

NGR / NGM

GUIDED WAVE RADAR LEVEL TRANSMITTERS
with Time Domain Reflectometry



measuring
•
monitoring
•
analyzing



- Operates Independent of Density, Temperature, Pressure, Humidity, or Conductivity
- NGR (for Liquids)
 - Max. Measuring Length: 6.5 ft
 - Max. Temperature: 212 °F
 - Max. Pressure: 145 PSI
 - Output: 4-20 mA / 0-10 V with Switching Output PNP or NPN
- NGM (for Liquids or Solids)
 - Max. Measuring Length: 65.5 ft
 - Temperature Range: -230...480 °F
 - Pressure Range: -14.5...580 PSIG
 - Output: 4-20 mA, HART® and PNP Switching Output



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Model:
NGR
NGM
LIT078

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Guided Wave Radar Level Transmitter Model NGR

NGR Overview

For full product information please visit www.koboldusa.com. The NGR is a level sensor that uses TDR technology (time domain reflectometry) and can be used in oil and water based liquids without calibration. The NGR's guided radar uses time-of-flight technology to measure electromagnetic pulses. The time difference between the sent pulse and the reflected pulse is used to calculate the level, both as a continuous value (analog output) and an adjustable switching point (switching output). With a probe that can be changed or cut in the field, the sensor can be quickly integrated into almost any application. The sensor's intuitive setup uses four buttons and an integral display to ensure quick and easy adaptation to the application.



NGR Technical Data Summary

Media:	Free-flowing liquids
Measurement:	Switch, continuous
Probe Length:	78" standard
Measuring Length:	(4" up to 78" by cutting standard probe or up to 236" with user supplied probe)
Process Pressure:	-14.5 ... 145 PSI
Process Temperature:	-4 ... 212 °F
RoHS Certificate:	Yes
Accuracy of Sensor Element¹⁾:	
	± 0.2 inches
Repeatability:	≤ 0.07 inches
Resolution:	< 0.07 inches
Response Time:	< 400 ms
Dielectric Constant:	
	≥ 5 for single probe ≥ 1.8 with concentric tube
Conductivity:	No limitation

Max. Level Change: ≤ 19.68 in/s

Inactive Area at Probe End¹⁾: 0.4 inches

Inactive Area at Process Connector²⁾: 1 inch

¹⁾ With water under reference conditions

²⁾ With parameterized tank with water under reference conditions, otherwise 40 mm.

Wetted Parts: 316L Stainless Steel, PTFE

Process Connection: ¾" NPT or G¾" A

Housing Material: Plastic PBT

Max. Probe Load: ≤ 6 Nm

Supply Voltage³⁾: 12 V_{DC} ... 30 V_{DC}

Power Consumption: ≤ 100 mA at 24 V_{DC} without output load

Initialization Time: ≤ 2 s

Electrical Connection: M12x1, 5-pin or M12x1, 8-pin

Output Signal³⁾: Analog output 4 mA ... 20 mA / 0 V ... 10 V
1 PNP-transistor output and 1 PNP/NPN-transistor output (user selectable) (Option 2) or 1 PNP-transistor output and 3 PNP/NPN-transistor output (user selectable) (Option 4)

Output Load: 4 mA ... 20 mA < 500 Ω at U_v > 15 V,
4 mA ... 20 mA < 350 Ω at U_v > 12 V,
0 V ... 10 V > 750 Ω at U_v ≥ 14 V

Hysteresis: Min. 0.07 inches, freely adjustable

Signal Voltage HIGH: V_s - 2 V

Signal Voltage LOW: ≤ 2 V

Output Current: < 100 mA

NGR Order Details (Example: NGR-1 2 4 1 N5 B)

Model	Version	Material	Signal Output	Output + Contacts	Connection	Probe Length
NGR-	..1.. = Single Probe (metal tanks DK ≥ 5)	..2.. = Stainless Steel/ PTFE	..4.. = 4-20 mA/ 0-10 V Switchable	..2.. = 1xPNP+1xPNP/NPN ..4.. = 1xPNP+3xPNP/NPN	..N5.. = ¾" NPT Male ..G5.. = G¾" Male	..0 = 78" (Standard)
	..2.. = Concentric (plastic tanks or metal tanks DK ≥ 1.8)					..L = 8"...78" (Please Specify Exact Length) ..B ¹⁾ = Mounted on Bypass

¹⁾ Only possible with NGR-1. For bypass specifications, please see NBK-M datasheet.

