

# Guided Wave Radar Level Transmitter



measuring  
•  
monitoring  
•  
analyzing

NGR



- For Liquids
- Operates Independent of Density, Temperature, Pressure, Humidity, and Conductivity
- Standard Probe Length: 6.5 Ft for Monoprobe or Concentric Tube, 13 Ft for Wire Rope Models (Shorter Lengths are Possible)
- Maximum Temperature: 212 °F
- Maximum Pressure: 145 PSI
- Output: 4-20 mA/0-10 V with Switching Output PNP or NPN



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### Description

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.

### Product Features

- No mechanical moving parts
- Length of monoprobe can be shortened, potential lengths from 0.66 feet to 6.56 feet.
- Length of wire rope models can also be shortened, potential lengths from 3.28 feet to 13 feet.
- Immune to deposit formation
- Process temperature to 212 °F
- Process pressures up to 145 PSI
- Small inactive areas, ideal for small containers
- Accurate measurement, even when the type of liquid changes
- 3-in-1: Combined display, analog output (acc. NAMUR NE 43) and switching output
- High enclosure rating of IP67, rotatable housing
- Rugged design increases longevity
- Adaptable design with interchangeable probe types
- Cost savings due to multiple output signals, one system for both level detection and continuous monitoring
- Time and cost savings due to low maintenance and quick installation
- No calibration or recalibration required for installation
- Compact, rotatable housing ensures easy installation
- No interference when several sensors are mounted next to each other
- Advanced technology enables adjustment-free measurement of oil and water-based liquids
- Concentric versions for plastic tanks or  $DK > 1.8$

### Technical Data

<b>Media:</b>	Free-flowing liquids
<b>Measurement:</b>	Continuous, Switch
<b>Standard Probe Length:</b>	78" standard for monoprobe and coaxial tube, 13' for wire probe

<b>Measuring Length:</b>	8" up to 78" by cutting standard probe or up to 157" with user supplied probe for monoprobe, 3.28 feet to 13 feet for wire probe
<b>Process Pressure:</b>	-14.5 ... 145 PSI
<b>Process Temperature:</b>	-4 ... 212 °F
<b>RoHS Certificate:</b>	Yes
<b>Accuracy of Sensor Element<sup>1)</sup>:</b>	±0.2"
<b>Repeatability:</b>	≤0.08"
<b>Resolution:</b>	<0.08"
<b>Response Time:</b>	<400 ms
<b>Dielectric Constant (DK):</b>	≥5 for single probe ≥1.8 with concentric tube
<b>Conductivity:</b>	No limitation
<b>Max. Level Change:</b>	≤19.68 in/s
<b>Inactive Area at Probe End<sup>1)</sup>:</b>	0.4"
<b>Inactive Area at Process Connector<sup>2)</sup>:</b>	1"
<b>Wetted Parts:</b>	316L Stainless Steel, PTFE
<b>Process Connection:</b>	¾" NPT or G¾" A
<b>Housing Material:</b>	Plastic PBT
<b>Max. Probe Load:</b>	≤6 Nm
<b>Supply Voltage<sup>3)</sup>:</b>	12 V <sub>DC</sub> ... 30 V <sub>DC</sub>
<b>Power Consumption:</b>	≤100 mA at 24 V <sub>DC</sub> without output load
<b>Initialization Time:</b>	≤2 s
<b>Electrical Connection:</b>	M12x1, 5-pin or M12x1, 8-pin
<b>Output Signal<sup>3)</sup>:</b>	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)
<b>Output Load:</b>	4 mA ... 20 mA <500 Ω at U <sub>v</sub> > 15 V, 4 mA ... 20 mA <350 Ω at U <sub>v</sub> > 12 V, 0 V ... 10 V >750 Ω at U <sub>v</sub> ≥ 14 V
<b>Hysteresis:</b>	Min. 0.08 inches, freely adjustable

<sup>1)</sup> With water under reference conditions

<sup>2)</sup> With parameterized tank with water under reference conditions, otherwise 40 mm.

