Operating Instructions

for

Level Sensor

Model: NGR

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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. A low-energy, electromagnetic pulse is generated in the sensor's electronic components, coupled to the mono-probe, and conducted along this 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.
- This manual applies to devices with firmware version V3.00.
- Connection, mounting, and setting may only be performed by trained specialists.
- The NGR is not a safety module according to 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 knowledge, operating the device is not considered to pose any health risks.
- Incorrect handling or improper use can lead to malfunctions in your application.

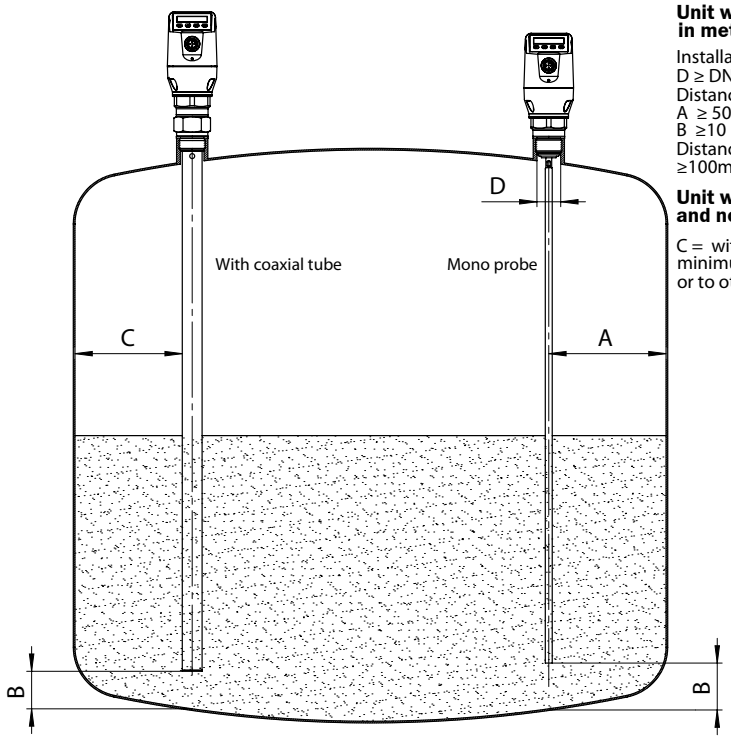
1.3 Fields of application

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 tubes. 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.
A minimum nozzle diameter in accordance with Diagram 1 below must be observed.
The NGR is to be installed in such a way that, after it has been mounted, there is a sufficient distance between it and the other tank components (e.g., supply pipes, other measuring devices) as well as the sides or bottom of the container. These minimum distances are also specified in Diagram 1. The NGR can also be used in a metal immersion tube or bypass. The installation conditions are shown in Diagram 2. Ensure that there is a good metallic connection between the NGR measuring device 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 has 360° rotation, allowing the cable outlet to be adjusted freely.

Installation in a container



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

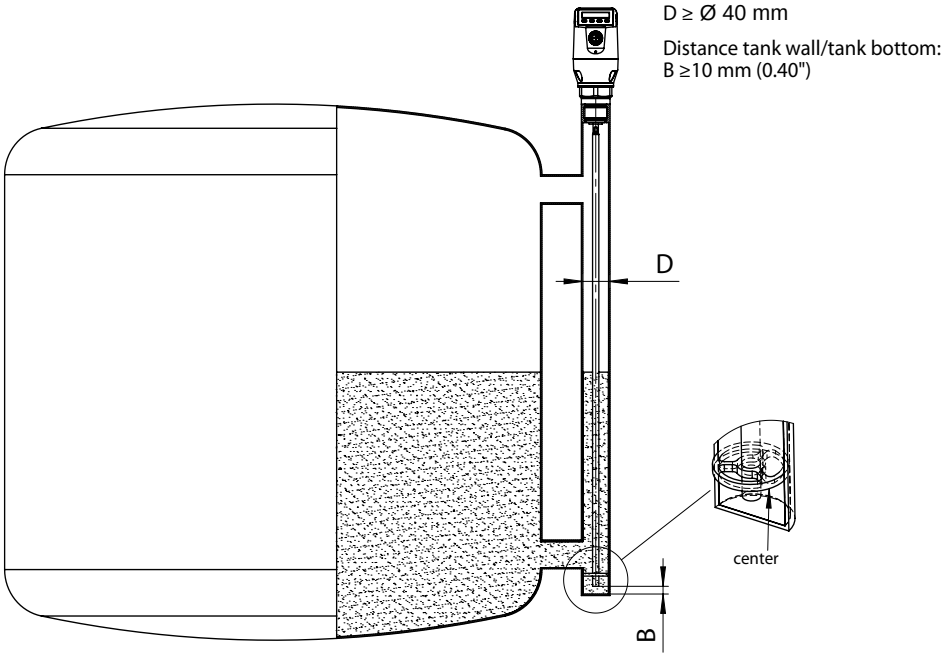


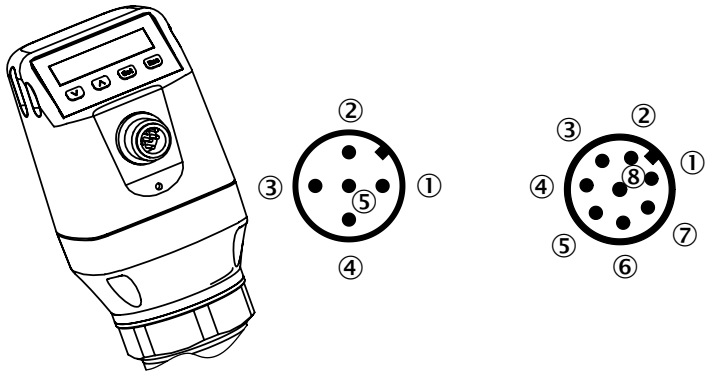
Diagram 2

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

Tank welds can affect the measurement accuracy.

1.5 Electrical connection

The sensor is connected using a pre-assembled cable socket with 1 x M12 plug connector (5 or 8-pin). With the power switched off, plug the cable socket 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 ground for current/voltage output, blue
④ C/Q_1: Switching output 1, PNP
black
⑤ Q_2: Switching output 2, PNP/NPN, gray

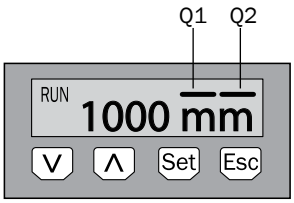
① L^+: Supply voltage
② Q_2: Switching output 2, PNP/NPN
③ M: Ground, reference ground for current/voltage output
④ C/Q_1: Switching output 1, PNP
⑤ Q_3: Switching output 3, PNP/NPN
⑥ Q_4: Switching output 4, PNP/NPN
⑦ Q_A: Analog current/voltage output
⑧ No function

The wire colors in 8-pin cables are not standardized. Please always take note of the sensor's pin assignment.