Note: Standard probe length <L> is 78". Optional lengths are available from 4" up to 78". Please clearly specify exact length when ordering. Longer lengths are possible, please consult factory.



NGM Overview

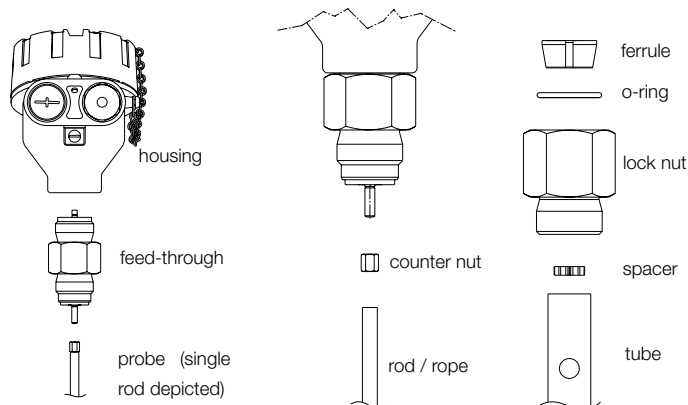
For full product information please visit www.koboldusa.com. NGM uses TDR (Time Domain Reflectometry) technology, which is also known as Guided Microwave or Guided Wave Radar. This means that low-energy and high-frequency electromagnetic impulses, generated by the sensor's circuitry, are propagated along 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 sent and the impulses reflected. The sensor can output the level as 4...20 m analog output, or it can convert the values into freely programmable switching output signal.

Application Areas

The innovative TDR technology enables direct, precise, and highly reliable continuous level measurement as well as point level detection in almost every liquid or light solid application independent of changing process conditions (such as density, conductivity, temperature, pressure or air humidity). The NGM can be mounted in small tanks, tall and narrow nozzles, and it measures precisely even with difficult tank geometries or in proximity to interfering structures. The NGM is also suitable for bypass chambers and stilling wells. It has exceptional performance in media with a low dielectric constant (i.e. low reflectivity) such as oils and hydrocarbons.

Sensor Components

The NGM consists of three major components: housing, feed-through, and probe. The only components that are exposed to the atmosphere inside the tank are the probe and the part of the feed-through below the lock nut. The housing contains the sensor's electronics and input/output terminals and has no contact with the tank atmosphere. The feed-through is mounted into the bottom of the housing and serves two main purposes: its outer threaded metal bushing securely connects the sensor to the tank and its inner components guide the high frequency measurement signal from the electronics through the tank wall into the tank and back. The probe is immersed in the media and propagates the signal. The NGM has a flexible modular concept. Any probe can be used with any housing since they are joined together by one universal feed-through.



Probe Types

- **Single Rod (max. 9.8 ft)**

The single rod probe has a wider detection radius around the rod. They are more responsive to measurement signal disturbances which can be easily overcome by observing a few mounting considerations and making simple configuration adjustments to the sensor. The single rod probe is recommended for liquid applications in bypass chambers and stilling wells.

- **Wire Rope (max. 65.6 ft)**

The wire rope probe is recommended for installation in light solids and liquids in tall tanks where limited headroom is available. It is suitable for a wide range of applications, but the signal has a wider detection radius around the rope, just like single rod probe, and is more responsive to measurement signal disturbances.

- **Concentric (max. 19.5 ft)**

In the concentric probe, the high-frequency measurement signal is completely contained within the outer tube. As a result, the concentric probe is immune to any external conditions and interfering objects outside its tube which would otherwise cause disturbances. This advantage makes the concentric probe the ideal hassle-free solution, ensuring reliable measurement under almost any conditions. The concentrated signal within the tube also makes the concentric probe the ideal choice for measuring low reflectivity liquids (i.e. low dielectric constants) such as oils and hydrocarbons. It is recommended for use with clean liquids only and cannot be used with solids; viscous, crystallizing, adhesive, coating, fibrous, or sticky liquids; sludge, slurry, pulp; or any liquids containing solid particles.

