Operating Instructions

for

Level Sensor

Model: NGR

Contents

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1 NGR level sensor

1.1 Principle of operation

The NGR uses TDR (Time Domain Reflectometry) technology. This is a process to determine transit times of electromagnetic waves. The sensor electronics generate a low-energy electromagnetic pulse, which is linked to and runs along the probe. If this pulse strikes the surface of the liquid to be measured, a portion of the pulse is reflected there and is conducted back up along the probe path to the electronics, which then calculate the level based on the time difference between the sent and the received pulse. The sensor can output this level as a continuous measured value (analog output) and can also derive two or four freely positionable switching points from it (switching outputs).

1.2 Safety notes

- Read the operating instructions prior to commissioning.
- These operating instructions are valid for devices from firmware version 4.00.
- Connection, mounting, and setting may only be performed by trained specialists.
- The NGR is not a safety component under the EU Machinery Directive.
- Observe national safety and work safety regulations.
- Repairs may only be carried out by the manufacturer. Altering or tampering with the device is not permitted.
- Wiring work and the opening and closing of electrical connections may only be carried out when the power is switched off.
- The radiated power is far lower than that from telecommunication equipment. According to current scientific research, the operation of this device can be classified as safe and nonhazardous.
- Incorrect handling or improper use can lead to malfunctions in your application.

1.3 Fields of application

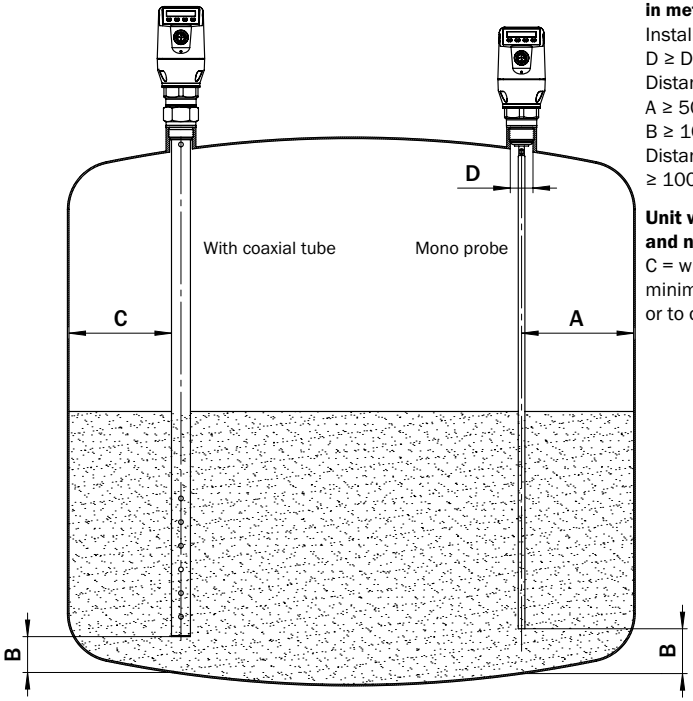
The innovative TDR technology enables reliable level measurement which is largely application-independent. The NGR is suitable for both continual level measurement and limit level detection in nearly all liquids.
It is not affected by changes in the properties of the liquids to be measured. The NGR can be used in metal containers or bypass/immersion pipes. A coaxial tube is required for use in plastic containers.

1.4 Installation conditions

The NGR is mounted vertically from above into the container or bypass, using its process connection. The NGR level sensor has a G ¾ or ¾" NPT threaded connection. Observe a minimum connection diameter in accordance with the following Diagrams 1 and 3. The NGR must be installed so that after mounting there is sufficient distance to other tank components (e.g., supply tubes, other measurement devices), the container wall, or the container bottom. Minimum distances are also described in Diagrams 1 and 3. The NGR can also be used in a metal immersion pipe or bypass. The installation conditions are shown in Diagram 2. Ensure that there is a good metallic connection bet een the NGR measuring de ice and the tank bypass. When operating the sensor, ensure that the ambient temperature is not above or below the limits. Insulating the sensor housing is not permitted for tanks with hot media. When positioning the device, ensure that the sensor is not directly exposed to the filling flow. The sensor housing can be rotated 360°, allowing for the cable outlet to be positioned freely.

Installation in a container

Note: The distances are the same for the sensor with remote amplifier.



Unit with mono probe mounted in metal tank
Installation in nozzle:
D ≥ DN 25 (1")
Distance tank wall/tank bottom:
A ≥ 50 mm (1.97")
B ≥ 10 mm (0.40")
Distance to other tank fittings
≥ 100mm (3.94")

Unit with coaxial tube for metal and non metal tank
C = with a coaxial tube there are no minimum distances to the tank wall or to other tank fittings required.

Diagram 1

Installation in a metal immersion tube or metal bypass

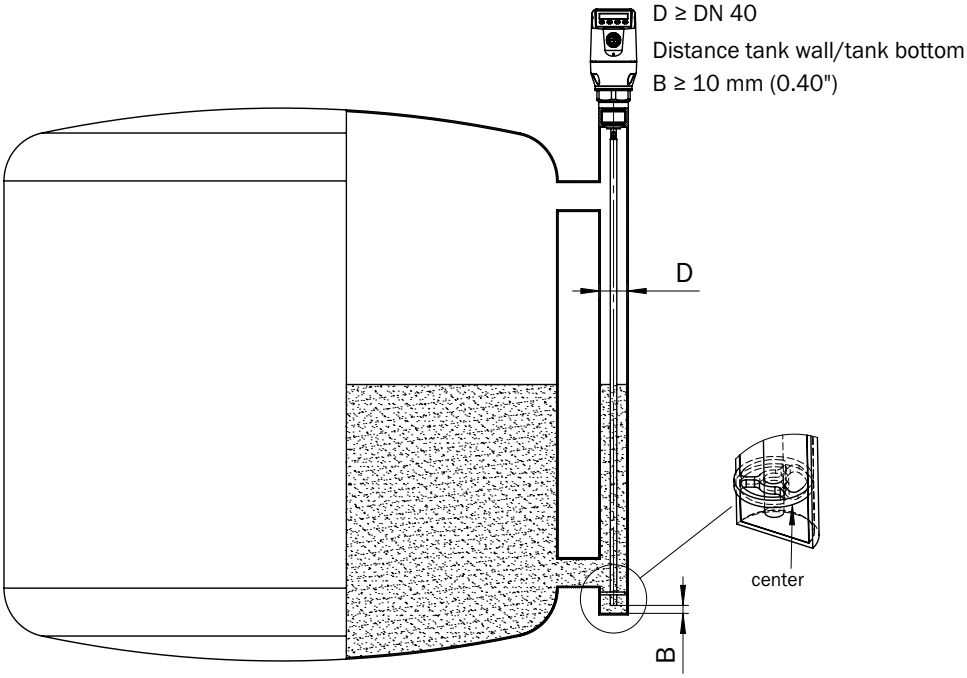
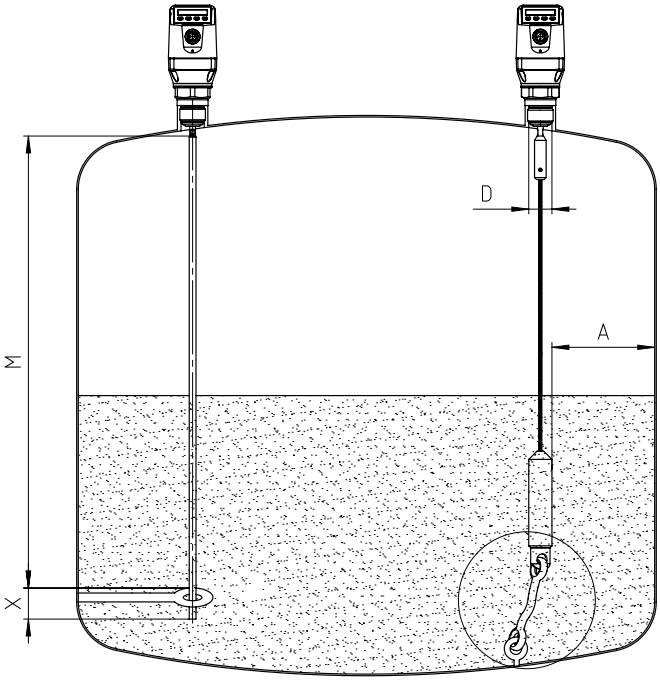


Diagram 2

Centering: To prevent contact between the probe and the bypass pipe during oscillations, the probe should be centered according to its length and depending on the diameter of the bypass pipe. To do this, it is necessary to insert one or two centering pieces.



Mono probe fixing
M = Measuring range
X = No measuring possible in this area

Rope probe mounted in metal tank
Installation in nozzle:
D ≥ DN 25 (1")
Distance tank wall/tank bottom:
A ≥ 50 mm (1.97")
Distance to other tank fittings
≥ 100 mm (3.94")

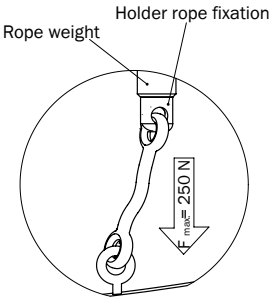
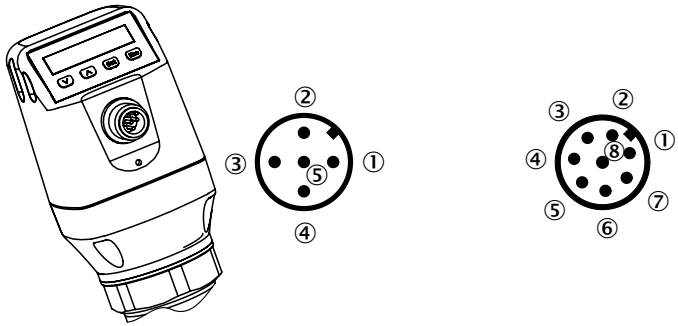


Diagram 3

Tank welds can affect the measurement accuracy.

1.5 Electrical connection

The sensor is connected using a pre-assembled female cable connector with 1 x M12 plug connector (5 or 8-pin). With the power switched off, plug the female cable connector into the sensor and screw it tight. Connect the cable according to its function. After the supply voltage has been applied, the sensor carries out a self-test. Once installed, the sensor is ready for operation on completion of the self-test (< 5 s). The display shows the current measured value.



① **L^+: Supply voltage, brown**
② Q_A: Analog current/voltage output, white
③ M: Ground, reference potential for current/voltage output, blue
④ C/Q_1: Switching output 1, PNP, IO Link communication, black
⑤ Q_2: Switching output 2, PNP/NPN, gray

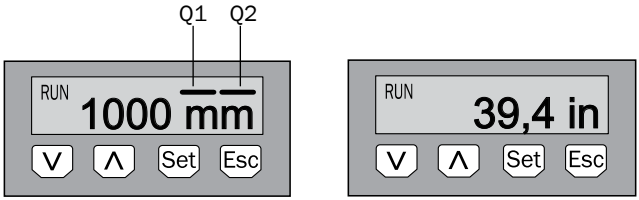
① L^+: Supply voltage
② Q_2: Switching output 2, PNP/NPN
③ M: Ground, reference potential for current/voltage output
④ C/Q_1: Switching output 1, PNP/IO Link communication
⑤ Q_3: Switching output 3, PNP/NPN
⑥ Q_4: Switching output 4, PNP/NPN
⑦ Q_A: Analog current/voltage output ⑧ No function

The wire colors for 8-pin cables are not uniform.Always note the pin assignment of the sensor.

1.6 Display

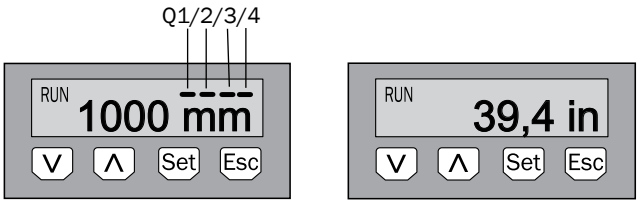
All lengths specified (in mm) in the menu refer to the end of the probe or for a configured offset (see “5.4 Configuring the probe length”) on the tank bottom. You can access the menu by pressing the Set pushbutton for at least three seconds.

Variants with two switching outputs



Note: The statuses of the switching outputs are indicated in millimeters by bar graphs above the unit. This display is not available when inches are selected as the unit.

Variants with four switching outputs



Arrow pushbuttons:	For navigating in the menu and changing values
Set pushbutton:	For saving and confirming
Esc pushbutton:	For exiting the operating menu step-by-step

1.7 IO-Link

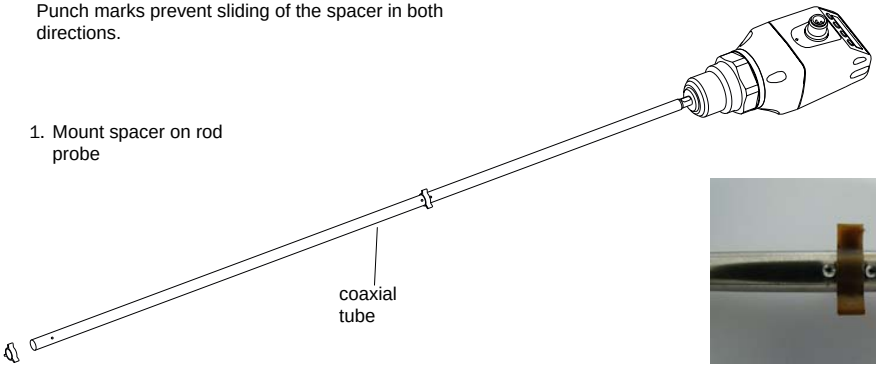
The IO-Link parameter table for NGR device can be found in Appendix 2.
To ensure that the IO-Link device can be operated correctly on the connected IO-Link master, it is necessary to install the device description file matching the device.
The device description files (IODD) are available in the IODDfinder, ioddfinder.io-link.com. Further information on IO-Link is available on the homepage www.io-link.com.

1.8 Mounting the coaxial tube

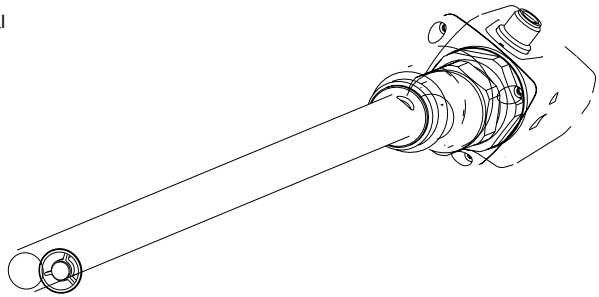
Retrofitting of coaxial probeMount the spacer on the rod probe
(first one at approx. 500 mm from thread, then every 500 mm) and make 2 to 3 punch marks on both sides of each spacer on the rod probe. Do not pull the spacers over the punch marks.