<sup>3)</sup> 12 V<sub>DC</sub> ... 30 V<sub>DC</sub>



**Technical Data Continued**

**Signal Voltage HIGH:**  $V_s - 2 V$   
**Signal Voltage LOW:**  $\leq 2 V$   
**Output Current:**  $< 100 \text{ mA}$   
**Inductive Load:**  $< 1 H$   
**Capacitive Load:**  $100 \text{ nF}$   
**Enclosure Rating:** IP67: EN60529  
**Temperature Drift:**  $< 0.1 \text{ mm/K}$

**Lower Signal Level:**  $3.8 \text{ mA} \dots 4 \text{ mA}$   
**Upper Signal Level:**  $20 \text{ mA} \dots 20.5 \text{ mA}$   
**EMC:** EN61326-1:2006, 2004/108/EG  
**Ambient Operating Temperature:**  $-4 \text{ to } 140 \text{ }^\circ\text{F}$   
**Ambient Storage Temperature:**  $-40 \text{ to } 176 \text{ }^\circ\text{F}$

<sup>3)</sup> All connections are polarity protected. All outputs are overload and short-circuit protected.

**Order Details** (Example: **NGR-1 2 4 2 N5 0**)

Model	Version	Material	Signal Output	Output + Switch	Connection	Probe Length
NGR-	..1.. = Single Probe (Metal tanks DK > 5) ..2 <sup>2)</sup> .. = Concentric (Plastic Tanks or Metal Tanks DK > 1.8)	..2.. = Stainless Steel/PTFE	..4.. = 4-20 mA/0-10 V Switchable	..2.. = 1xPNP+1xPNP/NPN ..4.. = 1xPNP+3xPNP/NPN	..N5.. = 3/4" NPT Male ..G5.. = G 3/4 Male	..0 <sup>1)</sup> = 78" (Standard) ..L/00 = Without Probe ..L/XX <sup>3)</sup> = Probe Length xx in (4-digit number 08... 78) ..B <sup>1)</sup> = Mounted on Bypass
	..4.. = Wire Probe	..2.. = Stainless Steel	..4.. = 4-20 mA/0-10 V Switchable	..2.. = 1xPNP+1xPNP/NPN	..N5.. = 3/4" NPT Male ..G5.. = G 3/4 Male	..0 = 13' (Standard) ..L = 3.3'...13' (Please Specify Exact Length)

<sup>1)</sup> Only possible with NGR-1. For bypass specifications, please see NBK-M datasheet  
<sup>2)</sup> Using a coaxial tube improves signal detection, particularly in media with low DK values (e.g. oil)  
<sup>3)</sup> L/78 only available for NGR-2. For NGR-1 and L=78" probe length "0" must be selected.

**Note:** Standard probe length "L" is 78". Optional lengths are available from 8" up to 78". Please specify exact length when ordering.

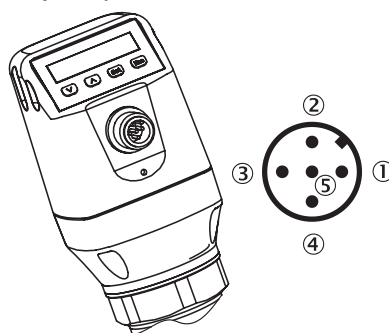
**Plug Connectors and Cables**

Model	Description
807.007	Cable, M12, 5-pin, Straight Connector Female with Molded Cable, 6 Ft, PUR/PVC (Use with Output Type 2)
807.087	Cable, M12, 8-pin, Straight Connector Female with Molded Cable, 6 Ft, PUR/PVC (Use with Output Type: 4)

**Electrical Connections:**

5-pin (w/Output: 2)

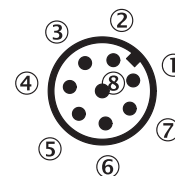
Device View



- 1 L\*: Supply voltage, Brown
- 2 Q<sub>A</sub>: Analog current-/voltage output, White
- 3 M: Ground, reference ground for current-/voltage output, Blue
- 4 Q<sub>1</sub>: Switching output 1, PNP, Black
- 5 Q<sub>2</sub>: Switching output 2, PNP/NPN, Grey

