

# Level instruments

## Continuous level measurement - Radar transmitters

### Radar transmitters

#### Overview

Radar measurement technology is non-contacting and low maintenance. Because microwaves require no carrier medium, they are virtually unaffected by the process atmosphere (vapour, pressure, dust, or temperature extremes). Siemens offers a choice of models to meet the specific needs of your application.

SITRANS Probe LR is a 2-wire, 6 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage vessels with nominal pressure and temperature, to a range of 20 m (66 ft).

SITRANS LR200 is a 2-wire, 6 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).

SITRANS 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). Ideal for small vessels and low dielectric media.

SITRANS LR260 is a 2-wire, 25 GHz pulse radar level transmitter for continuous monitoring of solids in silos to a range of 30 m (98.4 ft). Ideal for applications with extreme dust and high temperatures to +200 °C (+392 °F).

SITRANS LR300 is a 4-wire, 6 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).

SITRANS LR400 is a 4-wire, 24 GHz FMCW radar level transmitter for continuous monitoring of liquids and slurries in storage and process vessels including high temperature and high pressure, to a range of 50 m (164 ft). It is ideal for low dielectric media.

SITRANS LR460 is a 4-wire, 24 GHz FMCW radar level transmitter with extremely high signal to noise ratio and advanced signal processing for continuous monitoring of solids up to 100 m (328 ft). It is ideal for measurement in extreme dust.

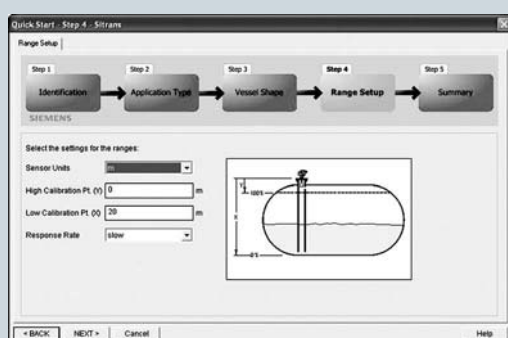
#### Auto False-Echo Suppression

SITRANS LR instruments offer the unique advantage of patented Process Intelligence signal processing technology. This in-depth knowledge and experience is built into the software's advanced algorithms to provide intelligent processing of echo profiles. The result is repeatable, fast and reliable measurement.

A special feature of SITRANS radar devices is Auto False-Echo Suppression, an echo processing technique that automatically detects and suppresses false echoes from vessel obstructions. You can implement this feature using two parameters on the local interface or SIMATIC PDM communicating over HART® or PROFIBUS PA.



**Local display interface** —graphically displays echo profiles and diagnostic information (available with LR200, LR250, LR260)



**Quick to configure**  
Quick Start Wizard via SIMATIC PDM guides you during setup (available with LR200, LR250, LR260, LR460)

#### Mode of operation

##### Principle of Operation

Radar measurement technology measures the time of flight from the transmitted signal to the return signal. From this time, distance measurement and level are determined.

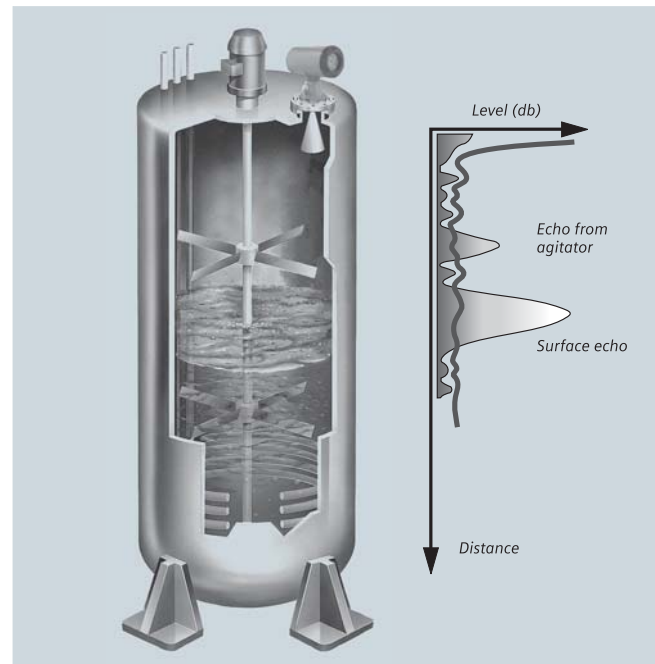
Unlike ultrasonic measurement, radar technology does not require a carrier medium and travels at the speed of light (300 000 000 m/s). Most industrial radar devices operate from 6 to 26 GHz.