Punch marks prevent sliding of the spacer in both directions.

1. Mount spacer on rod probe

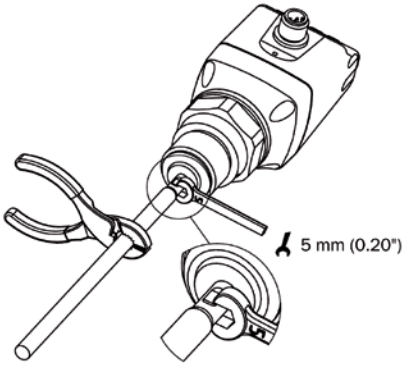


2. Screw coaxial probe

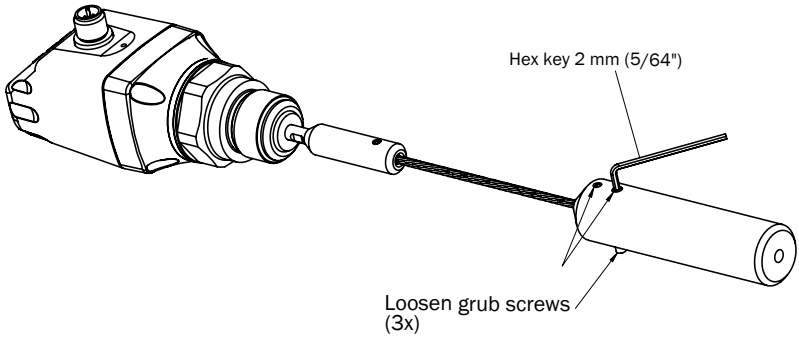


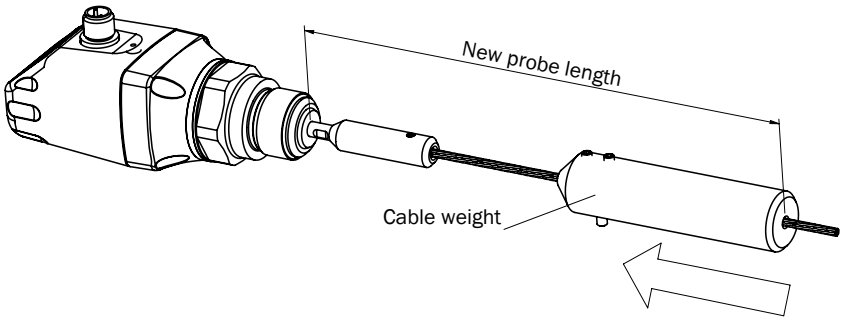
1.9 Shortening or replacing the probe rod/cable probe

If the probe rod or cable probe* is too long for the application, it can be shortened to the container height. In this case, you should not shorten the probe beyond its minimum length of 100 mm.
Procedure: Shorten the probe rod or cable probe* as desired. Set the new probe length in the NGR as described in Chapter “5.4 Configuring the probe length”. Ensure that this correction corresponds to the probe length, because an incorrect value in the *Length* menu has a direct effect on measurement accuracy and can lead to faults. The probe rod or cable probe* can be replaced on the NGR. Use a suitable tool. If the system experiences strong vibrations, secure the probe with thread locker.

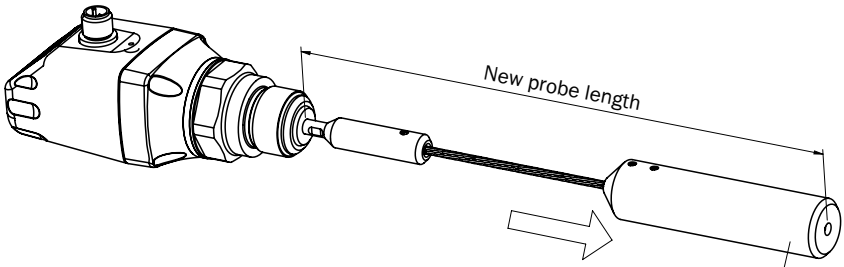


Shortening the cable probe*





Move cable weight to the desired length



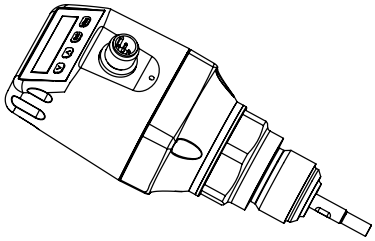
Move rope weight to the desired length

Rope weight

Tighten grub screws (1.5 Nm)*
(3x)

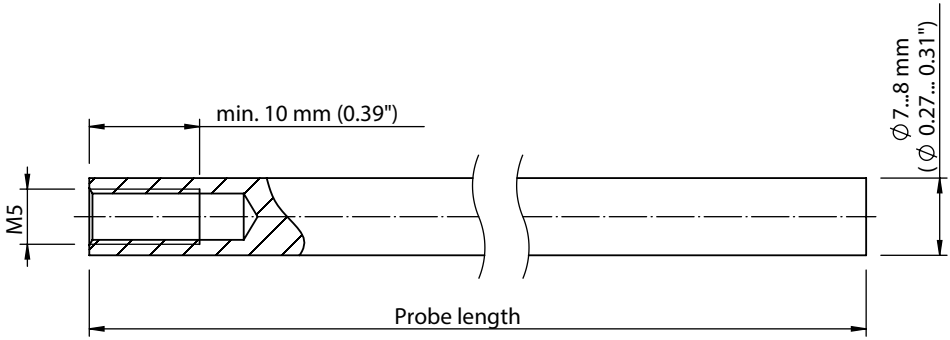
*We recomend to use thread locking fluid to secure the grub screws

1.9 Mounting the probe rod



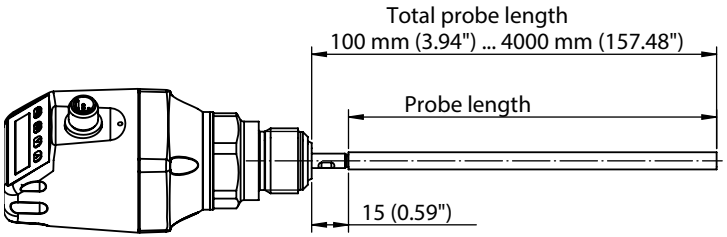
With the NGR, the probe rod can be modified by the customer. The specifications for the probe rod should be as follows:

- Probe rod diameter: 7 mm to 8 mm
- Probe rod female thread: M5
- Female thread length: min. 10 mm
- Material: Stainless steel



- Total probe length: 100 mm to 4,000 mm
- Total probe length = 15 mm + probe rod length

Set the total probe length as described in Chapter “5.4 Configuring the probe length”.
The *EXPRT-Config-Length* menu is password protected. If the system experiences strong vibrations, secure the probe with thread locker.



2 Commissioning the NGR

2.1 Quick commissioning (with factory settings)

Quick commissioning is used in applications under reference conditions (see Chapter 1.4 "Installation conditions").

The following information applies:
- Use in metallic containers or immersion/bypass pipes
- Use in plastic tanks with a coaxial tube (see Chapter “10 Accessories”)
- Situations where the liquid to be measured has a DK value of > 5 (see Chapter 14 "Medium list")

Commissioning

1. Mount the sensor according to the installation conditions (see Chapter 1.4 "Installation conditions" and 1.7 "Mounting the coaxial tube").

2. The container must be empty or the level must be below the end of the probe (see page 5 Installation in a container).

3. Log in to expert mode, see chapter 5.1 Expert mode.

4. After mounting, launch the *AutCal* menu item.
   - Press and hold the Set pushbutton for at least 3 secs.
   - Use the Set pushbutton to confirm the *AutCal* menu item and then use it again to confirm the security question *Ok?*.
   - The *AutCal* function is confirmed with *!CalOK*.

5. Configure the outputs (see Chapter 3 "Configuring the switching outputs" and Chapter 4 "Configuring the analog output").

Note: If the *AutCal* function has been confirmed with *!NoSig*, relaunch *AutCal*.
If you are encountering problems, see Chapter 7 "Troubleshooting".

2.2 Advanced commissioning

Advanced commissioning is required when quick commissioning is not sufficient or if one of the following situations applies:

- The liquid to be measured has a DK value of < 5 (see Chapter 14 "Medium list")
- There are tank components which can interfere with the measurement signal
- There are extreme ripples on the surface of the liquid
- There are variations in the installation conditions (see Chapter 1.4 "Installation conditions")

Commissioning

1. Mount the sensor according to the installation conditions (see Chapter 1.4 "Installation conditions" and 1.7 "Mounting the coaxial tube")

2. Log into expert mode (see Chapter 5.1 "Expert mode")

3. Select the measuring mode
   - Access the *EXPRT-CONFIG-MeasMd* menu using the arrow and Set pushbuttons
   - HiSpd: max. length = 2,005 mm, response time < 400 ms
   - HiAcc: max. length = 6,005 mm, response time < 2,800 ms, more stable measured values, recommended for liquids with low DK values and where TrsHld is < 70

4. Static sources of interference in the tank
   - Static sources of interference in the tank generated by tubes, beams, couplings, or a cleaning ball are taught into the system as standard.
   - Access the *EXPRT-CONFIG-CalRng* menu using the arrow and Set pushbuttons.
   - The following information applies:
     - Teach-in depth starts from the NGR process connection ▫
     Teach-in depth should cover all interference signals
     - Maximum teach-in depth (recommended) = probe length
   - Set the value range between 95 and 6,005 mm

5. Run the *AutCal* function
   - Access the AutCal menu using the arrow and Set pushbuttons.
   - **The following information applies: The probe must not be covered with liquid in the CalRng set in step 4 (teach-in depth + 200 mm).**
   - Use the Set pushbutton to confirm the *AutCal* menu item and then use it again to confirm the security question *Ok?*.
   - The *AutCal* function is confirmed with *!CalOK*.

6. Analyze the signal quality
   - The signal quality can be analyzed when the device is installed (“5.8 Evaluating signal quality”)
   - In the event of problems:
     - Reduce the value in the *EXPRT-CONFIG-TrsHld* menu
     - Set the parameter in the *EXPRT-CONFIG-MeasMd* menu to *HiAcc*
     - Switch on the filter in the *Set filters* menu
     - Reduce the parameter in the *EXPRT-CONFIG-MaxCol* menu

7. Configure the filter (see Chapter “5.2 Filtering measured values”)

8. Maximum change of level/plausibility check (see Chapter “5.2 Filtering measured values”)

9. Configure the outputs (see Chapter 3 "Configuring the switching outputs" and “4 Configuring the analog output”)

Notes
- Please use the foam commissioning instructions for applications with foam.
- The sensor automatically quits expert mode after 5 minutes of inactivity on the display.
- Configuration (*AutCal*) does not take place in the following processes:
  - Changing the probe length
  - Changing the measuring mode
  - Changing the teach-in depth

If you are encountering problems, see Chapter 7 "Troubleshooting".

2.3 Foam commissioning (with factory settings)

For use in applications with a significant buildup of foam.

Performing foam calibration

1. Mount the sensor according to the installation conditions (see Chapter 1.4 "Installation conditions" and 1.7 "Mounting the coaxial tube")

2. Log into expert mode (see Chapter 5.1 "Expert mode")

3. Empty the tank completely
   - The probe rod must be completely free from medium and foam.
   - Buildup must be removed from the probe.
   - The end of the probe must not be fixed to the bottom of the tank.

4. Select the measuring mode
   - Access the *EXPRT-CONFIG-MeasMd* menu using the arrow and Set pushbuttons, and configure to *HiAcc*.

5. Select mode
   Access the EXPRT-Config-Mode using the arrow and Set pushbuttons, and config-ure to Foam.

6. Perform empty calibration
   Access the *EXPRT-FOAM-CalEmp* menu using the arrow and Set pushbuttons.
   - *!CalOk:* proceed to step 7.
   - *!faild:* Ensure that the tank is empty and repeat step 6.

7. Fill with medium (without foam) until the probe is covered by at least 200 mm. The maximum level must remain 200 mm from the process connection, however.

8. Run *EXPRT-Foam-CalMe*d
   - !CalOk: Everything in working order, proceed to step 9
   - !faild: Carry out step 8 again

   The display must now show a valid measured value.
9. Check the foam calibration in *EXPRT-Foam-FomSta*
   - active: Foam commissioning was completed successfully.
   - inactive: Commissioning unsuccessful. Please repeat the process.

Notes

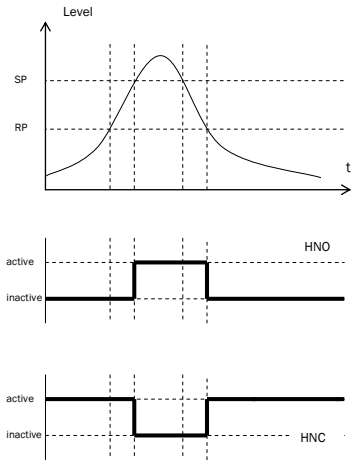
- Measurement deviation can be higher
- Signal quality 1 and 2 are not counted
- The sensor automatically quits expert mode after 5 minutes of inactivity on the display.
- Configuration (foam teach) does not take place in the following processes:
  - Changing the probe length
  - Changing the measuring mode
  - Changing the teach-in depth
  - Running *AutCal*

If you are encountering problems, see Chapter 7 "Troubleshooting".

3 Configuring the switching outputs

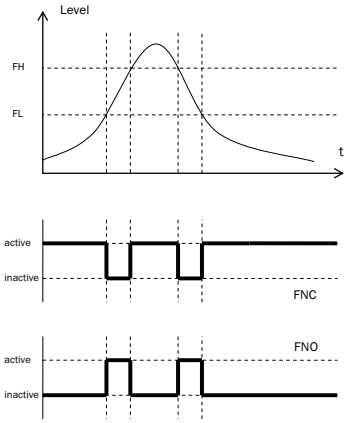
3.1 Switching hysteresis and window function

Depending on 2 or 4 output variants



If the level is fluctuating around the set value (e.g., ripple movement during filling), the hysteresis keeps the switching status of the outputs stable. When the level is increasing, the output switches when the respective switching point (SP) is reached; if the level sinks again, the output switches back only after the reset switching point (RP) has been reached.

Depending on 2 or 4 output variants



The window function enables monitoring of a defined range. If the level is between window high (FH) and window low (FL), the output will be active (normally open) or inactive (normally closed).

The error status of the measuring device reflects the cable break monitoring. During an error status, the measuring device switches to the safe state; i.e., the switching outputs become inactive.
As far as the downstream signal evaluation is concerned, this corresponds to a cable break.