Electrical Connection

The NGM is a 4-wire system with a set of 2 wires for the power supply and a separate set of 2 wires for each output. The electronic is galvanically isolated from the inputs/outputs and the tank potential, thus avoiding problems with electrochemical corrosion protection of the tank. Basic configuration of the device can be done directly via a DIP switch, a single push button and visual feedback from an LED. For even greater convenience, a simple spreadsheet file is provided so that remote configuration and extensive diagnostics may be performed, if desired. To accomplish this, a standard HART® modem is required for communication between computer and sensor (not supplied).



Guided Wave Radar Level Transmitter Model NGM

NGM Technical Data Summary

	Single Rod	Wire Rope	Concentric
Probe Diameter	6 mm	4 mm	17.2 mm
Max. Load	Lateral: 6 Nm = 0.2 kg at 3 m	Tensile: 5 kN	Lateral: 100 Nm = 1.67 kg at 6 m
Probe Length	4" ... 118"	40" ... 787"	4" ... 236" (standard) 4" ... 40" (high temperature)
Dielectric Constant (ϵ_r)	> 1.8	> 1.8	> 1.4
Viscosity (cP)	< 5000	< 5000	< 500
Media Temperature, Standard Version	-40...302 °F (without PTFE) 5...212 °F (PTFE lining)	-40...302 °F	-40...266 °F (EPDM O-ring) 5...302 °F (FKM O-ring)
High Temperature Version	-328...482 °F (NBR O-ring) -238...482 °F (FKM O-ring)	Not available	-328...482 °F (NBR O-ring) -238...482 °F (FKM O-ring)
Materials Exposed to Tank Atmosphere	Standard: 316-Ti Stainless Steel, PEEK PTFE, O-ring (see order code), (PTFE lining) High Temp: 316-Ti Stainless Steel, PEEK, PTFE, O-ring (see order code) In all cases, in addition, a Klinger SIL [®] C-4400 gasket at connection thread, 2 mm thick	316 Stainless Steel, PEEK In addition, a Klinger SIL [®] C-4400 gasket at connection thread, 2 mm thick	Standard: 316 L Stainless Steel, PEEK, O-ring (see order code), High Temp: 316 L Stainless Steel, PEEK, PTFE, O-ring (see order code) In all cases, in addition, a Klinger SIL [®] C-4400 gasket at connection thread, 2 mm thick

Materials

Housing: Aluminum alloy, epoxy coated, with safety chain and tin plated 304 SS external grounding screw
Option: 316 Stainless steel

O-ring: NGM Rod/Rope: None
NGM Concentric: FKM or EPDM
NGM High temperature: NBR or FKM

Weights

Housing inc. Electronics: 1.6 lb

Stainless Steel Housing inc. Electronics: 3.0 lb

Process Connection 3/4": (Rod/Rope): 0.5 lb

Process Connection 3/4": (Concentric) 0.8 lb

1m Rod Probe: 0.5 lb

1m Rope Probe: 0.15 lb + 0.85 lb ballast weight

1m Concentric Probe: 1.2 lb + 0.3 lb (attachment kit)

Cooling Extension for High Temperature: 2.0 lb

Installation Position: Vertical

Ambient Temperature: -10 ... 176 °F

Storage Temperature: -40 ... 185 °F

Max. Pressure: -14.5...580 PSIG (except NGM-19: 0 ... 58 PSIG)

Accuracy*: ±3 mm or 0.03 % of measured distance, whichever is greater

Repeatability*: < 2 mm

Resolution*: < 1 mm

*Reference condition: $\epsilon_r=80$, water, tank ϕ 1 m, DN200 metal flange

Velocity of Level Change: < 1000 mm/s

Media Conductivity: No restrictions

Media Density: No restrictions

Process Connection: Thread or flange, see ordering code

ATEX Certification

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



Guided Wave Radar Level Transmitter Model NGM

Electrical Data

Supply Voltage: 12 ... 30 V_{DC} (reverse-polarity protected < 50 mA), 4-wire system

