should be displayed. You can choose between the variables PV, SV, TV, QV, 4...20 mA (L1) and 4....20 mA (L2) in HART® mode and 4...20 mA (L1) and User in 4...20 mA mode. Set the range where you can decide between manual and automatic. In manual mode, you can define the lower range and the upper range value. Decide, if the limit lines of relay 1 and relay 2 should be displayed. The span results from the timescale and is configurable in menu **A4.4.13/A4.4.14**. Here you can set the time lag between two displayed values. Multiply the value with factor 200 to get the span.

Graph summary

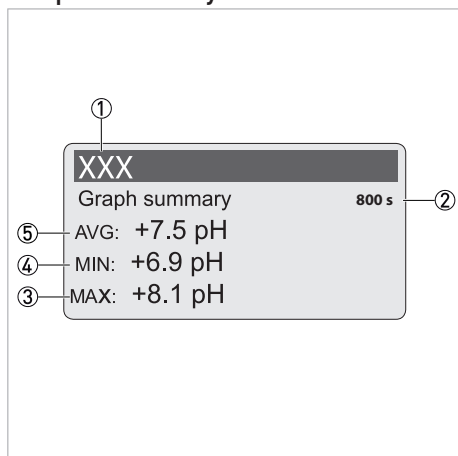


Figure 6-5: Graph summary

- ① TAG
- ② Span
- ③ Max. measured value
- ④ Min. measured value
- ⑤ Average measured value

On the Graph summary, the measured values for the configured parameters are evaluated for the defined span.

Status page

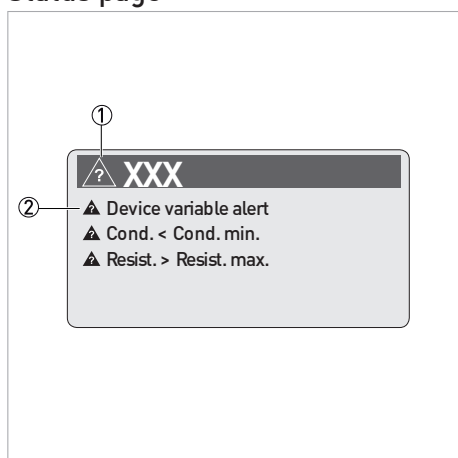


Figure 6-6: Status page

- ① TAG
- ② Error message

The status page shows the status of the field device. In front of each message there is a letter indicating the category of a status message. Furthermore, there is a status message explaining the error category in front of each group of messages. Press > to get detailed information about the displayed error and leave that page by pressing ↵. Press ▼ or ▲ to leave the status page to the measurement pages for entering the menu.

6.4.2 Number of format

The function “Number format” in menu **A4.5** allows to define the number format of each measuring value. In HART® mode, you can configure the number of digits and the decimals of PV, SV, TV, QV, 4...20 mA L1 and 4...20 mA L2. In 4...20 mA mode, it is possible to define the number of digits and the decimals for a user variable.

6.4.3 Configuration of Loop 1

HART® mode

Press > to enter the main menu	
Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Loop 1 is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Loop current settings is highlighted and press > to enter the submenu. Define the Lower range value and press ↵. Define the upper range value and press ↵. Press ↵ to get back in the higher level.	
Press ↓ or ↑ until the submenu Loop monitoring is highlighted and press > to enter the submenu. Activate the Monitoring for a comparative measurement between the measured current and the current transmitted by HART®. If required, set the Max. deviation and the Reaction time . Press ↵ several times to save the configuration and to return to the measuring mode.	

4...20 mA mode

Press > to enter the main menu.	
Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Loop 1 is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Unit is highlighted and press > to enter the submenu. Select the unit of the 4...20 mA signal from predefined unit groups or enter a custom unit. Press ↵ to get back in the higher level.	
Press ↓ or ↑ until the submenu Lower range value is highlighted and press > to enter the submenu. Define the measuring values for 4 mA and 20 mA. Press ↵ to get back in the higher level.	
Press ↓ or ↑ until the submenu Upper range value is highlighted and press > to enter the submenu. Define the measuring values for 4 mA and 20 mA. Press ↵ to get back in the higher level.	
Press ↓ or ↑ until the submenu Enable extended range is highlighted and press > to enter the submenu. Activate the extended range if required. Press ↵ several times to save the configuration and to return to the measuring mode.	

