SIEMENS

Operating instructions

SITRANS

Radar transmitters

SITRANS LR250 (PROFIBUS PA)

Edition 06/2018

www.siemens.com/processautomation

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Radar Transmitters LR250 (PROFIBUS PA)

Operating Instructions

06/2018
A5E32221386-AF

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Document order number: A5E32221386
℗ 04/2018 Subject to change

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Introduction

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1.1 LR250 PA manual usage

Note

This manual applies to the SITRANS LR250 (PROFIBUS PA) only.

Follow these operating instructions for quick, trouble-free installation, and maximum accuracy and reliability of your device.

We always welcome suggestions and comments about manual content, design, and accessibility. Please direct your comments to:

Technical publications (mailto:techpubs.smpi@siemens.com)

1.2 Purpose of this documentation

These instructions contain all information required to commission and use the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons mechanically installing the device, connecting it electronically, configuring the parameters and commissioning it, as well as service and maintenance engineers.

1.3 Revision history

This history establishes the correlation between the current documentation and the valid firmware of the device.

The documentation of this edition is applicable for the following firmware:

Edition	Firmware rev.	EDD rev.	Date	Remarks
1.0	1.00.04	1.00.05	12 Jun 2007	• Initial release.
1.1	1.01.00	1.01.00	23 Aug 2007	• EDD [a]/SIMATIC PDM: improved rendering of the echo profile and TVT.
2.0	1.01.01	1.01.01	26 Sep 2007	• PNO certification release.
2.1	1.01.02	1.01.02	10 Jun 2008	• Maintenance release for firmware and EDD[a]

Edition	Firmware rev.	EDD rev.	Date	Remarks
3.0	1.01.02	1.01.03	17 Jun 2008	• The internal EDD revision has been incremented.
3.1	1.02.00	1.02.00	27 May 2009	• Harmonization of menu structures and parameter names across products. • Display indicates progress towards first measurement.
3.2	1.02.01	1.02.00	7 June 2010	• Display contrast improvement. • Antenna type parameter cannot be modified.
4.0	1.02.02	1.02.00	24 May 2011	• Threaded PVDF antenna supported.
11/2012	1.02.03	1.02.01	31 Oct 2012	• Antenna parameter removed. • Quickstart on local display enhancements.
01/2014	N/A	N/A	Jan 2014	• Flanged encapsulated antenna version added
08/2014	N/A	N/A	Aug 2014	• Hygienic encapsulated antenna version added.
09/2014	1.02.04	1.02.01	Sept 2014	• Reset function improvement
12/2015	N/A	N/A	Dec 2015	• Manual maintenance

[a] Electronic Device Description

NOTICE

Use in a domestic environment

This Class A Group 1 equipment is intended for use in industrial areas.

In a domestic environment this device may cause radio interference.

1.4 Checking the consignment

1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.
3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

WARNING

Using a damaged or incomplete device

Risk of explosion in hazardous areas.

- Do not use damaged or incomplete devices.

1.5 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines, and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept.

Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. You can find more information about industrial security by visiting: http://www.siemens.com/industrialsecurity.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
http://www.siemens.com/industrialsecurity.

1.6 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

⚠ CAUTION

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration.

- Provide additional packaging as necessary.

1.7 Notes on warranty

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.

Safety information 2

2.1 Preconditions for safe use

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state.

2.1.1 Safety marking symbols

In manual	On product	Description
⚠	⚠ (Label on product: yellow back-ground.)	WARNING: refer to accompanying documents (manual) for details.

2.1.2 Laws and directives

Observe the test certification, provisions and laws applicable in your country during connection, assembly and operation.

2.1.3 FCC Conformity

US Installations only: Federal Communications Commission (FCC) rules

⚠ WARNING
Improper device modifications Danger to personnel, system and environment can result from improper modifications to the device. • Changes or modifications not expressly approved by Siemens could void the user's authority to operate the equipment.

Note

- 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 operating instructions, 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.

2.1.4 Industry Canada conformity

Canada Installations only: Industry Canada (IC) rules

NOTICE
Use on a "no-interference, no-protection" basis The installation of the LPR/TLPR device shall be done by trained installers, in strict compliance with the manufacturer's instructions. • The use of this device is on a "no-interference, no-protection" basis. That is, the user shall accept operations of high-powered radar in the same frequency band which may interfere with or damage this device. However, devices found to interfere with primary licensing operations will be required to be removed at the user's expense.

2.1.5 Conformity with European directives

The CE marking on the device symbolizes the conformity with the following European directives:

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
Low voltage directive LVD 2014/35/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
Atmosphère explosible ATEX 2014/34/EU	Directive of the European Parliament and the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres

Pressure equipment directive PED 2014/68/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment
RED 2014/53/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC

The applicable directives can be found in the EC conformity declaration of the specific device.

2.1.6 Radio Equipment Directive (RED) 2014/53/EU

For the receiver test that covers the influence of an interferer signal to the device, the performance criterion has at least the following level of performance according to ETSI TS 103 361 [6]:

- Performance criterion: measurement value variation Δd over time during a distance measurement
- Level of performance: Δd ≤ ±50 mm

2.1.7 CE Electromagnetic Compatibility (EMC) Conformity

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

EMC Standard	Title
CISPR 11:2009 + A1:2010/EN 55011:2009 + A1:2010, CLASS A	Limits and methods of measurements of radio disturbance characteristics of industrial, scientific, and medical (ISM) radio-frequency equipment.
EN 61326:2013 (IEC 61326:2012)	Electrical Equipment for Measurement, Control and Laboratory Use – Electromagnetic Compatibility.
EN61000-4-2:2009	Electromagnetic Compatibility (EMC) Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.
EN61000-4-3:2006 + A1:2008 + A2:2010	Electromagnetic Compatibility (EMC) Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test 2006 + A1:2008 + A2:2010.
EN61000-4-4:2004 + A1:2010	Electromagnetic Compatibility (EMC) Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test.
EN61000-4-5:2006	Electromagnetic Compatibility (EMC) Part 4-5: Testing and measurement techniques – Surge immunity test.
EN61000-4-6:2010	Electromagnetic Compatibility (EMC) Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields.
EN61000-4-8:2010	Electromagnetic Compatibility (EMC) Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test.

2.2 Improper device modifications

WARNING

Improper device modifications

Risk to personnel, system and environment can result from modifications to the device, particularly in hazardous areas.

- Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals.

2.3 Requirements for special applications

Due to the large number of possible applications, each detail of the described device versions for each possible scenario during commissioning, operation, maintenance or operation in systems cannot be considered in the instructions. If you need additional information not covered by these instructions, contact your local Siemens office or company representative.

Note

Operation under special ambient conditions

We highly recommend that you contact your Siemens representative or our application department before you operate the device under special ambient conditions as can be encountered in nuclear power plants or when the device is used for research and development purposes.

2.4 Use in hazardous areas

Qualified personnel for hazardous area applications

Persons who install, connect, commission, operate, and service the device in a hazardous area must have the following specific qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures, aggressive, and hazardous media.
- They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the pertinent safety regulations.

⚠ WARNING

Loss of safety of device with type of protection "Intrinsic safety Ex i"

If the device has already been operated in non-intrinsically safe circuits or the electrical specifications have not been observed, the safety of the device is no longer ensured for use in hazardous areas. There is a danger of explosion.

- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.
- Observe the specifications for the electrical data on the certificate.

Description

3

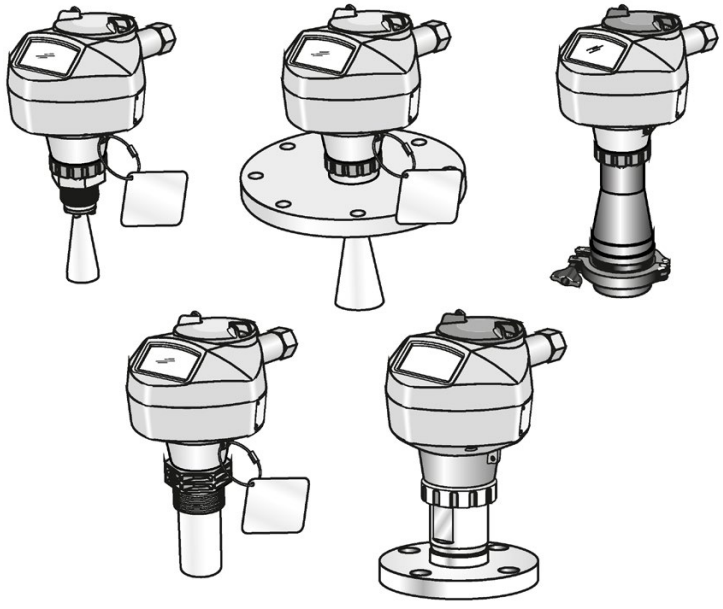
3.1 SITRANS LR250 overview

⚠ WARNING
Loss of protection Danger to personnel, system and environment can result from improper use of the device. • SITRANS LR250 is to be used only in the manner outlined in this manual, otherwise protection provided by the device may be impaired.

SITRANS LR250 is a 2-wire 25 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 meters (66 feet). It is ideal for small vessels, material such as chemicals, food, beverages, solvents (including those of corrosive or aggressive nature), and low dielectric media.

The device consists of an electronic circuit coupled to an antenna and either a threaded or flange type process connection.

This device 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.



3.2 Programming

This device 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 handheld programmer, or from a remote location using one of the following options:

- PROFIBUS PA (using SIMATIC PDM, FDT [such as PACTware or Fieldcare])
- HART (using 375 handheld Field Communicator, SIMATIC PDM, AMS, FDT [such as PACTware or Fieldcare]). See SITRANS LR560 (mA/HART) Instruction Manual for more information.
- Foundation Fieldbus FF (using 375 handheld Field Communicator or AMS). See SITRANS LR560 (Foundation Fieldbus) Instruction Manual for more information.

Once programmed, the graphic Local Display Interface (LDI) can be removed and used to transfer parameters to multiple SITRANS LR560s.

3.3 Applications

- liquids and slurries
- bulk storage vessels
- simple process vessels
- corrosive and aggressive
- hygienic/sanitary

3.4 Approvals and certificates

Note

For further details see Approvals (Page 168).

SITRANS LR250 is available with approvals for General purpose, sanitary or hygienic and for hazardous areas. In all cases, check the nameplate on your device, and confirm the approval rating.

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

Installing/mounting

4

4.1 Basic safety information

Note

Material compatibility

Siemens can provide you with support concerning selection of sensor components wetted by process media. However, you are responsible for the selection of components. Siemens accepts no liability for faults or failures resulting from incompatible materials.

⚠ WARNING

Unsuitable connecting parts

Risk of injury or poisoning.

In case of improper mounting, hot, toxic, and corrosive process media could be released at the connections.

- Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

⚠ WARNING

Exceeded maximum ambient or process media temperature

Danger of explosion in hazardous areas.

Device damage.

- Make sure that the maximum permissible ambient and process media temperatures of the device are not exceeded.

4.1.1 Unsuitable cables, cable glands and/or plugs

WARNING

Unsuitable cables, cable glands and/or plugs

Risk of explosion in hazardous areas.

- Use only cable glands/plugs that comply with the requirements for the relevant type of protection.
- Tighten the cable glands in accordance with the torques specified in Installation instructions (Page 31).
- Close unused cable inlets for the electrical connections.
- When replacing cable, glands use only cable glands of the same type.
- After installation, check that the cables are seated firmly.

WARNING

Incorrect conduit system

Risk of explosion in hazardous areas as result of open cable inlet or incorrect conduit system.

- In the case of a conduit system, mount a spark barrier at a defined distance from the device input. Observe national regulations and the requirements stated in the relevant approvals.

4.1.2 Pressure applications

DANGER

Pressure applications

Danger to personnel, system and environment will result from improper disassembly.

- Never attempt to loosen, remove, or disassemble process connection while vessel contents are under pressure.

WARNING

Pressure applications

Danger to personnel, system and environment can result from improper installation.

- Improper installation may result in loss of process pressure.

⚠ WARNING

Exceeded maximum permissible operating pressure

Danger of injury or poisoning.

The maximum permissible operating pressure depends on the device version. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released.

- Make sure that the device is suitable for the maximum permissible operating pressure of your system.

Note

- The process connection tag shall remain with the process pressure boundary assembly. (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). In the event the device package is replaced, the process connection tag shall be transferred to the replacement unit.
- Representative samples of this device have been hydrostatically tested, meeting or exceeding the requirement of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.

Note

- 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.

4.1.2.1 Pressure Equipment Directive, PED, 14/68/EU

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 Guideline A-08 and A-20).

4.2 Installation location requirements

⚠ WARNING

Aggressive atmospheres

Danger to personnel, system and environment can result from unsuitable environment.

- Provide an environment suitable to the housing rating and materials of construction.

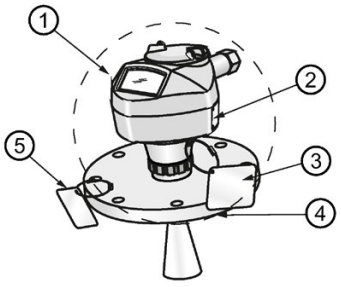
⚠ CAUTION

Direct sunlight

Device damage.

The device can overheat or materials become brittle due to UV exposure.

- Protect the device from direct sunlight.
- Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Environmental (Page 167).



① Ambient temperature
② Device nameplate
③ Device tag
④ Process temperature (at process connection)
⑤ Process connection tag (contains process connection related information)

Antenna	①	③
Horn	-40 to +80 °C (-40 to +176 °F)	with FKM O-ring:-40 to +200 °C (-40 to 392 °F)
		with FFKM O-ring:-20 to +200 °C (-4 to +392 °F)
PVDF	-40 to +80 °C (-40 to +176 °F)	-40 to +80 °C (-40 to +176 °F)
Flanged encapsulated	-40 to +80 °C (-40 to +176 °F)	-40 to +170 °C (-40 to +338 °F)
Hygienic encapsulated	-40 to +80 °C (-40 to +176 °F)	-40 to +170 °C (-40 to +338 °F)
		with FKM seals used on process connection: -20 to +170 °C (-4 to +338 °F)
		with EPDM seals used on process connection: -40 to +120 °C (-40 to +248 °F)

Note

Details about the process connection, process temperature and materials are laser etched into the body of the flanged and hygienic versions. All other SITRANS LR250 versions have details listed on a tag.

4.3 Proper mounting

Note

- Correct location is key to a successful application.
- Avoid reflective interference from vessel walls and obstructions by following guidelines in this chapter.

NOTICE

Incorrect mounting

The device can be damaged, destroyed, or its functionality impaired through improper mounting.

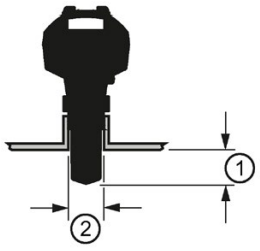
- Before installing ensure there is no visible damage to the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools. Refer to the information in Installation instructions (Page 31).

Note

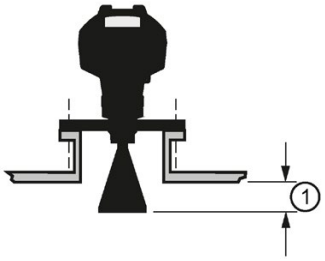
- On devices with a removable head, there is no limit to the number of times a device can be rotated without damage.
- When mounting, orient the front or back of the device towards the closest vessel wall or obstruction.
- Do not rotate the enclosure after programming and vessel calibration, otherwise an error may occur, caused by a polarity shift of the transmit pulse.

4.3.1 Nozzle design

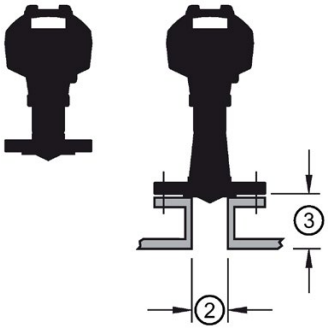
Threaded PVDF antenna



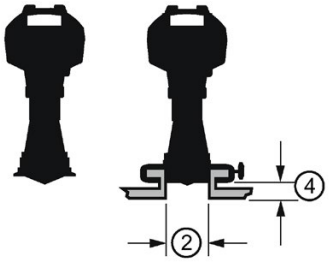
Stainless steel horn antenna



Flanged encapsulated antenna (FEA)



Hygienic encapsulated antenna (HEA)



① Minimum clearance: 10 mm (0.4")

② Minimum diameter: 50 mm (2")

③ Maximum nozzle length

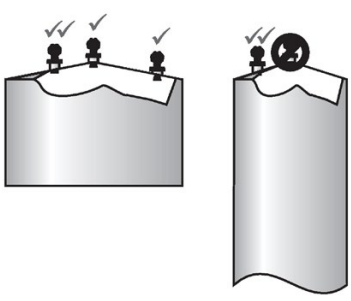
④ Maximum length/diameter ratio 1:1

- The end of the antenna must protrude a minimum of 10 mm (0.4") to avoid false echoes being reflected from the nozzle[1)].
- Minimum recommended nozzle diameter for the threaded PVDF antenna is 50 mm (2").
- An antenna extension (100 mm/3.93") is available for the horn antenna only.
- When installing the SITRANS LR250 with hygienic process connection, it is good hygienic practice to install the antenna in a nozzle that has a maximum length/diameter ratio of 1:1. For example, 2" (DN50) diameter nozzle should be no longer than 2" (50 mm).
- When removing any sanitary/hygienic clamp version of the HEA to clean the lens, ensure it is re-installed in the exact position it was removed from, to avoid re-commissioning the device.
- The maximum nozzle length for the FEA is 500 mm (19.68").

[1)] Not applicable for FEA or HEA

4.3.2 Nozzle location

- Avoid central locations on tall, narrow vessels
- Nozzle must be vertical and clear of imperfections



Preferred

Undesirable

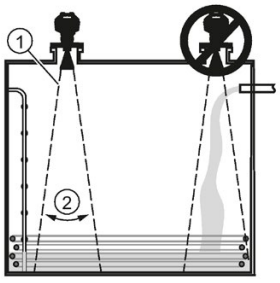
Beam angle

Note

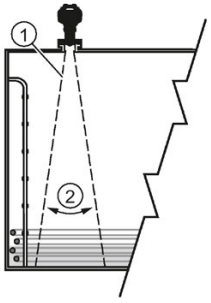
- Beam width depends on antenna size and is approximate: see below.
- For details on avoiding false echoes, see Auto False Echo Suppression (Page 220).

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

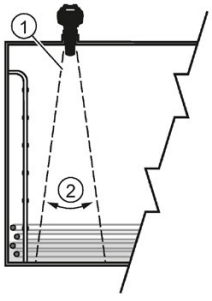
Horn antenna



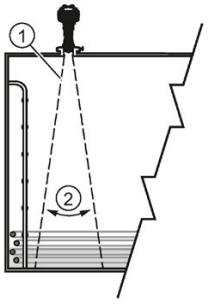
Flanged encapsulated antenna



Threaded PVDF antenna



Hygienic encapsulated antenna



① Emission cone

② Beam angle

Emission cone type and beam angle

Antenna type	Antenna size		Beam angle
Horn	1.5"		19°
	2"		15°
	3"		10°
	4"		8°
Threaded PVDF			19°
	Process connection size	Process connection type	
Flanged encapsulated	2"	Class 150 ASME B16.5	12.8°
	3, 4, 6"	Class 150 ASME B16.5	9.6°
	50A	10K JIS B 2220	12.8°
	80A/100A/150A	10K JIS B 2220	9.6°
	DN50	PN10/16 EN1092-1	12.8°
	DN80/DN100/DN150	PN10/16 EN1092-1	9.6°

Antenna type	Antenna size		Beam angle
Hygienic encapsulated	2"	Sanitary Clamp according to ISO 2852	12.8°
	3, 4"		9.6°
	DN50	Aseptic/Hygienic nozzle/slotted nut according to DIN 11864-1 [Form A]	12.8°
	DN80/DN100		9.6°
	DN50	Aseptic/Hygienic flanged according to DIN 11864-2 [Form A]	12.8°
	DN80/DN100		9.6°
	DN50	Aseptic/Hygienic Clamp according to DIN 11864-3 [Form A]	12.8°
	DN80/DN100		9.6°
	DN50	Hygienic nozzle/slotted nut according to DIN 11851	12.8°
	DN80/DN100		9.6°
	Type F (50 mm) and Type N (68 mm)	Tuchenhagen Varivent	12.8°

Emission cone

- Keep emission cone free of interference from obstructions such as ladders, pipes, I-beams, or filling streams.

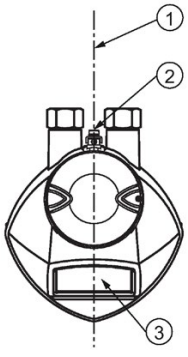
Access for programming

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

4.3.3 Orientation in a vessel with obstructions

Polarization reference point

For best results on a vessel with obstructions, or a stillpipe with openings, orient the front or back of the device toward the obstructions. For an illustration, see Device orientation (Page 31).



① Polarization axis
② Polarization reference point
③ Display

4.3.4 Mounting on a Stillpipe or Bypass Pipe

A stillpipe or bypass pipe is used for products with a low dK, or when vortex or extremely turbulent conditions exist. It can also be used to provide optimum signal conditions on foaming materials. See Dielectric constant of material measured in Performance (Page 163) for more information.

- The pipe diameter must be matched with the antenna size. Use the largest antenna size that will fit the stillpipe/bypass pipe[1)]. See Threaded Horn dimensions (Page 171), Raised-Face Flange per EN 1092-1 (Page 206), Flanged encapsulated dimensions (Page 180)or Hygienic encapsulated dimensions (Page 187).
- One continuous length of metallic pipe is preferred, without joints.
- Any false reflections created by joints/welds/imperfections will lead to inaccuracies of the measurement.
- Joints (if unavoidable) must be machined to ± 0.25 mm (± 0.010") and must have welded connecting sleeve on the outside.
- If using any hygienic process connections in conjunction with a stillpipe/bypass, please ensure that the antenna/lens are cleanable in accordance with the applicable approval.

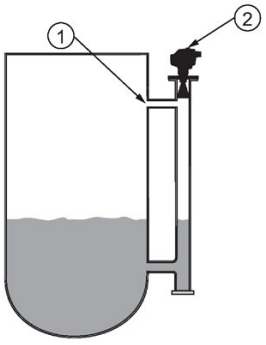
[1)] Mounting in a pipe greater than 100 mm (4") can cause large errors, and therefore is not recommended.

Suitable pipe diameters:	Horn antenna	40 to 100 mm (1.5 to 4")
	PVDF antenna	50 mm (2") only
	Flanged encapsulated antenna	50 to 100 mm (2 to 4")
	Hygienic encapsulated antenna	50 to 100 mm (2 to 4")
Not recommended:	> 100 mm (4")	
Bypass vent:	Required at the upper end of the bypass [1)]	

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

4.3.5 Device orientation

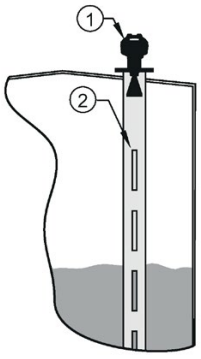
Bypass pipe installation



① Vent

② Align front or back of device with vents[1)]

Stillpipe installation



① Align front or back of device with stillpipe slots[1)]

② Slots

[1)] Horn antenna version shown as example

4.4 Installation instructions

WARNING

Pressure applications

Danger to personnel, system and environment can result from improper installation.

- Improper installation may result in loss of process pressure.

WARNING

Improper installation

Danger to personnel, system and environment can result from improper installation.

- Installation shall only be performed by qualified personnel and in accordance with local governing regulations.

NOTICE

Device handling

Damage to device may result from improper handling.

- Handle the device using the enclosure, not the process connection or tag, to avoid damage.
- Take special care when handling the threaded PVDF and Hygienic or Flanged encapsulated antennas. Any damage to the antenna surface, particularly to the tip/lens, could affect performance. (For example, do not sit device on its lens antenna.)

Note

- For European Union and member countries, installation must be according to ETSI EN 302372.
- Refer to the device nameplate for approval information.

Note

Do not remove the PTFE lens. It is a critical component for operation.

Note

The outer part of the lens on the flanged encapsulated antenna version may not appear to lie flush before installation and this is normal. This will flatten after installation and will not impact the performance of the device.

⚠ WARNING

Pressure applications

Danger of injury or poisoning.

It will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight. (The maximum recommended torque for Threaded versions is 40 N-m (30 ft.lbs.) See Flanged versions (Page 33) for FEA recommended torque values.)

Note

- On devices with a removable head, 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 vessel wall or obstruction.
- Do not rotate the enclosure after programming and vessel calibration, otherwise an error may occur, caused by a polarity shift of the transmit pulse.

4.4.1 Threaded versions

⚠ WARNING

Pressure applications

Danger of injury or poisoning.

It may be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight. (The maximum recommended torque for Threaded versions is 40 N-m (30 ft.lbs.)

1. Before inserting the device into its mounting connection, check to ensure the threads are matching, to avoid damaging them.
2. Simply screw the device into the process connection, and hand tighten, or use a wrench.

4.4.2 Flanged versions

NOTICE

Improper materials

The user is responsible for the selection of bolting and gasket materials (except for Flanged encapsulated antenna) which will fall within the limits of the process connection and its intended use, and which are suitable for the service conditions.

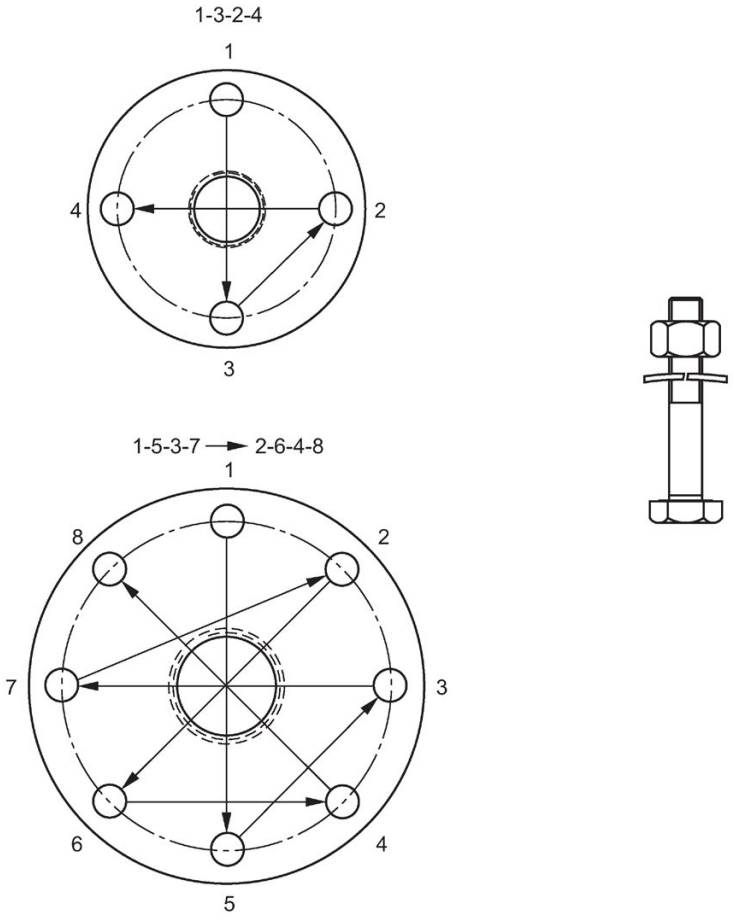
Special Instructions for Flanged encapsulated antenna only

Note

- Use spring washers
- Lens assembly acts as integral gasket, no other required
- Use recommended torque values for tightening bolts

Flange bolting: recommended torque

Pressure class	Nominal pipe size (NPS)	Number of bolts	Recommended torque (Nm)
ASME B16.5, Class 150	2"	4	30 – 50
	3"		50 – 70
	4"	8	40 – 60
	6"		70 – 90
EN1092-1, PN16 / JIS B 2220, 10K	DN50/50A	4	30 – 50
	DN80/80A	8	
	DN100/100A		
	DN150/150A		60 – 80



Flange bolting instructions:

1. Use cross-pattern sequence as shown.
2. Check uniformity of the flange gap.
3. Apply adjustments by selective tightening if required.
4. Torque incrementally until desired value is reached.
5. Check/re-torque after 4 to 6 hours.

Recommendations for flange bolting:

- Check bolts periodically, re-torque as required.
- Use new lens, O-ring and spring washers after removal from installation.
  For instructions on replacing the lens, see Part replacement (Page 151).

See Flanged Horn with extension (Page 176), Raised-Face Flange per EN 1092-1 (Page 206), Flat-Face Flange (Page 209), and Flanged encapsulated antenna (3"/DN80/80A sizes and larger) (Page 182) for dimensions.

4.4.3 Hygienic versions

WARNING

Loss of sanitary approvals

Loss of sanitary approvals can result from improper installation/mounting.

- Take special care when installing in hygienic or sanitary applications. Comply with installation/mounting guidelines to ensure cleanliness and the ability to keep the wetted parts in a position to be readily cleanable. (See relevant EHEDG/3A documentation - not supplied).

NOTICE

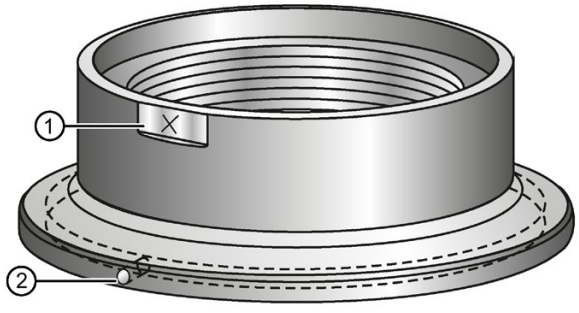
Loss of sanitary approvals

- For 3-A Sanitary Approved device installation where the customer tank process connection exists, a leak detection port of minimum 2.4 mm diameter must be provided at the lowest point in the process connection where leakage can occur.
- If leakage is detected at any time while the device is installed, then the device process connection parts must be disassembled and thoroughly cleaned prior to gasket replacement and reassembly.

Note

- For Hygienic encapsulated antenna, the lens acts as a gasket/seal and should be used in conjunction with a cleanable seal as required by the specific process connections (for example, DIN 11864-3).

Hygienic encapsulated antenna leak detection port



① Orientation mark for leak detection port

② Leak detection port

4.5 Disassembly

DANGER

Pressure applications

Danger to personnel, system and environment will result from improper disassembly.

- Never attempt to loosen, remove, or disassemble process connection while vessel contents are under pressure.

WARNING

Incorrect disassembly

The following risks may result from incorrect disassembly:

- Injury through electric shock

- Risk through emerging media when connected to the process

- Risk of explosion in hazardous area

In order to disassemble correctly, observe the following:

- Before starting work, make sure that you have switched off all physical variables such as pressure, temperature, electricity etc. or that they have a harmless value.
- If the device contains hazardous media, it must be emptied prior to disassembly. Make sure that no environmentally hazardous media are released.
- Secure the remaining connections so that no damage can result if the process is started unintentionally.

Connecting

5

5.1 Basic safety information

NOTICE

Condensation in the device

Damage to device through formation of condensation if the temperature difference between transportation or storage and the mounting location exceeds 20 °C (36 °F).

- Before taking the device into operation let the device adapt for several hours in the new environment.

⚠ WARNING

Missing PE/ground connection

Risk of electric shock.

Depending on the device version, connect the power supply as follows:

- **Power plug**: Ensure that the used socket has a PE/ground conductor connection. Check that the PE/ground conductor connection of the socket and power plug match each other.
- **Connecting terminals**: Connect the terminals according to the terminal connection diagram. First connect the PE/ground conductor.

5.2 Connecting SITRANS LR250

⚠ WARNING

Incorrect connection to power source

Risk to personnel, system and environment can result from improper power connection.

- 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. For example, Class 2 or Limited Energy Source.
- All field wiring must have insulation suitable for rated voltages.

WARNING

Loss of protection

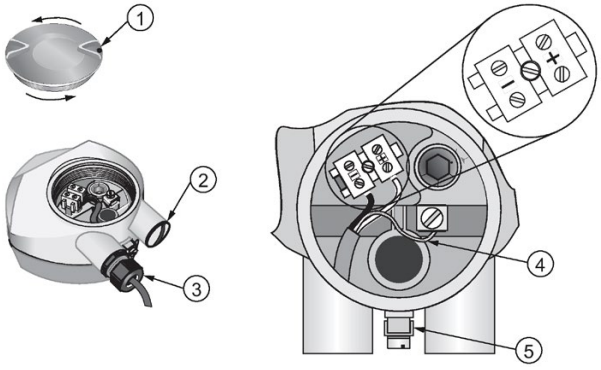
Loss of approvals can result from improper connection.

- Check the nameplate on your device, to verify the approval rating.
- Use appropriate cable entry seals to maintain IP or NEMA rating.
- See Wiring setups for hazardous area installations (Page 40).

NOTICE

Improper cables and conduit

- Separate cables and conduits may be required to conform to standard instrumentation wiring practices or electrical codes.



① Use a 2 mm Allen key to loosen the lid-lock set screw [c)]

② Plug (IP68)

③ Optional cable gland[a) b)](or NPT cable entry)[b)]

④ Cable shield

⑤ Ground terminal

[a)] May be shipped with the device.

[b)] If cable is routed through conduit, use only approved suitable-size hubs for waterproof applications.

[c)] Not applicable to 3-A Sanitary approved device.

Wiring instructions

1. Strip the cable jacket for approximately 70 mm (2.75") from the end of the cable, and thread the wires through the gland. (If cable is routed through conduit, use only approved suitable-size hubs for waterproof applications.)
2. Connect the wires to the terminals as shown: SITRANS LR250 (PROFIBUS PA) is not polarity sensitive.
3. Ground the device according to local regulations.
4. Tighten the gland to form a good seal.
5. Close the lid and secure the locking screw before programming and device configuration.

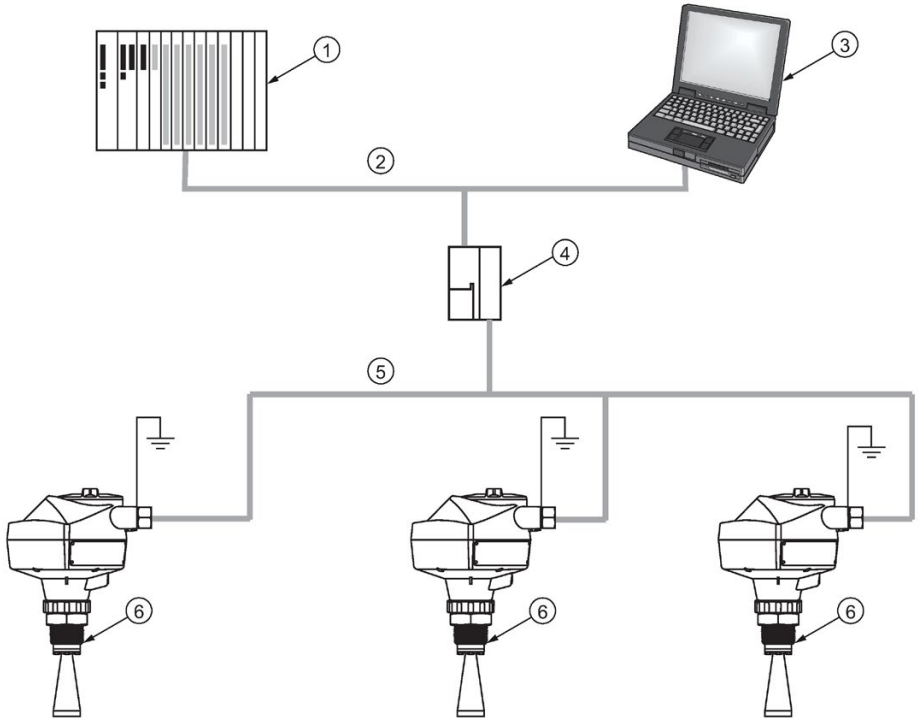
Note

Lid-lock set screw not applicable to 3-A Sanitary approved device.

Note

- PROFIBUS PA cable shield must be terminated at both ends of the cable for it to work properly.
- If a Weidmüller or other current limiting junction box is connected to this device, please ensure that the current limit is set to 40 mA or higher.
- Please refer to the PROFIBUS PA User and Installation Guidelines (order number 2.092) for information on installing PROFIBUS devices at:
  PROFIBUS PA (http://www.profibus.com/)

Basic PLC configuration with PROFIBUS PA



① Active PLC
② PROFIBUS DP
③ PC/laptop
④ DP/PA coupler
⑤ PROFIBUS PA
⑥ SITRANS LR250 (PROFIBUS PA)

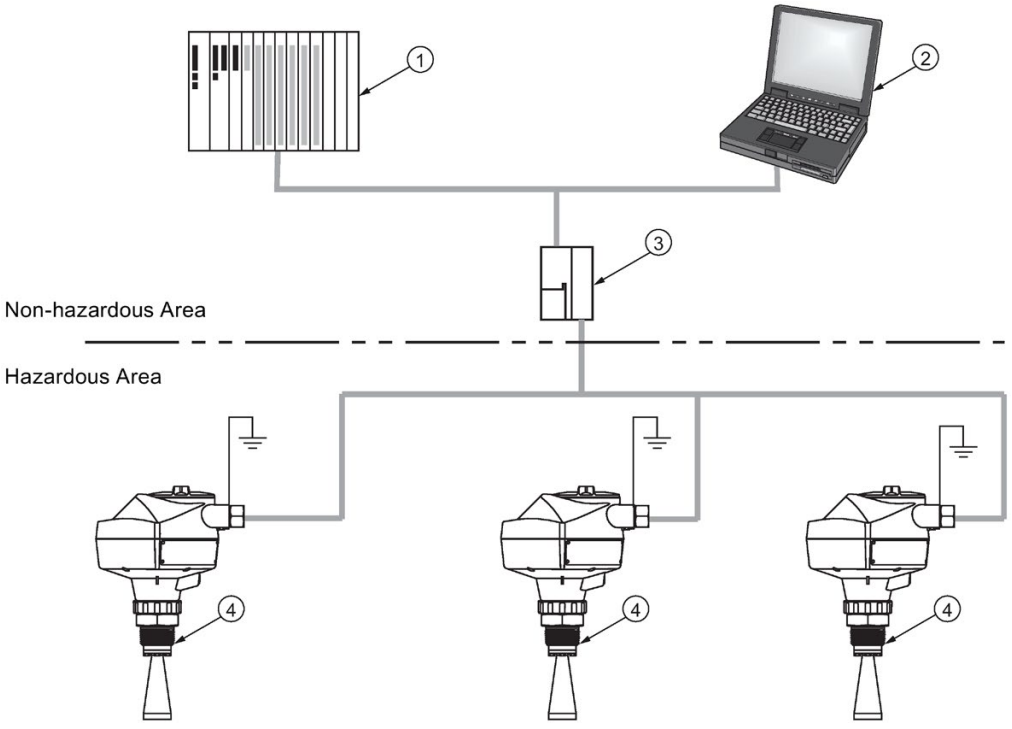
5.3 Wiring setups for hazardous area installations

There are three wiring options for hazardous area installations:

- Intrinsically safe wiring (Page 41)
- Non-sparking wiring (Page 43)
- Non-incendive wiring (US/Canada only) (Page 43)

In all cases, check the nameplate on your device, confirm the approval rating, and perform installation and wiring according to your local safety codes.

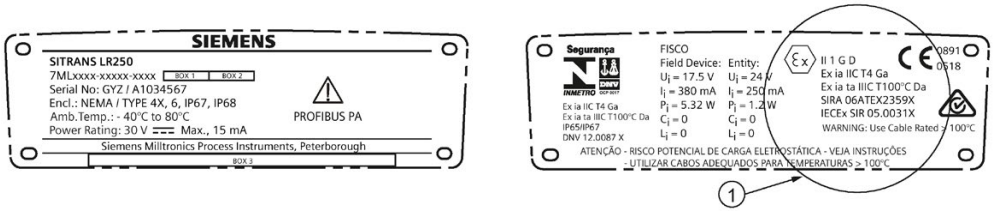
PLC configuration with PROFIBUS PA for hazardous areas



① PLC (active)
② PC/laptop
③ Ex ia type DP/PA coupler
④ Ex ia device

5.3.1 Intrinsically safe wiring

Device nameplate (ATEX/IECEx/INMETRO/RCM)



① ATEX certificate

The ATEX and INMETRO certificates listed on the nameplate can be downloaded from our website:

Product page (http://www.siemens.com/LR250)

Go to **Support > Approvals / Certificates.**

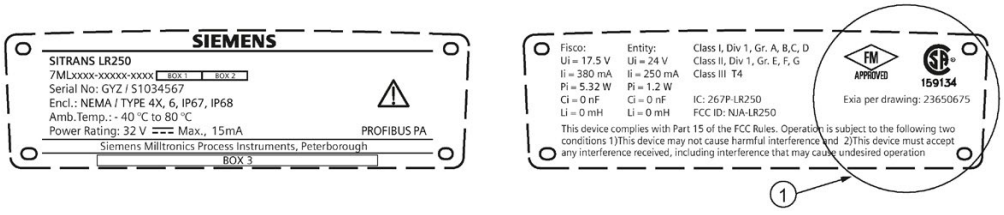
The IECEx certificate listed on the nameplate can be viewed on the IECEx website. Go to:

IECEx (http://iecex.iec.ch/)

Click on **Certified Equipment** and enter the certificate number **IECEx** SIR 05.0031X.

