Continuous level measurement Radar transmitters

Overview



4

SITRANS LR250 with threaded PVDF 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 10 m (32.8 ft) or 20 m (66 ft) when used in a stilling pipe.

Benefits

- Fully insulated PVDF antenna design for use in chemical and sanitary environments where aggressive and corrosive materials are used
- 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 50 mm (2 inch) process connection/antenna allow for easy mounting in nozzles
- 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 SITRANS DTM
- Suitable for use in Safety Related Systems in accordance with IEC 61508/61511 (SIL-2)
- 3 mm (0.118 inch) accuracy in accordance with IEC 60770-1

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 the Quick Start wizard with a few parameters required for basic operation.

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

SITRANS LR250 measures superbly in small vessels and in tanks/vessels up to 10 m (32 ft) on materials with dk > 3 or 20 m (66 ft) when used in a stilling pipe with dk \ge 1.6.

 Key Applications: liquid bulk storage tanks, process vessels with agitators, vaporous liquids, temperatures to 80 °C (176 °F), corrosive and aggressive materials and applications requiring functional safety

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

Orient front or back of

Mounting on bypass



Mounting on stilling well

Orient front or back of device toward stillpipe slots.





Mounting on vessel

Mounting on a nozzle



SITRANS LR250 PVDF Antenna installation, dimensions in mm (inch)

