Operating Instructions
for
Guided Wave Radar Level Transmitter
(TDR)

Model: NGM
We don’t accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products. The document may contain technical inaccuracies and typographical errors. The content will be revised on a regular basis. These changes will be implemented in later versions. The described products can be improved and changed at any time without prior notice.
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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein. The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

This quick installation guide gives instructions for mounting, wiring, and basic configuration of NGM. This will be sufficient to achieve a fully functional sensor in most applications. For further details and advanced configuration of NGM, please contact your local distributor or KOBOLD directly.

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition. Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:
The standard delivery includes:
• Guided Wave Radar Level Transmitter model: NGM
• Operating Instructions

4. Regulation Use

Any use of the Guided Wave Radar Level Transmitter, model: NGM, which exceeds the manufacturer’s specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.
5. Operating Principle

NGM uses TDR (Time Domain Reflectometry) technology, which is also known as Guide Microwave or Guided Wave Radar. This means that low-energy and high-frequency electromagnetic impulses, generated by the sensor’s circuitry, are propagated along the probe which is immersed in the liquid or solid to be measured.
When these impulses hit the surface of the media, part of the impulse energy is reflected back up the probe to the circuitry which then calculates the level from the time difference between the impulses reflected.
The sensor can output the analysed level as 4...20 m analogue output, or it can convert the values into freely programmable switching output signal.

6. Mechanical Connection

6.1 Mounting

In case NGM is delivered with a detached probe, attach the probe onto the small threaded stud below the hexagon. Ensure that you mount the counter nut first to secure the probe connection: it has to be interlocked against the probe, NOT against the plastic of the feedthrough (this would result in sheering off the small threaded stud; permanently damaging the sensor).

![Figure1: mounting](image-url)
NGM is mounted vertically to the tank via its connection thread, which is screwed directly into a standard threaded tank connection, i.e. weld-in socket, or it can be screwed into a flange, which is then connected to a tank nozzle. NGM should not be welded directly into the tank. Neither should flanges be welded onto NGM. Welding on the metal parts of NGM will cause serious damage to the sensor.

Do not lift or handle NGM by its probe; this can cause excessive stress on the probe connection. NGM should be handled by the hexagon or the lower section of the housing. Do not screw in NGM by its housing; it should be tightened only via its hexagon (wrench size 32mm). Tighten the coaxial probe only at its lower hexagon; the upper hexagon of the coaxial probe is not needed for mounting.

The customer has to ensure proper sealing of the sensor connection; based on his process conditions like temperature, pressure and resistance against his process liquids and atmosphere. G thread connections require a suitable gasket for pressure-tight joints. The G3/4A connection thread of NGM is supplied with a gasket made of Klingersil C-4400, thickness 2mm. The suggested tightening torque for this thread size, this type of gasket, and a process pressure of max. 40bar is 25Nm (maximum permissible torque: 45 Nm). For NPT thread connections, pressure-tight joints require a sealant directly on the threads.

6.2 Extended temperature range

NGM with the extended temperature option must be properly included into the tank insulation to prevent excessive temperatures at the sensor housing due to thermal radiation or convection, as well as prevention of condensate formation. However, the insulation layer should not reach higher than the hexagon nut; the cooling fins of the radiator-style temperature extension have to be outside the insulation in order to function properly. If necessary, adjust the height of the mounting socket or nozzle accordingly.

Figure 2: extended temperature option
6.3 PTFE coated single rod probe

PTFE coated probes must be handled carefully to prevent damage to the coating. For detailed instruction show to mount a PTFE coated NGM, please contact your local distributor or KOBOLD directly.

Figure 3: single rod probe, PTFE coated

6.4 Mounting considerations

The probes should be installed so that they are not directly impacted by liquids flowing out of the filling inlet. They should neither touch nor sway towards other objects inside the tank or the tank/nozzle walls; e.g. by agitator swirls. In applications with very strong fluid movements, which can also cause excessive lateral force on the probe, it is recommended to anchor the probe. The anchoring fixtures are customer supplied.

For further details about mounting NGM or if you would like to anchor the probes, please contact your local distributor or KOBOLD directly.

<table>
<thead>
<tr>
<th>single rod / wire rope probe</th>
<th>coaxial probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>nozzle diameter</td>
<td>&gt;60mm</td>
</tr>
<tr>
<td>nozzle height</td>
<td>&lt;300mm</td>
</tr>
<tr>
<td>clearance to tank wall or other internal objects</td>
<td>&gt;100mm</td>
</tr>
<tr>
<td>clearance between probe end and tank bottom</td>
<td>&gt;2mm</td>
</tr>
<tr>
<td>diameter of bypass chamber / stilling well</td>
<td>&gt;25mm</td>
</tr>
</tbody>
</table>

- = no restrictions

1 enough diameter to fit in the coaxial tube (Ø17,2mm)
2 enough diameter to fit in the coaxial tube (Ø17,2mm) and enough room around the probe for the liquid to flow in and out of the bypass chamber / stilling well

Figure 4: mounting considerations
The single rod probe is suitable for a very wide range of applications in liquids, but the signal has a wider detection radius around the rod. Thus, it is more responsive for measurement signal disturbances which can be easily overcome by observing a few mounting considerations (see Fig. 4) and making simple configuration adjustments to the sensor; in most cases it is enough to activate and utilize the powerful disturbance signal suppression features of NGM. However, those work most efficiently on stationary interference targets like tall and narrow nozzles or close-by objects. In case that non-stationary interference targets close to the single rod probe, like slowly rotating agitator blades, cause problems with the measurement, it is recommended to use the coaxial probe. The single rod probe is also the recommended probe type for mounting NGM into bypass chambers or stilling wells. In this case, plastic centering disks are needed to prevent the probe from contacting the wall. Please contact your local distributor or KOBOLD directly for further details.

<table>
<thead>
<tr>
<th>Covered Probe Length</th>
<th>6m</th>
<th>12m</th>
<th>20m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Ø</td>
<td>3m</td>
<td>6m</td>
<td>9m</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.7</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Corn</td>
<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>Rice</td>
<td>0.5</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Flour</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Sugar</td>
<td>0.7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Silica sand</td>
<td>1.1</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Cement</td>
<td>1.2</td>
<td>1.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Alumina</td>
<td>0.9</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Phosphate fertilizer</td>
<td>1.8</td>
<td>2.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Fly ash</td>
<td>1</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Coal dust</td>
<td>0.7</td>
<td>0.9</td>
<td>1</td>
</tr>
<tr>
<td>Plastic pellets</td>
<td>0.4</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

- = exceeds the max. tensile load of NGM: 5kN.