5.3.1.1 Intrinsically safe wiring (FM/CSA)

Device nameplate (FM/CSA)



① Connection drawing number

The FM/CSA Intrinsically Safe connection drawing 23650675 can be downloaded from the Siemens Industry Image Database:

SITRANS LR250 Profibus PA Connection drawing (23650675)
(http://www.automation.siemens.com/bilddb/index.aspx?gridview=view2&objkey=G_FI01_XX_11097&showdetail=true&view=Search)

5.3.1.2 Intrinsically safe wiring (notes)

- 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 (Page 44).

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.

5.3.1.3 FISCO concept

FISCO Concept

Note

Connection drawing

For complete details and instructions regarding the FISCO Concept, see the FM/CSA connection drawing which can be downloaded from the Siemens Industry Image Database: SITRANS LR250 Profibus PA Connection drawing (23650675) (http://www.automation.siemens.com/bilddb/index.aspx?gridview=view2&objkey=G_FI01_XX_11097&showdetail=true&view=Search)

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.

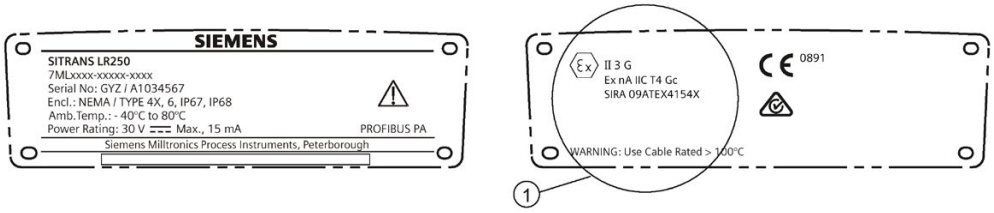
Under the entity evaluation concept, SITRANS LR250 has the following characteristics:

(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

Under the FISCO evaluation concept, SITRANS LR250 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

5.3.2 Non-sparking wiring



① ATEX certificate

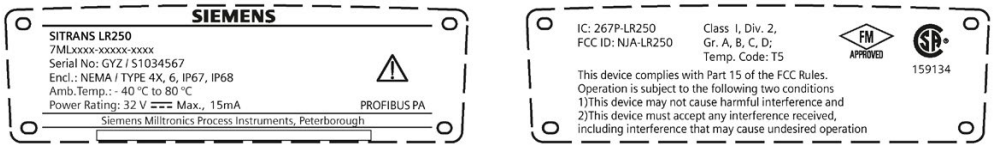
The ATEX certificate listed on the nameplate can be downloaded from our website:

Product page (http://www.siemens.com/LR250)

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.

5.3.3 Non-incendive wiring (US/Canada only)



FM/CSA Class 1, Div 2 connection drawing number 23650673 can be downloaded from the Siemens Industry Image Database:

FM/CSA Class 1, Div 2 connection drawing number 23650673 (http://www.automation.siemens.com/bilddb/index.aspx?gridview=view2&objkey=G_FI01_XX_03551&showdetail=true&view=Search)

- 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 (Page 44).

5.4 Instructions specific to hazardous area installations

5.4.1 (Reference European ATEX Directive 2014/34/EU)

The following instructions apply to equipment covered by certificate number SIRA 06ATEX2359X and SIRA 09ATEX4154X:

1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 1GD equipment per SIRA 06ATEX2359X, and Category 3G equipment per SIRA 09ATEX4154X.
3. The equipment may be used with flammable gases and vapors with apparatus group IIC, IIB and IIA and temperature classes T1, T2, T3 andT4.
4. The equipment has a degree of ingress protection of IP67 and a temperature class of T100 °C and may be used with flammable dusts.
5. The equipment is certified for use in an ambient temperature range of –40 °C to +80 °C.
6. The equipment has not been assessed as a safety related device (as referred to by Directive 2014/34/EU, clause 1.5).
7. 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).
8. The equipment is non-repairable.
9. 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.
10. 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. establishing from the material's data sheet that it is resistant to specific chemicals.

Special conditions for safe use (denoted by X after the certificate number)

- Parts of the enclosure may be non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam), which might cause a build-up of electrostatic charge on non-conducting surfaces.
- Aluminium, magnesium, titanium or zirconium may be used at the accessible surface of the equipment. In the event of rare incidents, ignition sources due to impact and friction sparks could occur. This shall be considered when the SITRANS LR250 PROFIBUS PA is being installed in locations that specifically require Equipment Protection level Ga or Da.

- The equipment shall be infallibly bonded according to the relevant code of practice.
- The end use must ensure that the explosion protection and ingress protection of IP64 is maintained at each entry to the enclosure by use of a blanking element or cable entry device that meets the requirements of the protection concepts type 'n' or increased safety 'e' or flameproof 'd'.

Commissioning 6

6.1 Basic safety information

⚠ WARNING

Loss of explosion protection

Risk of explosion when device is not properly commissioned

If opening device

- Isolate from power.

- or -

- Ensure that the atmosphere is explosion-free (hot work permit).

Ensure device is properly closed before returning to operation.

6.2 Operating via the handheld programmer

The handheld programmer used with this device contains lithium batteries that are non-replaceable.

Lithium batteries are primary power sources with high energy content designed to provide the highest possible degree of safety.

⚠ WARNING

Potential hazard

Lithium batteries may present a potential hazard if they are abused electrically or mechanically. Observe the following precautions when handling and using lithium batteries:

- Do not short-circuit, recharge or connect with false polarity.
- Do not expose to temperatures beyond the specified temperature range.
- Do not incinerate.
- Do not crush, puncture or open cells or disassemble.
- Do not weld or solder to the battery's body.
- Do not expose contents to water.

6.2.1 Power up

Power up the device. A transition screen showing first the Siemens logo and then the current firmware revision is displayed while the first measurement is being processed.

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

6.2.2 Handheld programmer functions

The radar device 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 step-by-step procedure to configure the device for a simple application. Access the wizards:

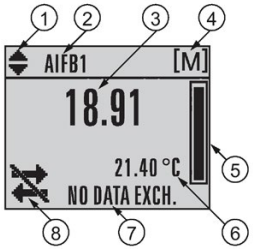
- locally [see Quick Start Wizard via the handheld programmer (Page 56)]
- or from a remote location [see Quick Start Wizard via SIMATIC PDM (Page 69)]

For more complex setups see Application Examples (Page 60), and for the complete range of parameters see Parameter Reference (Page 95).

6.2.2.1 The LCD display

Measurement mode display

Normal operation

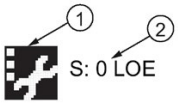


①	Toggle indicator [a] for analog input function blocks (AIFB 1 or AIFB 2)	⑤	Bar graph indicates level
②	Identifies which AIFB is source of displayed value	⑥	Secondary region indicates on request [b] electronics temperature, echo confidence, or distance
③	Measured value (level, space, distance, or volume)	⑦	Text area displays status messages
④	Units	⑧	Device status indicator, see Device status icons (Page 156)

[a] Press **UP** and **DOWN** arrow to switch.

[b] In response to a key press request. For details, see Handheld programmer (Part No. 7ML1930-1BK) (Page 50) for key functions in Measurement mode.

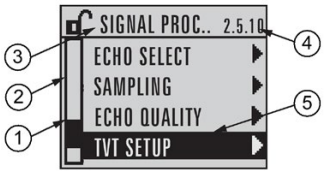
Fault present



① Device status indicator, see Device status icons (Page 156)
② Text area displays a fault code and a status message

Program mode display

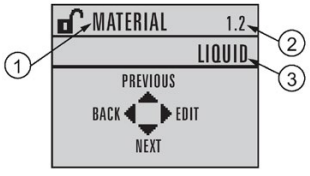
Navigation view



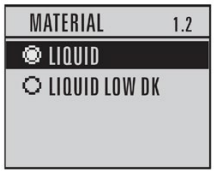
① Item band
② Menu bar
③ Current menu
④ Current item number
⑤ Current item

- 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



① Parameter name ② Parameter number ③ Parameter value/selection

6.2.2.2 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.	
	Updates distance measurement	
	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 2 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.

6.2.3 Programming

Note

- While the device is in PROGRAM mode the output remains active and continues to respond to changes in the device.
- The device automatically returns to Measurement mode after a period of inactivity in PROGRAM mode (between 15 seconds and 2 minutes, depending on the menu level).

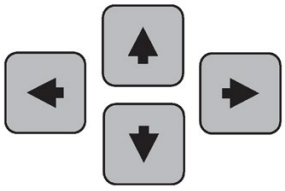
Change parameter settings and set operating conditions to suit your specific application. For remote operation see Operating via SIMATIC PDM (Page 67).

Parameters menu

Note

For the complete list of parameters with instructions, see Parameter Reference (Page 95).

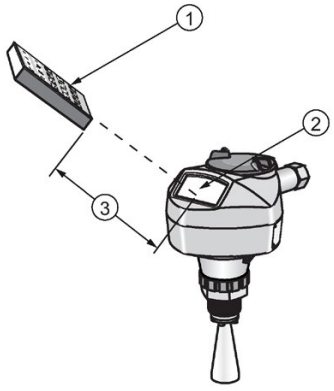
Parameters are identified by name and organized into function groups. See LCD menu structure (Page 263).



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 30 minutes, or menu level 1 if power has been cycled since then.



① Handheld programmer ② Display ③ Maximum distance: 300 mm (1 ft)

2. Navigating: key functions in Navigation mode

Note

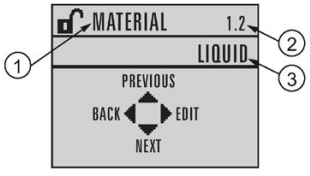
- In navigation mode **ARROW keys** move to the next menu item in the direction of the arrow.
- For Quick Access to parameters via the handheld programmer, press Home , then enter the menu number, for example: **(2.4.1.) Volume.**

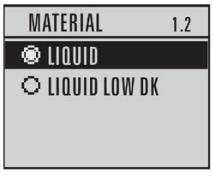
Key	Name	Menu level	Function
	**UP** or **DOWN arrow**	menu or parameter	Scroll to previous or next menu or parameter.
	**RIGHT arrow**	menu	Go to first parameter in the selected menu, or open next menu.
		parameter	Open **Edit** mode.
	**LEFT arrow**	menu or parameter	Open parent menu.
	**Mode**	menu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

3. Editing in PROGRAM mode

- Navigate to the desired parameter.
- Press **RIGHT arrow** to open parameter view.
- Press **RIGHT arrow** again to open **Edit** mode. The current selection is highlighted. Scroll to a new selection.
- Press **RIGHT arrow** to accept it.

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



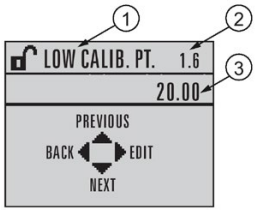


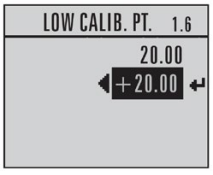
① Parameter name ② Parameter number ③ Current selection

4. Changing a numeric value

- Navigate to the desired parameter.
- Press **RIGHT arrow** to open parameter view. The current value is displayed.
- Press **RIGHT arrow** again to open **Edit** mode. The current value is highlighted.
- Key in a new value.
- Press **RIGHT arrow** to accept it.

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





① Parameter name ② Parameter number ③ Current value

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
	**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
	**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.
 to 	**Numeral**	Numeric editing	Enters the corresponding character.

6.2.3.1 Quick Start Wizard via the handheld programmer

Note

- A reset to factory defaults should be performed before running the Quick Start Wizard if the device has been used in a previous application. See **Master Reset (4.1.)**.
- The Quick Start wizard settings are inter-related and changes apply only after you select **YES** in **(1.8) Apply? (Apply changes)** in the Wizard Complete step.
- Do not use the Quick Start wizard to modify parameters: see instead Parameter reference (Page 95). (Perform customization for your application only after the Quick Start has been completed).
- Default settings in the parameter tables are indicated with an asterisk (*).

1. Quick Start

- 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.
- Press **RIGHT arrow** twice to navigate to menu item 1.1 and open parameter view.
- Press **RIGHT arrow** to open Edit mode or **DOWN arrow** to accept default values and move directly to the next item.
- To change a setting, scroll to the desired item or key in a new value.
- After modifying a value, press **RIGHT arrow** to accept it and press **DOWN arrow** to move to the next item.
- Quick Start settings take effect only after you select **Yes** to **Apply changes** from previous steps.

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.)** for more detail].

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

[a] dK < 3.0

1.3 Response Rate

Sets the reaction speed of the device to measurement changes in the target range. Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

Options	Response Rate (2.3.8.1.)	Fill rate (2.3.8.2.)/Empty rate per Minute (2.3.8.3.)
	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)

1.4 Units

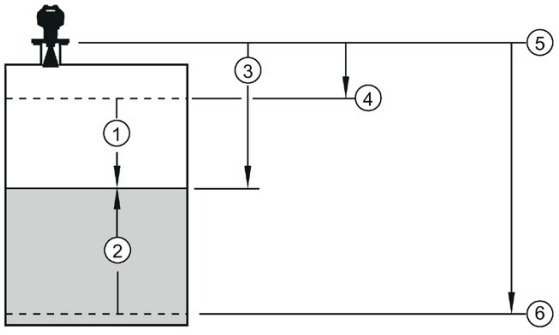
Sensor measurement units.

Options	m, cm, mm, ft, in.

1.5 Operating mode

Operation	Description
NO SERVICE	Measurement and associated loop current are not updated, and the device defaults to Fail-safe mode [a].
LEVEL	Distance to material surface referenced from Low Calibration Point
SPACE	Distance to material surface referenced from High Calibration Point
DISTANCE	Distance to material surface referenced from Sensor reference point

[a] See **Material Level (2.5.1.)** for more detail.



① Space
② Level
③ Distance
④ High Calibration Point (process full level)
⑤ Sensor reference point [a]
⑥ Low Calibration Point (process empty level)

[a] The point from which High and Low Calibration points are referenced: see **Dimension Drawings**.

1.6 Low Calibration Point

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

Values	Range: 0.00 to 20.00 m

1.7 High Calibration Point

Distance from Sensor reference point to High Calibration Point: usually process full level. (See **Operating mode** for an illustration.)

Values	Range: 0.00 to 20.00 m

1.8 Apply? (Apply changes)

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

Press **Mode** to return to **Measurement** mode. SITRANS LR250 is now ready to operate.

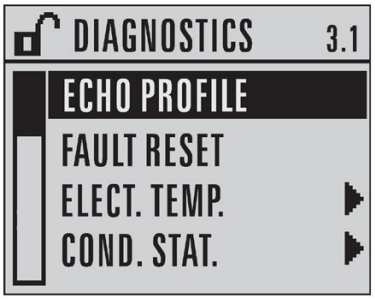
6.2.3.2 Auto False Echo Suppression

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

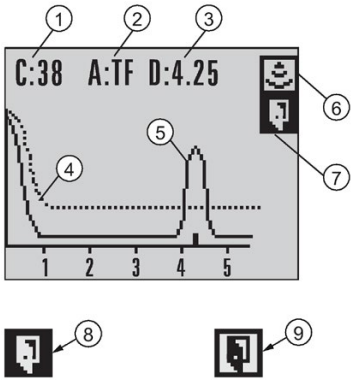
This feature can also be used if the display shows a false high level, or the reading is fluctuating between the correct level and a false high level.

6.2.3.3 Requesting an Echo Profile

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



- Use **UP** or **DOWN** **arrow** to scroll to an icon. When an icon is highlighted, that feature becomes active.
- To move a cross-hair, press **RIGHT** **arrow** to increase the value, **LEFT** **arrow** to decrease.
- To Zoom into an area, position the intersection of the cross-hairs at the center of that area, select **Zoom**, and press **RIGHT** **arrow.** Press **LEFT** **arrow** to Zoom out.
- To update the profile, select **Measure** and press **RIGHT** **arrow.**
- To return to the previous menu, select **Exit** then press **RIGHT** **arrow.**



①	confidence	⑥	measure
②	algorithm: tF (trueFrist)	⑦	exit
③	distance	⑧	exit icon selected/highlighted
④	TVT	⑨	exit icon deselected
⑤	echo		

6.2.3.4 Device address

Note

See Master Reset (Page 85) to reset Device Address to 126.

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

Values	0 - 126. Default: 126

1. In PROGRAM mode, navigate to: **Level Meter > (5.) Communication > (5.1.) Device Address**.
2. Press **RIGHT arrow**, **RIGHT arrow**, to open parameter view and enable Edit mode.
3. If required, key in a new value and press **RIGHT arrow** to accept it. The LCD displays the new value.
4. Press **Mode** to return to Measurement mode.

6.3 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** to apply changes in the final step.)

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.

6.3.1 Liquid resin in storage vessel, level measurement

Note

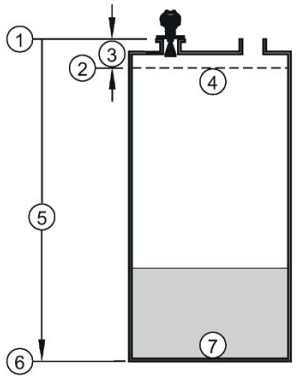
Minimum distance from flange face to target is limited by **Near Range (2.5.1.)**.

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 LR250 is to report a user-defined value of 4.5 m (14.76 ft) after 2 minutes.



① Sensor reference point
② High calibration point
③ 0.5 m
④ 100% level
⑤ 5 m
⑥ Low calibration point
⑦ 0% level

Parameter type	Parameter No. /Name	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. .

6.3.2 Horizontal vessel with volume measurement

Note

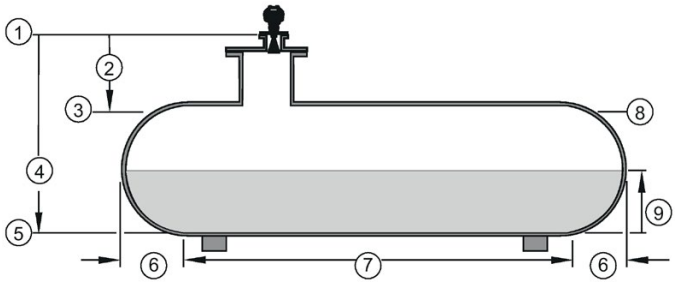
The minimum distance from the flange face to the target is limited by **Near Range (2.5.1.)**.

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

- Low Calibration Point = 3.5 m (11.48 ft) from sensor reference 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 LR250 is to report a user-defined value of 4.5 m (14.76 ft) after 2 minutes.



①	Sensor reference point	⑥	A = 0.8 m
②	0.5 m	⑦	L = 6 m
③	High calibration point	⑧	100% = 8000 L
④	3.5. m	⑨	Volume reading
⑤	Low calibration point		

Parameter type	Parameter No./Name	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 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.
Independent parameters	Vessel Shape (2.4.1.1.)	PARABOLIC ENDS	Defines vessel shape.
	Maximum Volume (2.4.1.2.)	8000	8000 liters
	Vessel Dimension A (2.4.1.3.)	0.8	0.8 m (2.62 ft)
	Vessel 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.

6.3.3 Application with stillpipe

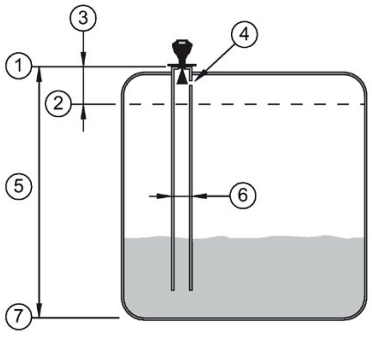
A stillpipe is recommended for products with a dK of less than 3, or if extremely turbulent or vortex conditions exist. This mounting arrangement can also be used to provide optimum signal conditions on foaming materials.

Note

- **Near Range (2.5.1.)** (Blanking) will be set at the factory. Check the process connection tag for specific values.
- Suitable pipe diameters are 40 mm (1.5") to 100 mm (4").
- The pipe diameter must be matched with the antenna size. Use the largest antenna size that will fit the stillpipe/bypass pipe. See Dimension drawings (Page 171).
- See Mounting on a Stillpipe or Bypass Pipe (Page 30) for installation guidelines.

This application is to obtain a level measurement and corresponding 4 to 20 mA output proportional to the oil level in a fuel storage vessel.

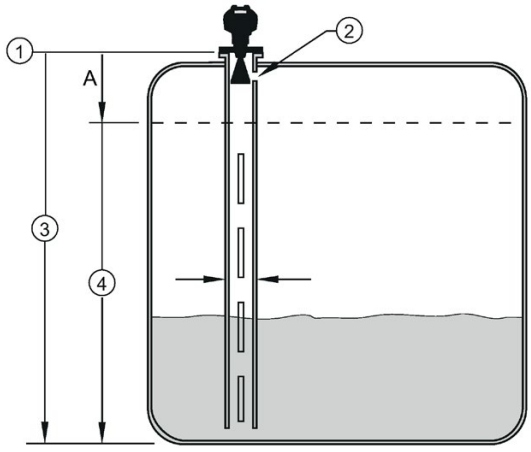
- Low Calibration Pt. is 5 m (16.4 ft) from the sensor reference point.
- High Calibration Pt. is 0.5 m (1.64 ft) from the sensor reference point.
- The stillpipe inside diameter is 50 mm (1.96").
- The maximum rate of filling or emptying is about 0.1 m (4")/min.



① Sensor reference point
② High calibration point
③ 0.5 m
④ Vent hole
⑤ 5 m
⑥ 50 mm I.D.
⑦ Low calibration point

Parameter type	Parameter No./Name	Options/Values	Function
Quick Start Wizard parameters	Introduction	**NEXT**	Continue with Wizard.
	Language (1.1)	**NEXT**	Continue with current language.
	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 select-ed.
	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)]	**0.988**	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	Low calibration point - 0.7 m = 4.3 m (14.1 ft)

a) The recommended values for the propagation factor and for CLEF range are dependent on the stillpipe diameter. See Propagation Factor/Stillpipe Diameter for values.



① sensor reference point
② air gap
③ low calibration point
④ CLEF range 2.5.7.4.
A 700 or 1000 mm (see CLEF Range settings in table below)

Propagation Factor/Stillpipe Diameter

Values	Range	0.3 to 1.0 depending on pipe size		
	Default	1.0000		
Nominal Pipe Size [a]	40 mm (1.5")	50 mm (2")	80 mm (3")	100 mm (4")
Propagation Factor	0.9844	0.988	0.9935	0.9965
CLEF Range (2.5.7.4.) settings	Low calibration point - 700 mm (2.29 ft)[b]	Low calibration point - 700 mm (2.29 ft)[b]	Low calibration point - 1000 mm (3.28 ft)[b]	Low calibration point - 1000 mm (3.28 ft)[b]

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

[b] CLEF range covers the whole measurement range except first 700 or 1000 mm from sensor reference point

Note

Flanged and Hygienic encapsulated antenna

For Flanged encapsulated antenna (7ML5432) and Hygienic encapsulated antenna (7ML5433) match the process connection size to the pipe diameter. For example, DN80/3" flange to DN80/3" pipe.

Remote operation

7

7.1 Operating via SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain process devices. Please consult the operating instructions or online help for details on using SIMATIC PDM. You can find more information on versions and compatibility at our website.

See also

SIMATIC PDM (www.siemens.com/simatic-pdm)

7.1.1 Functions in SIMATIC PDM

Note

- For a complete list of parameters see Parameter Reference (Page 95).
- 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 (Page 263) for a chart and Changing parameter settings using SIMATIC PDM (Page 74) for more details. The menu structure for SIMATIC PDM is almost identical to that for the LCD.

See Parameters accessed via pull-down menus (Page 74) for parameters that do not appear in the menu structure in SIMATIC PDM.

7.1.1.1 Features of SIMATIC PDM Rev. 6.0, SP4 or higher

The graphic interface in the device makes monitoring and adjustments easy.

Feature	Function
Quick Start (Page 69)	Device configuration for simple applications
Echo Profile Utilities (Page 75)	Easy access to echo profile viewing/comparison, TVT shaping, auto false echo suppression and echo setup
Auto False Echo Suppression (Page 78)	Screen out false echoes
TVT Shaper (Page 77)	Manual TVT adjustment
Process Variables (Page 86)	Monitor process variables and level trend
Security (Page 91)	Protect security and communication parameters from modification by the maintenance user

7.1.1.2 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 SP3 HF2 or higher is required.

7.1.1.3 SIMATIC PDM Version

Check the support page of our website to make sure you have the latest version of SIMATIC PDM, the most recent Service Pack (SP) and the most recent hot fix (HF): SIMATIC PDM Version (https://support.automation.siemens.com) Browse to **Product Support > Automation Technology > Process control systems > SIMATIC PCS 7 > System components > Plant Device Management > SIMATIC PDM.**

7.1.2 Electronic Device Description (EDD)

7.1.2.1 Updating the Electronic Device Description (EDD)

You can locate the EDD in Device Catalog, under **Sensors/Level/Echo/SiemensMilltronics/SITRANS LR250**. The EDD revision must match the Firmware revision in the device.

To install a new EDD:

1. Download the most current EDD from our website: Product page (http://www.siemens.com/LR250)
2. Save files to your computer, and extract the zipped file to an easily accessed location.
3. Launch **SIMATIC PDM – Manage Device Catalog**, browse to the unzipped EDD file and select it.

7.1.2.2 Configuring a new device

Note

- Clicking on **Cancel** during an upload from device to SIMATIC PDM will result in some parameters being updated.
- Application Guides for setting up PROFIBUS PA devices with SIMATIC PDM can be downloaded from our website:
  Product page (http://www.siemens.com/LR250).

1. Check that you have the most recent EDD, and if necessary update it. [See Updating the Electronic Device Description (EDD) (Page 68)].
2. Set Address via handheld programmer (default for PROFIBUS PA is 126). [See **Device Address (5.1.)** 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 the device.
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.

7.1.3 Quick start wizard via SIMATIC PDM

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

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

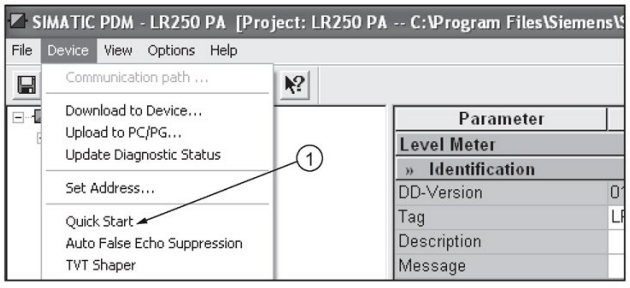
1. If you have not already done so, check that you have the most up-to-date Electronic Device Description (EDD) for your device. [See Configuring a new device (Page 68).]
2. Launch SIMATIC Manager and create a new project. Application Guides for setting up HART and PROFIBUS PA devices with SIMATIC PDM can be downloaded from the product page of our website:
   Product page (http://www.siemens.com/LR250)

Quick start

Note

- A reset to **Factory Defaults** should be performed before running the Quick Start Wizard if device has been used in a previous application. See Master Reset via SIMATIC PDM (Page 85).
- The Quick Start wizard settings are inter-related and changes apply only after you click on **FINISH AND DOWNLOAD** at the end of the last step 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 Profile via SIMATIC PDM (Page 75) or see Parameter Reference (Page 95) for a complete list. (Perform customization only after the Quick Start has been completed.)
- Click on **BACK** to return and revise settings or **CANCEL** to exit the Quick Start.
- For a vessel with obstructions see Auto False Echo Suppression via SIMATIC PDM (Page 78).

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



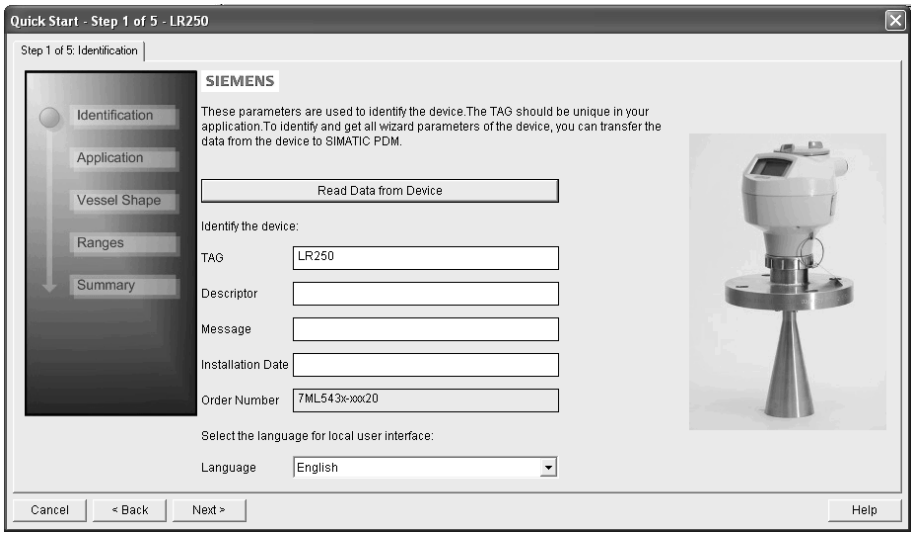
① Quick Start

Step 1 – Identification

Note

- The layout of the dialog boxes shown may vary according to the resolution setting for your computer monitor.
- SITRANS PDM limits the TAG field to a maximum of 24 characters.

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. (Description, Message, and Installation Date fields can be left blank.)



Step 2 – Application

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

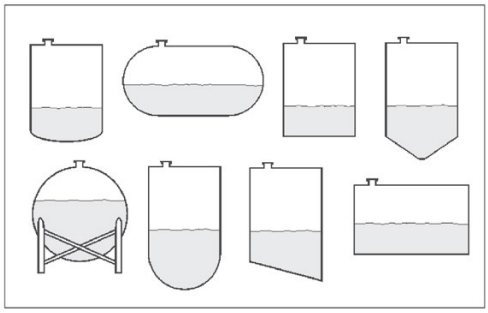
See Application with Stillpipe (Page 63) for a Low Dielectric Liquid application.

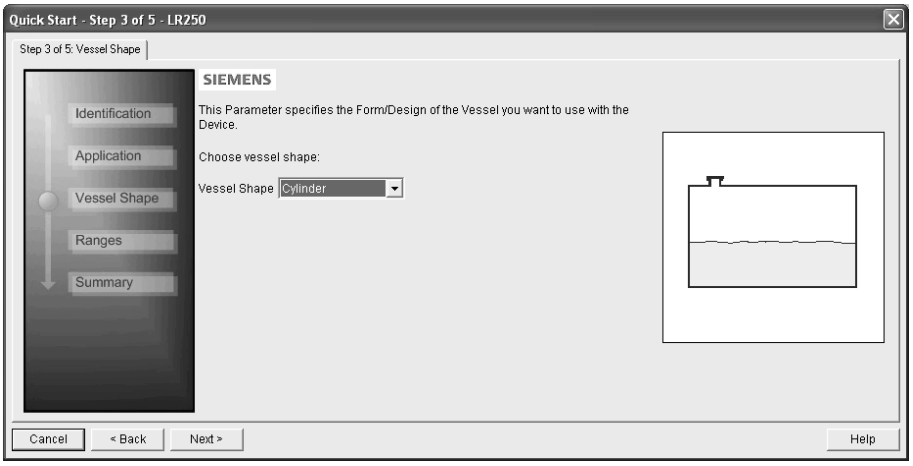
Step 3 – Vessel Shape

The vessel shapes shown are predefined.

For a vessel with obstructions, see Auto False Echo Suppression via SIMATIC PDM (Page 78).

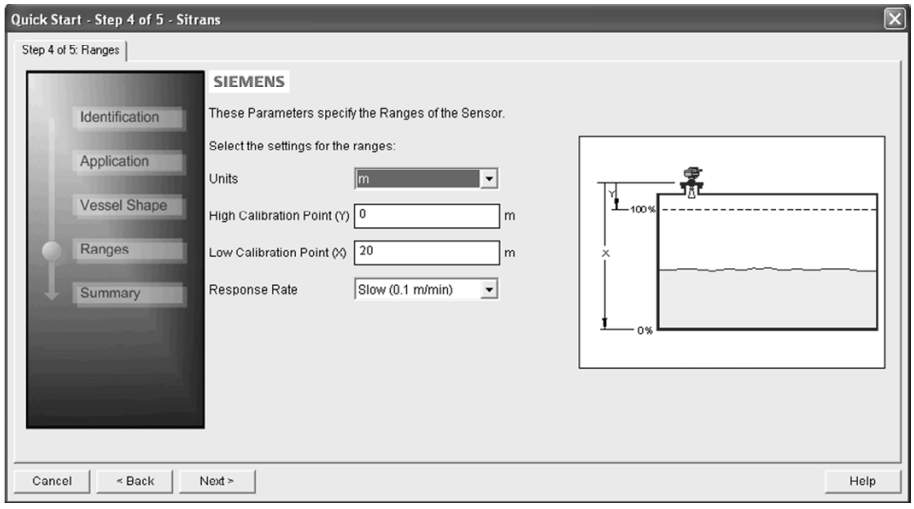
Select the vessel shape, and click on **NEXT**.





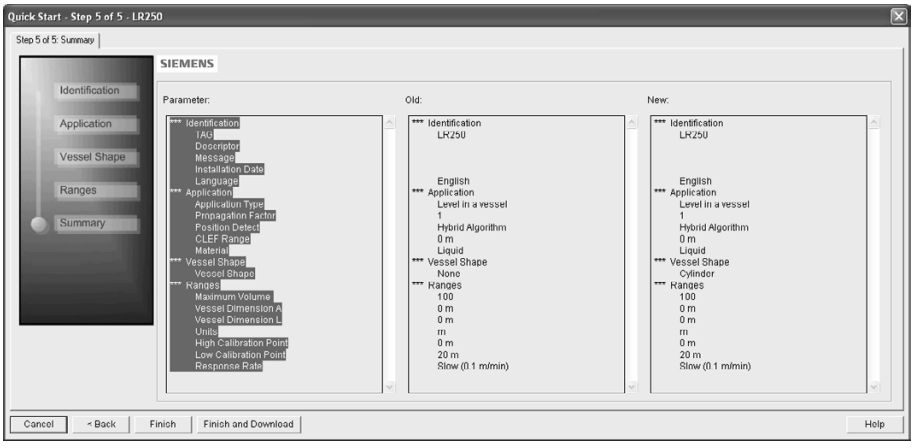
Step 4 – Ranges

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**.

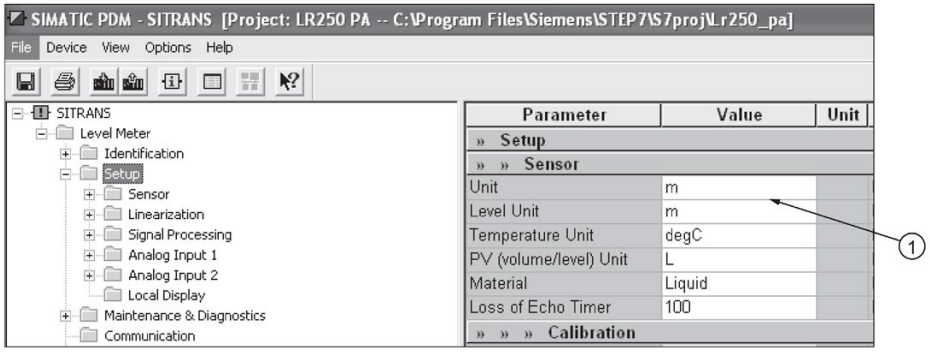
7.1.4 Changing parameter settings using SIMATIC PDM

Note

- For a complete list of parameters, see Parameter Reference (Page 95).
- Clicking on **Cancel** during an upload from device to SIMATIC PDM will result in some parameters being updated.

Many parameters are accessed via pull-down menus in PDM. See Parameters accessed via pull-down menus (Page 74) for others.

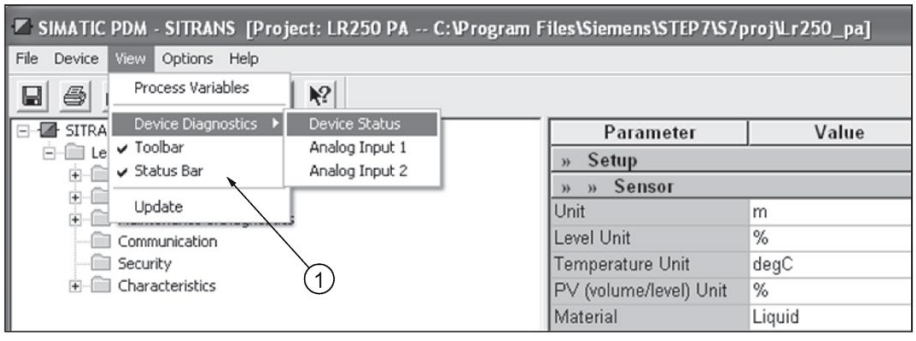
1. Launch SIMATIC PDM, connect to device, and upload data from device.
2. Adjust parameter values in the parameter value field then **Enter**. The status fields read **Changed**.
3. Open the Device menu, click on **Download to device**, then use **File - Save** to save settings offline. The status fields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



① value fields

7.1.5 Parameters accessed via pull-down menus

Click on **Device** or **View** to open the associated pull-down menus.



Pull-down menus

Device menus	View menus
Communication path	Process Variables (Page 86)
Download to device Upload to PC/PG Update Diagnostic Status	Device Diagnostics Toolbar Status bar
Wizard - Quick Start (Page 69)	Update
Echo Profile Utilities (Page 75) Maintenance (Page 81) Acknowledge Faults (Page 82) Wear (Page 82)	
Simulation (Page 82)	
Write Locking (Page 85) Master Reset (Page 85)	

7.1.5.1 Echo profile utilities

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

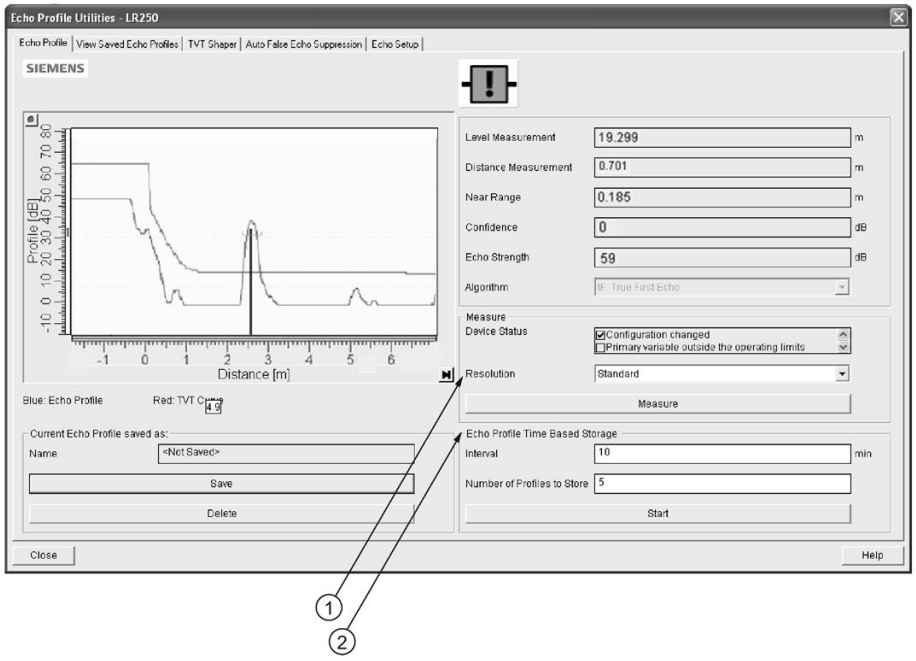
- Echo profile (Page 75)
- View Saved Echo Profiles (Page 76)
- TVT Shaper (Page 77)
- Auto False Echo Suppression (Page 78)
- Echo Setup (Page 80)

Echo profile

Note

- Double click on each axis to see the Xscale and Data Scale values.
- To zoom in to a section of the profile, left-click and drag a marquee around it. Right click inside the window to zoom out.
- Expand or compress the x and/or y axes:
  - Left-click on the axis and drag in either direction to reposition the low end of the scale.
  - Right-click on the axis and drag in either direction to reposition the high end of 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 the **Echo Profile** tab.
- Initial profile graph is blank upon entry to dialog. Click **Measure** to update the profile.
- It is recommended to use the **Detailed** resolution view of the echo profile for troubleshooting. For faster and more coarse views, the **Standard** resolution may be used.
- Click **Save** and in the new window enter a name and click **OK**.
- Click **OK** to exit.



