Radar Transmitters

SITRANS LR200 (PROFIBUS PA)

Operating Instructions · 06/2010

SITRANS

SIEMENS

Safety Guidelines: Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel: This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Unit Repair and Excluded Liability:

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

Warning: Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.
This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Note: Always use product in accordance with specifications.

Contact SMPI Technical Publications at the following address:
Technical Publications
Siemens Milltronics Process Instruments Inc.
1954 Technology Drive, P.O. Box 4225
Peterborough, Ontario, Canada, K9J 7B1
Email: **techpubs.smpi@siemens.com**

European Authorized Representative

Siemens AG
Industry Sector
76181 Karlsruhe
Deutschland

- For a selection of Siemens Milltronics level measurement manuals, go to: **www. siemens.com/level**. Choose **Instructions and Manuals** under the More Info list.
- For a selection of Siemens Milltronics weighing manuals, go to: **www. siemens.com/weighing**. Choose **Support**, and then **Manuals / Operating Instructions**.

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Safety Notes

Special attention must be paid to warnings and notes highlighted from the rest of the text by grey boxes.

WARNING symbol relates to a caution symbol on the product, and means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

WARNING symbol used when there is no corresponding caution symbol on the product, means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

Note: means important information about the product or that part of the operating manual.

Safety marking symbols

In manual	On product	Description
		Earth (ground) Terminal
		Protective Conductor Terminal
		(Label on product.) WARNING: refer to accompanying documents (manual) for details.

FCC Conformity

US Installations only: Federal Communications Commission (FCC) rules

WARNING: Changes or modifications not expressly approved by Siemens Milltronics could void the user's authority to operate the equipment.

Notes:

- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference to radio communications, in which case the user will be required to correct the interference at his own expense.

CE Electromagnetic Compatibility (EMC) Conformity

This equipment has been tested and found to comply with the following EMC Standards:

EMC Standard	Title
CISPR 11:2004/EN 55011:1998+A1:1999&A2:2002, CLASS B	Limits and methods of measurements of radio disturbance characteristics of industrial, scientific, and medical (ISM) radio-frequency equipment.
EN 61326:1997+A1:1998+A2:2001+A3:2003 (IEC 61326:2002)	Electrical Equipment for Measurement, Control and Laboratory Use – Electromagnetic Compatibility.
EN61000-4-2:2001	Electromagnetic Compatibility (EMC) Part 4-2:Testing and measurement techniques – Electrostatic discharge immunity test.
EN61000-4-3:2002	Electromagnetic Compatibility (EMC) Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test.
EN61000-4-4:2004	Electromagnetic Compatibility (EMC) Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test.
EN61000-4-5:2001	Electromagnetic Compatibility (EMC) Part 4-5: Testing and measurement techniques – Surge immunity test.
EN61000-4-6:2004	Electromagnetic Compatibility (EMC) Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields.
EN61000-4-8:2001	Electromagnetic Compatibility (EMC) Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test.

The Manual

Notes:

- This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.
- Please follow the installation and operating procedures for a quick, trouble-free installation and to ensure the maximum accuracy and reliability of your SITRANS LR200.
- This manual applies to the SITRANS LR200 (PROFIBUS PA) only.

This manual will help you set up your SITRANS LR200 for optimum performance. We always welcome suggestions and comments about manual content, design, and accessibility. Please direct your comments to techpubs.smpi@siemens.com.

For other Siemens Milltronics level measurement manuals, go to: www.siemens.com/level and look under **Level Measurement.**

Application Examples

The application examples used in this manual illustrate typical installations using SITRANS LR200. (See *Appendix E: Application Examples* on page 130.) Because there is often a range of ways to approach an application, other configurations may also apply.

In all examples, substitute your own application details. If the examples do not apply to your application, check the applicable parameter reference for the available options.

Technical Support

Support is available 24 hours a day.

To find your local Siemens Automation Office address, phone number and fax number go to:

www.siemens.com/automation/partner

- Click on the tab **Contact**, select **Service,** then click **Service** again to find your product group **(+Automation Technology > +Sensor Systems >+Process Instrumentation > +Level Measurement > +Continous)**. Select **Radar**.
- Select the country followed by the City/Region.
- Select **Technical Support**.

For on-line technical support go to:

www.siemens.com/automation/support-request

- Enter the device name (SITRANS LR200) or order number, then click on **Search**, and select the appropriate product type. Click on **Next**.
- You will be prompted to enter a keyword describing your issue. Then either browse the relevant documentation, or click on **Next** to email a detailed description of your issue to Siemens Technical Support staff.

Siemens IA/DT Technical Support Center: phone +49 (0)911 895 7222

Abbreviations and Identifications

Short form	Long Form	Description	Units
AIFB	Analog Input Function Block		
CE / FM / CSA	Conformitè Europèene / Factory Mutual / Canadian Standards Association	safety approval	
C_i	Internal capacitance		F

Short form	Long Form	Description	Units (cont'd)
DCS	Distributed Control System	control room apparatus	
dK	dielectric constant		
EDD	Electronic Device Description		
I_i	Input current		mA
I_o	Output current		mA
IS	Intrinsically Safe	safety approval	
L_i	Internal inductance		mH
mH	milliHenry	10^{-3}	Henry
µF	microFarad	10^{-6}	Farad
µs	microsecond	10^{-6}	Second
µV	microVolt	10^{-6}	V
PA	Process Automation (PROFIBUS)		
PED	Pressure Equipment Directive	safety approval	
pF	pico Farads	10^{-12}	Farad
ppm	parts per million		
PV	Primary Value[a)]	measured value	
rms	root mean square	a statistical measure	
SELV	Safety extra low voltage		
SV	Secondary Value[a)]	equivalent value	
TB	Transducer Block		
TVT	Time Varying Threshold	sensitivity threshold	
U_i	Input voltage		V
U_o	Output voltage		V

a) The output from the Transducer Block can be called the Primary Value (or Secondary Value). When it becomes the input to the Analog Input Function Block (AIFB), it is called the Process Variable.

SITRANS LR200 Overview

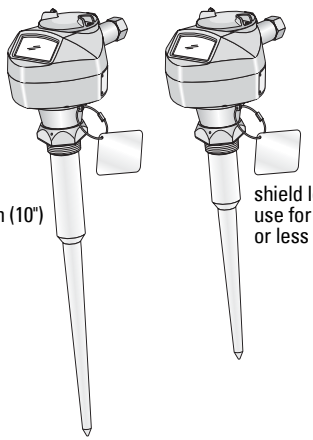
SITRANS LR200 is a 2-wire 6 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage vessels including high pressure and high temperature, to a range of 20 m (66 ft).

The instrument consists of an electronic circuit coupled to the antenna and process connection.

SITRANS LR200 supports PROFIBUS PA communication protocol, and SIMATIC PDM software. Signals are processed using Process Intelligence which has been field-proven in over 1,000,000 applications worldwide (ultrasonic and radar). This device supports acyclic communications from both a PROFIBUS Class I and Class II master.

Applications

- liquid bulk storage vessels
- simple process vessels with gentle agitation
- liquids and slurries



shield length 250 mm (10"): use for long nozzles of 250 mm (10") or less in length

shield length: 100 mm (4"): use for nozzles of 100 mm (4") or less in length

Programming

SITRANS LR200 is very easy to install and configure via a graphical local user interface (LUI). You can modify the built-in parameters either locally via the Siemens infrared hand-held programmer, or from a remote location via SIMATIC PDM.

Approvals and Certificates

SITRANS LR200 is available with General Purpose approval, or for hazardous areas. For details see *Approvals* on page 9.

Process Connections

A wide range of process connections and antenna options is available to suit virtually any vessel configuration.

Specifications

Notes:
- Siemens Milltronics makes every attempt to ensure the accuracy of these specifications but reserves the right to change them at any time.

Power

General Purpose:
Intrinsically Safe:
Non-Sparking/Energy Limited:
Non-incendive:

Bus powered	Per IEC 61158-2 (PROFIBUS PA)
Current consumed	10.5 mA

Performance

Reference operating conditions according to IEC 60770-1

• ambient temperature	+15 to +25 °C (+59 to +77 °F)
• humidity	45% to 75% relative humidity
• ambient pressure	860 to 1060 mbar g (86,000 to 106,000 N/m^2 g)

Measurement Accuracy (measured in accordance with IEC 60770-1)

• Maximum measured error (including hysteresis and non-repeatability)	
- From end of antenna to 600 mm	40 mm (1.57")
- Remainder of range	10 mm (0.4") or 0.1% of span (whichever is greater)
Frequency	5.8 GHz (6.3 GHz in N. America): refer to device nameplate for confirmation
Max. measurement range [1)]	20 m (65 ft)
Min. detectable distance[1)]	
• 3", 4", and 6" horn [2)]	300 mm (11.8")
• 8" horn	330 mm (12.9")
• PP rod, 100 mm internal shield	417 mm (16.4")
• PP rod, 250 mm internal shield	567 mm (22.3")
• PTFE rod, unshielded	417 mm (16.4")
• PTFE rod, 100 mm external shield	474 mm (18.6")
• PTFE rod, 250 mm external shield	624 mm (24.5")

1) From sensor reference point. For the sensor reference point for each configuration see *Dimensions: Uni-construction Polypropylene Rod Antenna* on page 11 for the standard version, or *Appendix H: Flange Adapter Versions* on page 154 onwards, for other configurations.

2) 3" and 4" horns should be used only in stillpipe applications.

Update time [1]	minimum 1 second, depending on settings for **Response Rate (2.3.8.1.)** and **LCD Fast Mode (4.9.)**.
Influence of ambient temperature	0.003% / K referred to maximum measurement range, averaged over full temperature range

Dielectric constant of material measured
- dK > 3 (for < 3 use waveguide antenna or stillpipe)

Memory
- non-volatile EEPROM
- no battery required.

Interface

Communication
- PROFIBUS PA

Configuration

• remote	Siemens SIMATIC PDM
• local	Siemens infrared handheld programmer
• display (local) [2]	graphic LCD, with bar graph representing level)

Mechanical

Process Connections:
- threaded connection

- polypropylene rod antenna	1.5" NPT (ANSI/ASME B1.20.1), R (BSPT, EN 10226-1) or G (BSPP, EN ISO 228-1)
- PTFE antenna, SS connection	2" NPT (ANSI/ASME B1.20.1), R (BSPT, EN 10226-1) or G (BSPP, EN ISO 228-1)

- flange connection (flat-face)

	2", 3", 4" (ASME 150 lb, 300 lb)
	DN50, DN80, DN100 (PN16, PN40)
	DN150, DN200 (PN16)
	50A, 80A, 100A (JIS 10K)
materials	316 L /1.4404 stainless steel
	or 316 L /1.4435 stainless steel

(See also *flange connection (raised face)* on page 8.)

1) Reference conditions: **Response Rate (2.3.8.1.)** set to **FAST**, **LCD Fast Mode (4.9.)** set to **ON**.

2) Display quality will be degraded in temperatures below –25 °C (–13 °F) and above +65 °C (+149 °F).

- flange connection (raised face)
  DN80, DN100, DN150 (PN16, PN40) per EN 1092-1 B1
  DN200 (PN16) per EN 1092-1 B1
  materials: 1.4404 or 1.4435 stainless steel

Antenna:
- polypropylene rod: hermetically sealed construction
  standard 100 mm (4") shield for maximum 100 mm (4") nozzle, or optional 250 mm (10") long shield
- PTFE rod: see *Appendix H: Flange Adapter Versions* on page 154
- horns/waveguide: see *Appendix H: Flange Adapter Versions* on page 154

Enclosure
- construction: aluminum, polyester powder-coated
- conduit entry: 2 x M20x1.5, or 2 x ½" NPT with adaptor
- ingress protection: Type 4X/NEMA 4X, Type 6/NEMA 6, IP 67, IP68 (see note below)

Notes:
- Check *Approvals* on page 9 for the specific configuration you are about to use or install.
- Use appropriate conduit seals to maintain IP or NEMA rating.

Weight (excluding extensions)
- 100 mm threaded polypropylene rod antenna: approx. 3.5 kg (7.7 lb)
- DN 50/PN 16 or 2" ASME 150 lb flat-face flange, rod or horn: approx. 8 kg (17.6 lb)
- DN 100/PN 16 or 4" ASME 150 lb flat-face flange, rod or horn: approx. 10.5 kg (23.1 lb)
- DN 200/PN 16 or 8" ASME 150 lb flat-face flange, rod or horn: approx. 19 kg (41.8 lb)
- DN100/PN16 raised-face flange, rod or horn: approx. 10 kg (22 lb)
- DN200/PN16 raised-face flange, rod or horn: approx. 20.8 kg (45.9 lb)

Environmental

- location — indoor/ outdoor
- altitude — 5000 m (16,404 ft) max.
- ambient temperature — –40 to +80 °C (–40 to +176 °F)
- relative humidity — suitable for outdoor
  Type 4X/NEMA 4X, Type 6/NEMA 6, IP67, IP68 enclosure (see note below)
- installation category — I
- pollution degree — 4

Note: Use appropriate conduit seals to maintain IP or NEMA rating.

Process

- process temperature [1)]
  -polypropylene rod — –40 to +80 °C (–40 to +176 °F)
  - PTFE rod or SS horn — –40 to +200 °C (–40 to +392 °F)
- pressure (vessel)[1)] — 3 bar, gauge (43.5 psi, gauge)

Approvals

Note: The device nameplate lists the approvals that apply to your device.

- General — $CSA_{US/C}$, FM, CE, C-TICK
- Radio — Europe (R&TTE)
  US: FCC
  Canada: Industry Canada
- Hazardous — Intrinsically Safe [2)]

(Europe)	ATEX II 1G, EEx ia IIC T4
(International)	IECEx TSA 05.0009X Ex ia IIC T4
(US/Canada)	FM/CSA: (barrier required) Class I, Div. 1, Groups A, B, C, D Class II, Div. 1, Groups E, F, G Class III T4

1) The maximum temperature is dependent on the process connection, antenna materials, and vessel pressure. For more detail, or for other configurations, see *Maximum Process Temperature Chart* on page 124, and *Process Pressure/Temperature derating curves* on page 125 onwards.

2) See *Intrinsically Safe wiring* on page 21

• Hazardous	Intrinsically Safe [1] (continued)		
		(Australia)	ANZEx Ex ia IIC T4
		(Brazil)	BR-Ex ia IIC T4
	Non-sparking/ Energy Limited [2]	(Europe)	ATEX II 3 G Ex nA/nL IIC T4 Gc
	Non-incendive [3]	(US)	FM: Class I, Div. 2, Groups A, B, C, D T5
• Marine	Lloyd's Register of Shipping ABS Type Approval		

Programmer (infrared keypad)

Notes:
- Battery is non-replaceable with a lifetime expectancy of 10 years in normal use.
- To estimate the lifetime expectancy, check the nameplate on the back for the serial number. The first six numbers show the production date (mmddyy), for example, serial number 032608101V.

Siemens Milltronics Infrared IS (Intrinsically Safe) Handheld Programmer for hazardous and all other locations.

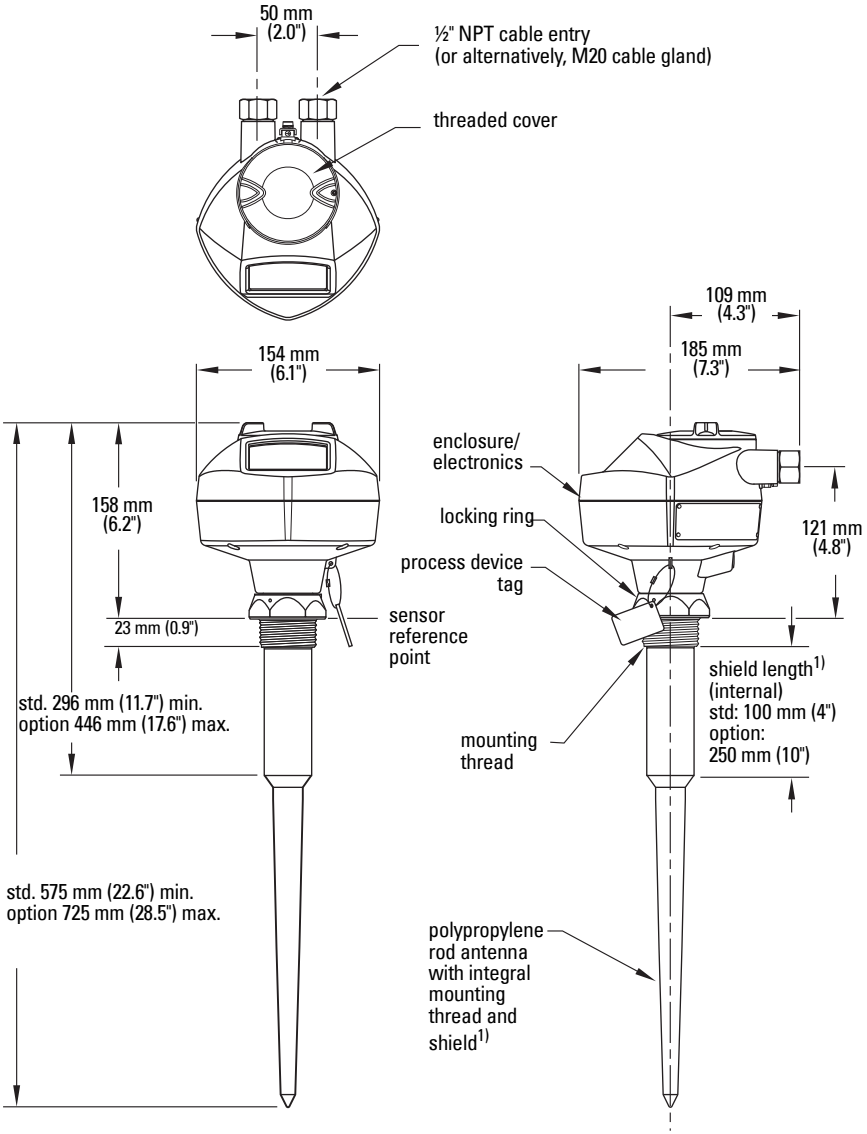
• approvals	FM/CSA Class I, II, III, Div. 1, Gr. A to G T6 CE ATEX II 1GD Ex ia IIC T4 Ga Ex iaD 20 T135 °C IECEx SIR 09.0073 Ex ia IIC T4 Ga Ex iaD 20 T135 °C INMETRO Br-Ex ia IIC T4
• ambient temperature	–20 to +50 °C (–5 to +122 °F)
• interface	proprietary infrared pulse signal
• power	3 V lithium battery
• weight	150 g (0.3 lb)
• color	black
• Part Number	7ML1930-1BK

[1] See *Intrinsically Safe wiring* on page 21

[2] See *Non-Sparking-Energy Limited* on page 23.

[3] See *Non-incendive wiring (US only)* on page 23.

Dimensions: Uni-construction Polypropylene Rod Antenna



1) The shield is the area of the rod which is inactive. The shield length must be longer than the vessel nozzle height.

Threaded Connection Markings

Threaded connection markings are found on the flat face/faces of the process connection.

Serial number:a unique number allotted to each process connection, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.

! WARNINGS:

- **Handle the device using the enclosure, not the antenna or the device tag, to avoid damage.**
- **Installation shall be performed only by qualified personnel and in accordance with local governing regulations.**
- **SITRANS LR200 is to be used only in the manner outlined in this manual, otherwise protection provided by the device may be impaired.**
- **Never attempt to loosen, remove, or disassemble process connection or instrument housing while vessel contents are under pressure.**
- **Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.**
- **The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use and which are suitable for the service conditions.**
- **Improper installation may result in loss of process pressure.**

Notes:

- Refer to the device nameplate for approval information.
- The Process Device Tag shall remain with the process pressure boundary assembly[1)]. In the event the instrument package is replaced, the Process Device Tag shall be transferred to the replacement unit.
- SITRANS LR200 units are hydrostatically tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.
- The serial numbers stamped in each process connection body provide a unique identification number indicating date of manufacture.
  Example: MMDDYY – XXX (where MM = month, DD = day, YY = year, and XXX= sequential unit produced)
  Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.

1) The process pressure boundary assembly comprises the components that act as a barrier against pressure loss from the process vessel: that is, the combination of process connection body and emitter, but normally excluding the electrical enclosure.

Pressure Equipment Directive, PED, 97/23/EC

Siemens Level Transmitters with flanged, threaded, or sanitary clamp type process mounts have no pressure-bearing housing of their own and, therefore, do not come under the Pressure Equipment Directive as pressure or safety accessories, (see EU Commission Guidelines 1/8 and 1/20).

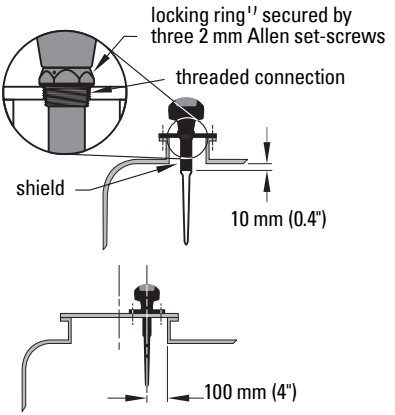
Mounting location

Notes:
- Correct location is key to a successful application.
- Avoid reflective interference from vessel walls and obstructions by following the guidelines below

Nozzle design

Notes:
- For nozzles 100 mm (4") in length or shorter use the 100 mm (4") shield.
- For nozzles 250 mm (10") in length or shorter use the 250 mm (10") shield.
- For details on other applications, see *Appendix H: Flange Adapter Versions* on page 154.

- The end of the shield section should protrude a minimum of 10 mm (0.4") to avoid false echoes being reflected from the nozzle.



Location on a manhole cover

- A manhole cover is typically a covered nozzle with a diameter 610 mm (24") or greater.
- For optimum signal conditions, locate the antenna off-center, typically 100 mm (4") from the side.

Nozzle location

! WARNING: For vessels with conical or parabolic tops, avoid mounting the instrument at the centre. (The concavity of the top can focus echoes into the centre, giving false readings.)

Note: Under certain circumstances, it may be acceptable to mount SITRANS LR200 at the centre of a flat-topped tank: please discuss this with your Siemens Milltronics Representative.

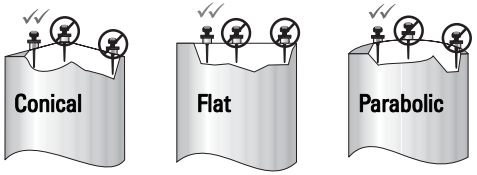
[1] When the locking ring is secured, it prevents the enclosure rotating on the threaded connection.

Nozzle location (continued)

- Avoid central locations on vessels

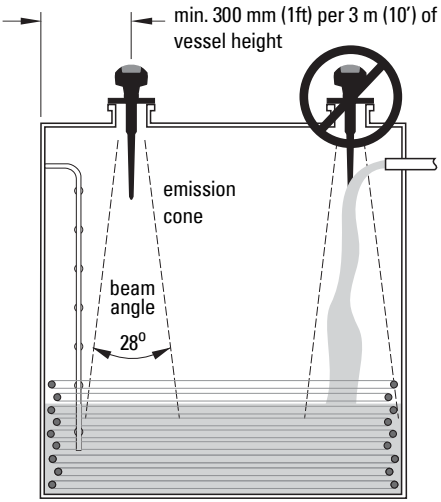
✓✓ preferred

⊘ undesirable



Beam angle

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



Emission cone

- Keep the emission cone free of interference from ladders, pipes, I-beams or filling streams.
- Locate the antenna away from the side wall, to avoid interference from indirect echoes.
- Make allowance for the emission cone spreading: allow a minimum of 300 mm (1 ft) for every 3 m (10 ft) of vessel height.

Environment

- Provide an environment suitable to the housing rating and materials of construction.
- Maintain ambient temperature within –40 to +80 °C (–40 to +176 °F)[1].
- Use a sunshield if the instrument will be exposed to direct sunlight.

(continued on next page)

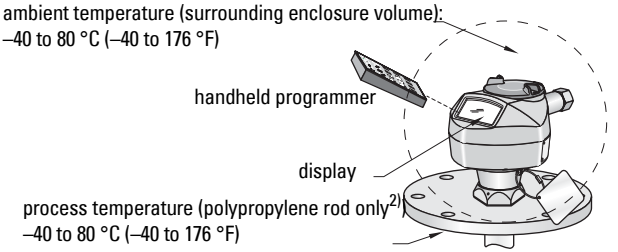
1) For more detail on maximum interface and process temperatures, see *Maximum Process Temperature Chart* on page 124.

2) For other configurations, see *Maximum Process Temperature Chart* on page 124, and the process pressure derating curves beginning on *Process Pressure/Temperature derating curves* on page 125.

Nozzle location (continued)

Access for programming

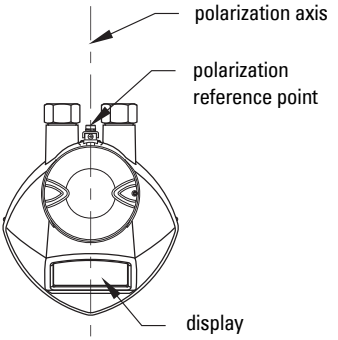
- Provide easy access for viewing the display and programming via the hand programmer.



Orientation in a vessel with obstructions

Polarization reference point

- For best results on a tank with obstructions, or a stillpipe with openings, orient the front or back of the device toward the obstructions.
- See *Mounting on a Stillpipe or Bypass Pipe* below, for more detail.



Mounting on a Stillpipe or Bypass Pipe

A stillpipe or bypass is used for products with a low dK[1], or when vortex or extremely turbulent conditions exist. It can also be used to provide optimum signal conditions on foaming materials.

Stillpipe or Bypass Pipe requirements

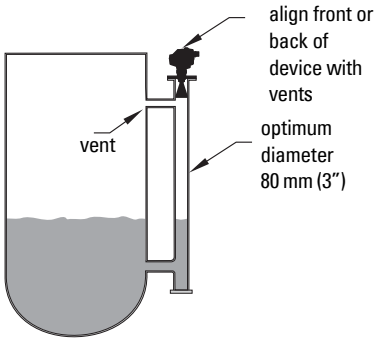
- The pipe diameter must be matched with the horn size. Use the largest horn size that will fit the stillpipe/bypass pipe (see *Flanged Horn dimensions* on page 158.
- Suitable pipe diameters: 50 mm (2") to 200 mm (8")
- One continuous length of metallic pipe is preferred, without joints (to avoid false echoes).

1) See *Dielectric constant of material measured* on page 7.

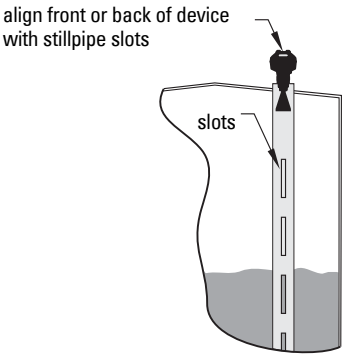
- Joints (if unavoidable) must be machined to ± 0.25 mm (± 0.010") and must have a welded connecting sleeve on the outside.
- Bypass vent is required at the upper end of the bypass[1)].
- Propagation factor. depends on pipe diameter. See **Propagation Factor (2.5.3.)** on page 70 for a table.

Device orientation

Bypass Installation



Stillpipe Installation



Installation Instructions

! WARNING: For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.

Notes:
- There is no limit to the number of times a device can be rotated without damage.
- When mounting, orient the front or back of the device towards the closest wall.
- Do not rotate the enclosure after programming and device configuration, otherwise an error may occur, caused by a polarity shift of the transmit pulse.

Threaded Version

1. Before inserting the device into its mounting connection, check to ensure the threads are matching, to avoid damaging them.
2. Simply screw SITRANS LR200 into the process connection, and hand tighten. For pressure applications, it will be necessary to use PTFE tape (or other appropriate thread sealing compound) and tighten the process connection beyond hand tight.

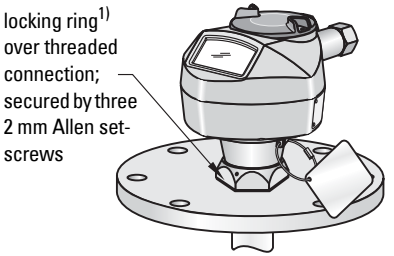
   The maximum torque is 40 N·m (30 ft.lbs).

(continued on next page)

[1)] To equalize pressure and keep the liquid level in the bypass constant with the liquid level in the vessel.

3. If you want to rotate the enclosure, use a 2 mm Allen key to loosen the set-screws that secure the locking ring[1)].

4. Once the enclosure is in a suitable position, tighten the set-screws.



1) When the locking ring is secured, it prevents the enclosure rotating on the threaded connection.

Wiring

Power

WARNINGS:

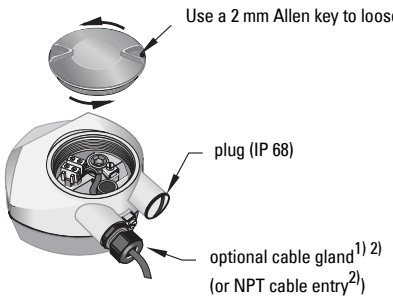
⚠ **The DC input terminals shall be supplied from a source providing electrical isolation between the input and output, in order to meet the applicable safety requirements of IEC 61010-1.**

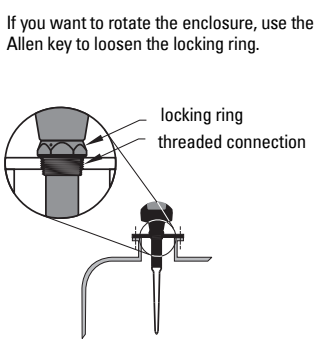
! **All field wiring must have insulation suitable for rated voltages.**

Connecting SITRANS LR200

! **WARNINGS:**

- **Check the nameplate on your instrument, to verify the approval rating.**
- **Use appropriate conduit seals to maintain IP or NEMA rating.**
- **See *Wiring Setups for hazardous area installations* on page 21.**





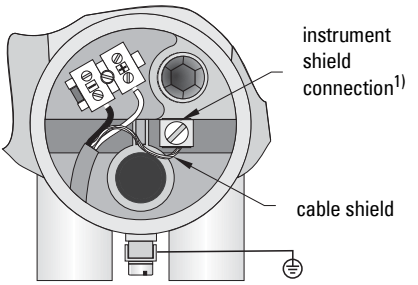
1. Strip the cable jacket for approximately 70 mm (2.75") from the end of the PROFIBUS PA cable, and thread the wires through the gland[2].

(continued on next page)

1) May be shipped with the device.

2) If cable is routed through conduit, use only approved suitable-size hubs for water-proof applications.

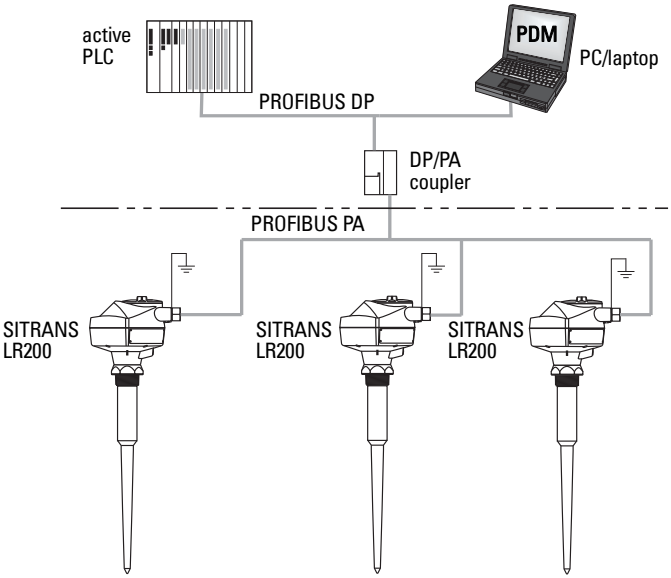
2. Connect the wires to the terminals as shown. (SITRANS LR200 is not polarity sensitive.)
3. Ground the instrument according to local regulations.
4. Tighten the gland to form a good seal.
5. Close the lid and secure the locking ring before programming and device configuration.



Notes:

- PROFIBUS PA must be terminated at both extreme ends of the cable for it to work properly.
- Please refer to the *PROFIBUS PA User and Installation Guidelines* (order number 2.092), available from www.profibus.com, for information on installing PROFIBUS devices.

Basic PLC configuration with PROFIBUS PA



1) The instrument shield connection is internally connected to the external ground lug.

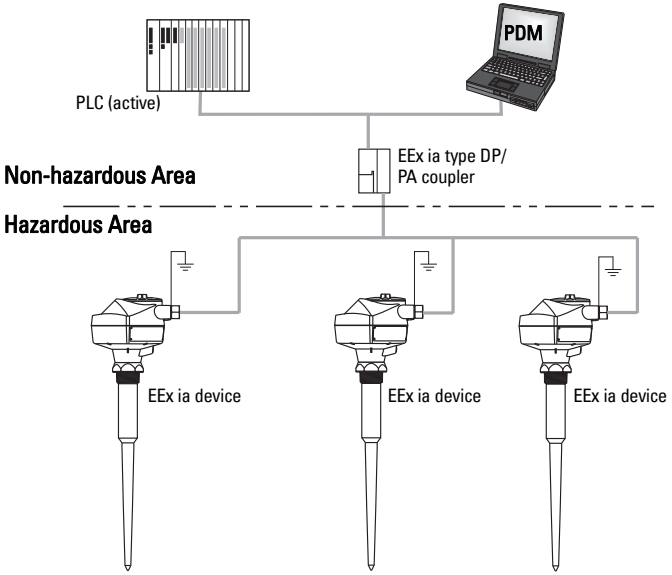
Wiring Setups for hazardous area installations

There are three wiring options for hazardous area installations:

- *Intrinsically Safe wiring* on page 21
- *Non-Sparking-Energy Limited* on page 23
- *Non-incendive wiring (US only)* on page 23

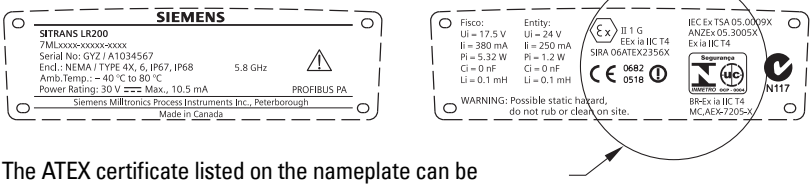
In all cases, check the nameplate on your instrument, and confirm the approval rating.

PLC configuration with PROFIBUS PA for hazardous areas



1. Intrinsically Safe wiring

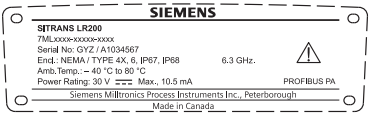
Device nameplate (ATEX/IECEX/INMETRO/C-TICK)

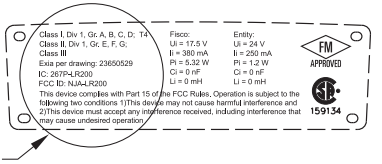


The ATEX certificate listed on the nameplate can be downloaded from the product page of our website at: www.siemens.com/LR200. Go to **Support > Approvals / Certificates.**

The IECEx certificate listed on the nameplate can be viewed on the IECEx website. Go to: http://iecex.iec.ch **> Ex Equipment Certificates of Conformity** and enter the certificate number **IECEx TSA 05.0009x**.

Device nameplate (FM/CSA)





The FM/CSA Intrinsically Safe connection drawing number **23650529** can be downloaded from the product page of our website at: www.siemens.com/LR200. Go to **Support > Installation Drawings > Level Measurement > Continuous - Radar.**

- For wiring requirements: follow local regulations.
- Approved dust-tight and water-tight conduit seals are required for outdoor NEMA 4X / type 4X / NEMA 6, IP67, IP68 locations.
- Refer to *Instructions specific to hazardous area installations* on page 24.

Under the entity evaluation concept, SITRANS LR200 has the following characteristics:

(input voltage) U_i	= 24 V
(input current) I_i	= 250 mA
(input power) P_i	= 1.2 W
(internal capacitance) Ci	= 0
(internal inductance) Li	= 0

Entity Concept:

The Entity Concept allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage and current which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal to or greater than the output voltage (Uo) and output current (Io) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (Ci) and Inductance (Li) of the intrinsically safe apparatus, including interconnecting wiring, must be equal to or less than the capacitance and inductance which can be safely connected to associated apparatus.

FISCO Concept

Under the FISCO evaluation concept, SITRANS LR200 has the following characteristics:

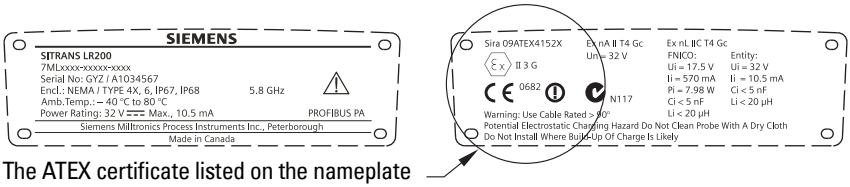
(input voltage) U_i	= 17.5 V
(input current) I_i	= 380 mA
(input power) P_i	= 5.32 W
(internal capacitance) Ci	= 0
(internal inductance) Li	= 0

Note: For complete details and instructions regarding the FISCO Concept The FM/CSA connection drawing number **23650529** can be downloaded from the product page of our website at: www.siemens.com/LR200. Go to **Support > Installation Drawings > Level Measurement > Continuous - Radar.**

The FISCO Concept allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage (Ui or Vmax), the current (Ii, or Imax) and the power (Pi, or Pmax) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal to or greater than the voltage (Uo or Voc or Vi), the current (Io or Isc or Ii), and the power (Po or Pmax) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (Ci) and inductance (Li) of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to 5 nF and 10 µH respectively.