3.2 N/O output with configurable hysteresis

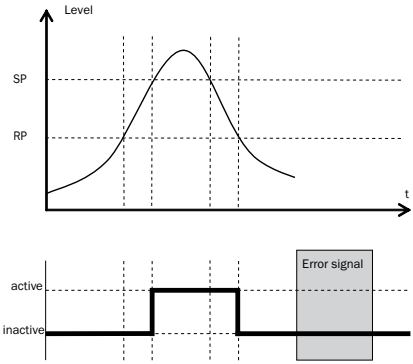
Applications

- Dry run protection
- Empty signal

Configuration

- Configure the *Qx* switching output as normally open
  - Set the parameter in the *QxMENU-OUx* menu to *Qx_Hno*
- Set the switching point
  - Set the value in the *QxMENU-SPx* menu to level in mm (e.g., 500 mm)
- Set the reset point
  - Set the value in the *QxMENU-RPx* menu to level in mm (e.g., 450 mm)
- Select the electrical property [NPN/PNP/DRV (push/pull)]
  - Select the parameter in the *QxMENU-TYPx* menu
  - The following information applies:
    - Qx-PNP = Switching output in PNP circuit
    - Qx-NPN = Switching output in NPN circuit
    - Qx-Drv = Switching output in push/pull function

- Switching output behavior



Switching output		PNP	NPN	DRV	Error status
Normally open/HNO	active	Uv	0 V	Uv (PNP switched)	inactive
	inactive	0 V [1]	Uv [2]	0 V (NPN switched)	

[1] Pulldown only

[2] Pullup only

3.3 N/C output with configurable hysteresis

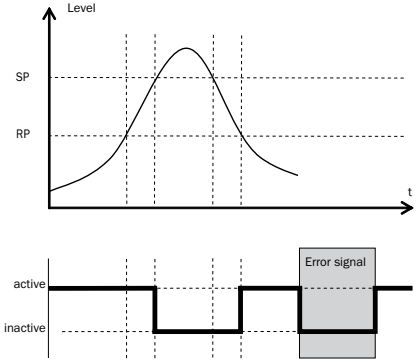
Applications

- Overfill protection
- Full signal

Configuration

- Configure the *Qx* switching output as normally closed
  - Set the parameter in the *QxMENU-OUx* menu to *Qx_Hnc*
- Set the switching point
  - Set the value in the *QxMENU-SPx* menu to level in mm (e.g., 500 mm)
- Set the reset point
  - Set the value in the *QxMENU-RPx* menu to level in mm (e.g., 450 mm)
- Select the electrical property [NPN/PNP/DRV (push/pull)]
  - Select the parameter in the *QxMENU-TYPx* menu
  - The following information applies:
    - Qx-PNP = Switching output in PNP circuit
    - Qx-NPN = Switching output in NPN circuit
    - Qx-Drv = Switching output in push/pull function

Switching output behavior



Switching output		PNP	NPN	DRV	Error status
Normally closed/HNC	active	Uv	0 V	Uv (PNP switched)	inactive
	inactive	0 V [1]	Uv [2]	0 V (NPN switched)	

[1] Pulldown only

[2] Pullup only

3.4 N/O output with window function

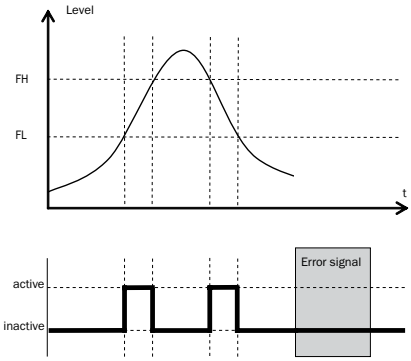
Application

Thecritical filling level for the application is within the FHx and FLx window thresholds.

Configuration

- Configure the Qx switching output as normally open
  - Set the parameter in the *QxMENU-OUx* menu to *Qx_Fno*
- Set the switching point
  - Set the value in the *QxMENU-FHx* menu to level in mm (e.g., 500 mm)
- Set the reset point
  - Set the value in the *QxMENU-FLx* menu to level in mm (e.g., 400 mm)
- Select the electrical property [NPN/PNP/DRV (push/pull)]
  - Select the parameter in the *QxMENU-TYPx* menu
  - The following information applies:
    - Qx-PNP = Switching output in PNP circuit
    - Qx-NPN = Switching output in NPN circuit
    - Qx-Drv = Switching output in push/pull function

Switching output behavior



Switching output		PNP	NPN	DRV	Error status
Normally open/FNO	active	Uv	0 V	Uv (PNP switched)	inactive
	inactive	0 V [1]	Uv [2]	0 V (NPN switched)	

[1] Pulldown only

[2] Pullup only

3.5 N/C output with window function

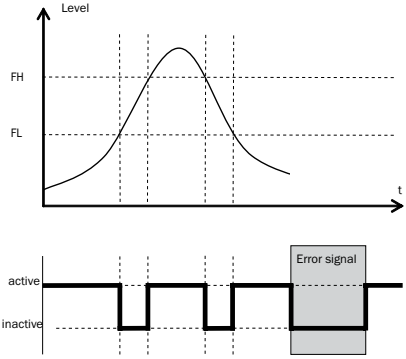
Application

The critical filling level for the application is outside the FHx and FLx window thresholds.

Configuration

- Configure *Qx* the switching output as normally closed
  - Set the parameter in the *QxMENU-OUx* menu to *Qx_Fnc*
- Set the switching point
  - Set the value in the *QxMENU-FHx* menu to level in mm (e.g., 500 mm)
- Set the reset point
  - Set the value in the *QxMENU-FLx* menu to level in mm (e.g., 400 mm)
- Select the electrical property [NPN/PNP/DRV (push/pull)]
  - Select the parameter in the *QxMENU-TYPx* menu
  - The following information applies:
    - Qx-PNP = Switching output in PNP circuit
    - Qx-NPN = Switching output in NPN circuit
    - Qx-Drv = Switching output in push/pull function

Switching output behavior



Switching output		PNP	NPN	DRV	Error status
Normally closed/FNC	active	Uv	0 V	Uv (PNP switched)	inactive
	inactive	0 V [1]	Uv [2]	0 V (NPN switched)	

[1] Pulldown only

[2] Pullup only

3.6 N/O output with error signal

Application

If there is an error message at the NGR, this can be transferred using a switching contact.

Configuration

- Configure the *Qx* switching output as normally open
  - Set the parameter in the *QxMENU-OUx* menu to Qx_Eno
- Select the electrical property [NPN/PNP/DRV (push/pull)]
  - Select the parameter in the *QxMENU-TYPx* menu
  - The following information applies:
    - Qx-PNP = Switching output in PNP circuit
    - Qx-NPN = Switching output in NPN circuit
    - Qx-Drv = Switching output in push/pull function

3.7 N/C output with error signal

Application

If there is an error message at the NGR, this can be transferred using a switching contact.

Configuration

- Configure the Qx switching output as normally closed
  - Set the parameter in the *QxMENU-OUx* menu to Qx_Enc
- Select the electrical property [NPN/PNP/DRV (push/pull)]
  - Select the parameter in the *QxMENU-TYPx* menu
  - The following information applies:
    - Qx-PNP = Switching output in PNP circuit
    - Qx-NPN = Switching output in NPN circuit
    - Qx-Drv = Switching output in push/pull function

4 Configuring the analog output

4.1 Automatic signal detection

The NGR can automatically detect which signal is required using the connected output load (see Chapter 9 "Technical data").
The following information applies:

- 4 mA to 20 mA < 500 ohms at Uv > 15 V
- 4 mA to 20 mA < 350 ohms at Uv > 12 V
- 0 V to 10 V > 750 ohms at Uv ≥ 14 V

Configuration

- Access the *QAMENU-TYP* menu using the arrow and Set pushbuttons.
- Set the *QAMENU-TYP* menu to *Auto?*
- Note: Automatic signal detection is only active when the device is switched on for the first time. After this the function can be activated in the *QAMENU-TYP* menu with *Auto?* again.

4.2 Current output 4-20 mA

Configuration

- Set upper limit value (20 mA)
  - Set the value in the *QAMENU-QAHIGH* menu to level in mm (e.g., 500 mm)
- Set lower limit value (4 mA)
  - Set the value in the *QAMENU-QALOW* menu to level in mm (e.g., 10 mm)
- Invert signal
  - The analog signal can be inverted in the *QAPOL* menu
  - Set the parameter in the *QxMENU-QAPOL* menu to *QA-INV*
    - QA-NRM = Analog output signal as configured
    - QA-INV = Analog output signal is inverted; QAHIGH 4 mA and QALOW 20 mA
- Select electrical signal
  - Set the parameter in the *QxMENU-QATYP* menu to 4–20 mA

4.3 Voltage output 0-10 V

Configuration

- Set upper limit value (10 V)
  - Set the value in the *QAMENU-QAHIGH* menu to level in mm (e.g., 500 mm)
- Set lower limit value (0 V)
  - Set the value in the *QAMENU-QALOW* menu to level in mm (e.g., 10 mm)
- Invert signal
  - The analog signal can be inverted in the *QAPOL* menu
  - Set the parameter in the *QxMENU-QAPOL* menu to *QA-INV*
    - QA-NRM = Analog output signal as configured
    - QA-INV = Analog output signal is inverted; QAHIGH 0 V and QALOW 10 V
- Select electrical signal
  - Set the parameter in the *QxMENU-QATYP* menu to 0–10 V

5 Advanced functions

5.1 Expert mode

Expert mode must first be set to activate special functions.

Logging into expert mode

- Access the PASSW menu using the arrow pushbuttons
- Enter password 000537 (NGR on mobile device keypad / L=5 / F=3 / P=7). If an incorrect password is entered or the device is switched off, expert mode is locked again.

5.2 Filtering measured values

Activating filtering

- Smoothing of the measured value; e.g., in the case of ripples on level surfaces For fast level changes, the average of the measured values over X seconds is indicated.
- Set the parameter in the *Filter* menu
- The possible values are Off, 400 ms, 600 ms, 1,000 ms, 1,400 ms, 2 s, 5 s, 10 s

Maximum change of level (plausibility check)

- For applications that cause the level to jump on the NGR due to strong interference. Entry for the maximum level dynamic in the application or the maximum permissible change rate of the level.
- Log into expert mode (see Chapter 5.1 "Expert mode")
- Reduce the parameter in the *EXPRT-CONFIG-MaxCol* menu
- AnySpd (50 cm/s) (default), 10 cm/s, 5 cm/s, 2 cm/s
- Note:
  - For MeasMd = HiSpd, any max. change rate is possible
  - For MeasMd = HiAcc, max. is 10 cm/s

5.3 Automated adjustment of the Interference signal limit

The adjustment of the interference signal limit (TrsHld) can be carried out automatically in many applications.

Configuration

1. Set a fill level of 30%.
2. Log in to expert mode; see “5.1 Expert mode”.
3. Perform in the EXPRT-Pulse-AutoTn menu.

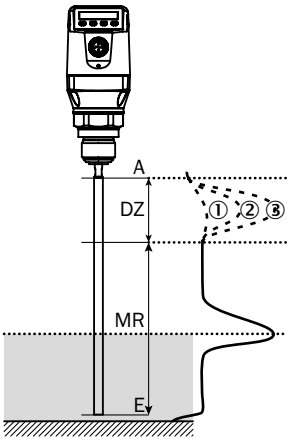
The sensor calculates a suitable value for TrsHld.

Note:

This setting can be used only in pulse mode.

Blanking the interference signals in the masked zone

To blank interference signals from the range above the maximum expected fill level, a zone can be masked (dead zone). This zone begins at the process connection and continues up to the configured point. If signal values above the defined limit value (TrsHld) occur within this range, the sensor enters a safe state and signals the error ! MaskZ.



MaskTr	①		②		③	
	DZ	MR	DZ	MR	DZ	MR
20%	x	✓	✓	x	✓	x
100%	x	✓	x	✓	✓	x
200%	x	✓	x	✓	x	✓

① No reflection/very weak reflection

② Weak reflection (e.g. spray water)

③ Strong reflection (e.g. thick layer of ketchup) DZ Dead zone

MR Active measuring range

x No detection/measurement

✓ Detection/measurement

Configuration

1. Log in to expert mode; see “5.1 Expert mode”.
2. Define the parameter in the EXPRT-Pulse-MaskZn menu.

Note:

This setting can be used only in pulse mode.

5.4 Selection of evaluation method

You can switch between pulse mode and foam mode as an evaluation method. Depending on the selected mode, other evaluation algorithms are used.

Configuration

1. Log in to expert mode; see “5.1 Expert mode”.
2. In the EXPRT-Config-Mode menu, select between Pulse and Foam.

The following rules apply:

- Mode = Pulse: The sensor measures either with or without AutCal.
- Mode = Foam: The sensor measures only with valid CalEmp+CalMed. If no valid calibration is available, the CalPls message is displayed and the sensor enters a safe state.

Note:

If AutCal is called up while the sensor is in foam mode, then AutCal is denied and the error message !Denid is shown.

5.5 Testing the configuration

Testing outputs

Switching/analog outputs can be simulated. This makes it possible to check the wiring and signal values on the connected systems, such as the PLC control, relay and lamps.

Configuration

Activate the Qx switching output

▶ Set the parameter in the QxMENU-SimQx menu to QxOn.

Additional options:

- QxOff = switching output off
- QxNorm = switching output in measuring operation
- QxOn = switching output is active

Note:

The simulation is automatically deactivated if the supply voltage is interrupted.

- Activate the QA analog output
  - Set the parameter in the *QAMENU-SimCur* or *SimVol* menu to the desired signal value.
    - SimCur for current output
    - SimVol for voltage output
- Note: The simulation is automatically deactivated if the supply voltage is interrupted.

Simulating the level

- Even if there is no liquid in the container yet, it is possible to select a filling level in the menu in order to test the sensor configuration. When simulating a level value, all outputs on the NGR are set according to the defined configuration. The function should not be selected until a configuration is complete.

Configuration

- Set parameter to the desired filling level as a % in the SimLev menu
- Note:
  - The level simulation refers to the probe length or container level (probe length + offset) if an offset is configured (see Chapter 5.12 "Setting the offset")
  - The simulation is only active when there are no error messages. The simulation is automatically deactivated if the supply voltage is interrupted.
- Parameter selection
  - SimOff: Off
  - Fill level 0%
  - Fill level 25%
  - Fill level 50%
  - Fill level 75%
  - Fill level 100%

5.6 Configuring the probe length

- Log into expert mode (see Chapter 5.1 "Expert mode")
- Access the *EXPRT-CONFIG-Length* menu using the arrow and Set pushbuttons.
- Enter the probe length in the *Length* menu. Please note the defined probe length in Chapter 8.8 "Dimensional drawings"
- Note:
  - HiSpd: max. length = 2,005 mm, response time < 400 ms
  - HiAcc: max. length = 6,005 mm, response time < 2,800 ms

5.7 Teaching in static interference signals

- Static interference signals in the tank generated by tubes, beams, couplings, or a cleaning ball can be taught-in. The probe length provides the value for the teach-in depth.
- Log into expert mode (see Chapter 5.1 "Expert mode")
- Access the *EXPRT-Config-CalRng* menu using the arrow and Set pushbuttons.
- Set the value range between 95 and 6,005 mm

- Note:
  - The value starts from the NGR process connection
  - The value should cover all interference signals
  - Maximum value = probe length – 100 mm
  - *AutCal* function must be run after this (see Chapter 2 "Commissioning the NGR")
  - The CalRng parameter should always correspond to the probe length for NGRs with remote amplifier

5.8 Evaluating signal quality

Parameters describe the quality of the measuring signal.