Siemens offers pulse radar transmitters (SITRANS Probe LR, SITRANS LR200, SITRANS LR250, SITRANS LR260, SITRANS LR300) and FMCW (Frequency Modulated Continuous Wave) radar transmitters (SITRANS LR400, SITRANS LR460).

Pulse radar emits a microwave pulse from the antenna at a fixed repetition rate that reflects off the interface between the two materials with different dielectric constants (the atmosphere and the material being monitored). The echo is detected by a receiver and the transmit time is used to calculate level.

Reflected echoes are digitally converted to an echo profile. The profile is analyzed to determine the distance from the material surface to the reference point on the instrument.

FMCW (Frequency Modulated Continuous Wave) radar devices send microwaves to the surface of the material. The wave frequency is modulated continuously. At the same time, the receiver is also receiving continuously and the difference in frequency between the transmitter and the receiver is directly proportional to the distance to the material.



Radar operation

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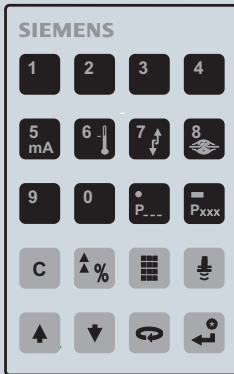
#### Technical specifications

##### Radar Selection Guide

Criteria	SITRANS Probe LR	SITRANS LR200	SITRANS LR250	SITRANS LR260	SITRANS LR300	SITRANS LR400	SITRANS LR460
Typical industries	Chemicals	Chemicals, petrochemicals	Chemicals, petrochemicals	Cement, power generation, food processing, mineral processing, mining	Chemicals, petrochemicals	Cement, petrochemicals	Cement, power generation, food processing, mineral processing, mining
Typical applications	Liquids, storage vessels	Liquids, storage and process vessels	Liquids, storage and process vessels with agitators, vaporous liquids, high temperatures, low dielectric media	Cement, plastics, grain, flour, coal	Liquids, process vessels	Liquids storage vessels, liquid petroleum gas (LPG)	Cement, flyash, grain, coal, flour, plastics
Range	0.3 to 20 m (1 to 65 ft)	0.3 to 20 m (1 to 65 ft)	50 mm (2") from end of horn to 20 m (65 ft), horn dependent	30 m (98.4 ft)	0.4 to 20 m (1.3 to 65 ft)	0.35 to 50 m (1.14 to 164 ft)	100 m (328 ft)
Frequency	5.8 GHz (North America 6.3 GHz)	5.8 GHz (North America 6.3 GHz)	K-band (25.0 GHz)	K-band (25.0 GHz)	5.8 GHz (North America 6.3 GHz)	24 to 25 GHz FMCW	24 to 25 GHz FMCW
Performance accuracy	0.1% of range or 10 mm (0.4")	0.1% of range or 10 mm (0.4")	5 mm (0.02")	25 mm (1") from minimum detectable distance to 300 mm (11.8") Remainder of range = 10 mm (0.39") or 0.1% of span (whichever is greater)	±15 mm (0.6") from 0.4 to 10 m (1.3 to 32.8 ft) ±0.15% from 10 to 20 m (1.3 to 65 ft)	≤ 5 mm (0.2") from 2 to 10 m (6.6 to 32.8 ft) ≤ 15 mm (0.6") from 10 to 50 m (32.8 to 164 ft)	0.25 %