In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system. The allowed voltage Uo (or Voc or Vt) of the associated apparatus is limited to the range of 14V dc to 24V dc. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except for a leakage current of 50 µA for each connected device. Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.

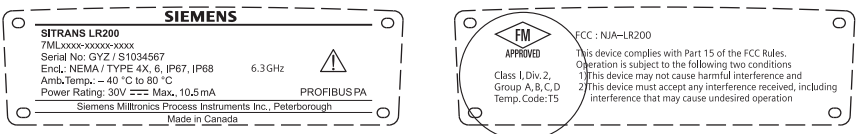
2. Non-Sparking-Energy Limited



The ATEX certificate listed on the nameplate can be downloaded from the product page of our website at: www.siemens.com/LR200. Go to: **Support > Approvals / Certificates.**

- For wiring requirements: follow local regulations.
- Approved dust-tight and water-tight conduit seals are required for outdoor NEMA 4X / type 4X / NEMA 6, IP67, IP68 locations.

3. Non-incendive wiring (US only)



FM Class 1, Div 2 connection drawing number 23650537 can be downloaded from the product page of our website at: www.siemens.com/LR200. Go to **Support > Installation Drawings > Level Measurement > Continuous - Radar.**

- For wiring requirements: follow local regulations.
- Approved dust-tight and water-tight conduit seals are required for outdoor NEMA 4X / type 4X / NEMA 6, IP67, IP68 locations.
- Refer to *Instructions specific to hazardous area installations* on page 24

Instructions specific to hazardous area installations

(Reference European ATEX Directive 94/9/EC, Annex II, 1/0/6)

The following instructions apply to equipment covered by certificate number SIRA 06ATEX2356X and SIRA 09ATEX4152X:

1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 1G equipment per SIRA 06ATEX2356X, and Category 3G equipment per SIRA 09ATEX4152X.
3. The equipment may be used with flammable gases and vapors with apparatus groups IIC, IIB, and IIA, and temperature classes T1, T2, T3, and T4.
4. The equipment is certified for use in an ambient temperature range of –40 °C to +80 °C.
5. The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).
6. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
7. The equipment is non-repairable.
8. The certificate numbers have an 'X' suffix, which indicates that special conditions for safe use apply. Those installing or inspecting this equipment must have access to the certificates.
9. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

   Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.

   Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

Operating via the handheld programmer

SITRANS LR200 carries out its level measurement tasks according to settings made via parameters. The settings can be modified locally via the Local User Interface (LUI) which consists of an LCD display and a handheld programmer.

A Quick Start Wizard provides an easy 5-step procedure to help you configure the device for a simple application. There are two ways to access the wizard:

- locally (see *Quick Start Wizard via the handheld programmer* on page 30)
- from a remote location (see *Quick Start Wizard via SIMATIC PDM* on page 36)

For more complex setups see *Appendix E: Application Examples* on page 130, and for the complete range of parameters see *Parameter Reference* on page 59.

Activating SITRANS LR200

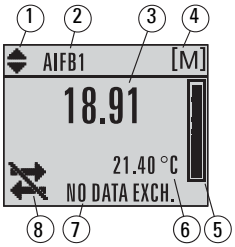
Power up the instrument. SITRANS LR200 automatically starts up in Measurement mode. A transition screen showing the current firmware revision and an incrementing line of stars is displayed while the first measurement is being processed.

Press **Mode** to toggle between Measurement and Program Mode.

The LCD Display

Measurement mode

Normal operation



1 – toggle indicator[1] for AIFB 1 or AIFB 2
2 – identifies which AIFB is source of displayed value
3 – measured value (level, space, distance, or volume)
4 – units
5 – bar graph indicates level
6 – secondary region indicates on request[2] electronics temperature, echo confidence, or distance
7 – text area displays status messages
8 – device status indicator

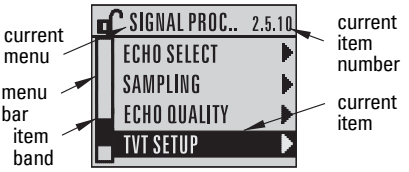
Fault present

7 – text area displays a fault code and an error message
8 – service required icon appears

1) Press **UP** or **DOWN** arrow to switch.
2) In response to a key press request. For details, see *Programming SITRANS LR200* on page 27.

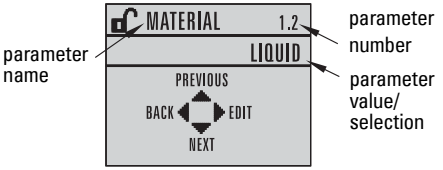
PROGRAM mode display

Navigation view

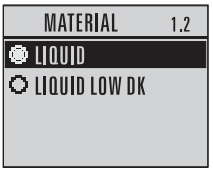


- A visible menu bar indicates the menu list is too long to display all items.
- A band halfway down the menu bar indicates the current item is halfway down the list.
- The depth and relative position of the item band on the menu bar indicates the length of the menu list, and approximate position of the current item in the list.
- A deeper band indicates fewer items.

Parameter view



Edit view



Handheld Programmer

(Part No. 7ML1930-1BK)

The programmer is ordered separately.

Key functions in Measurement mode

Key	Function	Result
6	Updates internal enclosure temperature reading.	New value is displayed in LCD secondary region.
8	Updates echo confidence value.	

Key	Function	Result (cont'd)
	Updates distance measurement.	New value is displayed in LCD secondary region
	Mode opens PROGRAM mode.	Opens the menu level last displayed in this power cycle, unless power has been cycled since exiting PROGRAM mode or more than 10 minutes have elapsed since PROGRAM mode was used. Then top level menu will be displayed.
	RIGHT arrow opens PROGRAM mode.	Opens the top level menu.
	UP or **DOWN arrow** toggles between AIFB 1 and AIFB 2.	Identifies which AIFB is the source of the displayed value.

Programming SITRANS LR200

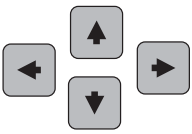
Notes:
- While the device is in PROGRAM mode the output remains active and continues to respond to changes in the device.
- SITRANS LR200 automatically returns to Measurement mode after a period of inactivity in PROGRAM mode (between 15 seconds and 10 minutes, depending on the menu level).

Change parameter settings and set operating conditions to suit your specific application. (For remote operation see *Operating via SIMATIC PDM* on page 34.)

Parameter menus

Note: For the complete list of parameters with instructions, see *Parameter Reference* on page 59

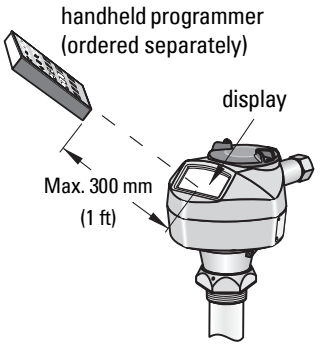
Parameters are identified by name and organized into function groups (see *LCD menu structure* on page 181).



1. QUICK START
2. SETUP
2.1. IDENTIFICATION
.....
2.4. LINEARIZATION
2.4.1. VOLUME
2.4.1.1.VESSEL SHAPE

1. Enter PROGRAM mode

- Point the programmer at the display (from a maximum distance of 300 mm [1 ft]).
- **RIGHT arrow** activates PROGRAM mode and opens menu level 1.
- **Mode** opens the menu level last displayed in PROGRAM mode within the last 10 minutes, or menu level 1 if power has been cycled since then.



2. Navigating: key functions in Navigation mode

Notes:

- In Navigation mode **ARROW keys** move to the next menu item in the direction of the arrow.
- For Quick Access to parameters via the handheld programmer, press **Home**, then enter the menu number, for example: **2.4.1.** (Volume)

Key	Name	Menu level	Function
	UP or **DOWN arrow**	menu or parameter	Scroll to previous or next menu or parameter.
	RIGHT arrow	menu	Go to first parameter in the selected menu, or open next menu.
		parameter	Open **Edit** mode.
	LEFT arrow	menu or parameter	Open parent menu.
	Mode	menu or parameter	Change to **MEASUREMENT** mode.
	Home	menu or parameter	Open top level menu: menu 1.

3. Editing in PROGRAM mode

Selecting a listed option

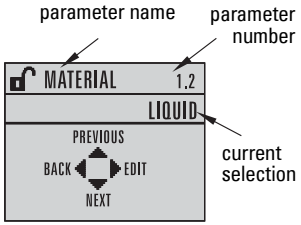
a) Navigate to the desired parameter.

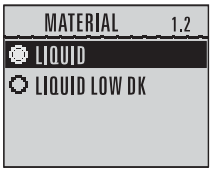
b) Press **RIGHT arrow** to open parameter view.

c) Press **RIGHT arrow** again to open **Edit** mode. The current selection is highlighted. Scroll to a new selection.

d) Press **RIGHT arrow** to accept it

The LCD returns to parameter view and displays the new selection.





Changing a numeric value

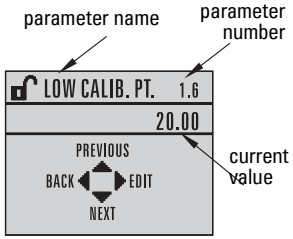
a) Navigate to the desired parameter.

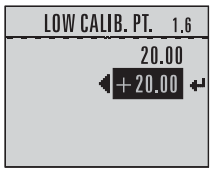
b) Press **RIGHT arrow** to open parameter view. The current value is displayed.

c) Press **RIGHT arrow** again to open **Edit** mode. The current value is highlighted.

d) Key in a new value.

e) Press **RIGHT arrow** to accept it. The LCD returns to parameter view and displays the new selection.





Key functions in Edit mode

Key	Name	Function	
▲ ▼	**UP** or **DOWN arrow**	Selecting options	Scrolls to item.
		Numeric editing	- Increments or decrements digits - Toggles plus and minus sign
▶	**RIGHT arrow**	Selecting options	- Accepts the data (writes the parameter) - Changes from **Edit** to **Navigation** mode
		Numeric editing	- Moves cursor one space to the right - or with cursor on Enter sign, accepts the data and changes from **Edit** to **Navigation** mode

Key	Name	Function (cont'd)	
◄	**LEFT arrow**	Selecting options	Cancels **Edit** mode without changing the parameter
		Numeric editing	- Moves cursor to plus/minus sign if this is the first key pressed - or moves cursor one space to the left.
C	**Clear**	Numeric editing	Erases the display.
•	**Decimal point**	Numeric editing	Enters a decimal point.
−/+	**Plus or minus sign**	Numeric editing	Changes the sign of the entered value.
0 to 9	**Numeral**	Numeric editing	Enters the corresponding character.

Quick Start Wizard via the handheld programmer

Notes:
- The Quick Start wizard settings are inter-related and changes apply only after you select **YES** in **Apply? (Apply changes) (1.8.)**
- Do not use the Quick Start wizard to modify individual parameters: see instead *Parameter Reference* on page 59. (Perform customization only after the Quick Start has been completed.)

1. Quick Start

a. Point the programmer at the display (from a maximum distance of 300 mm [1 ft]), then press **RIGHT arrow** ► to activate PROGRAM mode and open menu level 1.

b. Press **RIGHT arrow** ► twice to navigate to menu item 1.1 and open parameter view.

c. Press **RIGHT arrow** ► to open **Edit** mode or **DOWN arrow** ▼ to accept default values and move directly to the next item.

d. To change a setting, scroll to the desired item or key in a new value.

e. After modifying a value, press **RIGHT arrow** ► to accept it and press **DOWN arrow** ▼ to move to the next item.

1.1. Language

Selects the language to be used on the LCD and takes effect immediately.

Options	English, Deutsch, Français, Español

1.2. Material

Selects the appropriate echo processing algorithms for the material (see Position Detect (2.5.7.2.) on page 117 for more detail).

Options	LIQUID
	LIQUID LOW DK[1)] (low dielectric liquid – CLEF *algorithm enabled*)

1) dK < 3.0

1.3. Response Rate

Sets the reaction speed of the device to measurement changes in the target range.

	Response Rate (2.3.8.1.)	**Fill Rate (2.3.8.2.)/Empty rate (2.3.8.3.)**
Options	SLOW	0.1 m/min (0.32 ft/min)
	MED	1.0 m/min (3.28 ft/min)
	FAST	10.0 m/min (32.8 ft/min)

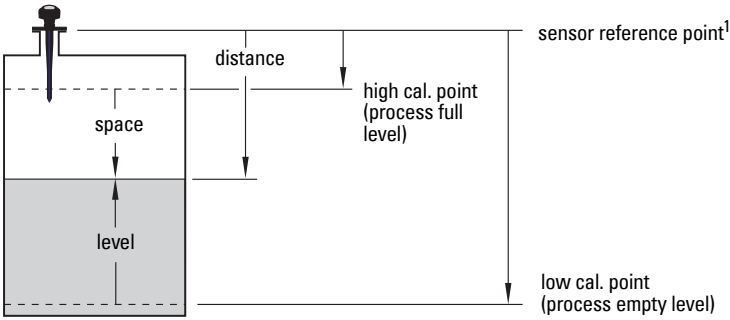
Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

1.4. Units

Sensor measurement units.

Options	M, CM, MM, FT, IN

1.5. Operating Mode



Operating Mode	**Description**	**Reference point**
NO SERVICE	Measurement not being updated. the device defaults to Fail-safe mode[1)].	
LEVEL	Distance to material surface	Low Calibration Point
SPACE	Distance to material surface	High Calibration Point
DISTANCE	Distance to material surface	Sensor Reference Point

1) See **Mode (2.6.9.1.)** on page 80 for more detail.

1) The point from which High and Low Calibration points are referenced: see *Dimensions: Uni-construction Polypropylene Rod Antenna* on page 11 and *Appendix H: Flange Adapter Versions* on page 154.

1.6. Low Calibration Point

*Distance from Sensor Reference to Low Calibration Point: usually process empty level. (See **Operating Mode (1.5.)** for an illustration.)*

Values	Range: 0.00 to 20.00 m

1.7. High Calibration Point

*Distance from Sensor Reference to High Calibration Point: usually process full level. (See **Operating Mode (1.5.)** for an illustration.)*

Values	Range: 0.00 to 20.00 m

1.8. Apply? (Apply changes)

*In order to save the Quick Start settings it is necessary to select **Yes** to apply changes.*

Options	YES, NO, DONE (Display shows DONE when Quick Start is successfully completed.)

Press **Mode** to return to Measurement mode. SITRANS LR200 is now ready to operate.

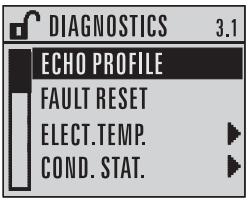
Auto False Echo Suppression

If you have a vessel with known obstructions, we recommend using Auto False Echo Suppression to prevent false echo detection. See **TVT setup (2.5.10.)** for instructions.

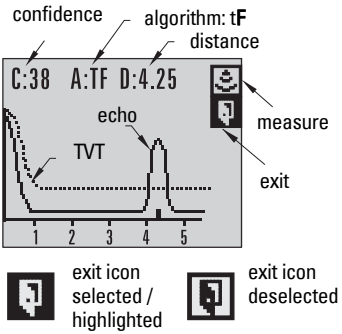
This feature can also be used if SITRANS LR200 displays a false high level, or the reading is fluctuating between the correct level and a false high level.

Requesting an Echo Profile

- In PROGRAM mode, navigate to: **Level Meter > Diagnostics (3.) > Echo Profile (3.1.)**
- Press **RIGHT arrow** to request a profile.



- **UP/DOWN arrows** are dedicated to scrolling through the icons.
- The selected icon is highlighted.
- Press **UP arrow** to select **Measure** and **RIGHT arrow** to update the profile.
- Press **DOWN arrow** to select **Exit** then press **RIGHT arrow** to return to the previous menu.



Device Address

The unique address of the device on the network (also called PROFIBUS address).

Values	0 - 126. Default: 126

a) In PROGRAM mode, navigate to: **Level Meter > Communication (5.) > Device Address (5.1.).**

b) Press **RIGHT arrow** twice to open parameter view and enable Edit mode.

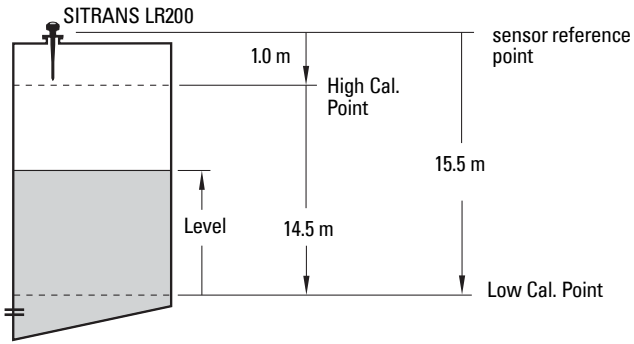
c) If required, key in a new value and press **RIGHT arrow** to accept it. The LCD displays the new value.

d) Press **Mode** to return to Measurement mode.

Level application example

The application is a vessel that takes an average 3 hours (180 minutes) to fill and 3 weeks to empty.

Fill rate = 0.08 m/minute [(Low Cal Pt. minus High Cal Pt.) / fastest of fill or empty time]
= (15.5 m – 1 m) / 180 min.
= 14.5 m /180 min. = 0.08 m/min.



Quick Start Parameter	Setting	Description
Material (1.2.)	LIQUID	
Response Rate (1.3.)	SLOW	Resets Fill Rate and Empty Rate to 0.1 m/minute.
Units (1.4.)	m	
Operating Mode (1.5.)	LEVEL	Material level referenced from Low Cal. Point.
Low Calibration Point (1.6.)	15.5	Process empty level.
High Calibration Point (1.7.)	1.0	Process full level.
Apply? (Apply changes) (1.8.)	YES	Save new settings.

Operating via SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain SITRANS LR200 and other process devices. Please consult the operating instructions or online help for details on using SIMATIC PDM. (You can find more information at www.siemens.com/simatic-pdm.)

Functions in SIMATIC PDM

Notes:
- For a complete list of parameters see *Parameter Reference* on page 59.
- While the device is in PROGRAM mode the output remains active and continues to respond to changes in the device.

SIMATIC PDM monitors the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data; also to set schedules for calibration and maintenance.

Parameters are identified by name and organized into function groups. See *LCD menu structure* on page 181 for a chart[1)] and *Changing parameter settings using SIMATIC PDM* on page 42 for more details.

See *Parameters accessed via pull-down menus* on page 43 for parameters that do not appear in the menu structure in SIMATIC PDM.

Features of SIMATIC PDM Rev. 6.0, SP4

The graphic interface in SITRANS LR200 makes monitoring and adjustments easy:

Feature	page	Function
Wizard - Quick Start	36	Device configuration for simple applications
Echo Profile Utilities	44	Easy access to echo profile viewing/comparison, TVT shaping, auto false echo suppression and echo setup
Auto False Echo Suppression	46	Screen out false echoes
TVT Shaper	45	Manual TVT adjustment
Linearization	39	Volume measurement in an irregular vessel
Process Variables	52	Monitor process variables and level trend
Security	56	Protect security and communication parameters from modification by the maintenance user

1) The menu structure for SIMATIC PDM is almost identical to that for the LCD.

Features of SIMATIC PDM Rev. 5.2, SP1

SIMATIC PDM Rev. 5.2 SP1 is supported only for basic configuration and troubleshooting. (For advanced features such as the Quick Start wizard, Rev. 6.0 SP4 or higher is required.)

Electronic Device Description (EDD)

You can locate the EDD in Device Catalog, under **Sensors/Level/Echo/Siemens Milltronics/ SITRANS LR200**. Check the product page of our website at: www.siemens.com/LR200, under **Downloads**, to make sure you have the latest version of SIMATIC PDM, the most recent Service Pack (SP) and the most recent hot fix (HF). If you need to install a new EDD see *Configuring a new device* below.

Configuring a new device

Note: Clicking on **Cancel** during an upload from device to SIMATIC PDM will result in some parameters being updated.

1) Check that you have the most recent EDD, and if necessary download it from the product page of our website at www.siemens.com/LR200. Save the files to your computer, and extract the zipped file to an easily accessed location. Launch **SIMATIC PDM – Manager Device Catalog**, browse to the unzipped EDD file and select it.
2) Set Address via handheld programmer (default for PROFIBUS PA is 126). (See *To set Device Address via SIMATIC PDM:* below to use SIMATIC PDM.)
   - In PROGRAM mode, navigate to: **Level Meter > Communication (5.) > Device Address (5.1.).**
   - Press **RIGHT arrow** [→], **RIGHT arrow** [→], to open parameter view and enable Edit mode.
   - If required, key in a new value and press **RIGHT arrow** [→] to accept it. The LCD displays the new value.
   - Press **Mode** [≡] to return to Measurement mode.
3) Launch SIMATIC Manager and create a new project for LR200. Application Guides for setting up PROFIBUS PA devices with SIMATIC PDM can be downloaded from the product page of our website at: www.siemens.com/LR200.
4) Open the menu **Device – Master Reset** and click on **Factory Defaults**.
5) After the reset is complete click on **Close**, then upload parameters to the PC/PG.
6) Configure the device via the Quick Start wizard.

To set Device Address via SIMATIC PDM:

- Open the project in **Process Device Network View** then right-click on the device.
- Go to **Object Properties > Connection** to access the field **Short Address**.

Quick Start Wizard via SIMATIC PDM

The graphic Quick Start Wizard provides an easy 5-step procedure that configures the device for a simple application.

Please consult the operating instructions or online help for details on using SIMATIC PDM.

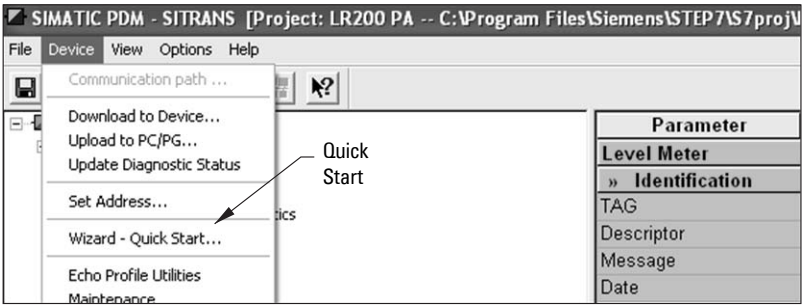
1) If you have not already done so, check that you have the most up-to-date Electronic Device Description (EDD) for your instrument. (See *Configuring a new device* on page 35.)
2) Launch SIMATIC Manager and create a new project for LR200. Application Guides for setting up PROFIBUS PA devices with SIMATIC PDM can be downloaded from the product page of our website at: www.siemens.com/LR200.

Wizard - Quick Start

Notes:

- The Quick Start wizard settings are inter-related and changes apply only after you click on **FINISH AND DOWNLOAD** at the end of step 5 to save settings offline and transfer them to the device.
- Do not use the Quick Start Wizard to modify individual parameters: For quick access to echo profile parameters see *Echo Setup* on page 48, or see *Parameter Reference* on page 59 for a complete list. (Perform customization only after the Quick Start has been completed.)
- Click on **BACK** to return and revise setting or **CANCEL** to exit the Quick Start.
- For a vessel with obstructions see *Auto False Echo Suppression* on page 46.

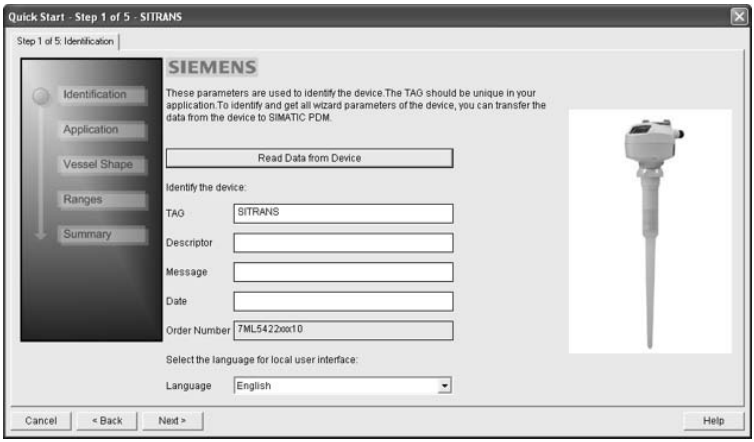
Launch SIMATIC PDM, open the menu **Device – Wizard - Quick Start**, and follow steps 1 to 5.



Step 1 – Identification

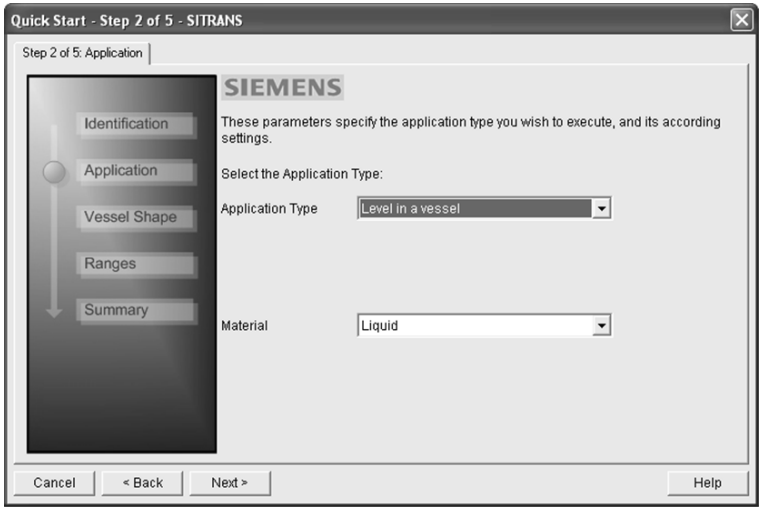
Note: The layout of the dialog boxes shown may vary according to the resolution setting for your computer monitor.

1) Click on **Read Data from Device** to upload Quick Start parameter settings from the device to the PC/PG and ensure PDM is synchronized with the device.
2) If required, change the language for the local user interface.
3) Click on **NEXT** to accept the default values. (Descriptor, Message, and Installation Date fields can be left blank. Note the TAG field will transfer a maximum of 24 characters to the device.)



Step 2 – Application

Select the application type (level or volume) and the material[1)], then click on **NEXT**.

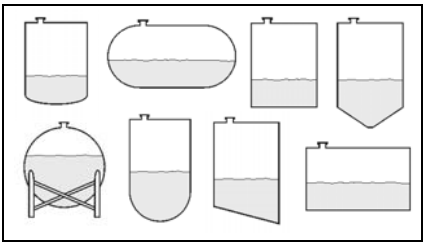


1) See *Configuring a stillpipe application* on page 42 for a Low Dielectric Liquid application.

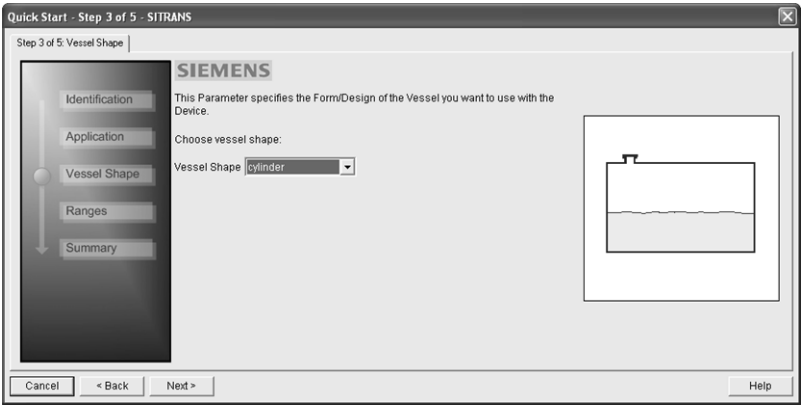
Step 3 – Vessel Shape

The vessel shapes shown are predefined. To describe a more complex shape see *Linearization* on page 39.

For a vessel with obstructions, see *Auto False Echo Suppression* on page 46.

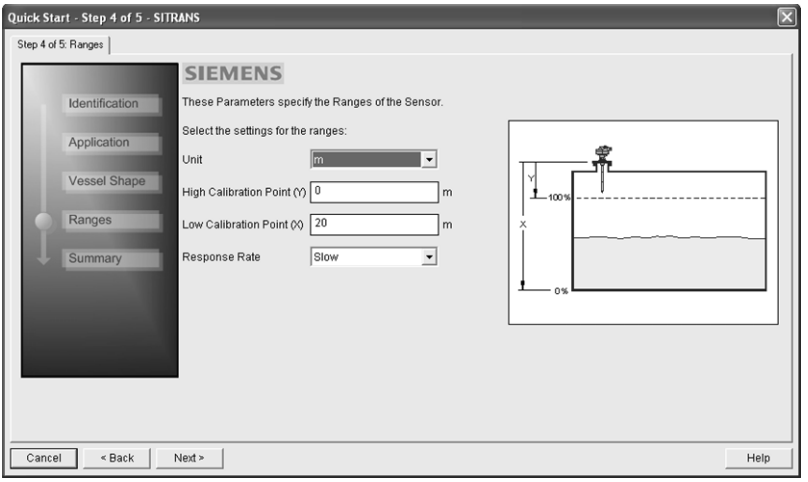


Select the vessel shape, and click on **NEXT**.



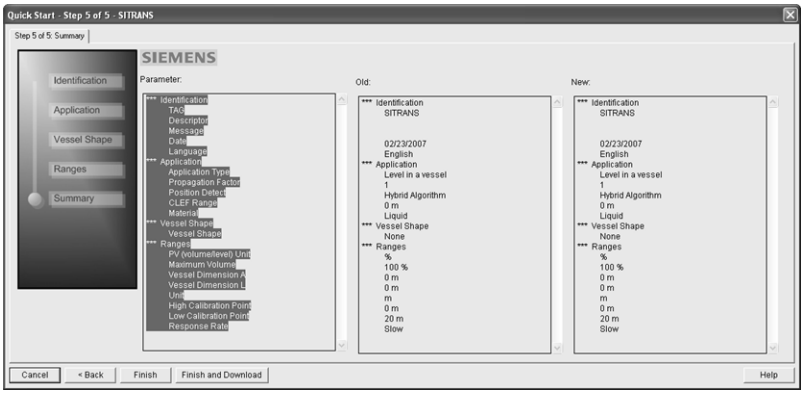
Step 4 – Range

Set the parameters, and click on **NEXT**.



Step 5 – Summary

Check parameter settings, and click on **BACK** to return and revise values, **FINISH** to save settings offline, or **FINISH AND DOWNLOAD** to save settings offline and transfer them to the device.

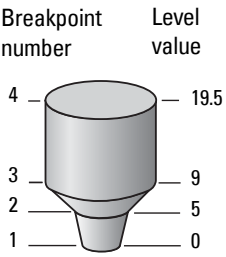


The message **Quick Start was successful** will appear. Click on **OK**.

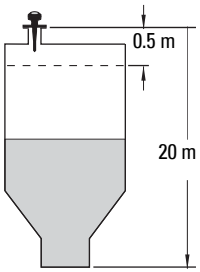
Linearization

You can use the linearization feature to define a more complex vessel shape and enter up to 32 level breakpoints where the corresponding volume is known. The values corresponding to 100% and 0% levels must be entered. The breakpoints can be ordered from top to bottom, or the reverse.

Example (values for example purposes only)



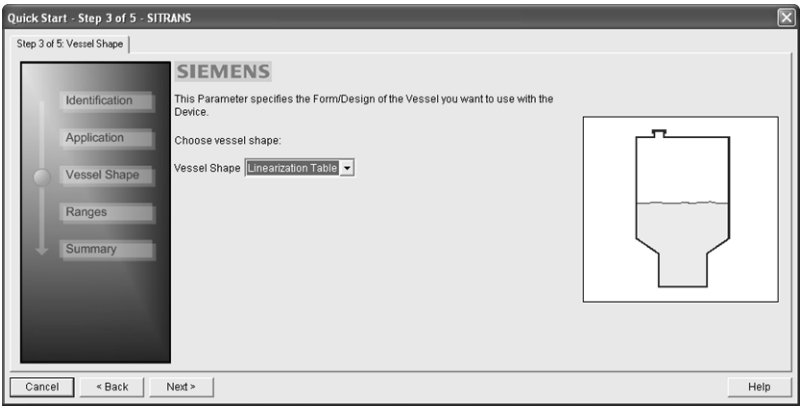
Break-point no.	Level value (m)	Volume value (l)
1	0	0
2	5	500
3	9	3000
4	19.5	8000



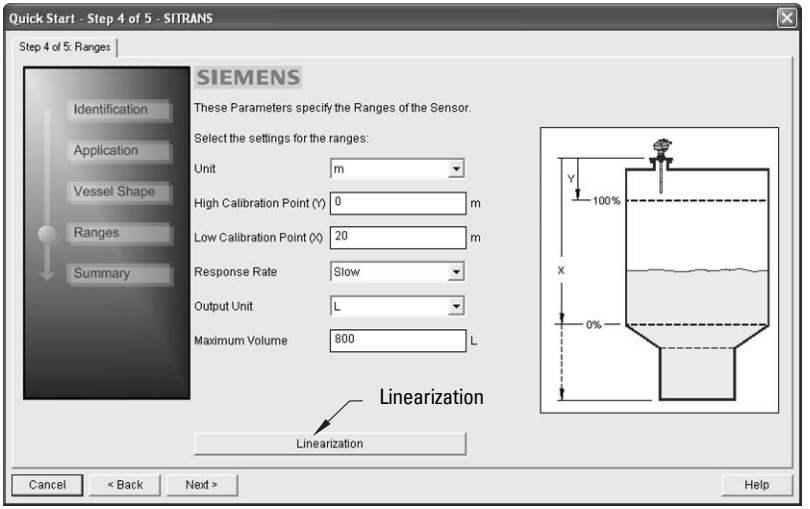
Using Linearization via the Quick Start wizard

Open the menu Device – Wizard - Quick Start:

1) In **Step 1 – Identification**, click on **Read Data from Device**, select language, and click on **Next**.
2) In **Step 2 – Application**, select a volume application, for example **Volume in a vessel,** and click on **Next**.
3) In **Step 3 – Vessel Shape**, choose the vessel shape option **Linearization Table** and click on **Next**.



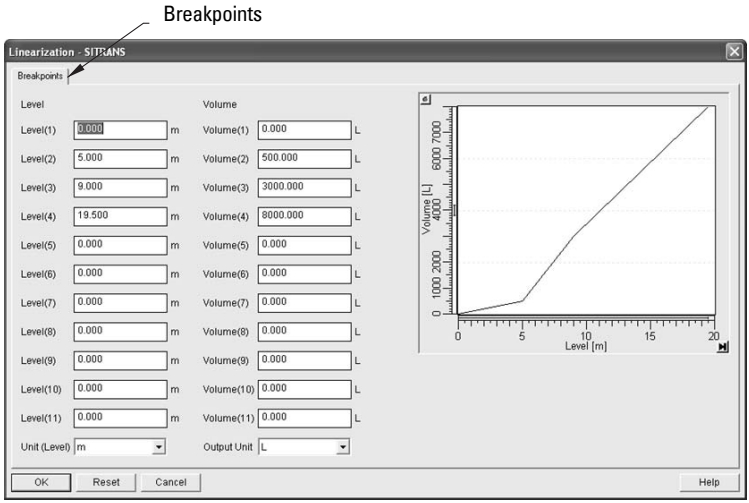
4) In **Step 4 – Ranges**:



a) Enter parameter values and select units.
b) Click on **Linearization**.

c) In the **Linearization** window under the **Breakpoints** tab enter the desired level and associated volume values[1].

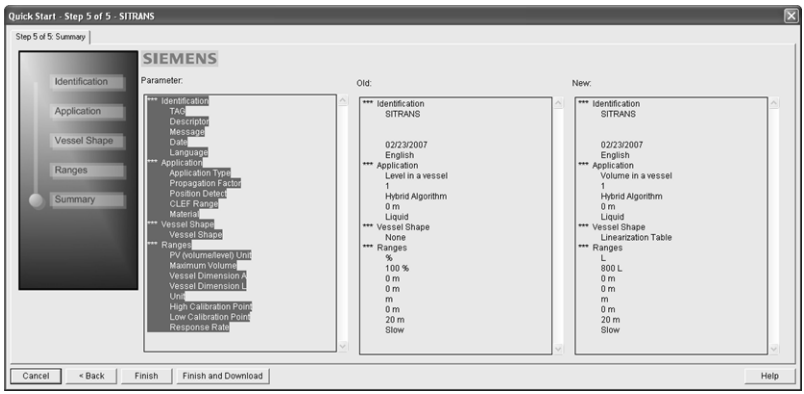
d) Click on **OK.**



Note: Reset resets values to the values in the offline table.

e) In the Step 4 window, click on **NEXT.**

5) In **Step 5 – Summary**, check parameter values. Click on **BACK** to return and revise values, **FINISH** to save settings offline, or **FINISH AND DOWNLOAD** to save settings offline and transfer them to the device.