8-pin (w/Output: 4)

Device View

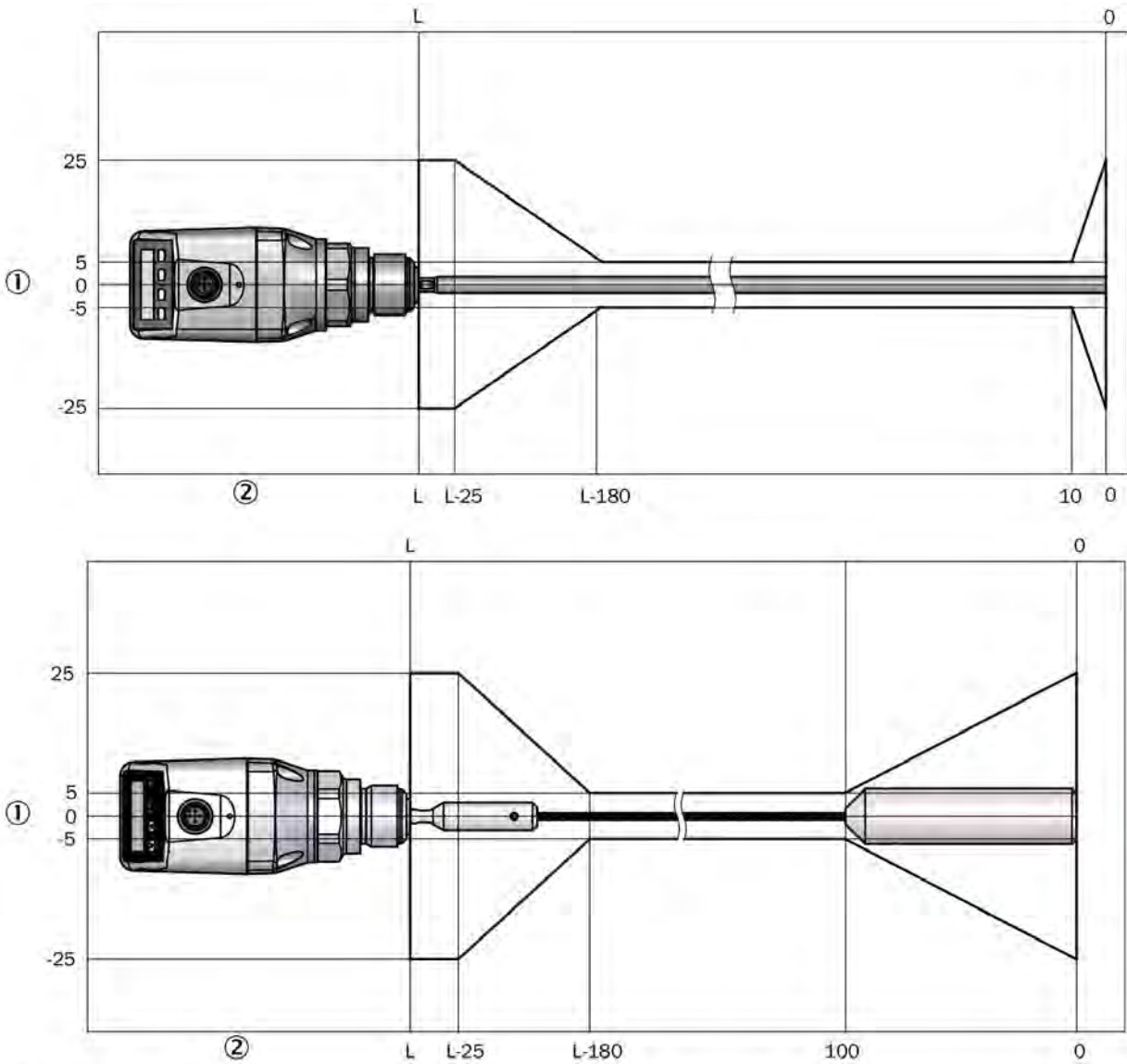


- 1 L\*: Supply voltage, White
- 2 Q<sub>2</sub>: Switching output 2, PNP/NPN, Brown
- 3 M: Ground, reference ground for current-/voltage output, Green
- 4 Q<sub>1</sub>: Switching output 1, PNP, Yellow
- 5 Q<sub>3</sub>: Switching output 3, PNP/NPN, Grey
- 6 Q<sub>4</sub>: Switching output 4, PNP/NPN, Pink