**Figure 5: approx. pulling forces [kN]**

Above figures are guidelines to estimate the approx. pulling forces from free-flowing solids acting on a suspended 4mm wire rope probe without any anchoring in a metal tank with smooth walls.

The wire rope probe is recommended for installations in solids, tall tanks and where limited headroom is available. Its performance characteristics and mounting considerations are similar to the single rod probe. In addition, please consider the following advice when using NGM in solid applications:

The bulk solid inside the tank or silo can exert a considerable tensile load on the wire rope probe, depending on properties of the bulk solid, tank dimension sand covered probe length (see Fig. 5). This can lead to considerable downwards pulling forces on the tank roof, which has to be able to withstand the max. tensile load of NGM: 5kN.
It is recommended that the tank be empty during installation. This ensures that the probe hangs down straight and does not get entangled. After installation also regularly check if the wire rope probe got entangled or unbraided. Some bulk solids easily form build-up on the tank wall or on internal structures. This will interfere with the measurements. Choose a mounting position where the wire rope probe is not in contact with, or close to, such product build-up. For anchoring the wire rope probe in solid applications, please contact your local distributor or KOBOLD directly.

The coaxial probe does not have restrictions regarding mounting position, tank connection, and proximity to the tank wall or other objects inside the tank. The coaxial probe is recommended for installing NGM into a non-metallic tank or open pit. If that is not possible, single rod or wire rope probes can be used when NGM is mounted into at least a DN50 metal flange or screwed into a metal sheet with at least Ø150mm.

Figure 6: cable entries

6.5 Cable entries and cable glands

The housing has two cable entries and can be ordered with assembled standard screw plugs and cable glands. Nevertheless, the customer has to confirm the suitability of those cable glands for his specific application requirements and cabling; and replace them when necessary.

Both cable entries can be fitted with cable glands or suitable conduit systems. If only one cable gland is fitted, it is recommended to use cable entry D2 (see Fig. 6). Then cable entry D3 has to be closed with a suitable screw plug.

IP68-rated screw plugs and cable glands have to be properly sealed and have to be properly tightened around cable of suitable type and diameter to ensure the IP68 rating of the housing.
Cable entries with metric threads can be sealed by mounting the suitable screw plug or cable gland with matching rubber washers underneath.

Cable entries with NPT threads require a sealant directly on the thread of the screw plug or cable gland.
For M20x1,5 cable entries, NGM comes assembled with:
1 x cable gland M20x1,5, IP68, nylon PA66, for non-armoured cable Ø5…9mm, with EPDM washer, max. tightening torque 6Nm on all hexagons, wrench size 24mm. For protection during shipment it is closed with an EPDM sealing plug which has to be removed for cabling
1 x screw plug, IP68, M20x1,5, nylon PA66, with EPDM washer
For ½” NPT cable entries, NGM comes assembled with:
2 x screw plug, 1/2” NPT, PE-LD. They are not IP68 and are only for housing protection during shipment. They have to be replaced by the customer

When wiring with shielded or armoured cable, suitable cable glands have to be used. The contact between the metal housing and the shielding of the cable is made by using a suitable EMC-type cable gland. Ground the shielding of the cable only on the sensor side; not on the supply side.

7. Electrical Connection

7.1 Wiring

Figure 7: lower sticker on the black plastic cartridge

Verify that the power supply for the sensor is switched off.

Establish an equipotential connection (potential equalization) between the external earth terminal of NGM and the closest ground potential terminal of the tank.

Open the housing cover by turning it counter clockwise. It may be necessary to loosen the cover locking screw with an allen key size 1,5mm. The cover has a safety chain to prevent it from falling to the ground after being unscrewed.

The lower sticker on the black plastic cartridge inside the housing gives instructions for the standard M20x1,5 cable gland (Fig. 7). When other cable glands are being used, their details have to be observed instead.
Loosen the cable gland and pull the cable through the cable gland into the housing. Pull it far enough to have a convenient length for stripping and handling the cable.

Install cable with a drip loop outside the housing where the bottom of the loop must be lower than the cable entry of the housing.

Dismantle the cable carefully and strip the wires as indicated on the sticker.

The stripped wire ends are connected to the sensor electronic via the green screwless, cage clamp terminal block. It can accommodate stranded and solid wires 0,5…2mm² / AWG 22…14. The usage of cable end sleeves with insulation collar is not recommended.

Simply press an orange lever straight down with a small flat tip screwdriver, insert a stripped wire end into the terminal hole, and release the orange lever; the wire is now connected.

The upper sticker inside the housing illustrates the inputs and outputs if the sensor. Connect all wires accordingly, as indicated in Fig. 8.

Pull the cable back, but make sure its mantle does not retract into the cable gland.

Tighten the cable gland to ensure proper sealing function.

Switch on the power supply for the sensor.

The sensor LED should start blinking green within 6 seconds after connecting the power (during this start-up time the LED is solid green). The blinking green LED indicates that the sensor is in measuring mode and working correctly.

Do not tighten the housing cover yet. Some basic configuration is still to be done…
8. Operation / Configuration / Adjustments

8.1 Control Elements

Figure 8: wiring

Figure 9: Control Elements
Basic configuration of NGM can be done directly on the device via three control elements: a DIP switch, a single push button and a LED for visual feedback. All settings required to get NGM fully operational can be performed directly on the device; or NGM can be ordered completely pre-configured.

All three control elements are enclosed in the black plastic cartridge inside the housing.

The DIP switch has 8 small white levers. Small numbers from 1 to 8 are printed underneath the levers: they indicate the DIP switch positions and correspond to the ones in Fig.9.

The upper position of a lever is off/0 and the lower position is on/1. On the left side of the DIP switch is also a small indication of the on/1 state.

The off/0 and on/1 states of the DIP switch correspond to the 0/1 indications in Fig.9.

The upper sticker on the black plastic cartridge shows three colour segments close to the DIP switch: red, grey, and blue; they correspond to the coloured rows in Fig.10.

red: indicates DIP switch position 8 which switches between measuring and configuration mode. Only when DIP switch position 8 is on/1, NGM can be configured; configuration mode is indicated by the LED blinking alternately green and red.

When DIP switch position 8 is off/0, NGM is in measuring mode; indicated by the LED blinking green.

It is only possible to enter the configuration mode when DIP switch positions 1 to 7 are off/0 before setting DIP switch position 8 to on/1; otherwise the LED is blinking red to indicate an error.

blue: indicates the DIP positions through which groups of functions are selected, e.g. all functions related to the analog current output or the switching output.

grey: indicates the DIP positions through which individual functions/configuration settings are selected.

