Continuous level measurement - Radar transmitters

Riels LR250 is a 2-wire, 25 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage and process vessels including high temperature and pressure, to a range of 20 m (66 ft).

Benefits

- Graphical local user interface (LUI) makes operation simple with plug-and-play setup using the intuitive Quick Start Wizard
- LUI displays echo profiles for diagnostic support
- 25 GHz high frequency allows for small antennas for easy mounting in nozzles
- Insensitive to mounting location and obstructions, and less sensitive to nozzle interference
- Short blanking distance for improved minimum measuring range to 50 mm (2") from the end of the antenna
- Communication using HART® or PROFIBUS PA, or FOUNDATION Fieldbus™
- Process Intelligence signal processing for improved measurement reliability and Auto False-Echo Suppression of fixed obstructions
- Programming using infrared Intrinsically Safe handheld programmer or over a network using SIMATIC PDM, Emerson AMS, or Field Device Tools, such as PACTware or Fieldcare via DTM
- Suitable for use in safety related systems in accordance with IEC 61508/61511 (SIL-2)

Key Applications:
- liquid bulk storage tanks, process vessels with agitators, vaporous liquids, high temperatures, low dielectric media

Application

Riels LR250 includes a graphical local user interface (LUI) that improves setup and operation by including an intuitive Quick Start Wizard, and echo profile displays for diagnostic support. Startup is easy using the Quick Start wizard with a few parameters required for basic operation.

The 25 GHz frequency creates a narrow, focused beam allowing for smaller antenna options and decreasing sensitivity to obstructions.

Riels LR250’s unique design allows safe and simple programming using the Intrinsically Safe handheld programmer without saving to open the instrument’s lid.

Riels LR250 measures superbly on low dielectric media, and in small vessels, as well as tall and narrow vessels.

Configuration

Installation

Note:
- Beam angle is the width of the cone where the energy density is half of the peak energy density.
- The peak energy density is directly in front of and in line with the horn antenna.
- There is a signal transmitted outside of the beam angle; therefore false targets may be detected.
Technical specifications

Mode of operation
- Measuring principle: Radar level measurement
- Frequency: K-band (25.0 GHz)
- Minimum measuring range: 50 mm (2") from end of antenna
- Maximum measuring range: 20 m (65 ft), antenna dependent

Output
- HART®: Version 5.1
  - Analog output: 4 to 20 mA
  - Accuracy: ± 0.02 mA
  - Fail-safe:
    - Programmable as high or low or hold (loss of echo)
    - NE 43 programmable
- PROFIBUS PA: Profile 3.1
  - Function block: 2 Analog Input (AI)
- FOUNDATION Fieldbus™: H1
  - Functionality: Basic or LAS
  - Version: I/TK 5.2.0
  - Function blocks: 2 Analog Input (AI)

Performance (according to reference conditions IEC60770-1)
- Maximum measured error: 5 mm (0.2")
- Influence of ambient temperature: <0.003 %/K

Rated operating conditions
- Installation conditions
  - Location: Indoor/outdoor
- Ambient conditions (enclosure):
  - Ambient temperature: -40 to +80 °C (-40 to +176 °F)
  - Installation category: I
  - Pollution degree: 4

Medium conditions
- Dielectric constant ε_r: > 1.6, antenna and application dependent
- Process temperature:
  - -40 to +200 °C (-40 to +392 °F) (at process connection with FKM o-ring);
  - -20 to +200 °C (-4 to +392 °F) (at process connection with FFKM o-ring)
- Process pressure: Up to 40 bar g (580 psi g), process connection and temperature dependent.
See Pressure/Temperature curves for more information