Continuous level measurement Radar transmitters

SITRANS LR250 Threaded PVDF Antenna

| Technical specifications | | | |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Mode of operation | | Certificates and approvals | |
| Measuring principle | Radar level measurement | General | CSA _{US/C} , CE, FM, RCM |
| Frequency | K-band (25.0 GHz) | Radio | FCC, Industry Canada, RED, RCM |
| Minimum measuring range | 50 mm (2 inch) from end of antenna | Hazardous | |
| Maximum measuring range | 10 m (32.8 ft) or 20 m (66 ft) when used in a stilling pipe with dk \geq 1.6 | Explosion Proof (Brazil) | INMETRO Ex d ia mb IIC T4 Ga/Gb, Ex ia ta IIIC T100 °C Da |
| Output | | Increased Safety (Brazil) | INMETRO Ex e ia mb IIC 14 Ga/Gb, Ex ia ta IIIC T100 °C Da |
| HART • Analog output | Version 5.1 | Intrinsically Safe (Brazil) | INMETRO Ex ia IIC T4 Ga, Ex ia ta IIIC T100 °C Da |
| Accuracy Fail-safe | ± 0.02 mA Programmable as high low or | Explosion Proof (Canada/USA) | CSA/FM Class I, Div. 1, Groups A, B, C, D; Class II, Div. 1, Groups E, F, G; Class III T4 |
| | NE 43 programmable Profile 3 1 | Intrinsically Safe (Canada/USA) | CSA/FM Class I, Div. 1, Groups A, B, C, D; Class II, Div. 1, Groups E, F, G; |
| Function blocks | 2 Analog Input (AI) | • Non-incendive (Canada/USA) | Class III 14 CSA/FM Class I, Div. 2, Groups A, B, |
| FOUNDATION Fieldbus | H1 Basic or LAS | Flame Proof/Increased Safety | Ex d ia mb IIC T4 Ga/Gb, Ex e ia mb |
| Version | ITK 5.2.0 | (China) | IIC T4 Ga/Gb, Ex iaD 20 T90 IP67 DIP A20 T _A 90 °C |
| Function blocks Performance (according to | 2 Analog Input (AI) | Intrinsically Safe (China) | Ex ia IIC T4 Ga, Ex iaD 20 T90 IP67 DIP A20 T _A 90 °C |
| reference conditions IEC60770-1) | | Non-sparking (China) Intrinsically Safe (Europe) | NEPSI Ex nA IIC T4 Gc |
| Maximum measured error | > 500 mm from sensor reference point: 3 mm (0.118 inch) < 500 mm from sensor reference | Non-sparking/Energy Limited | ATEX II 10 Ex ia ta IIC T4 Ga ATEX II 1D Ex ia ta IIC T100 °C Da ATEX II 3G Ex nA IIC T4 Gc |
| Influence of ambient temperature | point: 25 mm (1 inch) < 0.003 %/K | (Europe) Flame Proof (International/Europe) | IECEx/ATEX II 1/2 GD, 1D, 2D, Ex.d.mb.ia.IIC T4 Ga/Gb, Ex.ia.ta.IIC |
| Rated operating conditions | | | T100 °C Da |
| Installation conditions Location | Indoor/outdoor | Increased Safety (International/Europe) | IECEX/ALEX II 1/2 GD, 1D, 2D, Ex e mb ia IIC T4 Ga/Gb, Ex ia ta IIIC T100 °C Da |
| Ambient conditions (enclosure) Ambient temperature | -40 +80 °C (-40 +176 °F) | Intrinsically Safe (International) | IECEX/ATEX II 1 G Ex ia IIC T4 Ga, IECEX/ATEX II 1D Ex ia ta IIC T100 °C Da |
| Installation categoryPollution degree | l 4 | Explosion Proof (Bussia/Kazakhstan) | EAC Ex d |
| Medium conditions | | Increased Safety | EAC Ex e |
| Dielectric constant ε_r | \geq 3 (1.6 in stillpipe) | (Russia/Kazakhstan) | EAC Exia |
| Process temperature | -40 +80 °C (-40 +176 °F) at pro- cess connection (Is suitable for CIP at 120 °C for 1/2 hr max) | (Russia/Kazakhstan) • Marine | Lloyd's Register of Shipping ABS Type Approval |
| Process pressure | Up to 5 bar g (72 psi g) temperature dependent. | Functional Safety | Bureau Veritas SII -2 suitable in accordance with IEC |
| | See Pressure/Temperature curves for more information | | 61508/61511 |
| Design | | Programming | |
| Enclosure | | Intrinsically Safe Siemens handheld programmer | Infrared receiver |
| MaterialCable inlet | Aluminum, polyester powder-coated 2 x M20 x 1.5 or 2 x ¹ / ₂ " NPT | Approvals for handheld programmer | IS model: ATEX II 1 GD Ex ia IIC T4 Ga |
| Degree of protection | Type 4X/NEMA 4X, Type 6/ NEMA 6, IP67, IP68 | | Ex ia D 20 T135 °C T _a = -20 +50 °C CSA/FM Class I, II, III, Div. 1, Groups A. B. C. D. E. F. G. T6 |
| Weight | Approximately 3.3 kg (7.27 lb) | | $T_a = +50 \text{ °C}$ IECEX SIR 09.0073 |
| Display (local) | Graphic local user interface including quick start wizard and echo profile display | Handheld communicator | HART communicator 375/475 |
| Antenna | | 10 | Emerson AMS SITRANS DTM (for connection into |
| MaterialDimensions (nominal sizes) | PVDF (Polyvinylidene fluoride) 2 inch (48 mm) | | FDT, such as PACTware or Fieldcare) |
| Process connections | | Display (local) | Graphic local user interface including |
| Process connection | 2" NPT [(Taper), ASME B1.20.1] 2" [(BSPT), EN 10226] 2" [(BSPP). EN ISO 228-1] | | quick start wizard and echo profile displays |
| Power supply | | | |
| 4 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 | | |