- 7 Q<sub>A</sub>: Analog current-/voltage output, Blue
- 8: No function, Red

Note: The wire colors indicated above apply to the 807.087 8-pin M-12 accessory cable only. As 8-pin cables are not standardized, verify each wire's function if alternate accessory cables are used.

Accuracy Diagrams (mm)

Accuracy Diagram with Parameterized Tank

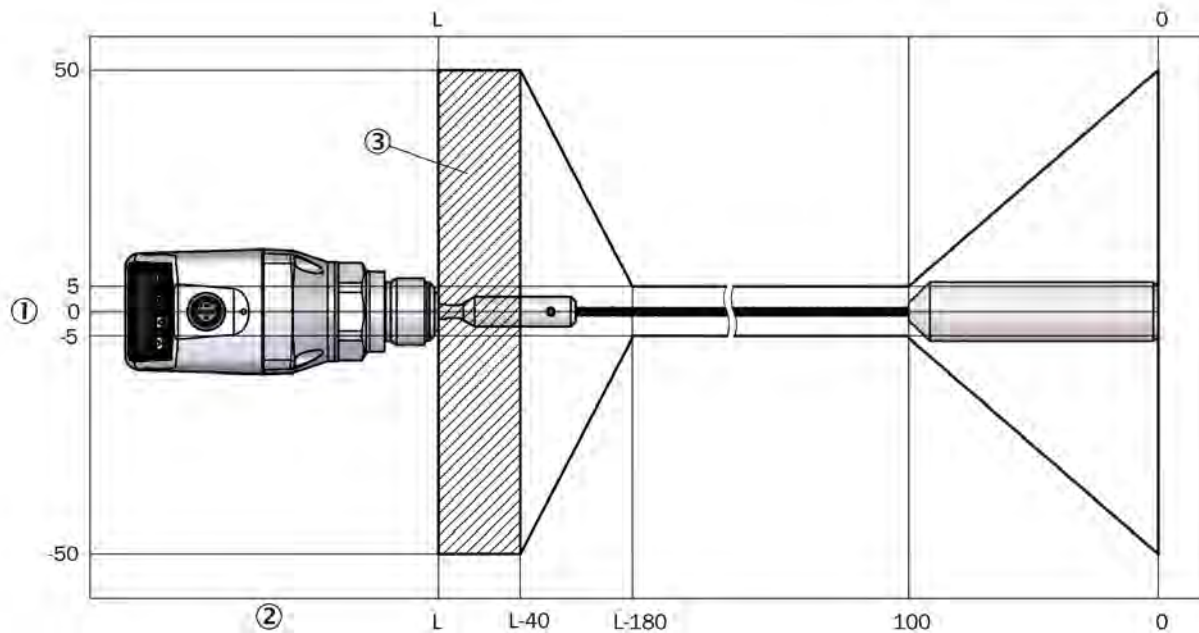
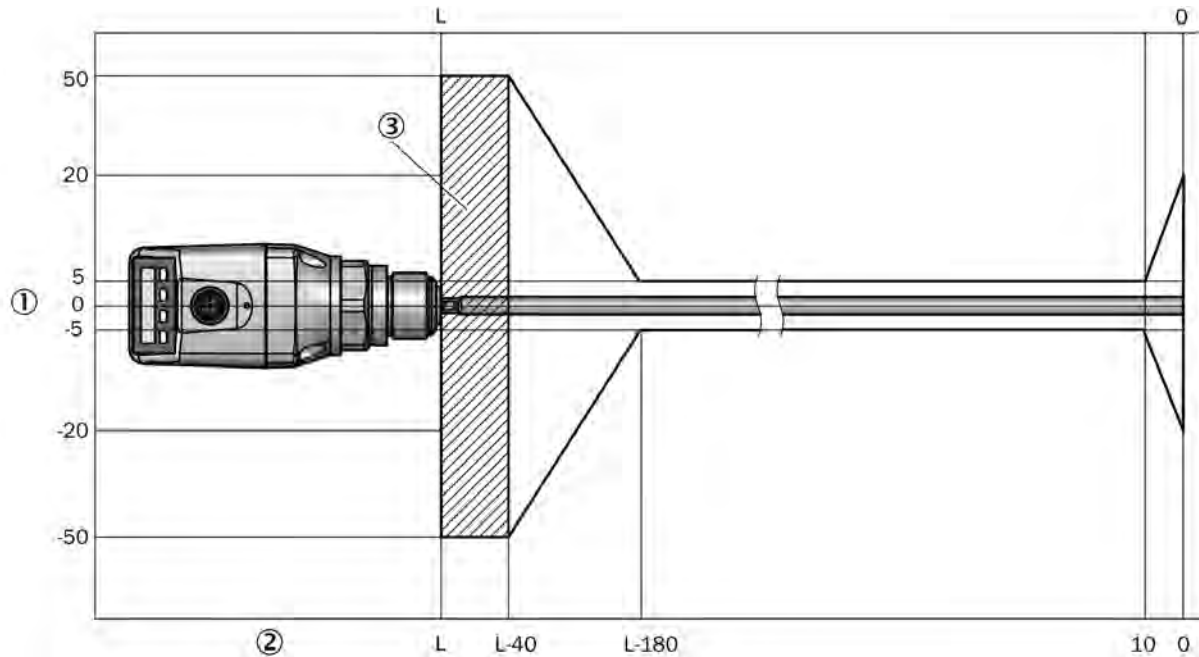