When entering into configuration mode, always start from DIP switch position 8 and move towards position 1.

When exiting configuration mode, always set back all the DIP switch positions to 0, starting from position 1 and move towards position 8.

After setting all DIP switch positions to represent the 0/1 sequence of the desired function (as described in Fig.10), the push button has to be pressed to execute the desired function. Execution of the function is indicated by the LED remaining green until the function has been properly executed, in which case the LED returns to blinking alternately green and red.
DIP switch Position

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
</table>

DIP switch settings | description
---|---
00000000 | measuring mode
00000001 | configuration mode

function group 1 | analog current output
---|---
00010001 | lower range value [4mA]; span 0%
00100011 | upper range value [20mA]; span 100%
01000110 | response time 0.5s [default]
01010110 | response time 2s
01101010 | response time 5s

function group 2 | switching output
---|---
00110011 | lower threshold
00111010 | upper threshold
01110111 | NC [default]
01111111 | NO

function group 3 | disturbance signal suppression
---|---
00001111 | perform disturbance signal scan
00010101 | disturbance signal scan: do not utilize
00011110 | disturbance signal scan: utilize [default]
01001110 | upper dead band: short [default]
01011110 | upper dead band: medium
01101110 | upper dead band: long
10001110 | amplitude threshold: low [default]
10011110 | amplitude threshold: medium
10101110 | amplitude threshold: high
11100010 | coaxial probe
11110010 | single rod / wire rope probe

function group 4 | reset
---|---
00111100 | reset to delivery configuration

function group 5 | measure probe length
---|---
00111110 | measure probe length

1 for single rod and wire rope probes with a probe length [L] >5.500mm only the top 5.500mm of the probe get scanned for disturbance signals.
2 for single rod and wire rope probes with a probe length [L] >3.000mm the default setting is upper dead band: long

Function groups 4 and 5 require the push button to be pressed and held for at least 10 seconds for the functions to be executed.

Figure 10: DIP switch settings

8.2 Configuration single rod probe or wire rope probe

For most standard applications, executing the three basic configuration steps below is sufficient to achieve a fully functional sensor; providing a continuous level measurement through its analog current output.

For further details and advanced configuration of NGM, please contact your local distributor or KOBOLD directly.
8.2.1 perform disturbance signal scan

- NGM has to be mounted in its final position and the tank has to be completely empty in order to perform a disturbance signal scan
- set the DIP switch positions to the 0/1 sequence in Fig. 11 on the left; start from position 8 and move towards position 1!
- LED will blink alternately green and red
- press the push button
- LED will remain green for a few seconds while the disturbance signal scan is being performed
- once the scan is completed successfully, the LED will return to blinking alternately green and red

<table>
<thead>
<tr>
<th>DIP switch Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8</td>
</tr>
</tbody>
</table>

DIP switch settings description

<table>
<thead>
<tr>
<th>DIP switch settings</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 0 1 0 1 1 1</td>
<td>perform disturbance signal scan</td>
</tr>
</tbody>
</table>

Figure 11: perform disturbance signal scan

8.2.2 lower range value [4mA]; span 0%

- fill the liquid into the tank up to the level where you want to position the lower range value [4mA]; span 0%.
- It is recommended that the lower range value stays within the measuring range [M]
- change DIP switch position 6 to off/0
- press the push button
- LED will remain green briefly while the lower range value setting is being executed
- once it has been executed successfully, the LED will return to blinking alternately green and red

<table>
<thead>
<tr>
<th>DIP switch Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8</td>
</tr>
</tbody>
</table>

DIP switch settings description

<table>
<thead>
<tr>
<th>DIP switch settings</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 0 1 0 0 1 1</td>
<td>lower range value [4mA]; span 0%</td>
</tr>
</tbody>
</table>

Figure 12: lower range value [4mA]; span 0%
8.2.3 upper range value [20mA]; span 100%

- raise the liquid inside the tank up to the level where you want to position the upper range value [20mA]; span 100%.
- It is recommended that the upper range value stays within the measuring range [M]
- change DIP switch position 3 to on/1
- change DIP switch position 4 to off/0
- press the push button
- LED will remain green briefly while the upper range value setting is being executed
- once it has been executed successfully, the LED will return to blinking alternately green and red
- set all the DIP switch positions to 0 as indicated in Fig.14 on the left; start from position 1 and move towards position 8!
- the LED will change to blinking green

<table>
<thead>
<tr>
<th>DIP switch Position</th>
<th>DIP switch settings</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8</td>
<td>0 0 1 0 0 0 1 1</td>
<td>upper range value [20mA]; span 100%</td>
</tr>
</tbody>
</table>

Figure 13: upper range value [20mA]; span 100%

Tighten the housing cover properly by turning it clockwise; make sure the cover safety chain does not tangle up. If desired, tighten the cover locking screw with an allen key size 1,5mm.

<table>
<thead>
<tr>
<th>DIP switch Position</th>
<th>DIP switch settings</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8</td>
<td>0 0 0 0 0 0 0 0</td>
<td>measuring mode</td>
</tr>
</tbody>
</table>

Figure 14: measuring mode
8.3 Configuration Coaxial probe

The coaxial probe has a very robust and reliable measurement performance in almost any application without further configuration. For basic configuration only the range values for the analogue current output have to be set. For further details and advanced configuration of NGM, please contact your local distributor or KOBOLD directly.

8.3.1 lower range value [4MA]; span 0%

- set the DIP switch positions to the 0/1 sequence in Fig.15 on the left; start from position 8 and move towards position 1!
- lower the liquid inside the tank down to the level where you want to position the lower range value [4mA]; span 0%
  It is recommended that the lower range value stays within the measuring range [M]
- press the push button
- LED will remain green briefly while the lower range value setting is being executed
- once it has been executed successfully, the LED will return to blinking alternately green and red

<table>
<thead>
<tr>
<th>DIP switch Position</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIP switch settings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>description</td>
<td>lower range value [4mA]; span 0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 15: lower range value [4mA]; span 0%

8.3.2 upper range value [20MA]; span 100%

- raise the liquid inside the tank up to the level where you want to position the upper range value [20mA]; span 100%
  It is recommended that the upper range value stays within the measuring range [M]
- change DIP switch position 3 to on/1
- change DIP switch position 4 to off/0.
- press the push button
- LED will remain green briefly while the upper range value setting is being executed
- once it has been executed successfully, the LED will return to blinking alternately green and red
- set all the DIP switch positions to 0 as indicated in Fig.17 on the left; start from position 1 and move towards position 8!
- the LED will change to blinking green
Tighten the housing cover properly by turning it clockwise; make sure the cover safety chain does not tangle up. If desired, tighten the cover locking screw with an allen key size 1,5mm.

