Level Measurement
Continuous level measurement — Radar transmitters

SITRANS LR250 Flanged Encapsulated Antenna

Overview

SITRANS LR250 with flanged encapsulated antenna is a 2-wire, 25 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage and process vessels including corrosives or aggressive materials, to a range of 20 m (66 ft) (antenna dependent).

Benefits

- Fully encapsulated horn antenna design with FDA approved TFM 1600 PTFE lens for use in chemical and sanitary environments where aggressive and corrosive materials are used
- Cost effective replacement for transmitters made of exotic materials
- 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 and 2 inch (50 mm) process connection/antenna allow for easy mounting
- Insensitive to mounting location and obstructions, and less sensitive to nozzle interference
- Short blanking distance for improved minimum measuring range to 50 mm (2 inch) from the end of the antenna
- Communication using HART, PROFIBUS PA, or FOUNDATION Fieldbus
- Process Intelligence signal processing for improved measurement reliability and Auto False-Echo Suppression of fixed obstructions
- Programming using infrared Instrinsically Safe handheld programmer or over a network using SIMATIC PDM, Emerson AMS, or Field Device Tools, such as PACTware or Fieldcare via SITRANS DTM
- Functional Safety (SIL 2). Device suitable for use in accordance with IEC 61508 and IEC 61511

Application

SITRANS 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 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.

SITRANS LR250's unique design allows safe and simple programming using the Instrinsically Safe handheld programmer without having to open the instrument's lid.

SITRANS LR250 measures superbly in small vessels and in tanks/vessels up to 20 m (66 ft) on materials with dk > 1.6.

Key Applications:
- liquid bulk storage tanks, process vessels with agitators, vaporous liquids, temperatures to 170 °C (338 °F), corrosive and aggressive materials and applications where ease of cleaning is required, such as food or fine chemicals.

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 antenna.
- There is a signal transmitted outside of the beam angle; therefore false targets may be detected.

Mounting unit on bypass
- Orient front or back of device toward stillpipe slots.

Mounting unit on stilling well
- Orient front or back of device toward vent.

Mounting unit on vessel
- Orient front or back of device toward stillpipe slots.

Mounting on a nozzle
- Min. 50 (2)
- Max. 500 (20)

SITRANS LR250 flanged encapsulated antenna installation, dimensions in mm (inch)
## Technical specifications

### Mode of operation
- **Measuring principle:** Radar level measurement
- **Frequency:** K-band (25.0 GHz)
- **Minimum measuring range:** 50 mm (2 inch) from end of antenna
- **Maximum measuring range:** 20 m (66 ft)

### Output
- **HART:** Version 5.1
  - **Analog output:** 4 ... 20 mA
  - **Accuracy:** ± 0.02 mA
  - **Fail-safe:** Programmable as high low or hold (loss of echo)
  - **NE 43 programmable**
- **PROFIBUS PA:** Profile 3.1
- **FOUNDATION Fieldbus:** 2 Analog Input (AI)

### Performance (according to reference conditions IEC60770-1)
- **Maximum measured error:**
  - > 500 mm from sensor reference point: 3 mm (0.118 inch)
  - < 500 mm from sensor reference point: 25 mm (1 inch)
- **Influence of ambient temperature:** < 0.003 %/K
- **Rated operating conditions**
  - **Location:** Indoor/outdoor
  - **Ambient conditions (enclosure):**
    - **Ambient temperature:** -40 ... +80 °C (-40 ... +176 °F)
    - **Installation category:** I
    - **Pollution degree:** 4

### Dielectric constant \(\varepsilon_r\)
- \(\geq 1.6\) (antenna dependent)

### Process connections
- **Raised face**
  - 2, 3, 4, 6” Class 150 ASME B16.5
  - 50A, 80A, 100A, 150A 10K JIS B 2220
  - DN 50, DN 80, DN 100 & DN 150 PN 10/16 EN 1092-1 type B1