6.4.4 Configuration of Loop 2

HART® mode

Press > to enter the main menu.		
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Loop 2 is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ to choose between Current output , Power supply , Off . Press ↵ to get back in the higher level.
		If Power supply is selected, you can use Loop 2 for backlight and LEDs for NAMUR NE 107 signalisation.
		If Current output is selected, the following possibilities are available for selection.
		Press ↓ or ↑ until the submenu Variable selection is highlighted and press > to enter the submenu. Choose a variable and press ↵.
		Press ↓ or ↑ until the submenu Lower range value is highlighted and press > to enter the submenu. Define the lowest value and press ↵.
		Press ↓ or ↑ until the submenu Upper range value is highlighted and press > to enter the submenu. Define the highest value and press ↵.
		Press ↓ or ↑ until the submenu Lower ext. value is highlighted and press > to enter the submenu. Define the lowest value and press ↵.
		Press ↓ or ↑ until the submenu Upper Ext. Value is highlighted and press > to enter the submenu. Define the highest value and press ↵.
		Press ↓ or ↑ until the submenu Error function is highlighted and press > to enter the submenu. Define the error function. If the measurement is defective or the HART® communication is interrupted, the value can be hold or a high or low error current can be sent.
		Press ↓ or ↑ until the submenu Trimming 4mA is highlighted and press > to enter the submenu. Define the 4mA Trimming and press ↵. Press ↵ to get back in the higher level.
		Press ↓ or ↑ until the submenu Trimming 20mA is highlighted and press > to enter the submenu. Define the 20mA Trimming and press ↵. Press ↵ several times to save the configuration and to return to the measuring mode.

4...20 mA mode

Press > to enter the main menu.		
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Loop 2 is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until Power supply is highlighted and press ↵. Press ↵ to get back in the higher level.
		Press ↓ or ↑ until the submenu Trimming 4mA is highlighted and press > to enter the submenu. Define the 4mA Trimming and press ↵ to get back in the higher level.
		Press ↓ or ↑ until the submenu Trimming 20mA is highlighted and press > to enter the submenu. Define the 20mA Trimming and press ↵. Press ↵ several times to save the configuration and to return to the measuring mode.

6.4.5 Function of relay 1 + 2

To configure relay 1 and 2, go to menu **A5.4** respectively **A5.5**.

Limit switch (band)

In Limit switch (band) mode, you define a permitted measuring range (band). When the measuring value exceeds or falls below this range, the relay switches.

You can choose if the relay opens (not inverted) or closes (inverted) when the value exceeds or falls below the band.

In addition, two hysteresis are configurable. For the upper limit you define an upper hysteresis and for the lower limit a lower hysteresis.

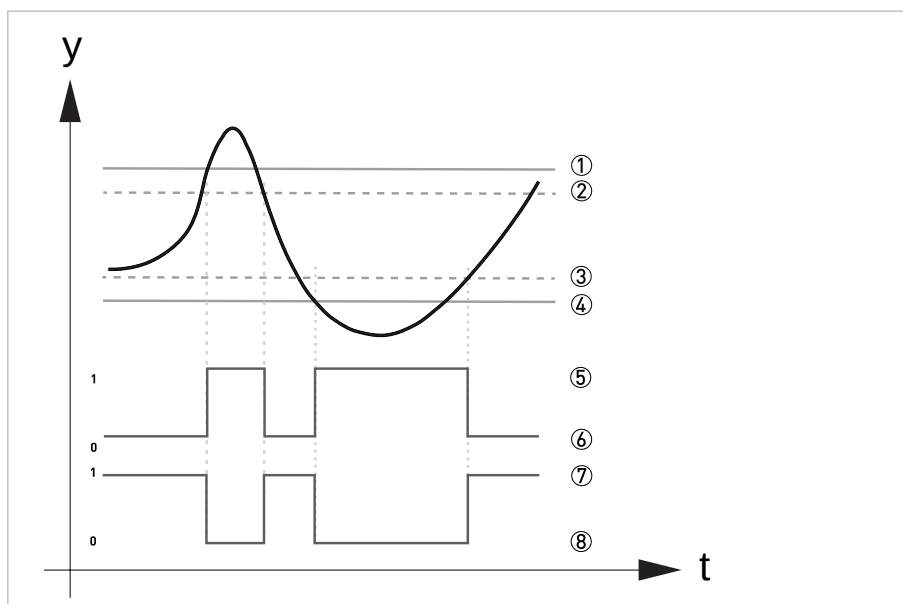


Figure 6-7: Limit switch (band)