Output: 4 ... 20 mA (programmable by HART[®] modem)

Total Load: < 500 Ω; HART[®] resistor approx. 250 Ω + load resistance approx. 250 Ω

Response Time: 0.5s [default], 2s, 5s (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

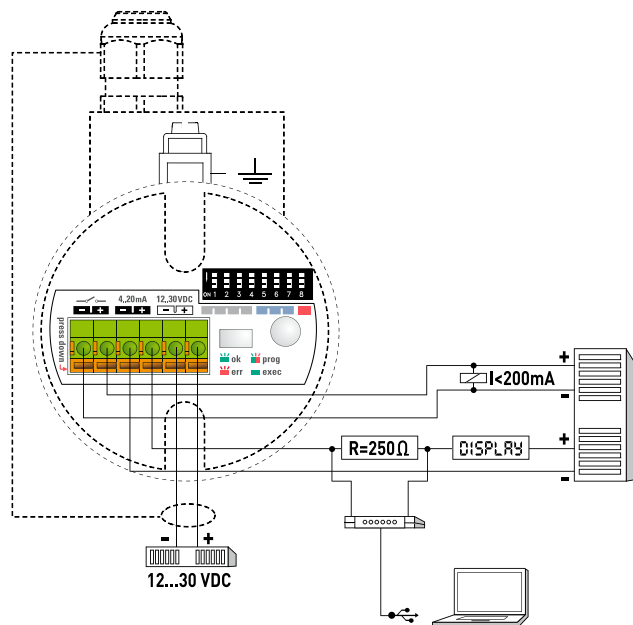
Current Consumption: < 50 mA at 24 V_{DC} (no burden)

Start-up Time: < 6 s

Cable Terminals: Clamp terminal block for cable 0.5 ... 2 mm²

Cable Entry: 2 x M20 x 1.5

Protection: IP 68



Order Details (Example: NGM-1200 N5 A40)

Model	Material (Probe/O-ring)	Connection	Output	Option
NGM-1..	..200.. = Stainless Steel, PEEK/without O-ring ..900.. ⁵⁾ = Stainless Steel, PEEK/FKM PTFE Coating	..N5.. = 3/4" NPT Male ..G5.. = G 3/4 Male ..A8.. = 1 1/2" ASME B16.5 CL150		..0 = Without
NGM-8..	..210.. = Stainless Steel, PEEK/NBR ..220.. = Stainless Steel, PEEK/FKM	..A9.. = 2" ASME B16.5 CL150 ..AB.. = 3" ASME B16.5 CL150	..A4.. = 4 ... 20 mA, PNP	..B ¹⁾ = Mounted on Bypass
NGM-2..	..230.. = Stainless Steel, PEEK/EPDM ..220.. = Stainless Steel, PEEK/FKM	..AC.. = 4" ASME B16.5 CL150 ..F8.. = DN40/ PN40 B1, 316L Flange EN1092-1 ..F9.. = DN50/ PN40 B1, 316L Flange EN1092-1	..E4.. ⁴⁾ = 4 ... 20 mA, PNP, ATEX-version	..S ²⁾ = Mounted on Stilling Well
NGM-9..	..210.. = Stainless Steel, PEEK/NBR ..220.. = Stainless Steel, PEEK/FKM	..FB.. = DN80/ PN0 B1, 316L Flange EN1092-1 ..FC.. = DN100/ PN16 B1, 316L Flange EN1092-1 ..XX.. = Special Design (Please specify in writing)		..K ³⁾ = Assembled with Bypasses with Local Roller/Ball Display
NGM-4..	..200.. = Stainless Steel, PEEK/without O-ring			

¹⁾ Bypass specification, see NBK-M data sheet

²⁾ please specify probe length L and stilling well length (in inches) in clear text while ordering

³⁾ Bypass specification, see NBK data sheet. Maximum measuring length is 18 feet. Not possible with NGM-2, -4, -9. Max. media viscosity of 500 cP.

⁴⁾ not possible with NGM-19..., NGM-8... and NGM-9...

⁵⁾ not possible for flange sizes < DN50/PN40 and < 2 1/2" ASME 150 lbs