Temperature	Ambient: -40 to +80 °C (-40 to +176 °F) Process: -40 to +80 °C (-40 to +176 °F)	Ambient: -40 to +80 °C (-40 to +176 °F) Process: -40 to +200 °C (-40 to +392 °F), dependent on antenna type	Ambient: -40 to +80 °C (-40 to +176 °F) Process: -40 to +200 °C (-40 to +392 °F), dependent on antenna type	Ambient: -40 to +80 °C (-40 to +176 °F) Process: -40 to +200 °C (-40 to +392 °F), dependent on antenna type	Ambient: -40 to +60 °C (-40 to +140 °F) Process: -40 to +200 °C (-40 to +392 °F), dependent on antenna type	Ambient: -40 to +65 °C (-40 to +149 °F) Process: -40 to +250 °C (-40 to +482 °F), dependent on antenna type	Ambient: max. +65 °C (+149 °F) Process: max. +200 °C (+392 °F)
Output/Communications	<ul style="list-style-type: none"> <li>4 to 20 mA/HART®</li> <li>SIMATIC PDM for remote configuration and diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA/HART</li> <li>PROFIBUS PA</li> <li>SIMATIC PDM for remote configuration and diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA/HART</li> <li>PROFIBUS PA</li> <li>SIMATIC PDM for remote configuration and diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA/HART</li> <li>PROFIBUS PA</li> <li>SIMATIC PDM for remote configuration and diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA/HART</li> <li>PROFIBUS PA</li> <li>Modbus ASCII/RTU</li> <li>SIMATIC PDM for remote configuration and diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA/HART</li> <li>PROFIBUS PA</li> <li>SIMATIC PDM for remote configuration and diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA/HART</li> <li>PROFIBUS PA</li> <li>SIMATIC PDM for remote configuration and diagnostics</li> </ul>
Power	<ul style="list-style-type: none"> <li>4 to 20 mA, 24 V DC nominal, 30 V DC max.</li> <li>Minimum voltage depends on total loop resistance</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA loop, 24 V DC nominal, 30 V DC max.</li> <li>Minimum voltage depends on total loop resistance</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA loop, 24 V DC nominal, 30 V DC max.</li> <li>Minimum voltage depends on total loop resistance</li> </ul>	<ul style="list-style-type: none"> <li>4 to 20 mA (±0.02 mA accuracy) 24 V DC nominal, 30 V DC max.</li> <li>Minimum voltage depends on total loop resistance</li> </ul>	<ul style="list-style-type: none"> <li>Universal AC/DC</li> <li>24 to 230 V AC, ±15%, 40 to 70 Hz, 28 VA/11W</li> <li>24 to 230 V DC, ±15%, 9W</li> </ul>	<ul style="list-style-type: none"> <li>120 to 230 V AC, ±15%, 50/60 Hz</li> <li>24 V DC, +25/-20%, 6 W (optional)</li> </ul>	<ul style="list-style-type: none"> <li>100 to 230 V AC, ±15%, 50/60 Hz, 6 W</li> <li>24 V DC, +25/-20%, 6 W</li> </ul>
Approvals	CE, CSA <sub>US/C</sub> , FM, Lloyds Register of Shipping, ABS, FCC, Industry Canada, R&TTE, ATEX, PED, C-TICK	CE, CSA <sub>US/C</sub> , FM, Lloyds Register of Shipping, ABS, FCC, Industry Canada, R&TTE, ATEX, PED, C-TICK	CSA <sub>US/C</sub> , CE, FM, FCC, Industry Canada, R&TTE, ATEX, PED, C-TICK	CSA <sub>US/C</sub> , CE, FM, R&TTE, Industry Canada, FCC, ATEX, C-TICK	CE, CSA <sub>NRTL/C</sub> , FM, Lloyds Register of Shipping, ABS, FCC, Industry Canada, R&TTE, ATEX, 3A, PED, C-TICK	CE, CSA <sub>US/C</sub> , FM, Lloyds Register of Shipping, ABS, FCC, Industry Canada, R&TTE, ATEX, PED, C-TICK	CSA <sub>US/C</sub> , CE, FM, R&TTE, Industry Canada, FCC, ATEX, C-TICK