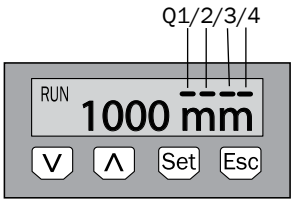
1.6 Display

All length specifications (in mm) in the menu refer to the end of the probe. You can access the menu by pressing the Set pushbutton for at least 3 seconds.

Variants with two switching outputs



Variants with four switching outputs

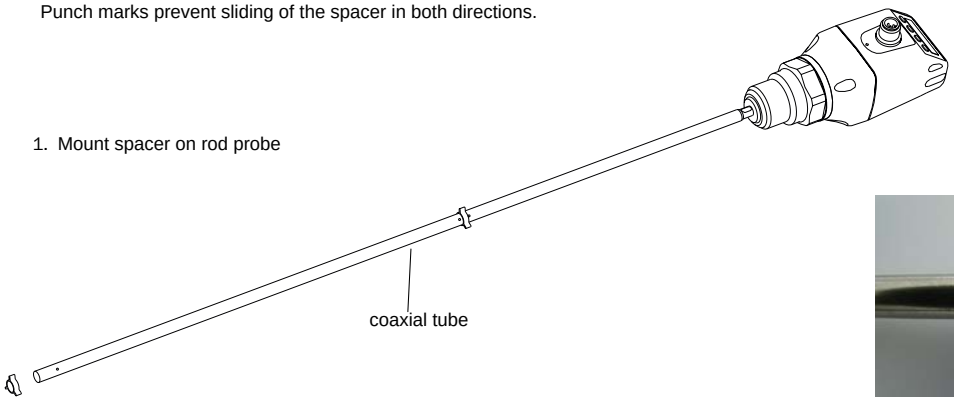


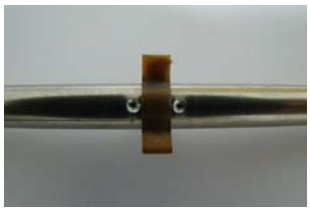
Arrow pushbuttons: For navigating in the menu and changing values
Set pushbutton: For saving and confirming
Esc pushbutton: For exiting the operating menu step-by-step

1.7 Mounting the coaxial tube

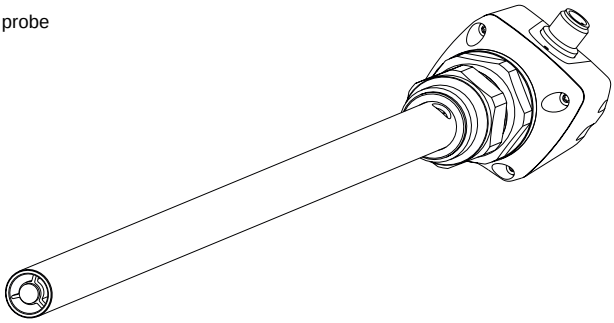
Retrofitting of coaxial probe: Mount the spacer on the rod probe
(first one at approx. 500 mm from thread, then every 500 mm) and make 2 to 3 punch marks on both sides of each spacer on the rod probe. Do not pull the spacers over the punch marks.
Punch marks prevent sliding of the spacer in both directions.

1. Mount spacer on rod probe





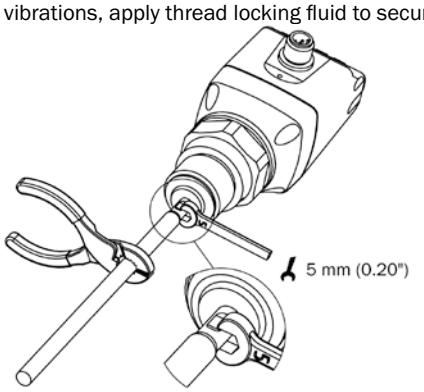
2. Screw coaxial probe



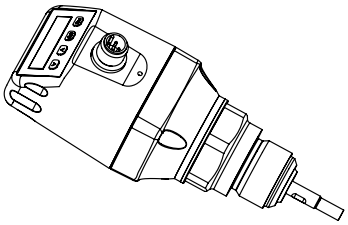
1.8 Shortening/changing the probe

If the mono-probe is too long for use, it can be shortened to the height of the container. In this case, you should not shorten the probe beyond its minimum length of 100 mm.

Procedure: Shortening the probe rod to the desired dimension. Set the new probe length in the NGR as described in Chapter 5.3 "Configuring the probe length". Please ensure that this adjustment matches the length of the probe, since an incorrect value in the *Length* menu has a direct effect on measurement accuracy and can lead to malfunctions. The probe length L is defined in Chapter 8.8 "Dimensional drawings".
The probe of NGR is exchangable. Please use an appropriate tool. In case of powerful system vibrations, apply thread locking fluid to secure the probe against loosening.

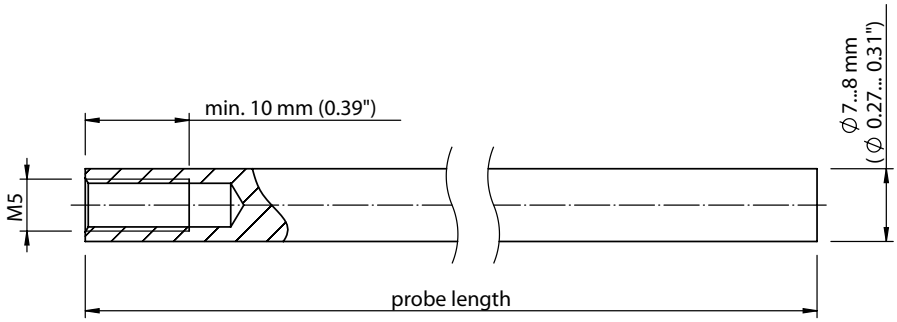


1.9 Mounting the probe rod



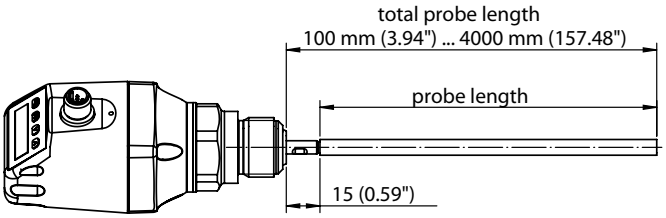
With the NGR, the probe rod can be modified by the customer. The specifications for the probe rod should be as follows:

- 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 specified in Chapter 5.3 "Configuring the probe length". The ***EXPRT-Config-Length*** menu is password-protected. In case of powerful system vibrations, apply thread locking fluid to secure the probe.



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 tubes
- Use in a plastic tank with a coaxial tube (see Chapter 9 „Accessories“)
- Situations where the liquid to be measured has a DK value of > 5 (see Chapter 13 "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 should be empty and/or the probe should not be covered by more than 750 mm of liquid starting at the process connection.