- ① High alarm
- ② High hysteresis
- ③ Low hysteresis
- ④ Low alarm
- ⑤ Relay closed (not inverted)
- ⑥ Relay open (not inverted)
- ⑦ Relay closed (inverted)
- ⑧ Relay open (inverted)

Limit switch (threshold)

In Limit Switch (Threshold) mode, you define a threshold. When the measuring value exceeds or falls below this threshold, the relay switches.

Decide if the relay opens (inverted) or closes (not inverted) when the value exceeds or falls below the threshold.

The hysteresis is freely configurable. Define an upper hysteresis if you have an upper threshold and a lower hysteresis if you have a lower threshold.

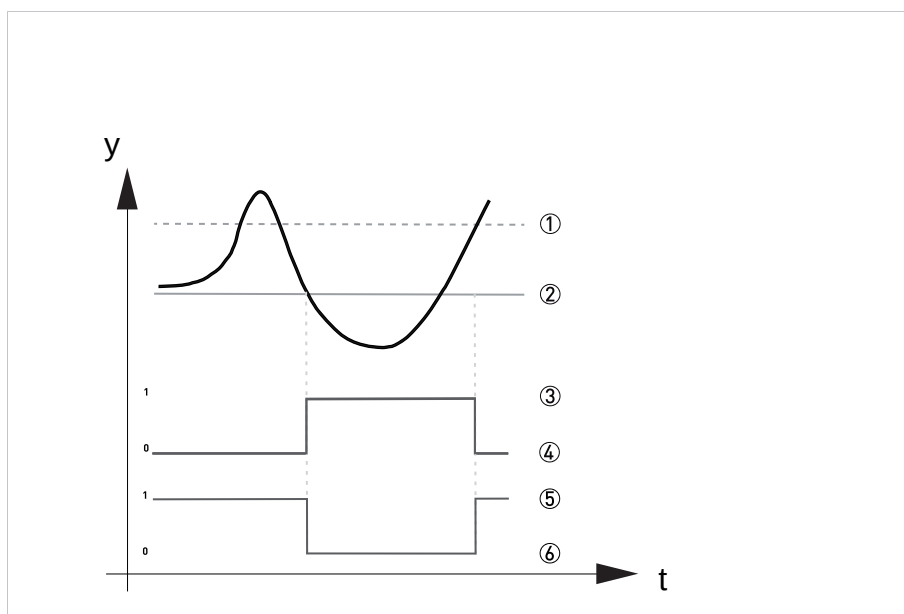


Figure 6-8: Limit switch (threshold) underrun direction

- ① Hysteresis
- ② Threshold
- ③ Relay closed (not inverted)
- ④ Relay open (not inverted)
- ⑤ Relay closed (inverted)
- ⑥ Relay open (inverted)

6.4.6 Configuration of relay 1+2

In **HART®** mode, you can choose between Limit switch (threshold), Limit switch (band), Off, System alarm, Loop 1 error current, USP<645> and Field device status.

In Limit Switch (Threshold) mode, you define a threshold. When the measuring value exceeds or falls below this threshold, the relay switches.

Limit switch (threshold)

In Limit Switch (Threshold) mode, you define a threshold. When the measuring value exceeds or falls below this threshold, the relay switches.

Press > to enter the main menu.			
		Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until the submenu Limit switch (thresh.) is highlighted and press ←.	
		Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ←.	
		Press ↓ or ↑ until the submenu Set variable is highlighted and press > to enter the submenu. Choose between 4...20 mA [L1], QV, TV, SV, PV, 4...20 mA [L2] to set the variable and press ←.	
		Press ↓ or ↑ until the submenu Set threshold is highlighted and press > to enter the submenu. Define the value and press ←.	
		Press ↓ or ↑ until the submenu Set hysteresis is highlighted and press > to enter the submenu. Define the value and press ←.	
		Press ↓ or ↑ until the submenu Set characteristic is highlighted and press > to enter the submenu. Choose between Overrun and Underrun and press ←.	
		Press ← several times to save the configuration and to return to the measuring mode.	