- Log into expert mode (see Chapter 5.1 "Expert mode")

SigQa1

- Characteristic for the robustness of the *EXPRT-Config-TrsHld* setting
- Not active in foam mode. The displayed value is only valid if the sensor displays the correct level value.
  - Value range: 0 to 100%
  - Good signal: > 40% (a high pulse reserve is provided with the current *TrsHld* setting.)
- Measures: Reduce *EXPRT-Config-TrsHld* to increase *SigQa1*.
- Note:
  - Changing *TrsHld* will have an impact on *SigQa2* and *SigQa3.*
  - If a satisfactory *SigQa1* value cannot be achieved by adjusting *TrsHld* in conjunction with the *SigQa* values, the installation condition must be checked. Using a coaxial tube improves signal detection, particularly in media with low DK values (e.g., oil).

SigQa2

- Characteristic for the robustness of echo pulse detection in relation to interference pulses
- Not active in foam mode. The displayed value is only valid if the sensor displays the correct level value.
  - Value range: 0 to 100%
  - Good signal: > 50%
- Measures: Run *AutCal*; check installation conditions; remove deposits from probe and process connection

SigQa3

- Characteristic for signal noise and electromagnetic interference
  - Value range: 0 to 100%
  - Good signal: > 75%
  - Poor signal: < 50%
- Not active in foam mode. The displayed value is only valid if the sensor displays the correct level value.
  - Value range: 0 to 100%
- Measures:
  - Increase *EXPRT-Config-TrsHld*
  - *EXPRT-Config-MeasMd = HiAcc*
  - Improve filtering
  - Switch on filter
  - Reduce *EXPRT-Config-MaxCol*

5.9 Changing the coaxial cable length (in preparation)

- Valid for versions with remote amplifier.
- This setting makes it possible to configure the coaxial cable length between the sensor head and process connection.

Configuration

- Predefined coaxial cable length (1,000 mm, 2,000 mm, or 3,300 mm)
- Log into expert mode (see Chapter “5.1 Expert mode”)
- Configure the coaxial cable length in the EXPRT-Config-CblLen menu (1,000 to 3,300 mm)

Note:
Only the following configurations are permitted:

	Max. probe length [mm]	
Coaxial cable length [mm]	**Foam mode inactive**	**Foam mode active**
1,000	4,000	2,000
2,000	3,000	1,500
3,300	1,000	500

5.10 Activating the display lock

- To prevent the sensor from being tampered with, password protection can be activated for the display.
- When the protection is active, the expert password (000537) must be entered before the menu can be accessed.
- The menu is only unlocked once the correct password is entered.

Configuration

- Log into expert mode (see Chapter “5.1 Expert mode”)
- The protection can be (de)activated via the EXPRT-Config-Lock menu.

Note:

- The user is logged out again after 5 minutes of inactivity.
- When the display is locked, only the configured measured value display (DspVal) can be seen

5.11 Selecting the display unit (millimeter/inch)

- This setting makes it possible to display and configure all length measurements in either millimeters or inches.

Configuration

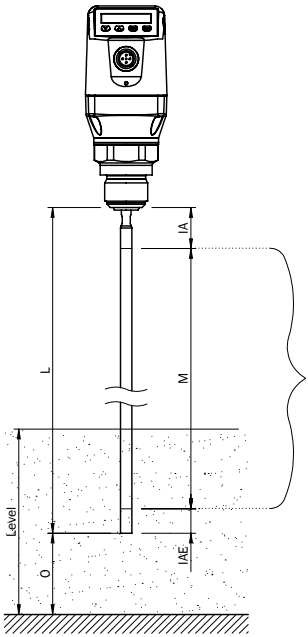
- Log into expert mode (see Chapter “5.1 Expert mode”)
- Set the unit in the EXPRT-Config-Unit menu (mm/inch)

5.12 Setting the offset

- This setting makes it possible to indicate the level value on the display in relation to the tank bottom instead of the end of the probe. The actual container level is then indicated on the display.

Configuration

- Log into expert mode (see Chapter “5.1 Expert mode”)
- Set the offset in the EXPRT-Config-Offset menu (0 to 3,000 mm)
- See the following diagram



QALOW / QAHIGH
SPx / RPx
FHx / Fl x
Can only be set within this zone

O: Offset
L: Probe length
M: Measuring length
IA: Inactive range at process connection
IAE: Inactive range at the end of the probe

Note:

- If the offset parameter is changed, the SPx/RPx/FLx/FHx/QALOW/QAHIGH parameters are automatically adjusted.

5.12 Resetting the calibration

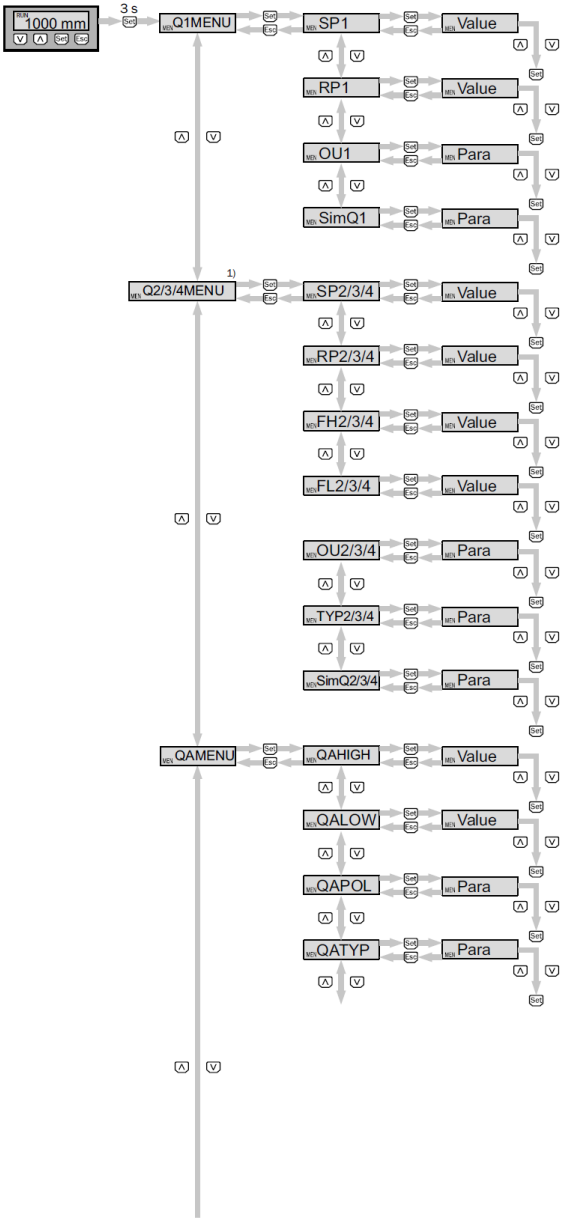
Resetting AutCal

1. Log in to expert mode; see “5.1 Expert mode”.
2. Reset AutCal in the EXPRT-Pulse-Reset menu.

Resetting CalEmp+CalMed

1. Log in to expert mode; see “5.1 Expert mode”.
2. Reset CalEmp+CalMed in the EXPRT-Foam-Reset menu.

6 Menu overview

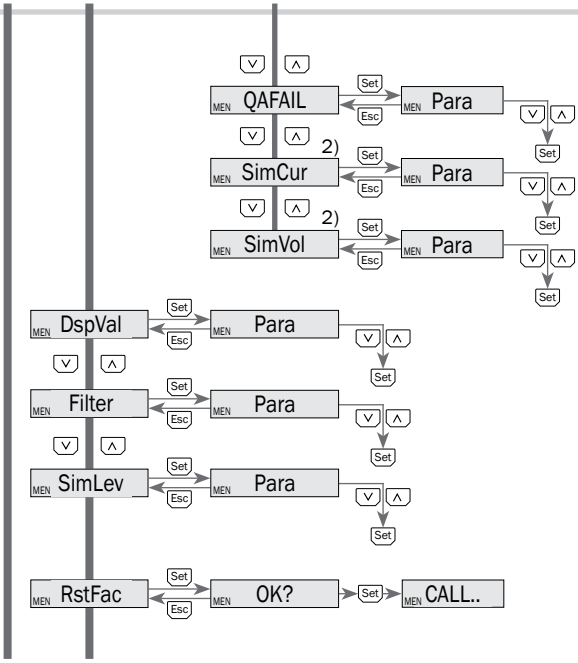


Menu overview continues on page 33.

Note: Q3 and Q4 are only available for an NGR with four switching outputs.

1) Visible Elements which are displayed depend on the OUx parameter selection.

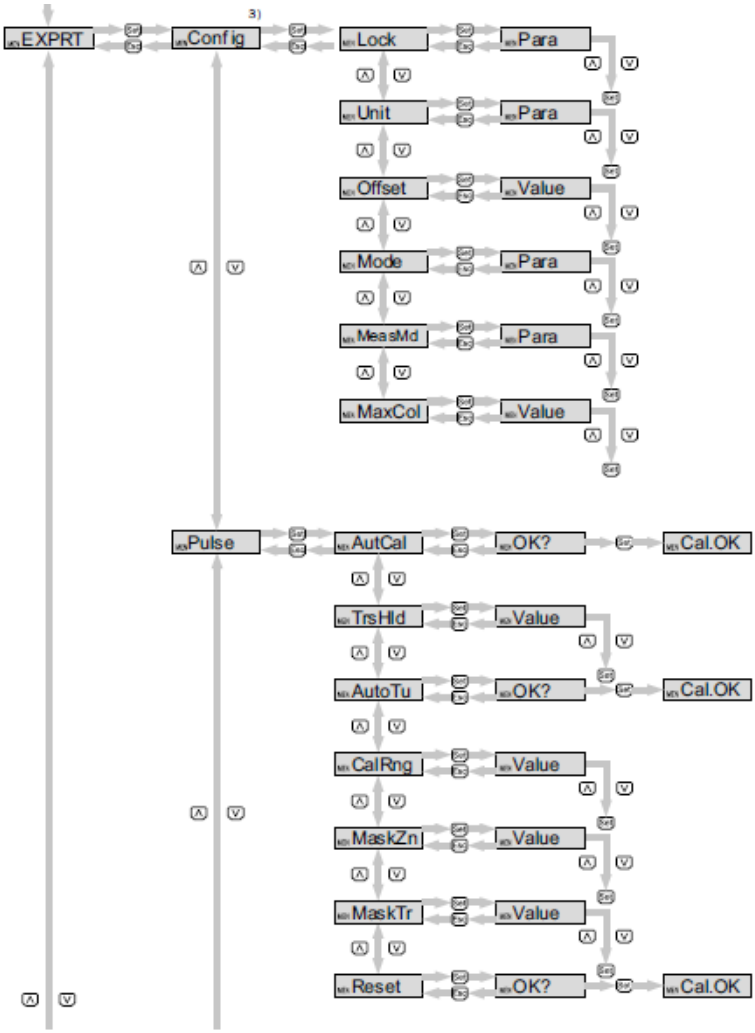
Parameter	Description
Q1MENU, Q2MENU, Q3MENU, Q4MENU	See Chapter 3 "Configuring the switching outputs"
SPx	Switching point, switching output 1 or 2 or 3 or 4 (SPx > RPx) Note: Not displayed if the switching output in the OUx menu is set to error or window.
RPx	Reset switching point, switching output 1 or 2 or 3 or 4 Note: Not displayed if the switching output in the OU2/3/4 menu is set to error or window.
FHx FLx	• Upper threshold (high) window function, switching output 2/3/4 (FHx > FLx) • Lower threshold (low) window function, switching output 2/3/4 Note: Not displayed if the switching output in the OU2/3/4 menu is set to error or hysteresis.
OUx	Switching function, switching output • Qx-Hno = Hysteresis function, normally open • Qx-Hnc = Hysteresis function, normally closed • Qx-Fno = Window function, normally open (function only available for Q2/3/4) • Qx-Fnc = Window function, normally closed (function only available for Q2/3/4) • Qx-Eno = Error signal, normally open (function only available for Q2/3/4) • Qx-Enc = Error signal, normally closed (function only available for Q2/3/4) If Qx is used as an error signal, SPx/FHx and RPx/FLx are hidden in the menu.
SimQx	See Chapter 5.3 "Testing the configuration"
TYP2/3/4	• Qx-PNP = Switching output in PNP circuit • Qx-NPN = Switching output in NPN circuit • Qx-Drv = Switching output executed in push/pull function
QAMENU	See Chapter 4 "Configuring the analog output"
QAHIGH	Input of the fill level in mm for 20 mA/10 V signal (QAHIGH > QALOW)
QALOW	Input of the fill level in mm for 4 mA/0 V signal
QAPOL	The analog output signal can be inverted • QA-Nrm = Analog output signal as configured • QA-INV = Analog output signal is inverted: QAHIGH 4 mA/0 V and QALOW 20 mA/10 V
QATYP	Setting of the output signal • 4-20 mA • 0-10 V • Auto V = Qa operated with voltage output of 0 to 10 V • Auto A = Qa operated with current output of 4 to 20 mA • Auto? = Automatic signal detection based on the existing load During a menu query, either 4-20 mA or 0-10 V is displayed.



Menu overview continues on page 35.

2) Elements which are displayed depend on the QATYP parameter selection.

