

RLI-G Guided Wave Radar Level Sensors

Level Sensors for Liquids

- ▶ Measuring Range up to 24m (80 feet)
- ▶ Accuracy: $\pm 5\text{mm}$ (0.2 inch)
- ▶ Measurement is Independent of Temperature, Pressure and Density Variations
- ▶ Rod, Cable and Coaxial Probes
- ▶ Minimum Dielectric Constant (ϵ_r) ≥ 1.4
- ▶ Removable Graphic Display
- ▶ 4-20 mA + HART Output
- ▶ Temperature Range: -22°F to $+194^\circ\text{F}$ (-30°C to $+90^\circ\text{C}$)
- ▶ Pressure, Max.: 580 psig (40 bar)
- ▶ IP67 Protection

The RLI-G Guided Wave Radar level transmitter is designed for continuous level measuring of conductive or non-conductive liquids, pulps and slurries. RLI-G level sensors operate on the well-known TDR (Time Domain Reflectometry) principle. Micropulses are sent along a probe guide at the speed of light. As soon as the impulse reaches the surface of the media, it is reflected back to the electronic module. Level distance is directly proportional to the flight time of the impulse. The reflected signal is dependent on the dielectric constant (ϵ_r) of the media, the feasibility of the measurement is $\epsilon_r \geq 1.4$. Our TDR technology is unaffected by the properties of the media as well as that of the space above it. Measurement is also unaffected by the change in the physical properties of the materials such as temperature or pressure.

Specifications

| | |
|---|--|
| Measured Values | Distance, level, volume (volume is calculated) |
| Measuring Range | Depends on the probe type and dielectric constant (ϵ_r) of the measured media |
| Probe Types | Mono cable, twin cable, mono rod, twin rod, coaxial pipe and segmented rod |
| Accuracy | |
| Linearity Error¹ | $\pm 5\text{mm}$ (0.2 inch), if probe length $\geq 10\text{ m}$ (32 feet): $\pm 0.05\%$ of the probe length |
| Resolution | $\pm 3\ \mu\text{A}$ |
| Minimal ϵ_r of the Media | 1.4 (some probe types require higher values) |
| Power Supply | 18 V - 35 V DC |
| Output | |
| Digital Communication | 4-20 mA + HART |
| Display | GMD-100 graphic display unit |
| Media Temperature | -22°F to $+194^\circ\text{F}$ (-30°C to $+90^\circ\text{C}$) |
| Media Pressure, Max. | |
| Coaxial Probes | 232 psig (16 bar/ 1.6 MPa) |
| Cable and Rod Probes | 580 psig (40 bar/ 4 MPa) |
| Ingress Protection | IP67 |
| Electrical Connection | 2x 1/2" NPT and 2x M20 x1.5 Internal Threads |
| Electrical Protection | Class III |
| Housing Material | Paint coated aluminium |
| Sealing | FPM, contact Gems for other options |
| Weight (Housing Unit) | 4.4 lb (2 kg) |
| Ambient Temperature | -22°F to $+140^\circ\text{F}$ (-30°C to $+60^\circ\text{C}$), with display: -4°F to $+140^\circ\text{F}$ (-20°C to $+60^\circ\text{C}$) |

Note:

1. Under reference conditions and stabilized temperature.



Applications

Mono cable / Mono rod / Mono segmented rod

- All high-viscosity liquids
- Clean and contaminated liquids
- For stilling wells (calibration required)
- Conductive foams
- High temperature applications
- Bypass and stilling well applications

Twin cable

- Works with water, solvents, oils or fuels
- Medias with low dielectric constant ($\epsilon_r > 1.8$)
- Narrow tanks or restricted spaces
- Where minimum dead-zone is needed
- Mounting close to tank wall

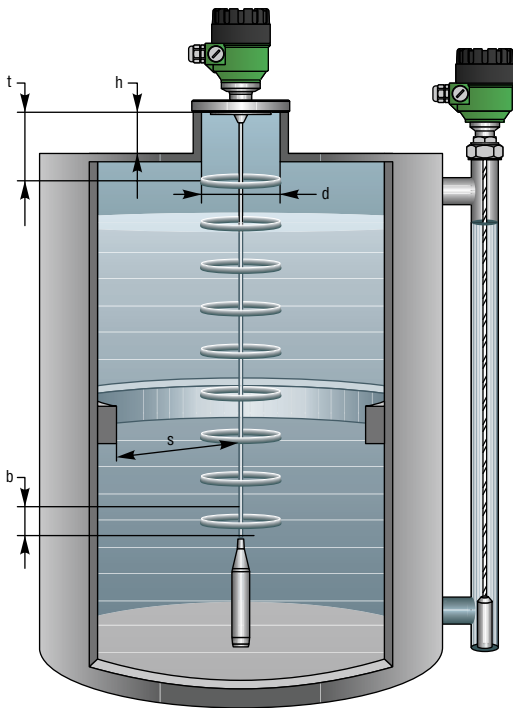
Twin rod

- Coated tanks
- Contaminated liquids
- Where minimum dead-zone is needed
- Narrow tanks or restricted spaces
- Slurries, Pulp