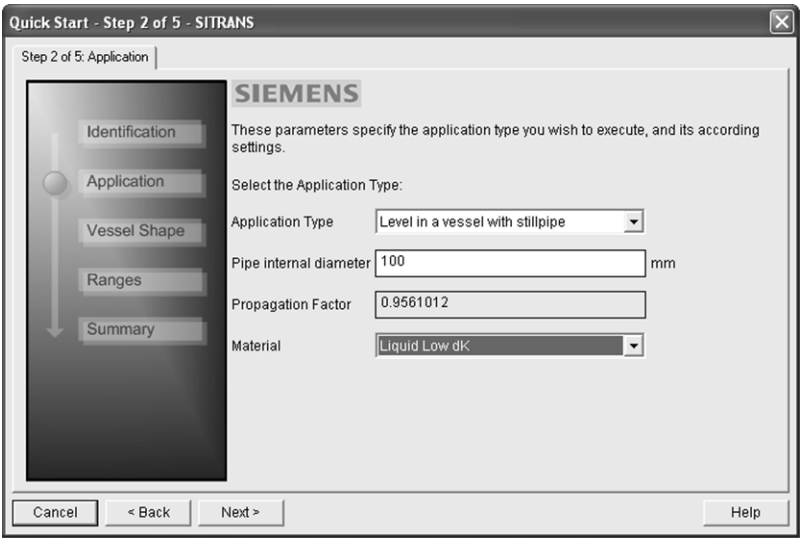


The message **Quick Start was successful** will appear. Click on **OK**.

[1] For display purposes we recommend entering values in ascending order (that is, the lowest values in level 1 and volume 1).

Configuring a stillpipe application

- Launch the Quick Start wizard and follow steps 1 to 2.
- In step 2, select Application Type – **Level in a vessel with stillpipe**; Material – **Liquid Low dK**; and set the stillpipe diameter as desired.
- The wizard updates the propagation factor according to the pipe diameter, and enables the CLEF algorithm for low dK liquids (see **CLEF Range (2.5.7.4.)** for more detail.



- Continue through steps 3 to 5 then click on **FINISH AND DOWNLOAD** to save settings offline and transfer them to the device.

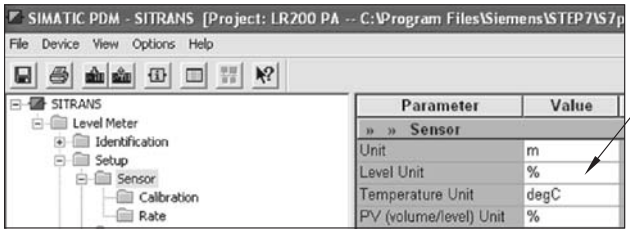
Changing parameter settings using SIMATIC PDM

Notes:

- For a complete list of parameters, see *Parameter Reference* on page 59.
- Clicking on **Cancel** during an upload from device to SIMATIC PDM will result in some parameters being updated.

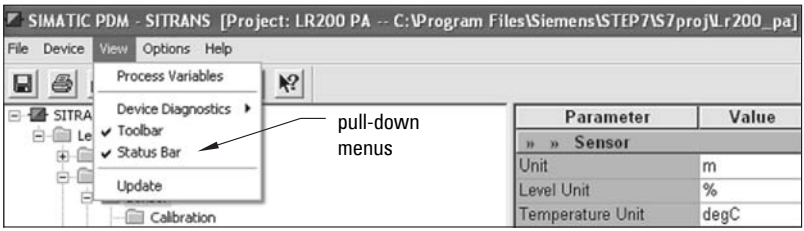
Many parameters are accessed via the 5-level menu in PDM. See *Parameters accessed via pull-down menus* on page 43 for the others.

1) Launch SIMATIC PDM, connect to SITRANS LR200, and upload data from the device.
2) Adjust parameter values in the parameter value field then press **Enter.** The status fields read **Changed**.
3) Open the Device menu, click on **Download to Device**, then use **File – Save**, to save parameter settings. The status fields are cleared.



Parameters accessed via pull-down menus

You have access to a number of functions via pull-down menus from the menu bar. under **Device** or **View**.



Pull-down menus

Device menus	page	View menus	page
Communication path		Process Variables	52
Download to device Upload to PC/PG Update Diagnostic Status		Device Diagnostics Toolbar Status bar	54
Set Address	43		
Wizard - Quick Start	36	Update	
Echo Profile Utilities Maintenance Acknowledge Faults Wear	44 48 49 49		
Simulation	49		
Write Locking Master Reset	51 51		

Set Address

Note: To reset address to 126 open the menu **Device – Master Reset** and click on **Reset Address to "126".**

Sets the unique address of the device on the network (also called PROFIBUS address).

Values	0 - 126. Default: 126

Open the menu **Device – Set Address** and assign a new address.

Echo Profile Utilities

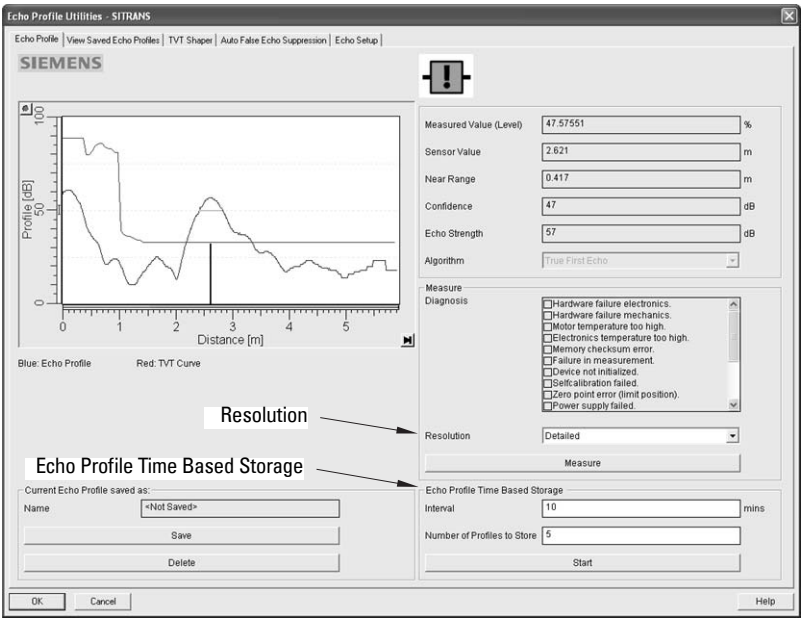
Open the menu **Device – Echo Profile Utilities** and click on the appropriate tab for easy access to:

- *Echo profile* on page 44
- *View Saved Echo Profiles* on page 44
- *TVT Shaper* on page 45
- *Auto False Echo Suppression* on page 46
- *Echo Setup* on page 48

Echo profile

Notes:

- Double click on each axis to see the Xscale and Data Scale values. Right-click or Left-click on the axis and drag to reposition the scale.
- After saving a profile click on **OK**, not the **x** button, to close the Echo Profile Utilities window, otherwise the profile will not be saved.



- In the **Echo Profile Utilities** window click on the tab **Echo Profile**.
- Click on the **Measure** button to update the profile. Select **Standard** resolution (loads 1 of every 8 points of the profile for a quick view) or **Detailed** resolution (loads all data points).
- Click on the **Save** button and in the new window enter a name and click on **OK**.
- Click on **OK** to exit.

View Saved Echo Profiles

To view a saved profile, click on the tab **View Saved Echo Profiles**.

Echo profile data logging

You can store up to 60 profiles at a selected interval (maximum 60 minutes).
Inside Echo Profile Utilities, in the **Echo Profile Time Based Storage** window:

- Enter the desired interval between stored profiles.
- Enter the desired number of profiles to be stored (maximum 60).
- Click on **Start**. A message appears warning of the time delay and warning that all previous saved profiles will be overwritten. Click on **OK** to proceed. The new profiles will be saved with their date and time.

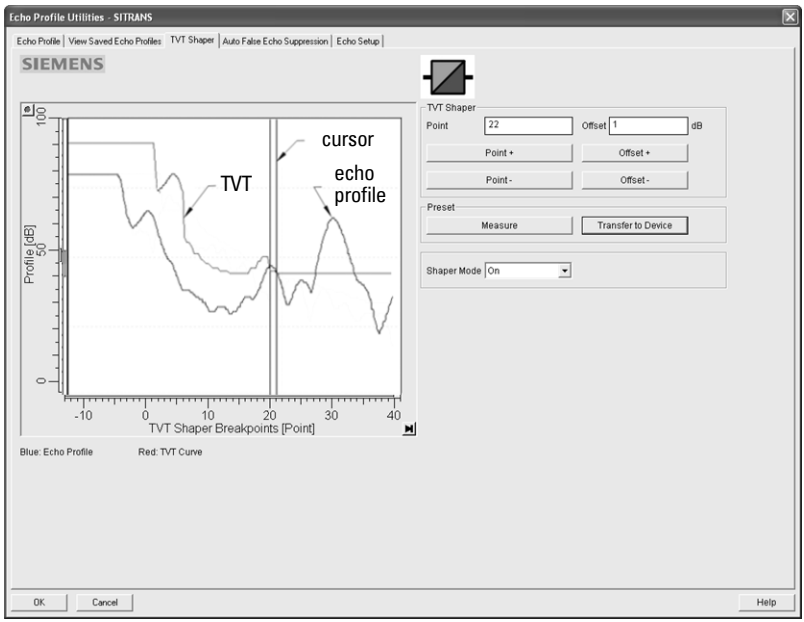
Click on the tab **View Saved Echo Profiles** to view the stored profiles

TVT Shaper

Note: Double click on each axis to see the Xscale and Data Scale values. Right-click or Left-click on the axis and drag to reposition the scale.

This feature allows you to manually adjust the TVT to avoid false echoes caused by obstructions. (For an explanation see *Auto False Echo Suppression (2.5.10.1.)* on page 120.)

Open the menu **Device – Echo Profile Utilities** and click on the tab **TVT Shaper**



- Click on **Measure** to refresh the echo profile and load the current TVT from the device.
- Change the position of the cursor on the TVT using the **Point+** and **Point–** buttons: raise and lower the TVT using **Offset+** and **Offset–**.
- Alternatively, enter values for **Point** and **Offset** directly into the dialog boxes.
- Click on **Transfer to Device.**

Auto False Echo Suppression

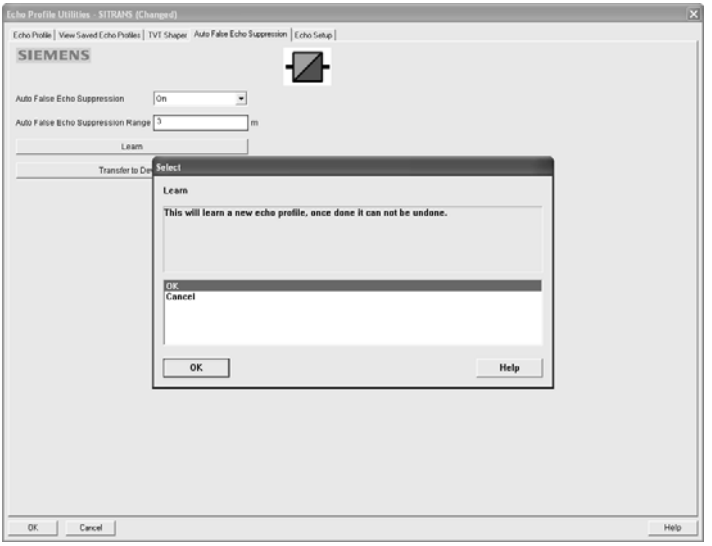
Notes:

- Make sure material level is below all known obstructions at the moment Auto False Echo Suppression is used to learn the echo profile. We recommend an empty or almost empty vessel.
- Note the distance to material level when the environment is learned, and set Auto False Echo Suppression Range to a shorter distance to avoid the material echo being screened out.
- Set Auto False Echo Suppression and Auto False Echo Suppression Range during startup, if possible.
- If the vessel contains an agitator it should be running.
- Before adjusting these parameters, rotate the instrument for best signal (lower false-echo amplitude).

If you have a vessel with known obstructions, we recommend using Auto False Echo Suppression to prevent false echo detection. This feature can also be used if the device displays a false high level, or the reading is fluctuating between the correct level and a false high level.

The device learns the echo profile over the whole measurement range and the TVT is shaped around all echoes present at that moment. (See *Auto False Echo Suppression (2.5.10.1.)* on page 120 for a more detailed explanation.)

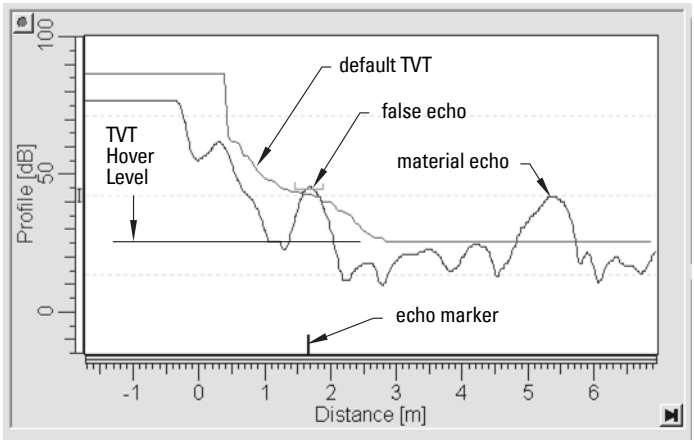
The learned TVT will be applied over a specified range. The default TVT is applied over the remainder of the measurement range.



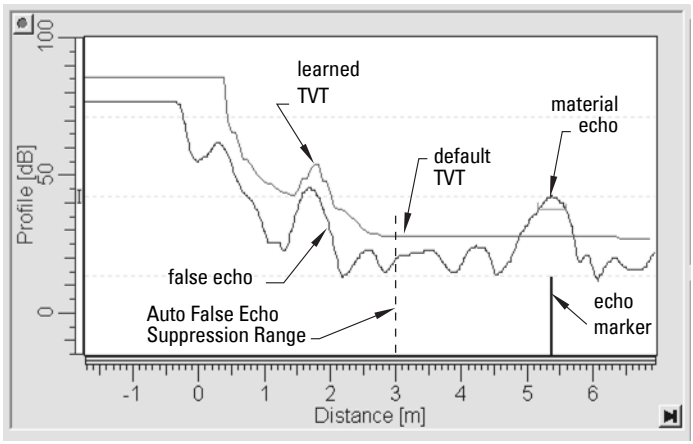
1) Make sure the material level is below all known obstructions.
2) Determine **Auto False Echo Suppression Range**. Measure the actual distance from the sensor reference point to the material surface using a rope or tape measure. Subtract 0.5 m (20") from this distance, and use the resulting value.

3) Open the menu **Device – Echo Profile Utilities** and click on the tab **Auto False Echo Suppression.**
4) Enter the value for **Auto False Echo Suppression Range** and select **On**.
5) Click on **Learn**. The message appears: **'This will learn a new echo profile. Once done it cannot be undone'.** Click on **OK**.
6) Once Auto TVT is complete click on **Transfer to Device.** To exit click on **OK**. Auto TVT is enabled and the learned TVT will be used.
7) To turn Auto False Echo Suppression off or on, reopen the **Auto False Echo Suppression** window and click on **Off** or **On**.

Before Auto False Echo Suppression



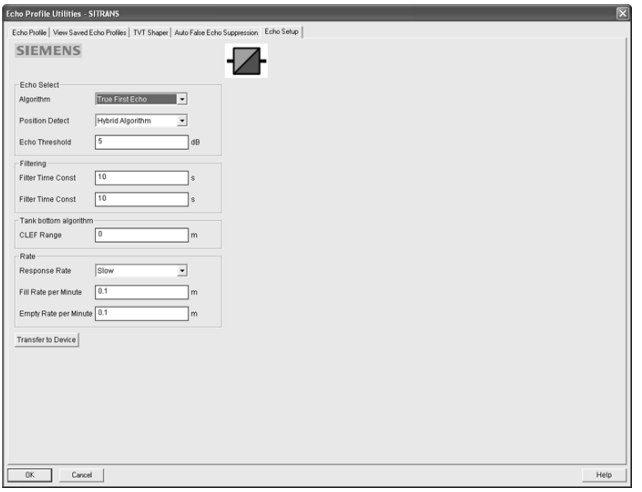
After Auto False Echo Suppression



Echo Setup

Provides quick access to echo selection, filtering, and response rate parameters.

Algorithm
Position Detect
Echo Threshold
Filter Time Constant
CLEF Range
Response Rate
Fill Rate/min.
Empty Rate/min.

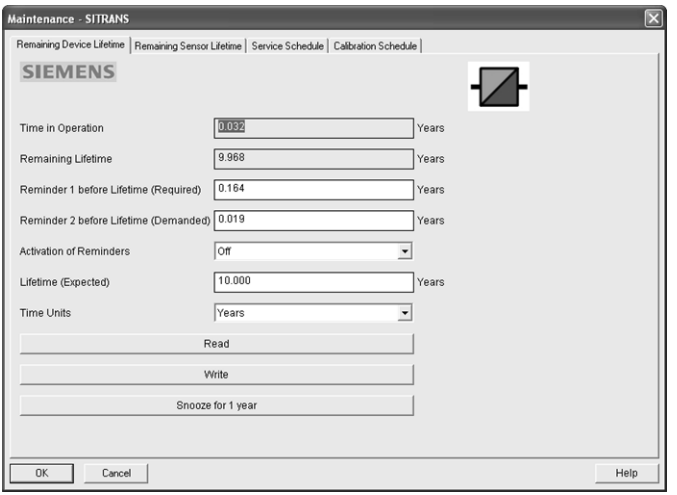


Open the menu **Device – Echo Profile Utilities** and click on **Echo Setup**.

Maintenance

You can set schedules for:

- maintenance of the device based on its projected lifetime
- maintenance of the sensor based on its projected lifetime
- service
- calibration



To set Device/Sensor Maintenance schedules:

1) Open the menu **Device – Maintenance**, and click on the **Remaining Device/ Sensor Lifetime** tab.
2) Modify desired values, and if desired, activate reminders for either or both of **Reminder 1 (Required)/Reminder 2 (Demanded)**.
3) Click on **Write**.
4) Click on **Read**, to see the effects of your modification.
5) Click on **Snooze** to add a year to the Total Expected Device Life.

To set Service/Calibration schedules:

1) Open the menu **Device – Maintenance**, and click on the **Service/Calibration Schedule** tab.
2) Modify desired values, and if desired, activate reminders for either or both of **Reminder 1 (Required)/Reminder 2 (Demanded)**.
3) Click on **Write**.
4) Click on **Read**, to see the effects of your modification.
5) Click on **Service/Calibration Performed** to reset the schedule.

Acknowledge Faults

Open the menu **Device – Acknowledge Faults**, select the appropriate item from the Extended Diagnostics pull-down menu, and click on **Transfer**.

Wear

Reports the number of hours the device has been operating, and the number of times it has been powered up.

Open the menu **Device** – **Wear** to view:

- Powered Hours
- Power-on Resets

Simulation

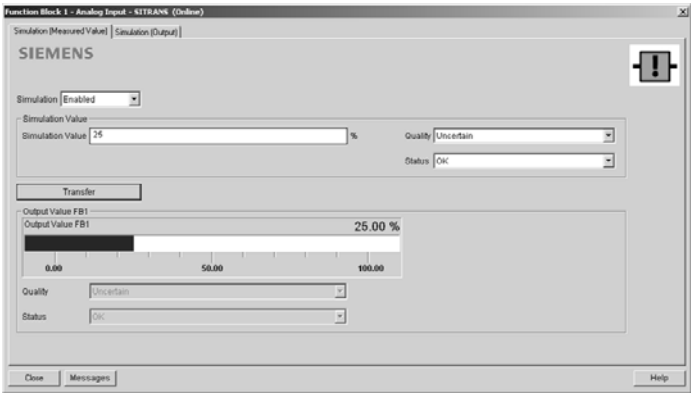
Note: The Simulation parameter influences output to the control system.

Two options enable you to test the functioning of the Analog Input Function Blocks or the functioning of everything between the Transducer Block and Output. For more details see *Analog Input Function Blocks 1 and 2* on page 137.

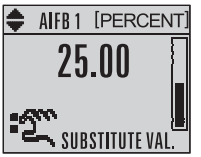
Simulate Analog Input to AIFB1 or AIFB2

Allows you to input a simulated measured value, status, and quality, in order to test the functioning of an Analog Input Function Block.

1) Open the menu **Device – Simulation**, and select the desired function block.

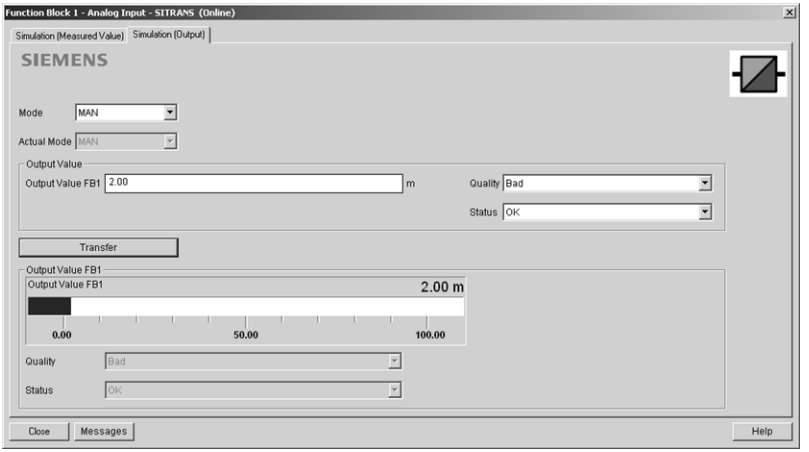


2) Click on the tab **Simulation (Measured value)**.
3) Enable simulation, enter a percentage value, set the desired quality and status[1)], and click on **Transfer**.
4) The Output value from the desired function block is displayed in PDM, and the LCD displays the substitute value. See *Simulate Output* below, to set the output mode.
5) After simulation is complete, disable simulation and click on **Transfer**.



Simulate Output

1) Open the menu **Device – Simulation**, select function block 1 or 2, and click on the tab Simulation (Output).
2) Select Manual Mode (from options AUTO, Manual, or Out of Service) and click on **Transfer**.



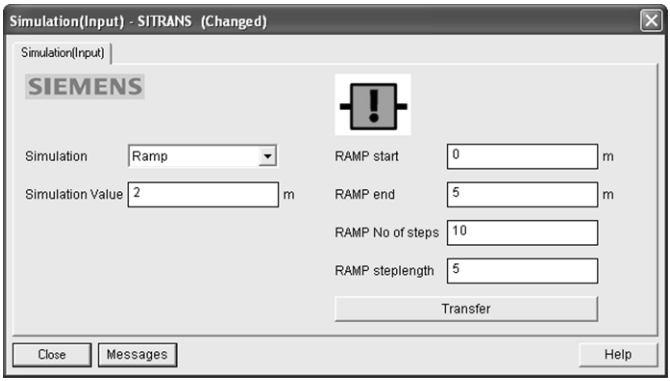
3) Enter simulated value and click on **Transfer**.
4) After simulation is complete, select **AUTO** mode and click on **Transfer**.

1) See *Status Byte* on page 143 for more information on status and quality.

Simulate Input

Allows you to simulate the sensor value which is input to the Level Transducer Block. This tests everything between the Level Transducer Block and Output.

1) Open the menu **Device – Simulation**, and select **Simulation (Input)**.



2) To enable simulation select **Fixed** or **Ramp**.
3) If you select Ramp, enter the step length and number of steps.
4) Enter the simulated value and click on **Transfer**.
5) After simulation is complete, disable simulation and click on **Transfer**.

Write Locking

Prevents any changes to parameters via PDM or the hand-held programmer. If Write Locking is enabled, the data can be viewed but not modified.

To enable/disable Write Locking

1) Open the menu **Device – Write Locking** and turn Write Protection **On** or **Off**.
2) Click on **Transfer**.

Master Reset

NOTE: Table continues on next page.

Options	Result
Factory Defaults	Resets all parameters to the manufacturer's default settings, with certain exceptions: see *Factory Defaults* on page 52.
Standard Defaults	Resets all parameters excluding device addresses to the PROFIBUS default settings
Informational	Resets parameters such as Tag and Description
Functional	Resets parameters that control device behavior, such as Low Calibration Pt.

Options	Result (continued)
Warm Start	Has the same effect as recycling power to the device
Reset Address to 126	• Resets the PROFIBUS device address to 126 • If the address lock was on,resetting the address will disable the lock.

1) Open the menu **Device – Master Reset** and click on the desired option.
2) Click on **OK**.

Factory Defaults

Factory Defaults *resets all user parameters to the default settings, with certain exceptions. The list of exceptions includes, but is not limited to:*

- Tag (2.1.1.)
- Message (2.1.3.)
- Descriptor (2.1.2.)
- Installation Data
- Device Address
- Write Protection unlock value
- Auto False Echo Suppression Range
- Learned TVT

To perform a reset to Factory Defaults:

1) Open the menu **Device – Master Reset**, and click on **Factory Defaults**.
2) After the reset is complete click on **Close**, then upload parameters to the PC/PG. (If you are performing a reset after replacing the device with a different instrument, do not upload parameters to the PC/PG.)

Resetting the PROFIBUS address to 126

1) Open the menu **Device – Master Reset** and click on **Reset Address to 126**.
2) Click on **OK**: the address will be reset to 126, and if the address lock was on, it will be disabled.

Diagnostics

You can monitor level/volume trends, function blocks, electronics temperature, and device status.

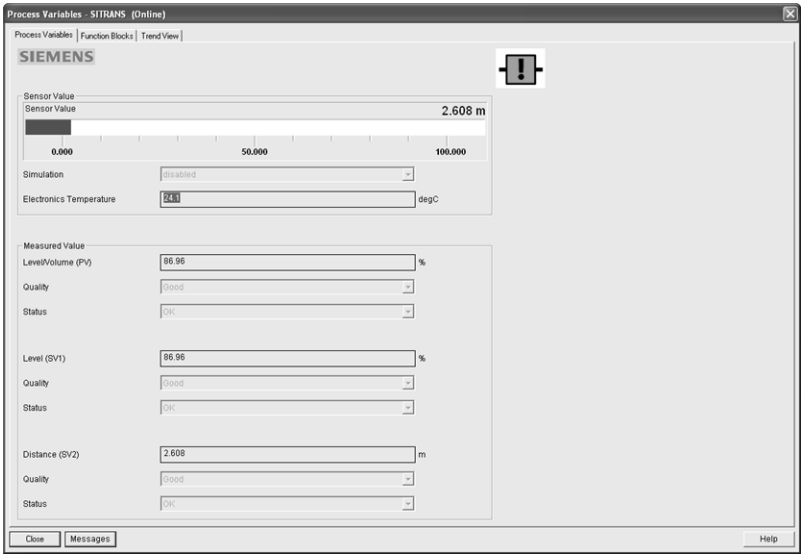
Process Variables

To compare outputs in real time open the menu **View – Process Variables.**

Process Variables

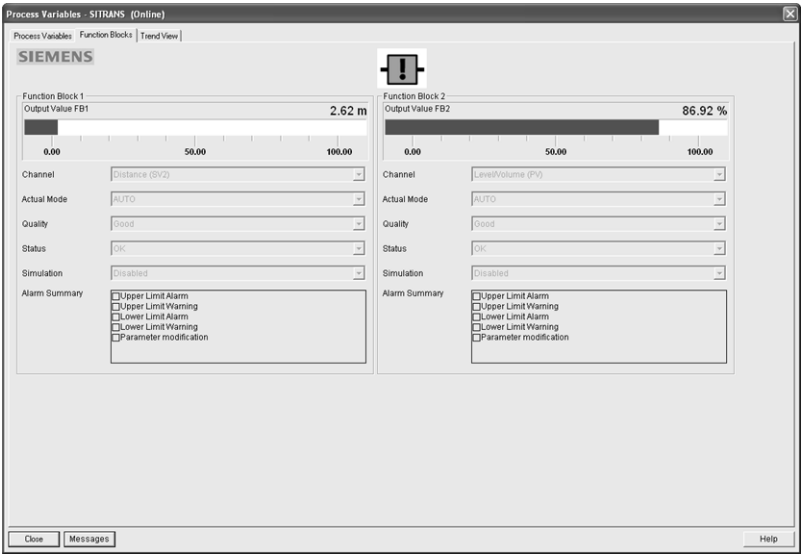
Note: To view peak sensor values, peak FB1 and FB2 values, or peak electronics temperatures, see *Device Diagnostics* on page 54.

- Sensor Value and simulation setting
- Electronics temperature
- Measured Value (level, volume, and distance) together with quality and status.



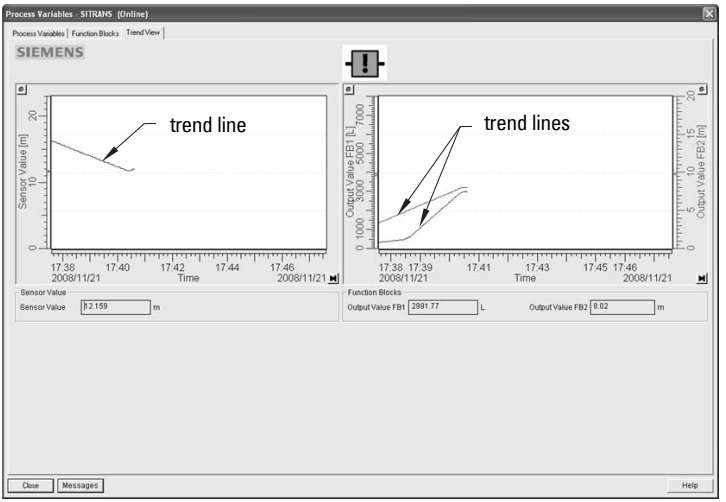
Function Blocks

Open the menu **View – Process Variables** and click on **Function Blocks** to view the channel (level, volume, space, or distance), operating mode (Auto, Manual, or Out of Service), quality, status, simulation setting, and summary of alarms.



Trend View

Open the menu **View – Process Variables** and click on **Trend View** to monitor Sensor Value and values for AIFB1 and AIFB2.



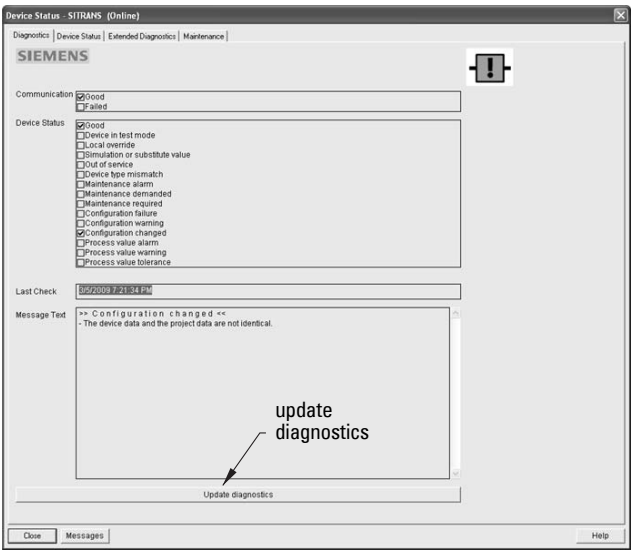
Device Diagnostics

Device Status

Open the menu **View – Device Diagnostics** and go to **Device Status** to view Diagnostics, Device Status, Extended Diagnostics, and Maintenance

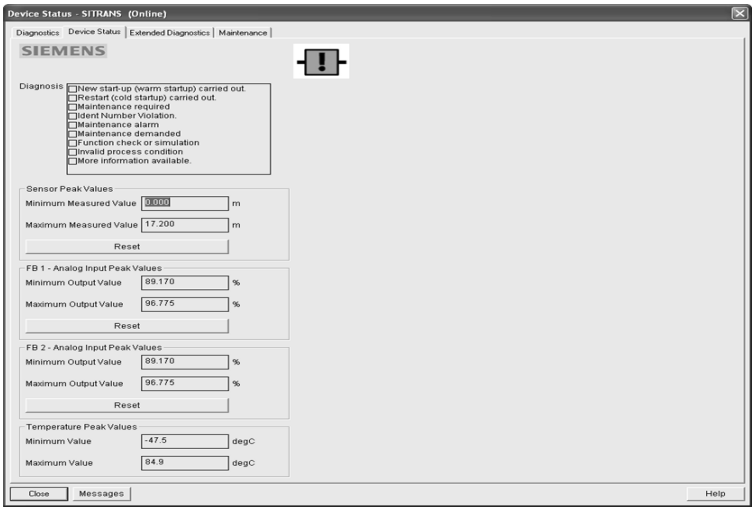
Diagnostics

In the Device Status window, click on the **Diagnostics** tab, then on the **Update diagnostics button**, to update diagnostic information and refresh linked icons.



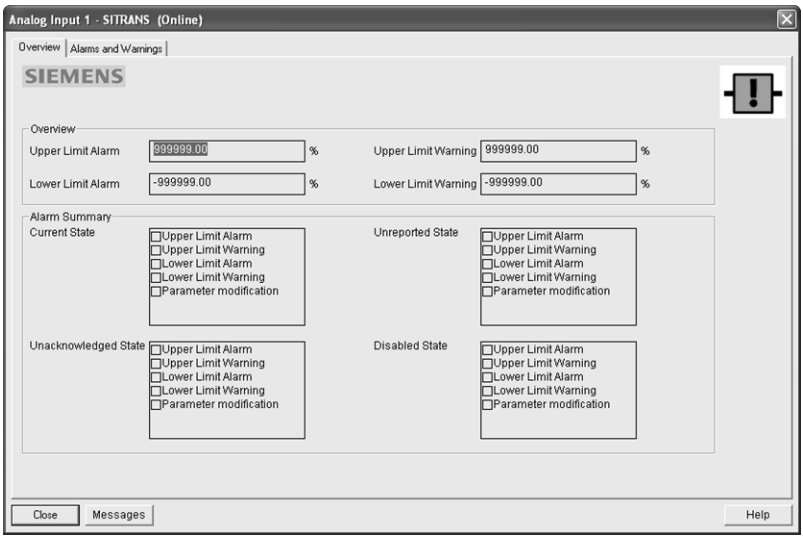
Device Status

Click on the **Device Status** tab to view peak sensor values, peak FB1 and FB2 values, and peak electronics temperatures.



Analog Input 1/Analog Input 2

Open the menu **View – Device Diagnostics** and go to **Analog Input 1/Analog Input 2**. Click on the tab **Overview** to see the status of all warnings and alarms. Click on the tab **Alarms and Warnings** for details.



Update

Open the menu **View – Update** to refresh the screen.

Security

A password option protects security and communication control parameters from modification by a maintenance user.

When you open a project the **User** dialog window provides two options: maintenance or specialist. If a password has been set it will not be possible to open the project as a specialist without it. A maintenance user will be able to open the project without a password but will not have access to security and communication control parameters.

1) Open a project, double-click on the device icon, and in the **User** window select **Specialist**.
2) Open the menu **Options – Settings** and click on the **Password** tab.
3) Enter a new password and re-enter it in the **Confirmation** window. Click on **OK**.

Operating via FDT (Field Device Tool)

FDT is a standard used in several software packages designed to commission and maintain field devices such as SITRANS LR200. Two commercially available FDTs are PACTware and Fieldcare.

Functionally FDT is very similar to PDM (see *Operating via SIMATIC PDM* on page 34 for more detail).

- To configure a field device via FDT you need the DTM (Device Type Manager) for the device.
- To configure a field device via SIMATIC PDM, you need the EDD (Electronic Data Description) for the device.

Device Type Manager (DTM)

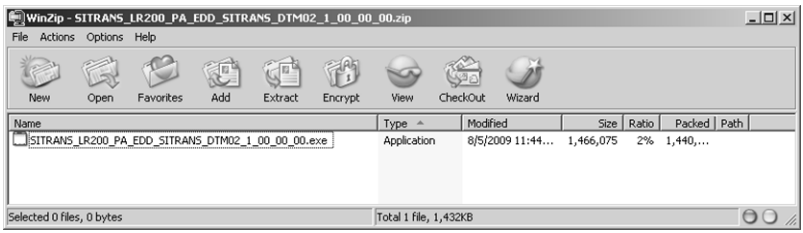
A DTM is a type of software that 'plugs into' FDT. It contains the same information as an EDD but an EDD is independent of the operating system.

SITRANS DTM

- SITRANS DTM is an EDDL interpreter developed by Siemens to interpret the EDD for that device.
- To use SITRANS DTM to connect to an instrument, you must first install SITRANS DTM on your system and then install the instrument EDD written for SITRANS DTM.
- You can download SITRANS DTM from the Siemens service and support website at: http://support.automation.siemens.com . Click on **Product Support** then go to **Product Information/Automation Technology/Sensor systems/Process Instrumentation/Software & Communications**.

The instrument EDD

The SITRANS LR200 PROFIBUS PA EDD for SITRANS DTM can be downloaded from the product page of our website. Go to **Support > Software Downloads.**



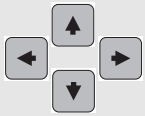
Configuring a new device via FDT

The full process to configure a field device via FDT is outlined in an application guide which can be downloaded from the product page of our website at : www.siemens.com/LR200 under **Support.**

Notes

Parameter Reference

Notes:
- Parameter names and menu structure are almost identical for SIMATIC PDM and the local user interface (LUI).
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- **Mode** toggles between **PROGRAM** and **Measurement** Modes.
- For Quick Access to parameters via the handheld programmer, press **Home**, then enter the menu number, for example: **2.2.1.**



- In Navigation mode, **ARROW keys** navigate the menu in the direction of the arrow.
- Press **RIGHT Arrow** to open **Edit** Mode, or to save a modification.