Siemens FI 01 · 2018 4/233

Δ

Continuous level measurement Radar transmitters

| Selection and Ordering data | Article No. | | Selection and Ordering data | Order code |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| SITRANS LR250 Threaded PVDF Antenna 🧷 🧷 | 7ML5431- | | Further designs | |
| 2-wire, 25 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage and process vessels including correctives | 0 - | | Please add "-Z" to Article No. and specify Order code(s). | |
| or aggressive materials, to a range of 10 m (32.8 ft) | | | Plug M12 with mating Connector ¹⁾²⁾³⁾ | A50 |
| or 20 m (66 ft) when used in a stilling pipe. | | | Plug 7/8" with mating Connector ²⁾³⁾⁴⁾ | A55 |
| Click on the Article No. for the online configura- tion in the PIA Life Cycle Portal. | | | Stainless steel tag [69 x 50 mm (2.71 x 1.97 inch)]: Measuring-point number/identification | Y15 |
| Process Connection and Antenna Material | | | (max. 27 characters); specify in plain text | |
| Presses Connection Type | - 4 | | Manufacturer's test certificate: M to DIN 55350, | C11 |
| Threaded connections PVDF | | | Part 18 and to ISO 9000 | |
| 2" NPT (ASME B1.20.1) (tapered thread) | PA | | Material inspection Certificate Type 3.1 per | C12 |
| R 2" [(BSPT), EN 10226-1] (tapered thread) | PB | | EN 10204 | |
| | | | Functional Satety (SIL 2). Device suitable for use in accordance with IEC 61508 and IEC 61511 ⁵⁾⁶⁾ | C20 |
| PROFIBUS PA 4 20 mA, HART, start-up at < 3.6 mA | 1 2 | L | Namur NE43 compliant, device preset to failsafe < 3.6 mA ⁵⁾ | N07 |
| FOUNDATION Fieldbus | 3 | | Compact Operating Instructions for HART/ | Article No |
| Enclosure/Cable inlet Aluminum, Epoxy painted | | | ma device | |
| 2 x ½ NPT 2 x M20 x 1.5 | 1 | | English, French, German, Spanish, Italian, Dutch, Danish, Finnish, Greek, Portuguese (Portugal) | A5E33469191 |
| Antenna | · · | | Swedish | |
| 2 inch (50 mm) threaded PVDF antenna | R | | English, Bulgarian, Czech, Estonian, Hungarian, | A5E33469171 |
| Approvals | - | | Latvian, Lithuanian, Polish, Romanian, Slovakian, | |
| General Purpose, CE, CSA, FM, FCC, RED, RCM | | A | | 4 |
| Intrinsically Safe: CSA/FM Class I, Div. 1, Groups A, | E | в | English, Portuguese (Brazil), Chinese | A5E34046583 |
| B, C, D, Class II, Div. 1, Groups E, F, G, Class III T4 FCC, Industry Canada | | | Note: The Operating Instructions should be ordered as a separate line item on the order. | |
| 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 RED PCM | | C | All literature is available to download for free, in a range of languages, at http://www.siemens.com/ processinstrumentation/documentation | |
| Non-incendive: CSA/FM Class I, Div. 2, Groups A, | 1 | D | Compact Operating Instructions for PROFIBUS PA device | |
| Non Sparking: ATEX II 3G Ex nA IIC T4 Gc, CE, | | E | English, French, German, Spanish, Italian, Dutch, Danish, Finnish, Greek, Portuguese (Portugal), | A5E33469239 |
| NED, NOM | | - | Swedish | |
| 2D Ex e mb ia IIC T4 Ga/Gb, Ex ia ta IIIC T100 °C Da, INMETRO Ex e ia mb IIC T4 Ga/Gb, Ex ia ta IIIC T100 °C Da CE RED RCM ¹⁾ | | | English, Bulgarian, Czech, Estonian, Hungarian, Latvian, Lithuanian, Polish, Romanian, Slovakian, Slovenian | A5E33472685 |
| Flameproof: IECEx/ATEX II 1/2 GD 1D. 2D Ex d mb | (| G | English, Portuguese (Brazil), Chinese | A5E34046624 |
| ia IIC T4 Ga/Gb, Ex ia ta IIIC T100 °C Da, INMETRO Ex d ia mb IIC T4 Ga/Gb, Ex ia ta IIIC | | - | Note: The Operating Instructions should be ordered as a separate line item on the order. | |
| Evolution proof: CSA/EM Class L II and III Div 1 | All literature is available to download for free, in a | | | |
| Groups A, B, C, D, E, F, G, FCC, Industry Canada ¹⁾ | | | processinstrumentation/documentation | |
| Non Sparking: NEPSI Ex nA IIC T4 Gc | ļ | к | | |
| Intrinsically Safe: NEPSI Ex ia IIC T4 Ga, Ex iaD 20 T90 IP67 DIP A20 T _A 90 ℃ | | L | | |
| Flameproof: NEPSI Ex d ia mb IIC T4 Ga/Gb, Ex iaD 20 T90 IP67 DIP A20 T₄90 ºC ¹⁾ | Ν | и | | |
| Increased Safety: NEPSI Ex e ia mb IIC T4 Ga/Gb, Ex iaD 20 T90 IP67 DIP A20 T_A 90 $^{\circ}C^{1)}$ | , | N | | |
| Pressure rating | | | | |
| Rating per Pressure/Temperature curves in manual | | 2 | | |