8.4 probe length and measuring range

The reference point for definition of the probe length \( [L] \) is always the shoulder of the connection thread. The probe length \( [L] \) is an important mechanical dimension which is needed to make sure the probe physically fits into the tank at the anticipated mounting location; it is not equal to the actual measuring range \([M]\) of the sensor!

TDR level sensors have small inactive areas at top \([I1]\) and bottom \([I2]\) of the probe. Those are due to the presence of unavoidable signal disturbances at both ends of the probe. In these inactive areas the measurements are non-linear or have reduced accuracy. Therefore, it is not recommended to actually measure level within those inactive areas. Their length depends on the probe type and the reflectivity (i.e. dielectric constant) of the liquid to be measured.

The measuring range \([M]\) of NGM extends between the top and bottom inactive areas of the probe; this is the area in which NGM will have the specified measurement performance. It is recommended that the maximum and minimum liquid levels to be measured in the tank are actually within the measuring range \([M]\) of the sensor. The span between the lower range value \([4mA]\) and the upper range value \([20mA]\) of the analog current output is equal to 0...100% of your continuous level measurement reading. It is recommended that the span between those two range values stays within the measuring range \([M]\).
The disturbance signal scan is a powerful disturbance signal suppression feature of NGM. The sensor scans its entire probe length for any disturbance signals in the application that could potentially be misinterpreted as level readings, memorizes and suppresses them during operation; that way NGM only recognizes the actual level signals caused by the liquid to be measured. The disturbance signal scan is intended for the single rod probe, since its signal has a wider detection radius around the rod, making it more responsive for measurement signal disturbances. The disturbance signal scan works most efficiently on stationary interference targets like tall and narrow nozzles or close-by objects. Thus, NGM has to be mounted in its final position and the tank has to be completely empty in order to perform a disturbance signal scan; that will ensure a reliable identification of the actual disturbance signals only. In case that non-stationary interference targets close to the single rod probe, like slowly rotating agitator blades or streams of liquid being filled into the tank, cause problems with the measurement, it is recommended to use the coaxial probe. Performing a disturbance signal scan is the prerequisite for utilizing this feature of NGM.
8.6 Guide to communicating from a PC to a NGM probe

(Configuration of device specific parameters)

8.6.1 Communication with NGM

Requirements:
- PC with Microsoft Office
- Excel file Configuration Tool Customer (HART) V173.xls
- HART Modem with USB connector
- Communication resistor approx. 250 Ohm
- KFA2 level probe
- Power supply 24VDC

Connection:
- Connect the NGM probe to the power supply
- The LED at the NGM must start to flash green
- Connect the resistor between + and – of the active 4…20mA output.
- Connect in parallel the HART modem to the resistor and plug in the USB connector to the PC
8.6.2 Connection of a NGM Probe to a PC

- Check the COM port assignment of the PC to the USB HART modem with the Device Manager
  
  [Image: Geräte-Manager]

  * In this case COM port 4 has been assigned to the HART modem
8.6.3 First Steps with the Excel Tool

1. Open the Excel file
2. Prerequisite: worksheet is active and the macros are running
   *(Hint: A restart of the Excel file might help to activate the Macros.)*
3. HOME
4. Enter the assigned COM port indicated at the device manager.

For the usage of the Excel tool, a click on the necessary cell activates the communication and/or parameters can be changed. For re-sending the command, click on a free cell elsewhere and move back to the required cell. The OK status has to return for a successful communication.
BASIC CONFIGURATION

Establishing a HART communication:

- Serial number obtainable by clicking on the light blue SEND button J2 in step 1 “get serial number”
- Macros are running
- OK status (H2) disappears and reappears after serial number read out and shown in G2

If OK status does not reappear, check the connection or the COM port settings

Now the HART communication is established and the modification of device-specific parameter as well as the read-out of the echo curve can be performed.
8.6.4 Upper / Lower Range Value

BASIC CONFIGURATION

• Read out actual 4...20mA settings by clicking on I6 and I7

With the command "get lower / upper range value", the actual 4...20mA values in mm are shown after the OK status disappeared and is visible again.

• Change actual 4...20mA settings by changing the values in G4 and G5 and clicking on I4 and I5 "set lower / upper range value"

• Verify changes by clicking again on I6 and I7 "get lower / upper range value"

Reference point = 0mm
8.6.5  Response Time

BASIC CONFIGURATION

• Read out actual response time, by clicking on I9.

Field G9 is showing the actual response time multiplied with 0,1ms.

• Change actual response time within a range of 2 … 100 (0,2 … 10sec) in field G8 and clicking on I8 “set response time”.

Use high response times for storage tanks with slow level movements. Use low response times for buffer and process tanks.

Verify changes by clicking again on I9 "get response time"
8.6.6 Switching Output Mode

BASIC CONFIGURATION

- Read out actual switching output mode by clicking on I11

Field G11 is showing the actual switching output mode.
- 0 = nc = normally closed
- 1 = no = normally open

Once the probe is powered, the switch output can be open or closed. The standard switch output mode is set to “normally closed”, as it would open at a power failure for highest safety.

- Change actual switching output mode 0 or 1 in field G10 and clicking on I10 “set switching output mode”

Verify changes by clicking again on I11 “get switching output mode”
8.6.7 Threshold switching output

BASIC CONFIGURATION

• Read out actual lower / upper threshold switching output, by clicking on I13 and I15.

Field G13/15 indicates the actual lower / upper switching threshold. With the help of the thresholds, a hysteresis can be programmed to avoid output switching at turbulent levels. First, the upper threshold must be passed to activate the output then the lower threshold for deactivation of the output.

• Change actual lower / upper threshold in field G12 / G14 and click on I12 / I14 “set lower / upper threshold switching output mode”.

Verify changes by clicking again on I13 / I15 “get lower / upper threshold switching output”
8.6.8  Upper Dead Band

**BASIC CONFIGURATION**

- Read out actual upper dead band, by clicking on I17.

Field G17 indicates the actual upper dead band. With the upper dead band, noisy signals or ringing caused by the installation can be blocked. Increase the value for cutting signals left to the dead band, whose position is indicated by a green line. Any signal left to the green line will not be analyzed by the software. Entered values are in mm and are visible at the echo curve.

- Change actual upper dead band in field G16 and click on I16 “set upper dead band”.