Parameters are identified by name and organized into function groups. See *LCD menu structure* on page 181 for a chart.

Parameters accessible via the handheld programmer are preceded by a number. Parameters not preceded by a number are accessible only via remote operation. For more details see *Operating via SIMATIC PDM* on page 34.

Quick Start Wizard

The Quick Start wizard provides an easy step-by-step procedure to configure the device for a simple application.

1. Quick Start

Notes:
- Do not use the Quick Start wizard to modify individual parameters. (Perform customization only after the Quick Start has been completed.)
- For access via remote operation see *Quick Start Wizard via SIMATIC PDM* on page 36.
- For detailed instructions see *Quick Start Wizard via the handheld programmer* on page 30.

1.1. Language

1.2. Material

1.3. Response Rate
1.4. Units
1.5. Operating Mode
1.6. Low Calibration Point
1.7. High Calibration Point
1.8. Apply? (Apply changes)

2. Setup

Notes:
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Values shown in the following tables can be entered via the handheld programmer.

2.1. Identification

2.1.1. Tag

Text that can be used in any way. A recommended use is as a unique label for a field device in a plant. Limited to 32 ASCII characters.

Note: SITRANS PDM limits the TAG field to a maximum of 24 characters.

2.1.2. Descriptor

Text that can be used in any way. Limited to 32 ASCII characters. No specific recommended use.

2.1.3. Message

Text that can be used in any way. Limited to 32 ASCII characters. No specific recommended use.

2.2. Device

2.2.1. Hardware Revision

Read only. Corresponds to the electronics hardware of the Field Device.

2.2.2. Firmware Revision

Read only. Corresponds to the software or firmware that is embedded in the Field Device.

2.2.3. Loader Revision

Read only. Corresponds to the software used to update the Field Device.

2.2.4. Order Option

Read only. Displays the device type.

2.3. Sensor

2.3.1. Unit

Sensor measurement unit.

Values	m, cm, mm, ft, in
	Default: m

2.3.2. Level Unit

Select engineering units for Level.

Options		m, cm, mm, ft, in, %
	*	%

2.3.3. PV Units (volume/level)

Notes:
- A greater selection of volume units is available via SIMATIC PDM.
- Default unit of AIFB1 or 2 is percent.
- You can select a different unit for your application.
- PV (Primary Value): the output from the Level Transducer Block. See *Transducer Block function groups* on page 135 and *How the Transducer Block works:* on page 135 for more details.

Select units for either volume or level.

Level Values		m, cm, mm, ft, in
Volume Values		liter, gal
Percent Value	*	%

2.3.4. Temperature Units

Selects the engineering unit to be displayed with the value representing temperature.

Options		**DEG C, DEG F, RANKINE, KELVIN**
	*	**DEG C**

2.3.5. Material

Automatically configures the device to operate in the chosen application type, by changing one or more of the following parameters: ***Propagation Factor (2.5.3.)****,* ***Position Detect (2.5.7.2.)****, and/or* ***CLEF Range (2.5.7.4.)****.*

Options	*	LIQUID
		LIQUID LOW DK[a] (low dielectric liquid – CLEF algorithm enabled)
Related parameters	Propagation Factor (2.5.3.) Position Detect (2.5.7.2.) CLEF Range (2.5.7.4.)	

a) dK < 3.0

You can configure each of the related parameters, to suit your particular application.

2.3.6. LOE Timer

Note: When a Loss of Echo occurs **Value (2.6.9.2.)** determines the material level to be reported when LOE Timer expires. See *Loss of Echo (LOE)* on page 122 for more detail.

Sets the time to elapse since the last valid reading, before the Fail-safe material level is reported.

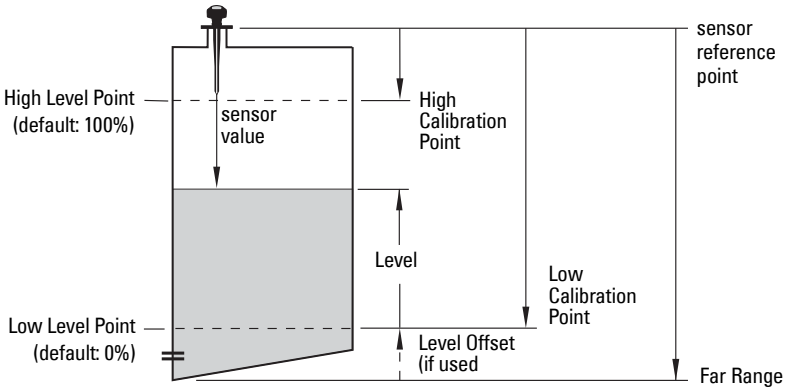
Values	Range: 0 to 720 seconds
	Default: 100 s

2.3.7. Calibration

Note: We recommend using the Quick Start wizard to configure the device.

2.3.7.1. Low Calibration Pt.

Distance from sensor reference point[1)] to Low Calibration Point (corresponding to Low Level Point). Unit is defined in ***Unit (2.3.1.)***



Values	Range: 0 to 20 m. Default: 20.00 m
Related parameters	Unit (2.3.1.) Far Range (2.5.2.)

1) The point from which **level** measurement is referenced (see *Dimensions: Uni-construction Polypropylene Rod Antenna* on page 11 and *Appendix H: Flange Adapter Versions* on page 154).

2.3.7.2. High Calibration Pt.

Distance from Sensor Reference to High Calibration Point (corresponding to High Level Point). Unit is defined in ***Unit (2.3.1.)****.*

Values	Range: 0 to 20 m. Default: 0.000 m

When setting the High Calibration Point value, note that echoes are ignored within **Near Range (2.5.1.)**

2.3.7.3. Sensor Offset

A constant offset that can be added to or subtracted from sensor value[1)] to compensate if the sensor reference point has shifted. (For example, this could result from adding a thicker gasket or reducing the standoff/nozzle height.) The units are defined in ***Unit (2.3.1.)****.*

Values	Range: -99.999 to 99.999. Default: 0.00 m
Related parameters	Unit (2.3.1.)

2.3.7.4. Low Level Point

The level when the material is at Low Calibration Point. The unit is defined in Level units.

Values	Default: 0%

2.3.7.5. High Level Point

The level when the material is at High Calibration Point. The unit is defined in Level units.

Values	Default: 100%

2.3.7.6. Level Offset

A constant offset that can be added to Level. The unit is defined in Level units.

Values	Default: 0%

2.3.7.7. Antenna

Read only. Identifies antenna configuration. ***Near Range (2.5.1.)*** *is automatically adjusted to suit.*

1) The value produced by the echo processing which represents the distance from sensor reference point to the target. (see **Calibration (2.3.7.)** on page 62 for an illustration).

2.3.8. Rate

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

2.3.8.1. Response Rate

Note: Changing Response Rate resets Fill Rate (2.3.8.2.), Empty rate (2.3.8.3.), and Filter Time Constant (2.6.8.1.).

Sets the reaction speed of the device to measurement changes.

Response Rate (2.3.8.1.)		Fill Rate (2.3.8.2.)/ Empty rate (2.3.8.3.)	Filter Time Constant (2.6.8.1.)
*	slow	0.1 m/min (0.32 ft/min)	10 s
	medium	1.0 m/min (3.28 ft/min)	10 s
	fast	10.0 m/min (32.8 ft/min)	0 s

Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

2.3.8.2. Fill Rate

Defines the maximum rate at which the reported sensor value is allowed to increase. Allows you to further adjust the SITRANS LR200 response to increases in the actual material level. Fill Rate is automatically updated whenever ***Response Rate (2.3.8.1.)*** *is altered.*

Options	Range: **0** to **999999** m / min.		
	Response Rate (2.3.8.1.)		**Fill Rate**
	*	Slow	0.1 m/min (0.32 ft/min)
		Medium	1.0 m/min (3.28 ft/min)
		Fast	10.0 m/min (32.8 ft/min)
Altered by:	Response Rate (2.3.8.1.)		
Related parameters	Level Unit (2.3.2.)		

Enter a value slightly greater than the maximum vessel-filling rate, in units per minute.

2.3.8.3. Empty rate

*Defines the maximum rate at which the reported sensor value is allowed to decrease. Adjusts the SITRANS LR200 response to decreases in the actual material level. Empty Rate is automatically updated whenever **Response Rate (2.3.8.1.)** is altered.*

Options	Range: **0** to **999999** m / min.		
	Response Rate (2.3.8.1.)		**Empty Rate**
	*	Slow	0.1 m/min (0.32 ft/min)
		Medium	1.0 m/min (3.28 ft/min)
		Fast	10.0 m/min (32.8 ft/min)
Altered by:	Response Rate (2.3.8.1.)		
Related parameters	Level Unit (2.3.2.)		

Enter a value slightly greater than the vessel's maximum emptying rate, in units per minute.

2.4. Linearization

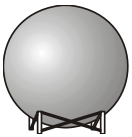
2.4.1. Volume

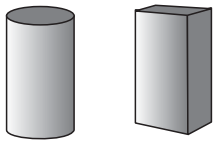
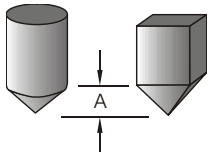
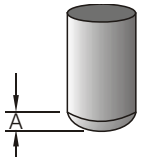
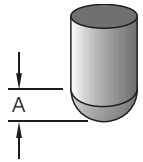
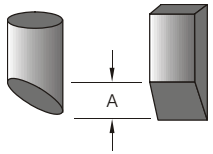
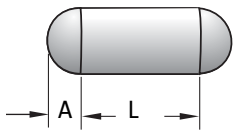
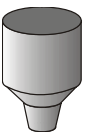
Carries out a volume conversion from a level value.

2.4.1.1. Vessel Shape

*Defines the vessel shape and allows the LR200 to calculate volume instead of level. If **None** is selected, no volume conversion is performed. Select the vessel shape matching the monitored vessel or reservoir.*

NOTE: Table is continued on next page.

	Vessel Shape	LCD DISPLAY/ Description	Also required
*	None	NONE/ No volume calculation required	N/A
		CYLINDER/ Flat end horizontal cylinder	maximum volume
		SPHERE/ Sphere	maximum volume

	Vessel Shape (cont'd)	LCD DISPLAY/ Description	Also required
		LINEAR/ Upright, linear (flat bottom)	maximum volume
		CONICAL BOT/ Conical or pyramidal bottom	maximum volume, dimension A
		PARABOLIC BOT/ Parabolic bottom	maximum volume, dimension A
		HALF SPHERE BOT/ Half-sphere bottom	maximum volume, dimension A
		FLAT SLOPED BOT/ Flat sloped bottom	maximum volume, dimension A
		PARABOLIC ENDS/ Parabolic end horizontal cylinder	maximum volume, dimension A, dimension L
		LINEAR TABLE[a]/ Linearization table (level/volume breakpoints)	maximum volume, level breakpoints, volume breakpoints

a) Linearization Table must be selected in order for level/volume values [see **XY index (2.4.1.5.)**] to be transferred.

2.4.1.2. Maximum Volume

The maximum volume of the vessel. Units are defined in ***PV Units (volume/level) (2.3.3.)****. Enter the vessel volume corresponding to High Calibration Point. The volume calculation is based on the maximum volume and scaled according to the vessel shape selected. If no vessel shape is entered, the default is 100, and the reading will be a percentage value.*

Values	Range: **0.0000 to 999999**
	Default: 100.0
Related Parameters	Low Calibration Pt. (2.3.7.1.) High Calibration Pt. (2.3.7.2.) Vessel Shape (2.4.1.1.)

For readings in volumetric units instead of percentage values:

a) Select a volumetric unit from **PV Units (volume/level) (2.3.3.)**.

b) Enter the vessel volume corresponding to High Calibration Point.

2.4.1.3. Dimension A

The height of the vessel bottom in Level Units when the bottom is conical, pyramidal, parabolic, spherical, or flat -sloped. If the vessel is horizontal with parabolic ends, the depth of the end. See ***Vessel Shape (2.4.1.1.)*** *for an illustration.*

Values	Range: **0.0000 to 999999** in Level Units
	Default: 0.0
Related Parameters	Vessel Shape (2.4.1.1.)

2.4.1.4. Dimension L

Length of the cylindrical section of a horizontal parabolic end vessel, in Level Units. See ***Vessel Shape (2.4.1.1.)*** *for an illustration.*

Values	Range**: 0.0000 to 999999** in Level Units
	Default: 0.0
Related Parameters	Vessel Shape (2.4.1.1.)

2.4.1.5. XY index

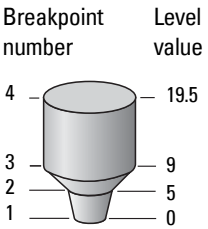
Level/Volume breakpoints allow you to define a complex vessel shape as a series of segments. A value is assigned to each level breakpoint and a corresponding value is assigned to each volume breakpoint.

Volume values are defined in volume units and can be percent or volumetric; level values are defined in level units, and can be percent or linear.

Level Values[1)]	Range: **-999999 to 999999** (m, cm, mm, ft, in, %)
	Default: 0.0
Volume Values[2)]	Range: **-999999 to 999999** (% or volumetric units)
	Default: 0.0

Enter up to 11 level breakpoints, where the corresponding volume is known. The values corresponding to 100% and 0% levels must be entered. The breakpoints can be ordered from top to bottom, or the reverse.

Example (values are for example purposes only)



Breakpoint Number	Level value (m)	Volume value (l)
1	0	0
2	5	500
3	9	3000
4	19.5	8000

Entering breakpoints via the hand-held programmer:

a) The default for level values is percent: if you want to select units instead, navigate to **Setup (2.) > Sensor (2.3.) > Level Unit (2.3.2.),** and select the desired unit

b) Navigate to **Setup (2.) > Sensor (2.3.) > PV Units (volume/level) (2.3.3.)**, and select the desired volume units.

c) Go to **XY index (2.4.1.5.)** and enter the number of the breakpoint you wish to adjust: for example, for breakpoint 1 enter **1.**

d) Go to **X value (2.4.1.6.)** and enter the level value for the breakpoint just identified.

e) Go to **Y value (2.4.1.7.)** and enter the volume value for the breakpoint just identified.

f) Repeat steps (c) to (e) until values have been entered for all required breakpoints.

1) See *Level Unit 2.3.2.* on page 61.

2) See *PV Units (volume/level) 2.3.3.* on page 61.

2.4.1.6. X value

2.4.1.7. Y value

Entering breakpoints via PDM:

See *Using Linearization via the Quick Start wizard* on page 40 for detailed instructions.

After completing the linearization setup you will need to configure AIFB1 and/or AIFB2. (See **AIFB1 (2.6.)** and **AIFB2 (2.7.)** for details.)

2.5. Signal Processing

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

2.5.1. Near Range

The range in front of the device (measured from the sensor reference point) within which any echoes will be ignored. This is sometimes referred to as blanking or a dead zone. The factory set range is dependent on the antenna type.

Values	Range: 0 to 20 m (0 to 65.6 ft).
	Default: Depends on the antenna. 0.3 m (1 ft), plus any shield length, from the sensor reference point[a)] 100 mm shield version default is 0.42 m (0.3 m plus 0.12 m from device reference to the end of the shield). See also *Min. detectable distance 1)* on page 6.

a) For the reference point for each configuration, see *Dimensions: Uni-construction Polypropylene Rod Antenna* on page 11 for the standard version, or *Appendix H: Flange Adapter Versions* on page 154.

2.5.2. Far Range

Note: Far Range can extend beyond the bottom of the vessel.

*Allows the material level to drop below Low Calibration Point without generating a Loss of Echo (LOE) state. See **Low Calibration Pt. (2.3.7.1.)** on page 62 for an illustration.*

Values	Range: 0 to 23 m (75.4 ft). Min. value depends on the setting for **Low Calibration Pt. (2.3.7.1.)** Default: **Low Calibration Pt. (2.3.7.1.)** + 1 m (3.2 ft)

Use this feature if the measured surface can drop below the Low Cal. Point in normal operation.

2.5.3. Propagation Factor

Notes:
- When operating in a stillpipe, values for **CLEF Range (2.5.7.4.)**, and for the propagation factor, should be set according to the pipe size. See the table below.
- For reliable results the horn size must be close to the pipe size.

Compensates for the change in microwave velocity due to propagation within a metal stillpipe, instead of in free space.

Values	Range: **0.3** to **1.5** depending on pipe size.			
	Default: **1.000**			
Nominal Pipe Size[a)]	40 mm (1.5")	50 mm (2")	80 mm (3")	100 mm (4")
Propagation Factor	0.9828	0.990	0.991	0.9965
CLEF Range (2.5.7.4.)	Low Cal Pt. – 700 mm	Low Cal Pt. – 700 mm	Low Cal Pt. – 1000 mm	Low Cal Pt. – 1000 mm

a) Since pipe dimensions may vary slightly, the propagation factor may also vary.

2.5.4. Minimum Sensor Value

*The minimum recorded Sensor value in units defined in **Unit (2.3.1.)**.*

- Open the menu **View – Device Diagnostics,** select Device Status, and click on the **Device Status** tab.
- Check **Sensor Peak Values**.

2.5.5. Maximum Sensor Value

*The maximum recorded Sensor value in units defined in **Unit (2.3.1.)**.*

- Open the menu **View – Device Diagnostics,** select Device Status, and click on the **Device Status** tab.
- Check **Sensor Peak Values**.

2.5.6. Shots

The number of echo profile samples averaged to produce a measurement.

Values	Range: **1** to **25**
	Default: **25**

2.5.7. Echo select

2.5.7.1. Algorithm

Selects the algorithm to be applied to the echo profile to extract the true echo.

Options	*	**TF**	**t**rue **F**irst echo
		L	**L**argest echo
		BLF	**b**est of **F**irst or **L**argest echo

2.5.7.2. Position Detect

Note: If a stillpipe is used, the setting for CLEF range is determined by the horn size: see **CLEF Range (2.5.7.4.)** for a table of values.

Defines where on the echo the distance measurement is determined. (See Position Detect (2.5.7.2.) on page 117 for more detail.)

Options		Center
	*	Hybrid (Center and CLEF)
		CLEF (Constrained Leading Edge Fit)
Related parameters		CLEF Range (2.5.7.4.)

If the vessel bottom is being reported as the level instead of the actual material level (at low level conditions), or if the dielectric constant of the liquid to be monitored is less than 3, we recommend setting Position to Hybrid and **CLEF Range (2.5.7.4.)** to 0.5 m (1.64 ft).

2.5.7.3. Echo Threshold

*Sets the minimum echo confidence that the echo must meet in order to prevent a Loss of Echo condition and the expiration of the LOE timer. When **Confidence (2.5.9.1.)** exceeds **Echo Threshold (2.5.7.3.)**, the echo is accepted as a valid echo and is evaluated.*

Values	Range: **0 to 99**
	Default: **5**
Related Parameters	LOE Timer (2.3.6.)

Use this feature when an incorrect material level is reported.

2.5.7.4. CLEF Range

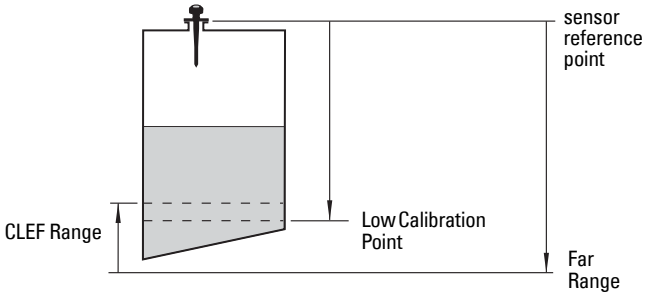
Notes:
- CLEF Range is referenced from Far Range.
- The value for CLEF Range must include the difference between Far Range and Low Calibration Point, plus any level above the Low Calibration Point to be managed by the CLEF algorithm.

The CLEF algorithm is used mainly to allow correct level reporting for low dK materials which may otherwise cause an incorrect reading in an empty or almost empty vessel.

It is used from Far Range up to the level defined by CLEF range (see illustration below). Above that point the Center algorithm is used. For more detail see CLEF Range (2.5.7.4.) on page 119.

Values	Range: **0** to **Far Range (2.5.2.)**
	Default: **0.0** m
Related parameters	Position Detect (2.5.7.2.)
	Far Range (2.5.2.)[a)]

a) If the value for Far Range is changed after a CLEF Range value is entered, CLEF Range is reset to its default (0.00 m).



In applications with low dK materials we recommend setting CLEF Range to 0.5 m (1.64 ft) and **Position Detect (2.5.7.2.)** to **Hybrid**.

2.5.8. Sampling

Provides a method of checking the reliability of a new echo before accepting it as the valid reading, based on numbers of samples above or below the currently selected echo.

2.5.8.1. Echo Lock

Note: Ensure the agitator is always running while SITRANS LR200 is monitoring the vessel, to avoid stationary blade detection.

Selects the measurement verification process. See Echo Lock (2.5.8.1.) on page 119 for more details.

Options			Lock Off (no verification)
			Maximum Verification (not recommended for radar)
		*	Material Agitator
			Total Lock (not recommended for radar)
Related parameters	Fill Rate (2.3.8.2.) Empty rate (2.3.8.3.) Sampling up (2.5.8.2.) Sampling down (2.5.8.3.)		

For radar applications, Material Agitator is the most often used setting, to avoid agitator blade detection.

2.5.8.2. Sampling up

Specifies the number of consecutive echoes that must appear above the echo currently selected, before the measurement is accepted as valid.

Values	Range: **1** to **50**
	Default: **5**

2.5.8.3. Sampling down

Specifies the number of consecutive echoes that must appear below the echo currently selected, before the measurement is accepted as valid.

Values	Range: **1** to **50**
	Default: **2**

2.5.9. Echo Quality

2.5.9.1. Confidence

*Indicates echo reliability: higher values represent better echo quality. The display shows the echo confidence of the last measurement. **Echo Threshold (2.5.7.3.)** defines the minimum criterion for echo confidence.*

Values (view only)	0 to 99	
	----	Shot not used
Related Parameters	Echo Threshold (2.5.7.3.)	

Open the menu **Device – Echo Profile Utilities** and click on the tab **Echo Profile**.

2.5.9.2. Echo Strength

Displays the absolute strength (in dB above 1 µV rms) of the echo selected as the measurement echo.

Values (view only)	**–20 to 99**

Open the menu **Device – Echo Profile Utilities** and click on the tab **Echo Profile**.

2.5.10. TVT setup

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

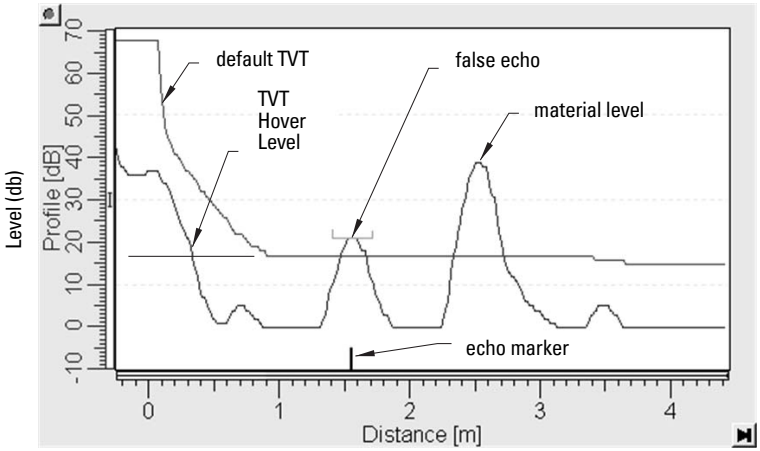
2.5.10.1. Auto False Echo Suppression

*Used together with **Auto False Echo Suppression Range (2.5.10.2.)** to screen out false echoes in a vessel with known obstructions.A 'learned TVT' (time varying threshold) replaces the default TVT over a specified range. See Auto False Echo Suppression (2.5.10.1.) on page 120 for a more detailed explanation.*

Notes:

- Make sure material level is below all known obstructions at the moment Auto False Echo Suppression is used to learn the echo profile. (An empty or almost empty vessel is recommended.)
- Note the distance to material level when Auto False Echo learns the environment. Set Auto False Echo Suppression Range to a shorter distance to avoid the material echo being screened out.
- Set Auto False Echo Suppression and Auto False Echo Range during startup, if possible.
- If the vessel contains an agitator it should be running.
- Before adjusting these parameters, rotate the instrument for best signal (lower false-echo amplitude).

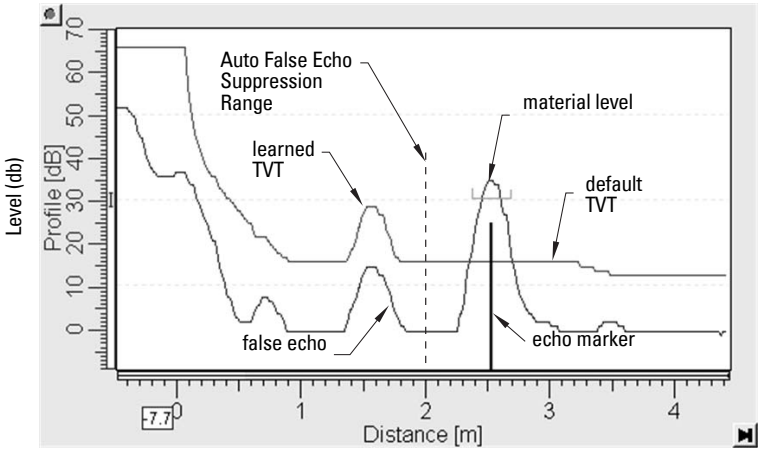
Before Auto False Echo Suppression



a) Determine Auto Suppression Range. Measure the actual distance from the sensor reference point to the material surface using a rope or tape measure.

b) Subtract 0.5 m (20") from this distance, and use the resulting value.

After Auto False Echo Suppression



To set Auto False Echo Suppression via SIMATIC PDM:

Open the menu **Device – Echo Profile Utilities** and click on the tab **Auto False Echo Suppression.**

(For more detailed instructions see *Auto False Echo Suppression* on page 46.)

To set Auto False Echo Suppression via the handheld programmer:

Options		OFF	Default TVT will be used.
	*	ON	'Learned' TVT will be used.
		LEARN	'Learn' the TVT.

c. Go to **Auto False Echo Suppression Range (2.5.10.2.)** and enter the value calculated in step b).

d) Go to **Auto False Echo Suppression (2.5.10.1.)** and press **RIGHT ARROW** to open Edit Mode

e) Select **Learn.** The device will automatically revert to On (Use Learned TVT) after a few seconds.

2.5.10.2. Auto False Echo Suppression Range

Defines the endpoint of the Learned TVT distance. Units are defined in Unit (2.3.1.).

Values	Range: **0.00** to **20.00 m**
	Default: **1.00 m**

a) Press **RIGHT ARROW** to open Edit mode.

b) Enter the new value and press **RIGHT ARROW** to accept it.

c) Set **Auto False Echo Suppression (2.5.10.1.)**

2.5.10.3. Hover Level[1)]

Defines how high the TVT (Time Varying Threshold) is placed above the noise floor of the echo profile, as a percentage of the difference between the peak of the largest echo in the profile and the noise floor. See ***Before Auto False Echo Suppression*** *on page 74 for an illustration.*)

Values	Range: **0** to **100%**
	Default: **40**%

When the device is located in the center of the vessel, the TVT hover level may be lowered to increase the confidence level of the largest echo.

2.5.10.4. Shaper Mode

Enables/disables ***TVT shaper (2.5.11.)****.*

Options	*	OFF
		ON

2.5.11. TVT shaper

Note: Shaper Mode (2.5.10.4.) must be turned ON in order for TVT shaper points to be transferred.

Adjusts the TVT (Time Varying Threshold) at a specified range (breakpoint on the TVT). This allows you to reshape the TVT curve to avoid unwanted echoes. There are 40 breakpoints arranged in 5 groups. (We recommend using SIMATIC PDM to access this feature.)

To use TVT shaper via SIMATIC PDM:

a) Go to **Level Meter > Setup > Signal Processing > TVT setup > Shaper Mode** and select **On**.
b) Open the menu **Device – Echo Profile Utilities** and click on **TVT Shaper.** For more detail see *TVT Shaper* on page 45.

To use TVT shaper via LUI (local user interface):

a) Go to **Shaper Mode (2.5.10.4.)** and select option **ON**.
b) In TVT shaper, go to **Breakpoint 1-9 (2.5.11.1.)**.
c) Open Breakpoint 1 and enter the TVT Offset value (between –50 and 50).
d) Go to the next Breakpoint and repeat step (c) till all desired breakpoint values have been entered.

2.5.11.1. Breakpoint 1-9

Values	Range[2)]: **– 50 to 50 dB**
	Default: **0 dB**

1) For an illustration, see *Before Auto False Echo Suppression* and *After Auto False Echo Suppression* on page 75.

2) The range is –100 to 100 bits. With 2 bits per dB this gives a range of –50 to 50 dB.

2.5.11.2. Breakpoint 10-18

Values	Range[1]: **– 50 to 50 dB**
	Default: **0 dB**

2.5.11.3. Breakpoint 19-27

Values	Range[1]: **– 50 to 50 dB**
	Default: **0 dB**

2.5.11.4. Breakpoint 28-36

Values	Range[1]: **– 50 to 50 dB**
	Default: **0 dB**

2.5.11.5. Breakpoint 37 - 40

Values	Range[1]: **– 50 to 50 dB**
	Default: **0 dB**

2.6. AIFB1

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

2.6.1. Static Revision No.

The revision level of the static data associated with Analog Input Function Block 1. The Static Revision No. is updated whenever a configuration parameter is changed.

2.6.2. Mode

Used to request an operating mode from the Analog Input Function Block.

Options	Automatic Mode (AUTO)
	Manual Mode (MAN)
	Out of Service (O/S)

Allows you to put the SITRANS LR200 into Out of Service Mode and then reset it to Automatic Mode.

Manual Mode is used in conjunction with Simulation. See *Simulation* on page 49. It should be used only with SIMATIC PDM in order to benefit from all the features available.

1) The range is –100 to 100 bits. With 2 bits per dB this gives a range of –50 to 50 dB.

2.6.3. Channel

Used to select between the different Level Transducer Block outputs.

Options		Level/Volume, Level, Distance
	*	Level/Volume

2.6.4. Label

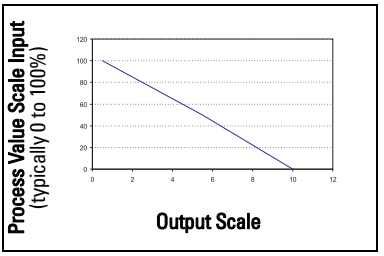
User defined label

2.6.5. Input Scaling

2.6.5.1. Upper Value

Defines the operational upper range value of the input value (Process Value Scale) in PV (volume/level) Units. Process Value Scale normalizes the input value to a customer-defined range.

Values	Range: -999999 to 999999
	Default: 100%



Provides Output values (Out) to AIFB1 or AIFB2

2.6.5.2. Lower Value

Defines the operational lower range value of the input value (Process Value Scale) in PV (volume/level) Units. Process Value Scale normalizes the input value to a customer-defined range.

Values	Range: -999999 to 999999
	Default: 0%

2.6.6. Output Scaling

Scales the Process Variable. The function block parameter OUT SCALE contains the values of the lower limit and upper limit effective range in AIFB1 units.

2.6.6.1. Upper Value

Defines the operational upper range value of the output value in AIFB1 units.

Values	Range: -999999 to 999999
	Default: 100%

2.6.6.2. Lower Value

Defines the operational lower range value of the output value in AIFB1 units.

Values	Range: -999999 to 999999
	Default: 0%

2.6.7. Alarms and Warnings

2.6.7.1. High Limit Alarm

The setting for the upper alarm limit in AIFB1 units.

Values	Range: -999999 to 999999
	Default: 999999

2.6.7.2. High Limit Warning

The setting for the upper warning limit in AIFB1 units

Values	Range: -999999 to 999999
	Default: 999999

2.6.7.3. Low Limit Warning

The setting for the lower warning imit in AIFB1 units.

Values	Range: -999999 to 999999
	Default: -999999

2.6.7.4. Low Limit Alarm

The setting for the lower alarm limit in AIFB1 units.

Values	Range: -999999 to 999999
	Default: -999999

2.6.7.5. Limit Hysteresis

Hysteresis is used to adjust the sensitivity of the trigger for alarm messages. It is used to compensate when a process variable fluctuates around the same value as a limit. A high level alarm occurs when a value exceeds an upper limit. The alarm's status remains true until the value drops below the limit minus the alarm hysteresis. The directions are reversed for low limit detection.

Values	Range: -999999 to 999999
	Default: 0.50

Enter a value for the hysteresis here, to be used for all warnings and alarms. The units are the same as the Output scale, i.e. AIFB1 units.

2.6.8. Display

2.6.8.1. Filter Time Constant

The time constant for the damping filter. The damping filter smooths out the response to a sudden change in level. This is an exponential filter and the engineering unit is always in seconds (see ***Damping*** *on page 122 for more detail*).

Values	Range 0 to 600 s
	Default: 0 s

2.6.8.2. Unit

Note: Additional units are available in SIMATIC PDM.

Engineering unit to be displayed with the output value

Options		m, cm, mm, ft, in, cu m, L, HL, cu in, cu ft, cu yd, gal, imp gal, bushels, Bbl, Bbl liquid, percent, PA, Follow out unit
	*	percent

2.6.8.3. Out Unit Text

If the desired unit is not listed in ***Unit (2.6.8.2.)*** *you can define it in* ***Out Unit Text****.*

2.6.8.4. Decimal Point

The number of digits to display after the decimal point. (The LCD is limited to displaying two decimal places in Measurement mode. In SIMATIC PDM up to seven decimal places may be used to display measured values.)

Options	Range: 0, 1, 2, 3, 4, 5, 6, 7
	Default: 2

2.6.9. Fail-safe Mode

2.6.9.1. Mode

Fail-safe Mode occurs if the status of the input value is bad, or if the device has been put into Fail-safe mode using Simulation. ***Mode*** *defines the material level to be reported when the LOE (Loss of Echo) timer expires.*

Options		**SUB VALUE**	Substitute value. **Value (2.6.9.2.)** used as output value.
	*	**LAST VALUE**	Last value. (Store last valid output value).
		USE BAD VALUE	Use bad value. (Calculated output value is incorrect).

2.6.9.2. Value

Note: Mode (2.6.9.1.) must be set to **Substitute Value** before **Value (2.6.9.2.)** can be defined.

*User-defined default for the Output Value, if sensor or sensor electronic fault is detected. Units are defined in **Unit (2.6.8.2.)**.*

Values	Range: -999999 to 999999
	Default: 0

2.7. AIFB2

*See **AIFB1 (2.6.)**: the parameters for AIFB2 are identical.*

2.8. Measured Values

Read only. Allows you to view measured values for diagnostic purposes

In SIMATIC PDM, open the menu **View – Process Variables.**

2.8.1. Main Output (PV– Primary Value)

The value for level, or volume (if volume conversion is selected).

2.8.2. Output, no linearization (SV1 – Secondary Value 1)

The value for level.

2.8.3. Output, no level offset (SV2 – Secondary Value 2)

The value for distance.

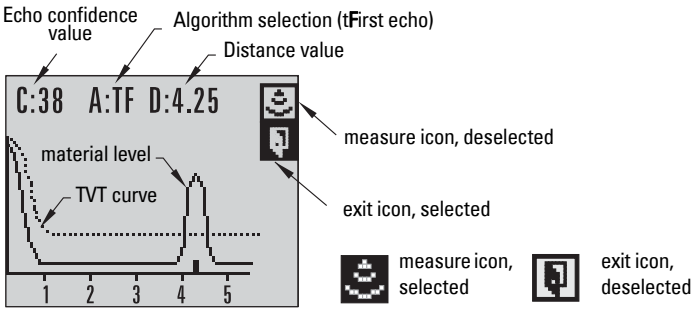
3. Diagnostics

3.1. Echo Profile

To request a profile via SIMATIC PDM:

Open the menu **Device – Echo Profile Utilities.** (See *Echo Profile Utilities* on page 44 for more detail.)

To request a profile via the handheld programmer:



Navigate to **Echo Profile (3.1.)** and press **RIGHT arrow**. (See *Requesting an Echo Profile* on page 32 for more details.)

3.2. Fault Reset

Clears the following faults:

Fault Code	Description
S3	Device Lifetime Reminder 1 (Maintenance Required)
S4	Device Lifetime Reminder 2 (Maintenance Demanded)
S6	Sensor Lifetime Reminder 1 (Maintenance Required)
S7	Sensor Lifetime Reminder 2 (Maintenance Demanded)
S8	Device Service Reminder 1 (Maintenance Required)
S9	Device Service Reminder 2 (Maintenance Demanded)
S12	Internal Temperature High
S17	Calibration Schedule Reminder 1 (Maintenance Required)
S18	Calibration Schedule Reminder 2 (Maintenance Demanded)

To clear a fault using the handheld programmer:

- Enter the fault code number then press **RIGHT arrow**.

To clear a fault via SIMATIC PDM:

- Open the menu **Device – Acknowledge Faults**.
- Select the fault to be cleared from the pull-down menu in Extended Diagnostics.
- Click on **Transfer** to clear the fault.

3.3. Electronics Temperature

3.3.1. Minimum Value

The minimum recorded internal electronics temperature of the SITRANS LR200.

3.3.2. Maximum Value

The maximum recorded internal electronics temperature of the SITRANS LR200.