① Resolution
② Echo Profile Time Based Storage

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 maximum 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.

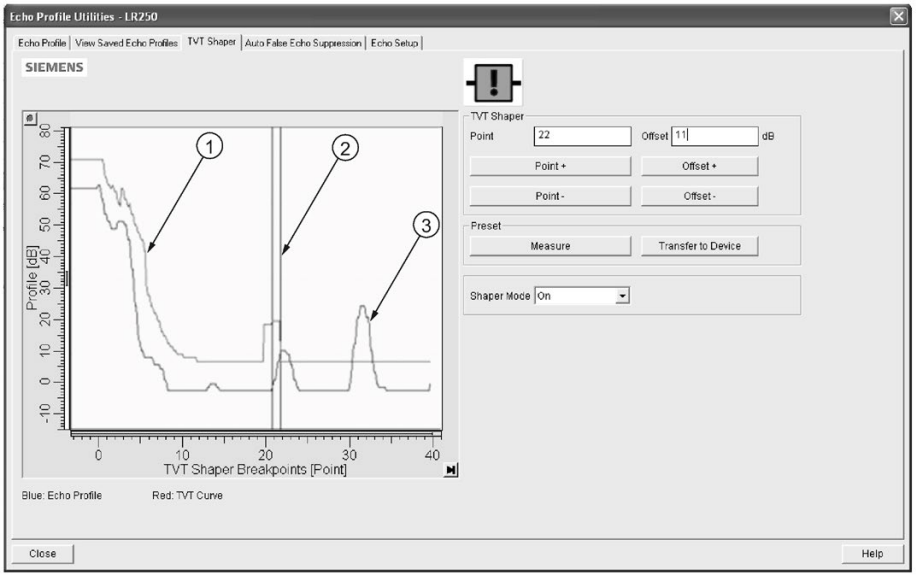
TVT Shaper

Note

Double click on each axis to see the X scale 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 (Page 220).

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



① TVT
② Cursor
③ Echo profile

- Initial profile graph is blank upon entry to dialog. Click on **Measure** to view and upload the current TVT from 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**.

7.1.5.2 Auto false echo suppression

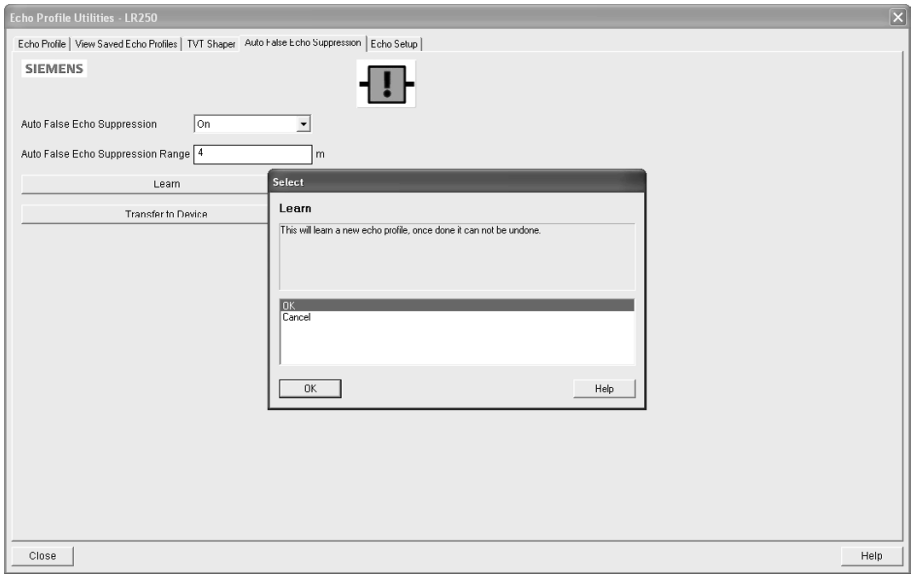
Note

- Ensure material level is below all known obstructions when using Auto False Echo Suppression to learn the echo profile. An empty or almost empty vessel is recommended.
- Note the distance to material level when learning the echo profile, 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 device for best signal (lower false-echo amplitude).

If you have a vessel with known obstructions, use 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.

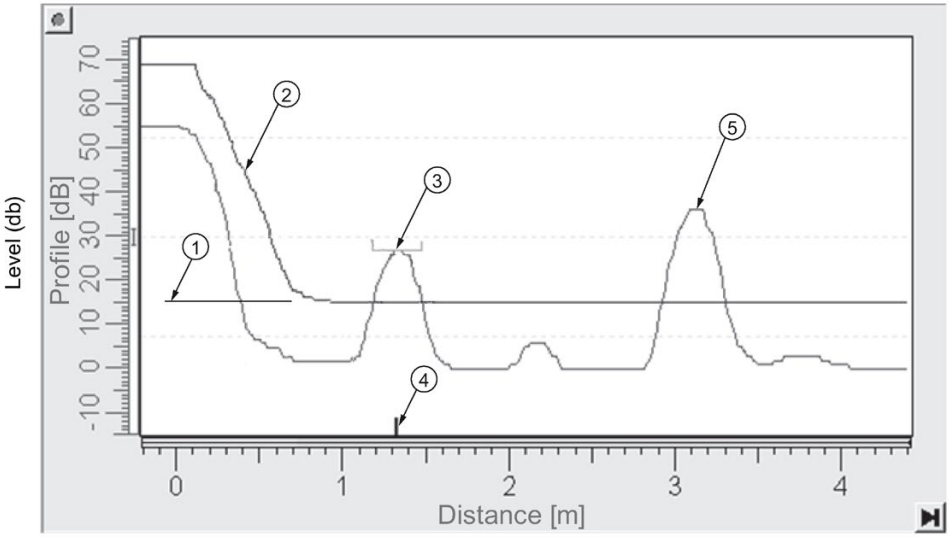
The device learns the echo profile over the whole measurement range and the TVT is shaped around all echoes present at that moment. See Auto False Echo Suppression (Page 220) for a more detailed explanation.

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



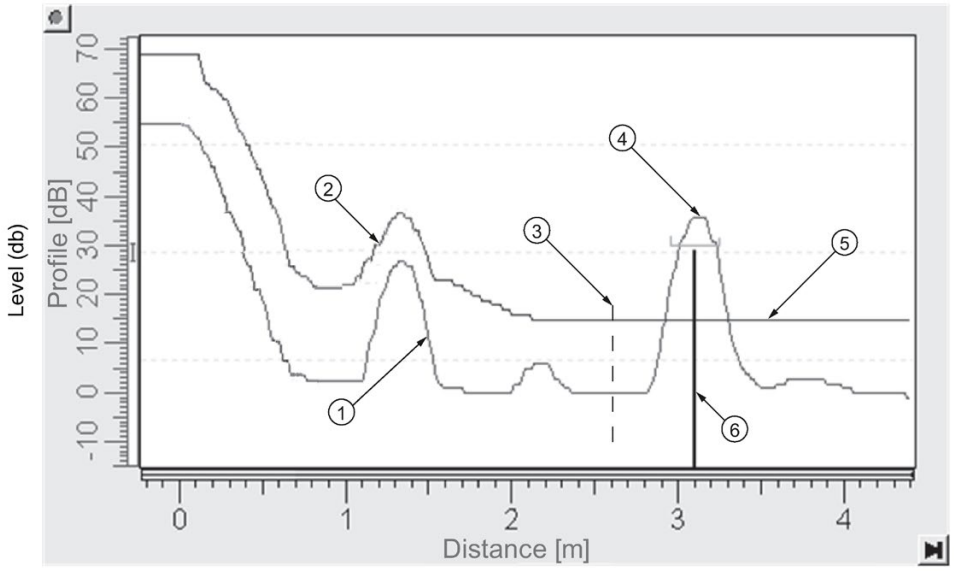
1. Make sure the material level is below all known obstructions.
2. Determine **Auto False Echo Suppression Range**. Measure the actual distance from the sensor reference point to the material surface using a rope or tape measure. Subtract 0.5 m (20") from this distance, and use the resulting value.
3. Open the menu **Device – Echo Profile Utilities** and click on the tab **Auto False Echo Suppression**.
4. Make sure **Auto False Echo Suppression Range** is **On**.
5. Enter the value for **Auto False Echo Suppression Range.**
6. Click **Learn**. The message appears: **'This will learn a new echo profile. Once done it cannot be undone'**. Click **OK**.
7. Once Auto TVT is complete click **Transfer to Device**. To exit click **Close**. Auto TVT is enabled and the learned TVT will be used.
8. To turn **Auto False Echo Suppression** off or on, reopen the **Auto False Echo Suppression** window, change the Auto False Echo Suppression to **Off** or **On**, click on **Transfer to Device.**

Before Auto False Echo Suppression



① TVT Hover Level
② Default TVT
③ False echo
④ Echo marker
⑤ Material level

After Auto False Echo Suppression

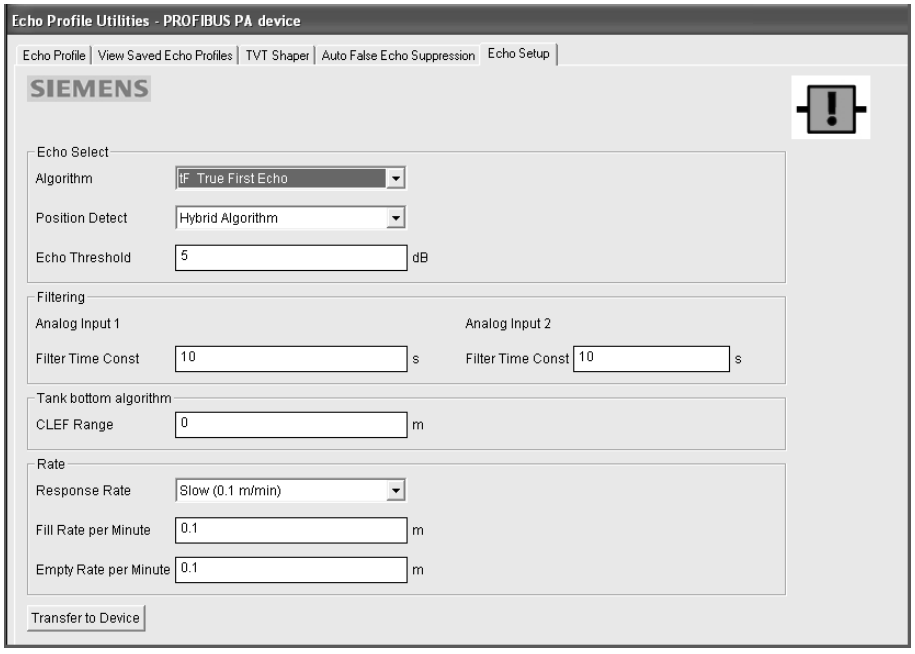


①	False echo	④	Material level
②	Learned TVT	⑤	Default TVT
③	Auto False Echo Suppression Range	⑥	Echo marker

7.1.5.3 Echo setup

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

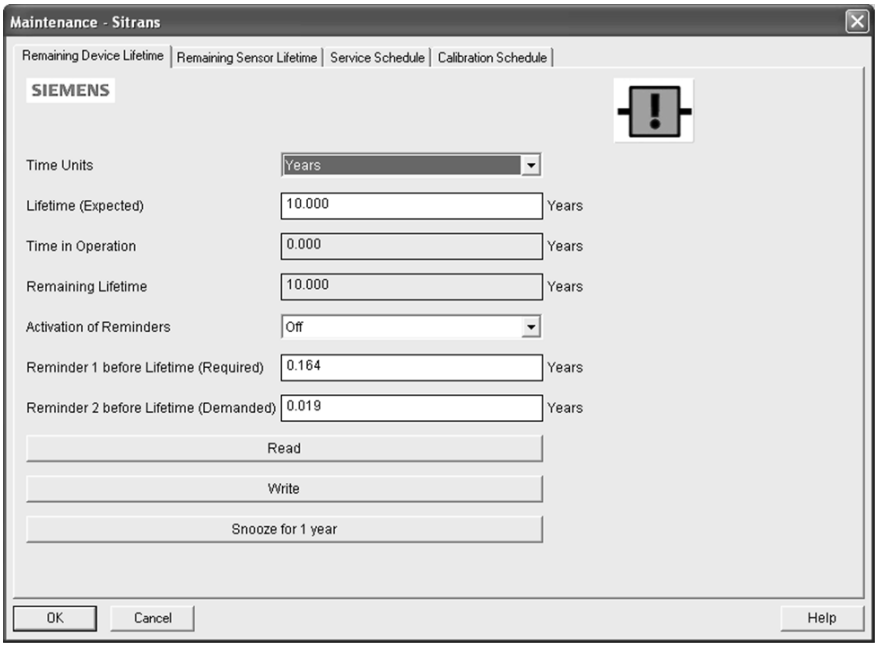
Open the menu **Device – Echo Profile Utilities** and click on **Echo Setup**.



7.1.5.4 Maintenance

You can set schedules and reminders for:

- device maintenance based on its projected lifetime
- sensor maintenance 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, set reminders for either or both of **Reminder 1 before Lifetime (Required)/Reminder 2 before Lifetime (Demanded)**.
3. Click **Write.**
4. Click **Read**, to see the effects of your modification.
5. Click **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, set reminders for either or both of **Reminder 1 before Lifetime (Required)/Reminder 2 before Lifetime (Demanded)**.
3. Click **Write.**
4. Click **Read**, to see the effects of your modification.
5. Click **Service/Calibration Performed** to reset the schedule.

7.1.5.5 Acknowledge Faults

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

7.1.5.6 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

7.1.5.7 Simulation

Note

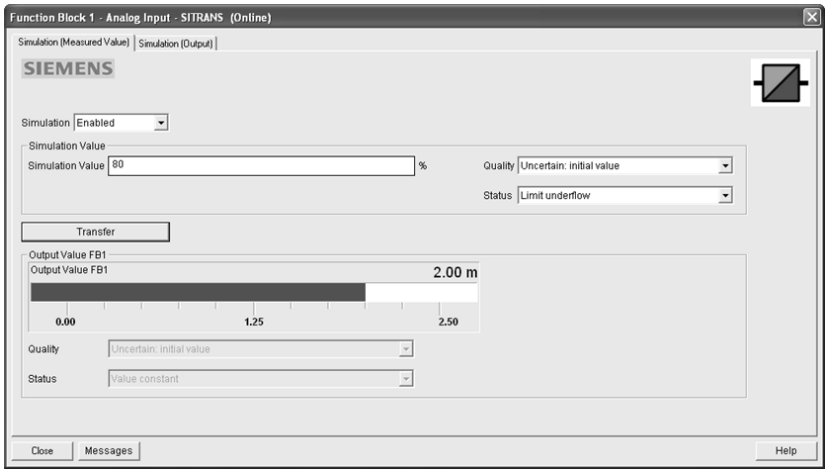
The Simulation parameter influences output to the control system.

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 (Page 242).

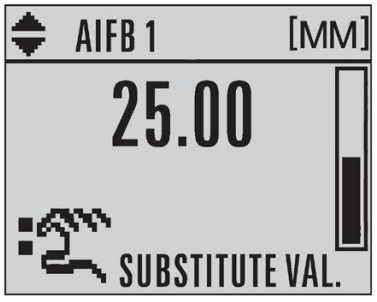
Simulate analog input to AIFB1 or AIFB2

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)**.



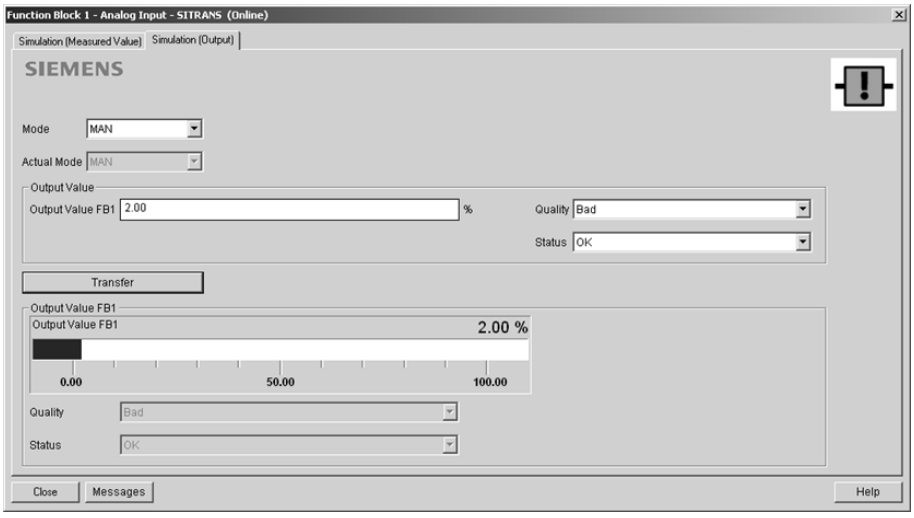
3. Enable simulation, enter a percentage value, set the desired quality and status, and click on **Transfer**. See Status Byte (Page 248) for more information on status and quality.
4. The Output value from the desired function block is displayed in PDM, and the LCD displays the substitute value. See Simulate Output below, to set the output mode.



5. After simulation is complete, disable simulation and click on **Transfer**.

Simulate output

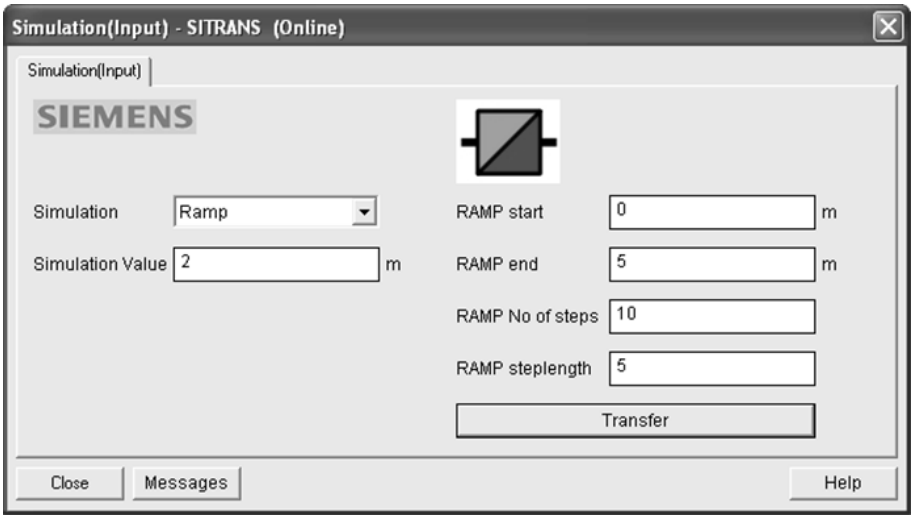
1. Open the menu **Device – Simulation**, select function block 1 or 2, and click on the tab Simulation (Output).
2. Select Manual Mode (from options AUTO, Manual, or Out of Service) and click on **Transfer**.



3. Enter simulated value and click on **Transfer**.
4. After simulation is complete, return to Simulate Output, reselect AUTO mode, and click on **Transfer**.

Simulate input

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**.

7.1.5.8 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.**

7.1.5.9 Master reset

Options	Result
Factory defaults	Resets all parameters to the manufacturer's default settings, with certain exceptions: see Factory defaults (Page 85).
Standard defaults	Resets all resettable parameters excluding device addresses to the PROFIBUS default settings.
Informational	Resets Tag parameter.
Functional	Resets parameters that control device behavior, such as Low Calibration Pt.
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, will disable the lock.

7.1.5.10 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
- Message
- Descriptor
- Installation Data
- Device Address
- Write Protection
- 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.

7.1.5.11 Diagnostics

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

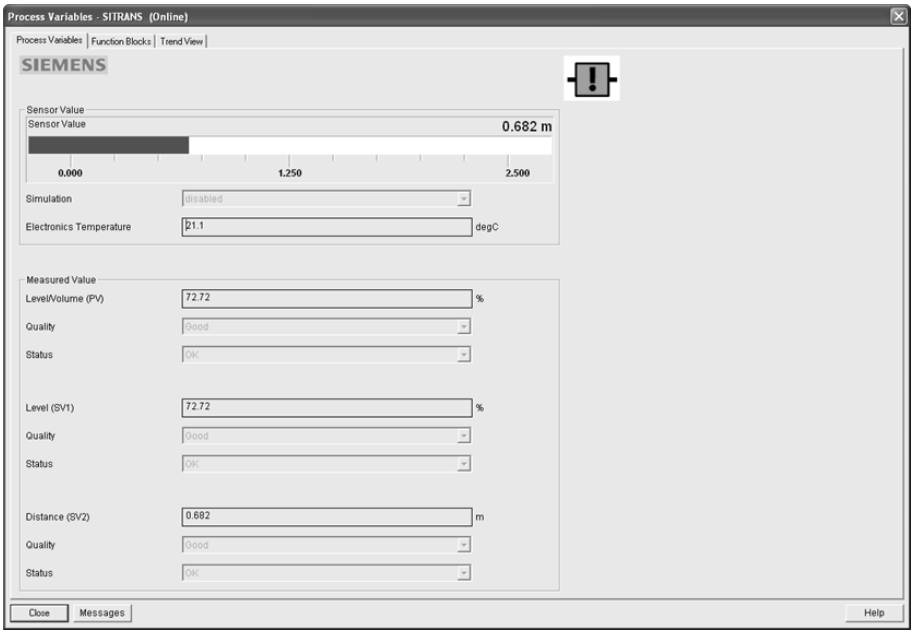
Process variables

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

Note

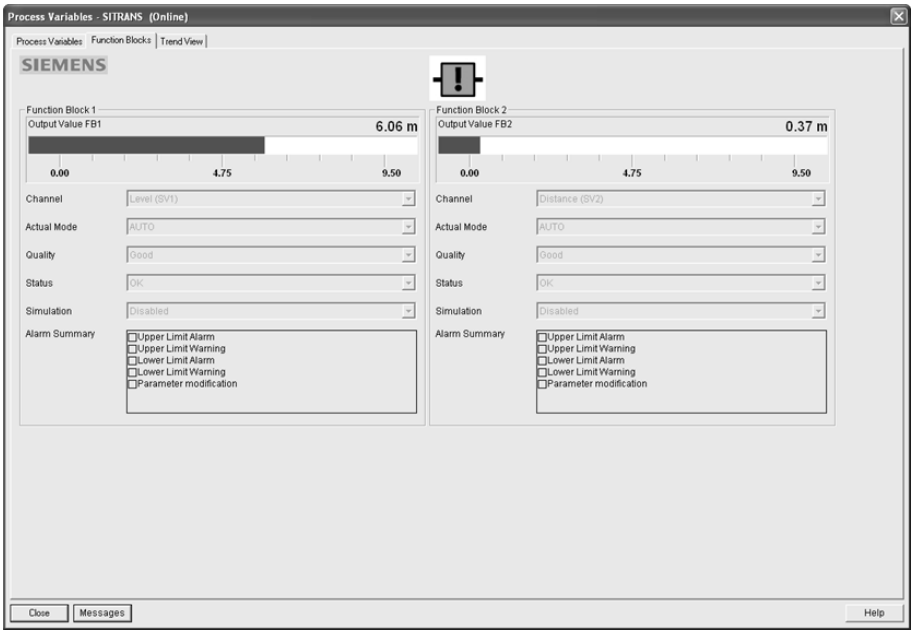
To view peak sensor values, peak FB1 and FB2 values, or peak electronics temperatures, see Device Diagnostics (Page 89).

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



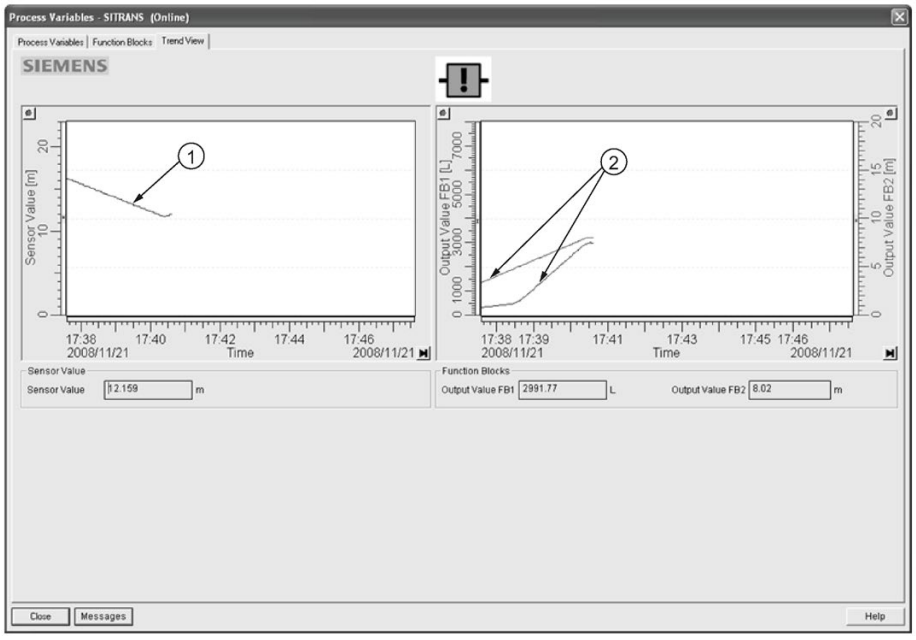
Function blocks

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.



① trend line

② trend lines

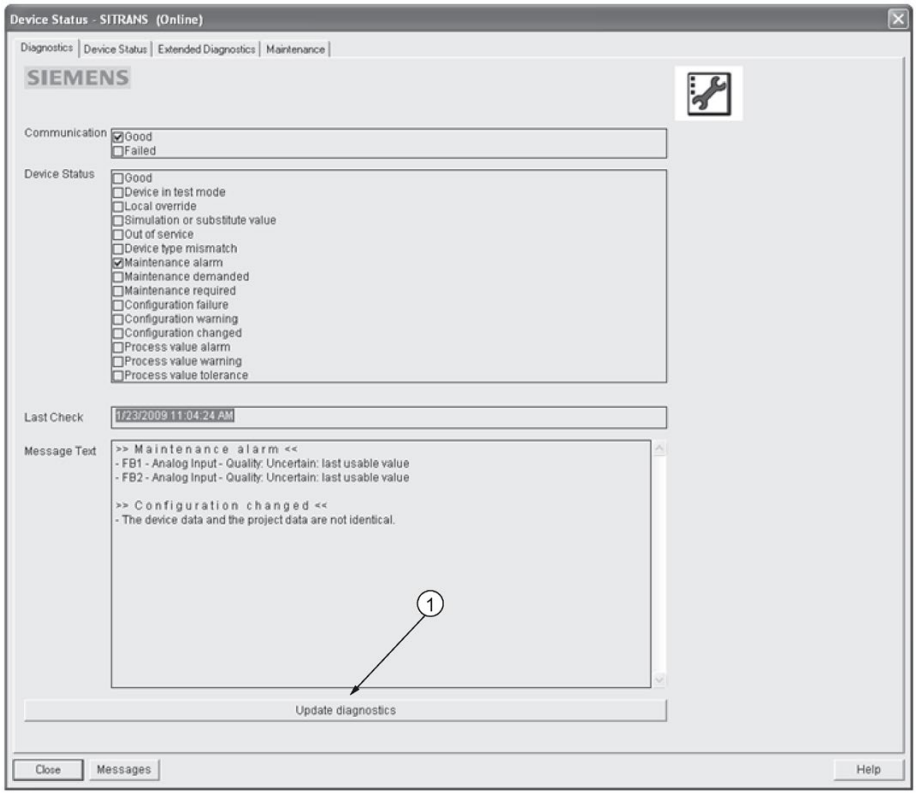
Device diagnostics

Device status

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

Diagnostics

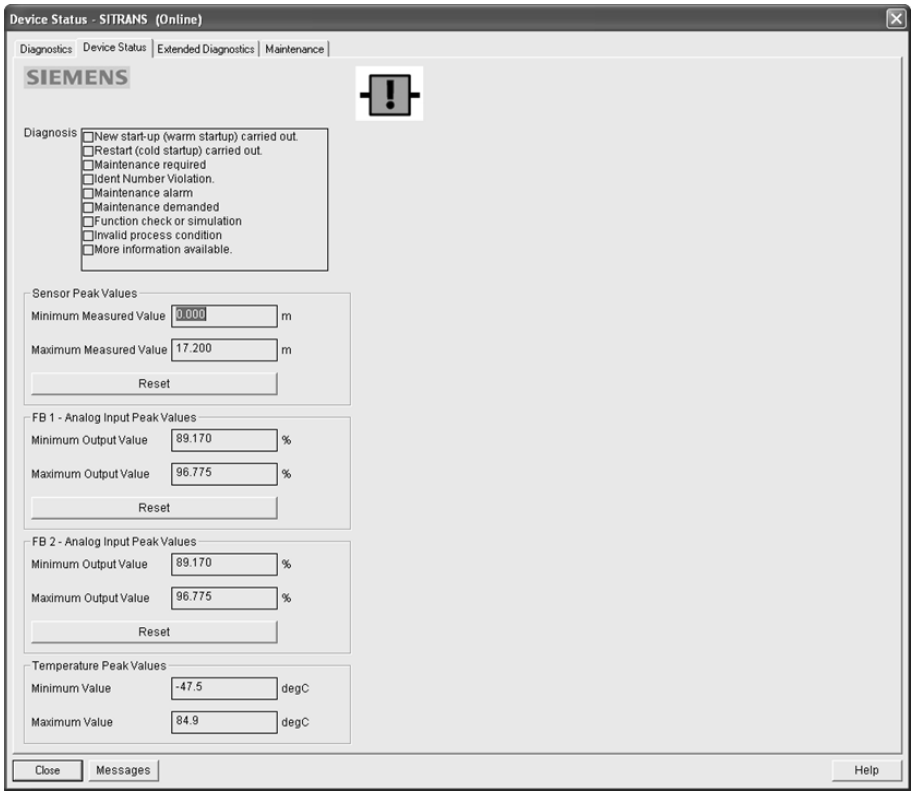
In the Device Status window, click on the **Diagnostics** tab, then on the **Update diagnostics button**, to update diagnostic information and refresh linked icons.



① Update diagnostics

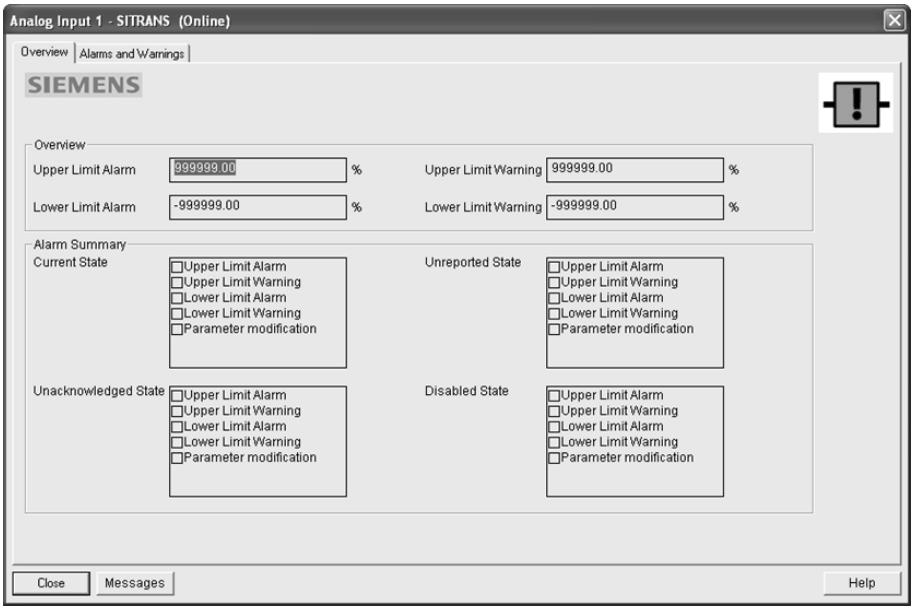
Device Status

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

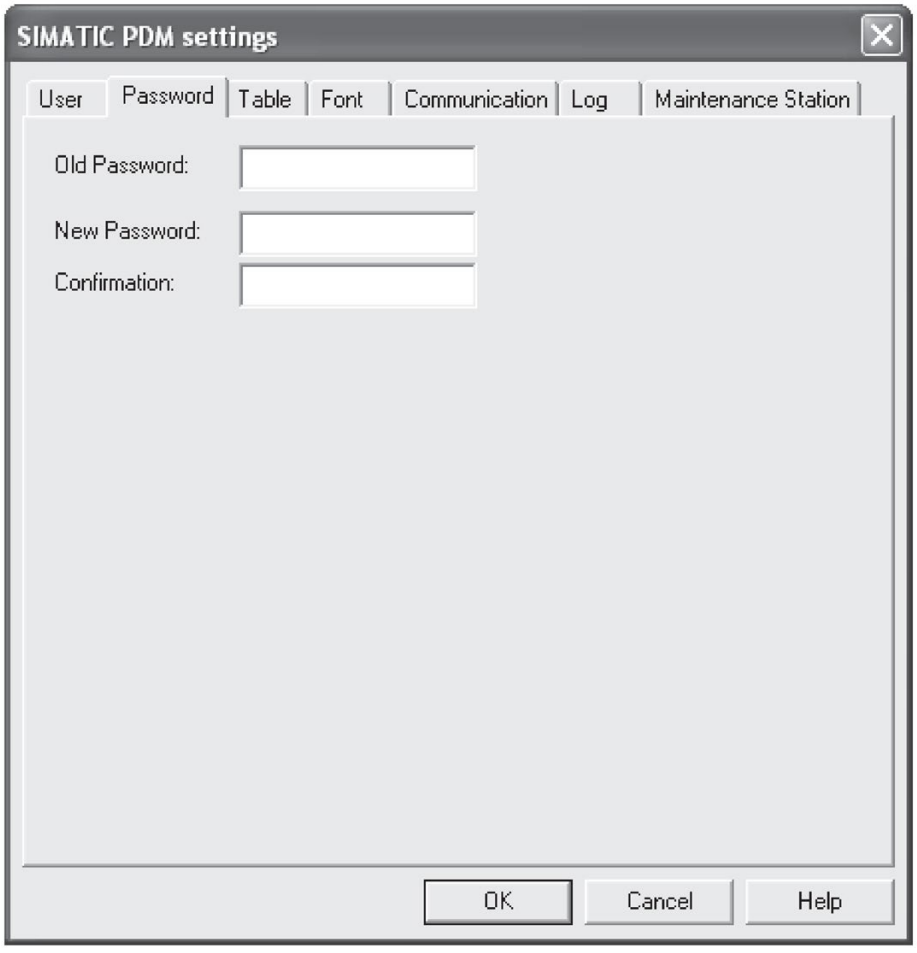
Open the menu **View – Update** to refresh the screen.

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**.



7.2 Operating via FDT

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

Functionally FDT is very similar to PDM. See Operating via SIMATIC PDM (Page 67) 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.

7.2.1 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.

7.2.2 SITRANS DTM

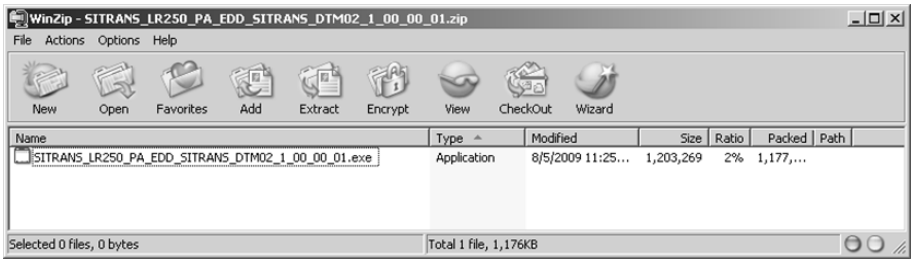
- SITRANS DTM is an EDDL interpreter developed by Siemens to interpret the EDD for that device.
- To use SITRANS DTM to connect to a device, you must first install SITRANS DTM on your system and then install the device EDD written for SITRANS DTM.
- You can download SITRANS DTM from the Siemens service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

7.2.3 The device EDD

The SITRANS LR250 PROFIBUS PA EDD for SITRANS DTM can be downloaded from our website:

Product page (http://www.siemens.com/LR250).

Go to **Support > Software Downloads**.



7.2.4 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 our website under **Support > Application Guides**.

Product page (http://www.siemens.com/LR250)

Parameter reference

8

Note

- 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 (Page 263) for a chart.

Parameters accessible via the handheld programmer are followed by the device menu number in parenthesis. Parameters not followed by a number are accessible only via remote operation.

For more details see:

- Operating via SIMATIC PDM (Page 67)

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

Quick Start (1.)

Note

- 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 (Page 69).
- For detailed instructions see Quick Start Wizard via the handheld programmer (Page 56).

Language (1.1.)

Material (1.2.)

Response Rate (1.3.)

Units (1.4.)

Operating Mode (1.5.)

Low Calibration Point (1.6.)

High Calibration Point (1.7.)

Apply? (Apply changes) (1.8.)

Setup (2.)

Note

- 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.

Identification (2.1.)

Tag (2.1.1.)

Note

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

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.

Descriptor (2.1.2.)

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

Message (2.1.3.)

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

Device (2.2.)

Hardware Revision (2.2.1.)

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

Firmware Revision (2.2.2.)

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

Loader Revision (2.2.3.)

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

Order Option (2.2.4.)

Read only. Displays the device type.

Sensor (2.3.)

Unit (2.3.1)

Sensor measurement unit.

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

Level Unit (2.3.2.)

Select engineering units for Level.

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

PV Units (volume/level) (2.3.3.)

Note

- 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 (Page 240) and How the Transducer Block works (Page 240) for more details.

Select units for either volume or level.

Level values		m, cm, mm, ft, in
Volume values		liter, gal
Percent value	*	%

Temperature Units (2.3.4.)

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

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

Material (2.3.5.)

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.

LOE Timer (2.3.6.)

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) (Page 223) 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

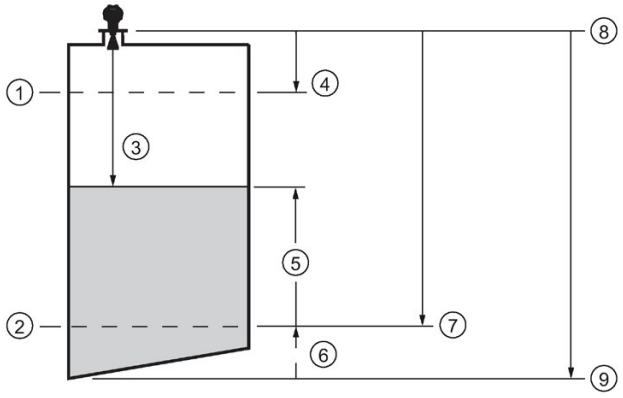
Calibration (2.3.7)

Note

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

Low Calibration Pt. (2.3.7.1.)

Distance from sensor reference point to Low Calibration Point (corresponding to Low Level Point). Units are defined in **Unit (2.3.1.).**



①	High level point (default: 100%)	⑥	Level offset (if used)
②	Low level point (default: 0%)	⑦	Low calibration point [a]
③	Sensor value	⑧	Sensor reference point
④	High calibration point	⑨	Far range
⑤	Level		

[a] Sensor reference point is the point from which level measurement is referenced. See Threaded Horn Antenna with extension (Page 171), Flanged Horn with extension (Page 176), and Flanged encapsulated antenna (3"/DN80/80A sizes and larger). (Page 182)

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

High Calibration Pt. (2.3.7.2.)

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

Values	Range: **0** to **20** m. Default 0.00 m
Related parameters	Unit (2.3.1.), Near Range (2.5.1.)

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

[1] The value produced by the echo processing which represents the distance from sensor reference point to the target. [see Threaded Horn Antenna with extension, (Page 174) Flanged Horn with extension (Page 178), and Flanged encapsulated antenna (3"/DN80/80A sizes and larger) (Page 182)].

Sensor Offset (2.3.7.3.)

A constant offset that can be added to or subtracted from the sensor value to compensate for a shifted sensor reference point. (For example, when adding a thicker gasket or reducing the standoff/nozzle height.) Sensor value is the value produced by the echo processing which represents the distance from sensor reference point to the target. (see **Calibration (2.3.7.)** for an illustration).The units are defined in **Unit (2.3.1.)**.

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

Low Level Point (2.3.7.4.)

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

Values	Range: **-999999.00** to **999999.00**. Default: 0%

High Level Point (2.3.7.5.)

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

Values	Range: **-999999.00** to **999999.00**. Default: 100%

Level Offset (2.3.7.6.)

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

Values	Range: **-999999.00** to **999999.00**. Default: 0%

Rate (2.3.8.)

Note

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

Response Rate (2.3.8.1.)

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 faster).

Fill Rate (2.3.8.2.)

Defines the maximum rate at which the reported sensor value is allowed to decrease. Allows you to adjust the SITRANS LR250 response to decreases in the actual material level. Fill Rate is automatically updated whenever **Response rate (2.3.8.1.)** is altered.