Verify changes by clicking again on I17 “get upper dead band”.
8.6.9  Amplitude threshold

BASIC CONFIGURATION

- Read out actual amplitude threshold, by clicking on I19

Field G19 indicates the actual amplitude threshold. Dynamic noise or ringing can be blocked if it is within the amplitude threshold band. The level reflection should be always 1/3 bigger than the width of the amplitude threshold band.

- Change actual amplitude threshold in field G18 and click on I18 “set amplitude threshold”.

![Diagram showing amplitude threshold and verification process]

Verify changes by clicking again on I19 “get amplitude threshold”
8.6.10 Disturbance Signal Scan Status

**BASIC CONFIGURATION**

- Read out actual disturbance signal scan status by clicking on I21

Field G21 indicates the actual disturbance scan signal status.
- 00 = off, raw echo curve
- 01 = disturbance signal active on top
- 10 = disturbance signal active on top and bottom

- Change actual disturbance signal scan status in field G20 and click on I20 “set disturbance signal scan status”
- Once changing it to “10” or “01” a disturbance signal scan must be performed with I22.

Verify changes by clicking again on I21 “get disturbance signal scan status”
8.6.11  Probe Type

BASIC CONFIGURATION

- Read out actual probe type status, by clicking on I24.

Field G24 indicates the actual probe type status.
- 0= coaxial probe
- 1= single probe rod or rope
Thresholds are adapted automatically by changing this parameter.

- Change actual probe type in field G23 and click on I23 “set probe type”.

Verify changes by clicking again on I24 “get probe type”
8.6.12 Probe Length

BASIC CONFIGURATION

• Read out actual probe length, by clicking on I26.

Field G26 indicates the actual probe length in mm.

• Change actual probe length in field G25 and click on I25 “set probe length”.

Verify changes by clicking again on I26 “get probe length”
8.6.13 Set Delivery Configuration

BASIC CONFIGURATION

- Set actual parameters as delivery configuration by clicking on I27

Former delivery configuration parameters will be overwritten!
No reset to factory conditions is possible anymore.
8.6.14 Reset to Delivery Configuration

BASIC CONFIGURATION
Reset unit back to delivery configuration, by clicking on I28.

4…20mA, response time, switching mode and thresholds, upper dead band, amplitude threshold, disturbance scan, probe type, and probe length will be set back to delivery configuration.

**UNDO NOT POSSIBLE!**
8.6.15 Level Reading

BASIC CONFIGURATION

• Get actual level reading, by clicking on I29.

If you do not measure the current output in series with a Multimeter, it is recommended to read out the level 3 – 5 times to recognize potential current fluctuations.

If a fluctuating current can be observed, the amplitude threshold or dead band needs to be adjusted.
### 8.6.16 Software Revision

**BASIC CONFIGURATION**
- Get actual software revision, by clicking on I30.

As of April 30, 2013, the actual software revision is V150.
For an upgrade please contact KOBOLD.
8.6.17 Device Status

BASIC CONFIGURATION

- Get actual device status, by clicking on I31.

Important probe status information can be communicated.

Click on the small red upper right corner for more details.
8.6.18  Signal Data – Echo Curve

**BASIC CONFIGURATION**

- Acquire actual signal data or also called echo curve by clicking on I32

Once the OK status in field H32 does not disappear anymore, the echo curve can be visualized by clicking on worksheet SIGNAL.

Reading out the echo curve from the electronics can take several seconds, as all data must be communicated via the serial HART protocol to the PC.
8.6.19 Signal Range

BASIC CONFIGURATION

• Set signal range, by entering values in field G33/34 and clicking on I33/34

Depending on the probe length, the range within the echo curve in worksheet SIGNAL can be adapted.

A negative X1 range of -1000 is always recommended and standard. With this the microwave generation and coupling can be verified.
8.6.20 Signal

**SIGNAL**
- Visualization of the actual echo curve, where the level calculation is based on.
- The NGM gets 70 echo curves every second for calculating the level.

The most important parameters (4…20mA; dead band and amplitude threshold) are visualized.

With the arrows up/down, the amplitude threshold can be positioned properly on the average zero line of the echo curve as a means to evaluate the correct value.

- x-axis: length in mm
- y-axis: voltage according to factory-specific scales
8.6.21 More Parameters…

**ADVANCED CONFIGURATION**

- Parameters within the worksheet ADVANCED CONFIGURATION are only recommended to change by experts.
8.6.22  Signal Discussion 1

Empty Coaxial Probe
• Nice reference reflection at the beginning
• Perfect coupling into the coaxial probe
• Positive end of probe reflection which corresponds to the physical end of probe

Dead band parameter at 30mm.
20mA parameter at 50mm.
4mA parameter at 230mm.
Amplitude threshold at 1000.
8.6.23 Signal Discussion 2

Level Coaxial Probe
- Stable reference reflection at the beginning
- Negative level reflection at 168mm
- No end of probe reflection as energy is completely reflected at water surface

Dead band parameter at 30mm.
20mA parameter at 50mm.
4mA parameter at 230mm.
Amplitude threshold at 1000.
8.6.24 Signal Discussion 3

Empty Rod Probe

- Nice reference reflection at the beginning
- Strong positive impulse at the transition of coupling to the single rod
- Reflection can change with mounting conditions.
- Positive end of probe reflection which corresponds to the physical end of probe

Dead band parameter at 30mm.
20mA parameter at 50mm.
4mA parameter at 230mm.
Amplitude threshold at 1000.
8.6.25 Signal Discussion 4

Level Rod Probe

- Stable reference reflection at the beginning
- Negative level reflection at 168mm
- No end of probe reflection as energy is completely reflected at water surface
- Positive coupling reflection in saturation as amplification factor increased

Dead band parameter at 30mm.
20mA parameter at 50mm.
4mA parameter at 230mm.
Amplitude threshold at 1000.
### 9. Technical Information