3. 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*.

4. 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 13 "Medium list")
- There are tank components which can interfere with the measurement signal
- There is extensive rippling 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 in to expert mode
   - Access the *PASSW* menu using the arrow pushbuttons
   - Enter password 000537 (NGR on the mobile keypad: L=5 / F=3 / P=7). Expert mode may be

locked again if the password is entered incorrectly or if the power supply is disconnected.

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 DKs 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 can be taught in.
   - Access the *EXPRT-CONFIG-CalRng* menu using the arrow and Set pushbuttons.
   - The following information applies:
     - The teach-in depth starts from the NGR process connection.
     - The teach-in depth should cover all interference signals.
     - Max. teach-in depth (recommended) = probe length – 100 mm
     - *AutCal* function must be launched afterwards (see Chapter 2.1 “Quick commissioning”)
   - Set the value range between 95 and 6,005 mm

5. Launch the *AutCal* menu
   - *Access AutCal* with arrow and Set pushbutton.
   - 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*.
   - The following information applies: It isn´t allowed that the probe is covered with medium in the calibration range. The minimum value is set at calibration range (CalRng see step 4) plus 200 mm.

6. Analyze signal quality
   - The signal quality is indicated once installed
   - Access the EXPRT-SigQua-SigQa1 menu using the arrow and Set pushbuttons.
   - The following information applies:
     - Good signal: > 40 %
   - Value range: 0 to 100 %
   - In the event of problems:
     - Reduce value in the *EXPRT-CONFIG-TrsHld* menu
     - Set parameter to HiAcc in the *EXPRT-CONFIG-MeasMd* menu
     - Switch on filters in the Set filters menu
     - Reduce parameters in the *EXPRT-CONFIG-MaxCol* menu

7. Configure filters (see Chapter 5.1 “Filtering the measured values”)

8. Maximum change of level/plausibility check (see Chapter 5.1 “Filtering the measured values”)

9. Configure 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 ends expert mode and logs the user out 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 in to expert mode
   - Access the *PASSW* menu using the arrow pushbuttons
   - Enter password 000537 (NGR on the mobile keypad: L=5 / F=3 / P=7). Expert mode may be locked again if the password is entered incorrectly or if the power supply is disconnected.

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. Perform empty calibration
   Access the *EXPRT-FOAM-CalEmp* menu using the arrow and Set pushbuttons.
   - *!CalOk:* proceed to step 6.
   - *!faild:* Ensure that the tank is empty and repeat step 5.

6. Pour in the medium (without foam) until the probe is covered by at least 200 mm, but up to a maximum level of 200 mm away from the process connection.

7. Adjust the sensitivity
   For exiting the EXPRT-menu use the ESC-pushbutton. The NGR has to show a valid measuring value. Adjust the TrsHld value in EXPRT-CONFIG-menu in case of an invalid measuring value.
   Access the EXPRT-CONFIG-TrsHld menu using the arrow and Set pushbuttons. The following information applies:
   - 50 % = high sensitivity
   - 100 % = standard
   - 200 % = low sensitivity
   - Value range 20 to 500 %
8. Launch *EXPRT-Foam-CalMe*d

- !CalOk: Everything has worked, continue with step 9
- !faild: Repeat step 5

9. Check foam calibration in *EXPRT-Foam-FomSta*
   - active: Foam commissioning was completed successfully.
   - inactiv: Commissioning incorrect. Please repeat the process.

Notes

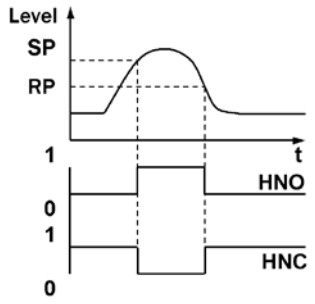
- Measurement value can be higher
- Signal quality 1 and 2 are not counted
- The sensor ends expert mode and logs the user out after 5 minutes of inactivity on the display.
- Configuration (foam teach) does not take place in the following processes:
  - Changing the probe length
  - Changing the measuring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

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

3 Configuring the switching outputs

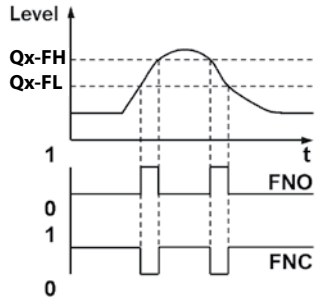
3.1 Switching hysteresis

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.

3.2 Window function

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.

3.3 Normally open with adjustable hysteresis

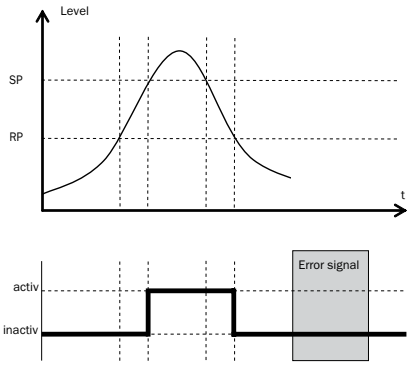
Applications

- Dry run protection
- Empty signal

Configuration

- Configure the *Qx* switching output as normally open
  - Set parameter to *Qx_Hno* in the *QxMenü-OUx* menu
- Set the switching point
  - In the *QxMenü-SPx* menu, set the value to the level height in mm (e.g., 500 mm)
- Set the reset switching point
  - In the *QxMenü-RPx* menu, set the value to the level height in mm (e.g., 450 mm)
- Select electrical property (NPN/PNP/DRV (Push-Pull))
  - Select parameters in the *QxMenü-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

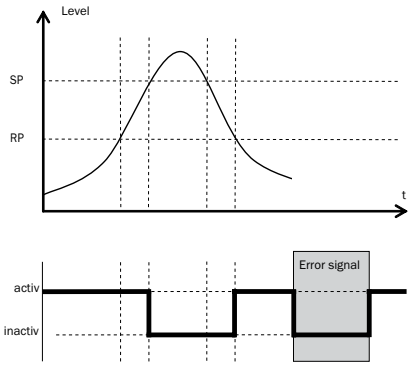
3.4 Normally closed with adjustable hysteresis

Applications

- Overfill protection
- Full signal

Configuration

- Configure *Qx* switching output as normally closed
  - Set parameter to *Qx_Hnc* in the *QxMenü-OUx* menu
- Set the switching point
  - In the *QxMenü-SPx* menu, set the value to the level height in mm (e.g., 500 mm)
- Set the reset point
  - In the *QxMenü-RPx* menu, set the value to the level height in mm (e.g., 450 mm)
- Select electrical property (NPN/PNP/DRV (Push-Pull))
  - Select parameters in the *QxMenü-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		PNP	NPN	DRV	Error status
Normally closed/HNC	Active	Uv	0 V	Uv	Inactive
	Inactive	0 V [1]	Uv [2]	0 V	

[1] Pulldown only.