Power supply
4 to 20 mA/HART: Nominal 24 V DC (max. 30 V DC) with max. 550 Ω

PROFIBUS PA:
- 15 mA
- per IEC 61158-2

FOUNDATION Fieldbus:
- 20.0 mA
- per IEC 61158-2

Certificates and approvals
- General: CSA, CE, FM, NE 21, C-TICK, KC
- Radio: FCC, Industry Canada and Europe ETSI EN 302-372, C-TICK
- Hazardous:
  - Intrinsically Safe (Europe):
    - ATEX II 1G Ex ia IIC T4
    - ATEX II 1D Ex e Td A20 IP67 T90°C
  - Intrinsically Safe (China):
    - NEPS Ex ia IIC T4/DIP A20 TA T90°C IP67
  - Non-sparking/Energy Limited (Europe):
    - ATEX II 3G Ex nA/nL IIC T4
  - Non-sparking/Energy Limited (China):
    - NEPS Ex nA/nL IIC T4
  - Intrinsically Safe (Canada/USA):
    - CSA/FM Class I, Div. I, Groups A, B, C, D; Class II, Div. I, Groups E, F, G; Class III T4
  - Non-incendive (Canada/USA):
    - CSA/FM Class I, Div. 2, Groups A, B, C, D T5
  - Intrinsically Safe (International):
    - IECEx Ex ia IIC T4, Ex tD A20 IP67 T90°C
  - Intrinsically Safe (Brazil):
    - INMETRO Br-Ex ia IIC T4
  - Flame Proof (International/Europe):
    - IECEx/ATEX II 1/2 GD, 1D, 2D, Ex dbia IIC T4 Ga/Gb, Ex tD A20 IP67 T90°C
  - Explosion Proof (Brazil): INMETRO Br-Ex dbia IIC T4
  - Increased Safety (International/Europe):
    - IECEx/ATEX II 1/2 GD, 1D, 2D, Ex dbia IIC T4 Ga/Gb, Ex tD A20 IP67 T90°C
  - Increased Safety (Brazil): INMETRO Br-Ex dbia IIC T4
  - Explosion Proof (Canada/USA):
    - CSA/FM Class I, Div. 1, Groups A, B, C, D; Class II, Div. I, Groups E, F, G; Class III T4
  - Increased Safety/Flameproof (China):
    - Ex dbia IIC T4/ Ex dbia IIC T4/ DIP A20 TA, T90°C IP67
  - Marine:
    - Lloyd’s Register of Shipping
  - ABS Type Approval
  - Bureau Veritas
  - Functional Safety:
    - SIL-2 suitable in accordance with IEC 61508/61511

Programming
- Intrinsically Safe hand held programmer: Infrared receiver
- Approvals for handheld programmer: IS model:
  - ATEX II 1 GD Ex ia IIC T4 Ga
  - Ex ia D 20 T135°C Td = -20 to +50 °C
  - Ta = +50 °C
  - IECEx SR 09.0073
- Handheld communicator: HART communicator 375/475
- PC
- SIMATIC PDM
- Emerson AMS
- DTM (for connection into FDT, such as PACTware or Fieldcare)
- Display (local): Graphic local user interface including quick start wizard and echo profile displays
### Design
- **Enclosure**
  - Material: Aluminium, polyester powdercoated
  - Cable inlet: 2 x M20x1.5 or 2 x ½" NPT
- **Degree of protection**: Type 4X/NEMA 4X, Type 6/NEMA 6, IP67, IP68
- **Weight**: < 3 kg (6.6 lbs) 3.75 mm (1½") threaded connection with 1½" horn antenna
- **Display (local)**: Graphic local user interface including quick start wizard and echo profile display
- **Antenna**
  - Material: 316L stainless steel [optional alloy N06022/2.4602 (Hastelloy® C-22® or equivalent)]
  - Dimensions (nominal horn sizes): Standard 1.5" (40 mm), 2" (48 mm), 3" (75 mm), 4" (95 mm) horn and optional 100 mm (4") horn extension

### Riels LR250 Ambient/process flange surface temperature curve

### Schematics

### Characteristic curves

### Notes:
1. DC terminal shall be supplied from a source providing electrical isolation between the input and output, to meet the applicable safety requirements of IEC 61010-1.
2. All field wiring must have insulation suitable for rated input voltages.
3. Use shielded twisted pair cable (14 to 22 AWG) for HART version.
4. Separate cables and conduit may be required to conform to standard instrumentation wiring practices or electrical codes.
### Dimensional Drawings

#### Flanged

![Flanged dimensional drawing](image1)

#### Threaded

![Threaded dimensional drawing](image2)

Riels LR250, dimensions in mm (inch)

<table>
<thead>
<tr>
<th>Nominal Horn Size</th>
<th>Horn O.D.</th>
<th>Horn Height</th>
<th>Beam Angle</th>
<th>Measurement Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 (1.5)</td>
<td>39.8 (1.57)</td>
<td>A</td>
<td>135 (5.3)</td>
<td>19 degrees</td>
</tr>
<tr>
<td>50 (2)</td>
<td>47.8 (1.88)</td>
<td>B</td>
<td>166 (6.55)</td>
<td>15 degrees</td>
</tr>
<tr>
<td>80 (3)</td>
<td>74.8 (2.94)</td>
<td>C</td>
<td>199 (7.85)</td>
<td>10 degrees</td>
</tr>
<tr>
<td>100 (4)</td>
<td>94.8 (3.73)</td>
<td>D</td>
<td>254 (10)</td>
<td>8 degrees</td>
</tr>
</tbody>
</table>

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