- ① Accuracy in mm
- ② Level in mm

Reference Conditions:

Container with a diameter of 3 Ft.  
 Central installation of the sensor  
 Minimum distance to built-in components > 11.81 inches  
 Distance from the end of probe to tank bottom > 0.59 inches  
 Air humidity: 65% +/- 20%  
 Temperature: 70 °F +/- 9 °F  
 Pressure: 0 PSIG ± 0.3 PSIG  
 Media: water (dielectric constant = 80)

### Accuracy Diagram without Parameterized Tank



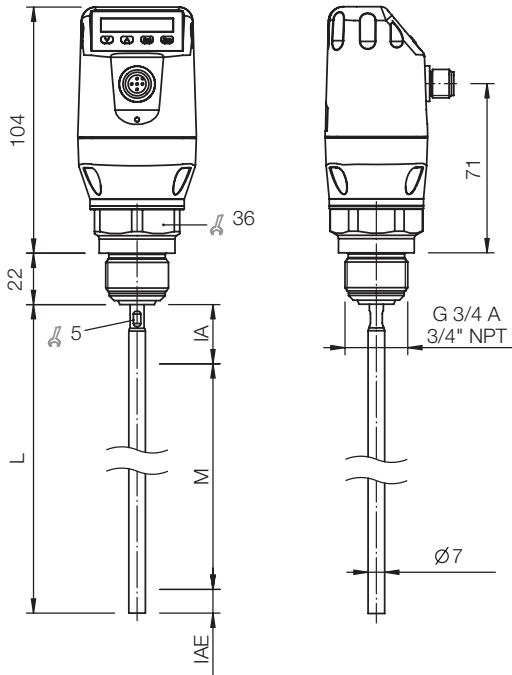
- ① Accuracy in mm
- ② Level in mm
- ③ Inactive Area