[2] Pullup only

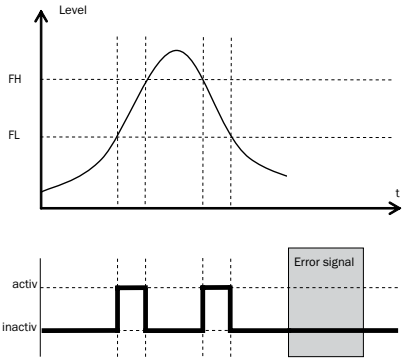
3.5 Normally open with window function

Application

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

Configuration

- Configure the *Q*x switching output as normally open
  - Set parameter to *Qx_Fno* in the *QxMenü-OUx* menu
- Set the switching point
  - In the *QxMenü-FHx* menu, set the value to the level height in mm (e.g., 500 mm)
- Set the reset switching point
  - In the *QxMenü-FLx* menu, set the value to the level height in mm (e.g., 400 mm)
- Select electrical property (NPN/PNP/DRV (Push-Pull))
  - Select parameters in the *QxMenü-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		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

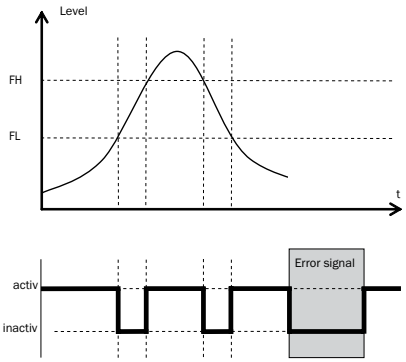
3.6 Normally closed with window function

Application

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

Configuration

- Configure *Qx* switching output as normally closed
  - Set parameter to *Qx_Fnc* in the *QxMenü-OUx* menu
- Set the switching point
  - In the *QxMenü-FHx* menu, set the value to the level height in mm (e.g., 500 mm)
- Set the reset point
  - In the *QxMenü-FLx* menu, set the value to the level height in mm (e.g., 400 mm)
- Select electrical property (NPN/PNP/DRV (Push-Pull))
  - Select parameters in the *QxMenü-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		PNP	NPN	DRV	Error status
Normally closed/FNC	Active	Uv	0 V	Uv	Inactive
	Inactive	0 V [1]	Uv [2]	0 V	

[1] Pulldown only.

[2] Pullup only

3.7 Normally open 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 parameter to Qx_Eno in the *QxMenü-OUx* menu
- Select electrical property (NPN/PNP/DRV (Push-Pull))
  - Select parameters in the *QxMenü-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

3.8 Normally closed 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 parameter to Qx_Enc in the *QxMenü-OUx* menu
- Select electrical property (NPN/PNP/DRV (Push-Pull))
  - Select parameters in the *QxMenü-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 sensor can automatically detect which signal is required by means of the connected output load (see Chapter 8 "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 menu *QAMenu-Typ* using the arrow and the Set pushbuttons and configure *Auto?*
- Note: Automatic signal detection is only active at the initial start. This fuction can be activated again in the menu *QAMenu-Typ* with *Auto?*

4.2 Current output 4-20 mA

Configuration

- Set upper limit value (20 mA)
  - In the *QAMenu-QAHigh* menu, set the value to the level height in mm (e.g., 500 mm)
- Set lower limit value (4 mA)
  - In the *QAMenu-QALow* menu, set the value to the level height in mm (e.g., 10 mm)
- Invert signal
  - The analog signal can be inverted in the *QAPOL* menu
  - Set parameter to *QA-Inv* in the *QxMenu-QAPOL* menu
    - *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 parameter to 4-20 mA in the *QxMenu-QATYP* menu

4.3 Voltage output 0-10 V

Configuration

- Set upper limit value (10 V)
  - In the *QAMenu-QAHigh* menu, set the value to the level height in mm (e.g., 500 mm)
- Set lower limit value (0 V)
  - In the *QAMenu-QALow* menu, set the value to the level height in mm (e.g., 10 mm)
- Invert signal
  - The analog signal can be inverted in the *QAPOL* menu
  - Set parameter to *QA-Inv* in the *QxMenu-QAPOL* menu
    - 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 parameter to 0-10 V in the *QxMenu-QATYP* menu

5 Advanced functions

5.1 Filtering the 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 parameters in the Set filters 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 which cause level jumps as a result of significant interference on the LFP. Enter the max. level dynamic value in the application, or the maximum permissible rate of change of the level
- Log in to expert mode
  - Access the *PASSW* menu using the arrow pushbuttons
  - Enter password 000537 (NGR on the mobile keypad: L=5 / F=3 / P=7). Expert mode may be locked again if the password is entered incorrectly or if the power supply is disconnected.
- Reduce parameters in the *EXPRT-CONFIG-MaxCol* menu
- AnySpd (50 cm/s) (default), 10 cm/s, 5 cm/s, 2 cm/s
- Note:
  - For MeasMd = HiSpd, all max. rates of change are possible
  - For MeasMd = HiAcc, max. is 10 cm/s

5.2 Testing the configuration

Testing outputs

- Switching/analog outputs can be simulated. This allows you to check the wiring and signal values at the connected systems, such as the PLC, relays, and lamps.

Configuration

- Activate the Qx switching output
  - Set parameter to QxOn in the *QxMenü-SimQx* menu
  - Further 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 parameter in menu *QAMenü-SimCur* or *SimVol* on 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 LFP 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
  - Simulation of the level refers to the probe length
  - 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
  - Filling level 0 %
  - Filling level 25 %
  - Filling level 50 %
  - Filling level 75 %
  - Filling level 100 %

5.3 Configuring the probe length

- Log in to expert mode
  - Access the *PASSW* menu using the arrow pushbuttons
  - Enter password 000537 (NGR on the mobile keypad: L=5 / F=3 / P=7). Expert mode may be locked again if the password is entered incorrectly or if the power supply is disconnected.
- 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 9.8 "Dimensional drawings"
- Note:
  - HiSpd: max. Length = 2,005 mm, response time < 400 ms
  - HiAcc: max. Length = 6,005 mm, response time < 2800 ms, more stable measured values

5.4 Programming 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 in to expert mode
  - Access the *PASSW* menu using the arrow pushbuttons
  - Enter password 000537 (NGR on the mobile keypad: L=5 / F=3 / P=7). Expert mode may be locked again if the password is entered incorrectly or if the power supply is disconnected.
- Access the *EXPRT-Config-CalRng* menu using the arrow and Set pushbuttons.
- Set the value range between 95 and 6,005 mm
- The following information applies:
  - 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 launched afterwards (see Chapter 2 "Commissioning")

5.5 Evaluating the signal quality

Parameters describe the quality of the measuring signal.