### Power supply
- **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

### Design
- **Enclosure**
  - **Material:** Aluminum, polyester powder-coated
- **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 (dependent on process connection):**
  - Approx. 7 kg (15.43 lb) for 2” Class 150 ASME B16.5 raised face flange (smaller size)
  - Approx. 17.7 kg (39.02 lb) for 6” Class 150 ASME B16.5 raised face flange (largest size)
- **Display (local):**
  - Graphic local user interface including quick start wizard and echo profile display
- **Antenna**
  - **Material:** Stainless steel 316L (1.4435 or 1.4404) and TFM 1600 PTFE
  - **Dimensions (nominal sizes):**
    - 48 mm (2 inch), 80 mm (3 inch), 100 mm (4 inch), 150 mm (6 inch)
### Level Measurement

**Continuous level measurement — Radar transmitters**

#### SITRANS LR250 Flanged Encapsulated Antenna

**Programming**

- Infrared receiver
- SIMATIC PDM
- SITRANS DTM (for connection into FDT, such as PACTware or Fieldcare)

**Display (local)**

- Graphic local user interface including quick start wizard and echo profile displays

**Selection and Ordering data**

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7ML5432-707</td>
<td>SITRANS LR250 flanged encapsulated antenna</td>
</tr>
</tbody>
</table>

**Process Connection Material**

- Stainless steel 1.4404/1.4435

**Process Connection Type**

- Flanged Process Connection Types
  - 2" Class 150 ASME B16.5 raised face
  - 3" Class 150 ASME B16.5 raised face
  - 4" Class 150 ASME B16.5 raised face
  - 6" Class 150 ASME B16.5 raised face
  - 50A 10K JIS B 2220 raised face
  - 80A 10K JIS B 2220 raised face
  - 100A 10K JIS B 2220 raised face
  - DN 50 PN 10/16 EN 1092-1 type B1 raised face
  - DN 80 PN 10/16 EN 1092-1 type B1 raised face
  - DN 100 PN 10/16 EN 1092-1 type B1 raised face

**Communication/Output**

- PROFIBUS PA
- 4 ... 20 mA, HART, startup at < 3.6 mA
- FOUNDATION Fieldbus

**Enclosure/Cable inlet**

- Aluminum, Epoxy painted
- 2 x ½" NPT
- 2 x M20x1.5

**Antenna lens material**

- TFM 1600 PTFE: Flush Lens

**Approvals**

- General Purpose, CE, CSA, FM, FCC, R&TTE, RCM
- Intrinsically Safe: IECEx/ATEX II 1 G Ex ia IIC T4 Ga, IECEx/ATEX II 1D Ex ia ta IIIC T100 °C Da, INMETRO Ex ia IIC T4 Ga, Ex ia ta IIIC T100 °C Da, CE, R&TTE, RCM
- Non Sparking: ATEX II 3G Ex nA IIC T4 Gc, CE, R&TTE, RCM
- Increased Safety: IECEx/ATEX II 1/2 GD,1D, 2D Ex e mb ia IIC T4 Ga/Gb, Ex ia ta III T100 °C Da, INMETRO Ex e ia mb IIC T4 Ga/Gb, Ex ia ta III T100 °C Da, CE, R&TTE, RCM
- Flameproof: IECEx/ATEX II 1/2 GD 1D, 2D Ex d mb ia IIC T4 Ga/Gb, Ex ia ta III T100 °C Da, INMETRO Ex d ia mb IIC T4 Ga/Gb, Ex ia ta III T100 °C Da, CE, R&TTE, RCM
- Non Sparking: NEPSI Ex nA IIC T4 Gc
- Intrinsically Safe: NEPSI Ex ia IIC T4 Ga, Ex iaD 20 T90 IP67 DIP A20 T90 °C
- Flameproof: NEPSI Ex d ia mb IIC T4 Ga/Gb, Ex iaD 20 T90 IP67 DIP A20 T90 °C
- Increased Safety: NEPSI Ex e ia mb IIC T4 Ga/Gb, Ex iaD 20 T90 IP67 DIP A20 T90 °C