Rating per Pressure/Temperature curves in manual

1) Applicable to Communication option 2 only

Continuous level measurement

Radar transmitters

SITRANS LR250 Threaded PVDF Antenna

| Selection and Ordering data | Article No. | Selection and Ordering data | Article No. |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Compact Operating Instructions for | A5E33472700 | Accessories | |
| FOUNDATION Fieldbus device | | Handheld programmer, Intrinsically safe, EEx ia | 7ML1930-1BK |
| English, French, German, Spanish, Italian, Dutch, Danish, Finnish, Greek, Portuguese (Portugal), Swedish | | HART modem/USB (for use with a PC and SIMATIC PDM) | 7MF4997-1DB |
| English, Bulgarian, Czech, Estonian, Hungarian, Latvian, Lithuanian, Polish, Romanian, Slovakian, | A5E33472738 | One metallic cable gland M20 x 1.5, rated -40 +80 °C (-40 +176 °F), HART | 7ML1930-1AP |
| Slovenian English, Portuguese (Brazil), Chinese | A5E34046626 | One metallic cable gland M20 x 1.5, rated -40 +80 °C (-40 +176 °F), PROFIBUS PA and FOUNDATION Fieldbus ²⁾ | 7ML1930-1AQ |
| Note: The Operating Instructions should be ordered as a separate line item on the order. | | FDA approved FKM o-ring for 2" G (BSPP) process connections -28 +80 °C (-28 +176 °F) | 7ML1830-3AN |
| All literature is available to download for free, in a range of languages, at http://www.siemens.com/ processinstrumentation/documentation | | SITRANS RD100, loop powered display - see Chapter 7 | 7ML5741 |
| Other Operating Instructions | | SITRANS RD200, universal input display with Modbus conversion - see Chapter 7 | 7ML5740 |
| SITRANS LR250 Functional Safety manual, English | A5E32286471 | SITRANS RD300, dual line display with totalizer and linearization curve and Modbus conversion - see Chapter 7 | 7ML5744 |
| Note: The Operating Instructions should be ordered as a separate line item on the order. | | | |
| All literature is available to download for free, in a range of languages, at http://www.siemens.com/ | | SITRANS RD500 web, universal remote monitoring solution for instrumentation - see Chapter 7 | 7ML5750 |
| | | For applicable back up point level switch - see point level measurement section | |
| | | ¹⁾ Available with Enclosure option 1 only | |
| | | 2) To be used with Communication options 1 and 3 only. Connector has IP67 rating. | |
| | | ³⁾ Available with Approval options A and B. Available with for use on intrinsically safe applications only. Not rated | th approval option C d for dust Ex. |

⁴⁾ Available with Enclosure option 0 only

- ⁵⁾ Available with communication option 2 only
- ⁶⁾ Available with approval options A, B, C, D, E, K, and L only

Characteristic curves



SITRANS LR250 PVDF Antenna pressure/temperature curve

Continuous level measurement Radar transmitters

Dimensional drawings



SITRANS LR250 PVDF Antenna, dimensions in mm (inch)

Circuit diagrams



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.