Options	Range: **0 to 99999** 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.

Empty Rate (2.3.8.3)

Defines the maximum rate at which the reported sensor value is allowed to increase. Adjusts the SITRANS LR250 response to increases 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.

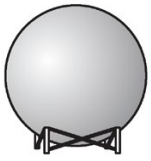
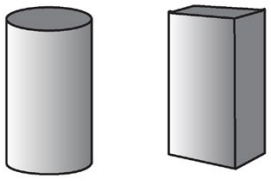
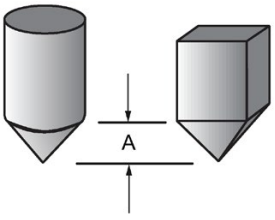
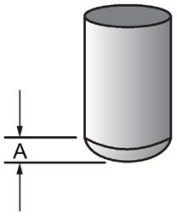
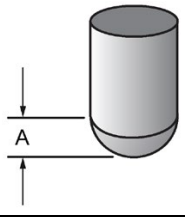
Linearization (2.4.)

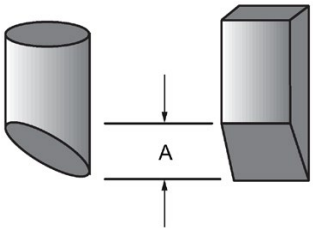
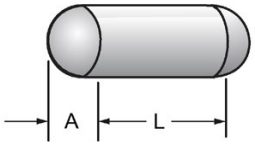
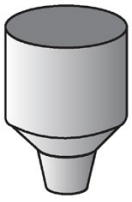
Volume (2.4.1.)

Carries out a volume conversion from a level value.

Vessel Shape (2.4.1.1.)

Defines the vessel shape and allows the LR250 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.

	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
		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

	Vessel Shape	LCD DISPLAY/ Description	Also required
		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, tables 1-32 level and volume breakpoints

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

Maximum Volume (2.4.1.2.)

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:

1. Select a volumetric unit from **PV Units (volume/level) (2.3.3.)**.
2. Enter the vessel volume corresponding to High Calibration Point.

Dimension A (2.4.1.3.)

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.)

Dimension L (2.4.1.4.)

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.)

XY index (2.4.1.5.)

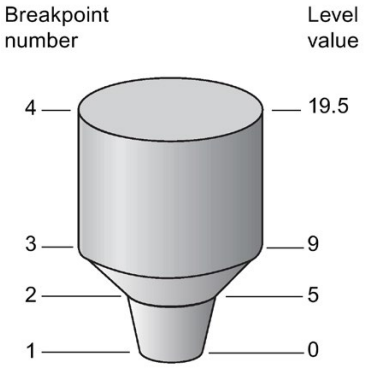
Level/Volume breakpoints allow you to define a complex vessel shape as a series of segments. A value is assigned to each level breakpoint and a corresponding value is assigned to each volume breakpoint.

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. See **Level Unit (2.3.2.)** and **PV Units (volume/level) (2.3.3.)**.

Level values	Range: **-999999.00** to **999999.00** (m, cm, mm, ft, in, %)
	Default: 0.0
Volume values	Range: **-999999.00** to **999999.00** (% or volumetric units)
	Default: 0.0

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 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:

1. 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.
2. Navigate to **Setup (2.) > Sensor (2.3.) > PV Units (volume/level) (2.3.3.)**, and select the desired volume units.
3. 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**.
4. Go to **X value (2.4.1.6.)** and enter the level value for the breakpoint just identified.
5. Go to **Y value (2.4.1.7.)** and enter the volume value for the breakpoint just identified.
6. Repeat steps 3 to 5 until values have been entered for all required breakpoints.

X value (2.4.1.6.)

Y value (2.4.1.7.)

Signal Processing (2.5.)

Note

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

Near Range (2.5.1.)

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 setting is 50 mm (2") past the end of the antenna, and the default is dependent on the antenna type and process connection. [See Dimension drawings (Page 171) for antenna heights.]

Values	Range: **0** to **20** m (0 to 65.6 ft)	
	Default depends on antenna type and process connection.	
	Examples:	1.5" threaded horn 185.3 mm (7.3")
		4" horn with stainless steel flange
		100 mm (4") extension 373.3 mm (14.7")
Related parameters	Units (2.3.1.)	

Far Range (2.5.2.)

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.)** for an illustration.

Values	Range: Min. = **Low Calibration Pt.** Max. = **23** m (75.45 ft) Default: Value for Low Calibration Pt. + 1 m (3.28 ft)
Related parameters	Units (2.3.1.)

Use this feature if the measured surface can drop below the Low calibration point in normal operation.

Propagation Factor (2.5.3.)

Note

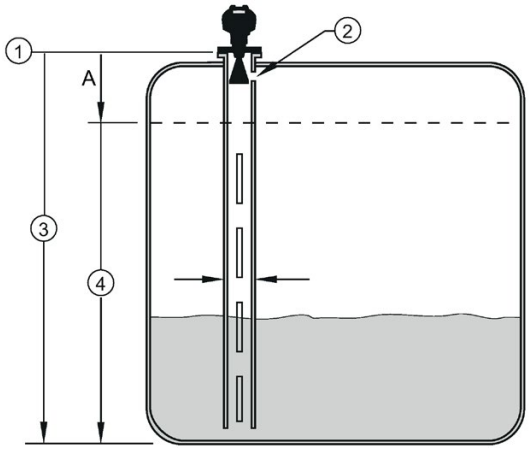
- When operating in a stillpipe, values for **CLEF Range (2.5.7.4.)**, and for the propagation factor, should be set according to the pipe size. See the table below.
- For reliable results, the antenna size must be close to the pipe size.

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

Values	Range:	0.3 to 1.0 depending on pipe size.		
	Default:	1.0000		
Nominal Pipe Size[a)]	40 mm (1.5")	50 mm (2")	80 mm (3")	100 mm (4")
Propagation Factor	0.9844	0.988	0.9935	0.9965
CLEF Range (2.5.7.4.)	Low calibration point - 700 mm (2.29 ft)[b)]	Low calibration point - 700 mm (2.29 ft)[b)]	Low calibration point - 1000 mm (3.28 ft)[b)]	Low calibration point - 1000 mm (3.28 ft)[b)]

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

[b)] CLEF range covers the whole measurement range except first 700 or 1000 mm from unit reference point (see A in graphic below)



① sensor reference point
② air gap
A 700 or 1000 mm
③ low calibration point
④ CLEF range 2.5.7.4.

Note

Flanged encapsulated antenna

For Flanged encapsulated antenna (7ML5432) match the process connection size to the pipe diameter whenever possible (for example, mount a DN80/3" flange on DN80/3" pipe).

Minimum Sensor Value (2.5.4.)

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

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

Maximum Sensor Value (2.5.5.)

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

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

Shots (2.5.6.)

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

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

Echo Select (2.5.7.)

Algorithm (2.5.7.1.)

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 **L**argest and **F**irst echo

Position Detect (2.5.7.2.)

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.

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 Detect to Hybrid and **CLEF Range (2.5.7.4.)** to 0.5 m (1.64 ft).

Echo Threshold (2.5.7.3.)

Sets the minimum echo confidence that the echo must meet in order to prevent a Loss of Echo condition and the expiration of the Fail-safe (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	Timer (2.3.6.)

Use this feature when an incorrect material level is reported.

CLEF Range (2.5.7.4.)

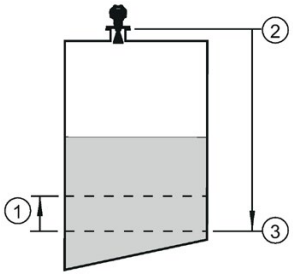
Note

CLEF Range is referenced from Low Calibration Point (process empty level).

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 Low Calibration Point (process empty level) 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 (Page 219).

Values	Range: **0** to **20** m (0 to 65.6 ft)
	Default: 0.0 m
Related parameters	Position Detect (2.5.7.2.)



① CLEF Range
② Sensor reference point
③ Low calibration point (process empty level)

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.

Sampling (2.5.8.)

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.

Echo Lock (2.5.8.1.)

Note

Ensure the agitator is always running while SITRANS LR250 is monitoring the vessel, to avoid stationary blade detection.

Selects the measurement verification process. See **Echo Lock (2.5.8.1.)** 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.

Sampling Up (2.5.8.2.)

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

Sampling Down (2.5.8.3.)

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

Echo Quality (2.5.9.)

Confidence (2.5.9.1.)

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**.

Echo Strength (2.5.9.2.)

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

Values (view only)	**-22** to **99**

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

TVT Setup (2.5.10.)

Note

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

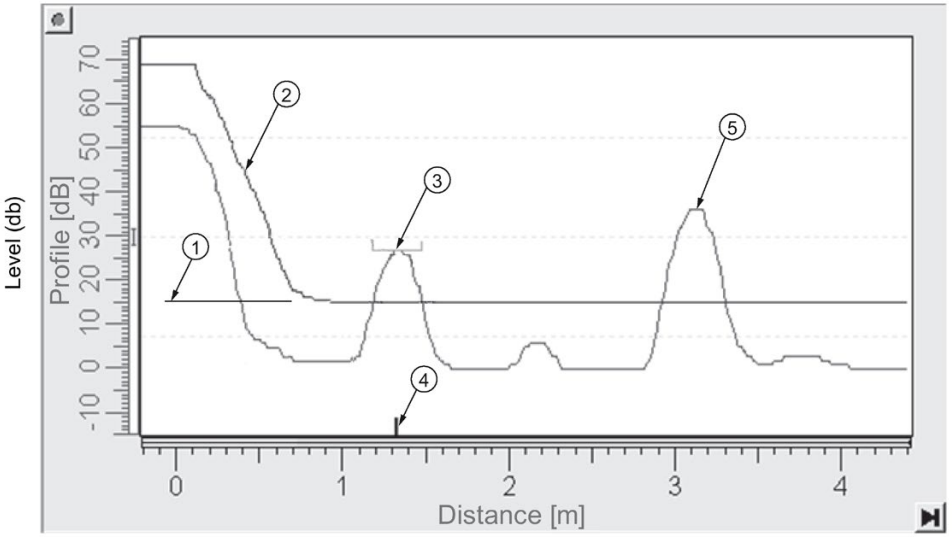
Auto False Echo Suppression (2.5.10.1.)

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 (Page 216) for a more detailed explanation.

Note

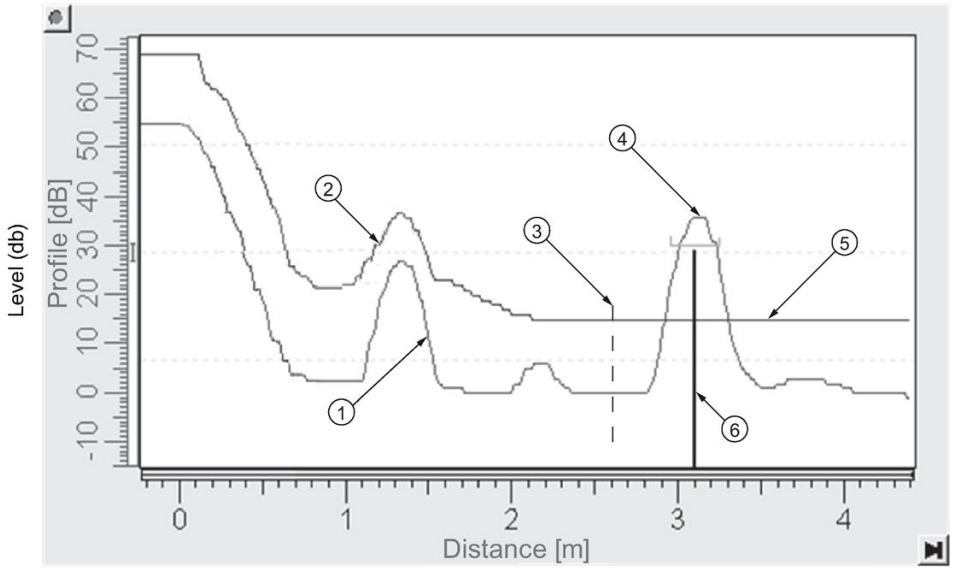
- Make sure material level is below all known obstructions when Auto False Echo Suppression is used to learn the echo profile. (An empty or almost empty vessel is recommended.)
- Note the distance to material level when Auto False Echo learns the environment. Set Auto False Echo Suppression Range to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

Before Auto False Echo Suppression



① TVT Hover Level
② default TVT
③ false echo
④ echo marker
⑤ material level

After Auto False Echo Suppression



①	false echo	④	material level
②	learned TVT	⑤	default TVT
③	Auto False Echo Suppression Range	⑥	echo marker

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 via SIMATIC PDM (Page 220).

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.

1. 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.
2. Subtract 0.5 m (20") from this distance, and use the resulting value.
3. Go to **Auto False Echo Suppression Range (2.5.10.2.)** and enter the value calculated in step 2.
4. Go to **Auto False Echo Suppression (2.5.10.1.)** and press **RIGHT arrow** to open Edit Mode.
5. Select **Learn**. The device will automatically revert to **On** (Use Learned TVT) after a few seconds.

Auto False Echo Suppression Range (2.5.10.2.)

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

1. Press **RIGHT arrow** to open Edit mode.
2. Enter the new value and press **RIGHT arrow** to accept it.
3. Set **Auto False Echo Suppression (2.5.10.1.)**.

Hover Level (2.5.10.3.)

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

Shaper Mode (2.5.10.4.)

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

Options		ON
	*	OFF

TVT shaper (2.5.11.)

Note

- The range is –50 to 50 dB.
- **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 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:

1. Go to **Level Meter > Setup > Signal Processing > TVT setup > Shaper Mode** and select **On**.
2. Open the menu **Device – Echo Profile Utilities** and click on TVT Shaper. For more detail see TVT Shaper via SIMATIC PDM (Page 77).

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

1. Go to **Shaper Mode (2.5.10.4.)** and select **ON**.
2. In TVT shaper, go to **Breakpoints 1-9 (2.5.11.1.)**.
3. Open Breakpoint 1 and enter the TVT Offset value (between –50 and 50 dB).
4. Go to the next Breakpoint and repeat step 3 until all desired breakpoint values have been entered.

Breakpoint 1-9 (2.5.11.1.)

Values	Range: **–50** to **50** dB
	Default: 0 dB

Breakpoint 10-18 (2.5.11.2.)

Values	Range: **–50** to **50** dB
	Default: 0 dB

Breakpoint 19-27 (2.5.11.3.)

Values	Range: **–50** to **50** dB
	Default: 0 dB

Breakpoint 28-36 (2.5.11.4.)

Values	Range: **–50** to **50** dB
	Default: 0 dB

Breakpoint 37-40 (2.5.11.5.)

Values	Range: **–50** to **50** dB
	Default: 0 dB

AIFB1 (2.6.)

Note

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

Static Revision No. (2.6.1.)

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.

Actual mode (2.6.2.)

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

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

Allows you to put the SITRANS LR250 into Out of Service Mode and then reset it to Auto Mode.

Manual Mode is used in conjunction with Simulation. See Simulation (Page 82). It should be used only with SIMATIC PDM in order to benefit from all the features available.

Channel (2.6.3.)

Used to select between the different Level Transducer Block outputs.

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

Label (2.6.4.)

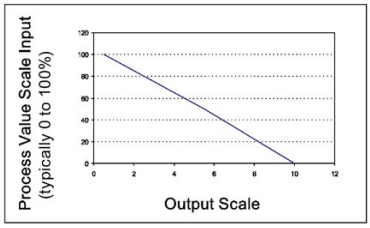
User defined label.

Input Scaling (2.6.5.)

Upper Value (2.6.5.1.)

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

Lower Value (2.6.5.2.)

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%

Output Scaling (2.6.6.)

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.

Upper Value (2.6.6.1.)

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

Values	Range: **-999999** to **999999**
	Default: 100%

Lower Value (2.6.6.2.)

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

Values	Range: **-999999** to **999999**
	Default: 0%

Alarms and Warnings (2.6.7.)

Upper Limit Alarm (2.6.7.1.)

The setting for the upper alarm limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: 999999

Upper Limit Warning (2.6.7.2.)

The setting for the upper warning limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: 999999

Lower Limit Warning (2.6.7.3.)

The setting for the lower warning limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: -999999

Lower Limit Alarm (2.6.7.4.)

The setting for the lower alarm limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: -999999

Limit Hysteresis (2.6.7.5.)

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.

Display (2.6.8.)

Filter Time Constant (2.6.8.1.)

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 (Page 222) for more detail.

Values	Range: **0** to **600** s
	Default: 10 s

Unit (2.6.8.2.)

Note

Additional units are available in SIMATIC PDM.

Engineering unit to be displayed with the output value.

Values		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

Out Unit Text (2.6.8.3.)

If the desired unit is not listed in **Unit (2.6.8.2.)** you can define it in **Out Unit Text (2.6.8.3.)**.

Decimal point (2.6.8.4.)

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

Fail-safe Mode (2.6.9.)

Mode (2.6.9.1.)

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).

Value (2.6.9.2.)

Note

Fail-safe Mode (2.6.9.) 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

AIFB2 (2.7.)

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

Measured Values (2.8.)

Read only. Allows you to view measured values for diagnostic purposes. In SIMATIC PDM, open the menu **View – Process Variables**.

Main Output (PV - Primary Value) (2.8.1.)

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

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

The value for level.

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

The value for distance.

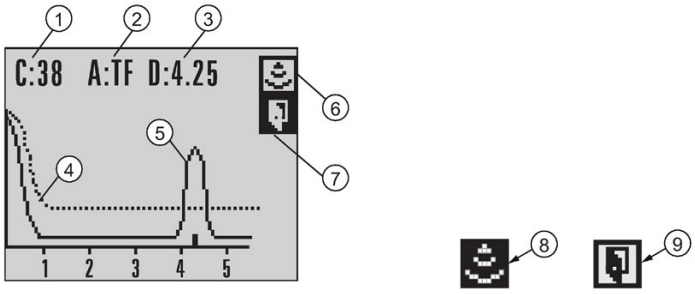
Diagnostics (3.)

Echo Profile (3.1.)

To request a profile via SIMATIC PDM:

Open the menu **Device – Echo Profile Utilities**. [See Echo Profile Utilities via SIMATIC PDM (Page 75) for more detail.]

To request a profile via the handheld programmer:



①	Echo confidence value	⑥	Measure icon, deselected
②	Algorithm selection (tFirst echo)	⑦	Exit icon, selected
③	Distance value	⑧	Measure icon, selected
④	TVT curve	⑨	Exit icon, deselected
⑤	Material level		

1. Navigate to **Level Meter > Diagnostics (3.) > Echo Profile (3.1.)**.
2. Press **RIGHT arrow** to request a profile. [See Requesting an Echo Profile (Page 59) for more details.]

Fault Reset (3.2.)

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:

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

Electronics Temperature (3.3.)

Minimum Value (3.3.1.)

The minimum recorded internal electronics temperature of the SITRANS LR250.

Maximum Value (3.3.2.)

The maximum recorded internal electronics temperature of the SITRANS LR250.

Condensed Status (3.4.)

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.

Enable (3.4.1.)

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.

Features supported (3.4.2.)

Read only. Features supported are:

- Condensed Diagnostics
- Extended Diagnostics
- Application Relationships

Features enabled (view only) (3.4.3.)

Read only. Lists those features that have been enabled.

Allocation (3.5.)

Event Index (3.5.1.)

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
35	S35	Receiver Init Calibration
36	S36	Receiver Calibration
37	S37	Technology Module Calibration
38	S38	Technology Module Ramp

[a)] See General Fault Codes (Page 157) 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:

1. Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
2. 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:

1. Go to **Diagnostics > Condensed Status Setup > Condensed Status Mode** and select **Yes** to enable Condensed Mode.
2. Go to **Diagnostics > Condensed Status**.
3. 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.

Event Status (3.5.2.)

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). See Condensed Status (Page 249) for more details.

	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

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

1. Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
2. Go to **Event Index (3.5.1.)** and enter the event index number corresponding to a particular event.
3. 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:

1. Go to **Level Meter > Diagnostics > Condensed Status Setup**, select **Yes** to enable Condensed Status Mode.
2. Go to **Level Meter > Diagnostics > Condensed Status**.
3. Select the Status line for the selected Event, then choose a Status option from the associated pull-down menu.

Event Diagnosis (3.5.3.)

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). See Condensed Mode Diagnosis (Page 253) for more detail.

	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:

1. Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
2. Go to **Event Index (3.5.1.)** and enter the event index number corresponding to a particular event.
3. 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:

1. Go to **Level Meter > Diagnostics > Condensed Status Setup**, and select **Yes** to enable Condensed Status Mode.
2. Go to **Level Meter > Diagnostics > Condensed Status**.
3. Select the Diagnosis line for the selected Event, then choose a Diagnosis option from the associated pull-down menu.

Peak Values (3.6.)

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 (Page 89).

Min. Measured Value (3.6.1.)

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

Max. Measured Value (3.6.2.)

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

Minimum Output Value - AIFB1 (3.6.3.)

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

Maximum Output Value - AIFB1 (3.6.4.)

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

Minimum Output Value - AIFB2 (3.6.5.)

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

Maximum Output Value - AIFB2 (3.6.6.)

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

Service (4.)

Note

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

Master Reset (4.1.)

Note

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

Reset options	Result
Factory Defaults	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 • Descriptor • Installation Data • Device Address • Write Protection • Auto False Echo Suppression Range • learned TVT
Standard Defaults	Resets all resettable parameters excluding device addresses to the PROFIBUS standard default settings.
Informational	Resets Tag parameter.
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
Reset Address to 126	Resets the PROFIBUS device address to 126 If the address lock was on, will disable the lock.

To access via SIMATIC PDM:

Open the menu **Device – Master Reset**. For more detail see Master Reset (Page 85).

To perform a reset via the handheld programmer:

1. Press **RIGHT Arrow** to open Edit Mode then scroll down to the desired Reset option and press **RIGHT Arrow** to select it.
2. Press **LEFT Arrow** to exit.

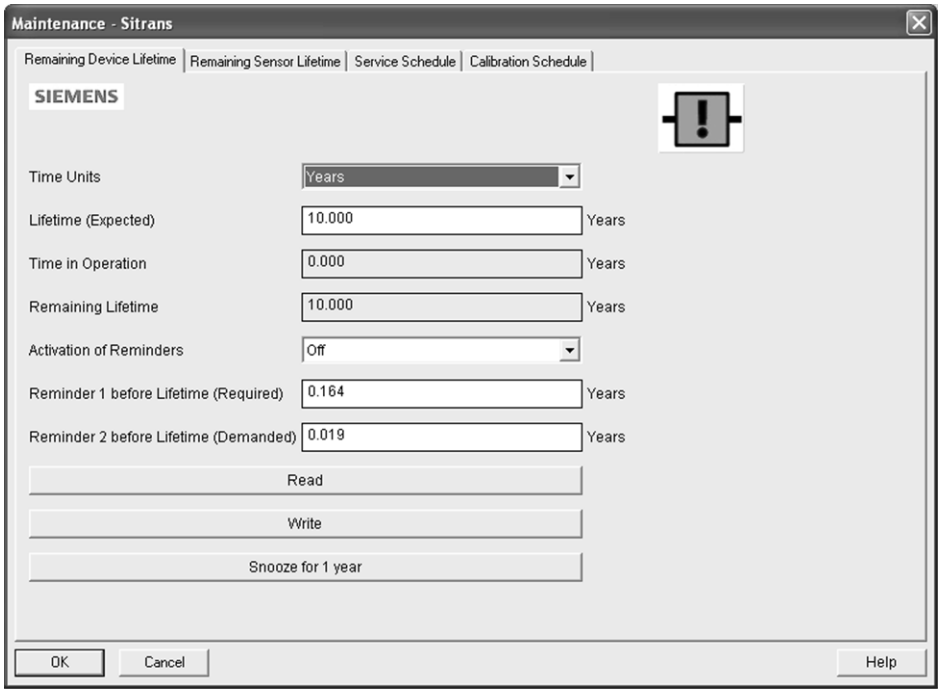
Remaining Device Lifetime (4.2.)

Note

- 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 Service/Calibration 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 an 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.

Lifetime Expected (4.2.1.)

Note

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.

Time in Operation (4.2.2.)

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

Remaining Lifetime (4.2.3.)

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

Reminder Activation (4.2.4.)

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

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

Reminder 1 (Required) (4.2.5.)

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

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

Reminder 2 (Demanded) (4.2.6.)

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

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

Maintenance Status (4.2.7.)

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.

Acknowledge Status (4.2.8.)

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.

Acknowledge (4.2.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

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

To acknowledge a reminder via the handheld programmer:

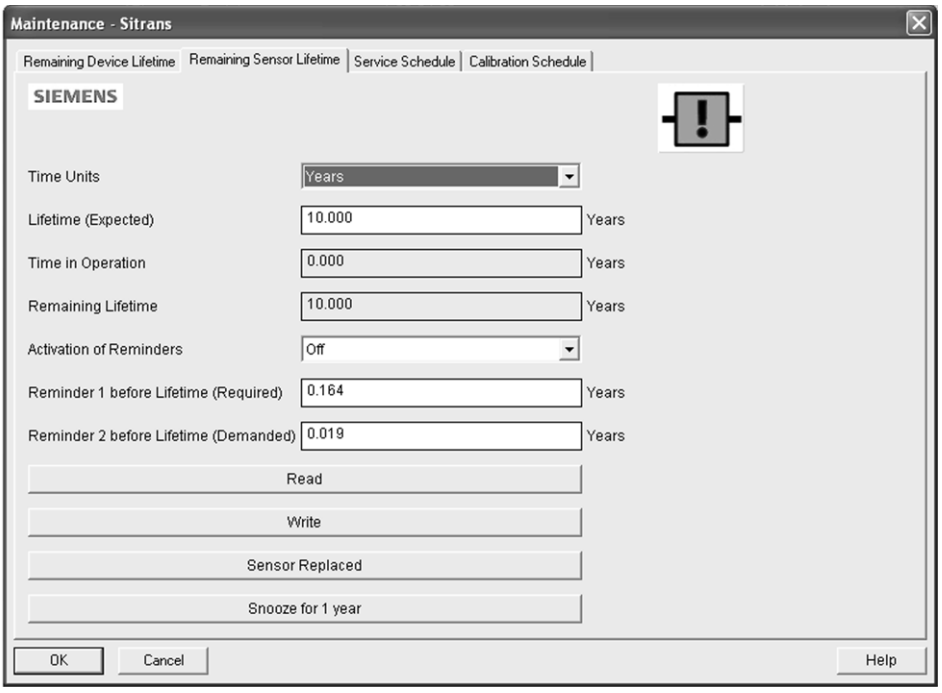
1. Press **RIGHT arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT arrow** to acknowledge the reminder.

Remaining Sensor Lifetime (4.3.)

Note

- 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.

Lifetime Expected (4.3.1.)

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.

Time in Operation (4.3.2.)

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.

Remaining Lifetime (4.3.3.)

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

Reminder Activation (4.3.4.)

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

1. First set the values in **Reminder 1 (Required) (4.3.5.)**/**Reminder 2 (Demanded) (4.3.6.)**.
2. Select the desired **Reminder Activation** option.

Reminder 1 (Required) (4.3.5.)

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

1. Modify values as required.
2. Set **Activation Reminder (4.3.4.)** to the desired option.

Reminder 2 (Demanded) (4.3.6.)

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

1. Modify values as required.
2. Set **Reminder Activation (4.3.4.)** to the desired option.

Maintenance Status (4.3.7.)

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.

Acknowledge Status (4.3.8.)

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.

Acknowledge (4.3.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

1. Open the menu **View – Device Diagnostics,** select **Device Status** and click on the **Maintenance** tab.
2. In the **Sensor Lifetime** section, click on **Acknowledge Warnings**.

To acknowledge a reminder via the handheld programmer:

1. Press **RIGHT arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT arrow** to acknowledge the reminder.

Service Schedule (4.4.)

Note

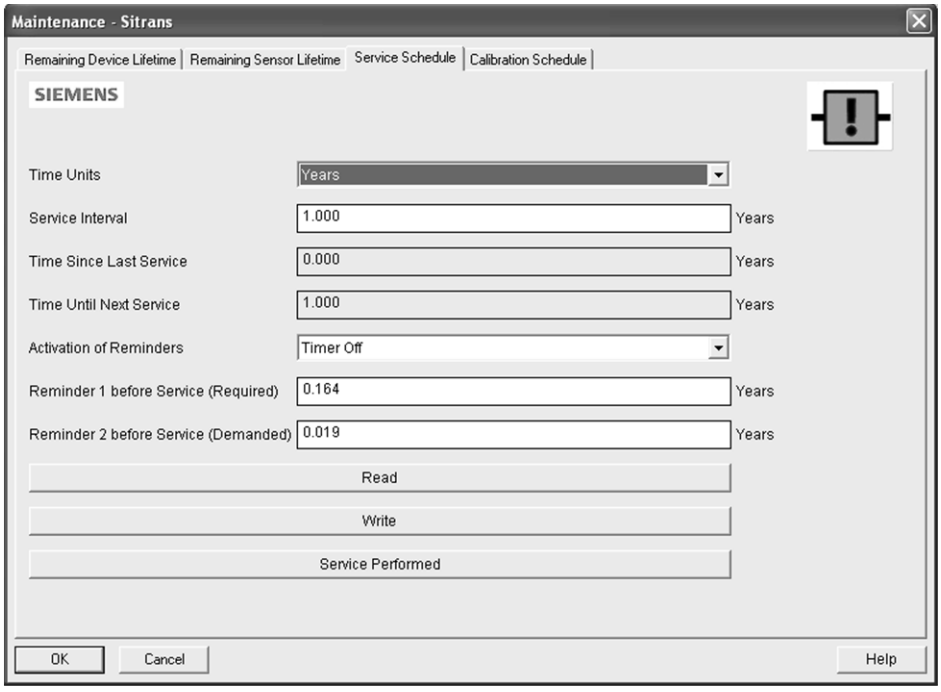
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Service/Calibration schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Remaining Sensor Lifetime (4.3.)**, and **Calibration Schedule (4.5.)**.
- 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 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 **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.

Service Interval (4.4.1.)

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.

Time since Last Service (4.4.2.)

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.

Time until Next Service (4.4.3.)

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

Reminder Activation (4.4.4.)

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

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

Reminder 1 (Required) (4.4.5.)

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

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

Reminder 2 (Demanded) (4.4.6.)

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

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

Maintenance Status (4.4.7.)

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.

Acknowledge Status (4.4.8.)

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.

Acknowledge (4.4.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

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

To acknowledge a reminder via the handheld programmer:

1. Press **RIGHT**  **arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT** **arrow** to acknowledge the reminder.

Calibration Schedule (4.5.)

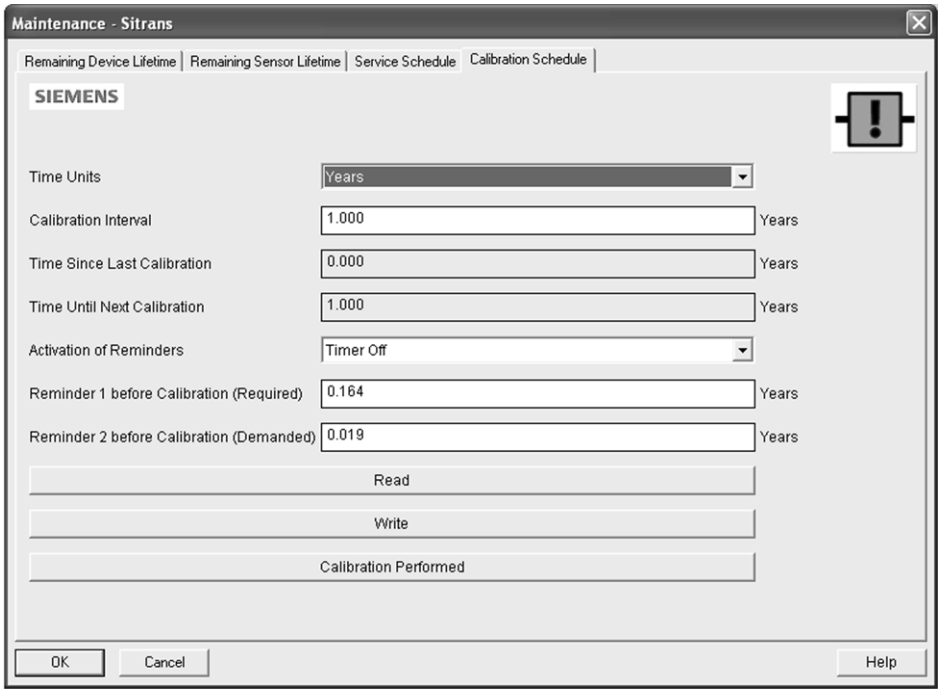
Note

- 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 Service/Calibration 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 Total 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.

Calibration Interval (4.5.1.)

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.

Time since Last Calibration (4.5.2.)

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.

Time until Next Calibration (4.5.3.)

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

Reminder Activation (4.5.4.)

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

1. First set the values in **Reminder 1 (Required) (4.5.5.)**/**Reminder 2 (Demanded) (4.5.6.)**.
2. Select the desired **Reminder Activation** option.

Reminder 1 (Required) (4.5.5.)

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

1. Modify values as required.
2. Set **Reminder Activation (4.5.4.)** to the desired option.

Reminder 2 (Demanded) (4.5.6.)

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

1. Modify values as required.
2. Set **Reminder Activation (4.5.4.)** to the desired option.

Maintenance Status (4.5.7.)

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.

Acknowledge Status (4.5.8.)

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.

Acknowledge (4.5.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

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

To acknowledge a reminder via the handheld programmer:

1. Press **RIGHT**  **arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT**  **arrow** to acknowledge the reminder.

Manufacture Date (4.6.)

Read only. The date of manufacture of the SITRANS LR250 (yy mm dd).

Powered Hours (4.7.)

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

In SIMATIC PDM, open the menu **Device – Wear**.

Power-on Resets (4.8.)

Read only. The number of power cycles that have occurred since manufacture.

In SIMATIC PDM, open the menu **Device – Wear**.

LCD Fast Mode (4.9.)

Note

- 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**

LCD Contrast (4.10.)

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** (low contrast) to **20** (high contrast). Default: 10

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

Communication (5.)

Note

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

Device Address (5.1.)

Note

The address can be changed and locked from a remote master. See PROFIBUS address (Page 246) for details on disabling the address lock and **Master Reset (4.1.)** 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 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.**

To change Device Address via the handheld programmer:

See Device Address (Page 60) for details.

PROFIBUS Ident Number (5.2.)

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 LR250 PROFIBUS PA [ident # = 0x8150]
		STD – AIFB 1 ONL.	Standard Profile AIFB 1 only (uses generic GSD for 1 AIFB) [ident # = 0x9700]

Security (6.)

Note

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

Remote Access (6.1.)

Remote Lockout (6.1.1.)

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)

Local Access (6.2.)

Write Protection (6.2.1.)

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.** Default: Off	
	2457 (unlock value)	Off (enables programming)
	any other value	On (disables programming)

Local Operation (6.2.2.)

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**.

Language (7.)

Selects the language to be used on the LCD.

Options	*	English
		Deutsch
		Français
		Español

8.1 Alphabetical parameter list

Note

For a detailed list of parameters see Parameter Reference (Page 95).

Actual Mode (2.6.2.)

AIFB1 (2.6.)

AIFB2 (2.7.)

Alarms and Warnings (2.6.7.)

Algorithm (2.5.7.1.)

Allocation (3.5.)

Auto False Echo Suppression (2.5.10.1.)

Auto False Echo Suppression Range (2.5.10.2.)

Calibration (2.3.7.)

Calibration Schedule (4.5.)

Channel (2.6.3.)

CLEF Range (2.5.7.4.)

Condensed Status (3.4.)

Confidence (2.5.9.1.)

Descriptor (2.1.2.)

Device Address (5.1.)

Dimension A (2.4.1.3.)

Dimension L (2.4.1.4.)

Display (2.6.8.)

Echo Lock (2.5.8.1.)

Echo Profile (3.1.)

Echo Quality (2.5.9.)

Echo Select (2.5.7.)
Echo Strength (2.5.9.2.)
Electronics Temperature (3.3.)
Empty rate (2.3.8.3.)
Event Index (3.5.1.)
Event Status (3.5.2.)
Event Diagnosis (3.5.3.)
Fail-safe Mode (2.6.9.)
Far Range (2.5.2.)
Fault Reset (3.2.)
Fill Rate (2.3.8.2.)
Filter Time Constant (2.6.8.1.)
Firmware Revision (2.2.2.)
Hardware Revision (2.2.1.)
High Calibration Pt. (2.3.7.2.)
High Level Point (2.3.7.5.)
Hover Level (2.5.10.3.)
Identification (2.1.)
Input Scaling (2.6.5.)
Label (2.6.4.)
Language (7.)
LCD Contrast (4.10.)
LCD Fast Mode (4.9.)
Level Offset (2.3.7.6.)
Level Unit (2.3.2.)
Limit Hysteresis (2.6.7.5.)
Linearization (2.4.)
Loader Revision (2.2.3.)
Local Access (6.2.)
Local Operation (6.2.2.)
LOE Timer (2.3.6.)
Low Calibration Pt. (2.3.7.1.)
Lower Limit Warning (2.6.7.3.)
Lower Limit Alarm (2.6.7.4.)
Low Level Point (2.3.7.4.)

Response Rate (2.3.8.1.)

Sampling (2.5.8.)

Sampling down (2.5.8.3.)

Sampling up (2.5.8.2.)

Sensor (2.3.)

Sensor Offset (2.3.7.3.)

Service Schedule (4.4.)

Shaper Mode (2.5.10.4.)

Shots (2.5.6.)

Signal Processing (2.5.)

Static Revision No. (2.6.1.)

Tag (2.1.1.)

Temperature Units (2.3.4.)

TVT setup (2.5.10.)

TVT shaper (2.5.11.)

Upper Limit Warning (2.6.7.2.)

Upper Limit Alarm (2.6.7.1.)

Unit (2.3.1.)

Value (2.6.9.2.)

Vessel Shape (2.4.1.1.)

Volume (2.4.1.)

Write Protection (6.2.1.)

XY index (2.4.1.5.)

X value (2.4.1.6.)

Y value (2.4.1.7.)

Service and maintenance

9

9.1 Basic safety information

⚠ WARNING

Impermissible repair of the device

- Repair must be carried out by Siemens authorized personnel only.

⚠ CAUTION

Releasing button lock

Improper modification of parameters could influence process safety.

- Make sure that only authorized personnel may cancel the button locking of devices for safety-related applications.

9.2 Cleaning

The radar device requires no 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 device from service and wipe the antenna clean using a cloth and suitable cleaning solution.

NOTICE

Penetration of moisture into the device

Device damage.

- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

WARNING

Electrostatic charge

Danger of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.

- Prevent electrostatic charging in hazardous areas.

9.3 Maintenance and repair work

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover screws
- Reliability of power supply, lightning protection, and grounds

WARNING

Maintenance during continued operation in a hazardous area

There is a risk of explosion when carrying out repairs and maintenance on the device in a hazardous area.

- Isolate the device from power.

- or -

- Ensure that the atmosphere is explosion-free (hot work permit).

WARNING

Humid environment

Risk of electric shock.

- Avoid working on the device when it is energized.
- If working on an energized device is necessary, ensure that the environment is dry.
- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

9.3.1 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.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

9.3.2 Part replacement

If the antenna, lens, secondary O-ring, and spring washers require replacement due to damage or failure, they may be replaced without the need for re-calibration if of the same type and size.

Replacing the antenna

Changing to a different antenna type may be performed by a Siemens authorized repair center or personnel.

If the electronics or enclosure require replacement due to damage or failure, please ensure the correct antenna version is used, otherwise a re-calibration will need to be performed by Siemens authorized personnel.

Replacing the lens

1. Remove existing lens by turning it counter-clockwise until it separates from the unit.
2. Replace the O-ring between the lens and process connection with a new one.
3. Carefully thread the replacement lens, and turn it clockwise until resistance is encountered.
   Do not over-tighten the lens, as this will permanently damage it.
4. For flange installation instructions, see Flanged versions (Page 33).

Note

After installation of the new lens onto the flanged encapsulated antenna version and before mounting on the vessel/tank, some lenses may not appear to lie flush on the device, but this is normal and will not impact performance.