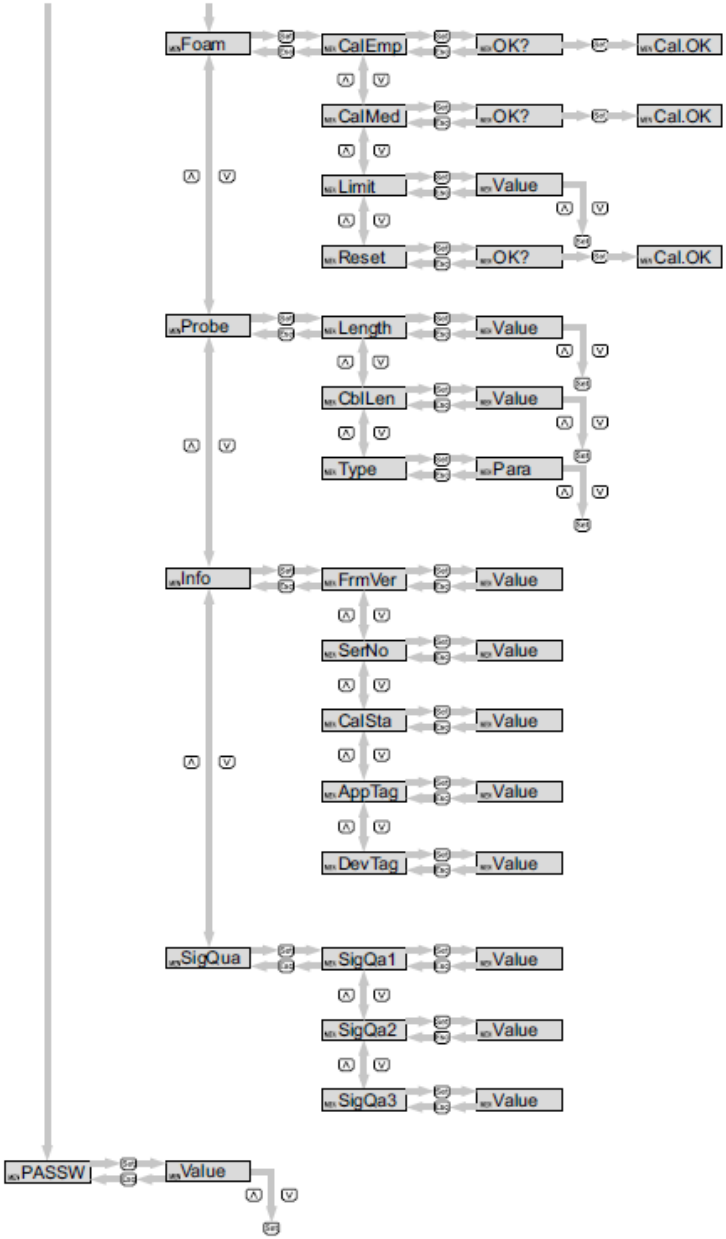
Parameter	Description
QAFAIL	Output behavior as per NE43 in the event of a fault (function only available when current output has been selected under QATYP). ● 3.5 mA = Analog current output is set to 3.5 mA in the event of a fault ● 21.5 mA = Analog current output is set to 21.5 mA in the event of a fault
SimCur	See Chapter 5.3 "Testing the configuration"
SimVol	See Chapter 5.3 "Testing the configuration"
DspVal	Display settings ● Distan = The display shows the distance in mm in relation to the end of the probe. ● QaPerc = The display shows the fill level in % in relation to the QA analog output with the corresponding QAHIGH and QALOW thresholds. ● QaBarG = The display shows a bar graph in relation to the QA analog output with the corresponding QAHIGH and QALOW thresholds. ● QaSign = The display shows the current QA output value in mA or V. ● QxSign = The display shows the output states.
Filter	See Chapter 5.2 "Filtering measured values"
SimLev	See Chapter 5.3 "Testing the configuration"
RstFac	Resetting of the set parameters back to the factory settings



Menu overview continues on page 37.

◥ Password-protected measuring range.

Parameter	Description
EXPRT	See Chapter 5.1 "Expert mode"
Lock	See Chapter “5.10 Activating the display lock”
Unit	See Chapter “5.11 Selecting the display unit (millimeter/inch)”
Offset	See Chapter “5.12 Setting the offset”
MeasMd	Measuring mode ● HiSpd: max. length = 2,005 mm, response time < 400 ms ● HiAcc: max. length = 6,005 mm, response time < 2,800 ms (more stable measured values, recommended for liquids with low DK values and where the TrsHld is < 70) ● mode-1: not supported, deactivates current AutCal/foam calibration
Mode	See “5.4 Selection of evaluation method”.
MaxCol	See Chapter “5.2 Filtering measured values”
Pulse	See “5.4 Selection of evaluation method”.
AutCal	See “2 Commissioning the NGR”.
TrsHld	This value describes a factor which determines how strong an echo has to be in order to be recognized by the device. The value range lies between 20% and 500%. The default is 100% in this case. Only shown if password entered. ● 20% = high sensitivity ● 100% = standard ● 500% = low sensitivity
AutoTn	See “5.3 Automated adjustment of the interference signal limit”.
CalRng	See “5.3 Automated adjustment of the interference signal limit”.
MaskZn	See “5.3 Blanking the interference signals in the masked zone”.
MaskTr	See “5.3 Blanking the interference signals in the masked zone”.
Reset	Resets the values.


Foam
CalEmp
OK?
Cal.OK
CalMed
OK?
Cal.OK
Limit
Value
Reset
OK?
Cal.OK
Probe
Length
Value
CblLen
Value
Type
Para
Info
FrmVer
Value
SerNo
Value
CalSta
Value
AppTag
Value
DevTag
Value
SigQua
SigQa1
Value
SigQa2
Value
SigQa3
Value
PASSW
Value

Parameter	Description
Foam	See “2.3 Foam commissioning (with factory settings)”.
CalEmp	See “2.3 Foam commissioning (with factory settings)”.
CalMed	See “2.3 Foam commissioning (with factory settings)”.
FomSta	Status of the foam calibration, read-only access ● inactv: CalEmp and/or CalMed not successful or not performed. Foam treatment inactive. ● active: Foam treatment active
Limit	Limit between foam and fluid. • Range: 20 to 100% • Factory setting: 90% • Medium surface: 90% • Foam surface: < 90% When measuring the foam surface, it may be necessary to reduce the limit. If the sensor displays a limit value that is too low, it is necessary to reduce the limit.
Probe	Special settings.
Length	• See “2.3 Foam commissioning (with factory settings)”
CblLen	See “5.9 Changing the coaxial cable length”.
Type	Choosing between rod and rope.
Info	Sensor information
FrmVer	Shows the firmware version
SerNo	Shows the serial number
CalSta	Displays the status of the container calibration
AppTag	Measuring point name, can only be described via IO-Link.
DevTag	Device name, can only be written over IO-Link.
SigQua	Parameter describes the quality of the measuring signal.
SigQa1	See Chapter “5.8 Evaluating signal quality”
SigQa2	See Chapter “5.8 Evaluating signal quality”
SigQa3	See Chapter “5.8 Evaluating signal quality”
StEcho	This function makes it possible to save diagnostic data in the device.
PASSW	See Chapter “5.1 Expert mode”

7 Troubleshooting

7.1 Error message on the display

Error	Cause	Solution
!InvEc & level present	AutCal not executed, interference superimposes medium reflection	Perform commissioning (see Chapter 2.1 "Quick commissioning")
	TrsHld setting is not suitable for the medium	Perform advanced commissioning (see Chapter 2.2 "Advanced commissioning")
!InvEc & empty tank	Probe length configured incorrectly	Check probe length and compare against configuration in EXPRT-Config-LENGTH
	Probe not available	Check probe
!ATTNT	A parameter was written outside of the valid value range and therefore adjusted	Write the value again inside of the valid range
	Another parameter was automatically adjusted due to a dependency (SPx, RPx)	Check parameter again
!WRONG	Incorrect password entered	Enter correct password
!NoCal	Information: The AutCal process or foam calibration was rejected because the probe length, teach-in depth, or measuring mode was changed	Perform commissioning again if necessary
!CalOk	The teach-in process was successful	
!NoSig	AutCal failed	Repeat commissioning
!faild	Foam-CalEmp or FoamCalMed menu item failed	Follow the foam commissioning instructions
!SC-Q1 !SC-Q2 !SC-Q3 !SC-Q4 !SC-Qa	Short-circuit at the output	Remove short-circuit
	Load resistance at the output is too low	Increase load resistance
!IOLOf	Supply voltage too low for IO-Link communication	Increase supply voltage to achieve the desired functionality
!QaOff	Supply voltage too low for analog output	Increase supply voltage to achieve the desired functionality
!QxOff	Supply voltage too low for switching outputs	Increase supply voltage to achieve the desired functionality
!QaOvf	The ohmic load at the analog current output Qa is too high	Reduce the load at Qa
	The analog current output Qa is not wired	Connect the load to Qa

Error	Cause	Solution
!Range	The maximum allowable measuring range was exceeded. Measurement in this configuration is not possible.	Reduce probe length and/or coaxial cable length (see Chapter “5.9 Changing the coaxial cable length”)
!Cable	The coaxial cable is damaged/faulty	Replace the coaxial cable
	The coaxial cable length was configured incorrectly	See Chapter 5.9 "Changing the coaxial cable length"
Display only shows RUN. Otherwise the display is empty.	DspVal menu parameter is set to QaBarG and the level is below QALOW	Change QALOW or DspVal
Display off	Temperature too high	Reduce the temperature
	Temperature is too low	Increase the temperature
	No supply voltage	Connect sensor correctly
!Err[xx] !ErM[xx] !ErI[xx] !ErO[xx]	System error	The device is faulty and must be replaced. Replace the sensor.
NVFail	Memory error	The device is faulty and must be replaced. Replace the sensor.

7.2 Operating the display

Error	Cause	Solution
The menu item SPx/RPx is not displayed	QxMENU/OUx is not configured to Qx-Hno or Qx-Hnc	Perform configuration of Qx (see Chapter 3 "Configuring the switching outputs")
The menu item FHx/FLx is not displayed	QxMENU/OUx is not configured to Qx-Fno or Qx-Fnc	Perform configuration of Qx (see Chapter 3 "Configuring the switching outputs")
QAFAIL is not displayed	The analog output Qa is in voltage mode (QATYP = 0 to 10 V)	Perform configuration of Qa (see Chapter 4 "Configuring the analog output")
SimVol is not displayed	The analog output Qa is in current mode (QATYP = 4 to 20 mA)	Perform configuration of Qa (see Chapter 4 "Configuring the analog output")
SimCur is not displayed	The analog output Qa is in voltage mode (QATYP = 0 to 10 V)	Perform configuration of Qa (see Chapter 4 "Configuring the analog output")
EXPRT-Config-... is not displayed	Correct password not entered	See Chapter 5.1 "Expert mode"

Error	Cause	Solution
EXPRT-Foam-... is not displayed	Correct password not entered	See Chapter 5.1 "Expert mode"
Lengths are expressed as decimal numbers	Inch is activated as the display unit	Perform configuration of unit [see Chapter 5.11 "Selecting the display unit (millimeter/inch)"]
The menu only shows PASSW	Display lock is activated	See Chapter 5.10 "Activating the display lock"

7.3 Outputs

Error	Cause	Solution
Switching output does not behave as expected	Configuration incorrect	Perform configuration of the switching output (see Chapter 3 "Configuring the switching outputs")
	An error is pending; the sensor outputs are in a safe state	Remove the cause of the error
	Cable break	Check the cable
Analog output does not behave as expected	Configuration incorrect	Configure the analog output (see Chapter 4 "Configuring the analog output")
	An error is pending; the sensor outputs are in a safe state	Remove the cause of the error
	Cable break	Check the cable

7.4 Behavior

Error	Cause	Solution
Sensor shows high level after installation even though the tank is empty	AutCal not performed	Perform commissioning (see Chapter 2 "Commissioning the NGR")
When used with a coaxial tube, the sensor indicates a high level although the tank is empty	AutCal not performed	Perform commissioning (see Chapter 2 "Commissioning the NGR")
Level value fluctuates on the display	Medium surface unsettled	Activate filtering (see Chapter 2.1 "Quick commissioning")

Error	Cause	Solution
The displayed level value / SPx/ RPx / FHx/FLx / QALOW/QAHIGH is greater than the probe length	An offset was configured for the level value	Adjust offset (See Chapter 5.12 "Setting the offset")
	Incorrect probe length configured	Adjust probe length (see Chapter 5.6 "Configuring the probe length")
Level occasionally jumps to a higher value	Contamination in the vicinity of the process connection	Clean
	Spray ball or feed dampen probe with medium above the medium surface	Observe the installation conditions Configure the MaxCoL plausibility filter (see chapter “5.2 Filtering measured values”)
	Change in the ambient conditions regarding the situation during the AutCal process	Perform commissioning again (see Chapter 2 "Commissioning the NGR")
	Significant buildup of foam	Perform foam commissioning (see Chapter 2.3 "Foam commissioning")
	TrsHld set too low, the echo algorithm detects interference reflections	Increase TrsHld
Level occasionally jumps to 0 mm	TrsHld set too high	Perform advanced commissioning (see Chapter 2 "Commissioning the NGR")
	Significant buildup of foam	Perform foam commissioning
No measurement of low levels for media with low DKs	Increased inactive range at the probe end for media with a low DK	
Increased measurement inaccuracy	Use of foam algorithm	

8 Technical Data

8.1 Features

Medium	Liquids
Detection type	Limit, continuous
Probe length **Mono-rod probe** **Cable probe***	 200 mm to 2,000 mm 1,000 mm to 4,000 mm
Adjustable measuring range	95 mm to 6,005 mm
Process pressure	–1 bar to 10 bar
Process temperature	–20 °C to +100 °C
RoHS certificate	✔
IO-Link	✔

8.2 Performance

Accuracy [1)]	±5 mm
Repeatability [1)]	≤ 2 mm
Resolution	< 2 mm
Response time [3)]	< 400 ms

* in preparation

Dielectric constant	≥ 5 for mono-rod probe/cable probe* ≥ 1.8 with coaxial tube

Conductivity	No limitation
Maximum change of level [4]	500 mm/s
Inactive area at process connection [2]	25 mm
Inactive area at end of probe [1]	10 mm

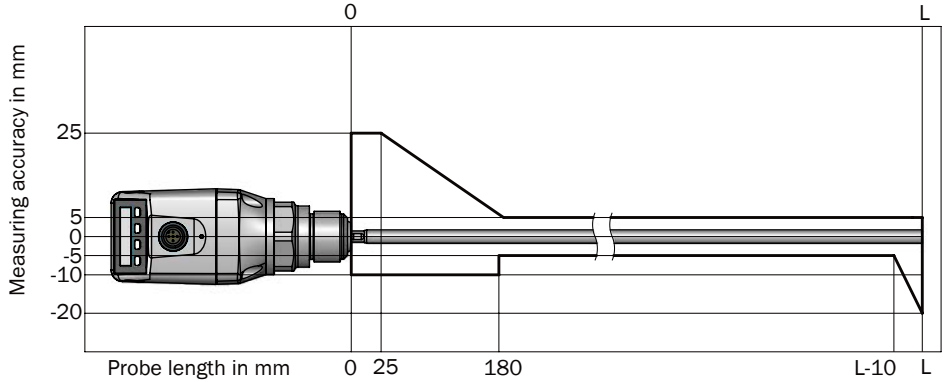
[1] With water under reference conditions.
[2] With parameterized container with water under reference conditions, otherwise 40 mm.
[3] Depends on measuring mode (high-speed < 400 ms, high accuracy < 2,800 ms)
[4] Depends on configuration (MaxCol - maximum change of level)