Continuous level measurement

Radar transmitters

SITRANS LR250 Threaded PVDF Specials

Selection and Ordering data

no process connection

| SITRANS LR250 threaded PVDF Specials | | SITRANS LR250 threaded PVDF Specials | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| | Article No. | | Article No. |
| NOTE: LR260 head can be supplied with any LR250 process connection or antenna as special order. For LR250, this means a stronger | | SITRANS LR250 threaded PVDF antenna version enclosures (< 3.6 mA start-up HART models) | |
| signal and longer measurement range is possible. | | M20 cable inlet, approval option A, with HART_communication start-up | A5E03569747 |
| SITRANS LR250 threaded PVDF antenna version enclosures (PROFIBUS PA models) | | at < 3.6 mA, no process connection SITRANS LR250 enclosure with board stack, NPT cable inlet approval option A | A5E03586807 |
| SITRANS LR250 threaded PVDF antenna version enclosure with board stack, M20 cable inlet, approval option A, with PROFIBUS PA | A5E03588171 | with HART communication start-up at < 3.6 mA, no process connection SITRANS LR250 enclosure with board stack, | A5E03586854 |
| SITRANS LR250 threaded PVDF antenna version enclosure with board stack, NPT cable inlet, approval option A with PROFIBUS PA | A5E03588253 | NPT cable inlet, approval option B, with HART communication start-up at < 3.6 mA, no process connection | |
| communication, no process connection SITRANS LR250 threaded PVDF antenna version enclosure with board stack, NPT cable inlet, | A5E03588512 | SITRANS LR250 enclosure with board stack, M20 cable inlet, approval option C, with HART communication start-up at < 3.6 mA, no process connection | A5E03586887 |
| approval option B, with PROFIBUS PA communication, no process connection | 4 | SITRANS LR250 enclosure with board stack, NPT cable inlet, approval option D, | A5E03586961 |
| enclosure with board stack, M20 cable inlet, approval option C, with PROFIBUS PA | A5E03589260 | with HART communication start-up at < 3.6 mA, no process connection SITRANS LR250 enclosure with board stack | A5E03587012 |
| SITRANS LR250 threaded PVDF antenna version enclosure with board stack, NPT cable inlet, | A5E03589262 | M20 cable inlet, approval option E, with HART communication start-up at < 3.6 mA, no process connection | |
| approval option D, with PROFIBUS PA communication, no process connection | A5E03589264 | SITRANS LR250 enclosure with board stack, M20 cable inlet, approval option F, with HABT_communication start-up | A5E03587132 |
| approval option E, with PROFIBUS PA communication, no process connection | | at < 3.6 mA, no process connection SITRANS LR250 enclosure with board stack, | A5E03587223 |
| SITRANS LR250 threaded PVDF antenna version enclosures | A5E03589266 | with HART communication start-up at < 3.6 mA, no process connection | |
| SITRANS LR250 enclosure with board stack, M20 cable inlet, approval option A, with FOUNDATION Fieldbus communication, no process connection | | SITRANS LR250 enclosure with board stack, NPT cable inlet, approval option H, with HART communication start-up at < 3.6 mA, no process connection | A5E03588125 |
| SITRANS LR250 enclosure with board stack, NPT cable inlet, approval option A | A5E03589275 | SITRANS LR250 threaded PVDF antenna kits | |
| with FOUNDATION Fieldbus communication, | | Antenna kit 2" NPT threaded PVDF | A5E03528941 |
| no process connection | | Antenna kit 2" R (BSPT) threaded PVDF | A5E03528943 |
| NPT cable inlet, approval option B. | A5E03589277 | Antenna kit 2" G (BSPP) threaded PVDF | A5E03528947 |
| with FOUNDATION Fieldbus communication, no process connection | | Kit of hardware parts for LR250 threaded PVDF antenna: consists of O-rings, screws, wavewasher, and loctite | A5E03528948 |
| SITRANS LR250 enclosure with board stack, M20 cable inlet, approval option C | A5E03589280 | Ex-proof plugs | |
| with FOUNDATION Fieldbus communication, no process connection | | Ex-proof plugs kit, 1/2" NPT, qty 5 | A5E39979991 |
| SITRANS LR250 enclosure with board stack, NPT cable inlet, approval option D, with FOUNDATION Fieldbus communication, no process connection | A5E03589281 | בא-טוסט אונעט אונ, ואו∠ט, ענא ס | HOE9431,8287 |
| SITRANS LR250 enclosure with board stack, M20 cable inlet, approval option E, with FOUNDATION Fieldbus communication, | A5E03589283 | | |