#### Reference Conditions:

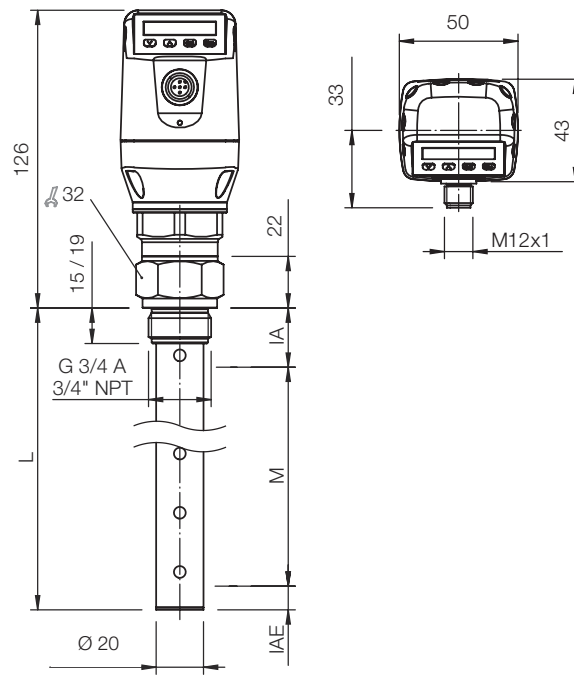
Container with a diameter of 3 Ft.  
 Central installation of the sensor  
 Minimum distance to built-in components > 11.81 inches  
 Distance from the end of probe to tank bottom > 0.59 inches  
 Air humidity: 65% +/- 20%  
 Temperature: 70 °F +/- 9 °F  
 Pressure: 0 PSIG ± 0.3 PSIG  
 Media: water (dielectric constant = 80)

Dimensions (mm)