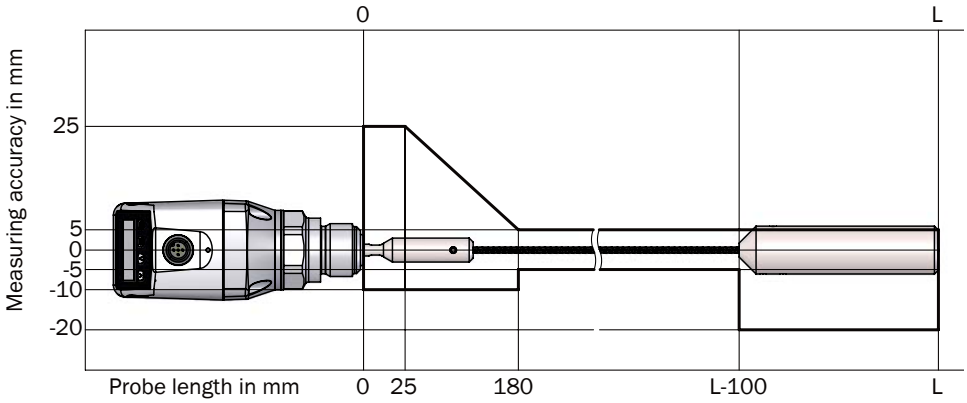
8.3 Reference conditions

Container with diameter	1 m
Minimum distance to built-in components	> 300 mm
Distance from end of probe to tank bottom	> 15 mm
Air humidity	65% ± 20%
Temperature	+20 °C ± 5 °C
Pressure	1,013 mbar abs. ± 20 mbar
Medium	Water, DK = 80
Centered installation of sensor	✔
Container parameterization carried out	✔

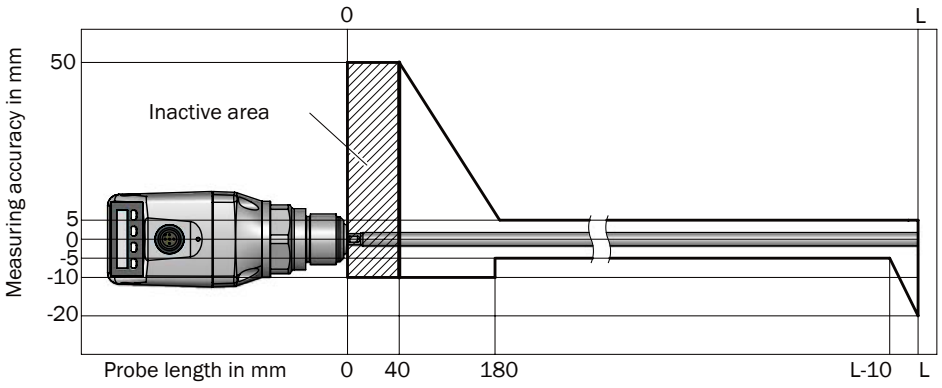
8.4 Measurement accuracy

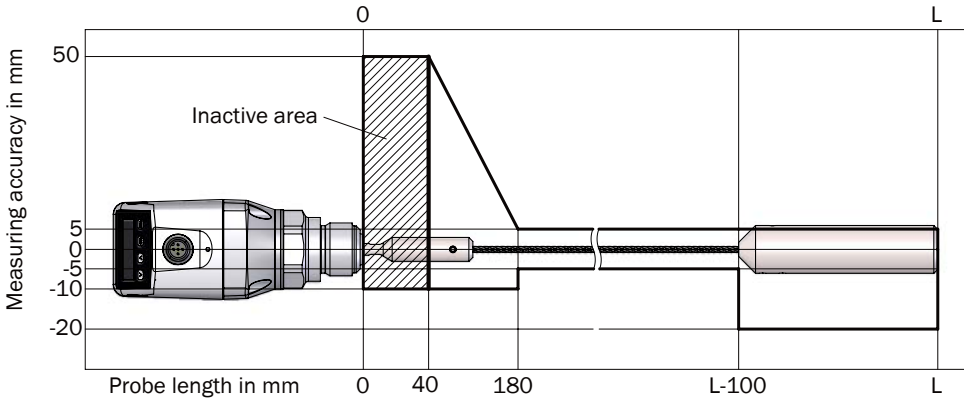
Measurement accuracy with parameterized container





Measurement accuracy without parameterized container





(in preparation)

8.5 Mechanics/materials

Wetted parts	1.4404, PTFE
Process connection	G 3/4 A, 3/4" NPT
Housing material	Plastic PBT
Max. probe load	≤ 6 Nm
Enclosure rating	IP67: EN 60529
Weight	Max. 1.3 kg
Coaxial cable insulation	PVC

8.6 Electrical connection values

Supply voltage [1) 2)]	12 V DC to 30 V DC
Current consumption	≤ 100 mA at 24 V without output load
Initialization time	≤ 5 s
Protection class	III
Connection type	M12 x 1 (5-pin) M12 x 1 (8-pin)
Hysteresis	Min. 3 mm, freely configurable
Output signal [1)]	4 mA to 20 mA / 0 V to 10 V automatically switchable depending on output load [1)] 1 PNP transistor output (Q1) and 1 PNP/NPN transistor output (Q2) switchable, or 1 PNP transistor output (Q1) and 3 PNP/NPN transistor outputs (Q2 to Q4) switchable (depending on type) [1)]
Signal voltage HIGH	Uv –2 V
Signal voltage LOW	≤ 2 V
Output current	< 100 mA
Inductive load	< 1 H
Capacitive load	100 nF
Temperature drift	< 0.1 mm/K
Output load	4 mA to 20 mA < 500 ohms at Uv > 15 V 4 mA to 20 mA < 350 ohms at Uv > 12 V 0 V to 10 V > 750 ohms at Uv ≥ 14 V
Lower signal level	3.8 mA to 4 mA
Upper signal level	20 mA to 20.5 mA
EMC	EN 61326-1:2006, 2004/108/EC

[1)] All connections are reverse polarity protected. All outputs are overload and short-circuit protected.
[2)] Use an energy-limited circuit for power supply as per UL61010-1 3rd Ed., Section 9.3

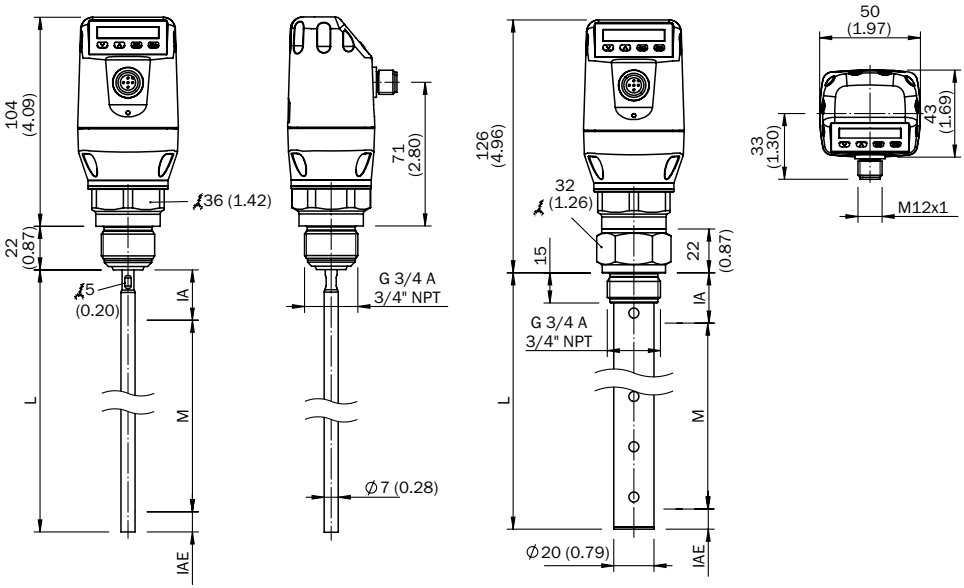
8.7 Environmental conditions

Ambient temperature, operation [1)]	–20 °C to +60 °C
Ambient temperature, storage	–40 °C to +80 °C

[1)] According to UL listing: degree of contamination 3 (UL61010-1: 2012-05); air humidity: 80% at temperatures up to 31 °C; installation height: max. 3,000 m above sea level; indoor applications only

8.8 Dimensional drawings

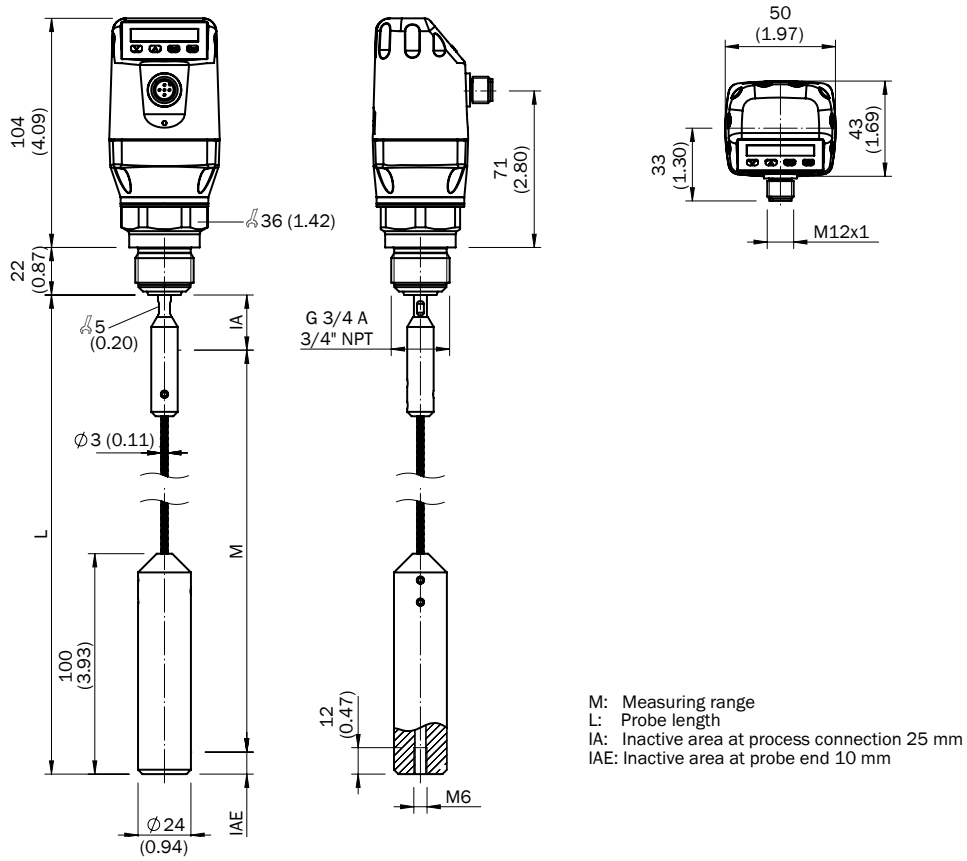
Dimensions in mm



Monoprobe with Coax tube

M: Measuring range
L: Probe length
IA: Inactive area at process connection 25 mm
IAE: Inactive area at probe end 10 mm

Standard version



M: Measuring range
L: Probe length
IA: Inactive area at process connection 25 mm
IAE: Inactive area at probe end 10 mm

8.9 Factory settings

Parameter	Factory setting
SP1	80% of the probe length measured from the end of the probe
RP1	5 mm below SP1
OU1	Q1_Hno
SP2	For 5-pin versions: 20% of the probe length measured from the end of the probe For 8-pin versions: 60% of the probe length measured from the end of the probe
RP2	5 mm below SP2
OU2	Q2_Hno
TYP2	Q2_PNP
SP3	40% of probe length measured from end of probe
RP3	5 mm below SP3
OU3	Q3_Hno
SP4	20% of the probe length measured from the end of the probe
RP4	5 mm below SP4
OU4	Q4_Hno
TYP3	Q3_PNP
TYP4	Q4_PNP
QAHigh	50 mm below start of probe
QALOW	10 mm above end of probe
QAPOL	QA_Nrm
QATYP	Auto
QAFAIL	3.5 mA
SimCur	SimOff
SimVol	SimOff
DspVal	Distan
Filter	Off
SimLev	SimOff
TrsHld	100
MaskZn	0 mm
MaskTr	50%
Mode	Pulse
CalSta	noCal
Probe/Type	Depending on probe type: Rod/Rope
MaxCol	Depending on measuring mode: HiSped = AnySped, HiAcc = 10 cm/s
MeasMd	HiSpd
CalRng	6,005 mm
FomSta	Inactive
Limit	90
Offset	0 mm
Unit	mm
Lock	Inactive

9 Order Details

Order Details (Example: **NGR 1 2 4 2 G5 B**)

Model	Version	Material	Signal Output	Contact	Connection	Probe length
NGR	**1** = probe **2**[2] = coaxial	**2** = stainless steel/ PTFE	**4** = 4-20 mA/ 0-10 V switchable	**2** = 1xPNP+1xPNP/NPN **4** = 1xPNP+3xPNP/NPN	**G5** = G¾ male **N5** = ¾" NPT male	**0**[1] = probe length 2000 mm (standard) **L/0000** = without probe (L = 0 mm) **L/xxxx**[3] = probe length xxxx mm (4-digit number 0200 ... 2000 mm rounded off to 10 mm) **B**[1] = mounted on bypass
	4 = wire	**2** = stainless steel	**4** = 4-20 mA/ 0-10 V switchable	**2** = 1xPNP+1xPNP/NPN	**G5** = G¾ male **N5** = ¾" NPT male	**4** = probe length 4000 mm (standard) **S** = Length 1000 ... 4000 mm (specify in clear text)

[1] Only possible with NGR 1. Bypass-specification, see NBK-M data sheet
[2] Using a coaxial tube improves signal detection, particularly in media with low DK values (e.g., oil)
[3] L/2000 only possible for NGR 2. For NGR 1… and L = 2000 mm probe length code „0" must be selected.

Note: *Standard probe length «L» = 2000 mm (NGR 1242G50 on stock). Probe length «L» available in steps of 10 mm. Example: 200, 210, 220, 230 ... 2000 mm.*
Standard wire length «L» = 4000 mm (NGR 4242G50 on stock). Probe length «L» available in steps of 100 mm. Example: 1000, 1100, 1200, 1300 ... 4000 mm. Please specify in clear text while ordering

Plug Connectors and Cables

Model	Brief description
ZUB-KAB-12K502	Cable, M12, 5-pin, straight connector female with molded cable, 2 m, PUR/PVC
ZUB-KAB-12K802	Cable, M12, 8-pin, straight connector female with molded cable, 2 m, PUR/PVC

10 Maintenance

The NGR is maintenance-free. We recommend doing the following regularly:
- Checking the probe for contamination
- Checking the screw connections and plug-in connections

11 Returning the level sensor

Declaration of no objection (contamination declaration in the event of service work)
Rinse off or clean removed devices before returning them in order to protect our employees and the environment from dangers posed by residue from measured materials. Faulty devices can only be examined when accompanied by a completed return form. A declaration of this type includes information about all materials which have come into contact with the device, including those which were used for testing purposes, operation, or cleaning. The return form is available at our Internet site (www.kobold.com).