SigQa1

- Characteristic for the robustness of the *TrsHld* setting
- Not active in foam mode. The displayed value is only valid if the sensor is displaying 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*.
- Please 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).

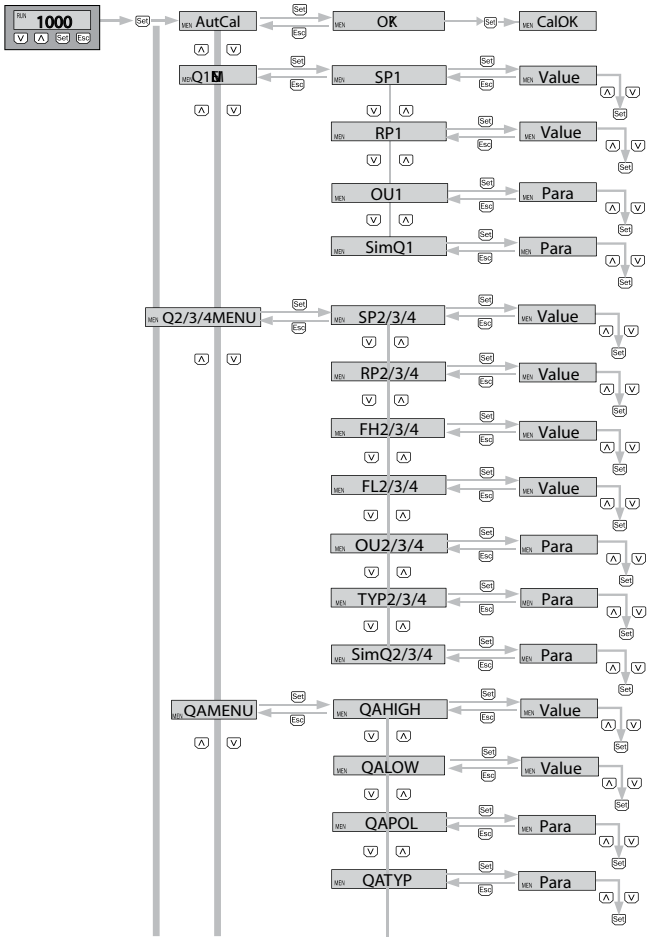
SigQa2

- 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: Launch AutCal; check installation conditions; remove buildup from the probe and the 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*

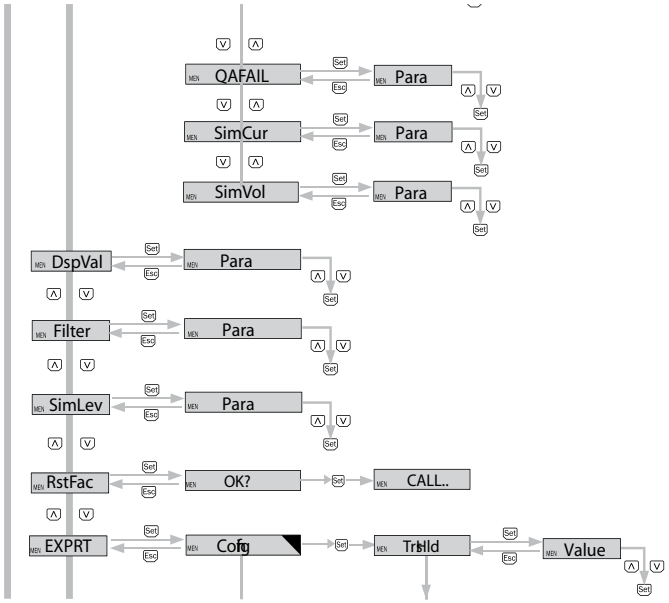
6 Menu overview



Continuation of the menu overview on page 86.
Note: Q3 and Q4 are only available for an NGR with four switching outputs.

◥ Password-protected measuring range.

Parameter	Description
AutCal	Activation of the container calibration
Q1MENU, Q2MENU, Q3MENU, Q4MENU	Switching output 1 menu, switching output 2 menu, switching output 3 menu, switching output 4 menu (depending on type)
SP1/2/3/4	Switching point, switching output 1/2/3/4 (SPx > RPx)
RP1/2/3/4	Reset point, switching output 1/2/3/4 Note: This stops appearing when the switching output is set to Error in the out2/3/4 menu.
FH2/3/4 FL2/3/4	• Upper threshold (high) window function, switching output 2/3/4 (FHx > FLx) • Lower threshold (low) window function, switching output 2/3/4 Note: This stops appearing when the switching output is set to Error in the out2/3/4 menu.
OU1/2/3/4	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 • Qx-Enc = Error signal, normally closed If Qx is used as an error signal, SPx/FHx and RPx/FLx are hidden in the menu.
SimQ1/2/3/4	Simulation of the switching outputs • QxOff = switching output off • QxNorm = switching output in measuring operation • QxOn = switching output is active The simulation is automatically deactivated if the supply voltage is interrupted.
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	Analog output menu
QAHIGH	Input of the filling level in mm for 20 mA/10 V signal (QAHIGH > QALOW)
QALOW	Input of the filling 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.