Raised-Face flange kits

Description	Process connection size	Part number
Replacement TFM™ 1600 PTFE Lens and Spring Washer Kit for ASME B16.5 Class 150 raised faced	2"	A5E32462817
	3"	A5E32462819
	4"	A5E32462820
	6"	A5E32462821
Replacement TFM™ 1600 PTFE Lens and Spring Washer Kit for JIS B 2220 10K raised Face	50A	A5E32462822
	80A	A5E32462823
	100A	A5E32462824
	150A	A5E32462825
Replacement TFM™ 1600 PTFE Lens and Spring Washer Kit for EN 1092-1 PN10/16 type B1 raised face	DN50	A5E32462826
	DN80	A5E32462827
	DN100	A5E32462828
	DN150	A5E32462829

Spare part kits

Description	Process connection size	Part number
ISO2852, Hygienic encapsulated antenna Lens and silicon O-ring	2"	A5E32572731
	3"	A5E32572745
	4"	A5E32572747
DIN11851, Hygienic encapsulated antenna Lens and silicon O-ring	DN50	A5E32572758
	DN80	A5E32572770
	DN100	A5E32572772
DIN11864-1, Hygienic encapsulated antenna Lens and silicon O-ring	DN50	A5E32572773
	DN80	A5E32572779
	DN100	A5E32572782
DIN11864-2/3, Hygienic encapsulated antenna Lens and silicon O-ring	DN50	A5E32572785
	DN80	A5E32572790
	DN100	A5E32572791
Tuchenhagen, Hygienic encapsulated antenna Lens and silicon O-ring	Type F	A5E32572794
	Type N	A5E32572795

Note

For more information about accessories such as clamps, seals and process connections, please see the catalog on the product page (http://www.siemens.com/LR250) (http://www.siemens.com/LR250).

9.4 Disposal

Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE).

Devices can be returned to the supplier within the EC, or to a locally approved disposal service for eco-friendly recycling. Observe the specific regulations valid in your country.

Further information about devices containing batteries can be found at: Information about battery / product return (WEEE) (https://support.industry.siemens.com/cs/document/109479891/)

9.5 Return procedure

Enclose the bill of lading, return document and decontamination certificate in a clear plastic pouch and attach it firmly to the outside of the packaging.

Required forms

- Delivery note
- Return goods delivery note (http://www.siemens.com/processinstrumentation/returngoodsnote)

  with the following information:

  – Product (item description)

  – Number of returned devices/replacement parts

  – Reason for returning the item(s)
- Decontamination declaration (http://www.siemens.com/sc/declarationofdecontamination)

  With this declaration you warrant "that the device/replacement part has been carefully cleaned and is free of residues. The device/replacement part does not pose a hazard for humans and the environment."

  If the returned device/replacement part has come into contact with poisonous, corrosive, flammable or water-contaminating substances, you must thoroughly clean and decontaminate the device/replacement part before returning it in order to ensure that all hollow areas are free from hazardous substances. Check the item after it has been cleaned.

  Any devices/replacement parts returned without a decontamination declaration will be cleaned at your expense before further processing.

Diagnosing and troubleshooting 10

10.1 Communication troubleshooting

1. Check the following:
   - There is power at the device.
   - The LCD shows the relevant data.
   - The device can be programmed using the handheld programmer.
   - If any fault codes are being displayed see Acyclic Extended Diagnostics (General Fault Codes) (Page 254) 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.

Symptom	Corrective action
The device cannot be programmed via the handheld programmer.	• Make sure **Write Protection (6.2.1.)** is set to the unlock value.
You try to set a SITRANS LR250 parameter via remote communications but the parameter remains unchanged.	• Ensure **Remote Lockout (6.1.1.)** is disabled. • Ensure **Write Protection (6.2.1.)** is set to the unlock value. • See Resetting the PROFIBUS address to 126 (Page 85) 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 (Page 160) for possible causes and corrective action.
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 LR250. • Check the network to ensure the PLC is communicating with the LR250.

If you continue to experience problems go to our website and check the FAQs for SITRANS LR250:

Product page (http://www.siemens.com/LR250), or contact your Siemens representative.

10.2 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
	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

10.3 General fault codes

Note

- 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 (Fault 52). These are indicated with an asterisk (*).

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 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.
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.
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.

Code/ Icon		Meaning	Corrective Action
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 SIMATIC 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.
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.

Code/ Icon		Meaning	Corrective Action
S: 33 	*	Factory calibration for the internal temperature sensor has been lost.	Repair required: contact your local Siemens representative.
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.	Repair required: contact your local Siemens representative.
S: 37 	*	Measurement hardware problem.	Repair required: contact your local Siemens representative.
S: 38 	*	Microwave module hardware failure: unable to calculate distance measurement.	Repair required: contact your local Siemens representative.
S: 43 	*	Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.

10.4 Operation troubleshooting

Operating symptoms, probable causes, and resolutions.

Symptom	Cause	Action
Display shows  S: 0 LOE	level or target is out of range	• check specifications • check **Low Calibration Pt. (1.6.)** • increase **Confidence (2.5.9.1.)**
Display shows  S: 0 LOE	material build-up on antenna	• clean the antenna • re-locate SITRANS LR250
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 (Page 220) • ensure Auto False Echo 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 LR250 processing wrong echo, for example, vessel wall, or structural member	• re-locate SITRANS LR250 • check nozzle for internal burrs or welds • rotate device 90° • use **Auto False Echo Suppression (2.5.10.1.)** • if necessary: see Auto False Echo Suppression (Page 220)
Measurement is consistently off by a constant amount	• setting for **Low Calibration Point (2.3.7.1.)** not correct • setting for **Sensor Offset (2.3.7.3.)** not correct	• check distance from sensor reference point to **Low Calibration Point (2.3.7.1.)** • check **Sensor Offset (2.3.7.3.)**
Screen blank	power error	• check nameplate rating against voltage supply • check power wiring or source
	too much load resistance	• change barrier type, or • remove something from the loop, or • increase supply voltage • reduce wire distance or use larger gage wire
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

Symptom	Cause	Action
	liquid surface vortexed	• decrease **Fill Rate (2.3.8.2..)** • relocate device to side pipe • increase confidence threshold in **Echo Threshold (2.5.7.3.)**
	material filling	• Re-locate SITRANS LR250
Reading response slow	**Fill Rate (2.3.8.2.)** setting 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 actual 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 LR250 • ensure **Algorithm (2.5.7.1.)** is set to t**F** (First 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 **Propogation Factor (2.5.3.)** for recommended settings

Technical data

11

Note

Device specifications

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

11.1 Power

⚠	General Purpose: Intrinsically Safe: Non-Sparking: Non-incendive:

Bus powered	Per IEC 61158-2 (PROFIBUS PA)
Current consumed	15 mA

11.2 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 a (86000 to 106000 N/m^2 a)
Interference reflections	minimum 20 dB lower than the main target reflections

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

Maximum measured error	=3 mm (0.12")[1) 2) 3)] including hysteresis and non-repeatability	
Frequency	K-band	
Maximum measurement range[4)]	1.5" antenna	10 m (32.8 ft)[5)]
	2" threaded PVDF antenna	
	2"/DN50/50A Flanged encapsulated antenna (FEA)	
	2", ISO 2852, DN50 DIN11864-1/2/3, DN50 DIN11851,Tuchenhagen Types F and N Hygienic encapsulated antenna (HEA)	
	all other versions	20 m (65.6 ft)
Minimum detectable distance	50 mm (2") from end of antenna[6)]	
Update time[7)]	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 (average over full temperature range, referenced to maximum range)	
Long-term stability	<0.1 % over 60 months	
Dielectric constant of material measured	dK > 1.6 [antenna and application dependent[8)]]	
Memory	non-volatile EEPROM	
	no battery required	

[1)] The statistical accuracy is typically 3 mm (0.12") 90% of the time, when tested in accordance with IEC 60770-1.

[2)] Under severe EMI/EMC environments per IEC 61326-1 or NAMUR NE21, the device error may increase to a maximum of 10 mm (0.4").

[3)] For 2" threaded PVDF antenna, Flanged encapsulated antennas and Hygienic encapsulated antennas, the maximum measured error <500 mm from the sensor reference point =25 mm (1").

[4)] From sensor reference point: see Dimension drawings (Page 171) and Flanged Horn with extension (Page 178).

[5)] 20 m (65.6 ft) possible in a stillpipe/bypass

[6)] Minimum range is antenna length +50 mm (2"). See Dimension drawings (Page 171).

[7)] Reference conditions: **Response Rate (2.4.1.)** set to **FAST, LCD Fast Mode (4.9.)** set to **ON**.

[8)] For 1.5" (40 mm) antenna and 2" (50 mm) threaded PVDF antenna, 2"/DN50/50A flanged encapsulated antenna, and 2" ISO 2852, DN50 DIN 11864-1/2/3, DN50 DIN11851, Tuchenhagen Types F and N hygienic encapsulated antenna the minimum dK is limited to 3 unless a stillpipe is used.

See Flanged horn antenna (Page 176).

See Flanged encapsulated antenna (3"/DN80/80A sizes and larger) (Page 182).

See Hygienic encapsulated antenna (2" ISO 2852 sanitary clamp) (Page 184).

11.3 Interface

Communication	PROFIBUS PA	
Configuration	Remote	Siemens SIMATIC PDM
	Local	Siemens infrared handheld programmer
	Display (local)[1)]	graphic LCD, with bar graph representing level

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

11.4 Mechanical

Process connection:	Threaded connection	1.5" NPT (ASME B1.20.1), R (BSPT, EN 10226-1) [a)] or G (BSPP, EN ISO 228-1) or 2" NPT (ASME B1.20.1), R (BSPT, EN 10226-1) or G (BSPP, EN ISO 228-1) or 3" NPT (ASME B1.20.1), R (BSPT, EN 10226-1) or G (BSPP, EN ISO 228-1)	
	Flange connection (flat-face) Materials	2, 3, 4" (ASME 150 lb, 300 lb) DN50, DN80, DN100 (PN10/16, PN25/40) 50A, 80A, 100A (JIS 10K) 316L /1.4404 or 316L /1.4435 stainless steel	
	Flange connection (raised face) Materials	2, 3, 4" (ASME 150 lb, 300 lb) DN50, DN80, DN100, DN150 (PN10/16, PN25/40) 1.4404 or 1.4435 stainless steel, optional Alloy N06022/2.4602 (Hastelloy®C-22 or equivalent)	
	Flanged encapsulated antenna (FEA) connection (raised face) Materials	2, 3, 4, 6" (ASME 150 lb); DN50, DN80, DN100, DN150 (PN10/16); 50A, 80A, 100A, 150A (JIS 10K) 316L /1.4404 or 316L /1.4435 stainless steel	
	Hygienic encapsulated antenna (HEA) connection Materials	ISO 2852 (2, 3, 4") DIN 11851 (DN50, DN80, DN100) DIN 11864-1/2/3 (DN50, DN80, DN100) Tuchenhagen (Type F [50 mm] and Type N [68 mm]) 316L /1.4404 or 316L /1.4435 stainless steel	
		ISO 2852 (2, 3, 4") DIN 11864-3 (DN50, DN80, DN100)	clamp: 304/1.4301 stainless steel
		Tuchenhagen (Type F [50 mm] and Type N [68 mm]) 316L /1.4404 or 316L /1.4435 stainless steel	clamp: 304/1.4301 stainless steel nut connection: 303/1.4305 stainless steel
		DIN 11851/11864-1 (DN50, DN80, DN100)	captive slotted nut connection: 304L/1.4307
		DIN 11864-2 (DN50, DN80, DN100)	mounting nuts and bolts: 304/1.4301 stainless steel

Antenna:	Horn Materials	standard 1.5" (40 mm), 2" (50 mm), 3" (80 mm), and 4" (100 mm) horn, optional 100 mm (4") horn extension 316L stainless steel with PTFE emitter optional Alloy N06022/2.4602 (Hastelloy®C-22 or equivalent) with PTFE emitter
	Threaded PVDF antenna Wetted materials	2" (50 mm) PVDF (Polyvinylidene fluoride)
	Flanged encapsulated antenna Wetted materials	316L /1.4404 or 316L /1.4435 stainless steel TFM™ 1600 PTFE lens
	Hygienic encapsulated antenna Wetted material	316L/1.4404 or 316L/1.4435 stainless steel TFM™ 1600 PTFE (plus chosen seal)
Enclosure	Construction	aluminum, polyester powder-coated
	Conduit entry	2 x M20x1.5, or 2 x ½" NPT
	Ingress protection	Type 4X/NEMA 4X, Type 6/NEMA 6, IP67, IP68
Weight (excluding extensions):	1.5" threaded connection with 1.5" horn antenna	approximately 5.1kg (11.2 lb)
	2" threaded connection with 2" horn antenna	approximately 5.5 kg (12.1 lb)
	3" threaded connection with 3" horn antenna	approximately 7.0 kg (15.4 lb)
	2" threaded PVDF antenna	approximately 3.3 kg (7.3 lb)
	DN50 PN10/16 or 2" 150 lb flat-face flange with 2" horn antenna	approximately 8 kg (17.6 lb)
	DN100 PN25/40 or 4" ASME 300 lb flat-face flange with 4" horn antenna	approximately 17.4 kg (38.3 lb)
	DN50 PN10/16 raised-face flange with 2" horn antenna	approximately 6 kg (13.2 lb)
	DN100 PN25/40 raised-face flange with 4" horn antenna	approximately 11.3 kg (24.9 lb)
	2" ASME 150 lb FEA	approximately 7.0 kg (15.4 lb)
	3" ASME 150 lb FEA	approximately 10.7 kg (23.6 lb)
	4" ASME 150 lb FEA	approximately 13.1 kg (28.9 lb)
	6" ASME 150 lb FEA	approximately 17.7 kg (39 lb)
	DN50 PN10/16 FEA	approximately 7.1 kg (15.7 lb)
	DN80 PN10/16 FEA	approximately 10.1 kg (22.3 lb)
	DN100 PN10/16 FEA	approximately 11.1 kg (24.5 lb)
	DN150 PN10/16 FEA	approximately 15.9 kg (35.1 lb)
	50 A JIS 10K FEA	approximately 6.5 kg (14.3 lb)
	80 A JIS 10K FEA	approximately 9 kg (19.8 lb)
	100 A JIS 10K FEA	approximately 10.1 kg (22.3 lb)
	150 A JIS 10K	approximately 16.3 kg (35.9 lb)
	2" ISO2852 HEA	approximately 4.7 kg (10.4 lb)

	3" ISO2852 HEA	approximately 6.3 kg (13.9 lb)
	4" ISO2852 HEA	approximately 6.8 kg (15 lb)
	DN50 DIN 11864-1 HEA	approximately 4.8 kg (10.6 lb)
	DN80 DIN 11864-1 HEA	approximately 6.7 kg (14.8 lb)
	DN100 DIN 11864-1 HEA	approximately 7.1 kg (15.7 lb)
	DN50 DIN 11864-2 HEA	approximately 5.0 kg (11 lb)
	DN80 DIN 11864-2 HEA	approximately 7.2 kg (15.9 lb)
	DN100 DIN 11864-2 HEA	approximately 7.9 kg (17.4 lb)
	DN50 DIN 11864-3 HEA	approximately 4.8 kg (10.6 lb)
	DN80 DIN 11864-3 HEA	approximately 6.6 kg (14.6 lb)
	DN100 DIN 11864-3 HEA	approximately 7.2 kg (15.9 lb)
	DN50 DIN 11851 HEA	approximately 4.8 kg (10.6 lb)
	DN80 DIN 11851 HEA	approximately 6.8 kg (15 lb)
	DN100 DIN 11851 HEA	approximately 7.2 kg (15.9 lb)
	Tuchenhagen Type F HEA	approximately 4.8 kg (10.6 lb)
	Tuchenhagen Type N HEA	approximately 4.9 kg (10.8 lb)

[a] For use with 1.5" (40 mm) horn antennas only.

11.5 Environmental

Note

- For the specific configuration you are about to use or install, check transmitter nameplate and see Approvals (Page 168).
- Use appropriate conduit seals to maintain IP or NEMA rating.

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 above)
Installation category	I
Pollution degree	4

11.6 Process

Note

The maximum temperature is dependent on the process connection, antenna materials, and vessel pressure. For more detailed information see Maximum Process Temperature Chart (Page 224) and Process Pressure/Temperature derating curves (Page 225).

Temperature at process connection	Standard Horn antenna (Threaded or Flanged):	with FKM O-ring	−40 to +200 °C (−40 to +392 °F)
		with FFKM O-ring	−20 to +200 °C (−4 to +392 °F)
	2" NPT / BSPT / G Threaded PVDF antenna:		−40 to +80 °C (−40 to +176 °F)
	Flanged encapsulated antenna (FEA)		-40 to +170 °C (−40 to +338 °F)
	Hygienic encapsulated antenna (HEA)		-40 to +170 °C (−40 to +338 °F)
			with FKM seals used on process connection: -20 to +170 °C (-4 to +338 °F)
			with EPDM seals used on process connection: -40 to +120 °C (-40 to +248 °F)
Pressure (vessel)			Refer to process connection tag and Process Pressure/Temperature derating curves (Page 225).

11.7 Approvals

Note

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

Application type	LR250 version	Approval rating	Valid for:
Non-hazardous	General purpose	$CSA_{US/C}$, FM, CE, RCM	N. America, Europe
	Radio	Europe (RED), FCC, Industry Canada	
Hazardous	Intrinsically safe (Page 41)	ATEX II 1G, Ex ia IIC T4 Ga ATEX II 1D, Ex ia ta IIIC T100 °C Da	Europe
		IECEx SIR 05.0031X, Ex ia IIC T4 Ga Ex ia ta IIIC T100 °C Da	International
		FM/CSA Class I, Div. 1, Groups A, B, C, D Class II, Div. 1, Groups E, F, G Class III T4	US/Canada

Application type	LR250 version	Approval rating	Valid for:
		INMETRO DNV 12.0087 X Ex ia IIC T4 Ga Ex ia ta IIIC T100 °C Da IP65/IP67 -40 °C ≤ Ta ≤ +80 °C DNV #OCP 0017 ABNT NBR IEC 60079-0:2008, ABNT NBR IEC 60079-11:2009, ABNT NBR IEC 60079-26:2008, ABNT NBR IEC 60079-31:2011	Brazil
		NEPSI Ex ia IIC T4 Ga Ex iaD 20 T90 IP67 DIP A20 T_A 90 ºC	China
	Non-Sparking (Page 43)	ATEX II 3 G, Ex nA IIC T4 Gc	Europe
		NEPSI Ex nA IIC T4 Gc	China
	Non-incendive	FM/CSA Class I, Div. 2, Groups A, B, C, D T5	US/Canada
	Marine	Lloyd's Register of Shipping ABS Type Approval BV Type Approval	
Hygienic/Sanitary		EHEDG EL Class I EHEDG EL Class I Aseptic	International
		3-A Sanitary Standards	

11.8 Programmer (infrared keypad)

The 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 date of manufacture is encoded in the serial number. For example, the following was manufactured on March 5, 2016:

PBD/**H3050001**

H: year of manufacture (H is the alpha code referring to 2016; J refers to 2017 and so on).

3: month of manufacture

05: day of manufacture

0001: 4-digit sequential

Year 2010: Apha code = A	Year 2016: Apha code = H
Year 2011: Apha code = B	Year 2017: Apha code = J
Year 2012: Apha code = C	Year 2018: Apha code = K
Year 2013: Apha code = D	Year 2019: Apha code = L
Year 2014: Apha code = E	Year 2020: Apha code = M
Year 2015: Apha code = F	

Siemens Milltronics Infrared IS (Intrinsically Safe) Handheld Programmer for hazardous and all other locations (battery is non-replaceable).

Approvals	CE FM/CSA Class I, II, III, Div. 1, Gr. A to G T6 ATEX II 1GD Ex ia IIC T4 Ga Ex iaD 20 T135 °C IECEx Ex ia IIC T4 Ga Ex iaD 20 T135 °C INMETRO Ex ia IIC T4 Ga Ex ia IIIC T135 °C Da
Ambient temperature	−20 to +50 °C (−5 to +122 °F)
Interface	proprietary infrared pulse signal
Power	3 V non-replaceable lithium battery
Weight	150 g (0.3 lb)
Color	black
Part number	7ML1930-1BK

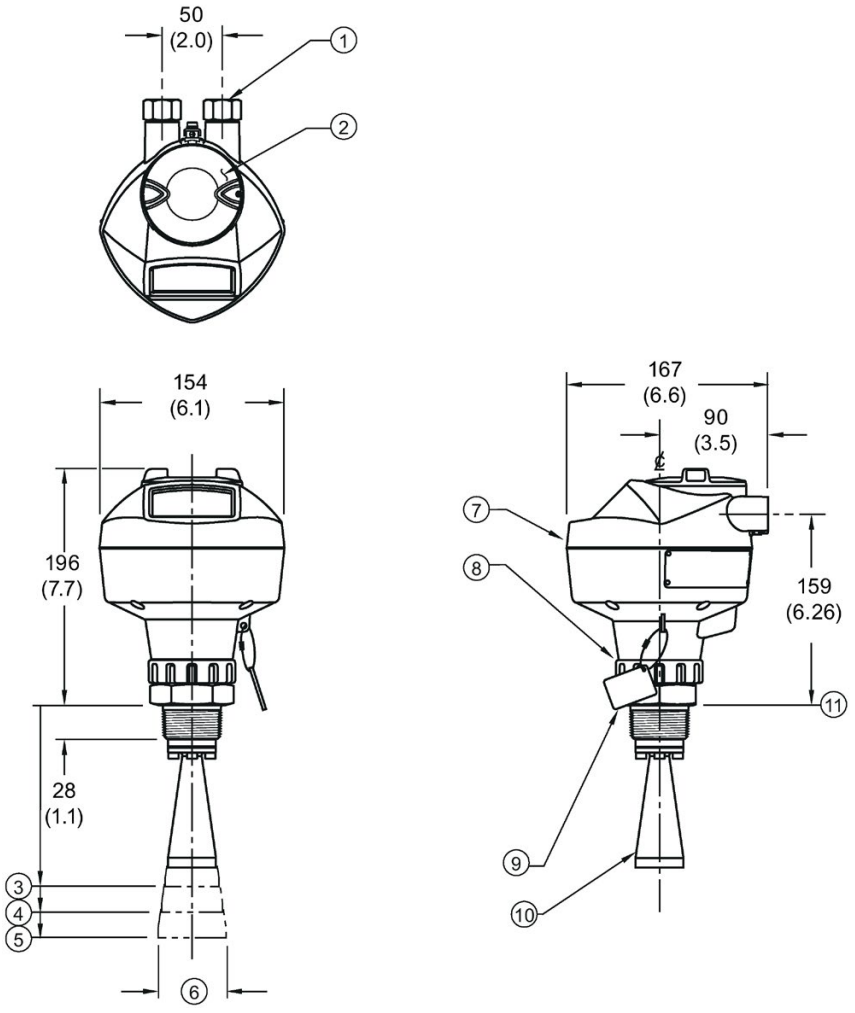
Dimension drawings

12

12.1 Threaded horn antenna

Note

- Process temperature and pressure capabilities are dependent upon information on the process connection tag. Reference drawing listed on the tag is available for download from our website under **Support/Installation drawings/Level Measurement/Continuous - Radar/LR250**:
  Product page (http://www.siemens.com/LR250)
- Process connection drawings are also available for download from the **Installation Drawings page**.
- Signal amplitude increases with horn diameter, so use the largest practical size.
- Optional extensions can be installed below the threads.



①	½" NPT cable entry, or M20 cable gland	⑦	enclosure/electronics
②	threaded cover	⑧	retaining collar
③	2" horn	⑨	process connection tag
④	3" horn	⑩	horn
⑤	4" horn	⑪	sensor reference point
⑥	horn O.D.		

Dimensions in mm (inch)

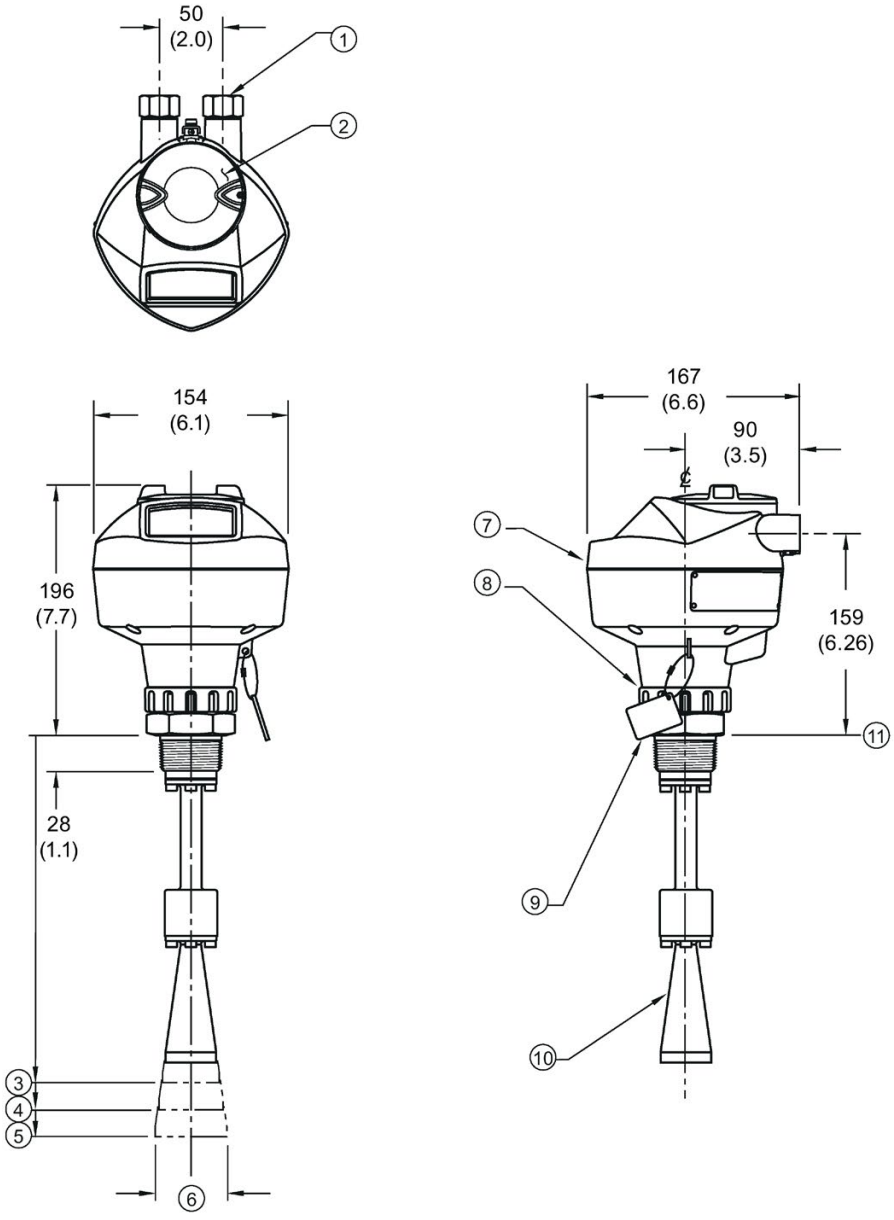
Threaded horn dimensions

Antenna Type	Antenna O.D., mm (inch)	Height to sensor reference point, mm (inch) [a]			Beam Angle (°)[b]	Measurement range, m (ft)
		1-1/2" threaded connection	2" threaded connection	3" threaded connection		
1.5"	39.8 (1.57)	135 (5.3)	N/A	N/A	19	10 (32.8)
2"	47.8 (1.88)	N/A	166 (6.55)	180 (7.09)	15	20 (65.6)
3"	74.8 (2.94)	N/A	199 (7.85)	213 (8.39)	10	20 (65.6)
4"	94.8 (3.73)	N/A	254 (10)	268 (10.55)	8	20 (65.6)

[a] Height from bottom of horn to sensor reference point as shown: see dimension drawing.

[b] -3dB in the direction of the polarization axis. For an illustration, see Polarization reference point (Page 29).

12.2 Threaded horn antenna with extension



①	½" NPT cable entry, or M20 cable gland	⑦	enclosure/electronics
②	threaded cover	⑧	retaining collar
③	2" horn	⑨	process connection tag
④	3" horn	⑩	horn
⑤	4" horn	⑪	sensor reference point
⑥	horn O.D.		

Dimensions in mm (inch)

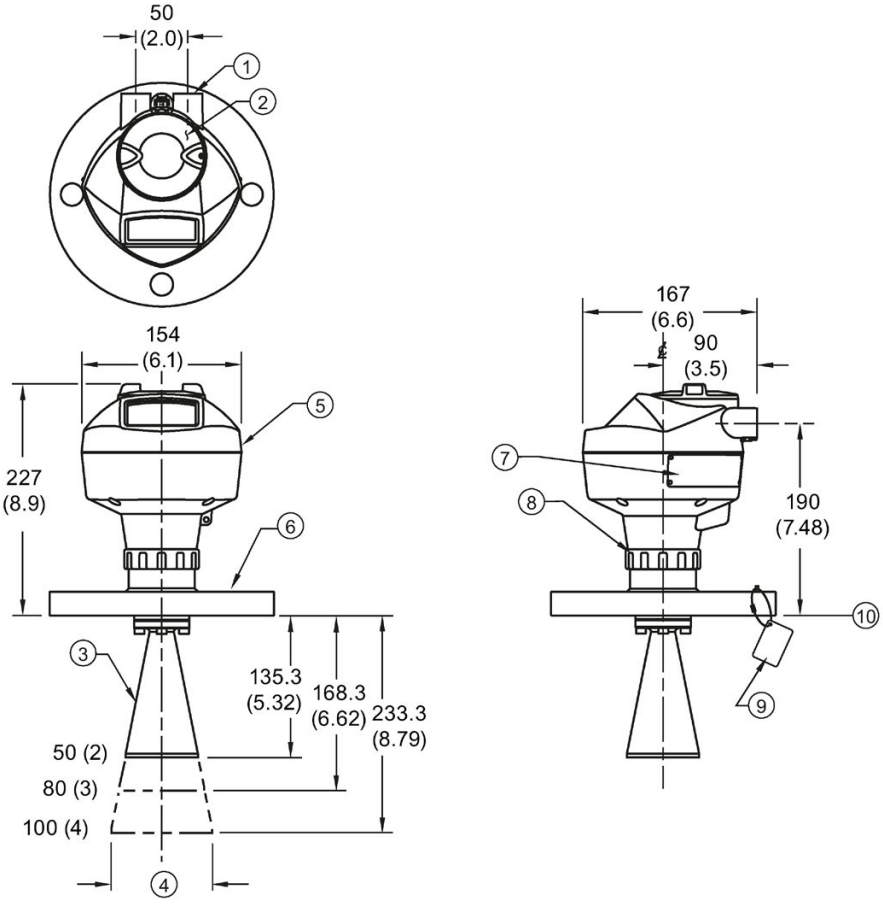
Threaded horn with extension dimensions

Antenna Type	Antenna O.D., mm (inch)	Height to sensor reference point, mm (inch) [a]			Beam Angle (°) [b]	Measurement range, m (ft)
		1-1/2" threaded connection	2" threaded connection	3" threaded connection		
1.5"	39.8 (1.57)	235 (9.25)	N/A	N/A	19	10 (32.8)
2"	47.8 (1.88)	N/A	266 (10.47)	280 (11.02)	15	20 (65.6)
3"	74.8 (2.94)	N/A	299 (11.77)	313 (12.32)	10	20 (65.6)
4"	94.8 (3.73)	N/A	354 (13.94)	368 (14.49)	8	20 (65.6)

[a] Height from bottom of horn to sensor reference point as shown: see dimension drawing.

[b] -3dB in the direction of the polarization axis. For an illustration, see Polarization reference point (Page 29).

12.3 Flanged horn antenna



①	½" NPT cable entry, or M20 cable gland	⑥	flange
②	threaded cover	⑦	name-plate
③	horn	⑧	retaining collar
④	horn O.D.	⑨	process connection tag
⑤	enclosure/electronics	⑩	sensor reference point

Dimensions in mm (inch)

Flanged Horn dimensions

Nominal horn size, mm (inch)	Horn O.D., mm (inch)	Height to sensor reference point, mm (inch)[a]		Beam angle (°)[b]	Measurement range, m (ft)
		Stainless steel flange: raised or flat-face	Optional alloy flange [c]		
50 (2)	47.8 (1.88)	135.3 (5.32)	138.3 (5.44)	15	20 (65.6)
80 (3)	74.8 (2.94)	168.3 (6.62)	171.3 (6. 74)	10	
100 (4)	94.8 (3.73)	223.3 (8.79)	226.3 (8.90)	8	

[a] Height from bottom of horn to sensor reference point as shown: see Flanged horn antenna with extension (Page 178). See also Raised-Face flange (Page 203), or Flat-Face flange (Page 209).

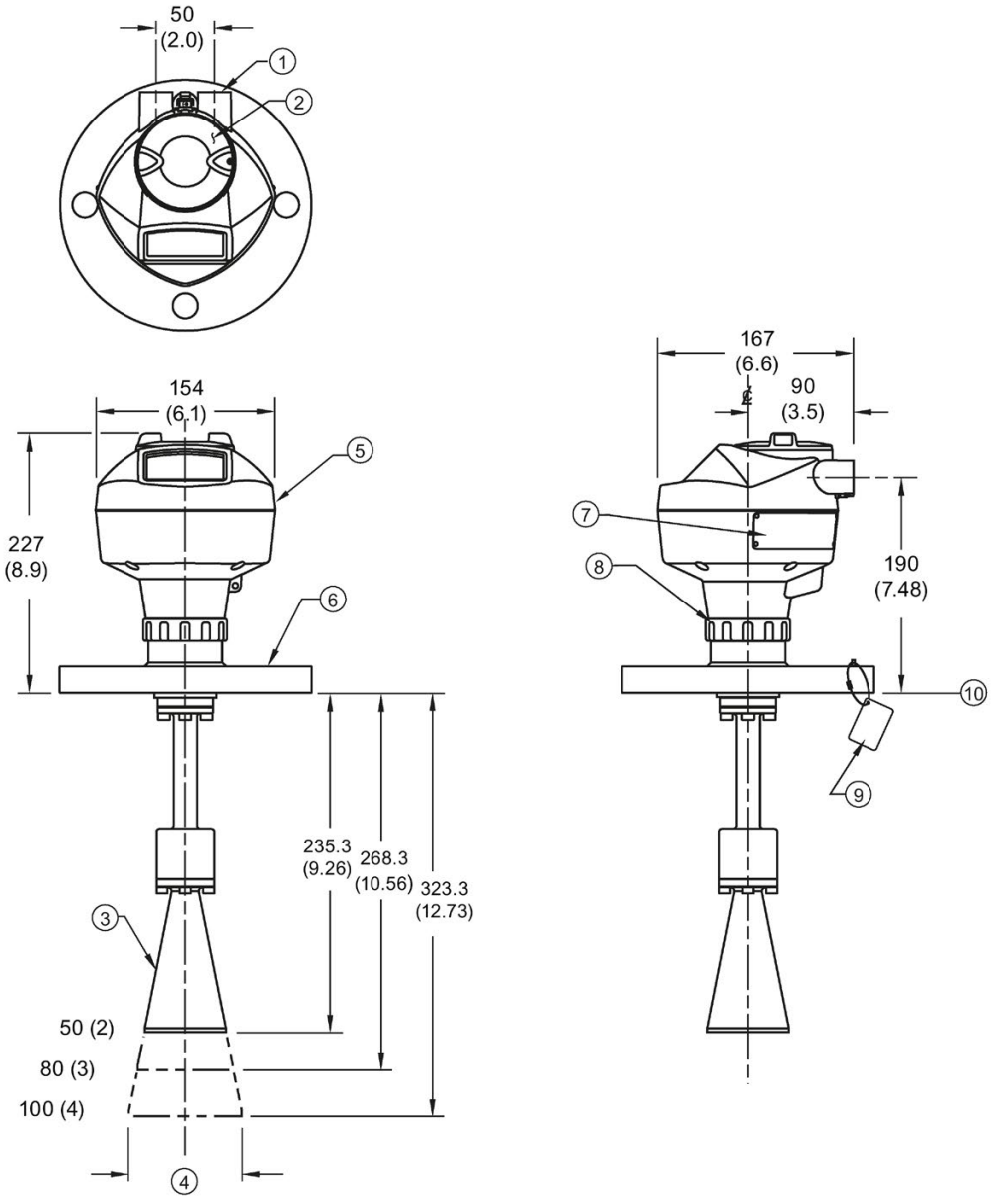
[b] -3dB in the direction of the polarization axis (see Polarization reference point (Page 29) for an illustration).

[c] Optional alloy N06022/2.4602 (Hastelloy® C-22 or equivalent). See Raised-Face Flange Dimensions (Page 203).

Note

Heights to sensor reference point are for stainless steel flanges. For optional alloy N06022/2.4602 (Hastelloy© C-22 or equivalent) see Flanged Horn dimensions above.

12.4 Flanged horn antenna with extension



①	½" NPT cable entry, or M20 cable gland	⑥	flange
②	threaded cover	⑦	name-plate
③	horn	⑧	retaining collar
④	horn O.D.	⑨	process connection tag
⑤	enclosure/electronics	⑩	sensor reference point

Dimensions in mm (inch)

Flanged horn with extension dimensions

Nominal horn size, mm (inch)	Horn O.D., mm (inch)	Height to sensor reference point, mm (inch) [a]		Beam angle (°)[b]	Measurement range, m (ft)
		Stainless steel flange: raised or flat-face	Optional alloy flange [c]		
50 (2)	47.8 (1.88)	235.3 (9.26)	238.3 (9.38)	15	20 (65.6)
80 (3)	74.8 (2.94)	268.3 (10.56)	271.3 (10.68)	10	
100 (4)	94.8 (3.73)	323.3 (12.73)	326.3 (12.85)	8	

[a] Height from bottom of horn to sensor reference point as shown: See also Raised-Face flange (Page 203) or Flat-Face Flange. (Page 209)

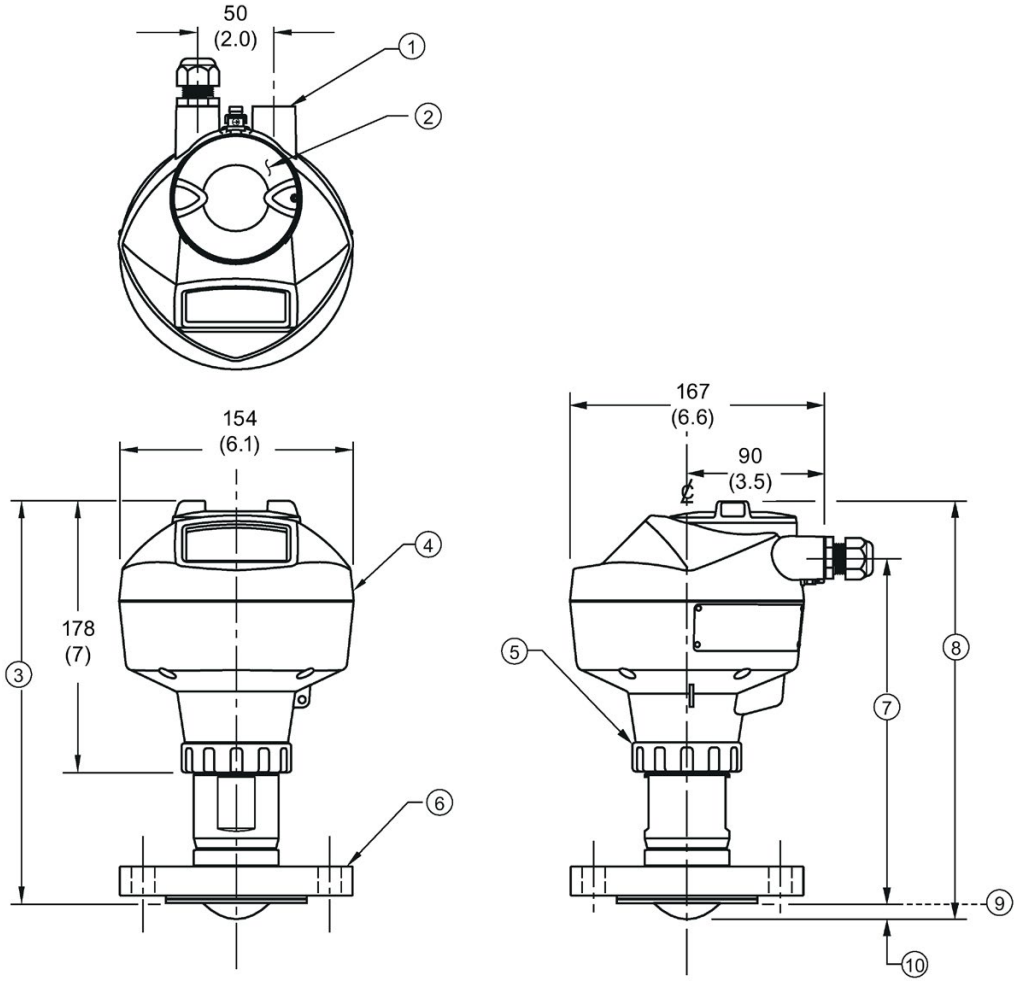
[b] -3dB in the direction of the polarization axis (see Polarization reference point (Page 29) for an illustration).