Coaxial pipe

- Small vessels or tanks with max. 6m (20 feet) height
- Solvents, LPG, LNG
- Clean liquids with low dielectric constant
- Agitated or flowing liquids
- Contact possible with metallic object or tank wall
- Where no dead-zone allowed

Installation & Ordering Guidance



Critical Dimensions

s = Minimum distance from the internal disturbing objects. Objects that are parallel to probe do not disturb the measurement.

| Probe Type | S Dim |
|----------------|-------------------|
| Mono | > 300mm (12 inch) |
| Twin | > 100mm (4 inch) |
| Coaxial | 0 |

$h \leq d$

t = Upper dead-zone

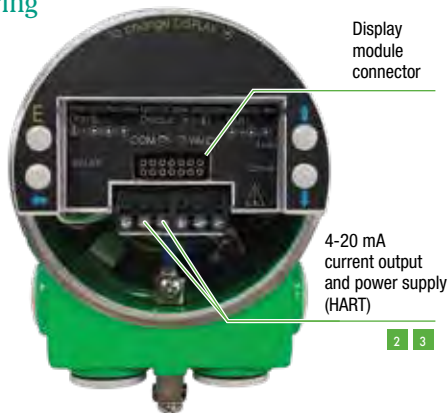
b = Lower dead-zone

Dead-zone

The unmeasurable upper and lower part of the tank, the lower dead-zone is extended with the length of the counterweight (cable versions only)

| Probe Type | $\epsilon_r = 80$ | | $\epsilon_r = 2.4$ | |
|---------------------------------|--------------------|---------------------|--------------------|-------------------|
| | Upper (t) | Lower (b) | Upper (t) | Lower (b) |
| 4mm Cable | 300mm (12 inch) | 20mm (0.75 inch) | 400mm (16 inch) | 100mm (4 inch) |
| 8mm Cable | | | | |
| 8mm Rod | | | | |
| 14mm Rod / Segmented Rod | 150mm (6 inch) | 20mm (0.75 inch) | 300mm (12 inch) | 100mm (4 inch) |
| 4mm Twin Cable | | | | |
| 8mm Twin Rod | 0mm (0 inch) | 10mm (0.4 inch) | 0mm (0 inch) | 100mm (4 inch) |
| Coaxial | | | | |

Wiring



Note: Consult Instruction Bulletin for proper wiring procedure.

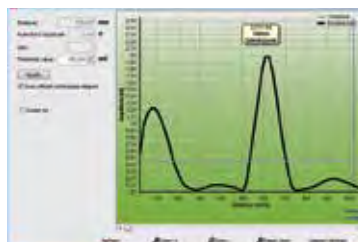
Setup and Programming

GMD-100 display unit



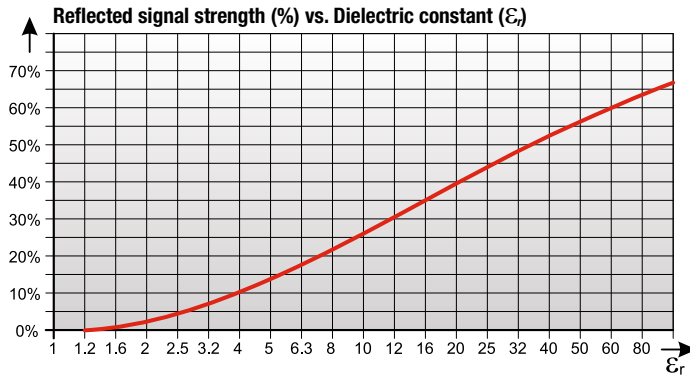
With the help of the GMD-100 plug-in display a simplified programming can be accomplished which covers most of the applications. The basic parameters of measurement and output can be set using the text-based menu system of the GMD-100. The large LCD display shows the measured values in numerical and bar graph form.