**Pressure rating**

Rating per Pressure/Temperature curves in instruction manual

1. Maximum range 10 m (32.8 ft), dk > 3 [20m (66ft) and dk>1.6 when mounted in stillpipe]
2. Applicable with communication option 2 only

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We can offer shorter delivery times for configurations designated with the Quick Ship Symbol. For details see page 9/5 in the appendix.
### Level Measurement

Continuous level measurement — Radar transmitters

**SITRANS LR250 Flanged Encapsulated Antenna**

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**Selection and Ordering data**

<table>
<thead>
<tr>
<th>Order code</th>
<th>Further designs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A50</td>
<td>Plug M12 with mating Connector[^2]</td>
</tr>
<tr>
<td>A55</td>
<td>Plug 7/8” with mating Connector[^2][^3][^4]</td>
</tr>
<tr>
<td>Y15</td>
<td>Stainless steel tag (69 x 50 mm (2.71 x 1.97 inch)); specify in plain text</td>
</tr>
<tr>
<td>C11</td>
<td>Manufacturer's test certificate: M to DIN 55350, Part 18 and to ISO 9000</td>
</tr>
<tr>
<td>C12</td>
<td>Inspection Certificate Type 3.1 per EN 10204</td>
</tr>
<tr>
<td>C20</td>
<td>Functional Safety (SIL 2). Device suitable for use in accordance with IEC 61508 and IEC 61511[^5][^6]</td>
</tr>
<tr>
<td>N07</td>
<td>Namur NE43 compliant, device preset to failsafe &lt; 3.6 mA[^6]</td>
</tr>
</tbody>
</table>

**Operating Instructions for HART/mA device**

- **English**
  - Article No. A5E32220602
- **German**
  - Article No. A5E32376088

**Multi-language Quick Start manual**

This device is shipped with the Siemens Milltronics manual DVD containing the ATEX Quick Start and Operating Instructions library.

**Selection and Ordering data**

<table>
<thead>
<tr>
<th>Order code</th>
<th>Operating Instructions for PROFIBUS PA device</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5E32221386</td>
<td><strong>English</strong></td>
</tr>
<tr>
<td>A5E32376094</td>
<td><strong>German</strong></td>
</tr>
</tbody>
</table>

**Operating Instructions for PROFIBUS PA device**

- **English**
  - Article No. A5E32221386
- **German**
  - Article No. A5E32376094

**Multi-language Quick Start manual**

This device is shipped with the Siemens Milltronics manual DVD containing the ATEX Quick Start and Operating Instructions library.

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**Operating Instructions for FOUNDATION Fieldbus device**

- **English**
  - Article No. A5E32221411
- **German**
  - Article No. A5E32376112

**Multi-language Quick Start manual**

This device is shipped with the Siemens Milltronics manual DVD containing the ATEX Quick Start and Operating Instructions library.

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**Accessories**

- Handheld programmer, Intrinsically safe, Ex ia
  - Article No. 7ML1930-1BA
- HART modem/RS 232
  - (for use with a PC and SIMATIC PDM)
  - Article No. 7MF4997-1DA
- HART modem/USB
  - (for use with a PC and SIMATIC PDM)
  - Article No. 7MF4997-1DB
- One metallic cable gland M20x1.5, rated -40 °C ... +80 °C (-40 °F ... +176 °F), HART
  - (2 are required)[^5]
  - Article No. 7ML1930-1AP
- One metallic cable gland M20x1.5, rated
  - -40 °C ... +80 °C (-40 °F ... +176 °F), PROFIBUS PA and FOUNDATION Fieldbus (2 are required)[^3][^6]
  - Article No. 7ML1930-1AQ
- SITRANS RD100 Remote display - see Chapter 7
- SITRANS RD200 Remote display - see Chapter 7
- SITRANS RD500 web, datalogging, alarming, ethernet, and modem support for instrumentation - see Chapter 7