3.4. Condensed Status

*When **Enable (3.4.1.)** is enabled, you can select the level of severity of errors, and tailor a device response appropriate for your particular process.*

- In **Event Index (3.5.1.)** you can select a particular event or error by means of its index number.
- In **Event Status (3.5.2.)** you can assign a status to the selected event.
- In **Event Diagnosis (3.5.3.)** you can assign a diagnosis to the selected event.

3.4.1. Enable

Note: When cyclic communication is in progress, Condensed Status Mode cannot be changed.

Options		NO (disabled)
	*	YES (enabled)

Select **Yes** or **No** to enable/disable Condensed Mode.

3.4.2. Features supported

Read only. Features supported are:

- Condensed Diagnostics
- Extended Diagnostics
- Application Relationships

3.4.3. Features enabled (View only)

Read only. Lists those features that have been enabled.

3.5. Allocation

3.5.1. Event Index

The numeric component of the Event Code for a Condensed Status event. Use the index number to identify a particular event in the list below.

Event Index	Event Code	Event Description[a)]
0	S0	Loss of Echo
2	S2	No Tech Power
10	S10	Level Transducer Block (LTB) Scale
11	S11	Internal Temperature Sensor
12	S12	Internal Temperature High
14	S14	AIFB1 PV Range
15	S15	AIFB2 PV Range
28	S28	Memory RAM
29	S29	Memory EEPROM
30	S30	Memory EEPROM Flags
31	S31	Memory Flash
33	S33	Internal Temperature Calibration
34	S34	Velocity Calibration

Event Index	Event Code	Event Description[a] (cont'd)
35	S35	Receiver Init Calibration
36	S36	Receiver Calibration
37	S37	Technology Module Calibration
38	S38	Technology Module Ramp

a) See *General Fault Codes* on page 109 for the meaning of each event.

For example:

Event Code for Loss of Echo = S0

Event Index = 0

To select a particular event via the handheld programmer:

a) Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
b) Go to **Event Index (3.5.1.)** and enter the event index number corresponding to the event.

To select a particular event via SIMATIC PDM:

a) Go to **Maintenance & Diagnostics > Condensed Status** and select **Yes** to enable Condensed Mode.
b) Go to **Maintenance & Diagnostics > Condensed Status > Allocation Level.**
c) For each event, you can select either the Status or the Diagnosis line, then choose a Status or Diagnosis option from the associated pull-down menu.

3.5.2. Event Status

*Event Status allows you to assign one of the status options listed below, to any of the events listed in **Event Index (3.5.1.)**. This allows you to tailor a device response appropriate for your particular process. (Event Status affects Condensed Status[1]).*

	Event Status Options
	Good
	Good: maintenance required
	Good: maintenance demanded
	Uncertain: maintenance demanded
*	Bad: maintenance alarm
	Uncertain: process related, no maintenance
	Bad: process related, no maintenance
	Bad: function check/local override
	Good: function check

1) See *Condensed Status* on page 144 for more detail.

To assign a status to a particular event via the handheld programmer:

a) Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
b) Go to **Event Index (3.5.1.)** and enter the event index number corresponding to a particular event.
c) Go to **Event Status (3.5.2.)** and choose a Status option from the table above.

To assign a status to a particular event via SIMATIC PDM:

a) Go to **Level Meter > Maintenance & Diagnostics > Condensed Status** and select **Yes** to enable Condensed Status Mode.
b) Go to **Level Meter > Maintenance & Diagnostics > Condensed Status > Allocation Level.**
c) Select the Status line for the selected Event, then choose a Status option from the associated pull-down menu.

3.5.3. Event Diagnosis

*Allows you to assign one of the diagnostic options listed below to any of the events listed in **Event Index (3.5.1.)**. This allows you to tailor a device response appropriate for your particular process.(Event Diagnosis affects Condensed Acyclic Diagnostics and Cyclic Extended Diagnostics[1]).*

	Event Diagnosis Options
	Status OK
	Maintenance Required
	Maintenance Demanded
*	Maintenance alarm
	Invalid process conditions
	Function check or simulation

To assign a diagnosis to a particular event via the handheld programmer:

a) Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
b) Go to **Event Index (3.5.1.)** and enter the event index number corresponding to a particular event.
c) Go to **Event Diagnosis (3.5.3.)** and choose a Diagnosis option from the table above.

To assign a status to a particular event via SIMATIC PDM:

a) Go to **Level Meter > Maintenance & Diagnostics > Condensed Status** and select **Yes** to enable Condensed Status Mode.
b) Go to **Level Meter > Maintenance & Diagnostics > Condensed Status > Allocation Level.**
c) Select the Diagnosis line for the selected Event, then choose a Diagnosis option from the associated pull-down menu.

1) See *Condensed Mode Diagnosis* on page 148 for more detail.

3.6. Peak Values

To view via SIMATIC PDM:

Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the tab **Device Status**. For more details see *Device Diagnostics* on page 54.

3.6.1. Min. Measured Value

*The minimum recorded Sensor value, reported in units defined in **Unit (2.3.1.)**.*

3.6.2. Max. Measured Value

*The maximum recorded Sensor value, reported in units defined in **Unit (2.3.1.)**.*

3.6.3. Minimum Output Value - AIFB1

The minimum recorded Output Value from the Analog Input Function Block 1.

3.6.4. Maximum Output Value - AIFB1

The maximum recorded Output Value from the Analog Input Function Block 1.

3.6.5. Minimum Output Value - AIFB2

The minimum recorded Output Value from the Analog Input Function Block 2.

3.6.6. Maximum Output Value - AIFB2

The maximum recorded Output Value from the Analog Input Function Block 2.

4. Service

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

4.1. Master Reset

Note: Following a Factory Reset, some degree of reprogramming may be required, depending on the option chosen below.

Reset Options	Result
Factory Defaults[a)]	Resets all user parameters to the manufacturer's default settings, with certain exceptions. The list of exceptions includes, but is not limited to: • Tag • Message • Description • Installation Data • Device Address • Write Protection • Auto False Echo Suppression Range • learned TVT
Standard Defaults[a)]	Resets all parameters excluding device addresses to the PROFIBUS standard default settings.

Reset Options	Result (cont'd)
Informational	Resets parameters such as Tag and Description
Functional	Resets parameters that control device behavior and functionality (such as calibration points)
Warm Start	Has the same effect as recycling power to the device
Device Address[b)]	• Resets the PROFIBUS device address to 126 • If the address lock was on, will disable the lock.

a) The only differences between Factory and Standard Defaults are the settings for Filter Time Constant (Damping) and Tag. Factory Defaults sets the Filter Time Constant to 10 s whereas Standard Defaults sets it to 0 s. Factory Defaults does not reset Tag, but Standard Defaults does reset it.

b) This option only resets the address to 126. Use **Device Address (5.1.)** for other addresses.

To access via SIMATIC PDM:

Open the menu **Device – Master Reset**. For more detail see *Master Reset* on page 51.

To acess via the handheld programmer:

a) Press **RIGHT Arrow** to open Edit Mode then scroll down to the desired Reset option and press **RIGHT Arrow** to select it.

b) Press **LEFT Arrow** to exit.

4.2. Remaining Device Lifetime

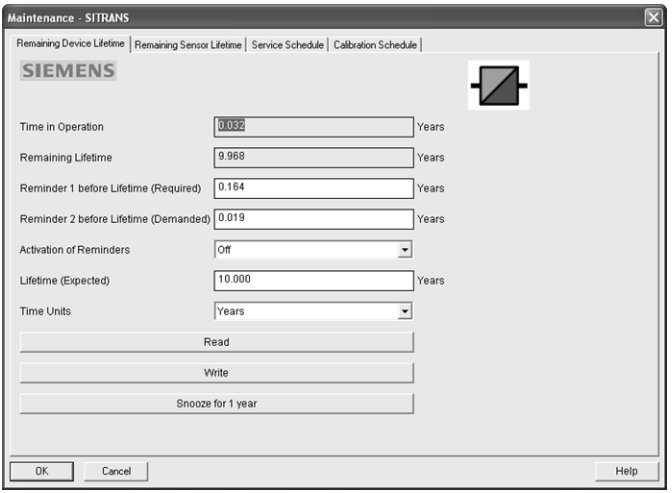
Notes:

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Sensor Lifetime (4.3.)**, **Service Schedule (4.4.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Remaining Device Lifetime parameters in hours or days (via SIMATIC PDM only) see **Lifetime Expected (4.2.1.)**.

The device tracks itself based on operating hours and monitors its predicted lifetime. You can modify the expected device lifetime, set up schedules for maintenance reminders, and acknowledge them.

The maintenance warnings and alarms are communicated via the Status byte. This information can be integrated into any Asset Management system. For optimal use,

we recommend that you use SIMATIC PCS7 Asset Management Software in conjunction with SIMATIC PDM.



To access these parameters via SIMATIC PDM:

- Open the menu **Device – Maintenance** and select the **Remaining Device Lifetime** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.
- Click on **Snooze** to add a year to the Total Expected Device Life.

Time Units

Options[a)]	Hours; days; years
	Default: years

a) Selectable only via SIMATIC PDM.

4.2.1. Lifetime Expected

Note: The device always operates in years. Changing the units affects only the parameter view of the Remaining Device Lifetime parameters in SIMATIC PDM.

Allows you to override the factory default.

Values	Units[a)]: hours, days, years
	Range: 0 to 20 years
	Default: 10.00 years

a) Units are selectable only via SIMATIC PDM.

4.2.2. Time in Operation

Read only. The amount of time the device has been operating in years.

4.2.3. Remaining Lifetime

Read only. ***Lifetime Expected (4.2.1.)*** *less* ***Time in Operation (4.2.2.)***.

4.2.4. Reminder Activation

Note: To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu **Device – Maintenance**.

Allows you to enable a maintenance reminder.

Values		Reminder 1 (Maintenance Required)
		Reminder 2 (Maintenance Demanded)
		Reminders 1 and 2
	*	OFF

a) First set the values in **Reminder 1 (Required) (4.2.5.)/Reminder 2 (Demanded) (4.2.6.)**.
b) Select the desired **Reminder Activation** option.

4.2.5. Reminder 1 (Required)

If ***Remaining Lifetime (4.2.3.)*** *is equal to or less than this value, the device generates a Maintenance Required reminder.*

Values	Range: 0 to 20 years
	Default: 0.164 years

a) Modify values as required.
b) Set **Reminder Activation (4.2.4.)** to the desired option.

4.2.6. Reminder 2 (Demanded)

If Remaining Lifetime (4.2.3.) is equal to or less than this value, the device generates a Maintenance Demanded reminder.

Values	Range: 0 to 20 years
	Default: 0.019 years

a) Modify limit values as required.
b) Set **Reminder Activation (4.2.4.)** to the desired option.

4.2.7. Maintenance Status

Indicates which level of maintenance reminder is active.

In SIMATIC PDM, open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab, and check the **Device Lifetime Status** window.

4.2.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

In SIMATIC PDM, open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab, and check the **Device Lifetime Status** window.

4.2.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

a) Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the **Maintenance** tab.
b) In the **Device Lifetime** section, click on **Acknowledge Warnings.**

To acknowledge a reminder via the handheld programmer:

a) Press **RIGHT arrow** → twice to open parameter view and activate **Edit** Mode.
b) Press **RIGHT arrow** → to acknowledge the reminder.

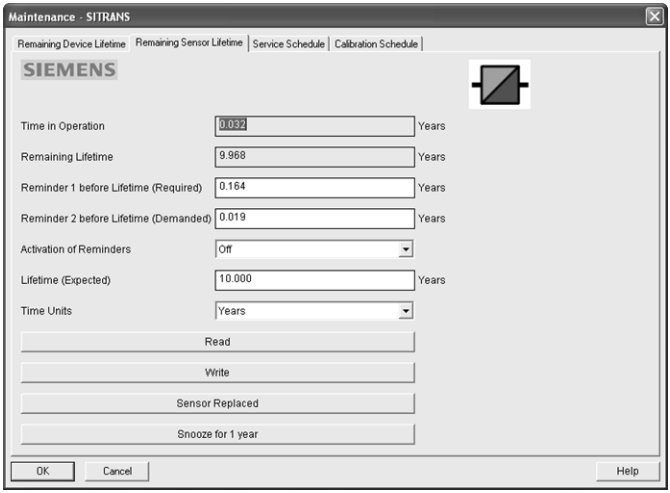
4.3. Remaining Sensor Lifetime

Notes:
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Service Schedule (4.4.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Remaining Sensor Lifetime parameters in hours or days (via SIMATIC PDM only) see **Lifetime Expected (4.3.1.)**.

The device monitors the predicted lifetime of the sensor (the components exposed to the vessel environment). You can modify the expected sensor lifetime, set up schedules for maintenance reminders, and acknowledge them.

To access these parameters via SIMATIC PDM:

- Open the menu **Device – Maintenance** and select the **Remaining Sensor Lifetime** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.
- Click on **Snooze** to add a year to the Total Expected Sensor Life.
- Click on **Sensor Replaced** to restart the timer and clear any fault messages.



Time Units

Options[a)]	Hours; days; years
	Default: years

a) Selectable only via SIMATIC PDM.

4.3.1. Lifetime Expected

Note: The device always operates in years. Changing the units affects only the parameter view of Remaining Sensor Life parameters in SIMATIC PDM.

Allows you to override the factory default.

Values	Units[a)]: hours, days, years
	Range: **0** to **20** years
	Default: **10.00** years

a) Units are selectable only via SIMATIC PDM.

4.3.2. Time in Operation

The amount of time the sensor has been operating. Can be reset to zero after performing a service or replacing the sensor.

To reset to zero:

- In SIMATIC PDM, open the menu **Device – Maintenance**, click on the **Remaining Sensor Lifetime** tab, and click on **Sensor Replaced** to restart the timer and clear any fault messages.
- Via the handheld programmer, manually reset **Time in Operation (4.3.2.)** to zero.

4.3.3. Remaining Lifetime

Read only. ***Lifetime Expected (4.3.1.)*** *less* ***Time in Operation (4.3.2.)****.*

4.3.4. Reminder Activation

Note: To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu **Device – Maintenance**.

*Allows you to enable a maintenance reminder***.**

Options		Reminder 1 (Maintenance Required)
		Reminder 2 (Maintenance Demanded)
		Reminders 1 and 2
	*	OFF

a) First set the values in **Reminder 1 (Required) (4.3.5.)/Reminder 2 (Demanded) (4.3.6.)**.

b) Select the desired **Reminder Activation** option.

4.3.5. Reminder 1 (Required)

If ***Remaining Lifetime (4.3.3.)*** *is equal to or less than this value, the device generates a* ***Maintenance Required*** *reminder.*

Values	Range: 0 to 20 years
	Default: 0.164 years

a) Modify values as required.

b) Set **Reminder Activation (4.3.4.)** to the desired option.

4.3.6. Reminder 2 (Demanded)

If ***Remaining Lifetime (4.3.3.)*** *is equal to or less than this value, the device generates a* ***Maintenance Demanded*** *reminder.*

Values	Range: 0 to 20 years
	Default: 0.019 years

a) Modify values as required

b) Set **Reminder Activation (4.3.4.)** to the desired option.

4.3.7. Maintenance Status

Indicates which level of maintenance reminder is active.

In SIMATIC PDM, open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab, and check the **Sensor Lifetime Status** window.

4.3.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

In SIMATIC PDM, open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab, and check the **Sensor Lifetime Status** window.

4.3.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

a) Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the **Maintenance** tab.

b) In the **Sensor Lifetime** section click on **Acknowledge Warnings.**

To acknowledge a reminder via the handheld programmer:

a) Press **RIGHT arrow** → twice to open parameter view and activate **Edit** Mode.

b) Press **RIGHT arrow** → to acknowledge the reminder

4.4. Service Schedule

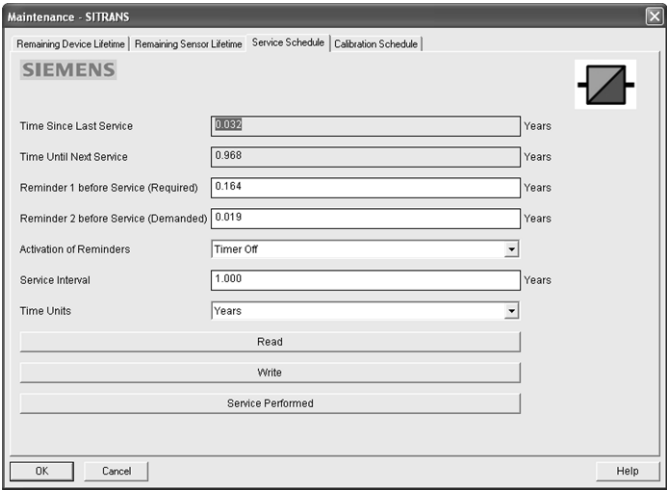
Notes:
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Remaining Sensor Lifetime (4.3.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Service Interval parameters in hours or days (via SIMATIC PDM only) see Service Interval (4.4.1.).

The device tracks service intervals based on operating hours and monitors the predicted lifetime to the next service. You can modify the Total Service Interval, set schedules for Maintenance Alerts, and acknowledge them.

The maintenance warnings and alarms are communicated via the Status byte. This information can be integrated into any Asset Management system. For optimal use, we recommend that you use SIMATIC PCS7 Asset Management Software in conjunction with SIMATIC PDM.

To access these parameters via SIMATIC PDM:

- Open the menu **Device – Maintenance** and select the **Service Schedule** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.
- Click on **Service Performed** to restart the timer and clear any fault messages.



Time Units

Options[a)]	Hours; days; years
	Default: years

a) Selectable only via SIMATIC PDM.

4.4.1. Service Interval

Note: The device always operates in years. Changing the units affects only the parameter view of the Service Interval parameters in SIMATIC PDM.

User-configurable recommended time between product inspections.

Values	Units[a)]: hours, days, years
	Range: **0 to 20 years**
	Default: **1.0** year

a) Units are selectable only via SIMATIC PDM.

4.4.2. Time since Last Service

Time elapsed since last service. Can be reset to zero after performing a service.

To reset to zero:

- In SIMATIC PDM, open the menu **Device – Maintenance**, click on the **Service Schedule** tab, and click on **Service Performed** to restart the timer and clear any fault messages.
- Via the handheld programmer, manually reset **Time since Last Service (4.4.2.)** to zero.

4.4.3. Time until Next Service

Read only. ***Service Interval (4.4.1.)*** *less* ***Time since Last Service (4.4.2.).***

4.4.4. Reminder Activation

Note: To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu **Device – Maintenance**.

Allows you to enable a maintenance reminder.

Values	*	Timer OFF
		ON - no reminders checked
		ON - Reminder 1 (Maintenance Required) checked
		ON - Reminders 1 and 2 checked
		ON - Reminder 2 (Maintenance Demanded) checked

a) First set the values in **Reminder 1 (Required) (4.4.5.)/Reminder 2 (Demanded) (4.4.6.)**.
b) Select the desired **Reminder Activation** option.

4.4.5. Reminder 1 (Required)

If ***Time until Next Service (4.4.3.)*** *is equal to or less than this value, the device generates a* ***Maintenance Required*** *reminder.*

Values	Range: **0 to 20 years**
	Default: 0.164 years

a) Modify values as required.
b) Set **Reminder Activation (4.4.4.)** to the desired option.

4.4.6. Reminder 2 (Demanded)

If ***Time until Next Service (4.4.3.)*** *is equal to or less than this value, the device generates a* ***Maintenance Demanded*** *reminder.*

Values	Range: **0 to 20 years**
	Default: 0.019 years

a) Modify values as required.
b) Set **Reminder Activation (4.4.4.)** to the desired option.

4.4.7. Maintenance Status

Indicates which level of maintenance reminder is active.

Open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab and check the **Service Schedule Status** window.

4.4.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

Open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab and check the **Service Schedule Status** window.

4.4.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

a) Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the **Maintenance** tab.
b) In the **Service Schedule Status** section click on **Acknowledge Warnings.**

To acknowledge a reminder via the handheld programmer:

a) Press **RIGHT arrow** → twice to open parameter view and activate **Edit** Mode.
b) Press **RIGHT arrow** → to acknowledge the reminder.

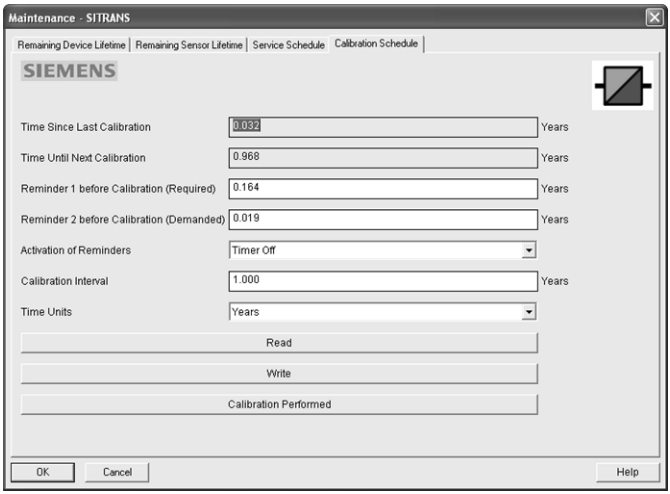
4.5. Calibration Schedule

Notes:
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Remaining Sensor Lifetime (4.3.)**, and **Service Schedule (4.4.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Calibration Interval parameters in hours or days (via SIMATIC PDM only) see **Calibration Interval (4.5.1.)**.

The device tracks calibration intervals based on operating hours and monitors the predicted lifetime to the next calibration. You can modify the Calibration Interval, set schedules for maintenance reminders, and acknowledge them.

To access these parameters via SIMATIC PDM:
- Open the menu **Device – Maintenance** and select the **Calibration Schedule** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.

- Click on **Calibration Performed** to restart the timer and clear any fault messages.



Time Units

Options[a)]	Hours; days; years
	Default: years

a) Selectable only via SIMATIC PDM.

4.5.1. Calibration Interval

Note: The device always operates in years. Changing the units affects only the parameter view of the Calibration Interval parameters in SIMATIC PDM.

User-configurable recommended time between product calibrations.

Values	Units[a)]: hours, days, years
	Range: **0 to 20 years**
	Default: **1.0** year

a) Units are selectable only via SIMATIC PDM.

4.5.2. Time since Last Calibration

Time elapsed since last calibration. Can be reset to zero after performing a calibration.

To reset to zero:

- In SIMATIC PDM, open the menu **Device – Maintenance**, click on the **Calibration Schedule** tab, and click on **Calibration Performed** to restart the timer and clear any fault messages.
- Via the handheld programmer, manually reset **Time since Last Calibration (4.5.2.)** to zero.

4.5.3. Time until Next Calibration

Read only. ***Calibration Interval (4.5.1.)*** *less* ***Time since Last Calibration (4.5.2.)***

4.5.4. Reminder Activation

Note: To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu **Device – Maintenance**.

*Allows you to enable a maintenance reminder***.**

Values	*	Timer OFF
		ON - no reminders checked
		ON - Reminder 1 (Maintenance Required) checked
		ON - Reminders 1 and 2 checked
		ON - Reminder 2 (Maintenance Demanded) checked

a) First set the values in **Reminder 1 (Required) (4.5.5.)**/**Reminder 2 (Demanded) (4.5.6.)**.

b) Select the desired **Reminder Activation** option.

4.5.5. Reminder 1 (Required)

If ***Time until Next Calibration (4.5.3.)*** *is equal to or less than this value, the device generates a* ***Maintenance Required*** *reminder.*

Values	Range: **0 to 20 years**
	Default: **0.164** years

a) Modify values as required.

b) Set **Reminder Activation (4.5.4.)** to the desired option.

4.5.6. Reminder 2 (Demanded)

If ***Time until Next Calibration (4.5.3.)*** *is equal to or less than this value, the device generates a* ***Maintenance Demanded*** *reminder.*

Values	Range: **0 to 20 years**
	Default: 0.019 years

a) Modify values as required.

b) Set **Reminder Activation (4.5.4.)** to the desired option.

4.5.7. Maintenance Status

Indicates which level of maintenance reminder is active.

In SIMATIC PDM, open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab, and check the **Calibration Schedule Status** window.

4.5.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

In SIMATIC PDM, open the menu **View – Device Diagnostics**, select **Device Status**, click on the **Maintenance** tab, and check the **Calibration Schedule Status** window.

4.5.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

a) Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the **Maintenance** tab.
b) In the **Calibration Schedule Status** section click on **Acknowledge Warnings.**

To acknowledge a reminder via the handheld programmer:

a) Press **RIGHT arrow** → twice to open parameter view and activate **Edit** Mode.
b) Press **RIGHT arrow** → to acknowledge the reminder.

4.6. Manufacture Date

The date of manufacture of the SITRANS LR200 (yy mm dd).

4.7. Powered Hours

Displays the number of hours the unit has been powered up since manufacture.

To view via SIMATIC PDM, open the menu **Device – Wear**.

4.8. Power-on Resets

The number of power cycles that have occurred since manufacture.

To view via SIMATIC PDM, open the menu **Device – Wear**.

4.9. LCD Fast Mode

Notes:
- LCD Fast Mode takes effect only after 30 minutes of inactivity. (Each time the device is powered up, a further 30 minutes of inactivity is required.)
- LCD Fast Mode affects Measurement mode only; it has no effect on Navigation mode.

Enables a faster rate of measurement from the device by disabling most of the display area. Only the bar graph will be refreshed when LCD Fast Mode is set to ON.

Values		**ON**
	*	**OFF**

4.10. LCD Contrast

The factory setting is for optimum visibility at room temperature and in average light conditions. Extremes of temperature will lessen the contrast.

Values	Range: **0** (High contrast) to **20** (Low contrast). Default: **10**

Adjust the value to improve visibility in different temperatures and light conditions. Change the value in small steps to ensure you can continue to read the display.

5. Communication

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

5.1. Device Address

Note: The address can be changed and locked from a remote master. See *PROFIBUS address* on page 141 for details on disabling the address lock and **Master Reset (4.1.)** on page 86 to reset Device Address to 126.

Sets the unique address of the device on the network (also called PROFIBUS address).

Values	0 - 126. Default: 126

To set Device Address via the handheld programmer:
See *Device Address* on page 33 for details.

To set Device Address via SIMATIC PDM:
See *Set Address* on page 43 for details.

5.2. PROFIBUS Ident Number

Identifies the device on the network. The Ident Number must match that in the GSD file (the GSD file provides information on the device to the master).

Options		**STD PROFILE**	Standard Profile (uses generic GSD for 2 AIFB [ident # = 0x9701]
	*	**MANUFACTURER**	Manufacturer-specific (uses Siemens EDD and GSD file, which identifies the LR200 [PROFIBUS PA]) [ident # = 0x8150]
		STD – AIFB 1 ONL	Standard Profile AIFB 1 only (uses generic GSD for 1 AIFB) [ident # = 0x9700]

6. Security

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

6.1. Remote Access

6.1.1. Remote Lockout

Note: If access control is changed to limit remote access, it can be reset only via the handheld programmer.

Enables or disables programming via the network and PDM.

Options	*	OFF (Remote operation enabled)
		ON (Remote operation disabled)

6.2. Local Access

6.2.1. Write Protection

Note: Do not lose this number value.

Prevents any changes to parameters via PDM or the hand-held programmer.

Hand-held programmer Values	Range: 0 to 99999	
	2457 (unlock value)	Off (enables programming)
	any other value	On (disables programming)

6.2.2. Local Operation

Enables or disables programming via the hand-held programmer.

Options	*	ENABLED
		DISABLED

In SIMATIC PDM, open the menu **Device – Write Locking**, select **On** or **Off**, and click on **Transfer.**

7. Language

Selects the language to be used on the LCD.

Options	*	ENGLISH
		DEUTSCH
		FRANÇAIS
		ESPAÑOL

Notes

Appendix A: Alphabetical Parameter List

Appendix B: Troubleshooting

Communication Troubleshooting

1. Check the following:
   - There is power at the instrument.
   - The LCD shows the relevant data.
   - The device can be programmed using the hand-held programmer.
   - If any fault codes are being displayed see *Acyclic Extended Diagnostics (General Fault Codes)* on page 149 for a detailed list.
2. Verify that the wiring connections are correct.
3. Check the PROFIBUS address and make sure all devices are at unique PROFIBUS addresses.
4. See the table below for specific symptoms (continued on next page).

Symptom	Corrective action
The device cannot be programmed via the hand-held programmer.	• Make sure **Write Protection (6.2.1.)** on page 101 is set to the unlock value.
You try to set a SITRANS LR200 parameter via remote communications but the parameter remains unchanged.	• Ensure **Remote Lockout (6.1.1.)** on page 101 is disabled. • Ensure **Write Protection (6.2.1.)** on page 101 is set to the unlock value. • Navigate to **Master Reset (4.1.)** on page 86 and select **Reset Address to 126** to disable an address lock.
The PLC value equals the display value but does not correspond to actual material level.	• Ensure Scaling in AIFB1 is correctly entered. • Ensure High Calibration Point is correctly entered. • View the echo profile to see if the wrong echo is being selected. If so, see *Operation Troubleshooting* on page 113 for possible causes and corrective action.

Symptom	Corrective action (cont'd)
The PLC value is not equal to the displayed value (regardless of actual material level).	• Confirm you are looking at the right spot in the PLC. • Ensure scaling has not been programmed into the PLC: all scaling should be performed by the LR200. • Check the network to ensure the PCL is communicating with the LR200.

If you continue to experience problems, go to our website at: www.siemens.com/LR200, and check the FAQs for SITRANS LR200, or contact your Siemens Milltronics representative.

Device Status Icons

Icon	Priority Level	Meaning
	1	• Maintenance alarm • Measurement values are not valid
	2	• Maintenance warning: maintenance demanded immediately • Measured signal still valid
	3	• Maintenance required • Measured signal still valid
	1	• Process value has reached an alarm limit
	2	• Process value has reached a warning limit
	3	• Process value has reached a tolerance limit
	1	• Configuration error • Device will not work because one or more parameters/components is incorrectly configured
	2	• Configuration warning • Device can work but one or more parameters/components is incorrectly configured

Icon	Priority Level	Meaning (cont'd)
	3	• Configuration changed • Device parameterization not consistent with parameterization in project. Look for info text.
	1	• Manual operation (local override) • Communication is good; device is in manual mode.
	2	• Simulation or substitute value • Communication is good; device is in simulation mode or works with substitute values.
	3	• Out of operation • Communication is good; device is out of action.
		• No data exchange
		• Write access enabled
		• Write access disabled

General Fault Codes

Notes:
- The status icon shown associated with each fault is the default icon in Condensed Mode.
- If more than one fault is present, the device status indicator and text for each fault alternate at 2 second intervals.
- Some faults cause the device to go to Fail-safe mode. These are indicated with an asterisk (*).

General Fault Codes			
Code / Icon		**Meaning**	**Corrective Action**
S:0 	*	The device was unable to get a measurement within the Fail-safe LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid configuration range.	• Ensure installation details are correct. • Ensure no material buildup. Clean if necessary. • Adjust process conditions to minimize foam or other adverse conditions. • Correct configuration range. • If fault persists, contact your local Siemens representative.
S: 2 	*	Unable to collect profile because of a power condition that is outside the operating range of the device.	Repair required. Contact your local Siemens representative.
S: 3 		Device is nearing its lifetime limit according to the value set in **Reminder 1 (Required) (4.2.5.)**.	Replacement is recommended.
S: 4 		Device is nearing its lifetime limit according to the value set in **Reminder 2 (Demanded) (4.2.6.)**.	Replacement is recommended.
S: 6 		Sensor is nearing its lifetime limit according to the value set in **Reminder 1 (Required) (4.3.5.)**.	Replacement is recommended.

General Fault Codes (cont'd)			
Code / Icon		**Meaning**	**Corrective Action**
S: 7 		Sensor is nearing its lifetime limit according to the value set in **Reminder 2 (Demanded) (4.3.6.)**.	Replacement is recommended.
S: 8 		Service interval as defined in **Reminder 1 (Required) (4.4.5.)** has expired.	Perform service.
S: 9 		Service interval as defined in **Reminder 2 (Demanded) (4.4.6.)** has expired.	Perform service.
S:10 		Input parameters **Low Calibration Point (1.6.)** and **High Calibration Point (1.7.)** are the same.	• Check calibration settings of device. • Ensure settings for High Calibration Point and Low Calibration Point are different.
S: 11 		Internal temperature sensor failure.	Repair required: contact your local Siemens representative.
S: 12 		Internal temperature of device has exceeded specifications: it is operating outside its temperature range.	• Relocate device and/or lower process temperature enough to cool device. • Inspect for heat-related damage and contact your local Siemens representative if repair is required. • Fault code will persist until a manual reset is performed using PDM or the LCD interface.
S:14 		**Input Scaling (2.6.5.)** Upper and lower values for AIFB1 are the same.	• Check configuration for AIFB1. • Ensure that Upper Value and Lower Value (Input Scaling) are not the same.

General Fault Codes (cont'd)			
Code / Icon		**Meaning**	**Corrective Action**
S:15 		**Input Scaling (2.6.5.)** Upper and lower values for AIFB2 are the same.	• Check configuration for AIFB2. • Ensure that Upper Value and Lower Value (Input Scaling) are not the same.
S: 17 		Calibration interval as defined in **Reminder 1 (Required) (4.5.5.)** has expired.	Perform calibration.
S: 18 		Calibration interval as defined in **Reminder 2 (Demanded) (4.5.6.)** has expired.	Perform calibration.
S: 28 	*	Internal device failure caused by a RAM memory error.	Repair required: contact your local Siemens representative.
S: 29 	*	EEPROM damaged.	Repair required: contact your local Siemens representative.
S: 31 	*	Flash error.	Repair required: contact your local Siemens representative.
S: 32 		IDENT number conflict.	Ensure value of the Ident number selector is correct for the network configuration. If it is correct, the device needs to be re-parameterized by the PLC.
S: 33 	*	Factory calibration for the internal temperature sensor has been lost.	Repair required: contact your local Siemens representative.

General Fault Codes (cont'd)			
Code / Icon		**Meaning**	**Corrective Action**
S: 34 	*	Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.
S: 35 	*	Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.
S: 36 	*	Unable to start microwave module.	Cycle power. If fault persists, contact your local Siemens representative.
S: 37 	*	Measurement hardware problem.	Cycle power. If fault persists, contact your local Siemens representative.
S: 38 	*	Microwave module hardware failure: unable to calculate distance measurement.	Cycle power. If fault persists, contact your local Siemens representative: repair required.
S: 43 	*	Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.

Operation Troubleshooting

Operating symptoms, probable causes, and resolutions (continued on next page).

Operation Troubleshooting		
Symptom	**Cause**	**Action**
Display shows  **S: 0 LOE**	level or target is out of range	• check specifications • check **Low Calibration Point (1.6.)** • increase **Confidence (2.5.9.1.)**
Display shows  **S: 0 LOE**	material build-up on antenna	• clean the antenna • re-locate SITRANS LR200
Display shows  **S: 0 LOE**	location or aiming: • poor installation • flange not level • Auto False Echo Suppression may be incorrectly applied	• check to ensure nozzle is vertical • ensure end of antenna protrudes from end of nozzle. • review *Auto False Echo Suppression (2.5.10.1.)* on page 120 • ensure Auto Suppression Range is set correctly
Display shows  **S: 0 LOE**	antenna malfunction: • temperature too high • physical damage • excessive foam • multiple echoes	• check temperature in **Maximum Value (3.3.2.)** • use foam deflector or stillpipe • relocate • use a defoamer • set **Algorithm (2.5.7.1.)** to t**F** (trueFirst echo)
Reading does not change, but the level does	SITRANS LR200 processing wrong echo, i.e. vessel wall, or structural member	• re-locate SITRANS LR200 • check nozzle for internal burrs or welds • rotate instrument 90° • use **Auto False Echo Suppression (2.5.10.1.)** if necessary: see *Auto False Echo Suppression (2.5.10.1.)* on page 120
Measurement is consistently off by a constant amount	• setting for Low Calibration Point not correct • setting for Sensor Offset not correct	• check distance from sensor reference point to **Low Calibration Point (1.6.)** • check **Sensor Offset (2.3.7.3.)**
Screen blank	power error	• check nameplate rating against voltage supply • check power wiring or source

Operation Troubleshooting (cont'd)		
Symptom	**Cause**	**Action**
Reading erratic	echo confidence weak	• refer to **Confidence (2.5.9.1.)** • use**Auto False Echo Suppression (2.5.10.1.)** and **Auto False Echo Suppression Range (2.5.10.2.)** • use foam deflector or stillpipe
	liquid surface vortexed	• decrease **Fill Rate (2.3.8.2.)** • relocate instrument to side pipe • increase confidence threshold in **Echo Threshold (2.5.7.3.)**
	material filling	• re-locate SITRANS LR200
Reading response slow	**Fill Rate (2.3.8.2.)** setting is incorrect	• increase measurement response if possible
Reads correctly but occasionally reads high when vessel is not full	• detecting close range echo • build up near top of vessel or nozzle • nozzle problem	• clean the antenna • use **Auto False Echo Suppression (2.5.10.1.)** and **Auto False Echo Suppression Range (2.5.10.2.)**
Level reading lower than material level	• material is within Near Range zone • multiple echoes processed	• decrease **Near Range (2.5.1.)**: minimum value depends on antenna type • raise SITRANS LR200 • ensure **Algorithm (2.5.7.1.)** is set to t**F** (trueFirst echo)
	• vessel near empty and low dK material	• ensure **Material (1.2.)** selection is LIQUID LOW DK • set **Position Detect (2.5.7.2.)** to **Hybrid** • check the setting for **CLEF Range (2.5.7.4.)**: see the table below **Propagation Factor (2.5.3.)** for recommended settings

Appendix C: Maintenance

SITRANS LR200 requires no maintenance or cleaning under normal operating conditions.