In Limit switch (band) mode, you define a permitted measuring range (band). When the measuring value exceeds or falls below this range, the relay switches.

Limit switch (band)

In Limit switch (band) mode, you define a permitted measuring range (band). When the measuring value exceeds or falls below this range, the relay switches.

Press > to enter the main menu.			
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.		
	Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.		
	Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.		
	Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu Press ↓ or ↑ until the submenu Limit switch (band) is highlighted and press ↵.		
	Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ↵.		
	Press ↓ or ↑ until the submenu Set variable is highlighted and press > to enter the submenu. Choose between 4...20mA and User and press ↵.		
	Press ↓ or ↑ until the submenu Set low alarm is highlighted and press > to enter the submenu. Define the value and press ↵.		
	Press ↓ or ↑ until the submenu Set low alarm hysteresis is highlighted and press > to enter the submenu. Define the value and press ↵.		
	Press ↓ or ↑ until the submenu Set high alarm is highlighted and press > to enter the submenu. Define the value and press ↵.		
	Press ↓ or ↑ until the submenu Set high alarm hysteresis is highlighted and press > to enter the submenu. Define the value and press ↵.		
Press ↵ several times to save the configuration and to return to the measuring mode.			

System alarm

Use of the relays for system alarm

Press > to enter the main menu.			
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.		
	Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.		
	Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.		
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until the submenu System alarm is highlighted and press ↵.	
		Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ↵.	
		Press ↵ several times to save the configuration and to return to the measuring mode.	

Loop1 error current

Use of the relays for error current

Press > to enter the main menu.			
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.		
	Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.		
	Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.		
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu Loop 1 error current is highlighted and press ←.	
		Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ←.	
		Press ↓ or ↑ until the submenu Loop 1 error current is highlighted and press > to enter the submenu. Choose between Both , Low and High to configure the switching point of the relay and press ←.	
Press ← several times to save the configuration and to return to the measuring mode.			

USP<645>

Use of the relays to control the conductivity according to USP<645> of ultrapure water

Press > to enter the main menu.		
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until the submenu USP<645> is highlighted and press ↵.
		Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ↵.
		Press ↓ or ↑ until the submenu Set factor for USP<645> is highlighted and press > to enter the submenu. Define the value and press ↵.
		Press ↵ several times to save the configuration and to return to the measuring mode.

Field device status

Use of the relays for a field device status

Press > to enter the main menu.		
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until the submenu Field device status is highlighted and press ↵.
		Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ↵.
		Press ↓ or ↑ until the submenu Field device status is highlighted and press > to enter the submenu. Choose between Maintenance requir. , Failure , Check function , Out of specification . The relay switches when the field device transmits the selected error category and press ↵.
		Press ↵ several times to save the configuration and to return to the measuring mode.

In **4...20 mA mode**, you can choose between Loop 1 error current, Limit switch (thresh.), Limit switch (band) and **Off**.

Loop 1 error current

Use of the relays for error current

Press > to enter the main menu	
Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until the submenu Loop 1 error current is highlighted and press ←.	
Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ←.	
Press ↓ or ↑ until the submenu Loop 1 error current is highlighted and press > to enter the submenu. Choose between Both , Low and High to configure the switching point of the relay and press ←. Press ← several times to save the configuration and to return to the measuring mode.	

Limit switch (thresh.)

In Limit switch (threshold) mode, you define a threshold. If the value is over or below the threshold, the relay switches.

Press > to enter the main menu	
Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.	
Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until the submenu Limit switch (thresh.) is highlighted and press ←.	
Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ←.	
Press ↓ or ↑ until the submenu Set variable is highlighted and press > to enter the submenu. Choose between 4...20 mA (L1) and User to define the relay variable and press ←.	
Press ↓ or ↑ until the submenu Set threshold is highlighted and press > to enter the submenu. Define the value and press ←.	
Press ↓ or ↑ until the submenu Set hysteresis is highlighted and press > to enter the submenu. Define the value and press ←.	
Press ↓ or ↑ until the submenu Set characteristic is highlighted and press > to enter the submenu. Choose between Overrun and Underrun to define when the relay should switch and press ←.	