For applicable back up point level switch - see point level section on page 4/9

1) Available with enclosure option 1 only
2) Available with communication options 1 and 3 only
3) Available with approval options A, B, C, and L only
4) Available with enclosure option 0 only
5) Applicable with communication option 2 only
6) Available with approval options A, B, C, D, E, K, and L only

We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ☻. For details see page 9/5 in the appendix.
Continuous level measurement — Radar transmitters

SITRANS LR250 Flanged Encapsulated Antenna

Characteristic curves

Pressure/temperature curve
LR250 Flanged Encapsulated Antenna
ASME flanged process connections
(7ML5432)

SITRANS LR250 flanged encapsulated antenna installation, dimensions in mm (inch)

Pressure/temperature curve
LR250 Flanged Encapsulated Antenna
EN 1092-1 flanged process connections
(7ML5432)

SITRANS LR250 flanged encapsulated antenna pressure/temperature curve
SITRANS LR250 Flanged Encapsulated Antenna

Permitted operating pressures

- Atmospheric Pressure
  - 10 bar (145 psi)
  - 20 bar (290 psi)
  - 30 bar (435 psi)

- Permitted operating temperatures
  - -40 °C (-40 °F)
  - 0 °C (32 °F)
  - 100 °C (212 °F)
  - 200 °C (392 °F)
  - 100 °F (38 °C)
  - 140 °F (60 °C)
  - 200 °F (93 °C)
  - 300 °F (149 °C)
  - 400 °F (204 °C)

SITRANS LR250 flanged encapsulated antenna pressure/temperature curve
## Dimensional drawings

**Flanged Encapsulated Antenna 2”/DN 50/50A**

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>Flange Class</th>
<th>Flange O.D.</th>
<th>Antenna aperture size</th>
<th>Height to Sensor reference point dimension E</th>
<th>Beam angle</th>
<th>Measurement Range</th>
<th>Dimension A</th>
<th>Dimension B</th>
<th>Dimension C</th>
<th>Dimension D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2”</td>
<td>150 lb</td>
<td>152 (5.98)</td>
<td>50 (1.97)</td>
<td>11 (0.43)</td>
<td>12.8°</td>
<td>10 m (32.8 ft)</td>
<td>263 (10.35)</td>
<td>178</td>
<td>223</td>
<td>274</td>
</tr>
<tr>
<td>DN 50</td>
<td>PN 10/16</td>
<td>165 (6.50)</td>
<td>50 (1.97)</td>
<td>11 (0.43)</td>
<td>12.8°</td>
<td>10 m (32.8 ft)</td>
<td>263 (10.35)</td>
<td>178</td>
<td>223</td>
<td>274</td>
</tr>
<tr>
<td>50A</td>
<td>10K</td>
<td>155 (6.10)</td>
<td>50 (1.97)</td>
<td>11 (0.43)</td>
<td>12.8°</td>
<td>10 m (32.8 ft)</td>
<td>263 (10.35)</td>
<td>178</td>
<td>223</td>
<td>274</td>
</tr>
</tbody>
</table>

1) Height from tip of lens to sensor reference point as shown.

SITRANS LR250 flanged encapsulated antenna, dimensions in mm (inch)
Flanged Encapsulated Antenna 3"/DN50/80A or greater