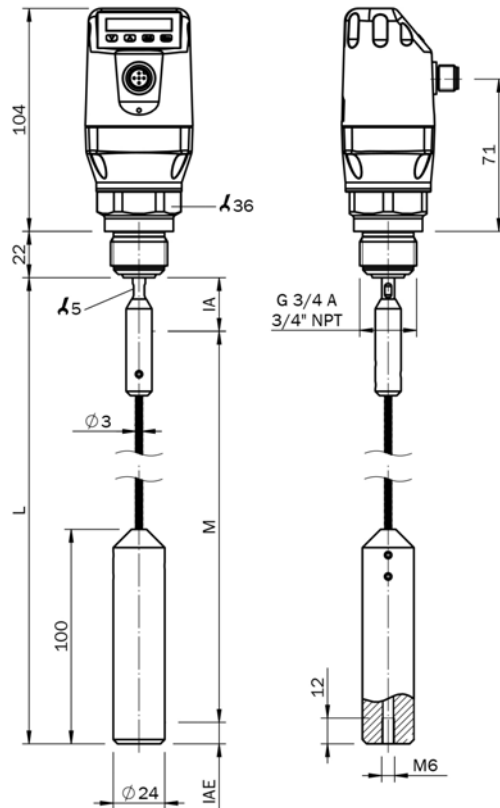
Single Probe



with Concentric Tube



Wire Probe



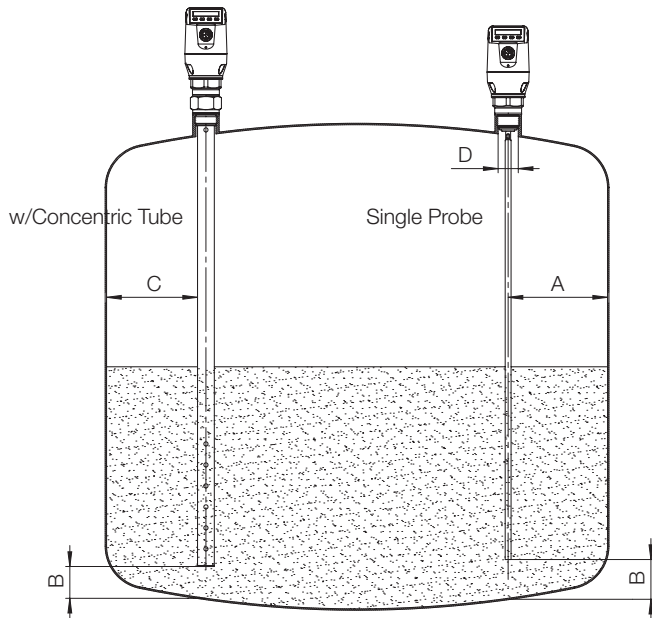
M: Measuring Range

L: Probe Length

IA: Inactive area at process connection: 1 inch

IAE: Inactive area at probe end: 0.4 inches

### Installation in a Tank



#### Installation Requirements:

Unit with single probe mounted in a metal tank

Installation within a nozzle:

$D \geq 1"$

Distance from tank wall/tank bottom:

$A \geq 2"$

$B \geq 0.4"$

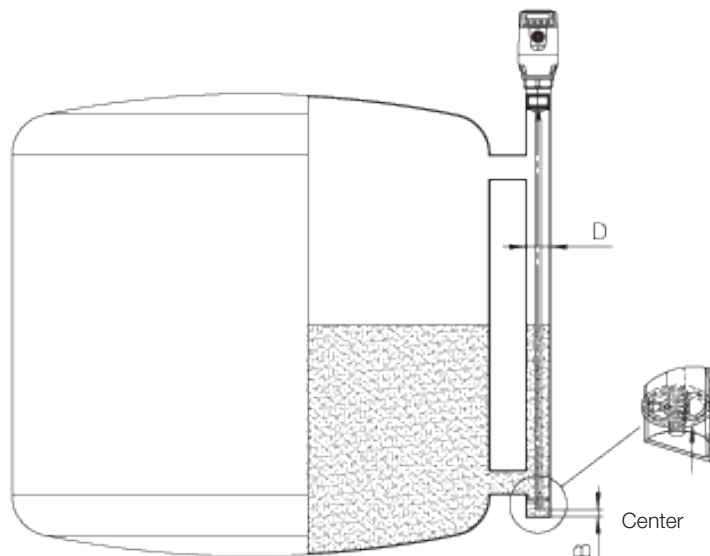
Distance to other tank fittings:

$\geq 4"$

Unit with concentric tube is suitable for use in both metallic and non-metallic tanks

C = with a concentric tube, there are no minimum distances to the tank wall or to other tank fittings required

### Installation of a Single Probe within a Metal Immersion Tube or Metal Bypass



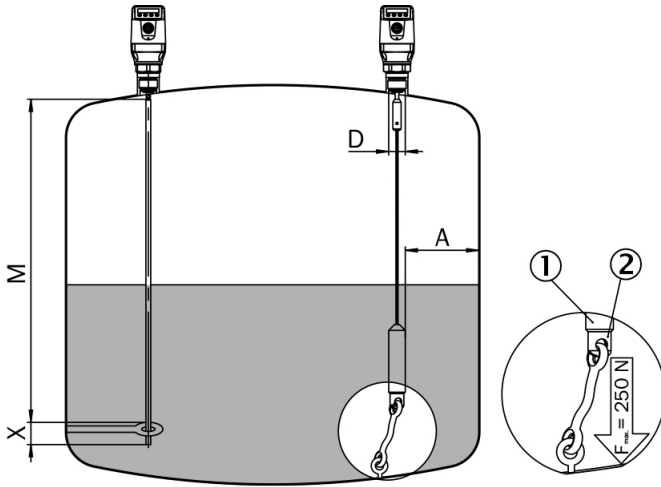
$D \geq 1.5"$

Distance tank wall/tank bottom:

$B \geq 0.4"$

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

### Installation of a Wire Probe within a Metal Container



- ① Roper Weight
- ② Bracket Rop Tension

Installation within a nozzle:

$D \geq 1''$

Distance from tank wall/tank bottom:

$A \geq 2''$

Distance to other tank fittings:

$\geq 4''$

Mounting of Monoprobe

M = Measuring range

X = No measurement is possible in this area

Container welding seams may affect the measurement accuracy.