Limit switch (band)

In Limit switch (Band) mode you define a band in which your value should be. When the value increases over the band or falls below the band, the relay switches.

Press > to enter the main menu.		
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
	Press ↓ or ↑ until the submenu I/O is highlighted and press > to enter the submenu.	
	Press ↓ or ↑ until the submenu Relay 1 is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu Mode is highlighted and press > to enter the submenu. Press ↓ or ↑ until the submenu Limit switch (band) is highlighted and press ↵.
		Press ↓ or ↑ until the submenu Invert is highlighted and press > to enter the submenu. Choose between Yes and No when an inversion is required or not and press ↵.
		Press ↓ or ↑ until the submenu Set variable is highlighted and press > to enter the submenu. Choose between 4...20 mA (L1) and User when to define the relay variable and press ↵.
		Press ↓ or ↑ until the submenu Set low alarm is highlighted and press > to enter the submenu. Define the value and press ↵.
		Press ↓ or ↑ until the submenu Set low alarm hysteresis is highlighted and press > to enter the submenu. Define the value and press ↵.
		Press ↓ or ↑ until the submenu Set high alarm is highlighted and press > to enter the submenu. Define the value and press ↵.
		Press ↓ or ↑ until the submenu Set high alarm hysteresis is highlighted and press > to enter the submenu. Define the value and press ↵.

6.4.7 Illumination Setting

Press > to enter the main menu.		
	Press ↓ or ↑ until the submenu Setup is highlighted and press > to enter the submenu.	
	Press ↓ or ↑ until the submenu Display is highlighted and press > to enter the submenu.	
	Press ↓ or ↑ until the submenu Illumination setting is highlighted and press > to enter the submenu.	
		Press ↓ or ↑ until the submenu Backlight is highlighted and press > to enter the submenu Choose between On , Off and Timer when a backlight is required and press ↵. If Timer was chosen, press ↓ or ↑ until the submenu Timer is highlighted and press > to enter the submenu. Define the holding time of backlight without key activation and press ↵.
		Press ↓ or ↑ until the submenu Status LEDs is highlighted and press > to enter the submenu. Choose between Yes and No when the LEDs are required or not and press ↵.
		Press ↵ several times to save the configuration and to return to the measuring mode.

6.4.8 Overflow sign and exponential format

If there is not enough space available for the complete measured value, the display either shows the overflow sign or uses the exponential format (depending on the settings in functions).

Overflow sign

The user can define that a particular display line should consist of a fixed number of digits in menu **A4.5**. For this purpose the corresponding function must not have the setting "automatic". If the measuring result in this line exceeds this number, the display shows the overflow sign right beside the plus/minus sign. It appears as a triangle pointing to the left as shown in the following drawings:

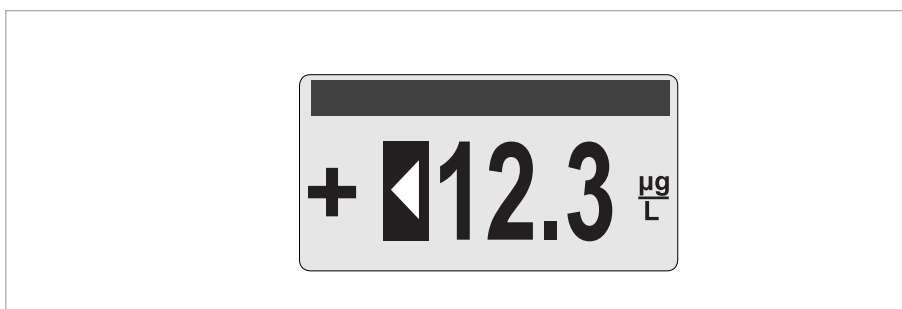


Figure 6-10: Overflow sign

Exponential format

If the format of the related display line is set to "automatic" in menu **A4.5** long measuring results appear in an exponential format:



Figure 6-11: Exponential format

7.1 Maintenance and repair

The device is maintenance free. Also note the following admonition concerning malfunctions:



DANGER!

In case of a malfunction only the technical service is allowed to repair the device. Never try to repair the device on your own, otherwise it may come to fatal injuries, destruction or damage of the device or measuring errors.