GemsView software



The GemsView configuration software can be downloaded free of charge. All user-modifiable parameters of the RLI-G can be set and all values can be queried through GemsView. Other features are: continuous "echo-map" reading, trend monitoring, data logging, data saving.

The measurability of the media and the reflected signal strength depends on the relative dielectric constant of the media.



| Informative ϵ_r values | | | |
|---------------------------------|-----------|-----------------|-----------|
| Butane | 1.4 | Grain | 3 - 5 |
| Cement | 1.5 - 10 | Edible oil | 3.9 |
| LPG | 1.6 - 1.9 | Limestone | 6.1 - 9.1 |
| Kerosene | 1.8 - 2.1 | Acetone | 21 |
| Crude oil | 2.1 | Ethanol | 24 |
| Diesel oil | | Methanol | 33.1 |
| Benzene | 2.3 | Glycol | 37 |
| Asphalt | 2.6 | Nitrobenzene | 40 |
| Clinker | 2.7 | Water | 80 |
| Resin | 2.4 - 3.6 | Sulphuric acid* | |

* (T = 20°C)

Technical Data

| Probe Type | 4mm Cable | 8mm Cable | 4mm Twin Cable | Coaxial ⁵ | 14mm Rod / Segmented Rod | 8mm Rod | 8mm Twin Rod |
|---|---|---|---|---|---|---|---|
| Dimensions (mm) | | | | | | | |
| Measuring Distance, Max. | 24m (80 feet) | | | 6m (20 feet) | | 3m (10 feet) | |
| Media ϵ_r, Min. | 2.1 | | 1.8 | 1.4 | 2.1 | 2.1 | 1.8 |
| Measuring Distance, Min. ($\epsilon_r = 80 / \epsilon_r = 2.4$) | 0.3m / 0.4m (1 foot / 1.3 feet) | | 0.15m / 0.3m (0.5 feet / 1 feet) | 0m (0 feet) | 0.3m / 0.4m (1 foot / 1.3 feet) | 0.3m / 0.4m (1 foot / 1.3 feet) | 0.15m / 0.3m (0.5 feet / 1 feet) |
| Sensing space around the probe¹ | Ø 600mm (2 feet) | | Ø 200mm (0.65 feet) | 0 mm (0 feet) | Ø 600mm (2 feet) | Ø 600mm (2 feet) | Ø 200mm (0.65 feet) |
| Probe material | 316 SS | | 316 SS | 316 SS (Ti) | 316 SS (Ti) | 316 SS (Ti) | 316 SS (Ti) |
| Probe Ø, nominal | 4mm (0.15 inch) | 8mm (0.3 inch) | 4mm (0.15 inch) | 28mm (1.1 inch) | 14mm (0.55 inch) | 8mm (0.3 inch) | 8mm (0.3 inch) |
| Separator material² | — | | PFA, welded on the cable | PTFE | — | | PTFE-GF25 |
| Available Process Connections^{3,4} | 1" BSP, 1" NPT, 1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI | 1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI | 1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI | 1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI | 1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI | 1" BSP, 1" NPT, 3" 150# ANSI, 4" 150# ANSI | 1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI |

Notes:

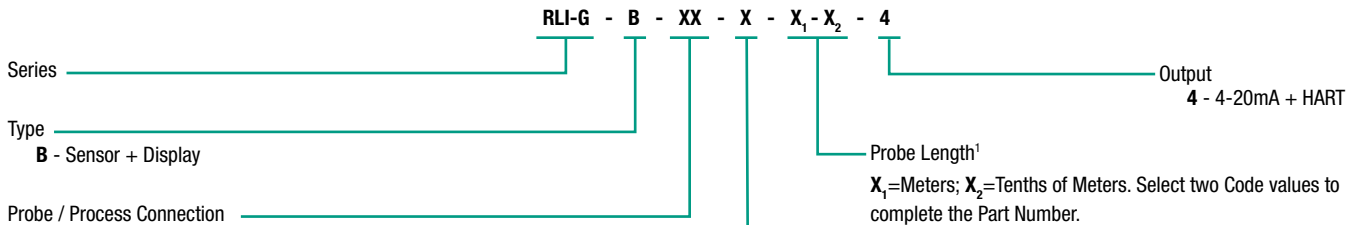
- For reduction of required sensing space, contact Gems Sensors about stilling well options.
- There is no separator below 1.5m (5 feet) length
- Except the coax types, probes can be removed from the head unit by the user.
- ANSI Flange connection will have head assembly threaded into flange based on probe selection.
- Coaxial types are segmented for lengths greater than 1.0m length

How to Order (not all combinations available)

Application Environmental Conditions: This information is essential to the accuracy and proper operation of your Gems configurable sensors. Please have this information readily available when you contact a Gems representative for ordering.