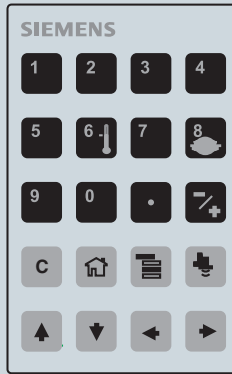
### Radar transmitters

#### 7ML5830-2AH



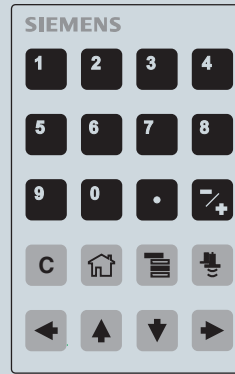
SITRANS Probe LR  
SITRANS LR300

#### 7ML5830-2AJ



SITRANS LR400  
SITRANS LR460

#### 7ML1930-1BK



SITRANS LR200  
SITRANS LR250  
SITRANS LR260

Handheld Programmer Selection Guide

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# SIEMENS

## Radar Application Questionnaire

### Customer information

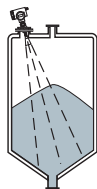
Contact: \_\_\_\_\_ Prepared By: \_\_\_\_\_  
 Company: \_\_\_\_\_ Date: \_\_\_\_\_  
 Address: \_\_\_\_\_ Notes on the Application: \_\_\_\_\_  
 City: \_\_\_\_\_ Country: \_\_\_\_\_  
 Zip/Postal Code: \_\_\_\_\_ Phone: ( ) \_\_\_\_\_  
 E-mail: \_\_\_\_\_ Fax: ( ) \_\_\_\_\_

### Vessel Information

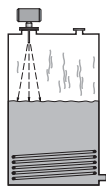
(supply sketch where possible)

Sketch attached

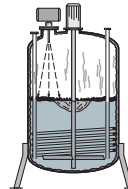
Storage  
Solids



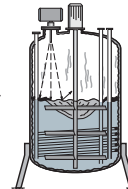
Storage  
Liquids



Process



Reactor



Area safety classification: \_\_\_\_\_

Height: \_\_\_\_\_ m/ft Diameter: \_\_\_\_\_ m/ft Filling method: \_\_\_\_\_

#### Top:

- Flat  
 Parabolic  
 Conical

#### Atmosphere: (indicate all that apply)

- Foam  
 Dust  
 Vapor  
 Steam  
 Deposit (build-up)

#### Pressure:

Norm: \_\_\_\_\_  
 Relief: \_\_\_\_\_

Mounting connection (specify type) \_\_\_\_\_

Distance to sidewall: \_\_\_\_\_ cm/in

Mounting connection maximum temperature: \_\_\_\_\_ C/F

Max. temperature at electronics: \_\_\_\_\_ C/F

Stilling well diameter: \_\_\_\_\_ cm/in

### Critical Information

Nozzle Length: \_\_\_\_\_ cm/in

Nozzle Diameter: \_\_\_\_\_ cm/in

### Material

Material being measured: \_\_\_\_\_  Liquid  Solid  Liquefied gas

Material temperature: Norm: \_\_\_\_\_ C/F Max: \_\_\_\_\_ C/F

Material surface:  Flat  Turbulent  Agitated  Vortex

Dielectric constant:   $\epsilon_r < 3$    $\epsilon_r > 3$

### Installation (indicate all that apply)

- Separated Head  
 Side  Manhole  
 Centre

### Available voltage:

- 100  230 V ac  
 115  24 V dc  
 200

### Communications:

- HART®  
 PROFIBUS PA  
 None

Products recommended: \_\_\_\_\_