12 Disposal

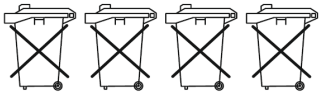
Dispose of device components and packaging materials in compliance with applicable country-specific waste treatment and disposal regulations of the region of use.

Note!

- Avoid environmental damage caused by media-contaminated parts
- Dispose of the device and packaging in an environmentally friendly manner
- Comply with applicable national and international disposal regulations and environmental regulations.

Batteries

Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:



1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

Electrical and electronic equipment

13 Medium list

This medium list (from page 55) provides an overview of the DK values of liquids. Water-based liquids always have a DK value of > 5, which allows NGR to be used easily. For DK values of < 5, a coaxial tube or a metallic immersion tube/bypass is always required.

Appendix 1 Medium list

Substance	DK value
Acetal (25°C)	3.8
Acetaldehyde	15.0
Acetamide (77°C)	59.2
Acetoacetic acid ethyl ester	15.0
Acetone	21.5
Acetophenone	18.0
Acetylacetone	23.0
Acetyl bromide	16.2
Acetyl chloride	15.9
Acetylene dibromide	7.2
Acetylene tetrabromide	5.6
Aconite acid ester	6.3
Adipic acid	1.8
Aerosile	1.0
Activated carbon	12.0
Alum (60°C)	4.2
Allyl alcohol	20.6
Allyl chloride	8.2
Allyl iodide	6.1
Aluminum bromide (100°C)	3.4
Aluminum foil	10.8
Aluminum hydroxide	2.5
Aluminum splinters	7.3
Aluminum sulfate	2.6

Substance	DK value
Formic acid	57.9
Ammonia	15.0
Ammonia solution (25%)	31.6
Ammonia salt	4.3
Pentanol	14.8
Amyl amine	4.5
Aniline	7.0
Anisealdehyde	22.3
Anisole	4.5
Anthracite	3.2
Antimony hydride	1.8
Malic acid diethylester	10.0
Argon	1.5
Arsine	2.1
Arsole	2.3
Asbestos	10.0
Ascorbic acid (vitamin C)	2.1
Azelaic acid diethylester	5.0
Azoxybenzene (36°C)	5.2
Basalt	2.5
Cotton fiber flour	3.2
Bauxite	2.5
Bentonite	8.1
Benzal chloride	6.9

Substance	DK value
Benzaldehyde	17.6
Benzil (80°C)	10.0
Benzine	2.0
Benzene	2.3
Benzene, heavy	3.2
Benzyl alcohol	13.5
Benzyl amine	4.6
Benzyl chloride	7.0
Beer brew	25.0
Bitumen	2.8
Hydrogen cyanide	158.0
Bore oil emulsion	25.0
Bornylacetate	4.6
Bromine	3.1
Butanoic acid	3.0
Camphene	2.3
Caproic acid (71°C)	2.6
Caprylic acid	2.5
Carbazole	1.3
Carbonylcyanide	10.7
Cellite	1.6
Cetyl alcohol (60°C)	3.6
Quinoline	8.8
Chlorine, liquid	2.1

Substance	DK value
Chloral	6.7
Chlorobenzine	5.7
Chloracetic acid	33.4
Chlorohydrin	31.0
Chlorinated lime	2.3
Chloroform (trichlormethane)	4.8
Cola essence	17.3
Cream (skin)	19.0
Cuminaldehyde	10.7
Cyanogen	2.5
Decalin	2.1
Degalan	3.1
Desmodur	10.0
Diacetone alcohol	18.2
Diamylether	3.0
Dibenzofuran (100°C)	3.0
Dibenzyl (60°C)	2.5
Diesel fuel	2.1
Diethylamine	3.8
Dimethylether (methyl ether)	5.0
Diofan	32.0
Dioxane	2.0
Diphenyl (75°C)	2.5
Printing ink	4.6

Substance	DK value
Ice cream (-20°C)	16.5
Iron (III) oxide red	1.9
Emulphor	4.0
Epichlorhydrin	23.0
Peanuts, dried	3.1
Peanut expeller	2.4
Vinegar	24.0
Acetic acid	6.2
Cement asbestos	3.2
Ethanol (ethyl alcohol)	16.2
Ether	4.0
Ethyl acetate	6.0
Ethylamine	6.9
Ethyl benzoate	6.0
Ethyl benzene	2.4
Ethylene chlorohydrin	25.0
Ethylene chloride	10.6
Ethylenediamine	15.0
Ethylene oxide (-1°C)	13.9
Ethyl mercaptan	6.9
Fenchone	12.8
Ferrite pellets	21.0
Ferrosilicone	10.0
Green vitriol (80°C)	32.4

Substance	DK value
Ferrozell	18.3
Fat coal	3.4
Fatty acid (35°C)	1.7
Fish oil	2.6
Flax pellets	1.4
Meat and bone meal	1.9
Tankage	1.9
Fly ash	3.3
Fluorine	1.5
Fluorbenzene	6.4
Hydrogen fluoride (0°C)	83.6
Calcium fluoride	2.5
Formamide	109.0
Furan	3.0
Furfurol	41.7
Animal feed grist	2.4
Germanium tetrachloride	2.4
Grain grist	3.0
Gypsum	1.8
Fiber glass powder	1.1
Glass granulate	4.0
Cullet	2.0
Glucose (50°C)	30.0
Glycerol	13.2

Substance	DK value
Glycerol water	37.0
Glycol	37.0
Glysantin	25.0
Granuform	4.0
Guaiacol	11.0
Guano (phosphate rock)	2.5
Oat	4.9
Urea	2.9
Resin	1.5
Hazelnuts	2.0
Hot glue (150°C)	2.3
Heating oil	2.1
Helium	1.1
Heptane	1.9
Heptanal	9.1
Heptanoic acid (71°C)	2.6
Heptene	2.1
Hexane	1.9
Hexene	2.1
Hexanol	12.5
Hibiscus	2.8
Wood chips	2.3
Charcoal	1.3
Wood swarf	1.5

Substance	DK value
Splints	1.1
Honey	24.0
Hydrazine	58.0
Imidazole, pure (100°C)	23.0
Isoamyl acetate	4.8
Isoamyl alcohol	15.6
Isoamyl bromide	6.0
Isoamyl chloride	6.1
Isoamyl ether	2.8
Isoamyl iodide	5.6
Isobutanoic acid	2.6
Isobutyl alcohol	18.1
Isobutyl amine	4.4
Isobutyl benzene	2.3
Isobutyl bromide	7.2
Isobutyl chloride	6.5
Isobutyl cyanide	18.0
Isobutyl iodide	6.5
Isobutyl nitrate	11.7
Isobutyl silane	2.5
Isoquinoline	10.7
Isocyanate	6.1
Isoprene	2.1
Isopropanol	18.0

Substance	DK value
Isosafrol	3.3
Iodine	11.1
Iodobenzene	4.6
Methyl iodide	7.1
Hydrogen iodide	2.9
Coffee beans	1.5
Cocoa beans	1.8
Caustic potash	3.3
Potash salt	2.0
Lime	2.0
Potato starch	1.7
Ceramic compound	17.0
Ketchup	24.0
Gravel	2.6
Diatomaceous earth	1.4
Silicic acid	2.0
Bone fat	2.7
Bonemeal	1.7
Sodium chloride	23.0
Coal, 15% moisture	4.0
Diethyl carbonate	2.8
Coal dust	2.5
Coconut oil (refined)	2.9
Coke	3.0

Substance	DK value
Cork powder	1.7
Concentrated feed	3.2
Chalk	2.1
Cresol	11.0
Cresol resin	18.3
Crystal sugar	2.0
Fertilizer	4.3
Plastic pellets	1.2
Copper ore	5.6
Nitrous oxide	1.5
Lanolin	4.2
Latex	24.0
Lauric acid ethyl ester	3.4
Glue	2.0
Linoleic acid	2.7
Solvent	18.0
Skim milk powder	2.3
Corn	3.6
Corn grist	2.1
Corn starch syrup	18.4
Malt	2.7
Mandelic acid nitril	18.0
Marble stones small (2-	2.5
Mice feed	2.3

Substance	DK value
Flour	2.5
Molasses	31.3
Menthol (42°C)	4.0
Mesityl oxide	15.0
Metal powder	6.0
Methanol (methyl alcohol)	33.0
Methyl acetate	8.0
Methylene bromide	7.0
Methylene chloride	9.0
Methylene chloride	9.1
Methylene iodide	5.3
Methyl nitrate	23.5
Methyl cellulose	3.0
Monochloremethane	9.8
Morpholine	7.3
Naphthenic acid	2.6
Naphthalene	2.5
Sodium carbonate	3.0
Sodium methylate	1.5
Sodium perborate	2.2
Sodium peroxide	2.7
Sodium sulfate	2.7
Nitrobenzene	35.0
Nitroethane	29.0

Substance	DK value
Nitroglycol	28.3
Nitroglycerin	19.3
Nitro varnish	5.2
Nitromethane	39.0
Nitrophoska	5.4
Nitrosyl bromide (13°C)	15.2
Nitrosyl chloride	19.0
Pasta, milled durum	1.9
Octane	2.0
Octene	2.1
Octyl bromide	5.0
Oil	2.0
Oileic acid	2.5
Water-in-oil emulsion	24.2
Oxalo ethyl acetate	6.0
Palmitic acid	2.3
Palm tree nuts	2.2
Palm tree nuts	2.8
Palm seed oil	1.8
Paper scraps	1.2
Paraffin	1.6
Paraldehyde	15.1
Pelargon	2.8
Penta borane	21.0

Appendix 1 Medium list

Substance	DK value
Penta ethyl chloride	3.8
Penta chlorotoluene	4.8
Pentane	1.8
Pentanal (15°C)	11.8
Pentene	2.0
Perchlorate	3.6
Hexachlorobutadiene	2.6
Perlite	1.7
PET powder	1.5
Phenetole	4.2
Phenol	8.0
Phenol resin	7.4
Phosgene	4.3
Phosphate	4.0
Phosphorus, liquid	3.9
Phosphorus salt	4.0
Pinane	2.1
Piperidine	5.8
Polyamide pellets	1.7
Polyethylene	1.2
Polypropylene	1.6
Polyrol	2.8
Polyvinyl acetals	2.8
Popcorn	1.1

Substance	DK value
Liquid detergent	1.2
Propanal (15°C)	14.4
Propanol (propyl alcohol)	2.2
Propanoic acid	3.2
Propylamine	3.0
Propylene, liquid	1.9
Propylene chloride	9.0
Propylether	3.3
PVC powder, pure	1.3
Pyridine	13.2
Pyrrol	8.0
Silica sand	2.0
Quartz stone meal	2.7
Mercury diethyl	2.1
Rapeseed	3.3
Rapeseed grist	2.1
Rice	3.0
Rye	6.0
Rye bran	2.2
Beetroot seeds	3.5
Beetroot cuttings	7.3
Carbon black	18.8
Saccharose solution	20.0
Sawdust	1.3

Substance	DK value
Nitric acid (98%)	19.0
Hydrochloric acid	5.0
Salt water	32.0
Oxygen	1.5
Chamotte	1.8
Foam flakes	1.1
Lard (80°C)	2.1
Soft soap	32.0
Chocolate powder	2.0
Black liquor	32.0
Sulfur	3.5
Sulfur dioxide (sulfurous acid)	14.0
Carbon disulfide, pure	2.6
Sulfuric acid	21.9
Sulfuric acid (15%)	31.0
Sulfuric acid (97%)	8.6
Sulfur trioxide	3.1
Hydrogen sulfide	6.0
Heavy fuel oil	2.2
Soap flakes	9.2
Soap pellets	3.5
Mustard	24.0
Mustard seeds	3.6
Silicone oil	2.7

Substance	DK value
Silicone rubber	2.9
Soy flour	4.5
Soy grains	2.9
Sunflower seeds	2.0
Chaff	1.5
Stearic acid	2.3
Rock salt (0–25 mm)	4.3
Styrene	2.4
Tobacco dust	1.8
Talcum	1.5
Tea powder	2.0
Tar, raw	4.0
Terephthalic acid	1.5
White spirit	2.0
Terpinene	2.7
Terpinolene	2.3
Tetrachloroethylene	2.5
Carbon tetrachloride	2.3
Thomaskali dust	3.4
Thujone (0°C)	10.8
Meat and bone meal	2.2
Titan tetrachloride	2.8
Toluene	2.4
Clay	2.3

Substance	DK value
Transformer oil	2.1
Trichloroethylene	3.2
Triethyl aluminum	2.9
Triptan	1.9
Dry yeast	2.0
Ultrasil	1.4
Undecan	2.0
Valeric acid	2.7
Viscose	34.5
Wax	1.8
Benzine	2.0
Water	80.3
Water (360°C)	10.0
Water, demineralized	29.3
Water, heavy	78.3
Sodium silicate	16.0
Hydrogen	1.2
Hydrogen peroxide, pure (0°C)	84.2
Wine	25.0
Tartaric acid	35.9
Wheat	4.0
Wheat starch	2.5
Xylitol	40.0
Xylene	2.3

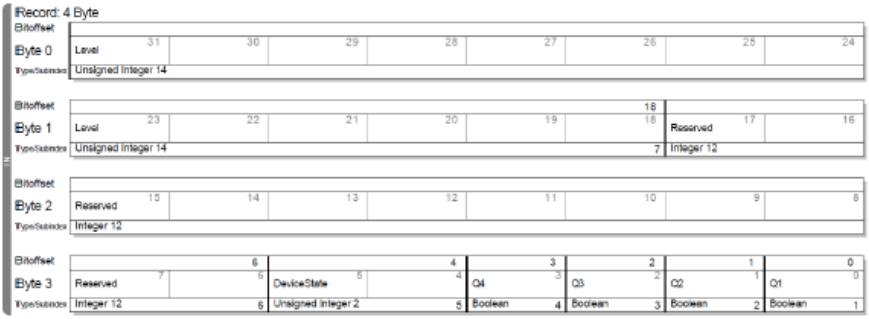
Substance	DK value
Toothpaste	18.3
Cellulose	1.2
Cement	2.2
Zinc oxide	1.5
Zinc powder	4.4
Sugar	1.8
Tinder	12.0