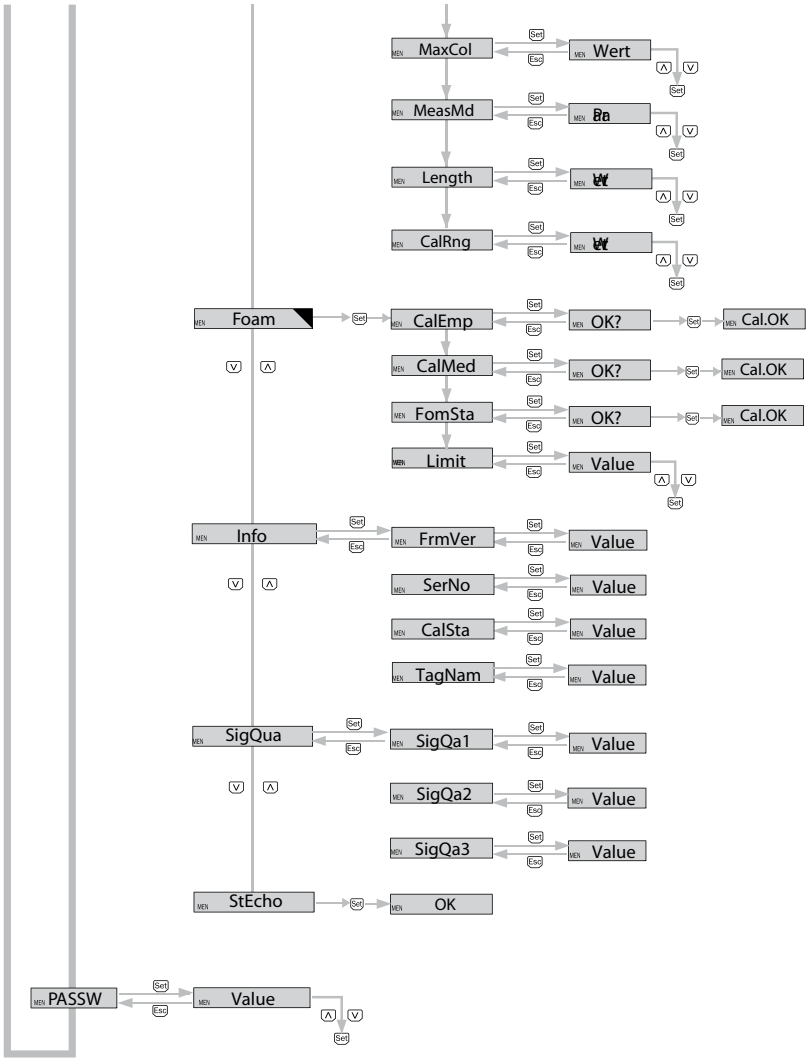


Continuation of the menu overview on page 28 .

◥ Password-protected measuring range.

Parameter	Description
QAFAIL	Output behavior according to NE43 in the event of a fault (function only available if it was selected under QATYP of the current output) ● 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	Current values can be simulated (function only available if it was selected under QATYP of the current output.) The simulation is automatically deactivated if the supply voltage is interrupted.
SimVol	Voltage values can be simulated (function only available if it was selected under QATYP of the voltage output) The simulation is automatically deactivated if the supply voltage is interrupted.
DspVal	Display settings ● Distan = The display shows the distance in mm in relation to the end of the probe. ● QaPerc = The display shows the filling level as a % in relation to the QA analog output with the respective thresholds QAHIGH and QALOW. ● QaBarG = The display shows a bar chart in relation to the QA analog output with the respective thresholds QAHIGH and QALOW. ● QaSign = The display shows the current QA output value in mA or V. ● QxSign = The display shows the output states.
Filter	Smoothing of the measured value. For fast level changes, the average of the measured values over X seconds is indicated (useful for rippling on surfaces). The possible values are Off, 400 ms, 600 ms, 1,000 ms, 1,400 ms, 2 s, 5 s, 10 s. The default is Off in this case.
SimLev	Simulation of the level in relation to the probe length ● SimOff: Off ● Filling level 0 % ● Filling level 25 % ● Filling level 50 % ● Filling level 75 % ● Filling level 100 % The simulation is only active when there are no error messages. The simulation is automatically deactivated if the supply voltage is interrupted.
RstFac*	Resetting of the set parameters back to the factory settings
EXPRT	Expert menu
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

*For all non-stock models (All versions with probe length less than 2000mm, coaxial versions and versions with 4 x contacts), it might be necessary to re-program the probe length and all other length related parameters, even after performing the factory reset!



◥ Password-protected measuring range.

Parameter	Description
MaxCol	Maximum permissible rate of change of the level (maximum change of level) • AnySpd (50 cm/s) (default) • 10 cm/s • 5 cm/s • 2 cm/s Plausibility check. Max. level dynamic value in application entered. • For MeasMd=HiSpd, all max. rates of change are possible • For MeasMd=HiAcc, max. is 10 cm/s
MeasMd	Measuring mode • HiSpd: max. Length = 2,005 mm, response time < 400 ms • HiSpd: max. Length = 6,005 mm, response time < 2,800 ms (more stable measured values, recommended for liquids with low DKs and where the TrsHld is < 70) • mode-1: not supported, deactivates current AutCal/foam calibration
Length	Probe length (Length) • Value range: 95 to 6,005 mm If the probe length (Length) is > 2,005 mm, MeasMd = HiAcc is set. Deactivates current AutCal/foam calibration
CalRng	Calibration area/Calibration length (calibration range) • Value range: 95 to 6,005 mm • Factory setting: 500 mm Range starting from the process connection in which static interference signals (coupling sections, welds, spray balls, etc.) are hidden during the AutCal process. During the AutCal process, there must not be any medium in the defined area of +200 mm.
Foam	In the case of foam application, foam calibration can be performed in this menu
CalEmp	Calibration empty tank • Teach in a completely empty tank. Note: The tank must be completely empty. There should be no metal connections between the end of the probe and the container.
CalMed	Calibration medium • Teach in the medium Note: Only the medium to be measured, without foam. The medium must be in the range between 200 mm after the process connection and 200 mm before the end of the probe. For shorter probes, ~100 mm of the probe must be covered.
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.

Parameter	Description
Info	Sensor information
FrmVer	Displays the firmware version
SerNo	Displays the serial number
CalSta	Displays the status of the container calibration • Initia = Container calibration not carried out • Calibr = Container calibration activated Only shown if password entered.
TagNam	Measuring point designation; can not be written
SigQua	Parameter describes the quality of the measuring signal.
SigQa1	Characteristic for the robustness of the 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 for improvement: Reduce Config/TrsHld to increase SigQa1. Please 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 the echo pulse detection regarding 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 for improvement: Perform AutCal; check installation conditions; remove buildup from the probe and the process connection
SigQa3	Characteristic for signal noise and electromagnetic interference • Value range: 0 to 100 % • Good signal: > 75 % • Poor signal: < 50 % Measures for improvement: • Increase Config-TrsHld • Config-MeasMd = HiAcc • Improve filtering • Switch on filter • Reduce Config-MaxCol
StEcho	This function makes it possible to save diagnostic data in the device.
PASSW	Enter password to access expert mode; • Password 000**537** (NGR on the mobile keypad: L=5 / F=3 / P=7) Expert mode may be locked again if the password is entered incorrectly or if the power supply is disconnected.

7 Troubleshooting

7.1 Error message on the display

Error message	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 align with configuration in EXPRT-Config-LENGTH
	Probe not available	Check probe
!ATTNT	A parameter was written outside of the valid range of values and therefore adjusted.	Rewrite the value in the valid range.
	Another parameter was automatically adjusted due to a dependency (SPx, RPx)	Check the parameter again.
!WRONG	Incorrect password entered	Enter the correct password.
!NoCal	Information: The AutCal process and/or the foam calibration was rejected, as the probe length, the teach-in depth, or the measuring mode was changed.	Repeat commissioning if necessary.
!CalOk	The teach-in process was successful	
!NoSig	AutCal failed	Repeat commissioning.
!faild	Foam/CalEmp or Foam/CalMed failed.	Follow 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 communication (not available)	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 message	Cause	Solution
The display only shows RUN. It is otherwise empty.	The Menu-DspVal menu parameter is at QaBarG and the level is below QALOW.	Configure QALOW differently or change DspVal
Display off	Temperature too high	Reduce the temperature
	Temperature too low	Increase the temperature
	No supply voltage	Connect sensor correctly
!Err[xx] !ErM[xx] !ErI[xx] !ErO[xx]	System error	Please contact our service department and quote this error code
NVFail	Memory error	Please contact our service department and quote this error code