7.2 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

7.3 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.



INFORMATION!

For more precise information, please contact your local sales office.

7.4 Returning the device to the manufacturer

7.4.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.



WARNING!

Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of the personnel, the manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*



WARNING!

If the device has been operated with toxic, caustic, radioactive, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that it is safe to handle and stating the product used.*

7.4.2 Form (for copying) to accompany a returned device


CAUTION!

To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.

Company:		Address:	
Department:		Name:	
Telephone number:		Email address:	
Fax number:			
Manufacturer order number or serial number:			
The device has been operated with the following medium:			
This medium is:		radioactive	
		water-hazardous	
		toxic	
		caustic	
		flammable	
		We checked that all cavities in the device are free from such substances.	
		We have flushed out and neutralized all cavities in the device.	
We hereby confirm that there is no risk to persons or the environment caused by any residual media contained in this device when it is returned.			
Date:		Signature:	
Stamp:			

7.5 Disposal


LEGAL NOTICE!

Disposal must be carried out in accordance with legislation applicable in your country.

Separate collection of WEEE (Waste Electrical and Electronic Equipment) in the European Union:


According to the directive 2012/19/EU, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste**. The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

7.5.1 Disassembly and recycling

This section briefly describes the instructions of handling and disassembling the device when it has reached the end of its useful life (EOL) or is disposed of after usage. The information given is sufficient to gather the most important parts of the device (by the end-user) which can be used for recycling.

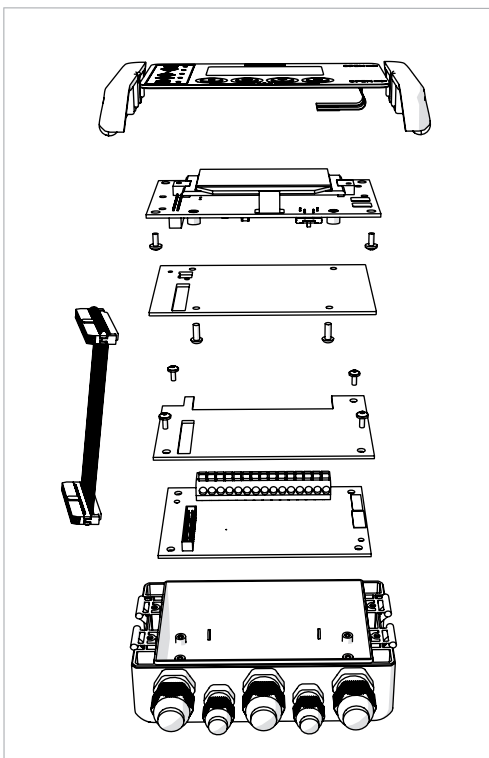


Figure 7-1: Overview disassembly- housing

	Component	Material	Weight [g/lb]
1	Housing	PC	228 / 0.5
2	LCD screen, size<23 cm ²	diverse	11 / 0.02
3	Cable	PVC, Copper	11 / 0.02
4	PCB display, size<76 cm ²	FR4	57 / 0.13
5	PCB display cover, size: 77 cm ²	FR4	23 / 0.05
6	PCB basic, size<82cm ²	FR4	52 / 0.12
7	PCB basic cover, size<81 cm ²	FR4	20 / 0.04

Table 7-1: Overview disassembly- housing

No battery and no capacitors >25 mm included

No battery and no capacitors >25 mm included

**INFORMATION!**

The percentage of hazardous substances present in the components comply with RoHS.

**INFORMATION!**

The product does not contain harmful gases or substances. There are no special guidance or actions necessary to disassemble the device.

**CAUTION!**

Before disassembling the device, make sure you have the proper tools needed.

- *Flat tool*

**INFORMATION!**

- *Wear personal protective equipment.*
- *Make sure you use a steady workplace/bench to do the disassembly actions.*

**DANGER!**

*The device **MUST** be disconnected from mains power before disassembling.*

Remove connection and/or other cable(s)

Connection cable materials consist of (several) metal conductor (usually copper), surrounded with a flexible plastic insulation.

Disassembling the device

- Open the housing with a flat tool.
- Disconnect all cables
- Remove the circuit boards

All main parts are now disassembled and can be shipped separately for reuse and/or recycling.