<table>
<thead>
<tr>
<th></th>
<th>Single rod</th>
<th>Wire rope</th>
<th>Coaxial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Probe diameter</strong></td>
<td>6 mm</td>
<td>4 mm</td>
<td>17.2 mm</td>
</tr>
<tr>
<td><strong>Max. Load</strong></td>
<td>Lateral: 6 Nm = 0.2 kg at 3 m</td>
<td>Tensile: 5 kN</td>
<td>Lateral: 100 Nm = 4.67 kg at 6 m</td>
</tr>
<tr>
<td><strong>Probe length L</strong></td>
<td>100...3000 mm</td>
<td>1000...20,000 mm</td>
<td>100...6000 mm (standard) 100...1000 mm (high temperature)</td>
</tr>
<tr>
<td><strong>Dielectric Constant (Ɛ_r)</strong></td>
<td>&gt; 1.8</td>
<td>&gt; 1.8</td>
<td>&gt; 1.4</td>
</tr>
<tr>
<td><strong>Viscosity (cP)</strong></td>
<td>&lt; 5000</td>
<td>&lt; 5000</td>
<td>&lt; 500</td>
</tr>
<tr>
<td><strong>Medium temperature, standard version</strong></td>
<td>-40...+150°C (without PTFE) -15...+100°C (PTFE lining)</td>
<td>-40...+150°C</td>
<td>-40...+130°C (EPDM O-ring) -15...+150°C (FKM O-ring)</td>
</tr>
<tr>
<td><strong>High temperature version</strong></td>
<td>-200...+250°C (NBR O-ring) -150...+250°C (FKM O-ring)</td>
<td>Not available</td>
<td>-200...+250°C (NBR O-ring) -150...+250°C (FKM O-ring)</td>
</tr>
<tr>
<td><strong>Materials exposed to tank atmosphere</strong></td>
<td>1.4571/316 Ti, PEEK Standard version PTFE, O-ring (see order code), (PTFE lining) 1.4571/316 Ti, PEEK PTFE O-ring (see order code), (high temperature version) In all cases, in addition, a Klinger SIL® C-4400 gasket at connection thread, 2 mm thick</td>
<td>1.4401/316, PEEK In addition, a Klinger SIL® C-4400 gasket at connection thread, 2 mm thick</td>
<td>1.4404/316 L, PEEK, O-ring (see order code), (standard version) 1.4404/316 L, PEEK, PTFE, O-ring (see order code), (high temperature version) In all cases, in addition, a Klinger SIL® C-4400 gasket at connection thread, 2 mm thick</td>
</tr>
</tbody>
</table>

Measuring principle: Guided Wave Radar (GWR)
Installation position: Vertical
Ambient temperature: -25...+80°C
Storage temperature: -40...+85°C
Max. Pressure: -1...+40 bar (except NGM-19:0...4 bar)
Accuracy*: ±3 mm or 0.03 % of measured distance, whichever is greater
Repeatability*: < 2 mm
Resolution*: < 1 mm
*Reference condition: Ɛ_r = 80, water, tank ø 1 m, DN200 metl flange
Velocity of level change: < 1000 mm/s
Medium conductivity: No restrictions
Medium density: No restrictions
Process connection: Thread or flange, see ordering code
Interface
(e.g. oil on top of water): An oil layer of < 70 mm thickness on top of water is not detected by the sensor; in this case the sensor will detect only the water level at a slightly lower position than actual. From an oil layer thickness > 70 mm onwards, the sensor detects the total level, including the oil layer, according to specifications.
**Materials**

**Housing:** Aluminium alloy, epoxy coated, with safety chain and tin plated 1.4301/SS304 external earth screw

Option: Stainless steel 1.4401/SS316

**O-ring:** NGM Rod/Rope: None

NGM Coaxial: FKM or EPDM

NGM high temperature: NBR or FKM

**Weights**

**Housing incl. electronics:** 720 g

**Stainless steel housing incl. electronics:** 1340 g

**Connection ¾ (Coaxial):** 350 g

**1 m Rod probe:** 230 g

**1 m Rope probe:** 66 g + 380 g ballast weight

**1 m Coaxial probe:** 540 g + 130 g (attachment kit)

**Cooling extension for high temperature:** 900 g

**Electrical data**

**Supply voltage:** 12...30 V<sub>DC</sub> (reverse-polarity protected < 50 mA)

4 wire-system

**Output:** 4...20 mA (programmable by HART<sup>®</sup> modem)

**Total load:** < 500 Ω + load resistance approx. 250 Ω

**Response time:** 0.5 s [default], 2 s, 5 s (selectable)

**Temperature drift:** < 0.2 mm/K change in ambient temperature

**Switching output**

**DC PNP (active):** NC [default] or NO (short-circuit protected)

**Load current:** < 200 mA

**Signal voltage HIGH:** Supply voltage – 2 V

**Signal voltage LOW:** 0 V...1 V

**Response time:** < 100 ms

**Current consumption:** < 50 MA at 24 V<sub>DC</sub> (no burden)

**Start-up time:** < 6 s

**Cable terminals:** Clamp terminal block for cable 0.5...2 mm<sup>2</sup>

**Cable entry:** 2 x M20 x 1.5

**Protection:** IP68
## 10. Order Codes

Ordering Data (Example: NGM-1200 G5 A40)

<table>
<thead>
<tr>
<th>Model</th>
<th>Material (Probe/O-ring)</th>
<th>Connection</th>
<th>Output</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGM-1 Rod probe</td>
<td>200 = stainless steel, PEEK/without O-ring 900 = stainless steel, PEEK/FKM PTFE coating</td>
<td>G5 = G ¾ male N5 = ¾ NPT male F8 = DN40 / PN 40 B1, 1.4404/316L flange EN1092-1 F9 = DN 50 / PN 40 B1, 316L flange EN1092-1</td>
<td>A4 = 4…20 mA, PNP E4 = 4…20 mA, PNP, ATEX-version</td>
<td>00 = without B3 = mounted in Bypass with DIN-flange DN10 B4 = mounted in Bypass with DIN-flange DN15 B5 = mounted in Bypass with DIN-flange DN20 B6 = mounted in Bypass with DIN-flange DN25 BB = mounted in Bypass with ANSI-flange ½&quot; BC = mounted in Bypass with ANSI-flange ¾&quot; BD = mounted in Bypass with ANSI-flange 1&quot; S1 = mount. in stilling well DIN-flange DN40/PN40 S2 = mount. in stilling well DIN-flange DN50/PN40 S3 = mount. in stilling well DIN-flange DN80/PN40 S4 = mount. in stilling well DIN-flange DN100/PN16 SA = mount. in stilling well ANSI-flange 1½” 150 lbs SB = mount. in stilling well ANSI-flange 2” 150 lbs SC = mount. in stilling well ANSI-flange 2½” 150 lbs SD = mount. in stilling well ANSI-flange 3” 150 lbs SE = mount. in stilling well ANSI-flange 4” 150 lbs KO = mounted in bypass with roller/ball display YY = special</td>
</tr>
<tr>
<td>NGM-8 Rod probe, high temperature</td>
<td>210 = stainless steel, PEEK/NBR 220 = stainless steel, PEEK/FKM</td>
<td>FB = DN 80 / PN 40 B1, 1.4404/316L flange EN1092-1 FC = DN 100 / PN16 B1, 1.4404/316L flange EN1092-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NGM-2 Coaxial probe</td>
<td>230 = stainless steel, PEEK/EPDM 220 = stainless steel, PEEK/FKM</td>
<td>A8 = 1 ½” ASME B 16.5 CL 150, 1.4404/316L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NGM-9 Coaxial probe, high temperature</td>
<td>210 = stainless steel, PEEK/NBR 220 = stainless steel, PEEK/FKM</td>
<td>AA = 2 ½” ASME B 16.5 CL 150, 1.4404/316L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NGM-4 Wire rope ø 4 mm (liquids and light solids only)</td>
<td>200 = stainless steel, PEEK/without O-ring</td>
<td>AC = 4” ASME B 16.5 CL 150, 1.4404/316L</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Bypass specification, see NBK-M data sheet
2) Please specify probe length L and stilling well length (when different from standard, see drawing dimensions) in clear text while ordering
3) Bypass specification, see NBK data sheet. Max. possible measuring length ML = 5500 mm. Not possible with NGM-2/9/4. Max. medium viscosity 500 cP.
4) Not possible with NGM-19..., NGM-8..., and NGM-9
5) Not possible for flange sizes <DN50/PN40 and <2½” ASME CL 150