Under severe operating conditions, the antenna may require periodic cleaning. If cleaning becomes necessary:

- Note the antenna material and the process medium, and select a cleaning solution that will not react adversely with either.
- Remove the instrument from service and wipe the antenna clean using a cloth and suitable cleaning solution.

Unit Repair and Excluded Liability

All changes and repairs must be done by qualified personnel, and applicable safety regulations must be followed. Please note the following:

- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

Replacing the antenna

- When a new antenna is installed the propagation factor will not change.
- After replacing the antenna check the material level reported by the device against the actual material level, and if necessary use **Sensor Offset (2.3.7.3.)** to compensate.

Appendix D: Technical Reference

Note: Where a number follows the parameter name, for example, **Algorithm (2.5.7.1.)** this is the parameter access number via the handheld programmer. See *Parameter Reference* on page 59 for a complete list of parameters.

Principles of Operation

SITRANS LR200 is a 2-wire 6 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries[1]. Radar level measurement uses the time of flight principle to determine distance to a material surface. The device transmits a signal and waits for the return echo. The transit time is directly proportional to the distance from the material.

Pulse radar uses polarized electromagnetic waves. Microwave pulses are emitted from the antenna at a fixed repetition rate, and reflect off the interface between two materials with different dielectric constants (the atmosphere and the material being monitored).

Electromagnetic wave propagation is virtually unaffected by temperature or pressure changes, or by changes in the vapor levels inside a vessel. Electromagnetic waves are not attenuated by dust.

SITRANS LR200 consists of an enclosed electronic circuit coupled to an antenna and process connection. The electronic circuit generates a radar signal (6.3 GHz in North America, 5.8 GHz elsewhere) that is directed to the antenna.

The signal is emitted from the antenna, and the reflected echoes are digitally converted to an echo profile. The profile is analyzed to determine the distance from the material surface to the sensor reference point[2]. This distance is used as a basis for the display of material level.

Echo Processing

Process Intelligence

The signal processing technology embedded in Siemens radar level devices is known as **Process Intelligence**.

Process intelligence provides high measurement reliability regardless of the dynamically changing conditions within the vessel being monitored. The embedded Process Intelligence dynamically adjusts to the constantly changing material surfaces within these vessels.

1) The microwave output level is significantly less than that emitted from cellular phones.

2) See *Dimensions: Uni-construction Polypropylene Rod Antenna* on page 11 and *Appendix H: Flange Adapter Versions* on page 154.

Process Intelligence is able to differentiate between the true microwave reflections from the surface of the material and unwanted reflections being returned from obstructions such as seam welds or supports within a vessel. The result is repeatable, fast and reliable measurement. This technology was developed as result of field data gained over some twenty years from more than 1,000,000 installations in many industries around the world.

Higher order mathematical techniques and algorithms are used to provide intelligent processing of microwave reflection profiles. This "knowledge based" technique produces superior performance and reliability.

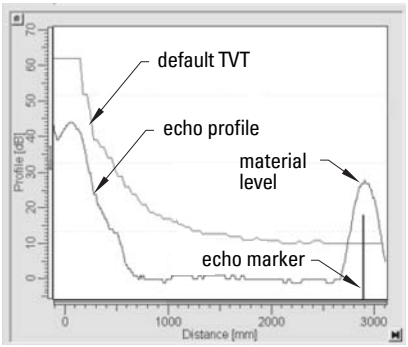
Echo Selection

Time Varying Threshold (TVT)

A Time Varying Threshold (TVT) hovers above the echo profile to screen out unwanted reflections (false echoes).

In most cases the material echo is the only one which rises above the default TVT.

In a vessel with obstructions, a false echo may occur. See *Auto False Echo Suppression (2.5.10.1.)* on page 120 for more details.



The device characterizes all echoes that rise above the TVT as potential good echoes. Each peak is assigned a rating based on its strength, area, height above the TVT, and reliability, amongst other characteristics.

Algorithm (2.5.7.1.)

The true echo is selected based on the setting for the Echo selection algorithm. Options are **t**rue **F**irst Echo, **L**argest Echo, or **b**est of **F**irst and **L**argest.

Position Detect (2.5.7.2.)

The echo position detection algorithm determines which point on the echo will be used to calculate the precise time of flight, and calculates the range using the calibrated propagation velocity (see **Propagation Factor (2.5.3.)** for values). There are three options:

- **Center**
- **CLEF** (Constrained Leading Edge Fit)
- **Hybrid**

Center

Uses center of the echo.

Hybrid

Uses the Center algorithm for the top part of the vessel, and the CLEF algorithm for the part nearest the vessel bottom, according to the setting for **CLEF range**.

CLEF (Constrained Leading Edge Fit)

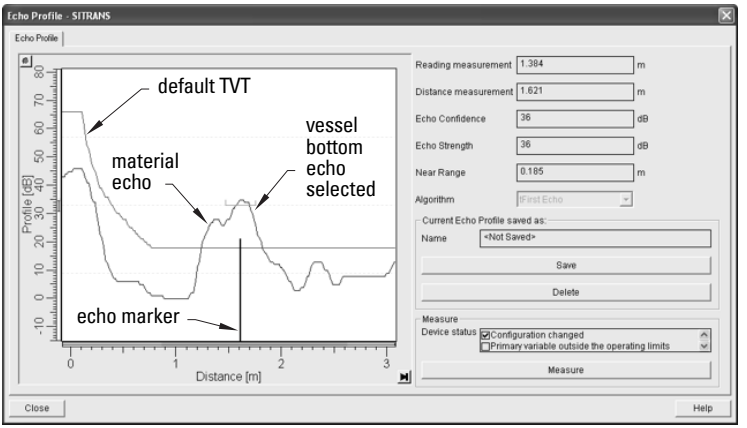
- Uses the leading edge of the echo.
- Is used mainly to process the echo from materials with a low dK value.

In an almost empty flat-bottomed vessel, a low dK material may reflect an echo weaker than the echo from the vessel bottom. The echo profile shows these echoes merging. The device may then report a material level equal to or lower than empty

The CLEF algorithm enables the device to report the level correctly.

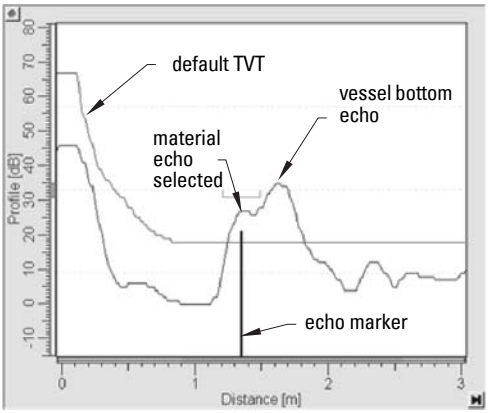
Example: CLEF off: Position set to Hybrid

Vessel height: 1.5 m; CLEF range set to 0 (**Center** algorithm gives the same result.)



Example: CLEF enabled

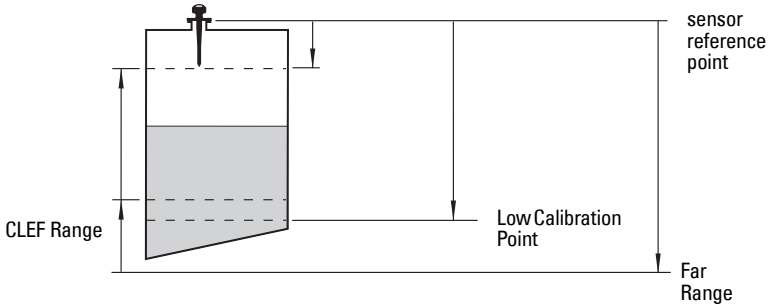
Vessel height: 1.5 m; CLEF range set to 0.5 m



CLEF Range (2.5.7.4.)

Determines the level below which the CLEF algorithm will be used. Above this level the Center algorithm is used when Hybrid is selected in **Position Detect (2.5.7.2.)**.

CLEF Range is referenced from Far Range.



Echo Threshold (2.5.7.3.)

Confidence (2.5.9.1.) describes the quality of an echo. Higher values represent higher quality. **Echo Threshold** defines the minimum confidence value required for an echo to be accepted as valid and evaluated.

Echo Lock (2.5.8.1.)

If the echo selected by **Algorithm** is within the Echo Lock window, the window is centered about the echo, which is used to derive the measurement. In radar applications, two measurement verification options are used:

Lock Off

SITRANS LR 200 responds immediately to a new selected echo (within the restrictions set by the Maximum Fill / Empty Rate), but measurement reliability is affected.

Material Agitator

A new measurement outside the Echo Lock Window must meet the sampling criteria before the window will move to include it.

The other available options, **Maximum Verification** and **Total Lock** are not recommended for radar.

Auto False Echo Suppression (2.5.10.1.)

Notes:

- For detailed instructions on using this feature via PDM see *Auto False Echo Suppression* on page 46.
- For detailed instructions on using this feature via the handheld programmer see **Auto False Echo Suppression (2.5.10.1.)** on page 74.

Auto False Echo Suppression is designed to learn a specific environment (for example, a particular vessel with known obstructions), and in conjunction with Auto False Echo Suppression Range to remove false echoes appearing in front of the material echo.

The material level should be below all known obstructions at the moment when Auto False Echo Suppression learns the echo profile. Ideally the vessel should be empty or almost empty, and if an agitator is present, it should be running.

The device learns the echo profile over the whole measurement range and the TVT is shaped around all echoes present at that moment.

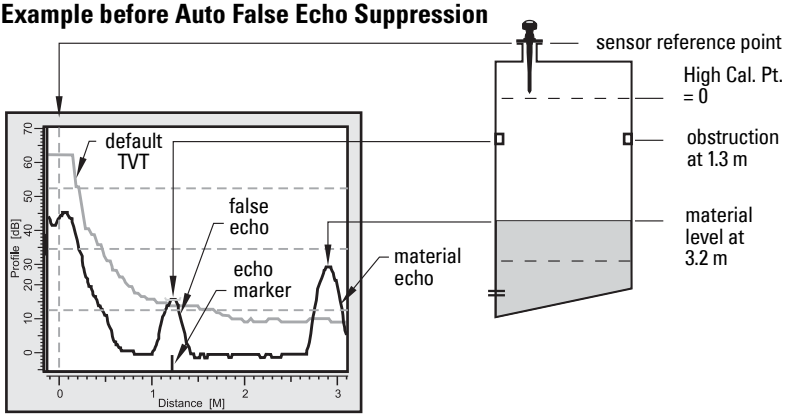
Auto False Echo Suppression Range (2.5.10.2.)

Auto False Echo Suppression Range specifies the range within which the learned TVT is applied. Default TVT is applied over the remainder of the range.

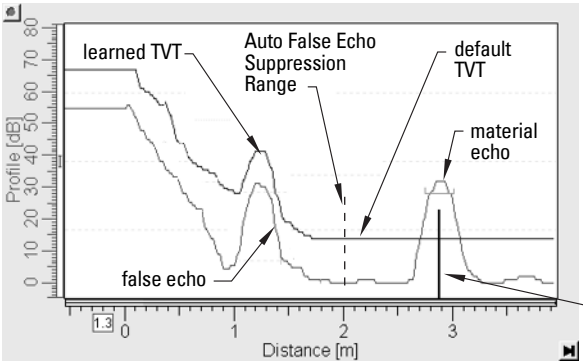
The learned TVT screens out the false echoes caused by obstructions. The default TVT allows the material echo to rise above it.

Auto False Echo Suppression Range must be set to a distance shorter than the distance to the material level when the environment was learned, to avoid the material echo being screened out.

Example before Auto False Echo Suppression



Example after Auto False Echo Suppression



Auto False Echo Suppression Range set to 2 m

echo marker

Measurement Range

Near Range (2.5.1.)

Near Range programs SITRANS LR200 to ignore the zone in front of the antenna. The default setting is 0.3 m (1 ft), plus any shield length, from the sensor reference point[1)].

Near Range allows you to increase the blanking value from its factory default. But Auto False Echo Suppression (2.5.10.1.) is generally recommended in preference to this.

Far Range (2.5.2.)

Far Range can be used in applications where the base of the vessel is conical or parabolic. A reliable echo may be available below the vessel empty distance, due to an indirect reflection path.

Increasing Far Range to 30% or 40% can provide stable empty vessel readings.

Measurement Response

Note: Units are defined in **Unit (2.3.1.)** and are in meters by default.

Response Rate (2.3.8.1.) limits the maximum rate at which the display and output respond to changes in the measurement. There are three preset options: slow, medium, and fast.

Once the real process fill/empty rate (m/s by default) is established, a response rate can be selected that is slightly higher than the application rate. Response Rate automatically adjusts the filters that affect the output response rate

	Response Rate (2.3.8.1.)	Fill Rate (2.3.8.2.)/Empty rate (2.3.8.3.)	
*	Slow	0.1 m/min (0.32 ft/min)	10 s
	Medium	1.0 m/min (3.28 ft/min)	10 s
	Fast	10.0 m/min (32.8 ft/min)	0 s

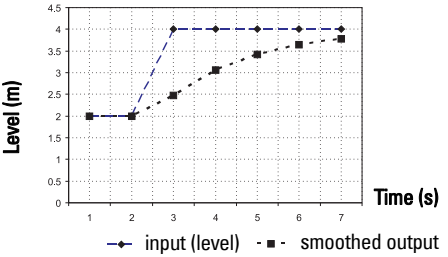
1) For the reference point for each configuration, see *Dimensions: Uni-construction Polypropylene Rod Antenna* on page 11 for the standard version, or *Appendix H: Flange Adapter Versions* on page 154.

Damping

.**Filter Time Constant (2.6.8.1.)** smooths out the response to a sudden change in level. This is an exponential filter and the engineering unit is always in seconds.

In 5 time constants the output rises exponentially: from 63.2% of the change in the first time constant, to almost 100% of the change by the end of the 5th time constant.

Damping example
time constant = 2 seconds
input (level) change = 2 m



Loss of Echo (LOE)

A loss of echo (LOE) occurs when the calculated measurement is judged to be unreliable because the echo confidence value has dropped below the echo confidence threshold.

Confidence (2.5.9.1.) describes the quality of an echo. HIgher values represent higher quality.

Echo Threshold (2.5.7.3.)defines the minimum confidence value required for an echo to be accepted as valid and evaluated.

If the LOE condition persists beyond the time limit set in **LOE Timer (2.3.6.)** the LCD displays the Service Required icon, and the text region displays the fault code **S: 0** and the text **LOE**.

If two faults are present at the same time, the fault code, error text, and error icon for each fault are displayed alternately. For example, Loss of Echo and faulty power supply:

S: 0 LOE **S: 2 NO TECH POWER**

Upon receiving a reliable echo, the loss of echo condition is aborted, the Service Required icon and error message are cleared, and the reading returns to the current level.

LOE Timer

LOE Timer (2.3.6.) determines the length of time a Loss of Echo (LOE) condition will persist before a Fail-safe state is activated. The default is 100 seconds. **Mode (2.6.9.1.)** determines the level to be reported when the Fail-safe timer expires.

Fail-safe Behavior

The purpose of the Fail-safe setting is to put the process into a safe mode of operation in the event of a fault or failure. The value to be reported in the event of a fault is selected so that a loss of power or loss of signal triggers the same response as an unsafe level.

Fail-safe mode may be triggered by a loss of echo, a bad configuration, or certain device faults. You can select one of three possible values to be reported when a Fail-safe mode is activated.

Mode (2.6.9.1.)

Mode determines the material level to be reported when **LOE Timer (2.3.6.)** expires.

Mode (2.6.9.1.)		
SUB VALUE		Use substitute value. **Value (2.6.9.2.)** used as output value.
LAST VALUE	*	Last value (Store last valid output value).
USE BAD VALUE		Use bad value (Calculated output value is incorrect).

Value (2.6.9.2.)

Value defines the material level to be reported if the option **Use substitute value** is selected in **Mode (2.6.9.1.)**.

The two Analog Input Function blocks are set separately.

To set a user-defined value

- Navigate to **Level Meter** > **Setup** > **Analog Input (1 or 2)**.
- Set **Mode (2.6.9.1.)** to **Use substitute value**.
- Go to **Value (2.6.9.2.)** and enter the desired value.

Maximum Process Temperature Chart

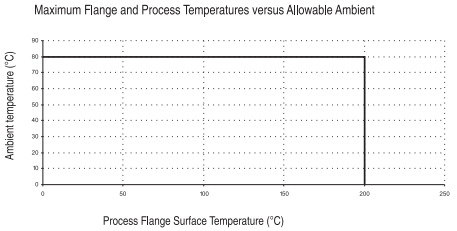
Flange Adapter versions of SITRANS LR200

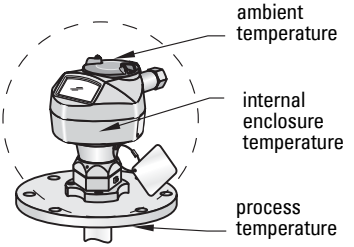
! WARNING: Internal temperature must not exceed 80 °C (176 °F).

Notes:

- The chart below is for guidance only:
- The chart does not represent every possible process connection arrangement. For example, it will NOT apply if you are mounting SITRANS LR200 directly on a metallic vessel surface.
- The chart does not take into consideration heating from direct sunshine exposure.

Maximum Process Temperature versus allowable ambient





Where the chart does not apply, please use your own judgement regarding the use of SITRANS LR200.

See **Minimum Value (3.3.1.)** on page 82 and **Maximum Value (3.3.2.)** on page 82 to monitor the Internal Temperature.

If the internal temperature exceeds the maximum allowable limit, a sun shield or a longer nozzle may be required.

Process Pressure/Temperature derating curves

! **WARNINGS:**

- **Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.**
- **Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.**
- **The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use and which are suitable for the service conditions.**
- **Improper installation may result in loss of process pressure and/or release of process fluids and/or gases.**

Notes:

- The Process Device Tag shall remain with the process pressure boundary assembly[1)]. In the event the instrument package is replaced, the Process Device Tag shall be transferred to the replacement unit.
- SITRANS LR200 units are hydrostatically tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.
- The serial numbers stamped in each process connection body, (flange, threaded, or sanitary), provide a unique identification number indicating date of manufacture.
  Example: MMDDYY – XXX (where MM = month, DD = day, YY = year, and XXX= sequential unit produced)
  Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.

Pressure Equipment Directive, PED, 97/23/EC

Siemens Level Transmitters with flanged, threaded, or sanitary clamp type process mounts have no pressure-bearing housing of their own and, therefore, do not come under the Pressure Equipment Directive as pressure or safety accessories, (see EU Commission Guidelines 1/8 and 1/20).

1) The process pressure boundary assembly comprises the components that act as a barrier against pressure loss from the process vessel: that is, the combination of process connection body and emitter, but normally excluding the electrical enclosure.

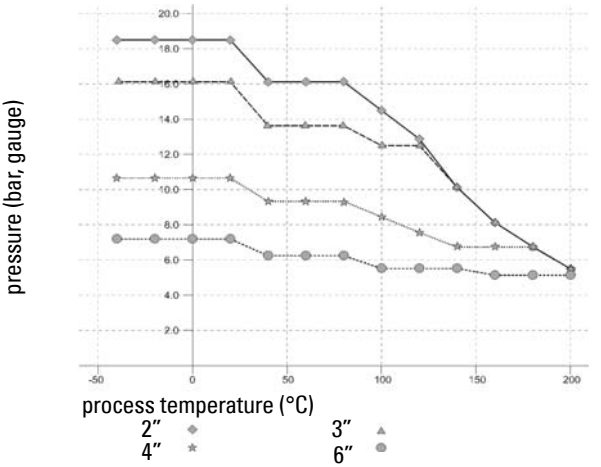
WARNING: Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.

Notes:

- Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.
- UHMW-PE antennas are rated to a maximum of 80°C (176°F) of continuous duty, however, they can be used for periods of up to 3 hours at temperatures up to 120°C (248°F) at 1 bar pressure.

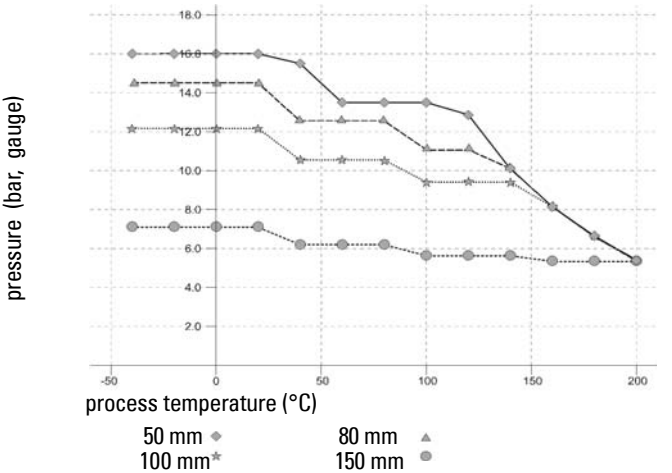
PTFE Rod Antenna ASME Hole Pattern, 150 lb

Flat-Face Flange (constant flange thickness series)



PTFE Rod Antenna, DN Hole Pattern, PN16

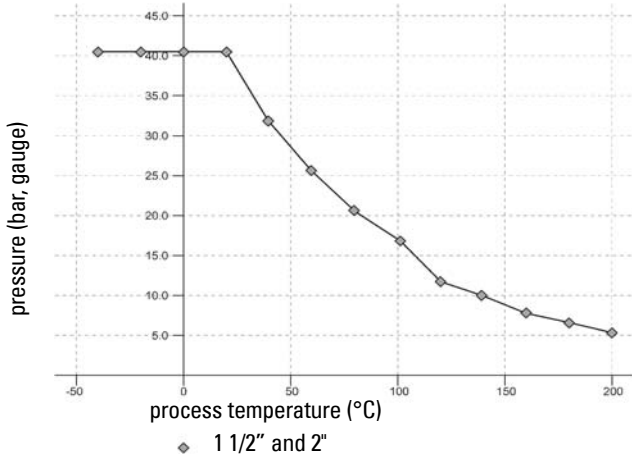
Flat-Face Flange (constant flange thickness series)



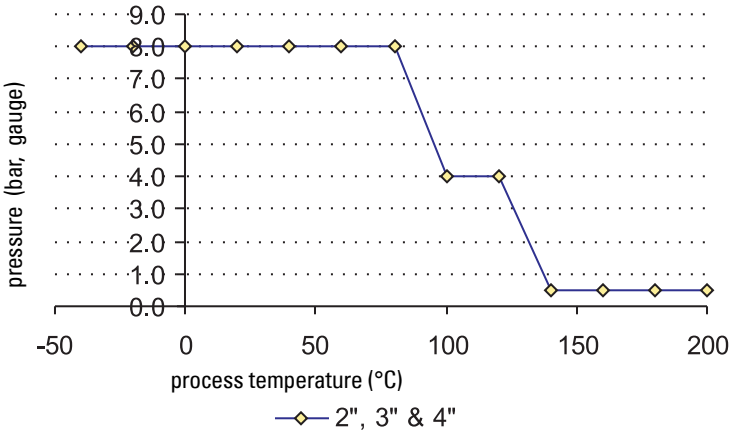
! WARNING: Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.

Note: UHMW-PE antennas are rated to a maximum of 80°C (176°F) of continuous duty, however, they can be used for periods of up to 3 hours at temperatures up to 120°C (248°F) at 1 bar pressure.

PTFE Rod Antenna Threaded Connection



PTFE Rod Antenna Sanitary Connection



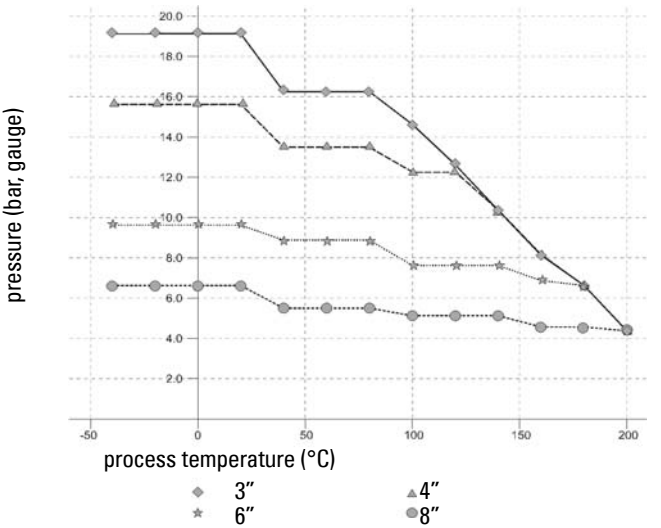
WARNING: Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.

Notes:

- Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.
- UHMW-PE antennas are rated to a maximum of 80°C (176°F) of continuous duty, however, they can be used for periods of up to 3 hours at temperatures up to 120°C (248°F) at 1 bar pressure.

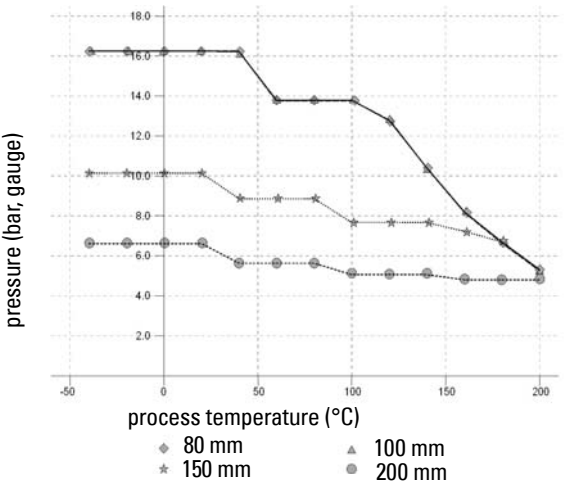
Horn Antenna or Waveguide, ASME Hole Pattern, 150 lb

Flat-Face Flange (constant flange thickness series)



Horn Antenna or Wave Guide DN Hole Pattern, PN16

Flat-Face Flange (constant flange thickness series)



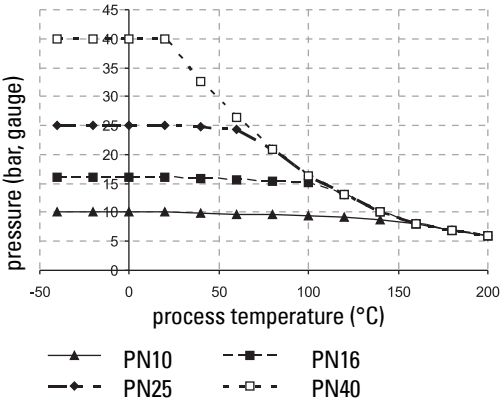
WARNING: Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.

Notes:

- Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.
- UHMW-PE antennas are rated to a maximum of 80°C (176°F) of continuous duty, however, they can be used for periods of up to 3 hours at temperatures up to 120°C (248°F) at 1 bar pressure.

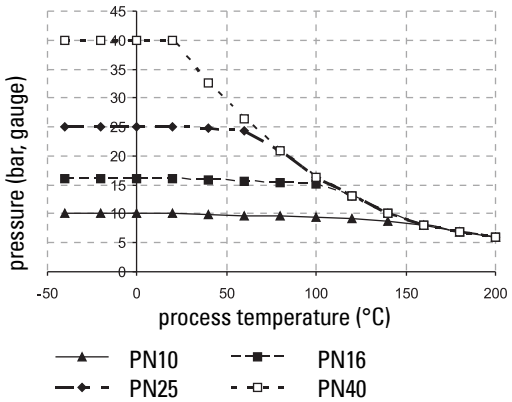
PTFE Rod Antenna, DN Hole Pattern, PN16, PN40

Raised Face Flange per EN 1092-1



Horn Antenna or Waveguide, DN Hole Pattern, PN16, PN40

Raised Face Flange per EN 1092-1



Appendix E: Application Examples

Note: In the applications illustrated below, values are for example purposes only.

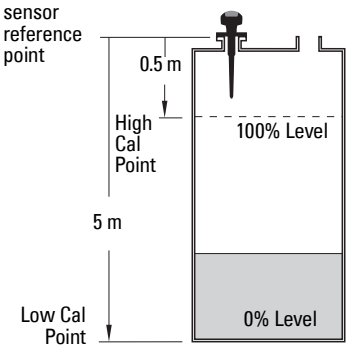
You can use these examples as setup references. Enter the values in the parameter tables to select the corresponding functions.

Configure the basic settings using the Quick Start wizard parameters. (These parameters are inter-related, and changes take effect only after you select **YES** in the last step to apply changes.)

In each example, after performing a Quick Start, navigate to the other required parameters (either via the handheld programmer, or via SIMATIC PDM) and enter the appropriate values.

Liquid resin in storage vessel, level measurement

Note: Minimum distance from flange face to target is limited by **Near Range (2.5.1.)**.



To obtain level measurement proportional to resin levels:

Low Calibration Pt. = 5 m (16.4 ft) from sensor reference point

High Calibration Pt.= 0.5 m (1.64 ft) from sensor reference point.

Max.fill/empty rate = 0.2 m/min. (0.65 ft/min)

In the event of a loss of echo:

SITRANS LR200 is to report a user-defined value of 4.5 m (14.76 ft) after 2 minutes.

Parameter type	Parameter Name/No.	Options/ Values	Function
Quick Start Wizard parameters	Material (1.2.)	**LIQUID**	
	Response Rate (1.3.)	**MED**	Medium =1 m/minute
	Units (1.4.)	**M**	meters
	Operating Mode (1.5.)	**LEVEL**	Level
	Low Calibration Point (1.6.)	**5**	5 m (16.4 ft)
	High Calibration Point (1.7.)	**0.5**	0.5 m (1.64 ft)
	Apply? (Apply changes) (1.8.)	**YES**	Transfers Quick Start settings to device.
Independent parameters	LOE Timer (2.3.6.)	**2**	2 minutes
	Mode (2.6.9.1.)	**Substitute value**	User-defined value to be used.
	Value (2.6.9.2.)	**4.5**	4.5 m (14.76 ft)

Press **Mode** to return to **Measurement** mode.

Horizontal vessel with volume measurement

Note: The minimum distance from the flange face to the target is limited by **Near Range (2.5.1.)**.

To obtain level measurement proportional to vessel volume in a chemical vessel:

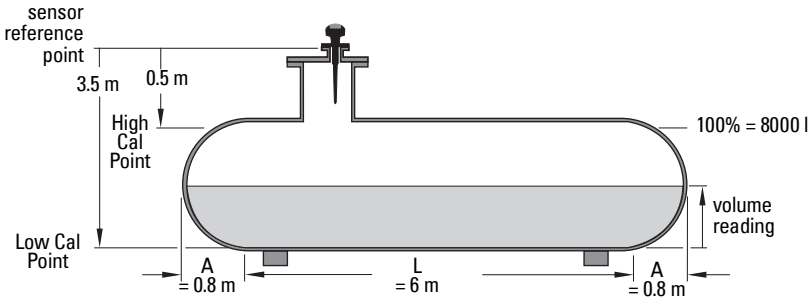
Low Calibration Point = 3.5 m (11.48 ft) from sensor ref. point

High Calibration Point = 0.5 m (1.64 ft) from sensor reference point.

Max. fill/empty rate = 0.2 m/min. (0.65 ft/min.)

Select vessel shape, Parabolic Ends, and enter values for A and L, to obtain a volume reading instead of level.

In the event of a loss of echo: SITRANS LR200 is to report a user-defined value of 4.5 m (14.76 ft) after 2 minutes.



NOTE: Table continues on next page.

Parameter type	Parameter Name/No.	Options/Values	Function
Quick Start Wizard parame-ters	Material (1.2.)	**LIQUID**	
	Response Rate (1.3.)	**MED**	Medium =1 m/minute
	Units (1.4.)	**M**	meters
	Operating Mode (1.5.)	**LEVEL**	Level is reported as Volume when a vessel shape is selected.
	Low Calibration Point (1.6.)	**3.5**	3.5 m (11.48 ft)
	High Calibration Point (1.7.)	**0.5**	0.5 m (1.64 ft)
	Apply? (Apply changes) (1.8.)	**YES**	Transfers Quick Start settings to device.

Parameter type	Parameter Name/No.	Options/Values	Function (cont'd)
Independent parameters	Vessel Shape (2.4.1.1.)	**PARABOLIC ENDS**	Defines vessel shape.
	Maximum Volume (2.4.1.2.)	**8000**	8000 liters
	Dimension A (2.4.1.3.)	**0.8**	0.8 m (2.62 ft)
	Dimension L (2.4.1.4.)	**6**	6 m (19.68 ft)
	LOE Timer (2.3.6.)	**2**	2 minutes
	Mode (2.6.9.1.)	**Substitute value**	User-defined value to be used.
	Value (2.6.9.2.)	**4.5**	4.5 m (14.76 ft)

Return to **Measurement**: press **Mode** to start normal operation.

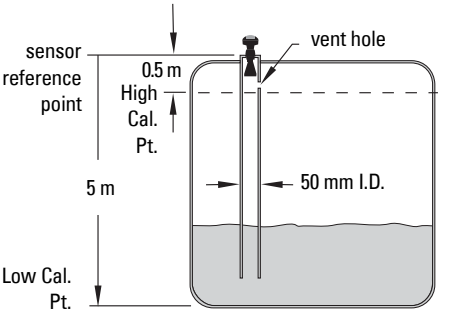
Application with Stillpipe

A stillpipe is recommended for products with a dK of less than 3, or if extremely turbulent or vortex conditions exist. This mounting arrangement can also be used to provide optimum signal conditions on foaming materials.

Notes:
- **Near Range (2.5.1.)** will be set at the factory. Check the Process Device Tag for specific values.
- Suitable pipe diameters are 40 mm (1.5") to 100 mm (4").
- The pipe diameter must be matched with the horn size. Use the largest horn size that will fit the stillpipe/bypass pipe (see *Flanged Horn dimensions* on page 158).
- See *Mounting on a Stillpipe or Bypass Pipe* on page 16 for installation guidelines.

This application is to obtain a level measurement proportional to the oil level in a fuel storage vessel.

- Low Calibration Pt. is 5 m (16.4 ft) from the sensor reference point.
- High Calibration Pt. is 0.5 m (1.64 ft) from the sensor reference point.
- The stillpipe inside diameter is 50 mm (1.96").
- The maximum rate of filling or emptying is about 0.1 m (4")/min.



Parameter type	Parameter Name/No.	Options/Values	Function
Quick Start Wizard parameters	Material (1.2.)	**LIQUID LOW DK**	
	Response Rate (1.3.)	**MED**	Medium =1 m/minute
	Units (1.4.)	**M**	meters
	Operating Mode (1.5.)	**LEVEL**	Level is reported as Volume when a vessel shape is selected.
	Low Calibration Point (1.6.)	**5**	5 m (16.4 ft)
	High Calibration Point (1.7.)	**0.5**	0.5 m (1.64 ft)
	Apply? (Apply changes) (1.8.)	**YES**	Transfers Quick Start settings to device.
Independent parameters	Propagation Factor (2.5.3.)[a)]	**0.990**	P.F. for a 50 mm (1.96") I.D. stillpipe
	Position Detect (2.5.7.2.)	**HYBRID**	
	CLEF Range (2.5.7.4.)[a]	**4.3**	4.3 m (14.10 ft)

a) The recommended values for the propagation factor and for CLEF range are dependent on the stillpipe diameter. Refer to the next table for values.

Propagation Factor/Stillpipe Diameter

Nominal Pipe Size [a)]	40 mm (1.5″)	50 mm (2″)	80 mm (3″)	100 mm (4″)
Propagation Factor	0.9828	0.990	0.991	0.9965
CLEF Range (2.5.7.4.) settings	Low Cal Pt. minus 700 mm (2.29 ft)	Low Cal Pt. minus 700 mm (2.29 ft)	Low Cal Pt. minus 1000 mm (3.28 ft)	Low Cal Pt. minus 1000 mm (3.28 ft)

a) Since pipe dimensions may vary slightly, the propagation factor may also vary.

Appendix F: PROFIBUS PA Profile Structure

PROFIBUS Level Device Design

The device follows the profile block model and is implemented as a Profile 3.0, Class B, PA device. Standard profile parameters are used to program the level transducer block.

Block Model

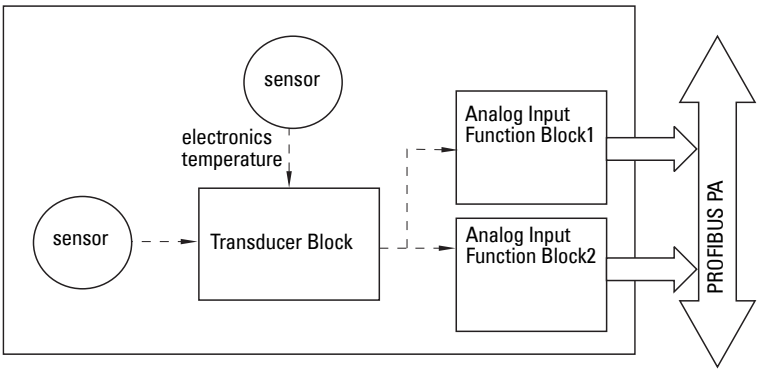
The Block Model represents how measured values are recorded and processed. All data is viewed from the perspective of the DCS or PLC, so information from the sensor is an input.