[c] Optional alloy N06022/2.4602 (Hastelloy® C-22 or equivalent). See Raised-Face flange (Page 203).

Note

Heights to sensor reference point are for stainless steel flanges. For optional alloy N06022/2.4602 (Hastelloy© C-22 or equivalent) see Flanged Horn dimensions above.

12.5 Flanged encapsulated antenna (2"/DN50/50A sizes only)



①	½" NPT cable entry, or M20 cable gland	⑥	flange
②	threaded cover	⑦	see table below
③	see table below	⑧	see table below
④	enclosure	⑨	sensor reference point
⑤	retaining collar	⑩	see table below

Dimensions in mm (inch)

Flanged encapsulated antenna (2"/DN50/50A) dimensions

Flange size	③ mm (inch)	⑦ mm (inch)	⑧ mm (inch)	⑩ mm (inch)[1]
2"/DN50/50A	263 (10.35)	223 (8.78)	274 (10.79)	11 (0.43)

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

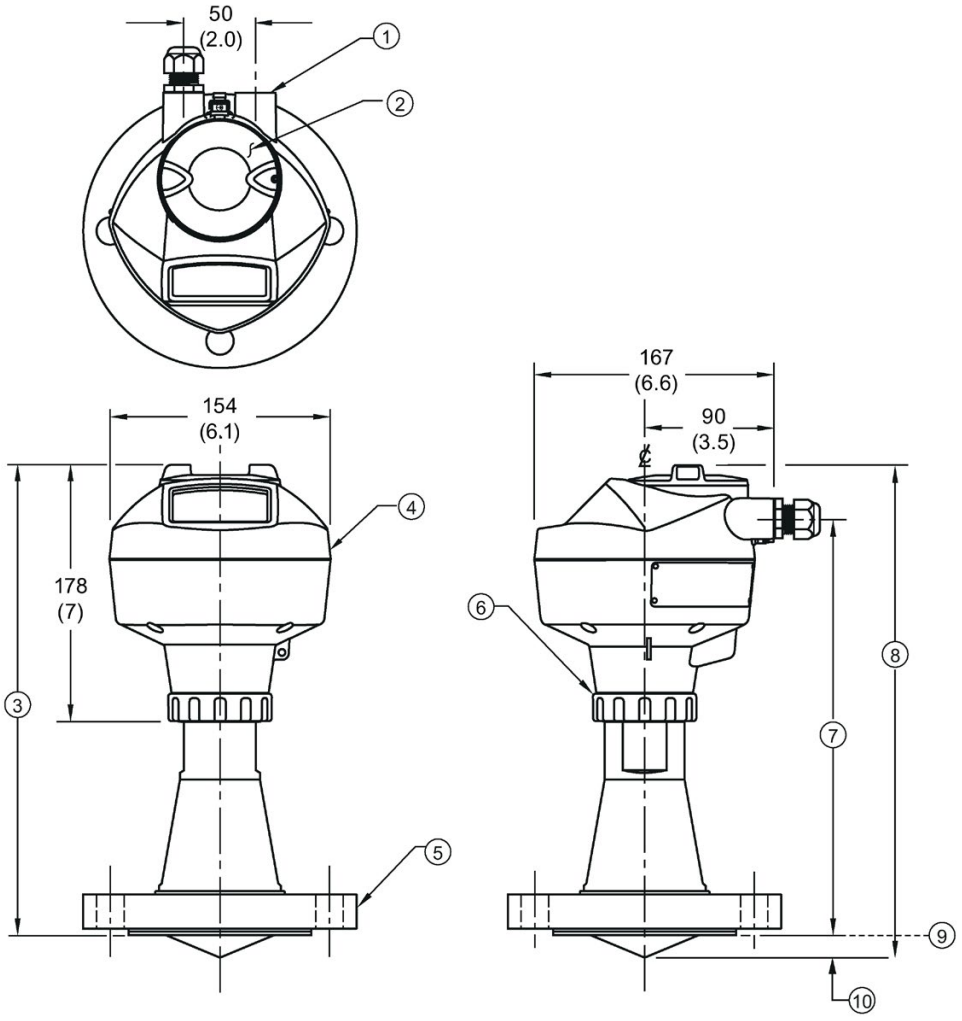
Flange size	Flange class	Flange O.D. [mm (inch)]	Antenna aperture size [mm (inch)]	Beam angle (°)[1]	Measurement range [m (ft)]
2"	150 LB	152 (5.98)	50 (1.97)	12.8	10 (32.8)[2]
DN50	PN10/16	165 (6.50)			
50A	10K	155 (6.10)			

[1] -3 dB in the direction of the polarization axis.

[2] 20m if installed in stillpipe

See Raised-Face Flange per EN 1092-1, (Page 206)and Polarization reference point (Page 29).

12.6 Flanged encapsulated antenna (3"/DN80/80A sizes and larger)



①	½" NPT cable entry, or M20 cable gland	⑥	retaining collar
②	threaded cover	⑦	see table below
③	see table below	⑧	see table below
④	enclosure	⑨	sensor reference point
⑤	flange	⑩	see table below

Dimensions in mm (inch)

Flanged encapsulated antenna (3"/DN80/80A and larger) dimensions

Flange size	③ mm (inch)	⑦ mm (inch)	⑧ mm (inch)	⑩ mm (inch)[1]
3"/DN80/80A	328 (12.91)	288 (11.34)	343 (13.50)	15 (0.59)
4"/DN100/100A	328 (12.91)	288 (11.34)	343 (13.50)	13 (0.51)
6"/DN150/150A	333 (13.11)	293 (11.54)	348 (13.70)	15 (0.59)

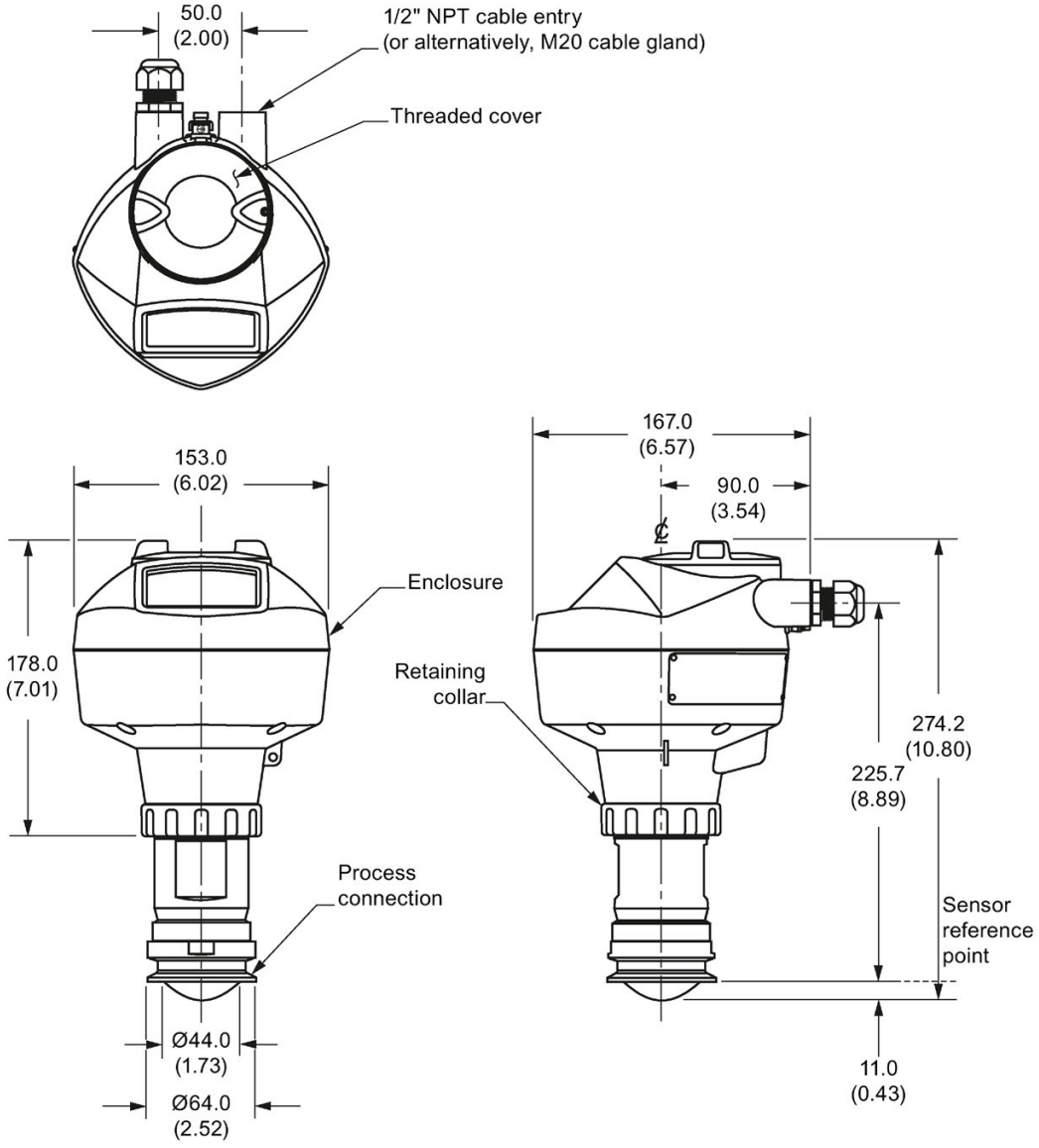
1) Height from tip of lens to sensor reference point as shown. See also Raised-Face Flange per EN 1092-1.

Flange size	Flange class	Flange O.D. [mm (inch)]	Antenna aperture size [mm (inch)]	Beam angle (°)[1]	Measurement range [m (ft)]
3"	150 LB	190 (7.48)	75 (2.95)	9.6	20 (65.6)
DN80	PN10/16	200 (7.87)			
80A	10K	185 (7.28)			
4"	150 LB	230 (9.06)	75 (2.95)	9.6	20 (65.6)
DN100	PN10/16	220 (8.66)			
100A	10K	210 (8.27)			
6"	150 LB	280 (11.02)	75 (2.95)	9.6	20 (65.6)
DN150	PN10/16	285 (11.22)			
150A	10K	280 (11.02)			

1) -3 dB in the direction of the polarization axis.

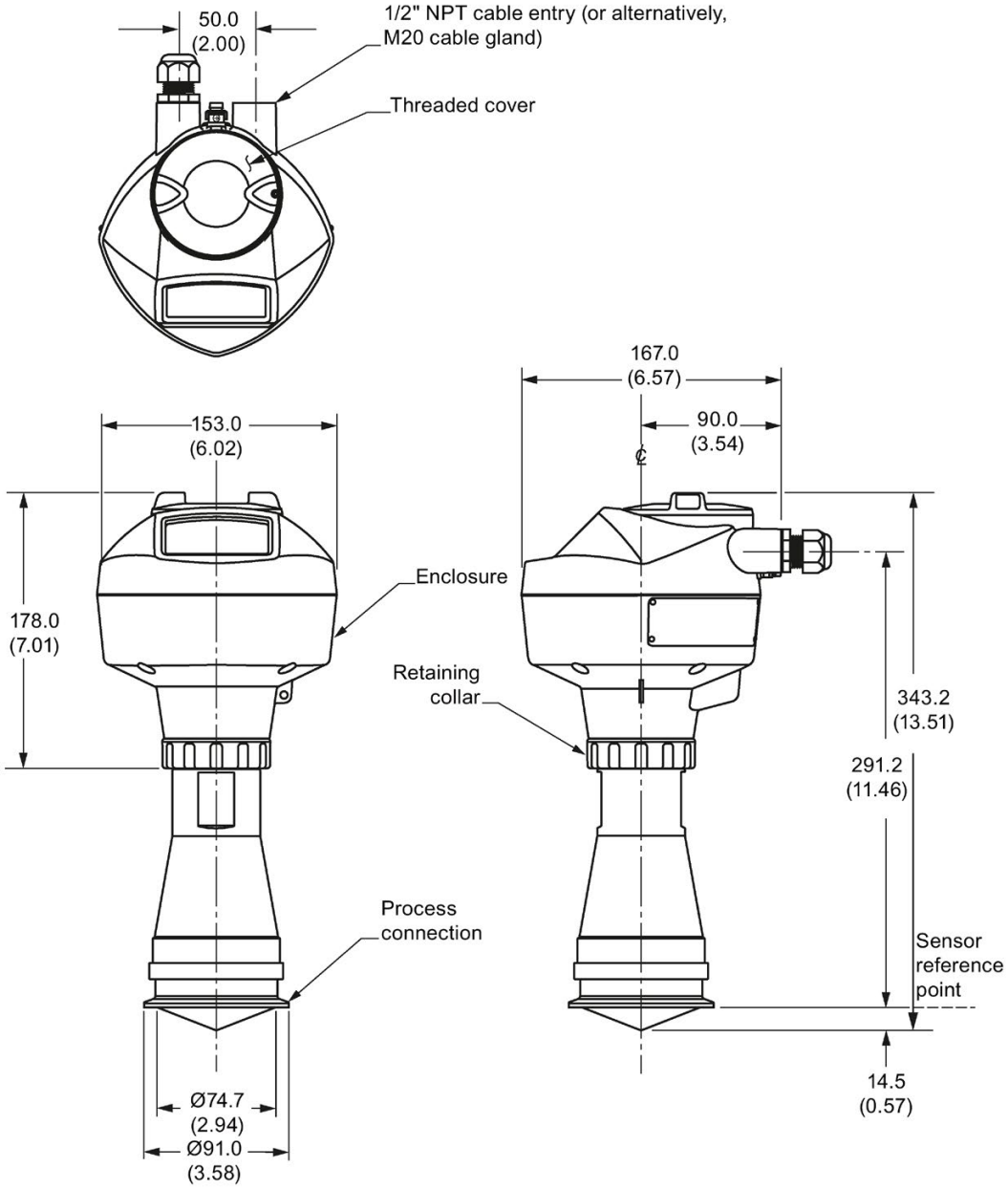
See Raised-Face Flange per EN 1092-1 (Page 206), and Polarization reference point (Page 29).

12.7 Hygienic encapsulated antenna (2" ISO 2852 sanitary clamp)



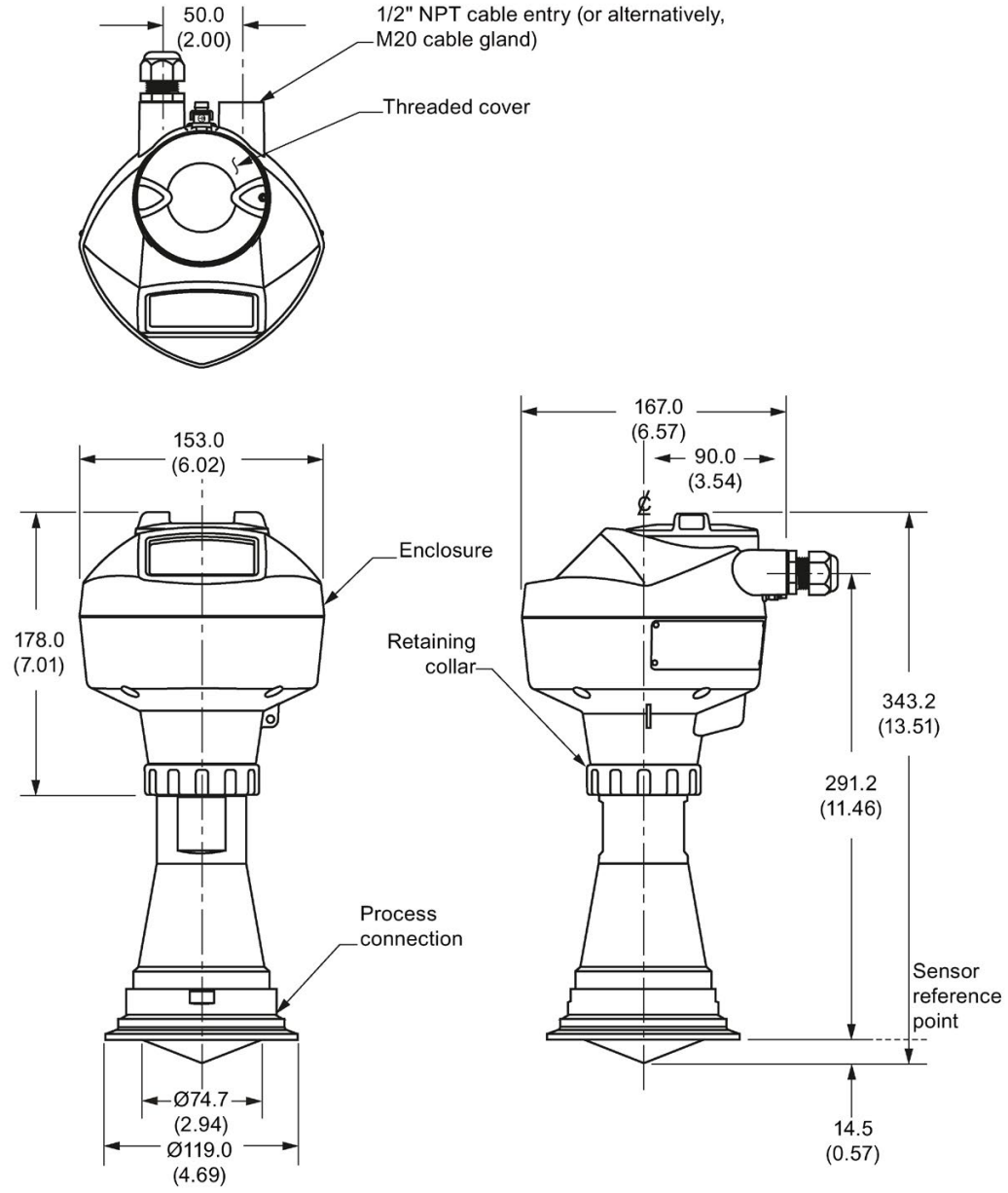
Dimensions in mm (inch)

12.8 Hygienic encapsulated antenna (3" ISO 2852 sanitary clamp)



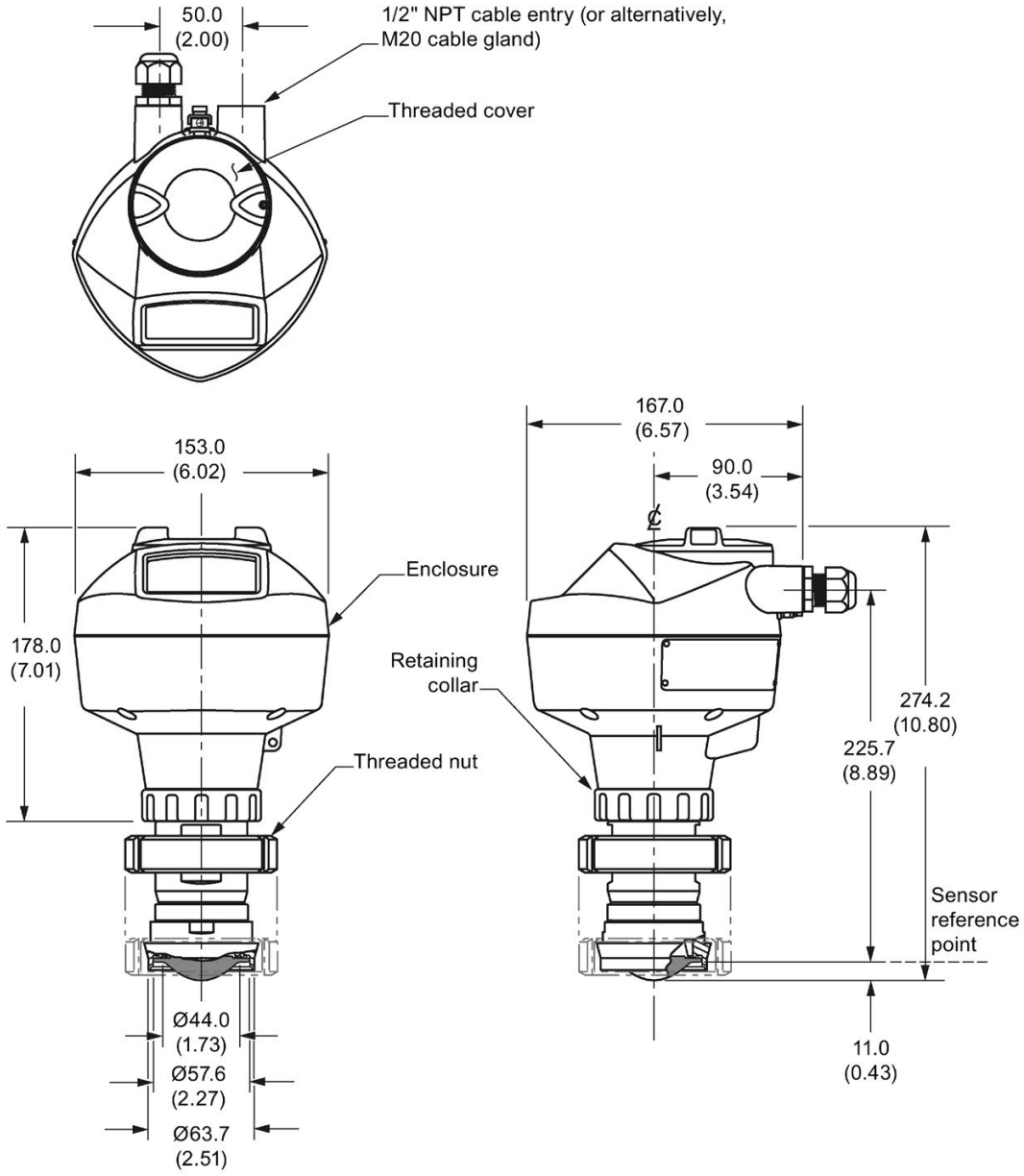
Dimensions in mm (inch)

12.9 Hygienic encapsulated antenna (4" ISO 2852 sanitary clamp)



Dimensions in mm (inch)

12.10 Hygienic encapsulated antenna (DN50 nozzle/slotted nut to DIN 11851)

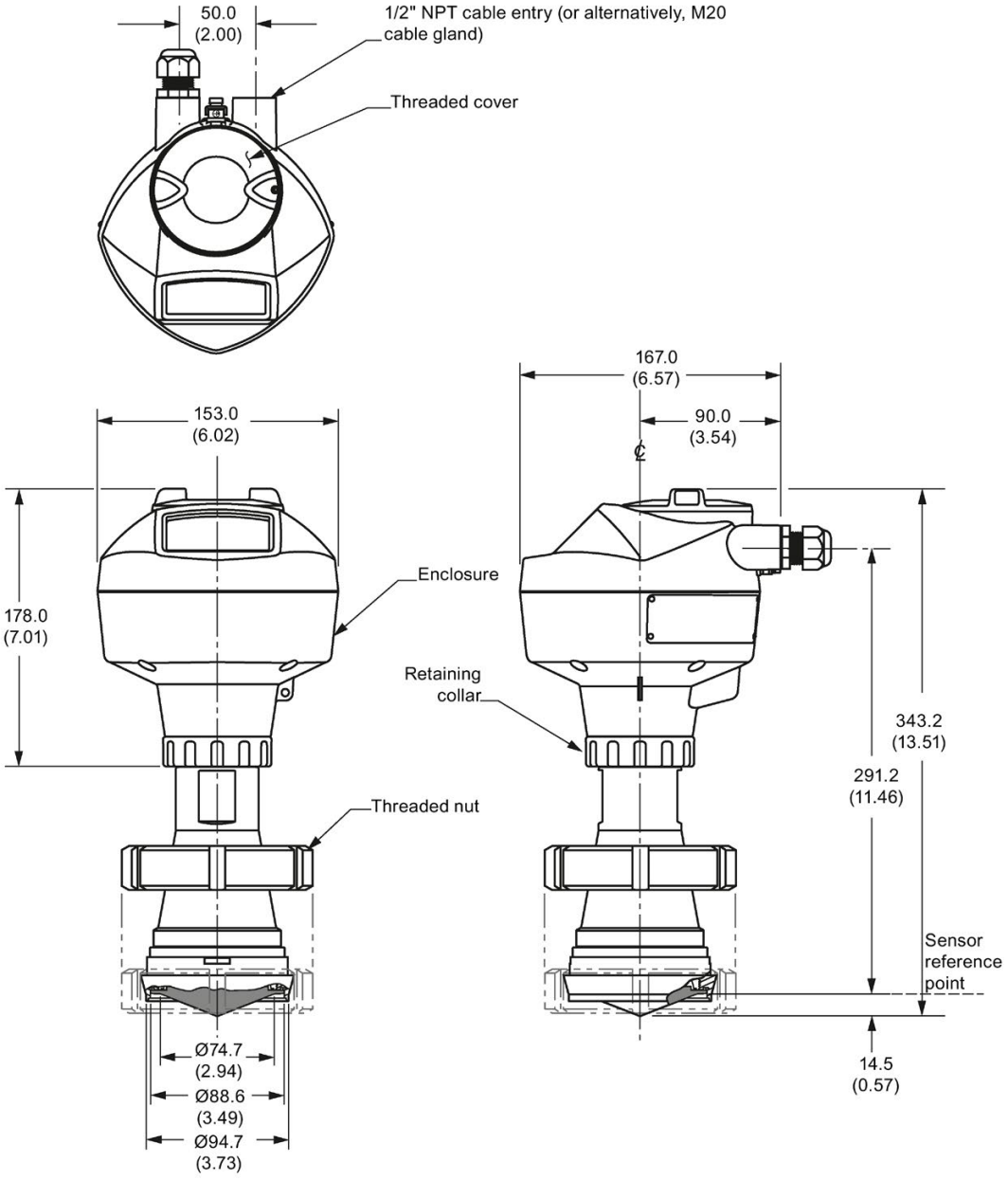


Dimensions in mm (inch)

Note

Cut out of process connection and placement of threaded nut are shown for illustration purposes only.

12.11 Hygienic encapsulated antenna (DN80 nozzle/slotted nut to DIN 11851)

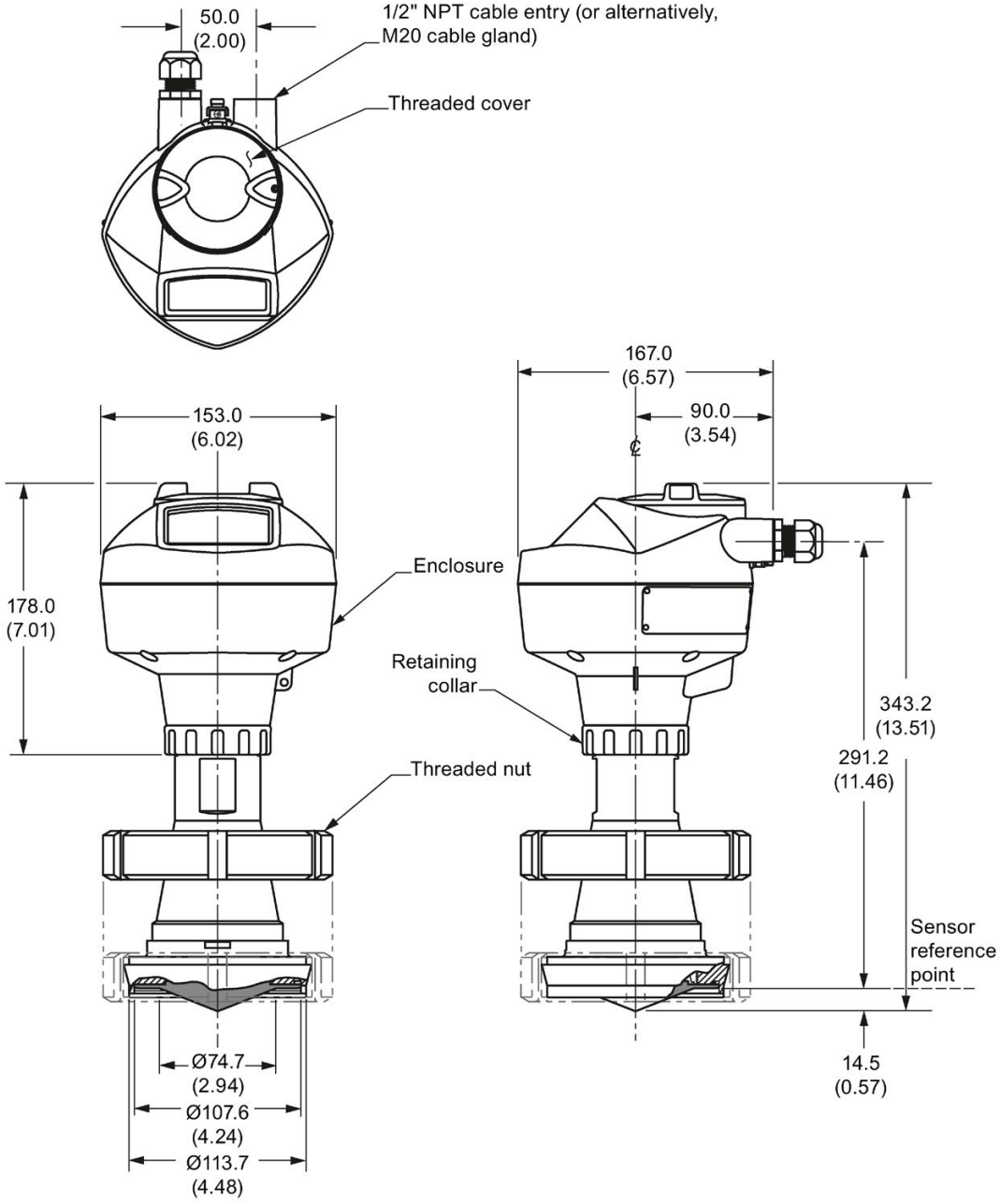


Dimensions in mm (inch)

Note

Cut out of process connection and placement of threaded nut are shown for illustration purposes only.

12.12 Hygienic encapsulated antenna (DN100 nozzle/slotted nut to DIN 11851)

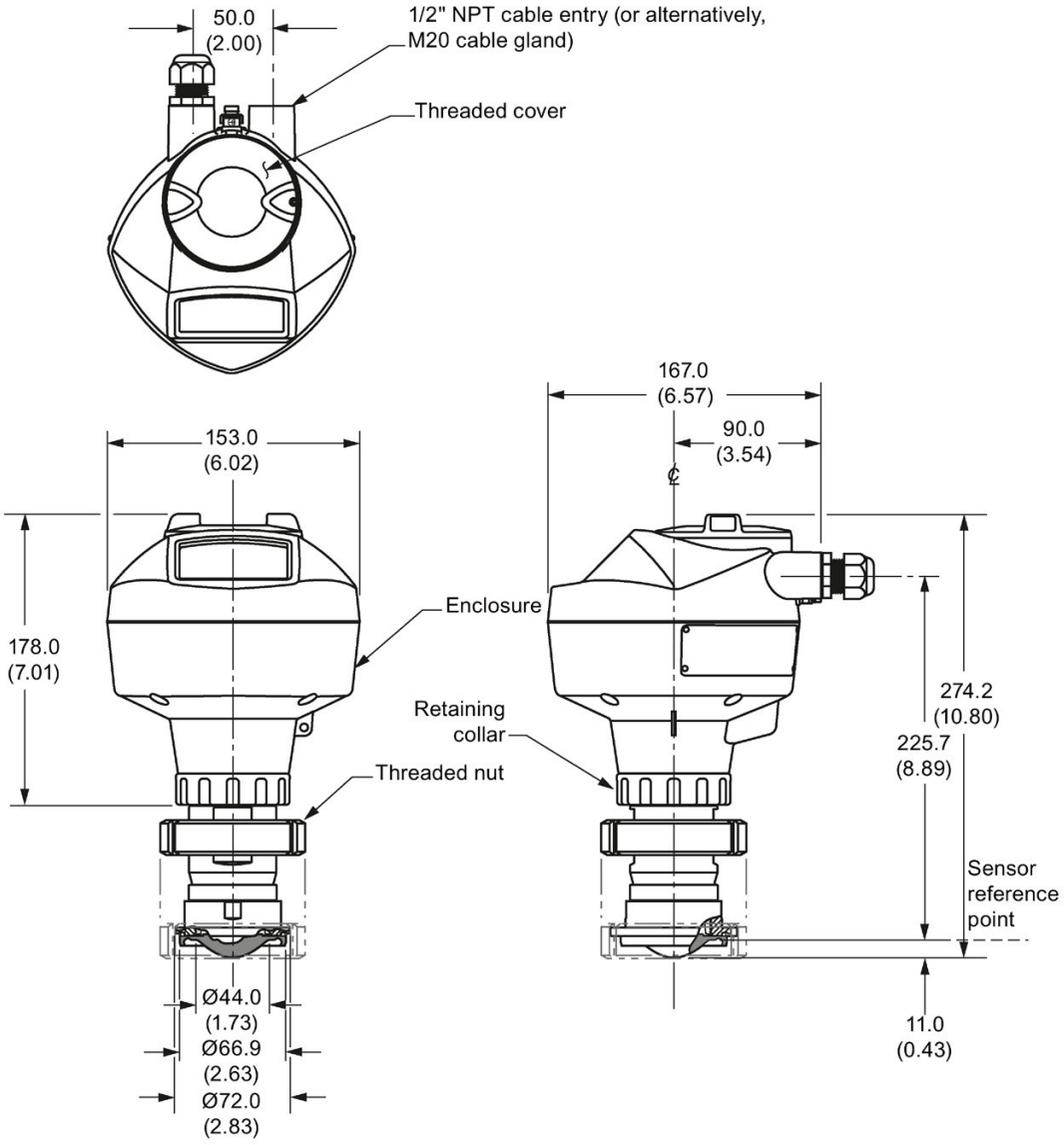


Dimensions in mm (inch)

Note

Cut out of process connection and placement of threaded nut are shown for illustration purposes only.

12.13 Hygienic encapsulated antenna (DN50 aseptic slotted nut to DIN 11864-1)

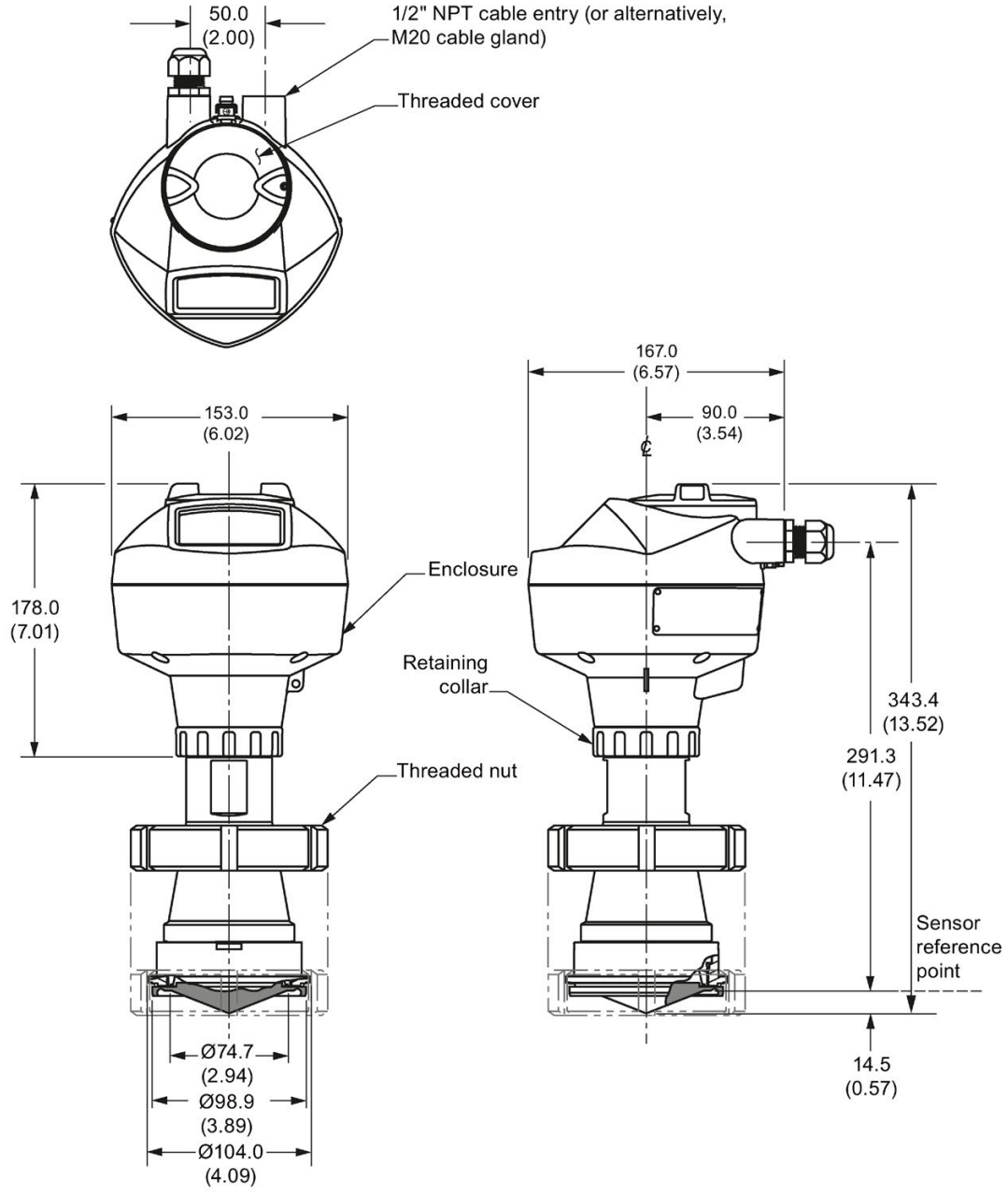


Dimensions in mm (inch)

Note

Cut out of process connection and placement of threaded nut are shown for illustration purposes only.

12.14 Hygienic encapsulated antenna (DN80 aseptic slotted nut to DIN 11864-1)

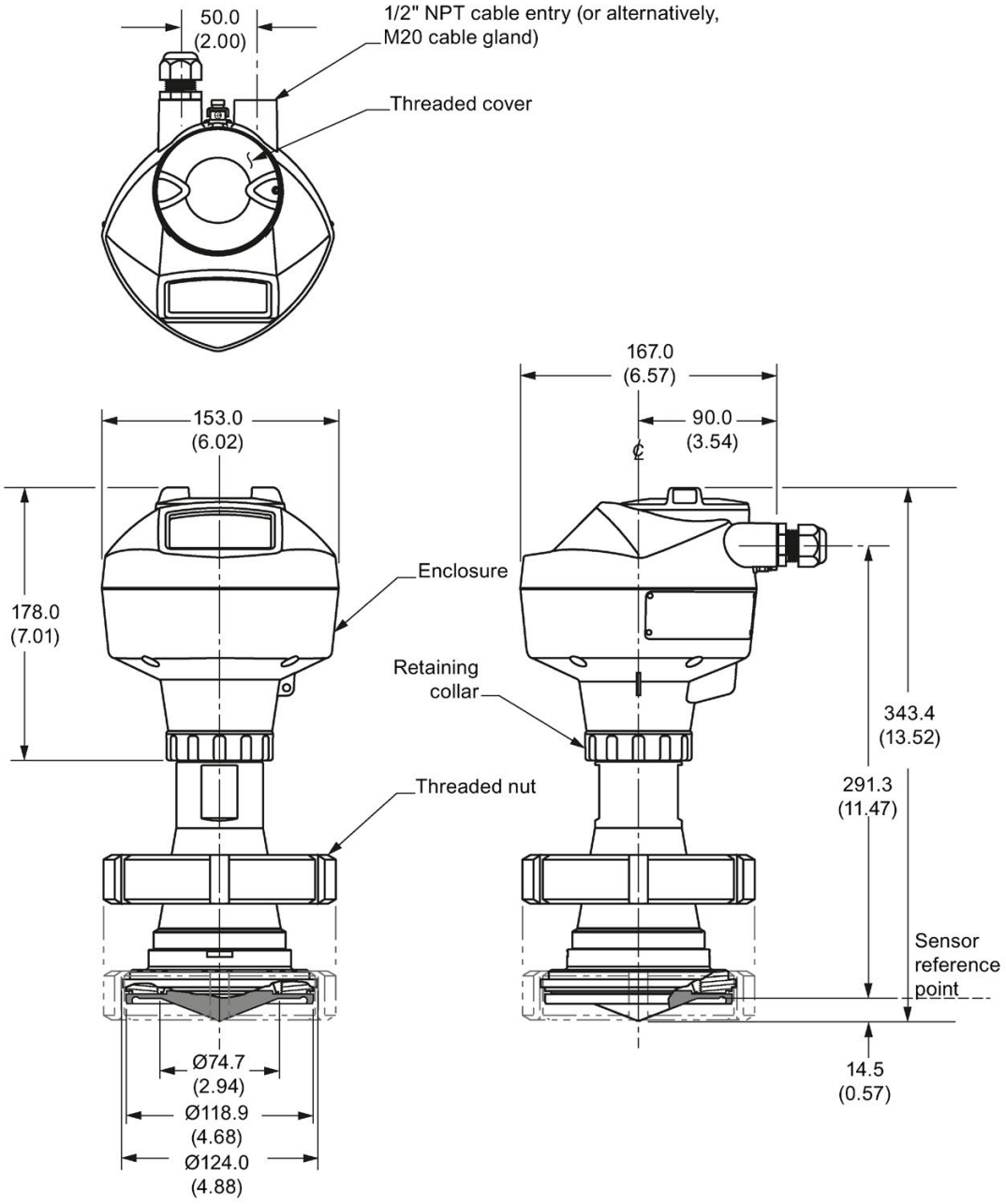


Dimensions in mm (inch)

Note

Cut out of process connection and placement of threaded nut are shown for illustration purposes only.