Note: Please specify probe length L in clear text while ordering
11. Dimensions

NGM-12.../NGM-42... with thread connection
Single rod/wire rope probe
Standard application temperature

NGM-12.../NGM-42... with flange connection
Single rod version
Wire rope version
NGM-22 with thread connection
Coaxial probe
Standard application temperature

NGM-19 with flange connection
Single rod probe, PTFE coated
Flange disk

NGM-22 with flange connection

NGM-19 with thread connection
Single rod probe, PTFE coated
Connection thread
NGM-8…/NGM-9… with thread connection
(high temperature version)
Single rod/coaxial probe
Extended application temperature

NGM assembled in a bypass tube option B

NBK-M
Bottom cover with G¼ (DIN flanges) or ¼" NPT (ASME flanges)
drain plug or optional needle valve
NGM with „Top Mounting in Stilling Well“ option S

NGM assembled in a bypass tube with roller/ball display (redundant measurement) option K
12. Safety Instructions for Ex-Versions Model NGM

NGM
4-wire TDR-Sensor with single rod or coaxial probe for continuous level measurement and point level detection in liquids, with analog and switching output.

DOCUMENT DESCRIPTION
These safety instructions are part of the NGM Quick Installation Guide and give instructions regarding to proper installation and operation of NGM in hazardous areas.

GENERAL DESCRIPTION
NGM is suitable for applications with hazardous gas or dust atmospheres, for applications requiring instruments of category 1/2G, 1/2D or 2G, 2D. If NGM is installed and operated in hazardous areas, the general hazardous area installation regulations IEC 60079-14, all relevant national, regional and local regulations and standards, as well as these safety instructions must be observed. The installation of electrical equipment in hazardous areas must always be carried out by qualified personnel.

APPROVAL DETAILS
CE 0158 SEV 13 ATEX 0108 X
II 1/2G Ex ia/d IIC T6 Ga/Gb
II 1/2D Ex ia/tb IIIC T86°C IP68 Da/Db
II 2G Ex ia d IIC T6 Gb
II 2D Ex ia tb IIIC T86°C IP68 Db

SENSOR COMPONENTS
NGM consists of three major components: housing, feedthrough, and probe. The only components that are exposed to the atmosphere inside the tank are probe and the part of the feedthrough below the hexagon. NGM has a flameproof metal housing that contains the sensor's electronics and input/output terminals and has no contact to the atmosphere inside the tank. For hazardous applications that require category 1/2G, 1/2D devices, the housing is installed in hazardous areas requiring devices of category 2G, 2D (zone 1, zone 21). The feedthrough of the sensor (acting as separation barrier between zones 0/1, zone 20/21) is installed in the wall which separates areas requiring devices of category 2G, 2D from 1G, 1D. The probe is installed in hazardous areas requiring devices of category 1G, 1D (zone 0, zone 20). For hazardous applications that require category 2G, 2D devices, all components of NGM are installed in hazardous areas requiring devices of category 2G, 2D (zone 1, zone 21).
**MOUNTING**

NGM is mounted vertically to the tank via its connection thread, which is screwed directly into a standard threaded tank connection, i.e. weld-in socket, or it can be screwed into a flange, which is then connected to a tank nozzle. NGM should not be welded directly into the tank. Neither should flanges be welded onto NGM. Welding on the metal parts of NGM will cause serious damage to the sensor. Do not lift or handle NGM by its probe; this can cause excessive stress on the probe connection. NGM should be handled by the hexagon or the lower section of the housing. Do not screw in NGM by its housing; it should be tightened only via its hexagon (wrench size 32mm for connection thread G3/4A). Tighten the coaxial probe only at its lower hexagon; the upper hexagon of the coaxial probe is not needed for mounting. The customer has to ensure suitability of all materials exposed to the tank atmosphere as well as proper sealing of the sensor connection; based on his process conditions like temperature, pressure and resistance against his process liquids and atmosphere. G thread connections require a suitable gasket for pressure-tight joints. The G3/4A connection thread of NGM is supplied with a gasket made of Klingersil C-4400, thickness 2mm. The suggested tightening torque for this thread size, this type of gasket, and a process pressure of max. 40bar is 25Nm (maximum permissible torque: 45 Nm). For NPT thread connections, pressure-tight joints require a sealant directly on the threads.
MOUNTING CONSIDERATIONS
The probes should be installed so that they are not directly impacted by liquids flowing out of the filling inlet. They should neither touch nor sway towards other objects inside the tank or the tank/nozzle walls; e.g. by agitator swirls. In applications with very strong fluid movements, which can also cause excessive lateral force on the probe, it is recommended to fix the probe. The anchoring fixtures are customer supplied.