IO-Link Operating Instructions for NGR-XXXXXX

1. Physical Layer

SIO Modus	yes
Min Cycle Time	16000 µs
Baudrate	COM2
Process Data Length	32 Bit

2. Process Data



3. Service Data

IO-Link specific							
Index dec (hex)	Name	Format (Offset)	Length	Access[1]	Default Value	Value / Range	Remark [Unit]
16 (0x10)	Vendor Name	String	64 Byte	ro	Kobold Messring		
18 (0x12)	Product Name	String	64 Byte	ro	NGR-		
19 (0x13)	Product ID	String	64 Byte	ro	NGR-XXXXXX		
21 (0x15)	Serial Number	String	16 Byte	ro			
22 (0x16)	Hardware Version	String	64 Byte	ro			
23 (0x17)	Firmware Version	String	64 Byte	ro			
24 (0x18)	Application Specific Tag	String	Byte	rw	***		

Kobold device specific							
Index dec (hex)	Name	Format (Offset)	Length	Access[1]	Default Value	Value / Range	Remark [Unit]
64 (0x40)	Device Specific Tag	String	16 Byte	rw	***		
90 (0x5A)	Part Number	String	8 Byte	ro	Part Number		
100 (0x64)	SP1/FH1	UInt	16 Bit	rw	0...6005	Q1 SP1: Setpoint / FH1: High Limit Point	
101 (0x65)	RP1/FL1	UInt	16 Bit	rw	0...6005	Q1 RP1: Resetpoint / FL1: Low Limit Point	
102 (0x66)	OU1	UInt	8 Bit	rw	0 = Q1_Hno 1 = Q1_Hnc 2 = Q1_Fno 3 = Q1_Fnc 4 = Q1_Eno 5 = Q1_Enc	Q1 Function	
103 (0x67)	SimQ1	UInt	8 Bit	rw	0 = Q1Norm 1 = Q1On 2 = Q1Off	Simulate Q1	
104 (0x68)	SP2/FH2	UInt	16 Bit	rw	0...6005	Q2 SP2: Setpoint / FH2: High Limit Point	
105 (0x69)	RP2/FL2	UInt	16 Bit	rw	0...6005	Q2 RP2: Resetpoint / FL2: Low Limit Point	
106 (0x6A)	OU2	UInt	8 Bit	rw	0 = Q2_Hno 1 = Q2_Hnc 2 = Q2_Fno 3 = Q2_Fnc 4 = Q2_Eno 5 = Q2_Enc	Q2 Function	

ro = read only, wo = write only, rw = read/write

Kobold device specific							
Index dec (hex)	Name	Format (Offset)	Length	Access	Default Value	Value / Range	Remark [Unit]
107 (0x6B)	TYP2	UInt	8 Bit	rw	0 =Q2_PNP 1 =Q2_NPN 2 =Q2_DRV	Q2 Output Driver	
108 (0x6C)	SimQ2	UInt	8 Bit	rw	0 =Q2Norm 1 = Q2On 2 = Q2Off	Simulate Q2	
109 (0x6D)	SP3/FH3	UInt	16 Bit	rw	0...6005	Q3 SP3: Setpoint / FH3: High Limit Point	
110 (0x6E)	RP3/FL3	UInt	16 Bit	rw	0...6005	Q3 RP3: Resetpoint / FL3: Low Limit Point	
111 (0x6F)	OU3	UInt	8 Bit	rw	0 = Q3_Hno 1 = Q3_Hnc 2 = Q3_Fno 3 = Q3_Fnc 4 = Q3_Eno 5 = Q3_Enc	Q3 Function	
112 (0x70)	TYP3	UInt	8 Bit	rw	0 = Q3_PNP 1 = Q3_NPN 2 = Q3_DRV	Q3 Output Driver	
113 (0x71)	SimQ3	UInt	8 Bit	rw	0 = Q3Norm 1 = Q3On 2 = Q3Off	Simulate Q3	
114 (0x72)	SP4/FH4	UInt	16 Bit	rw	0...6005	Q4 SP4: Setpoint / FH4: High Limit Point	
115 (0x73)	RP4/FL4	UInt	16 Bit	rw	0...6005	Q4 RP4: Resetpoint / FL4: Low Limit Point	
116 (0x74)	OU4	UInt	8 Bit	rw	0 =Q4_Hno 1 =Q4_Hnc 2 =Q4_Fno 3 =Q4_Fnc 4 =Q4_Eno 5 =Q4_Enc	Q4 Function	
117 (0x75)	TYP4	UInt	8 Bit	rw	0 =Q4_PNP 1 =Q4_NPN 2 =Q4_DRV	Q4 Output Driver	
118 (0x76)	SimQ4	UInt	8 Bit	rw	0 = Q4Norm 1 = Q4On 2 = Q4Off	Simulate Q4	
119 (0x77)	QAHIGH	UInt	16 Bit	rw	0...6005	QA High Limit Point	
120 (0x78)	QALOW	UInt	16 Bit	rw	0...6005	QA Low Limit Point	
121 (0x79)	QAPOL	UInt	8 Bit	rw	0 = QA_Nrm 1 = QA_Inv	QA Polarity	
122 (0x7A)	QATYPE	UInt	8 Bit	rw	0 =4-20mA 1 =0-10V 2 = Auto 3 = Auto 4-20mA 4 = Auto 0-10V	QA Output Driver	
123 (0x7B)	QAFail	UInt	8 Bit	rw	0 = 3.5mA 1 =21.5mA	QA Failure State	
124 (0x7C)	SimCur	UInt	8 Bit	rw	0 = SimOff 1 = 3.5mA 2 = 3.8mA 3 = 4.0mA 4 = 10.0mA 5 = 12.0mA 6 = 18.0mA 7 = 20.0mA 8 = 20.5mA 9 = 21.5mA	Simulate QA Current	
125 (0x7D)	SimVol	UInt	8 Bit	rw	0 = SimOff 1 = 0.0V 2 = 2.0V 3 = 4.0V 4 = 6.0V 5 = 8.0V 6 = 10.0V 7 = 10.5V	Simulate QA Voltage	
126 (0x7E)	DspVal	UInt	8 Bit	rw	0 = Distan 1 = Qa-Perc 2 = QaBarG 3 = QaSign 4 = QxSign	Display Mode	

Kobold device specific							
Index dec (hex)	Name	Format (Offset)	Length	Access	Default Value	Value / Range	Remark [Unit]
					6 = 600ms 10 = 1000ms 14 = 1400ms 20 = 2s 50 = 5s 100 = 10s		
128 (0x80)	SimLev	UInt	8 Bit	rw	0 = SimOff 1 = 0 % 2 = 25 % 3 = 50 % 4 = 75 % 5 = 100 %	Simulate Level	
205 (0xCD)	Profile Version	String	4 Byte	ro			
300 (0x12C)	Lock	Bool	1 Bit	rw	false = inactive true = active	Menu Password Protection	
301 (0x12D)	Unit	UInt	8 Bit	rw	0 = mm 1 = inch	Display Level Unit	
302 (0x12E)	Offset	UInt	16 Bit	rw	0	0...3000	Level Offset
303 (0x12F)	Mode	UInt	8 Bit	rw	0 = Pulse 1 = Foam	Algorithm Mode	
304 (0x130)	MeasMd	UInt	8 Bit	rw	0 = mode1 1 = HiSpd 2 = HiAcc 3 = mode2	Measuring Mode	
305 (0x131)	MaxCoL	UInt	8 Bit	rw	2 = 2cm/s 5 =5cm/s 10 = 10cm/s 50 = AnySpeed	Maximum Change of Level	
310 (0x136)	TrsHld	UInt	16 Bit	rw	100	20...500	Threshold for Pulse Detection
311 (0x137)	CalRng	UInt	16 Bit	rw	6005	95...6005	AutCal Range
312 (0x138)	MaskZn	UInt	16 Bit	rw	0	0...6005	Masked Zone Range
313 (0x139)	MaskTr	UInt	16 Bit	rw	50	10...500	Masking Threshold
320 (0x140)	Limit	UInt	8 Bit	rw	90	20...100	Foam Algorithm Detection Limit
330 (0x14A)	Length	UInt	16 Bit	rw	95...6005	Probe Length	
331 (0x14B)	CblLen	UInt	16 Bit	rw	200...350 0	Coaxial Cable Length	
332 (0x14C)	Type	UInt	8 Bit	rw	0 = Rod 1 = Rope	Probe Type	
342 (0x156)	CalSta	UInt	8 Bit	ro	0 = NoCal 1 = AutCal 2 = FomCal 3 = CalMis	Calibration Status	
350 (0x15E)	SigQa1	UInt	8 Bit	ro	Signal Quality 1		
351 (0x15F)	SigQa2	UInt	8 Bit	ro	Signal Quality 2		
352 (0x160)	SigQa3	UInt	8 Bit	ro	Signal Quality 3		
360 (0x168)	SupplyVoltage	UInt	16 Bit	ro	Sensor Supply Voltage [V]		
361 (0x169)	SensorTemperature	Int	16 Bit	ro	Internal Electronics Temperature [°C]		
362 (0x16A)	PowerUpCounter	UInt	32 Bit	ro	Power Up Counter		
363 (0x16B)	OperatingTime	UInt	32 Bit	ro	Run Time [s]		
364 (0x16C)	SystemMonitor	Record	4 Byte	ro	System Monitor		
1 (0x01)	SystemState	Bit (0)	2 Bit	ro	0 = FAILURE 1 = WARNING 2 = OK		
2 (0x02)	SC-Q2	Bit (2)	1 Bit	ro	true = active false = -		
3 (0x03)	SC-Q3	Bit (3)	1 Bit	ro	true = Active false = -		
4 (0x04)	SC-Q4	Bit (4)	1 Bit	ro	true = Active false = -		
5 (0x05)	SC-Qa	Bit (5)	1 Bit	ro	true = Active false = -		
6 (0x06)	QaOvf	Bit (6)	1 Bit	ro	true = Active false = -		
7 (0x07)	reserved	Bit (7)	1 Bit	ro	true = Active false = -		
8 (0x08)	reserved	Bit (8)	1 Bit	ro	true = Active		

Kobold device specific							
Index dec (hex)	Name	Format (Offset)	Length	Access	Default Value	Value / Range	Remark [Unit]
9 (0x09)	InvEc	Bit (9)	1 Bit	ro	true = Active false = -		
10 (0x0A)	Cable	Bit (10)	1 Bit	ro	true = Active false = -		
11 (0x0B)	Range	Bit (11)	1 Bit	ro	true = Active false = -		
12 (0x0C)	MaskZ	Bit (12)	1 Bit	ro	true = Active false = -		
13 (0x0D)	Temp	Bit (13)	1 Bit	ro	true = Active false = -		
14 (0x0E)	reserved	Bit (14)	1 Bit	ro	true = Active false = -		
15 (0x0F)	reserved	Bit (15)	1 Bit	ro	true = Active false = -		
16 (0x10)	reserved	Bit (16)	1 Bit	ro	true = Active false = -		
17 (0x11)	reserved	Bit (17)	1 Bit	ro	true = Active false = -		
18 (0x12)	reserved	Bit (18)	1 Bit	ro	true = Active false = -		
19 (0x13)	reserved	Bit (19)	1 Bit	ro	true = Active false = -		
20 (0x14)	reserved	Bit (20)	1 Bit	ro	true = Active false = -		
365 (0x16D)	MinimumLevel	UInt	16 Bit	ro	0…6005	Minimum Level Since Power Up / Last Reset	
366 (0x16E)	MaximumLevel	UInt	16 Bit	ro	0…6005	Maximum Level Since Power Up / Last Reset	
380 (0x17C)	InputData	Array	32 Byte	rw	Unsigned Integer8 [32]	Input Data	
381 (0x17D)	OutputData	Array	32 Byte	ro	Unsigned Integer8 [32]	Output Data	
382 (0x17E)	UniqueID	Array	8 Byte	ro	Unsigned Integer8 [8]	Unique Device ID	
383 (0x17F)	Reserved	Array	8 Byte	rw	Unsigned Integer8 [8]	Reserved	

4. Standard Command

Index dec (hex)		Access	Value	Name	Remark [Unit]
2 (0x02)	Standard Command	wo	130	Restore Factory Settings	
			165	Pulse_AutCal	
			166	Pulse_AutoTune	
			167	Pulse_Reset	
			170	Foam_CalEmp	
			171	Foam_CalMed	
			172	Foam_Reset	
			180	Reserved0	
			190	Reset_LevelMinMax	
			200	Reserved1	
			201	Reserved2	
			202	Reserved3	
			203	Reserved4	

IO-Link

KOBOLD

MANUFACTURER'S DECLARATION OF CONFORMITY

We:

Kobold Messring GmbH
Nordring 22-24
65719 Hofheim
Germany

declare under our own responsibility that the product(s):

NGR-XXXXXX ***(IO-Link Device)***

to which this declaration refers conform to:

- ☑ IO-Link Interface and System Specification, V1.1, July 2013 (NOTE 1,2)
- IO Device Description, V1.1, August 2011
- ☐ IO-Link Interface and System Specification, V1.0, January 2009 (NOTE 1)
- IO Device Description, V1.0.1, March 2010

The conformity tests are documented in the test report:

IO-Link_Device_TestReport_NGR_Kobold_2015.11.06.pdf
IO-Link_PhysicalLayer_TestReport_NGR_Kobold_2015.11.12.pdf
IO-Link_Integration_TestReport_NGR_Kobold_2015.05.06.pdf

Issued at Hofheim, 15.04.2019

Harald Peters
General Manager

Manfred Wenzel
Proxy Holder

NOTE 1 Relevant Test specification is V1.1, July 2014
NOTE 2 Additional validity in Corrigendum Package 2015

15 EU Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

Level Sensor **Model: NGR-XXXXXX**

to which this declaration relates is in conformity with the standards noted below:

EN 61326-1	**Emissions: Class A**
EN 61326-2-x	**Immunity: Industrial environment**
EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also the following EU guidelines are fulfilled:

2014/30/EU	**EMC Directive**
2011/65/EU	**RoHS** (category 9)
2015/863/EU	Delegated Directive (RoHS III)

Hofheim, 12 July 2022

H. Volz
General Manager

ppa.

M. Wenzel
Proxy Holder

16 UK Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

Level Sensor **Model: NGR-XXXXXX**

to which this declaration relates is in conformity with the standards noted below:

EN 61326-1	**Emissions: Class A**
EN 61326-2-x	**Immunity: Industrial environment**
EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also the following UK guidelines are fulfilled:

S.I. 2016/1091	**Electromagnetic Compatibility Regulations 2016**
S.I. 2012/3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Hofheim, 12 July 2022

H. Volz General Manager

M. Wenzel Proxy Holder

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