12.15 Hygienic encapsulated antenna (DN100 aseptic slotted nut to DIN 11864- 1)

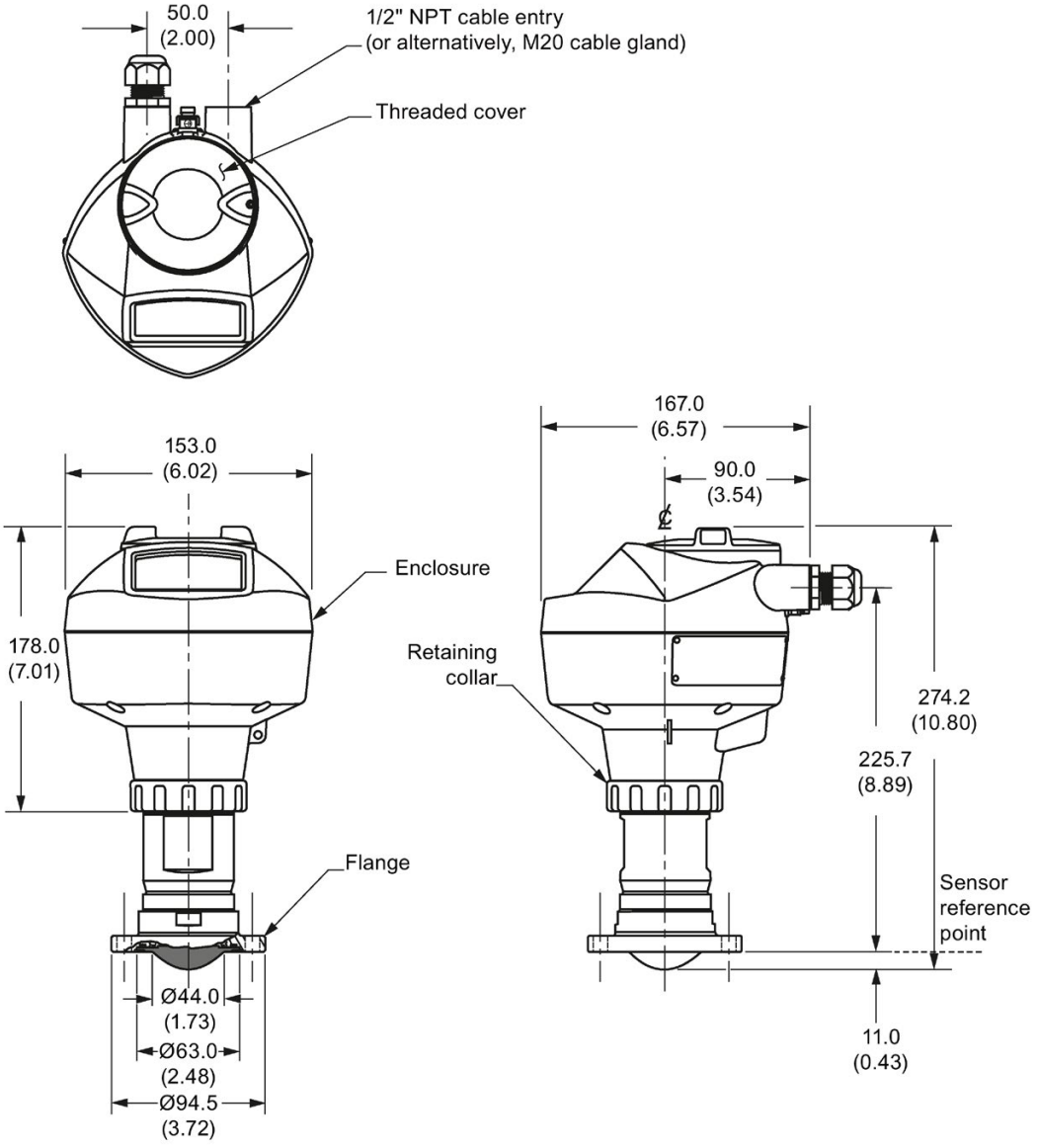


Dimensions in mm (inch)

Note

Cut out of process connection and placement of threaded nut are shown for illustration purposes only.

12.16 Hygienic encapsulated antenna (DN50 aseptic flange to DIN 11864-2)

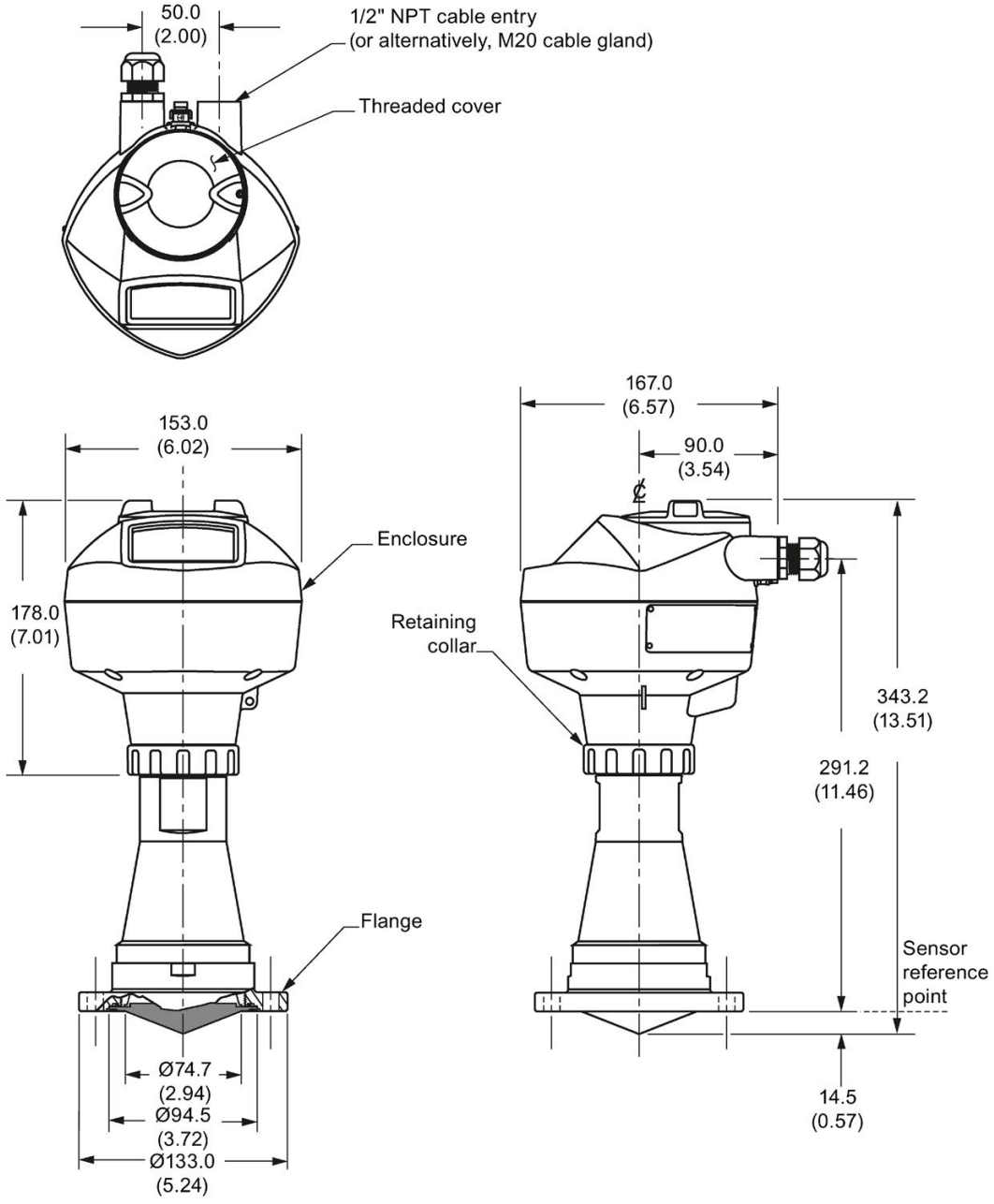


Dimensions in mm (inch)

Note

Cut out of process connection and flange are shown for illustration purposes only.

12.17 Hygienic encapsulated antenna (DN80 aseptic flange to DIN 11864-2)

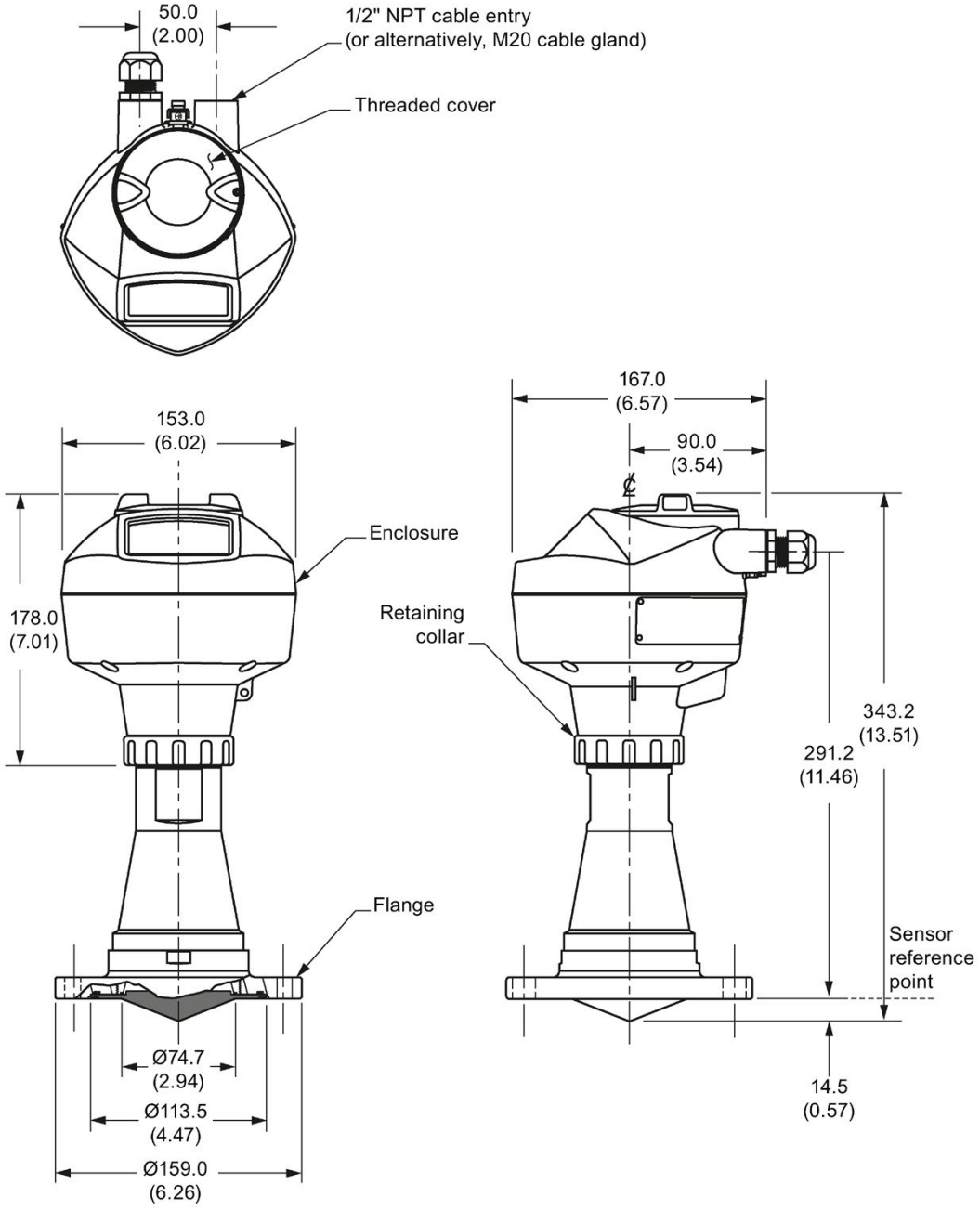


Dimensions in mm (inch)

Note

Cut out of process connection and flange are shown for illustration purposes only.

12.18 Hygienic encapsulated antenna (DN100 aseptic flange to DIN 11864-2)

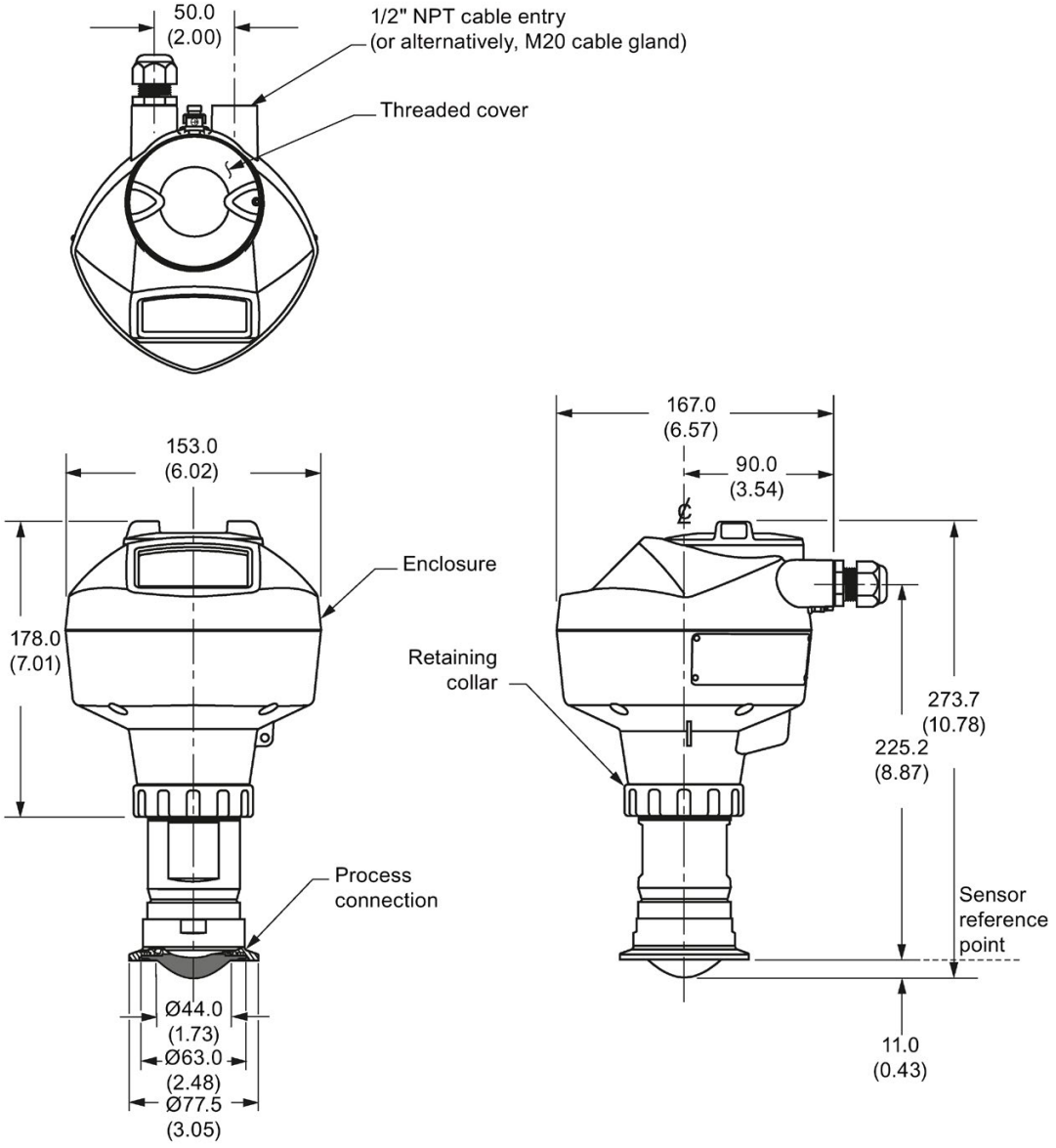


Dimensions in mm (inch)

Note

The cut out of the process connection and the flange are shown for illustration purposes only.

12.19 Hygienic encapsulated antenna (DN50 aseptic clamp to DIN 11864-3)

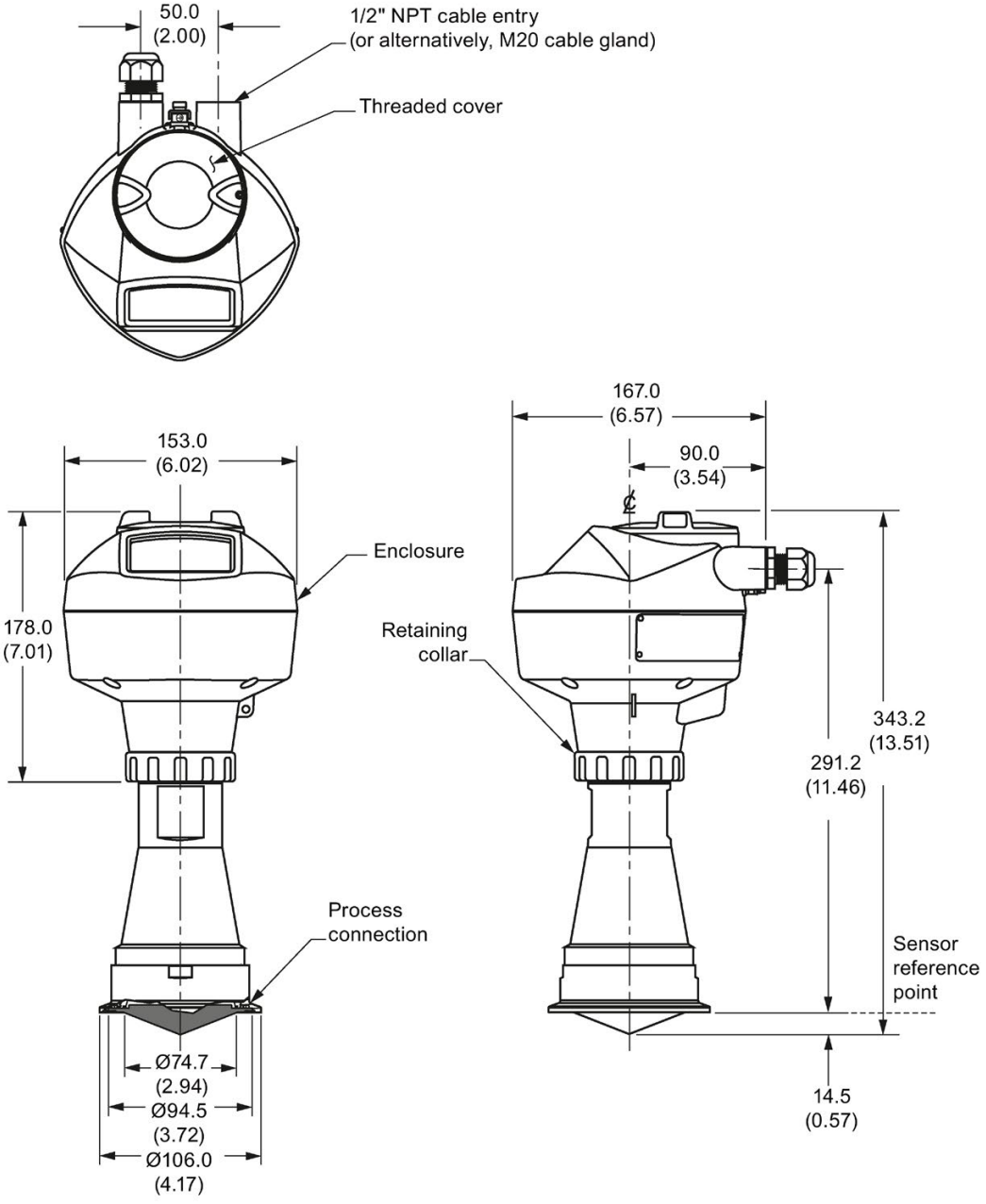


Dimensions in mm (inch)

Note

Cut out of process connection is shown for illustration purposes only.

12.20 Hygienic encapsulated antenna (DN80 aseptic clamp to DIN 11864-3)

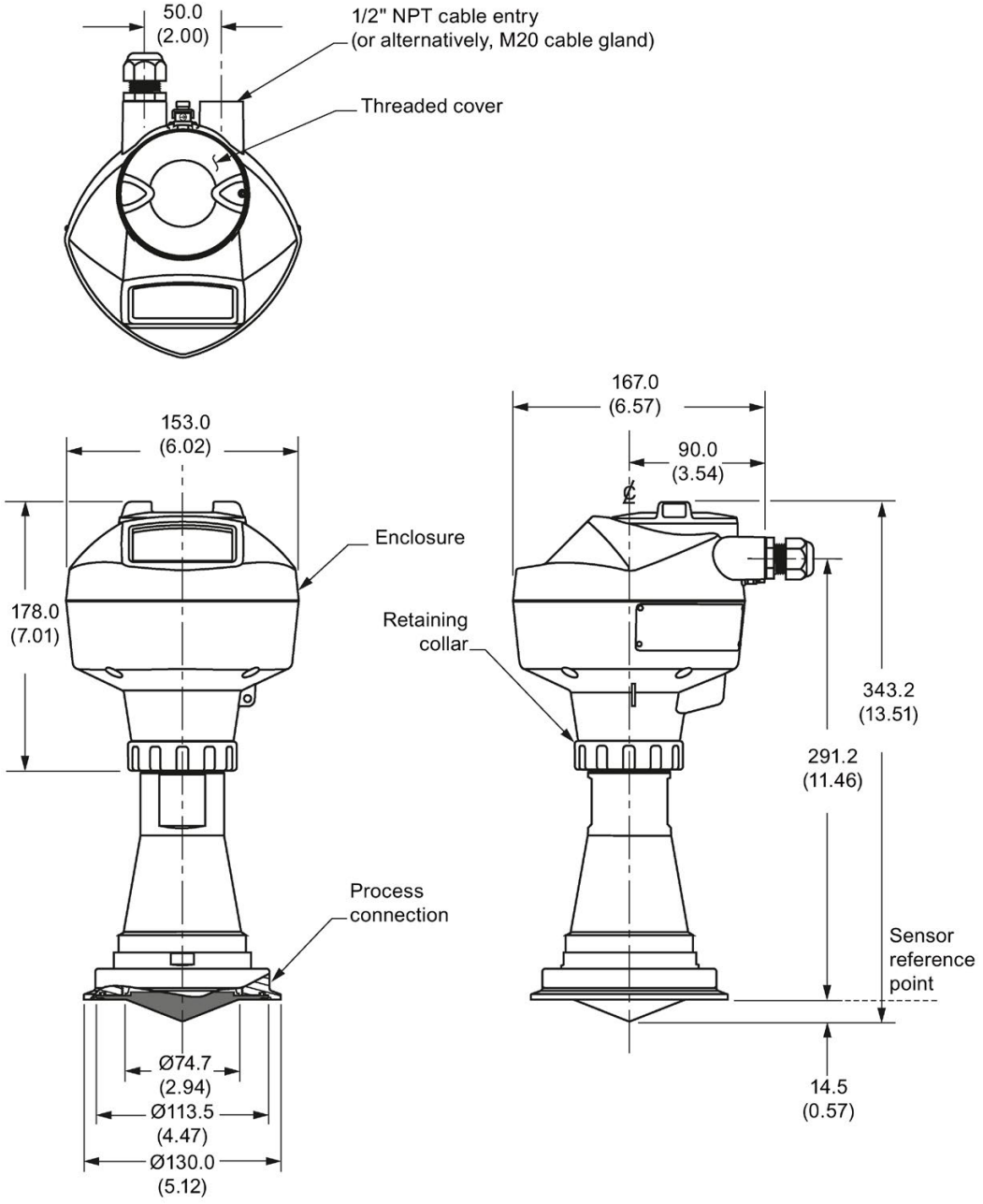


Dimensions in mm (inch)

Note

Cut out of process connection is shown for illustration purposes only.

12.21 Hygienic encapsulated antenna (DN100 aseptic clamp to DIN 11864-3)

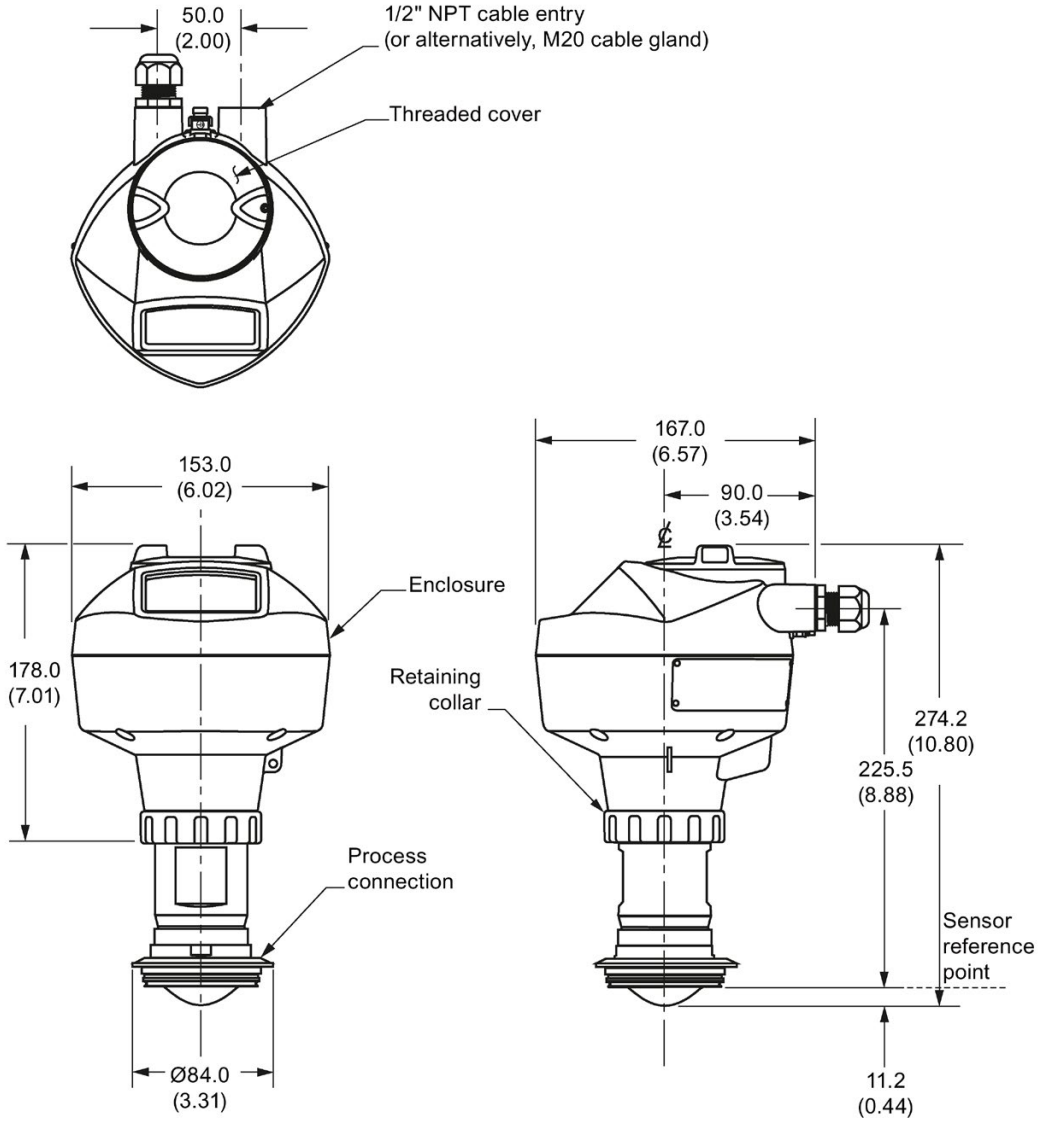


Dimensions in mm (inch)

Note

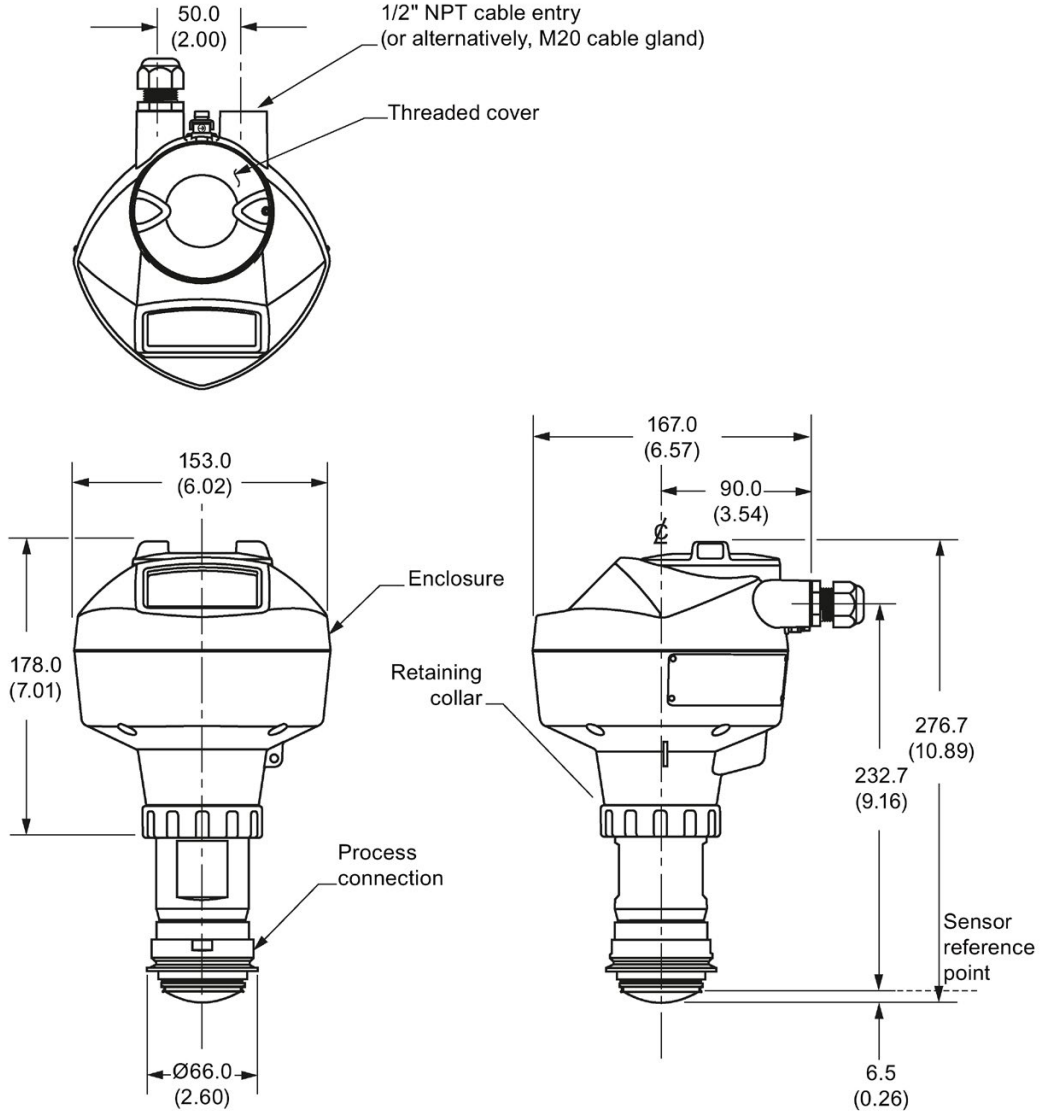
Cut out of process connection is shown for illustration purposes only.

12.22 Hygienic encapsulated antenna (Tuchenhagen Type N)



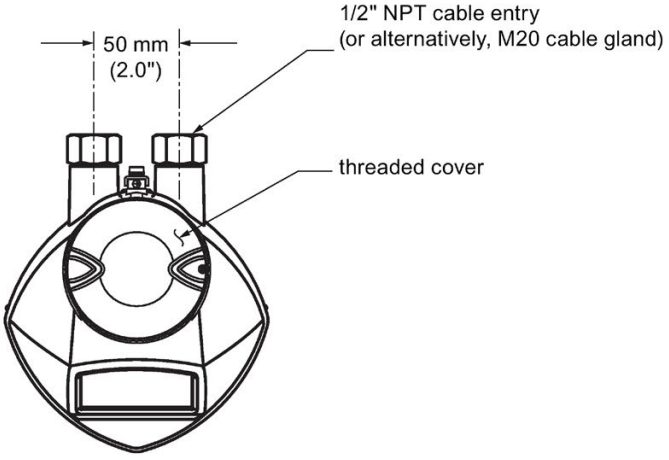
Dimensions in mm (inch)

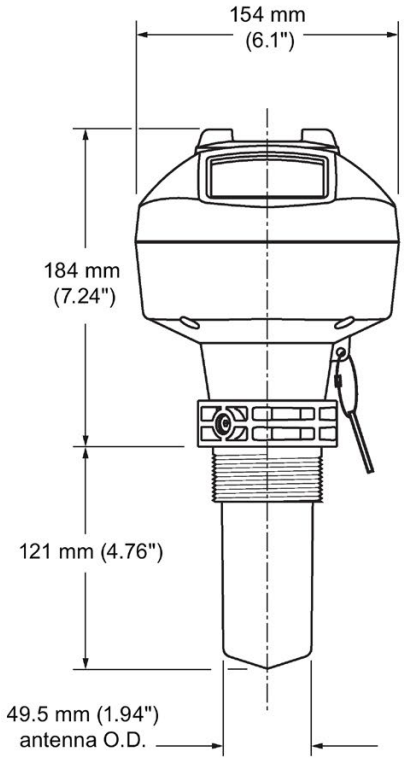
12.23 Hygienic encapsulated antenna (Tuchenhagen Type F)

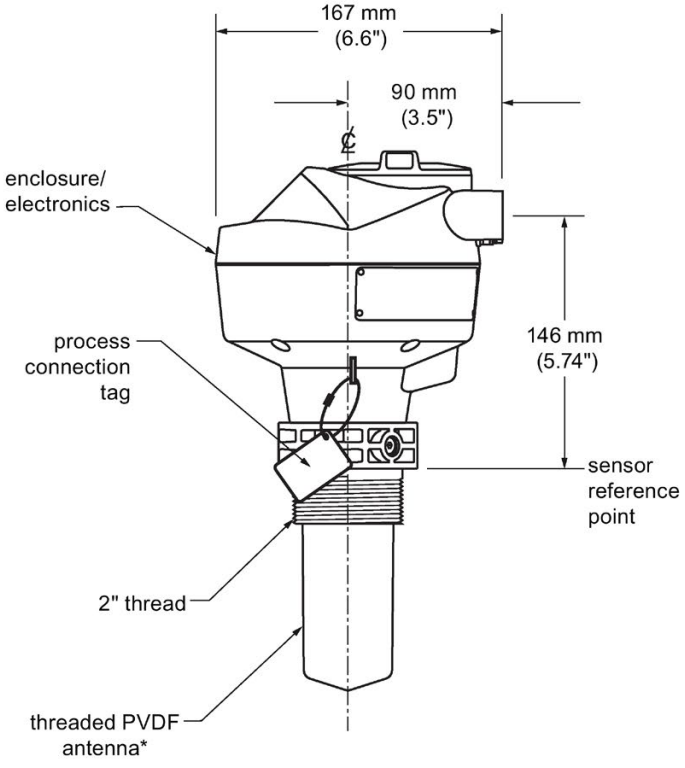


Dimensions in mm (inch)

12.24 Threaded PVDF antenna







*The color of the antenna may vary.

Threaded PVDF antenna dimensions

Nominal antenna size	Antenna O.D.	Height to sensor reference point [a]	Beam angle [b]	Measurement range
50 mm (2")	49.5 mm (1.94")	121 mm (4.76")	19 degrees	10 m (32.8 ft)[c]

[a] Height from bottom of antenna to sensor reference point as shown: see dimension drawing.

[b] -3dB in the direction of the polarization axis. See Polarization reference point (Page 29) for an illustration.

[c] 20m when installed in stillpipe.

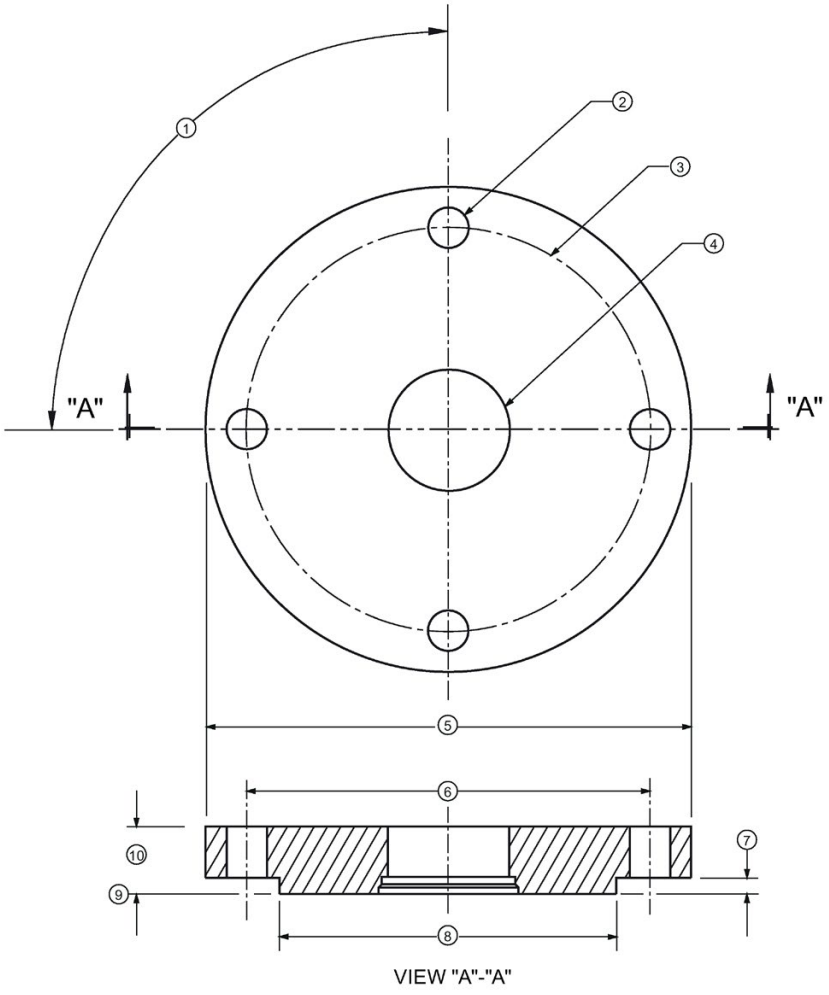
12.25 Threaded connection markings

With the exception of the threaded PVDF antenna, 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, (indicating the sequential unit produced).

12.26 Raised-Face flange

Stainless steel or optional alloy N06022/2.4602 (Hastelloy® C-22)



①	angle of adjacent bolt holes	⑥	bolt hole circle diameter
②	bolt hole diameter	⑦	facing height
③	bolt hole circle diameter	⑧	facing diameter
④	waveguide mounting hole	⑨	sensor reference point
⑤	Flange O.D.	⑩	thickness

Raised-Face flange dimensions

Pipe size	Flange bolt hole pattern	⑤ Flange O.D. (mm)	③ Bolt hole circle Ø (mm)	② Bolt hole Ø (mm)	No. of bolts	① Angle of adjacent bolt holes	⑧ Facing Ø (mm)	⑩ Thickness (mm)
DN50	PN10/PN16	165	125	18	4	90	102	18
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
DN50	PN25/PN40	165	160	18	4	90	138	20
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

ANSI Raised-Face flange dimensions

Pipe size	Flange bolt hole pattern (lb)	Flange O.D. (mm)	Bolt hole circle Ø (mm)	Bolt hole Ø (mm)	No. of bolts	Angle of adjacent bolt holes	Thickness (mm)	Eyelet feature location		Facing Ø (mm)
								Angle	Distance	Facing thick-ness (mm)
2"	150	152.4	120.7	19.1	4	90	22.4	45	60.4	92.1
										2.0
3"	150	190.5	152.4	19.1	4		24.4		76.2	127.0
										2.0
4"	150	228.6	190.5	19.1	8	45	31.8	22.5	95.3	157.2
										2.0
2"	300	165.1	127.0	19.1	8		28.4		63.5	92.1
										2.0
3"	300	209.6	168.3	22.3	8		35.1		84.2	127.0
										2.0
4"	300	254.0	200.2	22.3	8		38.1		100.1	157.2
										2.0

Raised-Face flange markings

Blind Flange Markings (Optional Manufacturer's Logo [optional]; Flange Standard; Nominal Size; Material; Heat Code)	Machining Identification			Welded Assembly Identification [a]		
	Serial no.	Logo	Flange series	Flange series	Heat Code no.	Facing
Manufacturer's logo; EN 1092-1 05 'B1'; 'DN50' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyxx		xxxxx	xxxxx	A1B2C3	RF

[a] When flange material is alloy N06022/2.4602, additional material and heat code identification is provided.