TEMPERATURE CLASSES
For applications in hazardous gas atmospheres, the maximum permissible application and ambient temperatures, depending on the temperature classes, are specified in figure 3. For applications in hazardous dust atmospheres, the maximum permissible surface temperature is +86°C and the ambient temperature range is -40 to +70°C. For hazardous areas that require category 1/2G devices, the application pressure must be between 0.8 to 1.1 bar. If NGM is operated at temperatures higher than those specified in figure 3, please make sure through appropriate measures that there is no danger of ignition from the hot surfaces. The maximum permissible ambient temperature should not exceed the values specified in figure 3. For application conditions in non-hazardous area, please refer to the data sheet.
ELECTRICAL DATA
Supply voltage (terminals 1+2): U = 12 30V DC
Um = 250V AC
Analog output (terminals 3+4): I = 4 20mA
Um = 250V AC
Switching output (terminals 5+6): Us = 0 U
Um = 250V AC

CABLE ENTRIES AND CABLE GLANDS
The housing has two cable entries. For installation in hazardous areas, only cable glands certified according to IEC 60079-1 or certified conduit systems are permitted. The tightening torque specified by the manufacturer of the certified cable glands or conduit systems has to be observed. The torque mentioned on the sensor electronic only applies to standard cable glands/conduits, which are not permitted for installation in hazardous areas. Both cable entries can be fitted with cable glands/conduits. If only one cable gland/conduit is fitted, it is recommended to use cable entry D2 (see Fig. 5).
Then cable entry D3 has to be sealed with a certified screw plug. The cable entries have to be properly sealed and cable glands have to be properly tightened around cable of suitable type and diameter to ensure the IP68 rating of the housing. **The seals for mounting the cable glands/conduits, the cable glands/conduits themselves and the cable used for wiring have to be rated for a temperature of +86 °C.** When wiring with shielded or armoured cable, suitable cable glands have to be used. The contact between the metal housing and the shielding of the cable is made by using a suitable EMC-type cable gland. Ground the shielding of the cable only on the sensor side; not on the supply side.

![Figure 5: cable entries](image)

**WIRING**
Before opening the housing cover for any reason, verify that the power supply for the sensor has been switched off for at least 6 minutes or no explosive atmosphere is present. After wiring NGM, tighten the housing cover properly by turning it clockwise (make sure the cover safety chain does not tangle up) and properly tighten the cover locking screw with an allen key size 1.5mm (see Fig. 5). Only when the cover is tightened and secured it is permitted to power up NGM. The housing cover of NGM features a thread acting as a flameproof gap and a caution message; it must not be exchanged for any other cover. Establish an equipotential connection (potential equalization) between the external earth terminal of NGM and the closest ground potential terminal of the tank.
Figure 6: wiring

- Control system, e.g. DCS or PLC
- Power supply 12…30 VDC
- HART modem
- Computer

Diagram showing connections between the control system, power supply, HART modem, and computer.
13. Declaration of Conformance

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

**Guided Wave Radar Level**  **Model: NGM**

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


Also the following EWG guidelines are fulfilled:

**2004/108/EC**  **EMC Directive**

**94/9/EG**  
Equipment and Protective systems intended for use in potentially Explosive Atmospheres (ATEX 100a)  
Quality Management Production  
Certificate number: DMT 03 ATEX ZQS / E 110  
Notified body: Deutsche Montan Technologie  
Identification number: 0158

Hofheim, 16. Mai 2013

H. Peters  
General Manager

M. Wenzel  
Proxy Holder
14. Atex-Certification

EC-Type Examination Certificate

(2) Equipment or protective system intended for use in potentially explosive atmospheres - Directive 94/9/EC

(3) Examination certificate number: SEV 13 ATEX 0108 X

(4) Equipment: Level Sensor NGM-xxx

(5) Manufacturer: KOBOLD Messring GmbH

(6) Address: Nordring 22-24, DE-65719 Hofheim

(7) The equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) Electrosuisse SEV, notified body No. 1258 in accordance with article 9 of the Council Directive of the European Communities of 23 March 1994 (94/9/EC), certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment or protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive. The results of the examination are recorded in confidential report no. 09-IK-0358.40.

(9) Compliance with the essential health and safety requirements has been assured by compliance with:

- EN 60079-0:09
- EN 60079-1:07
- EN 60079-11:12
- EN 60079-26:07
- EN 60079-31:09

(10) If the sign "Ex" is placed after the certificate number, it indicates that the equipment or protective system is subjected to special conditions for safe use specified in the schedule to this certificate.

(11) This examination certificate relates only to design and construction of the specified equipment in accordance with the directive 94/9/EC. Further requirements of this directive apply to the manufacturing process and the placing on the market of the equipment.

(12) The marking of the equipment shall include the following:

- II 1/2G Ex ia/d IIC T8 Ga/Gb
- II 1/2D Ex ia/ib IIC T85°C IP68 Da/Db
- II 2G Ex ia d IIC T6 Gb
- II 2D Ex ia tb IIC T85°C IP68Db

Electrosuisse Notified Body ATEX

Fehrlorf, 2013-02-25

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Appendix

EC-Type Examination Certificate

15. Description of the equipment
4-wire NGM-Sensor with single rod, wire rope or coaxial probe for continuous level measurement and point level detection in liquids, with analog and switching output. The sensor is delivered without cable glands. It is the customer’s responsibility to seal the two cable entries with approved cable glands.

Rating:

Supply voltage: \( U = 12 \ldots 30 \text{ V DC} \)  \( (U_n = 250 \text{ V AC}) \)

Analog output: \( I = 4 \ldots 20 \text{ mA} \)  \( (U_{in} = 250 \text{ V AC}) \)

Switching output: \( U_s = 0 \ldots U \)  \( (U_{in} = 250 \text{ V AC}) \)

Rated ambient temperature range: \(-40^\circ \text{C} \text{ to } +70^\circ \text{C}\)

The temperature class depends on ambient temperature and application temperature on the sensor. These relations are shown in the following tables:

### CATEGORY 1/2G

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Application temperature</th>
<th>Ambient temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1...T6</td>
<td>-20...+60 °C</td>
<td>-40...+70 °C</td>
</tr>
</tbody>
</table>

### CATEGORY 2G

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Application temperature</th>
<th>Ambient temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-40...+85 °C</td>
<td>-40...+70 °C</td>
</tr>
<tr>
<td>T5</td>
<td>-40...+100 °C</td>
<td>-40...+70 °C</td>
</tr>
<tr>
<td>T4</td>
<td>-40...+135 °C</td>
<td>-40...+70 °C</td>
</tr>
<tr>
<td>T1...T3</td>
<td>-40...+150 °C</td>
<td>-40...+70 °C</td>
</tr>
</tbody>
</table>

### CATEGORY 1/2D and 2D

<table>
<thead>
<tr>
<th>max. surface temperature</th>
<th>+86 °C</th>
<th>-40...+70 °C</th>
</tr>
</thead>
</table>
Test Report

Special conditions for safe use

POWER DOWN WARNING:
Marking and Safety Instruction: After de-energizing, wait 6 minutes before opening

CABLE ENTRIES AND CABLE GLANDS:
Safety Instruction: The housing has two cable entries. For installation in hazardous areas, only cable glands certified according to IEC 60079-1 or certified conduit systems are permitted.

Fundamental essential health and safety requirements
Fulfilled by the standards applied