The functions of the device are divided into blocks with different areas of responsibility. The blocks are configured by parameters.

The device is implemented with one Physical Block, one Transducer Block (TB), and two Analog Input Function Blocks (AIFB1 and AIFB2).

Physical Block

The Physical Block handles functionality and descriptions relating to the device as a whole: for example, LCD Contrast (functionality) and Firmware Revision and Tag (descriptions).



Transducer Block (TB)

The Transducer Block carries out adjustments to the sensor, such as level calibration and volume calibration. It supplies the measurement value[1)] utilized by either or both of the AIFBs.

Analog Input Function Blocks AIFB1 and AIFB2

The two AIFBs are completely independent of each other. They utilize the measurement value output from the Transducer Block[1)] and apply any required quality checks, scaling, and Fail-safe operation selections.

The Analog Input Function Block output supplies the measured value and associated status information to the PROFIBUS PA network via cyclic data transfer.

1) Primary Value (PV), Secondary Value 1 (SV1), or Secondary Value 2 (SV2)

Description of the blocks

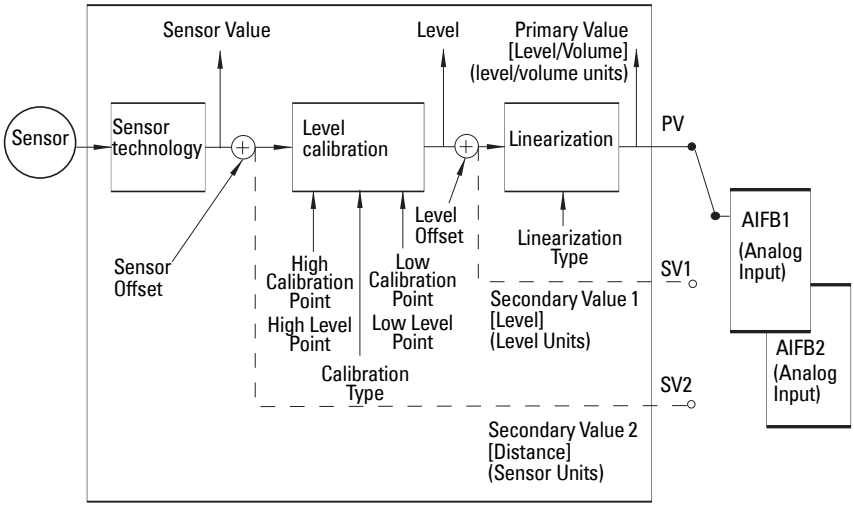
Transducer Block function groups

The figure below shows the signal flow of measured values from the sensor through the Transducer Block into the output value:

- Primary Value (PV): Level or Volume
- Secondary Value 1 (SV1): Level
- Secondary Value 2 (SV2): Distance

The Transducer Block implements all of the basic parameters (see parameter diagram on page 136), including level to volume calculation, if that option has been selected.

Transducer Block



How the Transducer Block works:

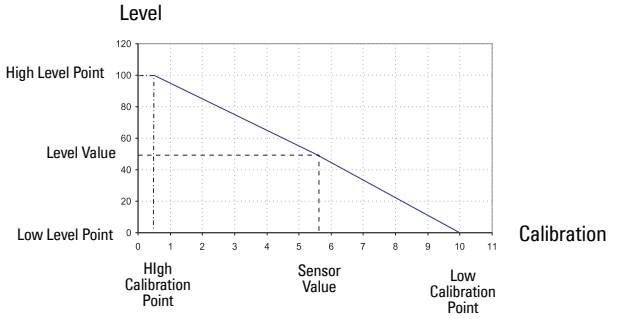
1. The sensor technology block selects the proper echo. For an explanation of sensor technology, see *Appendix D: Technical Reference* , page 116 onwards.

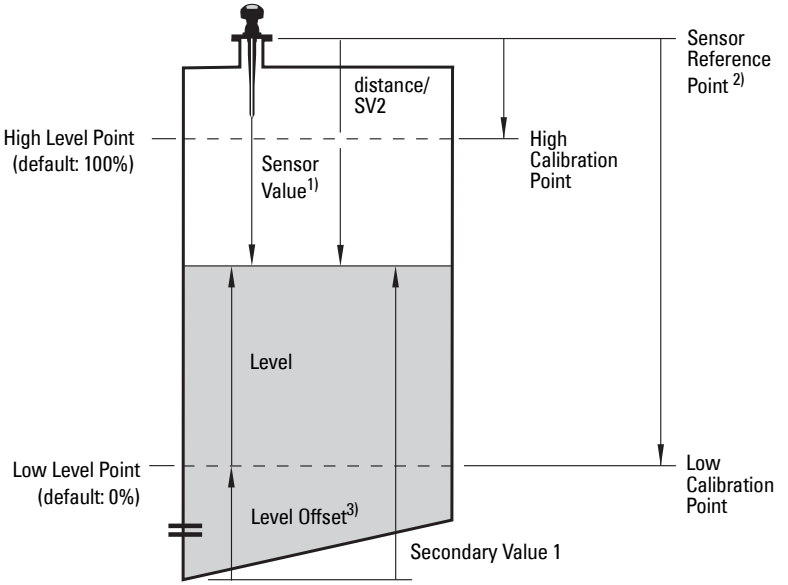
   The sensor value (in sensor units) is checked to see if it is within its measuring limits. If the limit is exceeded, this results in a **Bad** status and the error message **Failure in measurement**. The sensor value is stored in Sensor Value.

   The analog signal from the sensor is transformed into a digital representation.

   A Sensor Offset (default 0) compensates for changes to the sensor reference point, if necessary.

2. Level Calibration is a linear transfer function that converts a sensor value to a level value.





3. Linearization can be carried out to accommodate complex vessel shapes, or to provide level to volume conversion.
4. The Transducer Block provides three possible outputs
   - Primary Value (PV) / Level or Volume
   - Secondary Value 1 (SV1) / Level
   - Secondary Value 2 (SV2) / Distance (sensor units)

1) Referenced from Sensor Reference Point.

2) **Sensor Offset (2.3.7.3.)** is a constant offset that can be added to or subtracted from sensor reference point to compensate if the sensor has been changed.

3) Level Offset (default 0) can compensate for specific vessel configurations.

Electronics temperature

The Transducer Block monitors the internal temperature of the device electronics. A change in temperature can provide advance warning of a possible device failure, and allow for preventive maintenance.

If a temperature limit is exceeded, the output value is unchanged but the output status changes. (The permitted limits correspond to those of the permitted ambient temperature.)

Peak indicators[1] allow you to check the maximum and minimum temperatures that have occurred.

Analog Input Function Blocks 1 and 2

The input to the AIFB is a value with a status (see *Transducer Block function groups* on page 135 for a graphic representation).

Output Conversion

The Analog Input Function Blocks can modify the output value.

Scaling

Output Scaling (2.6.6.) allows you to scale the output to any desired units.

Fail-safe

If the status of the input[2] is **bad**, the fault logic can output either the last usable measured value, or a given substitute value. Set **Mode (2.6.9.1.)** and, if desired, define a value in **Value (2.6.9.2.)**.

Device/ Input Simulation

You can define a simulated value to be input to the AIFB instead of the output value from the Transducer Block. The simulated value allows the AIFB to be tested independently of the characteristics of the environment.

Mode: Device / Output Simulation

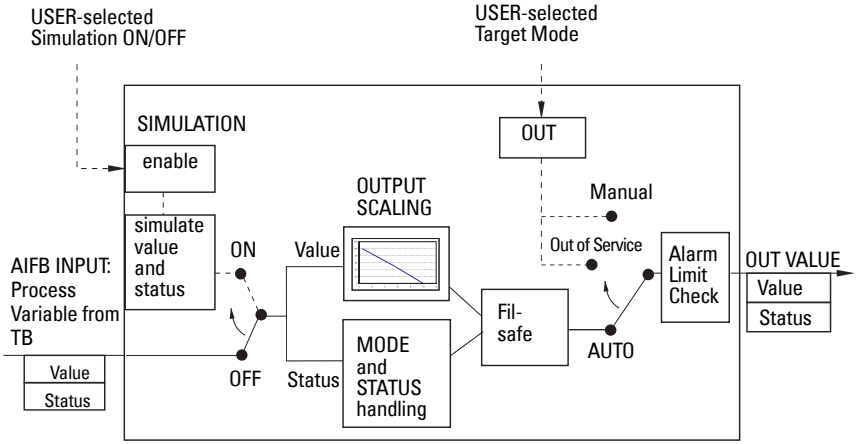
Mode allows you to select one of three possible outputs.

Mode (2.6.2.)	description	Output value
AUTO	automatic	the automatically-recorded measured value
MAN	manual	a manually-set fixed simulation value
O/S	function block disabled	the preset safety value.

1) Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the tab **Device Status** to see peak temperature values.

2) TB output value or Simulation Value

AIFB function groups



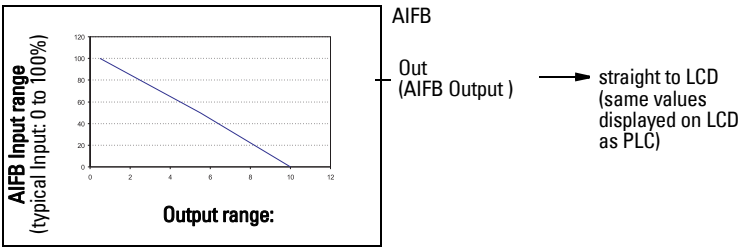
Analog Input Function Block function groups (simulation, mode and status)

Measured values are processed within an Analog Input Function Block to produce the device output (see *AIFB function groups* above). The output is communicated via cyclic transfer to PROFIBUS PA and displayed on the LCD.

How an Analog Input Function Block works

The AIFB provides a linear conversion to any desired units.

1. The AIFB Input value is the processed output value of the Transducer Block, in Transducer Block units.
2. The user selects the desired AIFB output units and scaling is applied.



3. Damping may be applied based on a time constant provided by the user (see *Damping* on page 122 for details).
4. The status of the input value from the Transducer Block is checked. If the status is Bad, a Fail-safe condition occurs. The output is determined by the setting for Fail-safe Mode.
5. **Mode (2.6.2.)** allows the entire AI block to be overridden by a Manual Output value. See **Mode (2.6.2.)** on page 77 for details.

6. The value is checked against the user-defined warning and alarm limits. The upper and lower limits are defined in units corresponding to the Output range, and a limit hysteresis can be used to adjust the sensitivity. See **Alarms and Warnings (2.6.7.)** on page 79 for details.
7. The output value (OUT) is communicated via cyclic data transfer.

Appendix G: Communications via PROFIBUS PA

SITRANS LR200 (PROFIBUS PA) is a Profile Version 3.01, Class B, PA device. It supports Class 1 Master for cyclic and acyclic data exchange, and Class 2 for acyclic services. The full range of SITRANS LR200 functions is available only over a PROFIBUS PA network.

PROFIBUS PA is an open industrial protocol. Full details about PROFIBUS PA can be obtained from PROFIBUS International at www.profibus.com.

Device Configuration tool

To use PROFIBUS PA, you will need a PC configuration tool: we recommend SIMATIC PDM. Please consult the operating instructions or online help for details on using SIMATIC PDM. (You can find more information at www.siemens.com/simatic-pdm.)

SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain SITRANS LR200 and other process devices. For more detail see *Functions in SIMATIC PDM* on page 34.

Electronic Device Description (EDD)

Note: SITRANS LR200 requires the EDD for SIMATIC PDM Rev. 6.0 with SP4.

In order to use **Process Device Manager (PDM)** with PROFIBUS PA, you will need the Electronic Device Description for SITRANS LR200. For details see *Electronic Device Description (EDD)* on page 35.

Enhanced EDD (Electronic Device Description)

The Enhanced EDD has improved usability features: for example, see *Wizard - Quick Start* on page 36 and *Echo Profile Utilities* on page 44.

Network Configuration

To configure a PROFIBUS PA Class 1 Master (for example, a PLC), you will need a **GSD** file.

The GSD file

The GSD file **SIEM810F.gsd** is available from the SITRANS LR200 product page on our web site. Go to www.siemens.com/LR200 and click **Downloads.**

Bus Termination

Note: PROFIBUS PA MUST be terminated at both extreme ends of the cable for it to work properly. Please refer to the PROFIBUS PA User and Installation Guidelines (order number 2.092), available from www.profibus.com.

Power Demands

To determine how many devices can be connected to a bus line, calculate the combined maximum current consumption of all the connected devices: 10.5 mA for each SITRANS LR200. Allow a current reserve for safety.

PROFIBUS address

Notes:

- It is possible to change the device address via a Class 1 master (for example, a PLC) and lock the device address to prevent further changes.
- If this Address Lock is on, the PA address cannot be changed. This lock can be disabled only by performing an Address Reset.

A unique PROFIBUS address identifies each device on the network.

- To set the PROFIBUS address see **Device Address (5.1.)** on page 100.
- To reset the PROFIBUS address to 126 see **Master Reset (4.1.)** on page 86.

Operating as a Profile Device

Every manufactured PROFIBUS product has a unique PROFIBUS identification number which identifies it to the system. PROFIBUS Profile Standard version 3.01 also defines a Profile Model which can identify a product as a generic profile device on the network.

SITRANS LR200 can be identified in one of three ways:

	Device Identification	Profile Model
	STD PROFILE	Standard Profile (uses generic GSD for 2 AIFB [ident # = 0x9701]
*	MANUFACTURER	Manufacturer-specific (uses Siemens EDD and GSD file, which identifies the LR200 [PROFIBUS PA]) [ident # = 0x8150]
	STD – AIFB 1 ONLY	Standard Profile AIFB 1 only (uses generic GSD for 1 AIFB) [ident # = 0x9700]

Defining the device as Profile-specific as opposed to Manufacturer-specific makes it possible to exchange the device for any other device of the same profile type without changing the GSD file.

To set up SITRANS LR200 as a profile device see **PROFIBUS Ident Number (5.2.)** on page 100.

Configuring a device

See *Configuring a new device* on page 35.

Configuring PROFIBUS PA with an S7-300/ 400 PLC

1. If SITRANS LR200 is not listed in the STEP 7 device catalog, you can download the DeviceInstall file from the Siemens Web site and run it from your computer. Go to www.siemens.com/LR200 and click **Downloads**.
2. Add the SITRANS LR200 "rack": click and drag the SITRANS LR200 folder from the hardware catalog.
3. Fill the rack with desired modules, by dragging and dropping them from the hardware catalog.
4. After configuring PROFIBUS PA in steps 2 and 3, download it to the PLC.
5. Add code to the PLC program to read data consistently using the SFC14.

Cyclic versus Acyclic Data

When you request data from a device via PROFIBUS PA, you have two choices. Cyclic data is provided at every bus scan: acyclic data is requested and provided as needed.

Input information is always requested at every bus scan and is set up as cyclic data. Configuration information is only needed periodically and is set up as acyclic data.

Cyclic Data

When you configure SITRANS LR200 on the PROFIBUS PA bus, there are two slots available for modules.

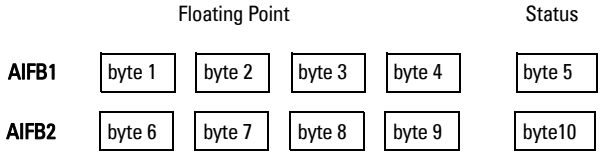
Note: Each of the slots has to have a module defined in it.

Slot 0 always transmits **AIFB1** information[1)]; slot 1 defaults to Free Place, but can be changed to **AIFB2** information. If you do not wish to have data transmitted, then you must use a **Free Place** module in that slot.

Each of the two Analog Input Function Blocks can be set up to return **Level**, **Distance**, or **Volume**. Within the function blocks, the values are scaled according to the user requirements (please see *Analog Input Function Blocks 1 and 2* on page 137 for details).

1) For more information, please see *Analog Input Function Blocks 1 and 2* on page 137.

AIFB1 and **AIFB2** return 5 bytes of data each:



The first 4 bytes are the floating point representation (IEEE) of the variable. The variables are the outputs of the function block. The 5th byte is the status word and the list of possible values is given in the chart below.

The 5 bytes must be read consistently, in a contiguous chunk: they cannot be read byte by byte, and cannot suffer an interrupt. If you are using an S7-300 / 400, you will need to use SFC14 DPRD_DAT: Read Consistent Data of a Standard PD Slave.

Status Byte

In PROFIBUS PA there are two possible types of status byte:

- **status byte**: originally defined in Profile Standard V3.0
- **condensed status**: an alternative status byte defined in Profile Standard V3.01

You can choose which type of status byte will be returned, by enabling or disabling **Condensed Status (3.4.)**: see **Enable (3.4.1.)** on page 83 for details. When Condensed Status is disabled, Status Byte will be returned, and the following codes will be used.

Status Codes for Good Quality	
Values in hex notation	**Description**
0x80	Data is GOOD.
0x84	A parameter in the function block has been changed: status active for 10 s
0x89	Active low warning.
0x8A	Active high warning.
0x8D	Active low alarm.
0x8E	Active high alarm.

Status Codes for Uncertain Quality	
Values in hex notation	**Description**
0x4B	Value is a substituted value (normally used in Failsafe).
0x4C/0x4F	Initial value.
0x47	Last usable value.

Status Codes for Bad Quality	
Values in hex notation	**Description**
0x10	The LOE timer has expired: this could be caused by LOE or by a sensor malfunction: value is BAD.
0x01	There is an error in the configuration of the function blocks in PROFIBUS PA[a].
0X1F	The function block, or the transducer block, has been placed out of service.

a) This could happen when a firmware download has been done, but a system reset has not been done. This could also happen if the function blocks are not configured properly using the handheld programmer, PDM or acyclic services.

Condensed Status

These codes are available when Condensed Status is enabled. See **Condensed Status (3.4.)** on page 82 for more details.

Condensed Status (GOOD)		
Hex value	**Status – GOOD**	**Description**
0x80	GOOD – ok	No error or special condition is associated with this value.
0x84	GOOD – update event	Set if the value is good and the block has an active Update event. (This status remains active for 20 seconds.)
0x86	GOOD – active advisory alarm	Set if the value is good and the block has an active Alarm.
0x80 ...0x8E	GOOD – limit check/ update event	See *Status Codes for Good Quality* on page 143.
0xA0 ...0xA3	GOOD – initiate fail safe	This fault is not generated by the product, but can be simulated.
0xA4 ...0xA7	GOOD – maintenance required	Value is valid. Maintenance is recommended within a medium-term period.
0xA8 ...0xAB	GOOD – maintenance demanded	Value is valid. Maintenance is demanded within a short-term period.
0xBC ...0xBF	GOOD – function check	Device performs internal function check without influencing the process. Value is valid.

Condensed Status (UNCERTAIN)		
Hex value	**Status – UNCERTAIN**	**Description**
0x45	UNCERTAIN – substitute set	Output of Failsafe logic only.
0x4F	UNCERTAIN – initial value	Default value as long as no measured value is available or until a diagnosis is made that affects the value and the status accorded to it.
0x68 ...0x6B	UNCERTAIN – maintenance demanded	Usability of the process value depends on the application. Value is potentially invalid. Cause can be determined by reading the extended diagnostics[a]. Maintenance is demanded within a short-term period.
0x73	UNCERTAIN – simulated value, start	Indicates the start of a simulation. Simulation of a measured value or Input FB mode changes from AUTO to MAN. • This status remains active for at least 10 seconds: – after enabling simulation – after setting the FB to MAN mode – after a restart (e.g. power down cycle) if the simulation is enabled or the FB is in MAN mode – after passivation is cleared if simulation is enabled or the FB is in MAN mode • In MAN mode the status remains until a subsequent write command overwrites the OUT value after the 10 seconds have expired. • In simulation mode the written status is buffered and appears in the value flow after 10 seconds. However the new written SIMULATE parameter with its status can be read before the 10 seconds have expired.
0x74 ...0x77	UNCERTAIN – simulated value, end	Indicates the end of a simulation. Simulation of a measured value is disabled or Input FB mode changes from MAN to AUTO. This Status remains active for 10 seconds after simulation ends. While this status is active there is no reliable process value. Measured values and their status are updated afterwards.

a) See *Acyclic Extended Diagnostics (General Fault Codes)* on page 149.

Condensed Status (BAD)		
Hex value	**Status BAD**	**Description**
0x00	BAD – non specific	Proxy determines that a device does not communicate.
0x23	BAD – passivated (diagnostics alerts disabled)	Configured failsafe value is used, accompanied by this status.
0x24 ...0x27	BAD – maintenance alarm, more diagnosis available	No measurement available because of a failure.
0x25	BAD – process related, no maintenance	No measurement available because of invalid process conditions.
0x3C ...0x3F	BAD – function check / local override, value not usable	Occurs during cleaning or calibration process.

Diagnostics

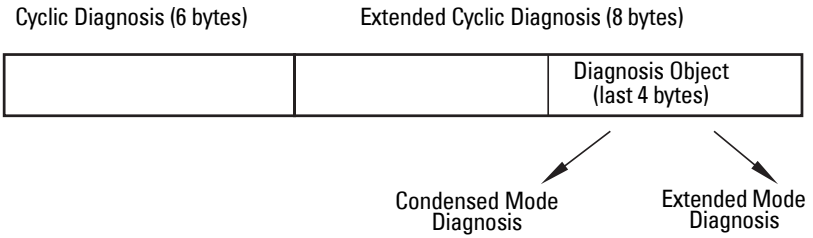
All diagnostic information shown below is viewable via PDM.

Diagnosis reply (available cyclically)

During DPV0 data exchange, the PROFIBUS PA slave will notify the Master when a serious error occurs. The Master will then send a Diagnosis request. The reply to this request is normally logged in the PLC and is referred to as the "Hex values."

The reply may contain two parts. The first part is 6 bytes long and is defined by the PROFIBUS standard. If there is a second part, it is called the 'extended cyclic diagnosis' and it is 8 bytes long. The last 4 bytes of the extended diagnostic message give the error diagnosis (see *Extended Mode Diagnosis* on page 147 and *Condensed Mode Diagnosis* on page 148).

The same information is also available acyclically via the Diagnosis Object.



Diagnosis Object (available cyclically or acyclically)

This consists of four bytes.

In PROFIBUS PA there are two options for the Diagnosis Object:

- Extended Mode Diagnosis (see page 147)
- Condensed Mode Diagnosis (see page 148)

You can choose which of these will be returned, by enabling or disabling Condensed Status. See **Enable (3.4.1.)** on page 83. When Condensed Status is disabled **Extended Mode Diagnosis** will be returned, and the following codes will be used.

Extended Mode Diagnosis				
Hex values	**Byte**	**Bit**	**Description**	**Indication class[a)]**
0x01000000	0	0	Electronics failure	R
0x02000000		1	Mechanical failure	R
0x04000000		2	Motor Temperature too high	R
0x08000000		3	Electronics temperature too high	R
0x10000000		4	Memory error	R
0x20000000		5	Measurement failure	R
0x40000000		6	Device not initialized (no calibration)	R
0x80000000		7	Self calibration failed	R
0x00010000	1	0	Zero point error (limit position)	R
0x00020000		1	Power supply failure (electrical, pneumatic)	R
0x00040000		2	Configuration invalid	R
0x00080000		3	New startup carried out (Warm Start)	A
0x00100000		4	Restart carried out (Cold Start)	A
0x00200000		5	Maintenance required	R
0x00400000		6	Characterization invalid	R
0x00800000		7	Set to 1 (one), if the Ident_Number of the running cyclic data transfer and the value of Physical Block IDENT__NUMBER_SELECTOR parameter are different.	R
	2	0 to 7	Reserved for use within the PNO	
	3	0 to 6	Reserved for use within the PNO	
0x00000080		7	More diagnosis information is available	

a) **R** indicates the message remains active as long as the reason for the message exists.
A indicates the message will automatically reset after 10 seconds

Values of the DIAGNOSIS bit: **0** = not set; **1** = set

Condensed Mode Diagnosis

Condensed Mode Diagnosis				
Hex values	**Byte**	**Bit**	**Description**	**Indication class[a)]**
0x01000000	0	0	Electronics failure	R
0x02000000		1	Mechanical failure	R
0x04000000		2	Motor Temperature too high	R
0x08000000		3	Electronics temperature too high	R
0x10000000		4	Memory error	R
0x20000000	0 (cont'd)	5	Measurement failure	R
0x40000000		6	Device not initialized (no calibration)	R
0x80000000		7	Self calibration failed	R
0x00080000	2	3	New startup carried out (Warm Start)	A
0x00100000		4	Restart carried out (Cold Start)	A
0x00200000		5	Maintenance required	R
0x00400000		6	Reserved for use within the PNO	
0x00800000		7	Set to 1 (one), if the Ident_Number of the running cyclic data transfer and the value of Physical Block IDENT__NUMBER_SELECTOR parameter are different.	R
0x00010000	3	0	Failure of the device or armature	R
0x00020000		1	Maintenance demanded	R
0x00040000		2	Device is in function check mode, or simulation, or under local control e.g. maintenance	R
0x00080000		3	The process conditions do not allow the return of valid values. (Set if a value has the quality Uncertain - Process related, no maintenance or Bad - Process related, no maintenance.)	R
		4 to 7	Reserved for use within the PNO	
	4	0 to 6	Reserved for use within the PNO	
0x80000000		7	0: There is no more information available 1: More diagnosis information is available in DIAGNOSIS_EXTENSION	

a) **R** indicates the message remains active as long as the reason for the message exists.
A indicates the message will automatically reset after 10 seconds

Acyclic Extended Diagnostics (General Fault Codes)

In addition to the extended diagnostics available by cyclic data exchange (shown above), further extended diagnostics are available via acyclic communications. This consists of six bytes. See *Diagnosis reply (available cyclically)* on page 146 for information on the location of the **Extended Diagnostics**

Note: Certain fault codes (identified by an asterisk [*] in the table below) will persist until a manual reset has been performed (see **Fault Reset (3.2.)** on page 82).

Acyclic Extended Diagnostics /General Fault Codes					
LCD display		**Meaning**	**Corrective Action**	**Byte**	**Bit**
S:0		The device was unable to get a measurement within the Fail-safe LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid configuration range.	• Ensure installation details are correct. • Ensure no antenna material buildup. Clean if necessary. • Adjust process conditions to minimize foam or other adverse conditions. • Correct configuration range. • If fault persists, contact your local Siemens representative.	0	0
S:2		Unable to collect profile because of a power condition that is outside the operating range of the device.	Repair required. Contact your local Siemens representative.		2
S:3		Device is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.		3
S:4		Device is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.		4
S:6		Sensor is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.		6

Acyclic Extended Diagnostics /General Fault Codes (cont'd)					
LCD display		**Meaning (cont'd)**	**Corrective Action**	**Byte (cont'd)**	**Bit**
S:7		Sensor is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.	0 (cont'd)	7
S:8		Service interval as defined in Maintenance Required Limit has expired.	Perform service.	1	0
S:9		Service interval as defined in Maintenance Demanded Limit has expired.	Perform service.		1
S:10		Input parameters High Calibration Point and Low Calibration Point are the same.	• Check calibration settings of device. • Ensure settings for High Calibration Point and Low Calibration Point are different.		3
S:11		Internal temperature sensor failure.	Repair required. Contact your local Siemens representative.		4
S:12	*	Internal temperature of the device has exceeded specifications: it is operating outside its temperature range.	• Relocate device and/or lower process temperature enough to cool device. • Inspect for heat-related damage and contact your local Siemens representative if repair is required. • Fault code will persist until a manual reset is performed using PDM or the LCD interface.		5
S:14		Upper and lower input values (Process Value Scale) for AIFB1 are the same.	• Check configuration for AIFB1. • Ensure that Upper Value and Lower Value (Process Value Scale) are not the same.		6
S:15		Upper and lower input values (Process Value Scale) for AIFB2 are the same.	• Check configuration for AIFB2. • Ensure that Upper Value and Lower Value (Process Value Scale) are not the same.		7

Acyclic Extended Diagnostics /General Fault Codes (cont'd)					
LCD display		Meaning (cont'd)	Corrective Action	Byte (cont'd)	Bit
S: 17		Calibration interval as defined in Maintenance Required Limit has expired.	Perform calibration.	2	1
S: 18		Calibration interval as defined in Maintenance Demanded Limit has expired.	Perform calibration.		2
S:28		Internal device failure caused by a RAM memory error.	Repair required: contact your local Siemens representative.	3	4
S:29		EEPROM damaged.	Repair required: contact your local Siemens representative.		5
S:31		Flash error.	Repair required: contact your local Siemens representative.		7
S: 32		IDENT number conflict.	Ensure value of the Ident number selector is correct for the network configuration. If it is correct, the device needs to be re-parameterized by the PLC.	4	0
S:33		Factory calibration for the internal temperature sensor has been lost.	Repair required: contact your local Siemens representative.		1
S:34		Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.		2
S:35		Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.		3
S:36		Unable to start microwave module.	Cycle power. If fault persists, contact your local Siemens representative.		4
S:37		Measurement hardware problem.	Cycle power. If fault persists, contact your local Siemens representative.		5
S:38		Microwave module hardware failure: unable to calculate distance measurement.	Cycle power. If fault persists, contact your local Siemens representative.		6

Acyclic Extended Diagnostics /General Fault Codes (cont'd)					
LCD display		Meaning (cont'd)	Corrective Action	Byte (cont'd)	Bit
S:43		Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.	5	3

Acyclic Data

SITRANS LR200 supports up to four simultaneous connections by a Class 2 Master (C2 connection). It supports one connection by a Class 1 Master (C1 connection).

In order for a Class 1 Master to read parameters from an instrument, it needs to know the slot and absolute index of the parameter.

The parameters are all listed in SIMATIC PDM under Help. If you do not have SIMATIC PDM you can download the EDD (Electronic Device Description) and reference the HTML help file directly.

To find the slot and index numbers via SIMATIC PDM, go to **Help > Communications**, and select the appropriate block from the list. For each parameter, the slot and the relative index is listed. For example.

AIFB 1		
Index	**Parameter**	**Datatype**
1	Static Revision No.	UNSIGNED_INTEGER (2)

Each block has a slot number and an Index Offset value.

Block Name	Slot	Index Offset
Physical block	0	16
Transducer block	0	77
AIFB 1	1	16
AIFB 2	2	16

To get the absolute index for any parameter, add the Index Offset for the appropriate block to the relative index for that parameter. The parameter takes the slot number of the block in which it is located.

For example:

- Parameter **Static Revision Number** has relative index = 1 and is located on AIFB1.
- It has Absolute Index = 17 (relative index 1 + index offset 16).
- It is located at Slot 1 (the slot number for AIFB 1).

Notes

Appendix H: Flange Adapter Versions

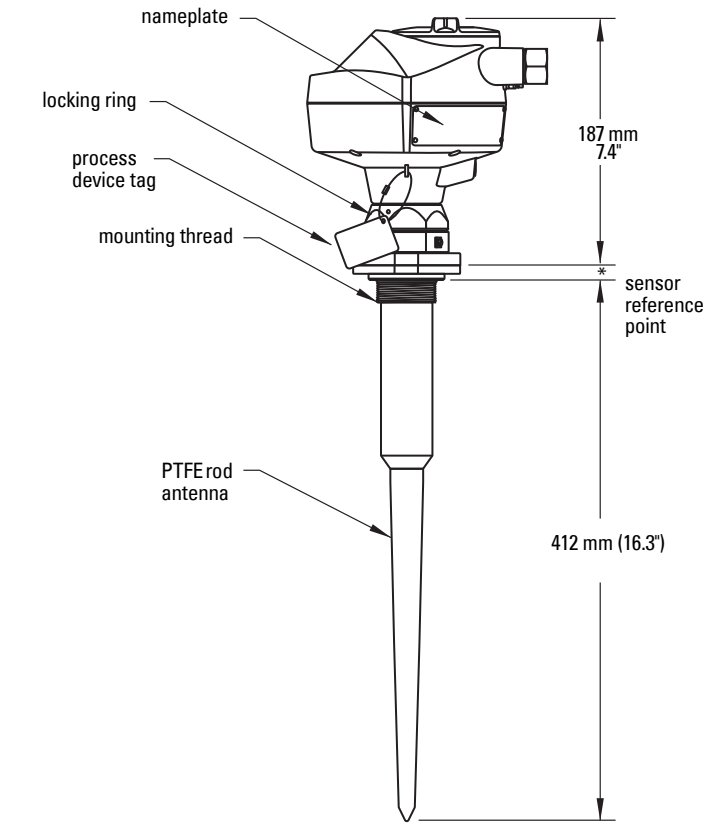
Dimensions:

Threaded connection, PTFE Rod

! WARNING: For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.

Notes:

- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at: www.siemens.com/LR200, under **More Info/Installation drawings/Level Measurement/Installation Drawings/LR200**.
- Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.

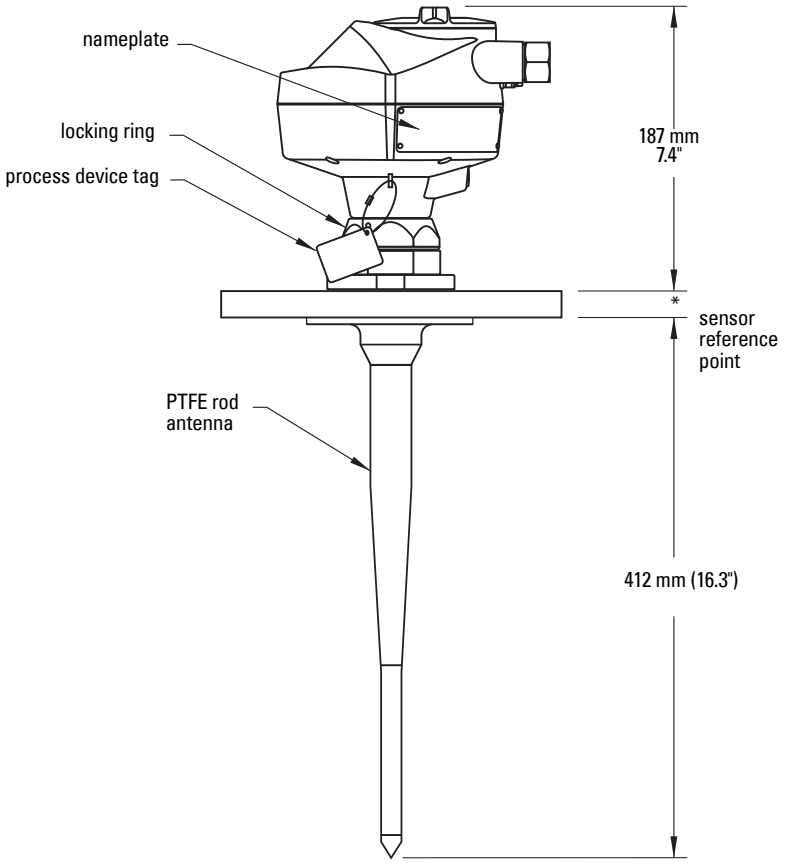


* 17 mm (0.67")

PTFE Rod Antenna, Flat-Face[1)] Flange

Notes:

- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at: www.siemens.com/LR200, under **More Info/Installation drawings/Level Measurement/Installation Drawings/LR200**.
- Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.
- For other flange dimensions and bolt hole sizing see *Flat-Face Flange Dimensions* on page 165.



*Flange thickness: FF (flat-face) = 20 mm (0.80") nominal
RF (raised-face): thickness depends on flange size. See *Raised Face Flange Dimensions* on page 163.

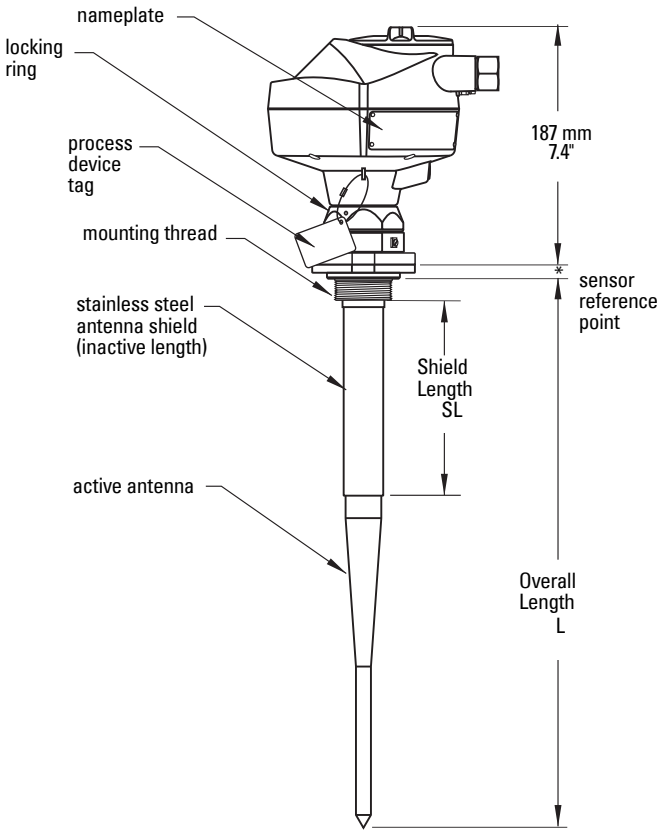
1) Constant thickness series.

Threaded Connection, PTFE Rod, external shield

! WARNING: For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.