8.1 Technical data



INFORMATION!

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).

Measuring system

Measuring principle	The measuring principle depends on the used field device(s), for further information refer to the field device manual(s).
Measuring range	The measuring range depends on the used field device(s), for further information refer to the field device manual(s).

Design

Construction	A typical measuring system consists of: • SHD 200 • HART® capable field device • Field device cable
Communication protocol	≥ HART® 5

Display and user interface

Graphic display	LC display 256 x 128 pixel
Operating elements	4 push buttons for operator control of the signal converter without opening the housing.
Operating menu	The operation menu consists of: Measuring mode: 6 pages (5 measurement pages and 1 status page) Menu mode: variety of main and submenus that allows to customise the device according to the demands of the measuring point.
Operating and display languages	English, German, French, Italian, Spanish
Units	HART® units and customer specific units

Operating conditions

Temperature	
Ambient	-20...+70°C / -4...+158°F Note: the manufacturer strongly recommends to protect the signal converter from external heat sources such as direct sunlight as higher temperatures reduce the life cycle of all electronic components!
Storage	-30...+70°C / -22...+158°F
Altitude	≤ 2000 m / 6561.68 f

Other conditions

Humidity	RH4...100% rH (IEC 60721-3-4:1995 Class 4K4)
Ingress protection acc. to IEC 60529:	IP66/ IP67

Installation conditions

Weight	Approx. 413 g / 0.91 lb
Installation	Wall mounting; assure a vertical mounting orientation Wall or pipe mounting with weather protection cover

Materials

Housing	Plastic (Polycarbonate)
Cable glands	3xM16x1.5 2xM12x1.5 Material: Polyamid

Electrical connections

Power supply	20...30 VDC, loop powered from 4...20 mA signal input; Voltage drop max. 4V at 4 mA and 2V at 20 mA
System requirements	250 Ω loop resistance for HART® communication. Note: In most Ex isolation amplifiers the 250 Ohm resistor is already integrated.
Current output	12...30 VDC; 4...20 mA signal output (passive)
Relays	Two solid state relays working as status output, system alarm or limit switch • The relay contacts are electrically isolated from each other and from all other circuits • The output stages of the status outputs/limit switches behave like relay contacts • Possible conditions: NO (normally open) or NC (normally closed) Contact ratings: • Maximum voltage = 60 V • Maximum load current = 75 mA up to 55°C and 50 mA above 55°C • Max on resistance = 10 Ohm

Approvals and certifications

CE	
The device meets the essential requirements of the EU directives. The CE marking indicates the conformity of the product with the union legislation applying to the product and providing for CE marking.	
For full information of the EU directives and standards and the approved certifications, please refer to the EU declaration on the website of the manufacturer.	
Other approvals and standards	
NAMUR recommendation	NE 6, NE 21, NE 43, NE 53, NE 107
Shock resistance	IEC 60721-3-4 class 4M4
Vibration resistance	IEC 60721-3-4 class 4M4
	IEC 61298-3 low vibration control room

8.2 Dimensions

Housing

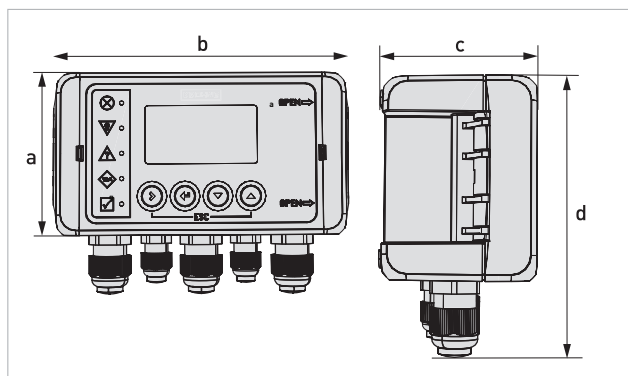


Figure 8-1: Dimension housing

	Dimensions [mm]				Weight [g]
	a	b	c	d	
Wall mounted	80	151	60	105	413

Table 8-1: Dimension housing in mm

	Dimensions [inch]				Weight [pound]
	a	b	c	d	
Wall mounted	3.15	5.94	2.36	4.13	0.91

Table 8-2: Dimension housing in inch







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