7.2 Operating the display

Error message	Cause	Solution
The menu item SPx/RPx is not displayed	QxMENU/OUx is not set on 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 set on Qx-Fno or Qx-Fnc	Perform configuration of Qx (see Chapter 3 "Configuring the switching outputs")
QAFAIL Is not displayed.	The current 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 current 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 current 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	Log in as expert (see Chapter 2.2 "Advanced commissioning")
EXPRT/Foam/... is not displayed	Correct password not entered	Log in as expert (see Chapter 2.2 "Advanced commissioning")

7.3 Outputs

Error message	Cause	Solution
Switching output behaving unexpectedly.	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 behaving unexpectedly.	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 message	Cause	Solution
After installation, the sensor indicates a high level although 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	Activating filtering (see Chapter 2.1 "Quick commissioning")
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 5.1 "Filtering the 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

Error message	Cause	Solution
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	200 mm to 2,000 mm
Process pressure	-1 bar to 10 bar
Process temperature	-20 °C to+100 °C
GOST certificate	✔
RoHS certificate	✔

8.2 Performance

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

Dielectric constant	≥ 5 for mono-probe ≥ 1.8 with coaxial tube

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

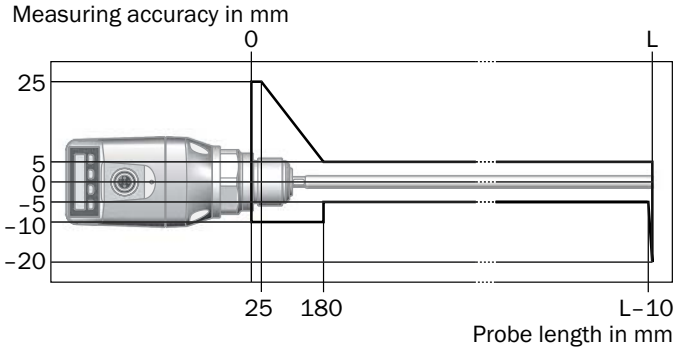
[1] With water under reference conditions.
[2] With parameterized container with water under reference conditions, otherwise 40 mm.
[3] Dependent on measuring mode (high speed < 400 ms, high accuracy < 2,800 ms)
[4] Dependent on configuration (maxCol - Maximum change of level)

8.3 Reference conditions

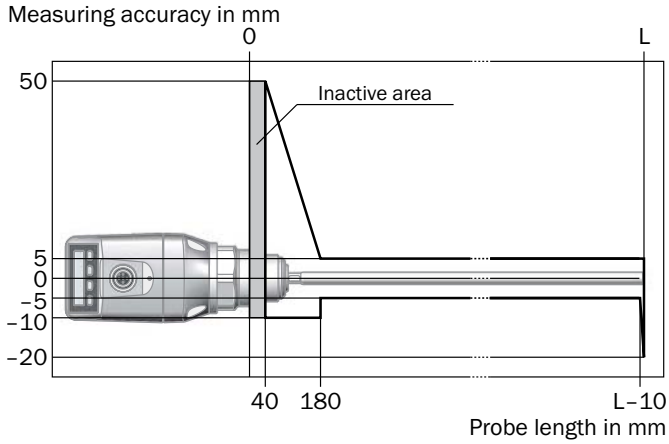
- Container with a diameter of 1 meter
- Central installation of the sensor
- Minimum distance to built-in components > 300 mm
- Distance from end of probe to tank bottom > 15 mm
- Air humidity 65% ±20%
- Temperature: +20 °C ±5 °C
- Pressure: 1,013 mbar abs. ±20 mbar.
- Container parameterization carried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

8.4 Measurement accuracy

Measurement accuracy with parameterized container



Measurement accuracy without parameterized container



8.5 Mechanics/Materials

Wetted parts	1.4404/316L, PTFE
Process connection	G 3/4 A, 3/4" NPT
Housing material	Plastic PBT
Max. probe load	≤ 6 Nm
Enclosure rating	IP 67: EN 60529
Weight	max. 1.3 kg

8.6 Electrical connection values

Supply voltage [1) 2)]	12 V DC to 30 V DC
Power 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. 2 mm, freely adjustable

[1)] All connections are reverse polarity protected. All outputs are overload and short-circuit protected.

Output signal [1]	4 mA to 20 mA/0 V to 10 V automatically switchable depending on output load[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] For the voltage supply, use an energy-limited circuit in accordance with UL61010-1 2nd Ed., Section 9.3; for indoor use only

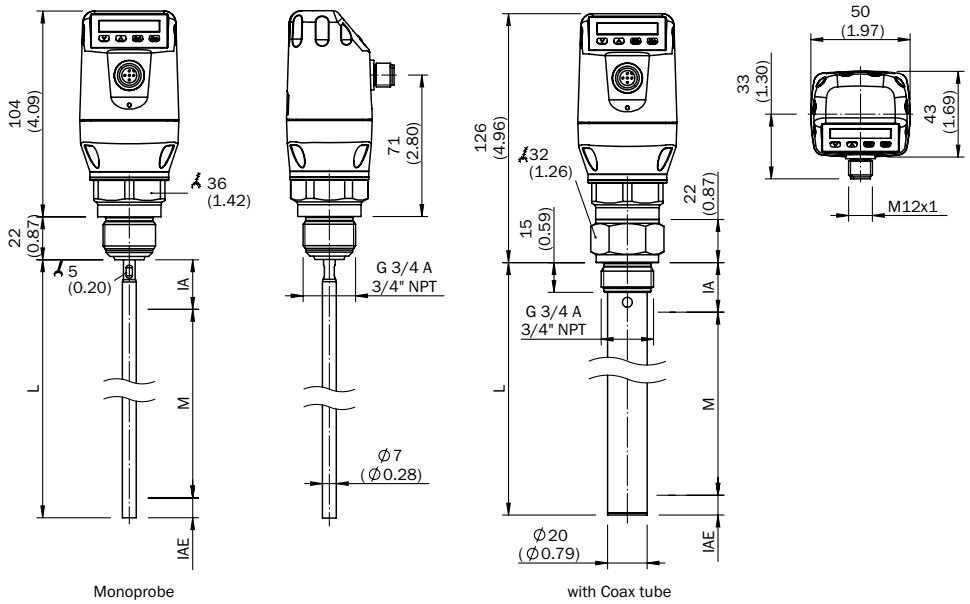
8.7 Environmental conditions

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

[1] According to UL-Listing: Pollution degree 3 ((UL61010-1: 2012-05); maximum relative humidity 80 % for temperatures up to 31 °C ; maximum operating altitude of 3.000 m above sea level

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

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 the probe length measured from the end of the 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
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
MaxCol	Depending on measuring mode : HiSped = AnySped, HiAcc = 10 cm/s
MeasMd	Depending on probe length: < 2005 mm = HiSped, > 2005 mm = HiAcc
CalRng	500 mm
FomSta	inactive
Limit	90

9 Order Details

Ordering code Guided Wave Radar Level Transmitter model NGR

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

Model	Version	Material	Signal Output	Contact	Connection	Option
NGR	1 = probe 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 = without B[1)] = mounted on bypass

[1)] Bypass-specification, see NBK-M data sheet

Note: *Probe length <<L>> available in steps of 10 mm. Example: 200, 210, 220, 230…2000 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 Returns

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.