- 1. **Liquid Media:** _____
- 2. **Pressure:** Minimum _____ psig Maximum _____ psig
- 3. **Temperature:** Minimum _____ °F Maximum _____ °F
- 4. **Media Dielectric:** _____
- 5. **Tank:** Material _____ Depth _____
- 6. **Application Location:** Indoors Outdoors

Part Number Specification: Use the **bold** characters from the chart below to construct a product code.



- 8mm Rod**
- R** - 1" BSP
 - P** - 1" NPT
 - AC** - 3" 150# ANSI¹
 - AD** - 4" 150# ANSI¹
- 4mm Cable**
- K** - 1" BSP
 - L** - 1" NPT
 - V** - 1-1/2" BSP
 - W** - 1-1/2" NPT
 - AG** - 3" 150# ANSI
 - AH** - 4" 150# ANSI

- 14mm Segmented Rod**
- S** - 1-1/2" BSP
 - Z** - 1-1/2" NPT
 - AC** - 3" 150# ANSI¹
 - AD** - 4" 150# ANSI¹
- 8mm Cable**
- N** - 1-1/2" BSP
 - J** - 1-1/2" NPT
 - AJ** - 3" 150# ANSI
 - AK** - 4" 150# ANSI

- 8mm Twin Rod**
- D** - 1-1/2" BSP
 - E** - 1-1/2" NPT
 - AE** - 3" 150# ANSI
 - AF** - 4" 150# ANSI
- 4mm Twin Cable**
- T** - 1-1/2" BSP
 - U** - 1-1/2" NPT
 - AL** - 3" 150# ANSI
 - AM** - 4" 150# ANSI

- Coaxial²**
- For Lengths ≤1.0m
- C** - 1-1/2" BSP
 - H** - 1-1/2" NPT
 - AA** - 3" 150# ANSI
 - AB** - 4" 150# ANSI
- For Lengths >1.0m
- CS** - 1-1/2" BSP
 - HS** - 1-1/2" NPT
 - AAS** - 3" 150# ANSI
 - ABS** - 3" 150# ANSI

Coaxial, Rod, Segmented Rod, and Twin Rod Probes:

| X ₁ | | X ₂ | |
|----------------|----------|----------------|----------|
| Length | Code | Length | Code |
| 0m | 0 | 0m | 0 |
| 1m | 1 | 0.1m | 1 |
| 2m | 2 | 0.2m | 2 |
| 3m | 3 | 0.3m | 3 |
| 4m | 4 | 0.4m | 4 |
| 5m | 5 | 0.5m | 5 |
| 6m | 6 | 0.6m | 6 |
| | | 0.7m | 7 |
| | | 0.8m | 8 |
| | | 0.9m | 9 |

Mono and Twin Cable Probes:

| X ₁ | | X ₂ | |
|----------------|----------|----------------|----------|
| Length | Code | Length | Code |
| 0m | 0 | 0m | 0 |
| 10m | 1 | 1m | 1 |
| 20m | 2 | 2m | 2 |
| | | 3m | 3 |
| | | 4m | 4 |
| | | 5m | 5 |
| | | 6m | 6 |
| | | 7m | 7 |
| | | 8m | 8 |
| | | 9m | 9 |

Accessories

| Accessories | Order Code |
|--|----------------|
| Plug-in graphic display module | GMD-100 |
| GemsView configuration software for remote programming with PC | FREE download! |
| HART-USB modem for remote programming with PC ¹ | DPC-55 |

Note:
 1. HART-USB programming assembly comes with an integrated 24V 250 Ohm resistor.

Ordering Notes:

1. **Rod and Segmented Rod Probes Using Codes AC or AD:**
 - a) 8mm Rods may not exceed 3m.
 - b) 14mm Segmented Rods may not exceed 6m.
 - c) Both 8mm and 14mm Rod Types share Process Connection Codes **AC** and **AD** (ANSI flanges).
 - d) Unless otherwise specified at time of order, Lengths ≤3m will be supplied with 8mm Rods. Lengths >3m will be supplied with 14mm Segmented Rods.
 - e) If you prefer to have 14mm Segmented Rods used for Length <3m, please alert your Sales Representative, or include a note with your order.
2. Coaxial types greater than 1m length are segmented. For lengths ≤1m, product is 1-piece construction.
3. For Coated Probe option, contact Gems Sensors.
4. For Stilling Well options, contact Gems Sensors.