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>Flange Class</th>
<th>Flange O.D.</th>
<th>Antenna aperture size</th>
<th>Height to Sensor reference point dimension E</th>
<th>Beam angle</th>
<th>Measurement Range</th>
<th>Dimension A</th>
<th>Dimension B</th>
<th>Dimension C</th>
<th>Dimension D</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>150 lb</td>
<td>190 (7.48)</td>
<td>75 (2.95)</td>
<td>15 (0.59)</td>
<td>9.6°</td>
<td>20 m (65.6 ft)</td>
<td>328 (12.91)</td>
<td>178 (7)</td>
<td>288 (11.34)</td>
<td>343 (13.54)</td>
</tr>
<tr>
<td>DN80</td>
<td>PN10/16</td>
<td>200 (7.87)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80A</td>
<td>10K</td>
<td>185 (7.28)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot;</td>
<td>150 lb</td>
<td>230 (9.06)</td>
<td>75 (2.95)</td>
<td>13 (0.51)</td>
<td>9.6°</td>
<td>20 m (65.6 ft)</td>
<td>328 (12.91)</td>
<td>178 (7)</td>
<td>288 (11.34)</td>
<td>343 (13.50)</td>
</tr>
<tr>
<td>DN100</td>
<td>PN10/16</td>
<td>220 (8.66)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100A</td>
<td>10K</td>
<td>210 (8.27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot;</td>
<td>150 lb</td>
<td>280 (11.02)</td>
<td>75 (2.95)</td>
<td>15 (0.59)</td>
<td>9.6°</td>
<td>20 m (65.6 ft)</td>
<td>333 (13.11)</td>
<td>178 (7)</td>
<td>293 (11.54)</td>
<td>348 (13.70)</td>
</tr>
<tr>
<td>DN150</td>
<td>PN10/16</td>
<td>285 (11.25)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150A</td>
<td>10K</td>
<td>280 (11.02)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

° Height from tip of lens to sensor reference point as shown.

SITRANS LR250 flanged encapsulated antenna, dimensions in mm (inch)
Level Measurement
Continuous level measurement — Radar transmitters

SITRANS LR250 Flanged Encapsulated Antenna

Schematics

Connect the wires to the terminals as shown: the polarity is identified on the terminal block.

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 ... 22 AWG) for HART version.
4. Separate cables and conduit may be required to conform to standard instrumentation wiring practices or electrical codes.

SITRANS LR250 connections
Continuous level measurement – Radar transmitters

SITRANS LR250 Flanged Encapsulated Specials

<table>
<thead>
<tr>
<th>SITRANS LR250 flanged encapsulated antenna version enclosures (PROFIBUS PA models)</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option A, with PROFIBUS PA communication, no process connection</td>
<td>A5E32462853</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option A, with PROFIBUS PA communication, no process connection</td>
<td>A5E32462854</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, NPT cable inlet, approval option A, with PROFIBUS PA communication, no process connection</td>
<td>A5E32462855</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option C, with PROFIBUS PA communication, no process connection</td>
<td>A5E32462856</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, NPT cable inlet, approval option D, with PROFIBUS PA communication, no process connection</td>
<td>A5E32462857</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option E, with PROFIBUS PA communication, no process connection</td>
<td>A5E32462858</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITRANS LR250 flanged encapsulated antenna version enclosures (FOUNDATION Fieldbus models)</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option A, with FOUNDATION Fieldbus communication, no process connection</td>
<td>A5E32462859</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, NPT cable inlet, approval option A, with FOUNDATION Fieldbus communication, no process connection</td>
<td>A5E32462860</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, NPT cable inlet, approval option B, with FOUNDATION Fieldbus communication, no process connection</td>
<td>A5E32462861</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option C, with FOUNDATION Fieldbus communication, no process connection</td>
<td>A5E32462862</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option D, with FOUNDATION Fieldbus communication, no process connection</td>
<td>A5E32462863</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option E, with FOUNDATION Fieldbus communication, no process connection</td>
<td>A5E32462864</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITRANS LR250 flanged encapsulated antenna version enclosures (&lt; 3.6 mA start-up HART models)</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, M20 cable inlet, approval option A, with HART communication start-up at &lt; 3.6 mA, no process connection</td>
<td>A5E32462865</td>
</tr>
<tr>
<td>LR250 flanged encapsulated antenna version (7ML5432) enclosure with board stack, NPT cable inlet, approval option A, with HART communication start-up at &lt; 3.6 mA, no process connection</td>
<td>A5E32462866</td>
</tr>
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</table>