13 Medium list

This medium list provides a guide to 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.

Substance	DK value
Acetal	3,8
Acetaldehyde	15,0
Acetamide	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 tetrabro-mide	5,6
Aconite acid ester	6,3
Adipic Acid	1,8
Aerosile	1,0
Activated carbon	12,0
Alum	4,2
Allyl alcohol	20,6
Allyl chloride	8,2
Allyl iodide	6,1
Aluminium bromide	3,4
Aluminium foil	10,8
Aluminium hydroxide	2,5
Aluminium splinters	7,3
Aluminium 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/hard coal	3,2
Antimony hydride	1,8
Malic acid diethyl-ester	10,0
Argon	1,5
Arsine	2,1
Arsole	2,3
Asbestos	10,0
Ascorbic acid (vitamin C)	2,1
Azelaic acid diethyl-ester	5,0
Azoxybenzene	5,2
Basalt	2,5
Cotton fibre flour	3,2
Bauxite	2,5
Bentonite	8,1
Benzal chloride	6,9

Substance	DK value
Benzaldehyd	17,6
Benzil (80°C)	10,0
Gas	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
Bornylacetat	4,6
Bromine	3,1
Butanoic acid	3,0
Camphene	2,3
Caproic acid	2,6
Caprylic acid	2,5
Carbazole	1,3
Carbonylcyanid	10,7
Cellit	1,6
Cetyl alcohol (60°C)	3,6
Quinoline	8,8
Chlor, fluid	2,1

Substance	DK value
Chloral	6,7
Chlor benzene	5,7
Chloroacetic acid	33,4
Chloorhydrin	31,0
Chlorinated lime	2,3
Chloroform (trichlor-methane)	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	2,5
Printing ink	4,6

Substance	DK value
Ice cream	16,5
Iron(III)oxide red	1,9
Emulphor	4,0
Epichlorhydrin	23,0
Peanuts, dried	3,1
Peatnut expeller	2,4
Vinegar	24,0
Acetic acid	6,2
Cement asbestos	3,2
Ethanol (ethyl alkohol)	16,2
Aether	4,0
Ethayl acetate	6,0
Ethylamine	6,9
Ethyl benzoate	6,0
Ethyl benzene	2,4
Ethylene chlorhydrin	25,0
Ethylene chloride	10,6
Ethylenediamine	15,0
Etylene oxide	13,9
Ethyl mercaptan	6,9
Fenchone	12,8
Ferrite pellets	21,0
Ferrosilicon	10,0
Green vitriol	32,4

Substance	DK value
Ferrozell	18,3
Fat coal	3,4
Fatty acid	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	83,6
Calcium fluoride	2,5
Formamide	109,0
Furan	3,0
Furfurol	41,7
Animal feed grist	2,4
Germanium tetra-chloride	2,4
Grain grist	3,0
Gypsum	1,8
Fiber glass powder	1,1
Glass granulate	4,0
Cullet	2,0
Glucose (50%)	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	2,5
Oat	4,9
Urea	2,9
Resin	1,5
Hazels	2,0
Hot glue	2,3
Heating oil	2,1
Helium	1,1
Heptane	1,9
Heptanal	9,1
Heptanoic acid	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	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
Cacao 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
Fertiliser	4,3
Plastic pellets	1,2
Copper ore	5,6
Laughing gas	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 sirup	18,4
Malt	2,7
Mandelic acid nitril	18,0
Marble stones small (2-3 mm)	2,5
Mice feed	2,3

Substance	DK value
Flour	2,5
Molasses	31,3
Menthol	4,0
Mesityl oxide	15,0
Metal powder	6,0
Methanol (methyl alkohol)	33,0
Methyl acetate	8,0
Methylene bromide	7,0
Methylene chloride	9,0
Methylene chloride	9,1
Metylene iodide	5,3
Methyl nitrate	23,5
Methyl cellulose	3,0
Mono chlormethane	9,8
Morpholine	7,3
Naphthenic acid	2,6
Naphtalene	2,5
Soda	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
Nitro phoska	5,4
Nitrosyl bromide	15,2
Nitrosyl chloride	19,0
Pasta	1,9
Octane	2,0
Octene	2,1
Octyl bromide	5,0
Oil	2,0
Oleic acid	2,5
Water-in-oil-emulsion	24,2
Oxalo ethyl acetate	6,0
Palmitic acid	2,3
Palm tree nut	2,2
Palm nut/kernel/ seed	2,8
Palm seed oil	1,8
Paper scraps	1,2
Paraffin	1,6
Paraldehyde	15,1
Pelargon	2,8
Penta borane	21,0

Substance	DK value
Penta ethyl chloride	3,8
Penta chlortoluene	4,8
Pentane	1,8
Pentanal	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
Pril	1,2
Propionaldehyde	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,	1,3
Pyridine	13,2
Pyrroles	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
Beets seeds	3,5
Beets 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
Sulphur	3,5
Sulphur dioxide	14,0
Carbon disulphide	2,6
Sulfuric acide	21,9
Sulfuric acide (17%)	31,0
Sulfuric acide (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
Grain of mustard seed	3,6
Silicone oil	2,7

Substance	DK value
Silicone rubber	2,9
Soy flour	4,5
Grain of soy	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	4,0
Terephthalic acid	1,5
White spirit	2,0
Terpinene	2,7
Terpinolene	2,3
Tetrachlorethylene	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
Triethylaluminium	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	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
Tooth paste	18,3
Cellulose	1,2
Cement	2,2
Zinc oxide	1,5
Zinc powder	4,4
Sugar	1,8
Tinder	12,0

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

Level Sensor Model: NGR

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

EN 61326-1
Electrical equipment for measurement, control and laboratory use - EMC requirements – Part 1: General requirements

EN 61326-2-x
Electrical equipment for measurement, control and laboratory use - EMC requirements – Part 2-1: Particular requirements - Test configurations, operational conditions and performance criteria for sensitive test and measurement equipment for EMC unprotected applications (

Also the following EWG guidelines are fulfilled:

2004/108 EC EMC Directive

Hofheim, 26. Nov. 2013

H. Peters
General Manager

M. Wenzel
Proxy Holder

Manufactured and sold by:

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-299-0
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

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