Notes:

- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at: www.siemens.com/LR200, under **More Info/Installation drawings/Level Measurement/Installation Drawings/LR200**.
- Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.



* 17 mm (0.67")

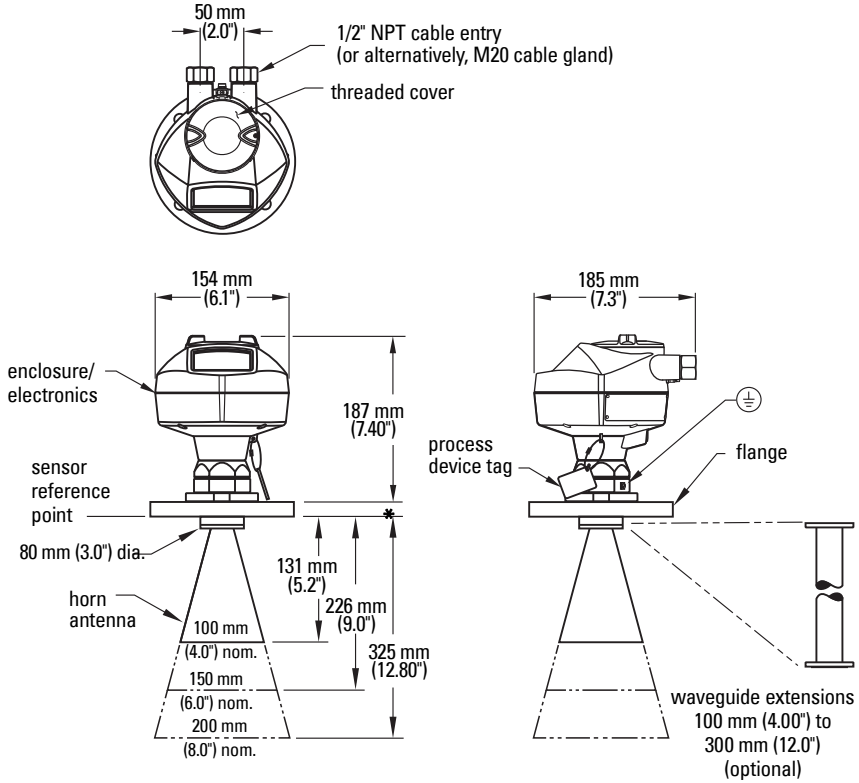
SL = min. 100 mm (4") (customer-specified)

L = 374 mm (14.7") plus shield length

Flat-Face[1)] Flange with Horn Antenna and Waveguide extension

Notes:

- For other flange dimensions and bolt hole sizing see *Flat-Face Flange Dimensions* on page 165 or *Raised Face Flange Dimensions* on page 163.
- See *Flanged Horn dimensions* on page 158 for more details.
- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at: www.siemens.com/LR200, under **More Info/Installation drawings/Level Measurement/Installation Drawings/LR200**.
- Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.
- Optional waveguide extensions and/or purging2) system can be installed between the flange and the antenna.



* Flange thickness: 20 mm (0.80") nominal

1) Constant thickness series.

2) A purging system is an option available for this antenna type. This provides an inlet on the flange where cooling air or cleaning fluid may be supplied. The air or liquid passes through the flange and exits the inside of the horn to clean the antenna system.

Flanged Horn dimensions

Notes:
- Signal amplitude increases with horn diameter, so use the largest practical size.
- 80 mm (3") and 100 mm (4") are not recommended in vessels due to the wide beam/ poor performance. They are to be used in stillpipe applications only.

Nominal Horn Size	Horn O.D.	Height to sensor reference point[a)]	Beam Angle[b)]	Measurement Range
100 mm (4")	95.3 mm (3.75")	131.0 mm (5.16")	29 degrees	20 m (65.6 ft)
150 mm (6")	146.0 mm (5.75")	225.8 mm (8.89")	20 degrees	
200 mm (8")	199.4 mm (7.85")	325.1 mm (12.79")	17 degrees	

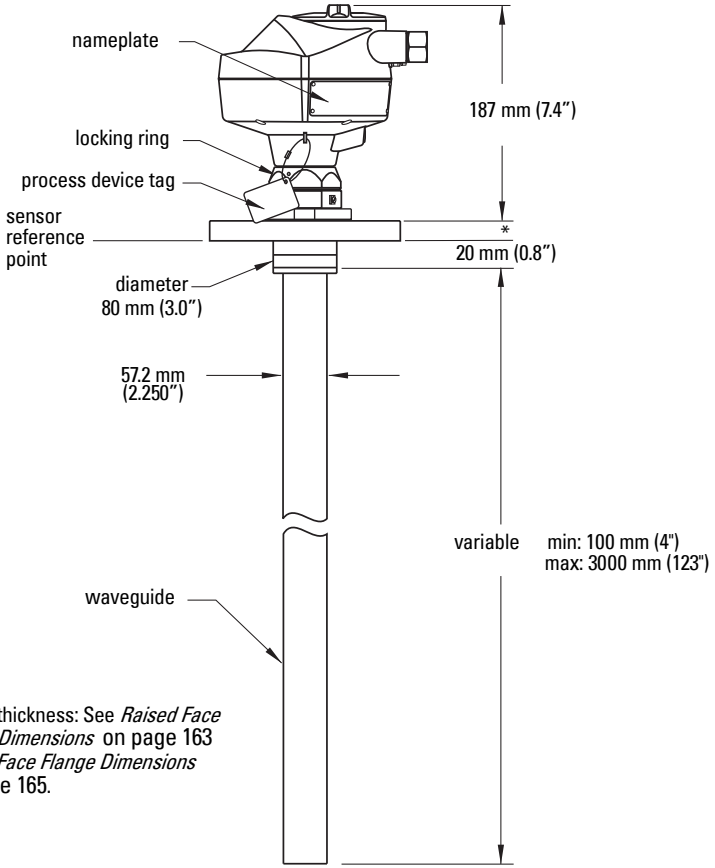
a) Height from bottom of horn to sensor reference point as shown: see *Flat-Face Flange with Horn Antenna and Waveguide extension* on page 157, *Raised Face or Flat-Face Flange with Waveguide* on page 159, or *Sliding Waveguide Configuration* on page 160.

b) – 3dB in the direction of the polarization axis (see *Polarization reference point* on page 16 for an illustration).

Raised Face[1)] or Flat-Face[2)] Flange with Waveguide

Notes:

- For other flange dimensions and bolt hole sizing see *Flat-Face Flange Dimensions* on page 165 or *Raised Face Flange Dimensions* on page 163.
- You can connect a maximum of two waveguides together.
- This option is recommended only for clean liquids on vessels without agitators or turbulence.
- Horizontal stress on this antenna must be avoided, otherwise mechanical support may be required.
- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at: www.siemens.com/LR200, under **More Info/Installation drawings/Level Measurement/Installation Drawings/LR200**.
- Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.



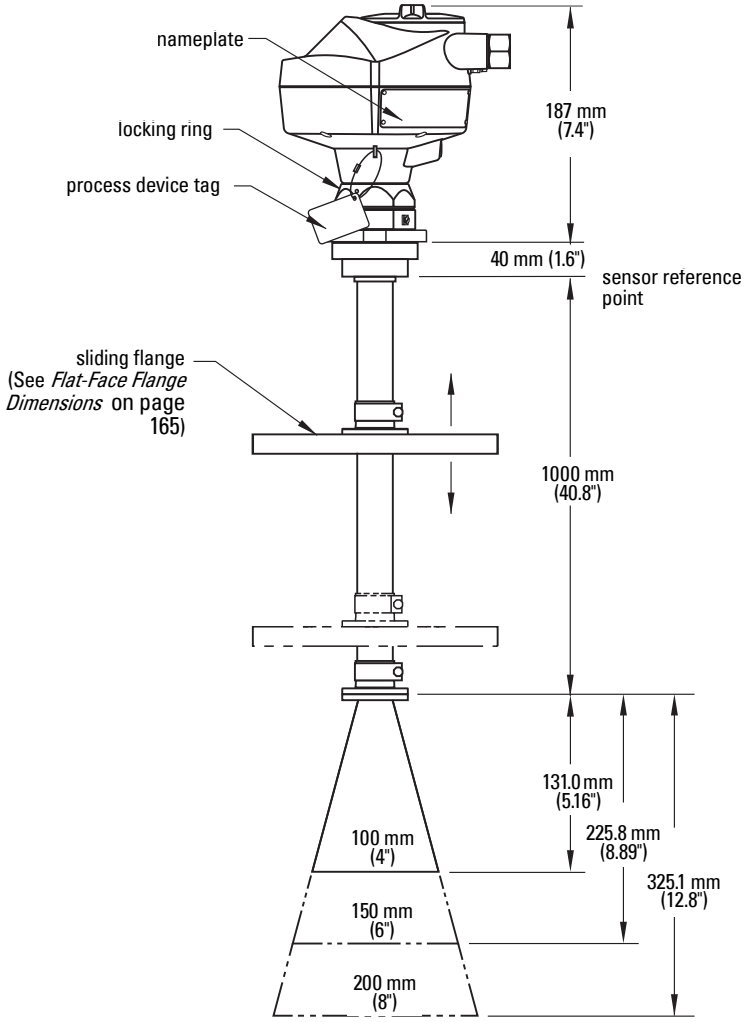
1) Per EN-1092-1.

2) Constant thickness series.

Sliding Waveguide Configuration

Notes:

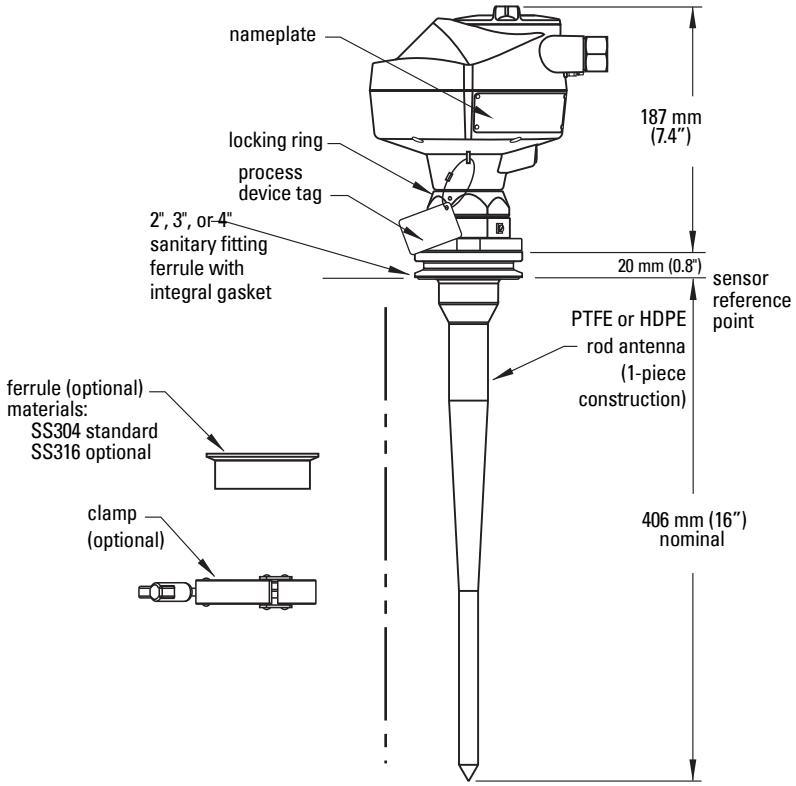
- Always clamp the instrument in the same position for operation.
- For other flange dimensions and bolt hole sizing see *Flat-Face Flange Dimensions* on page 165.
- Maximum pressure 0.5 bar at 60° C (140° F) for sliding flange option.
- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at: www.siemens.com/LR200, under **More Info/Installation drawings/Level Measurement/Installation Drawings/LR200**.
- Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.



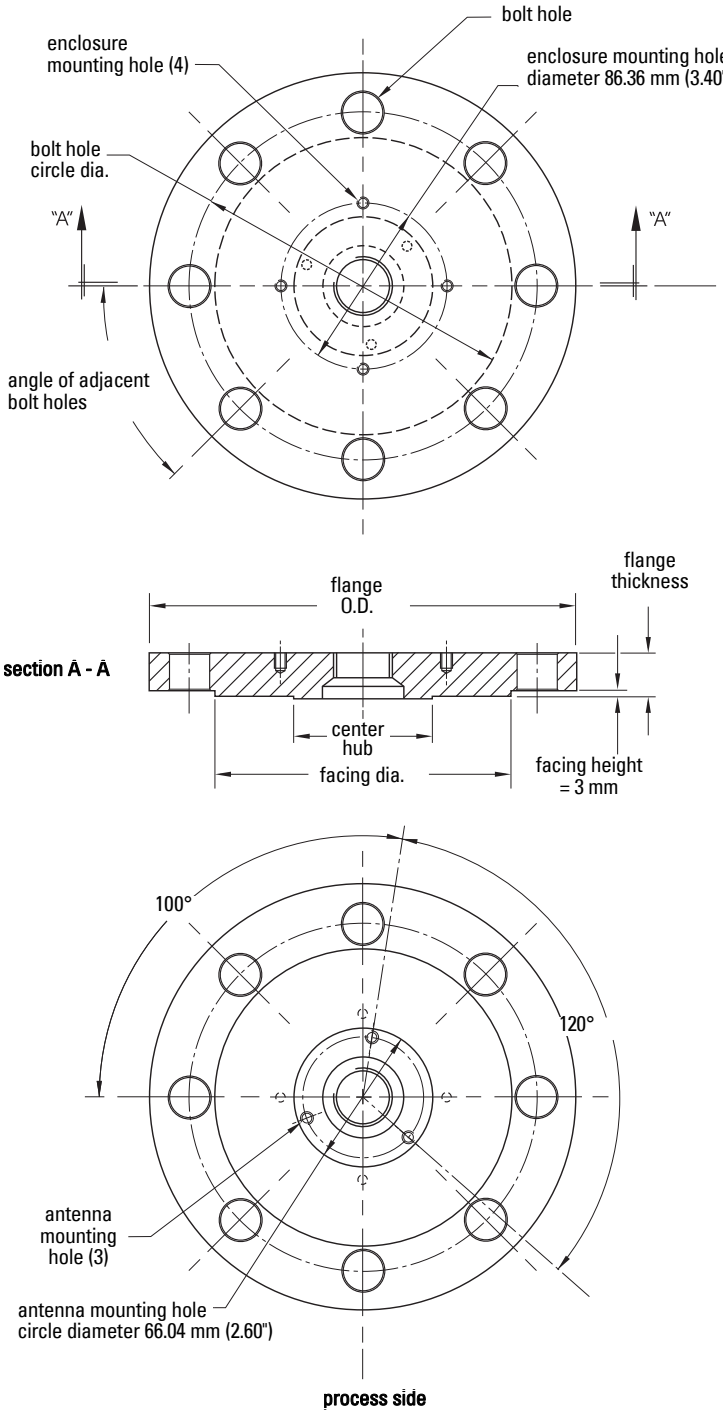
Sanitary connection, Rod Antenna, PTFE or HDPE

Notes:

- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at: www.siemens.com/LR200, under **More Info/ Installation drawings/Level Measurement/Installation Drawings/LR200**.
- Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.



Raised Face Flange per EN 1092-1



Raised Face Flange Dimensions

Pipe size	Flange bolt hole pattern	Flange O.D. (mm)	Bolt Hole Circle Ø (mm)	Bolt Hole Ø (mm)	No. of Bolts	Angle of adjacent bolt holes	Facing Ø (mm)	Thick-ness (mm)
DN80	PN10/PN16	200	160	18	8	45	138	20
DN100	PN10/PN16	220	180	18	8	45	158	20
DN150	PN10/PN16	285	240	22	8	45	212	22
DN200	PN16	340	295	22	12	30	268	24
DN80	PN25/PN40	200	160	18	8	45	138	24
DN100	PN25/PN40	235	190	22	8	45	162	24
DN150	PN25/PN40	300	250	26	8	45	218	28

Raised Face[1)] Flange markings

Flange Standard; Nominal Size; Material; Heat Code	Serial no.	Logo	Heat Code no.	Facing
EN 1092-1 05 'B1'; 'DN80' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyxxx		A1B2C3	RF

The flange markings are located around the outside edge of the flange.

Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.

Flange series: the Siemens Milltronics drawing identification.

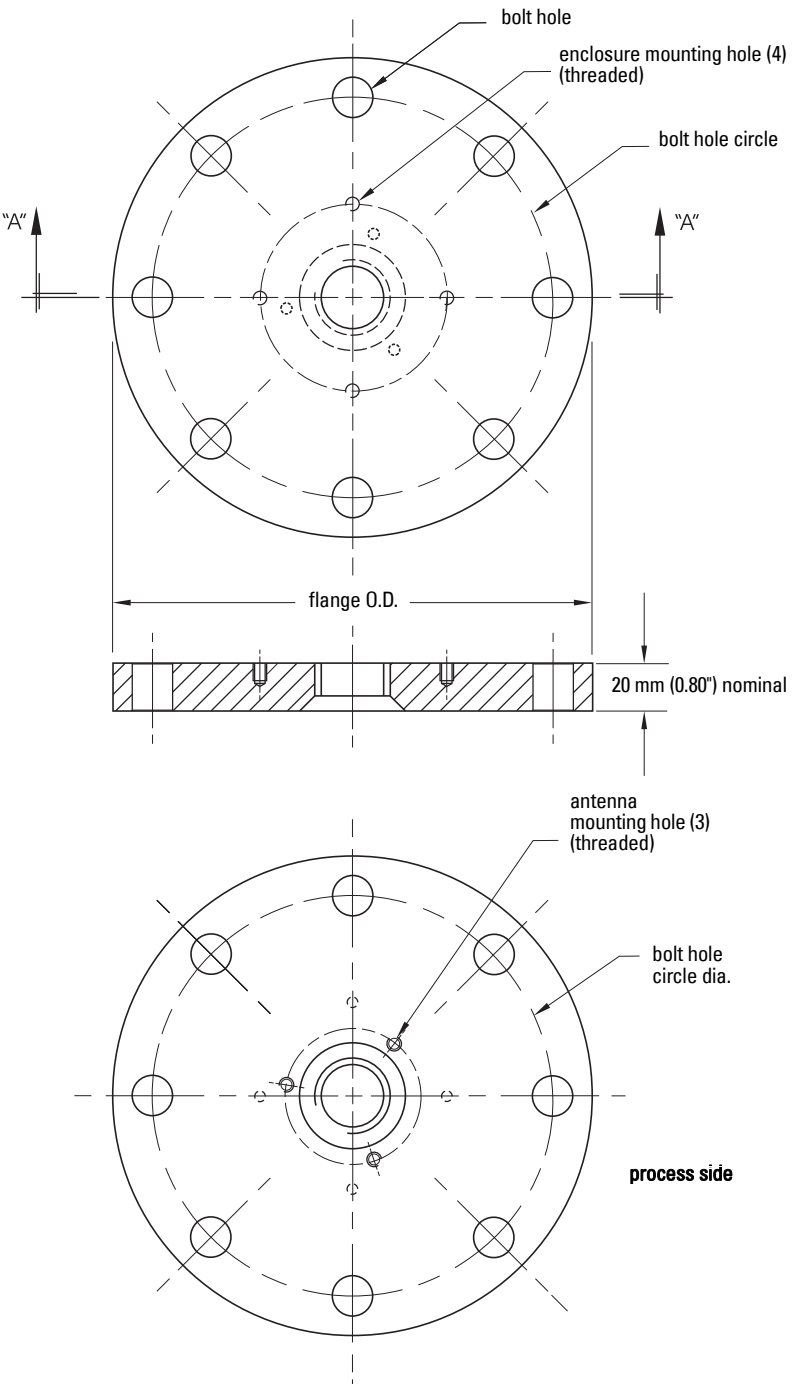
Heat code: a flange material batch code identification.

Facing: Defines RF option.

1) Per EN 1092-1.

Flat-Face Flange (constant thickness series)

See *Flat-Face Flange Dimensions* on page 165 for details.



Flat-Face[1)] Flange Dimensions

Pipe size	Flange Size	Flange O.D.	Bolt Hole Circle Ø	Bolt Hole Ø	Number of Bolts
2″	ASME 150 lb	6.0″	4.75″	.7″	4
3″	ASME 150 lb	7.5″	6.0″	.75″	4
4″	ASME 150 lb	9.0″	7.50″	.75″	8
6″	ASME 150 lb	11.0″	9.50″	.88″	8
8″	ASME 150 lb	13.5″	11.75″	.88″	8
2″	ASME 300 lb[a)]	6.50″	5.00″	.75″	4
3″	ASME 300 lb	8.25″	6.62″	.88″	8
4″	ASME 300 lb	10.00″	7.88″	.88″	8
6″	ASME 300 lb	12.50″	10.62″	.88″	12
8″	ASME 300 lb	15.00″	13.00″	1.00″	12
DN50	PN16	165 mm	125 mm	18 mm	4
DN80	PN16	200 mm	160 mm	18 mm	8
DN100	PN16	220 mm	180 mm	18 mm	8
DN150	PN16	285 mm	240 mm	22 mm	8
DN200	PN16	340 mm	295 mm	22 mm	12
DN200	PN25	360 mm	310 mm	26 mm	12
DN50	PN40	165 mm	125 mm	18 mm	4
DN80	PN40	200 mm	160 mm	18 mm	8
DN100	PN40	235 mm	190 mm	22 mm	8
DN150	PN40	300 mm	250 mm	26 mm	8
DN200	PN40	375 mm	320 mm	30 mm	12
50A	JIS 10K	155 mm	120 mm	19 mm	4
80A	JIS 10K	185 mm	150 mm	19 mm	8
100A	JIS 10K	210 mm	175 mm	19 mm	8
150A	JIS 10K	280 mm	240 mm	23 mm	8
200A	JIS 10K	330 mm	290 mm	23 mm	12

a) Due to the limited space on this flange, SITRANS LR200 can only use 4 of the standard 8 bolt holes of the 2″ ASME 300 lb size.

1) Constant thickness series.

Flat-Face[1)] Flange markings

Flange markings located around the outside edge of the flat-face flange identify the flange assembly on which the device is mounted.

Flat Face Flange Identification							Welded Assembly Identification	
Serial No.	Logo	Flange Series			Material	Heat Code	Flange Series	Heat Code No.
		Series	Nominal Size					
MMDDYYXXX		25556	2	150	316L/ 1.4404 or 316L/ 1.4435	A1B2C3	25546	A1B2C3
			DN 80	PN16				

Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.
Flange series: the Siemens Milltronics drawing identification.
Nominal size: the flange size followed by the hole pattern for a particular flange class. For example,
– a 2 inch ANSI B 16.5 150 lb class flange (North America)
– a DN 80 EN 1092-1 PN16 class flange (Europe).
Material: the basic flange material (AISI or EU material designation). North American material codes are followed by European ones. For example, material designation 316L/1.4404.
Heat code: a flange material batch code identification.

Threaded Connection Markings

Threaded connection markings are found on the flat face/faces of the process connection.

Logo	Serial Number	Thread Size	Thread Series
	MMDDYYXXX	1.5	NPT
			BSP
			G/PF

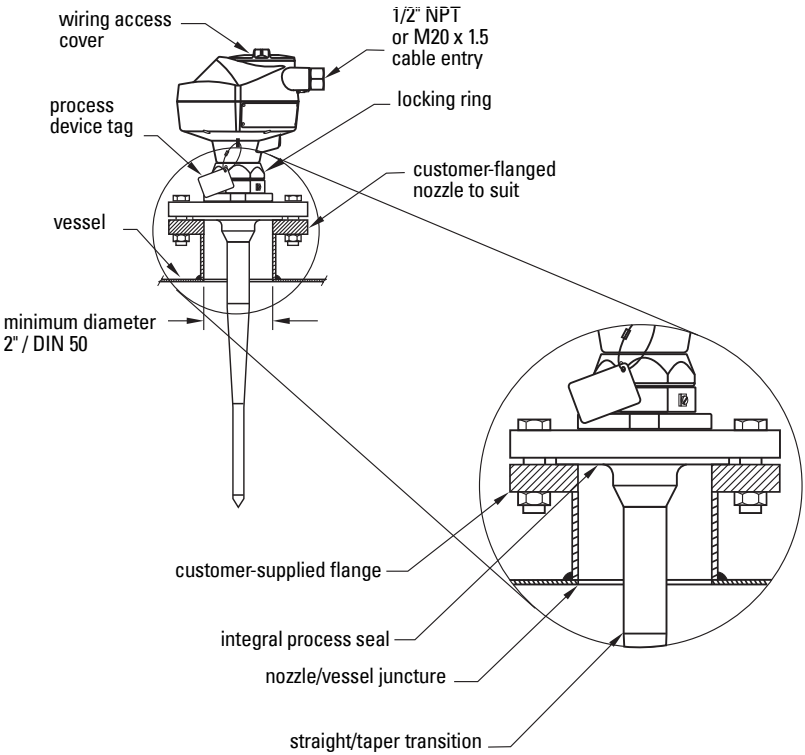
Serial number:a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.

1) Constant thickness series.

Flange Mounting Instructions

Notes:

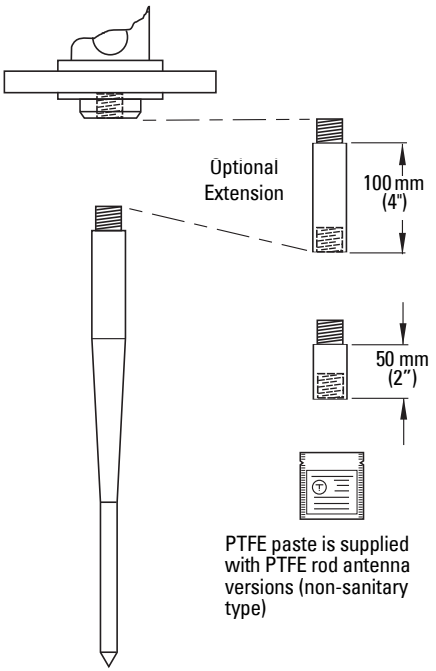
- The integral process seal MUST rest on the customer-supplied flange (see the detail below).
- The straight/taper transition of the rod should extend past the nozzle/vessel opening. Add extensions as required[1)].



1) Refer to the *Rod Extension Requirements* table on page 168.

Rod Assembly

! WARNING: For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.



Notes:

- Water or process fluids must not enter the connecting threads: this could cause reflections at the connection, which will appear as false echoes.
- Apply a small amount of PTFE paste to the antenna threads before threading the antenna together, and tighten slowly. Ensure that the rod sections mate securely with no gaps. Do not apply too much PTFE paste or the parts will not mate securely.
- Do not use wrenches or pliers. Hand tighten only (except in pressure applications: see warning above).

Rod Extension Requirements

Nozzle I.D.	Nozzle Height[a] mm (inches)		
	<100 (4)	100 to 150 (4 to 6)	150 to 200 (6 to 8)
50 mm (2")	extension not required	Application not recommended for 50 mm (2") I.D. nozzles longer than 100 mm (4")[b].	
80 mm (3")		50 mm	100 mm
100 mm (4")		50 mm	100 mm
150 mm (6")		50 mm	100 mm
>150 mm (6")	extension not required		

a) Consult Siemens Milltronics for assistance with nozzle sizes not listed.

b) Shielded rod antennas are available for these applications.

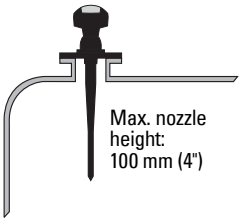
Mounting Guidelines

Nozzle fabrication

Weld seams must be on the outside of the nozzle. Seams or lips on the inside of the nozzle may cause erratic readings.

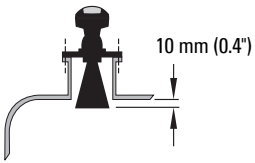
Nozzle design

- The nozzle should be as short as possible.
- If your application requires a nozzle longer than our recommended maximum length consider using a shielded rod.



Horn Antennas

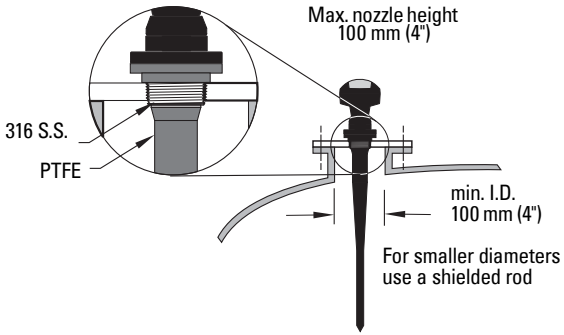
The end of the horn should protrude a minimum of 10 mm (0.4") to avoid interference from the nozzle.



Threaded Rod Antenna

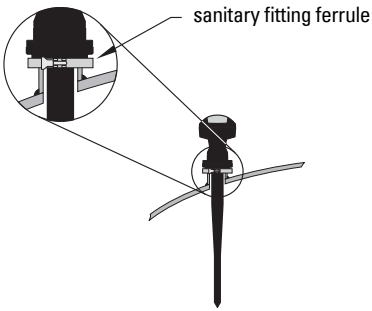
> **! WARNING: For pressure applications, it is necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.**

1.5" or 2" threaded process connections are available in three thread types: NPT, BSP, and G.



Sanitary Rod Antenna

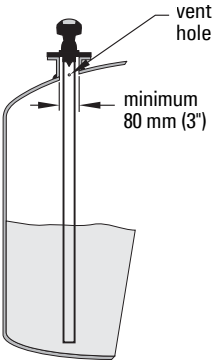
2",3," and 4" sanitary fitting ferrule with integral gasket, with rod antenna



Waveguide Antenna

Notes:

- You can connect a maximum of two waveguides together.
- This option is recommended only for clean liquids, and only on vessels without an agitator, with no turbulence.
- Horizontal stress on this antenna must be avoided, otherwise mechanical support may be required.
- Process temperature and pressure capabilities are dependent upon information on the process device tag. The reference drawing listed on the tag can be downloaded from our website at: www.siemens.com/LR200.

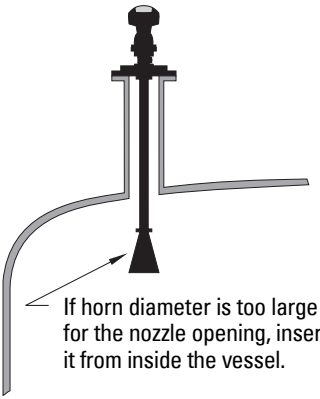


- Recommended for products with a dK lower than 3.
- See **Propagation Factor (2.5.3.)** on page 70 for the related propagation factor.

Horn with Waveguide Extensions

- Recommended for long nozzles with a small diameter.

  For example, if the nozzle is 100 mm (4") in diameter and 460 mm (18") in length), the rod antenna is not suitable due to interference from the nozzle.
- Waveguide extensions are available in custom lengths.
- The horn must be connected to the SITRANS LR200 process flange.



Appendix J: Firmware Revision History

Firmware Rev.	EDD Rev.	Date	Changes
1.03.00	1.03.00	22 Oct 2004	• Initial release
1.04.00	1.04.00	05 Jul 2005	• MP&F parameters added to device
2.01.00	2.01.00	24 Feb 2006	• Improved linearity over ambient temperature
3.00.03	3.00.06	15 Feb 2008	• New Local User Interface
3.01.00	3.01.00	18 Aug 2009	• Harmonization of menu structures and parameter names across products. • Display indicates progress towards first measurement.
3.01.01	3.01.00	7 June 2010	• Display contrast improvement. • Antenna type parameter cannot be modified.

Notes

Glossary

accuracy: degree of conformity of a measure to a standard or a true value.

agitator: mechanical apparatus for mixing or aerating. A device for creating turbulence.

algorithm: a prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.

ambient temperature: the temperature of the surrounding air that comes in contact with the enclosure of the device.

antenna: an aerial which sends out and receives a signal in a specific direction. There are four basic types of antenna in radar level measurement, horn, parabolic, rod, and waveguide.

attenuation: a term used to denote a decrease in signal magnitude in transmission from one point to another. Attenuation may be expressed as a scalar ratio of the input magnitude to the output magnitude or in decibels.

Auto False-Echo Suppression: a technique used to adjust the level of a TVT (Time Varying Threshold) to avoid the reading of false echoes. (See TVT.)

Auto False-Echo Suppression Distance: defines the endpoint of the TVT distance. (See TVT.) This is used in conjunction with auto false echo suppression.

beam angle: the angle diametrically subtended by the one-half power limits (-3 dB) of the microwave beam.

beam spreading: the divergence of a beam as it travels through a medium.

blanking: a blind zone extending away from the reference point plus any additional shield length.The instrument is programmed to ignore this zone.

capacitance: the property of a system of conductors and dielectrics that permits the storage of electricity when potential differences exist between the conductors. Its value is expressed as the ratio of a quantity of electricity to a potential difference, and the unit is a Farad.

confidence: see **Echo Confidence**

damping: term applied to the performance of an instrument to denote the manner in which the measurement settles to its steady indication after a change in the value of the level.

dB (decibel): a unit used to measure the amplitude of signals.

derating: to decrease a rating suitable for normal conditions according to guidelines specified for different conditions.

dielectric: a nonconductor of direct electric current.[1)]

[1)] Many conductive liquids/electrolytes exhibit dielectric properties; the relative dielectric constant of water is 80.

dielectric constant (DK): the ability of a dielectric to store electrical potential energy under the influence of an electric field. Also known as Relative Permittivity. An increase in the dielectric constant is directly proportional to an increase in signal amplitude. The value is usually given relative to a vacuum /dry air: the dielectric constant of air is 1^1.

echo: a signal that has been reflected with sufficient magnitude and delay to be perceived in some manner as a signal distinct from that directly transmitted. Echoes are frequently measured in decibels relative to the directly transmitted signal.

Echo Confidence: describes the quality of an echo. Higher values represent higher quality. Echo threshold defines the minimum value required for an echo to be accepted as valid and evaluated.

Echo Lock Window: a window centered on an echo in order to locate and display the echo's position and true reading. Echoes outside the window are not immediately processed.

Echo Marker: a marker that points to the processed echo.

Echo Processing: the process by which the radar unit determines echoes.

Echo Strength: describes the strength of the selected echo in dB above 1 μV rms (root mean square).

Echo Profile: a graphical display of a processed echo.

false echo: any echo which is not the echo from the desired target. Generally, false echoes are created by vessel obstructions.

frequency: the number of periods occurring per unit time. Frequency may be stated in cycles per second.

hertz (Hz): unit of frequency, one cycle per second. 1 Gigahertz (GHz) is equal to 10^9 Hz.

horn antenna: a conical, horn-shaped antenna which focuses microwave signals. The larger the horn diameter, the more focused the radar beam.

i**nductance:** the property of an electric circuit by virtue of which a varying current induces an electromotive force in that circuit or in a neighboring circuit. The unit is a Henry.

mean: the arithmetic average of a set of values.

microwaves: the term for the electromagnetic frequencies occupying the portion of the radio frequency spectrum from 1 GHz to 300 GHz.

multiple echoes: secondary echoes that appear as double, triple, or quadruple echoes in the distance from the target echo.

Near Blanking: see Blanking

nozzle: a length of pipe mounted onto a vessel that supports the flange.

parameters: in programming, variables that are given constant values for specific purposes or processes.

polarization: the property of a radiated electromagnetic wave describing the time-varying direction and amplitude of the electric field vector.

polarization error: the error arising from the transmission or reception of an electromagnetic wave having a polarization other than that intended for the system.

PROFIBUS PA: one of the PROFIBUS family of protocols, specifically tailored for the needs of process industries (PA = Process Automation).

propagation factor (pf): where the maximum velocity is 1.0, pf is a value that represents a reduction in propagation velocity as a result of the wave travelling through a pipe or medium.

pulse radar: a radar type that directly measures distance using short microwave pulses. Distance is determined by the return transit time.

radar: radar is an acronym for **RA**dio **D**etection **A**nd **R**anging. A device that radiates electromagnetic waves and utilizes the reflection of such waves from distant objects to determine their existence or position.

range: distance between a transmitter and a target.

range extension: the distance below the zero percent or empty point in a vessel.

relative permittivity: see dielectric constant.

repeatability: the closeness of agreement among repeated measurements of the same variable under the same conditions.

root mean square: a statistical measure of the magnitude of a varying quantity (the square root of the mean of the squares of the values).

shot: one transmit pulse or measurement.

speed of light: the speed of electromagnetic waves (including microwave and light in free space. Light speed is a constant 299,792,458 meters per second.

stillpipe: a pipe that is mounted inside a vessel parallel to the vessel wall, and is open to the vessel at the bottom.

stilling-well: see **stillpipe**.

two wire radar: a low-energy radar. Can be loop powered, analog, intrinsically safe, or a digital (BUS) transmitter.

TVT (time varying threshold): a time-varying curve that determines the threshold level above which echoes are determined to be valid.

waveguide antenna: a hollow, metallic tube that transmits a microwave signal to the product target.

Notes

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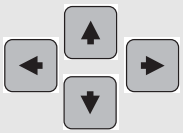
Note: Parameter names are capitalized.

LCD menu structure

LCD menu structure



Notes:

- In Navigation mode **ARROW keys** navigate the menu in the direction of the arrow..
- See *Parameter Reference* on page 59 for detailed information and instructions.

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For more information

www.siemens.com/level

www.siemens.com/continuous-weighing

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Subject to change without prior notice
Rev. 2.2

7ML19985JR02
Printed in Canada