The flange markings are located around the outside edge of the flange.

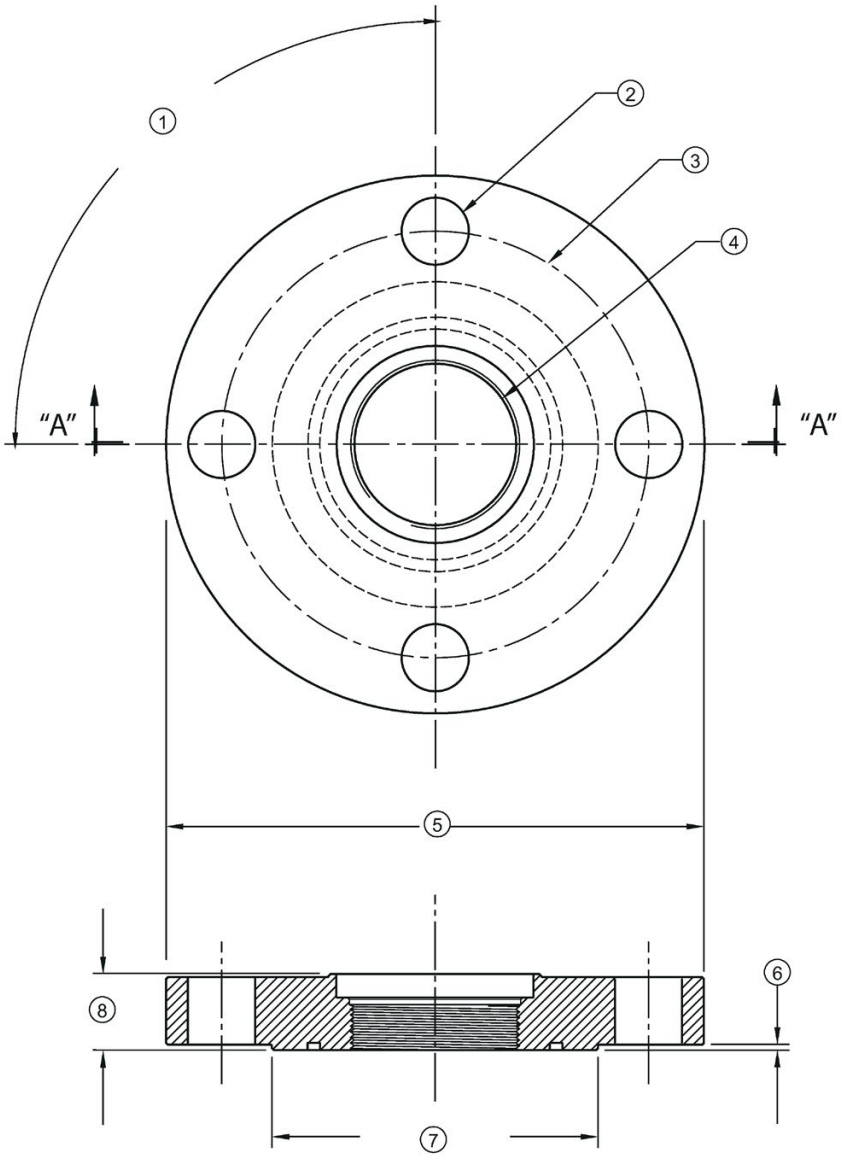
Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999 (indicating the sequential unit produced).

Flange series: the Siemens Milltronics drawing identification.

Heat code: a flange material batch code identification.

12.27 Raised-Face flange per EN 1092-1 for flanged encapsulated antenna

Stainless steel



VIEW "A"-"A"

①	angle of adjacent bolt holes	⑤	flange O.D.
②	bolt hole diameter	⑥	facing height
③	bolt hole circle diameter	⑦	facing diameter
④	antenna	⑧	flange thickness

Raised-Face flange dimensions

Pipe size	Flange class	⑤ Flange O.D. [mm (inch)]	③ Bolt hole circle Ø [mm (inch)]	② Bolt hole Ø [mm (inch)]	No. of bolt holes	① Angle of adjacent bolt holes	⑦ Facing Ø [mm (inch)]	⑨ Flange thickness [mm (inch)]	⑥ Flange facing thickness [mm (inch)]
2"	150 LB	152 (5.98)	120.7 (4.75)	19 (0.75)	4	90	92.1 (3.63)	20.6 (0.81)	1.5 (0.06)
3"		190 (7.48)	152.4 (6.00)				127 (5.00)	25.9 (1.02)	2 (0.08)
4"		230 (9.06)	190.5 (7.50)		8	45	157.2 (6.19)		2 (0.08)
6"		280 (11.02)	241.3 (9.50)	22.2 (0.87)			215.9 (8.50)	26.9 (1.06)	1.5 (0.06)
DN50	PN10/16	155 (6.10)	125 (4.92)	18 (0.71)	4	90	102 (4.02)	18 (0.71)	2 (0.08)
DN80		200 (7.87)	160 (6.30)		8	45	138 (5.43)	20 (0.79)	2 (0.08)
DN100		220 (8.66)	180 (7.09)				158 (6.22)		2 (0.08)
DN150		285 (11.22)	240 (9.45)	22 (0.87)			212 (8.35)	22 (0.87)	2 (0.08)
50A	10K	155 (6.10)	120 (4.72)	19 (0.75)	4	90	96 (3.78)	16 (0.63)	2 (0.08)
80A		185 (7.28)	150 (5.91)		8	45	126 (4.96)	18 (0.71)	2 (0.08)
100A		210 (8.27)	175 (6.89)				151 (5.94)		2 (0.08)
150A		280 (11.02)	240 (9.45)	23 (0.91)			212 (8.35)	22 (0.87)	2 (0.08)

Raised-Face flange markings

Blind Flange Markings (Optional Manufacturer's Logo [optional]; Flange Standard; Nominal Size; Material; Heat Code)	Machining Identification			Welded Assembly Identification		
	Serial no.	Logo	Flange series	Flange series	Heat Code no.	Facing
Manufacturer's logo; EN 1092-1 05 'B1'; 'DN50' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyxxx		xxxxx	xxxxx	A1B2C3	RF

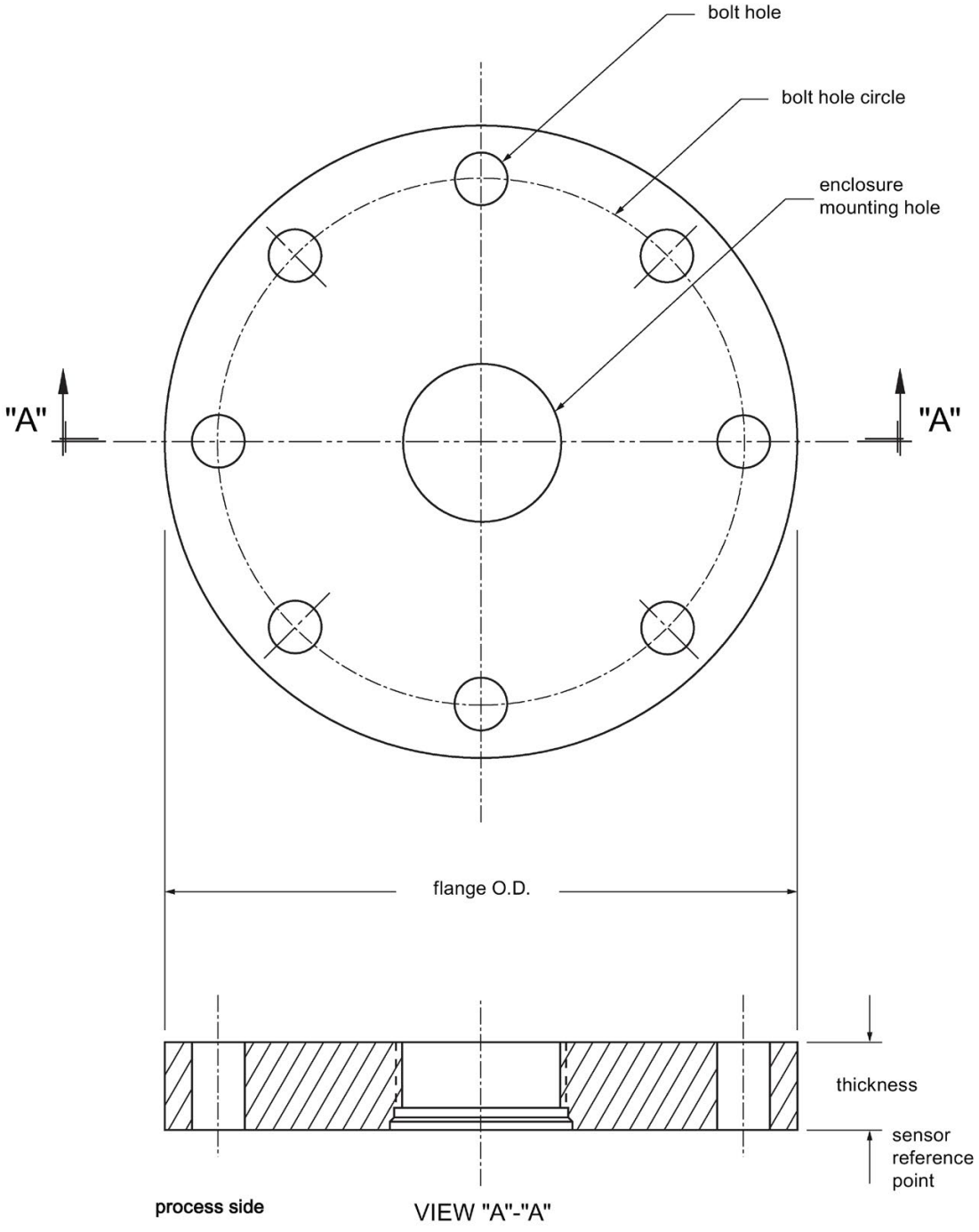
The flange markings are located around the outside edge of the flange.

Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999 (indicating the sequential unit produced).

Flange series: the Siemens Milltronics drawing identification.

Heat code: a flange material batch code identification.

12.28 Flat-Face flange



Flat-Face flange dimensions

Flange size [a]	Flange class	Flange O.D.	Bolt hole circle Ø	Bolt hole Ø	No. of bolt holes	Thickness
2"	ASME 150 lb	6.0"	4.75"	0.75"	4	0.88"
3"	ASME 150 lb	7.5"	6.0"	0.75"	4	0.96"
4"	ASME 150 lb	9.0"	7.50"	0.75"	8	1.25"
2"	ASME 300 lb	6.50"	5.00"	0.75"	8	1.12"
3"	ASME 300 lb	8.25"	6.62"	0.88"	8	1.38"
4"	ASME 300 lb	10.00"	7.88"	0.88"	8	1.50"
DN50	EN PN16	165 mm	125 mm	18 mm	4	24.4 mm
DN80	EN PN16	200 mm	160 mm	18 mm	8	31.8 mm
DN100	EN PN16	220 mm	180 mm	18 mm	8	31.8 mm
DN50	EN PN40	165 mm	125 mm	18 mm	4	25.4 mm
DN80	EN PN40	200 mm	160 mm	18 mm	8	31.8 mm
DN100	EN PN40	235 mm	190 mm	22 mm	8	38.1 mm
50A	JIS 10K	155 mm	120 mm	19 mm	4	23.8 mm
80A	JIS 10K	185 mm	150 mm	19 mm	8	24.4 mm
100A	JIS 10K	210 mm	175 mm	19 mm	8	28.5 mm

[a] A 2" flange is designed to fit a 2" pipe: for actual flange dimensions see Flange O.D. Flange markings located around the outside edge of the flat faced flange identify the flange assembly on which the device is mounted.

Flat-Face flange markings

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
			DN80	PN16				

Serial number: A unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999 (indicating the sequential unit produced).

Flange series: The Siemens Milltronics drawing identification.

Nominal size: The flange size followed by the hole pattern for a particular flange class. For example:

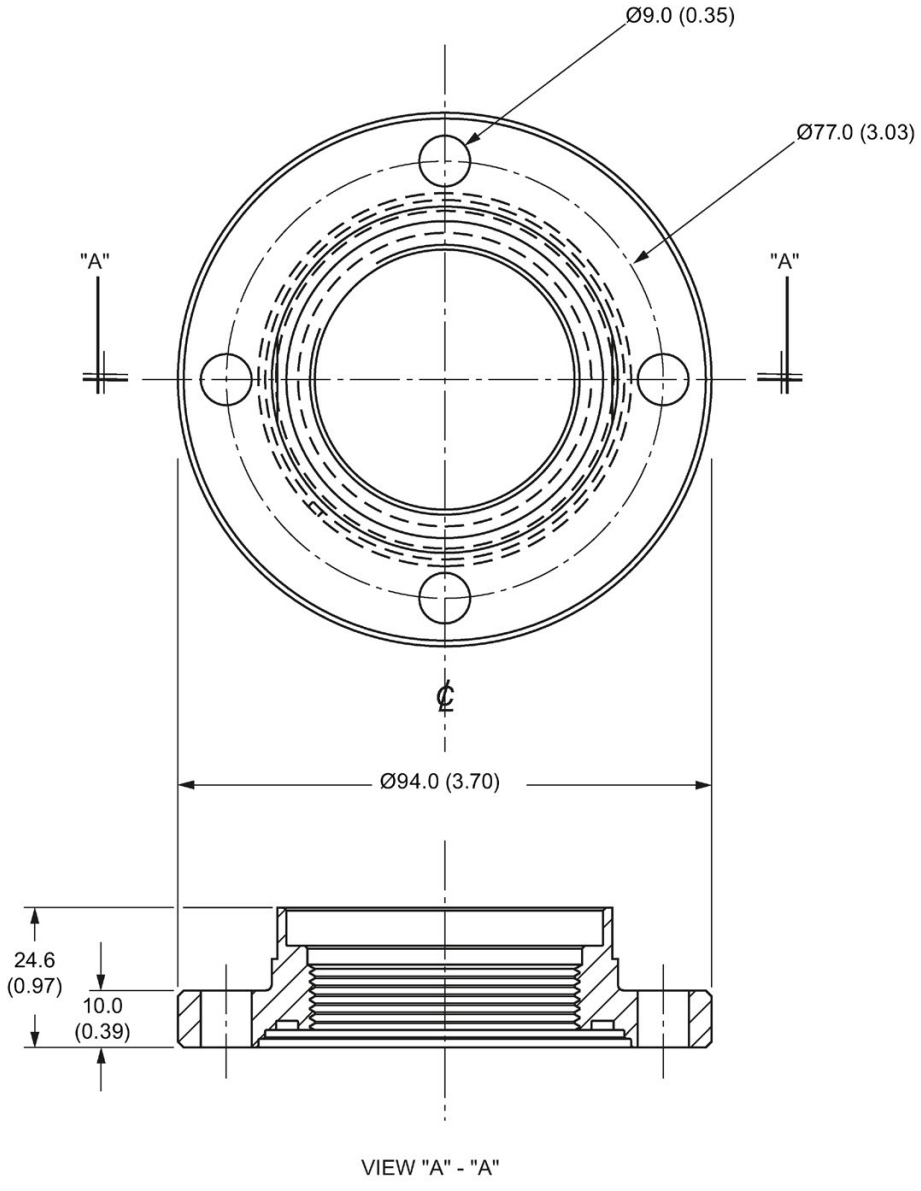
- A 2 inch ASME B16.5 150 lb class flange (North America)
- A DN80 EN 1092-1 PN16 class flange (Europe)

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.

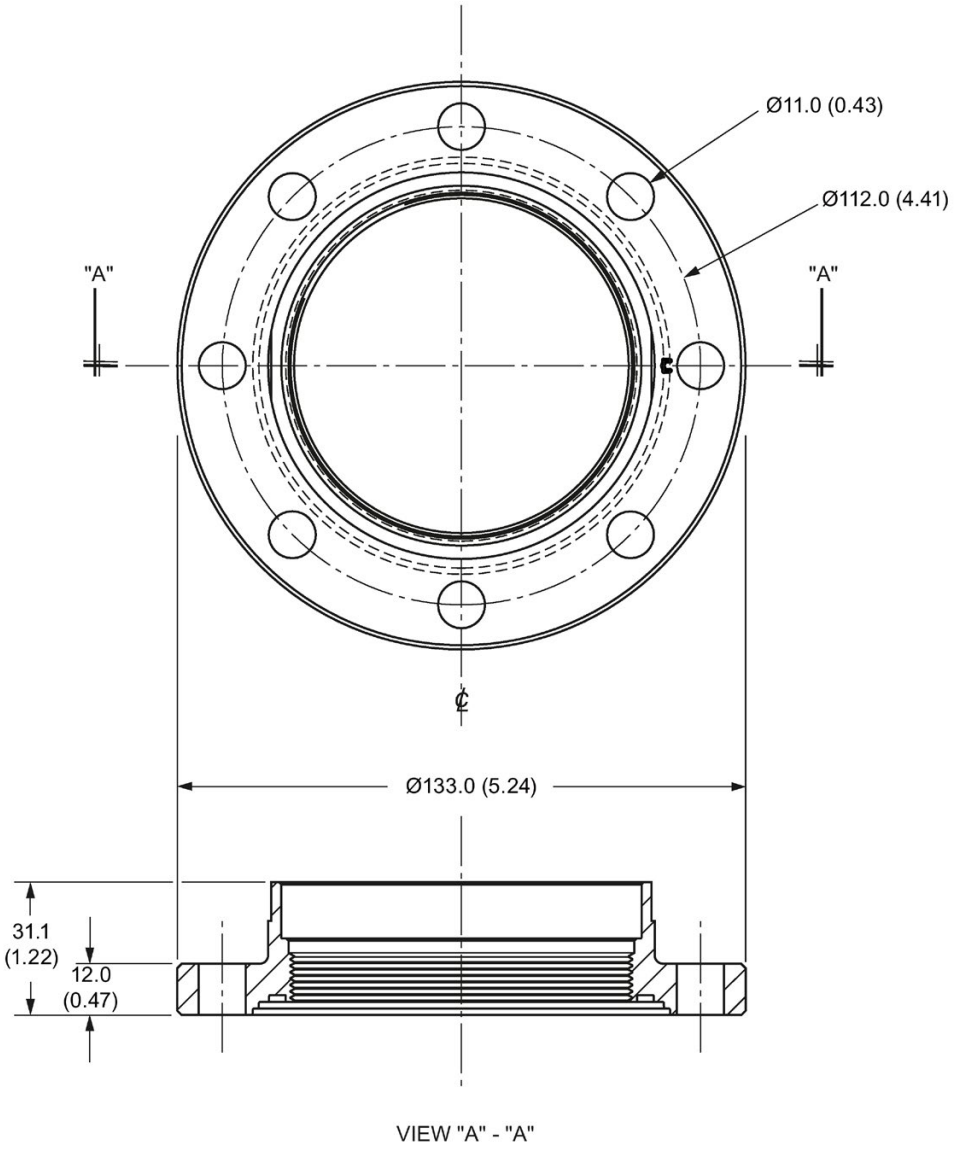
12.29 Aseptic/hygienic flange DN50, DN80, DN100 for DIN 11864-2

Aseptic/hygienic flange DN50



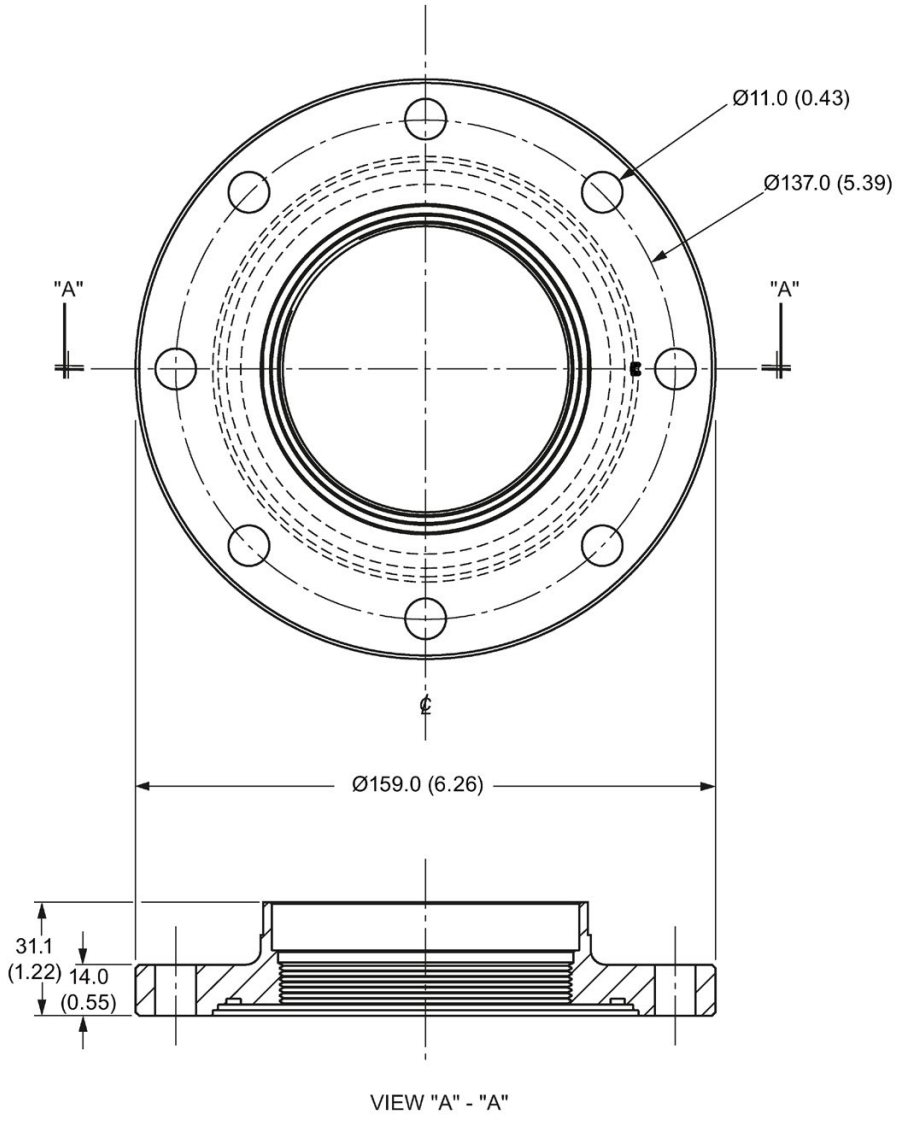
Dimensions in mm (inch)

Aseptic/hygienic flange DN80



Dimensions in mm (inch)

Aseptic/hygienic flange DN100



Dimensions in mm (inch)

12.30 Process connection tag (pressure rated versions)

For pressure-rated versions only, the process connection label lists the following information:

Process connection tag (pressure rated versions)

Item	Sample Text	Comments/Explanation
SERIAL #	GYZ / 00000000	Pressure Boundary Assembly
NOMINAL PIPE SIZE (DN)	4 INCH / 100mm	Nominal Pipe Size
INSTRUMENT MAWP (PS)	11.0 BAR	Maximum Allowable Working Pressure at Design Temperature for the device
DESIGN TEMP. (TS)	200 ºC	Maximum Allowable Working Temperature
MINIMUM PROCESS	15.9 BAR AT 40 ºC	Minimum Wetted Process Conditions
TEST PRESSURE (PT)	22.7 BAR	Production Test Pressure
TEST DATE	10/11/11	Date of Pressure Test (Year/Month/Day)
CONNECTION SERIES	ASME B16.5	Flange Series: dimensional pattern based on ASME B16.5 flange standards
PROCESS SERIES	25546	Pressure Tag Family Series
WETTED NON-METALLICS	TFM	Antenna Emitter
WETTED METALLICS	316L	Process Connection Material(s)
WETTED SEALS	FKM	Seal Material(s)

- Minimum Wetted Process Conditions: the minimum pressure and temperature to which the device assembly may be exposed in the process, and continue to provide a pressure-retaining function.
- Pressure Tag Family Series: the identification number used to indicate specific process connection information relating to operating conditions.
- For Flanged encapsulated antenna: this information is laser-etched on antenna body

BACK FACE	
Sample Text	Comments/Explanation
CRN 0Fxxxxx.5	Canadian Registration Number (CRN)

Appendix A: Technical reference

A

Note

Where a number follows the parameter name [for example, **Master Reset (4.1.)**] this is the parameter access number via the handheld programmer. See Parameter Reference (Page 95) for a complete list of parameters.

A.1 Principles of operation

SITRANS LR250 is a 2-wire 25 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries. (The microwave output level is significantly less than that emitted from cellular phones.) 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 LR250 consists of an enclosed electronic circuit coupled to an antenna and process connection. The electronic circuit generates a radar signal (25 GHz) 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. See Dimension drawings (Page 171). This distance is used as a basis for the display of material level and mA output.

A.2 Echo processing

A.2.1 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.

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.

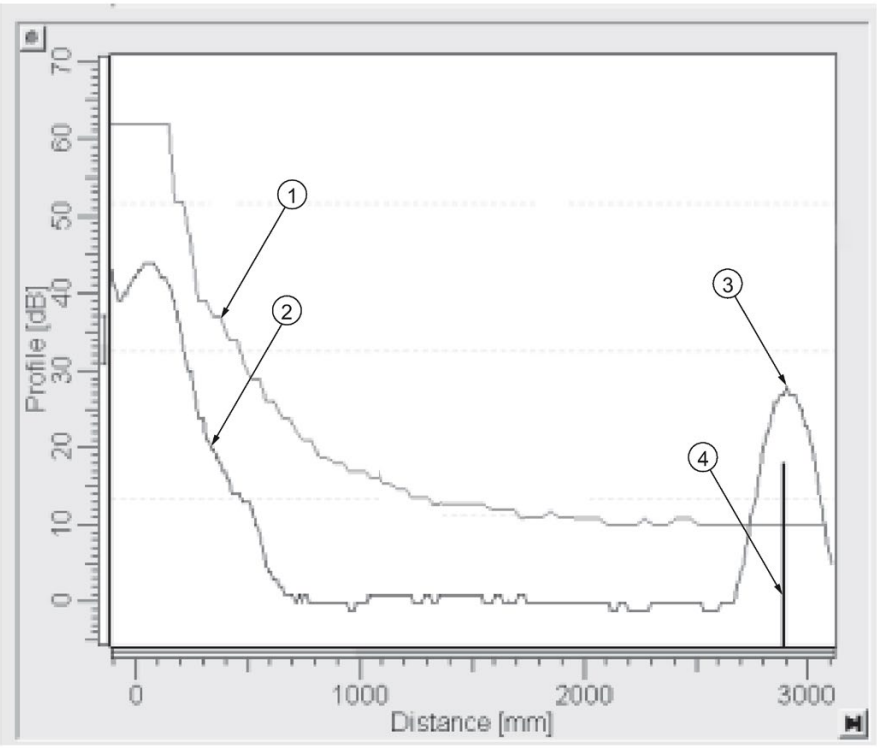
A.2.2 Echo Selection

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 (Page 220) for more details.



① default TVT
② echo profile
③ material level
④ echo marker

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

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)

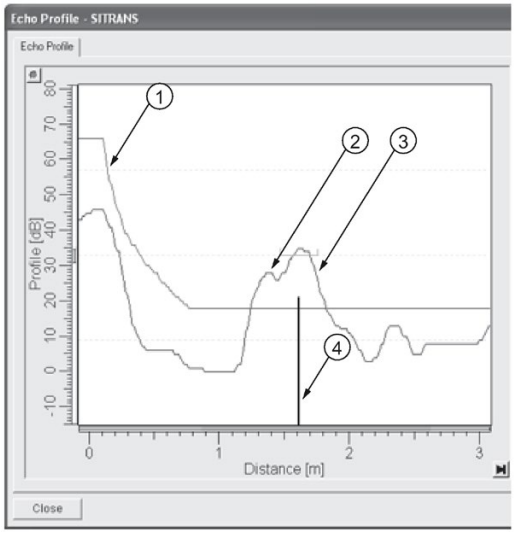
- Uses the leading edge of the echo.
- Is used mainly to process the echo from materials with a low dK value.

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

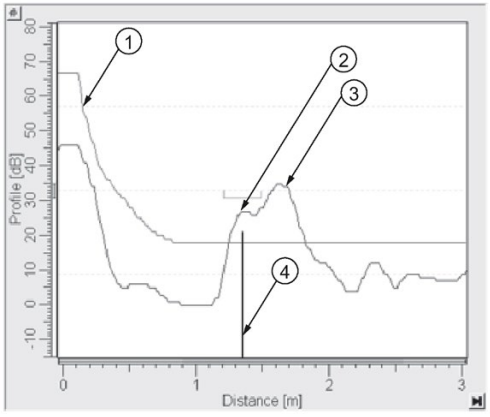
Vessel height: 1.5 m; CLEF range set to 0 (**Center** algorithm gives the same result.)



① default TVT
② material echo
③ vessel bottom echo selected
④ echo marker

Example: CLEF enabled

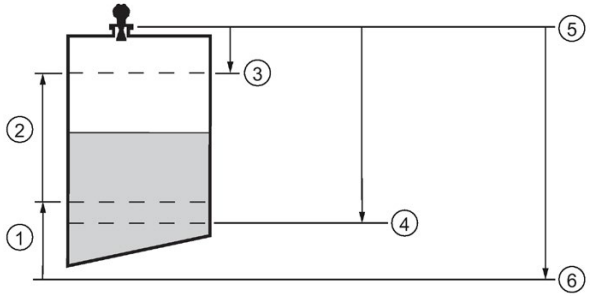
Vessel height: 1.5 m; CLEF range set to 0.5 m



① default TVT
② material echo selected
③ vessel bottom echo
④ echo marker

A.2.3 CLEF Range

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 Low Calibration Point (process empty level).



① CLEF range
② (Center algorithm applied)
③ High calibration point
④ Low calibration point
⑤ Sensor reference point
⑥ Low Calibration Point (process empty level)

A.2.4 Echo Threshold

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.

A.2.5 Echo Lock

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 LR250 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.

A.2.6 Auto False Echo Suppression

Note

- For detailed instructions on using this feature via PDM see Auto False Echo Suppression (Page 78).
- For detailed instructions on using this feature via the handheld programmer see **Auto False Echo Suppression (2.5.10.1.).**

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.

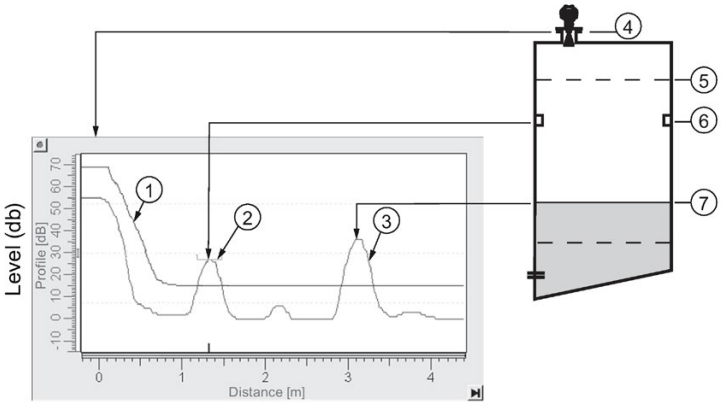
Auto False Echo Suppression Range (2.5.10.2.)

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.

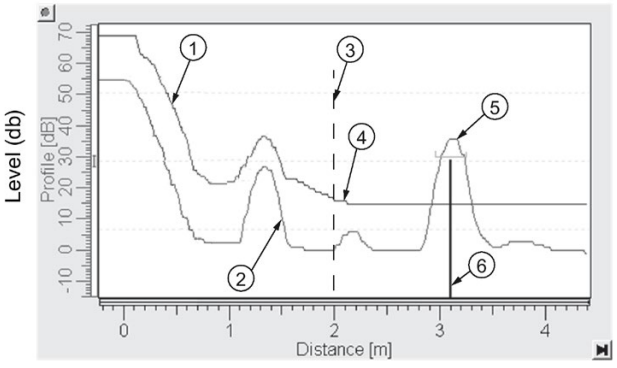
Auto False Echo Suppression Range must be set to a distance shorter than the distance to the material level when the environment was learned, to avoid the material echo being screened out.

Example before Auto False Echo Suppression



① default TVT
② false echo
③ material echo
④ sensor reference point
⑤ high calibration point = 0
⑥ obstruction at 1.3. m
⑦ material level at 3.2 m

Example after Auto False Echo Suppression



Auto False Echo Suppression Range set to 2 m

① Learned TVT
② False echo
③ Auto False Echo Suppression Range
④ Default TVT
⑤ Material echo
⑥ Echo marker

A.2.7 Measurement Range

Near Range (2.5.1.)

Near Range programs SITRANS LR250 to ignore the zone in front of the antenna. The default blanking distance is 50 mm (1.97") from the end of the antenna.

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 extending the blanking distance from factory values.

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.

A.2.8 Measurement Response

Note

Units are defined in **Units (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

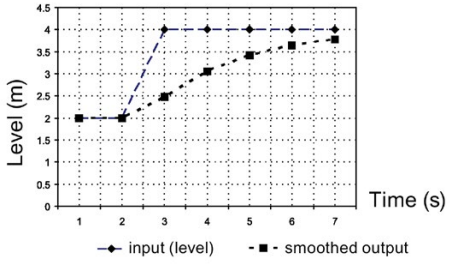
A.2.9 Damping

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



A.2.10 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:

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.

A.2.10.1 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. Fail-safe Mode determines the level to be reported when the Fail-safe timer expires.

A.2.10.2 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

Mode (2.6.9.1.) 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

Value (2.6.9.2.) 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 the Level Meter > Setup > desired 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.

A.3 Maximum Process Temperature Chart

WARNING

Exceeded maximum internal and process temperatures

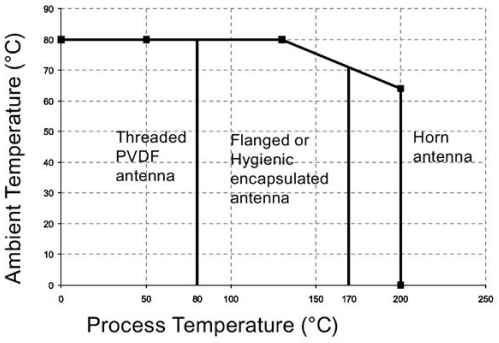
Danger of device malfunction

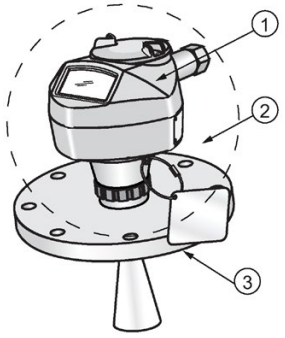
- Internal temperature must not exceed +80 ° C (+176 °F).
- Process temperature must not exceed limits specified by the antenna type.

Note

- 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 LR250 directly on a metallic vessel surface.
- The chart does not take into consideration heating from direct sunlight exposure.

Maximum Process Temperatures versus allowable ambient





① Internal enclosure temperature

② Ambient temperature

③ Process temperature (at process connection)

Where the chart does not apply, please use your own judgement regarding the use of SITRANS LR250.

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

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

A.4 Process Pressure/Temperature Derating Curves

⚠WARNING

Exceeded maximum permissible operating pressure

Danger of injury or poisoning.

The maximum permissible operating pressure depends on the device version. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released.

- Make sure that the device is suitable for the maximum permissible operating pressure of your system.

DANGER

Pressure applications

Danger to personnel, system and environment will result from improper disassembly.

- Never attempt to loosen, remove, or disassemble process connection while vessel contents are under pressure.

WARNING

Pressure applications

Danger to personnel, system and environment can result from improper installation.

- Improper installation may result in loss of process pressure.

WARNING

Unsuitable connecting parts

Risk of injury or poisoning.

In case of improper mounting, hot, toxic, and corrosive process media could be released at the connections.

- Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

Note

Material compatibility

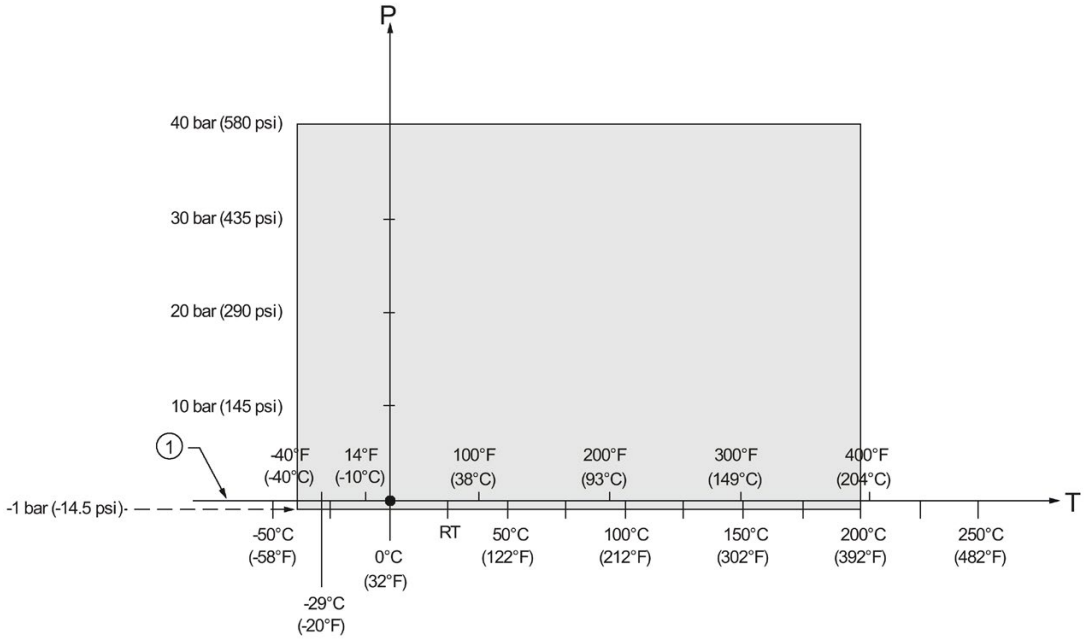
Siemens can provide you with support concerning selection of sensor components wetted by process media. However, you are responsible for the selection of components. Siemens accepts no liability for faults or failures resulting from incompatible materials.

A.4.1 Pressure Equipment Directive, PED, 14/68/EU

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 Guideline A-08 and A-20).

A.4.2 Horn antenna

1.5", 2" and 3" [NPT, G (BSPP), R (BSPT)] Threaded Versions



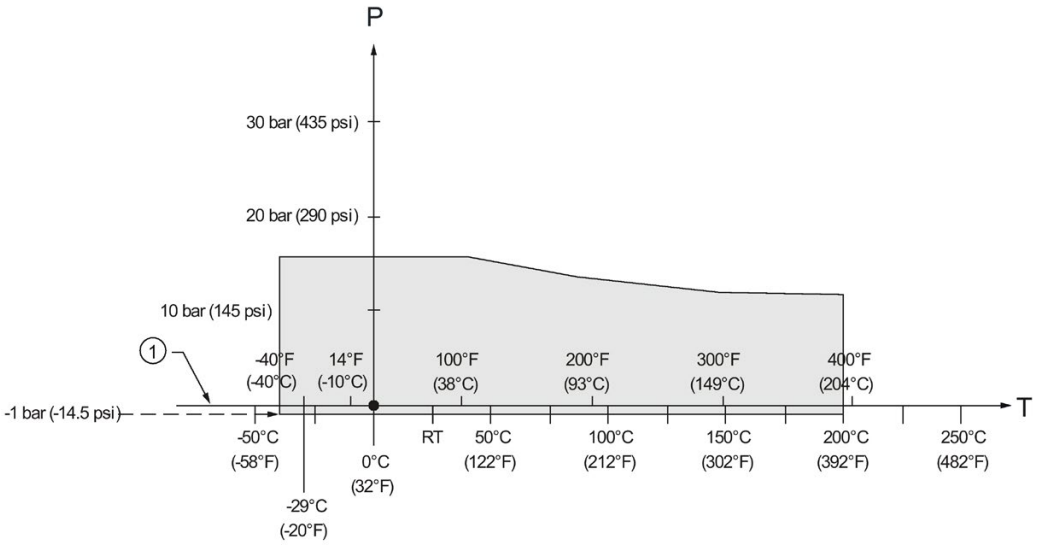
① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

A.4.3 Flanged horn antenna

JIS B 2220, 10K: 50A, 80A, and 100A

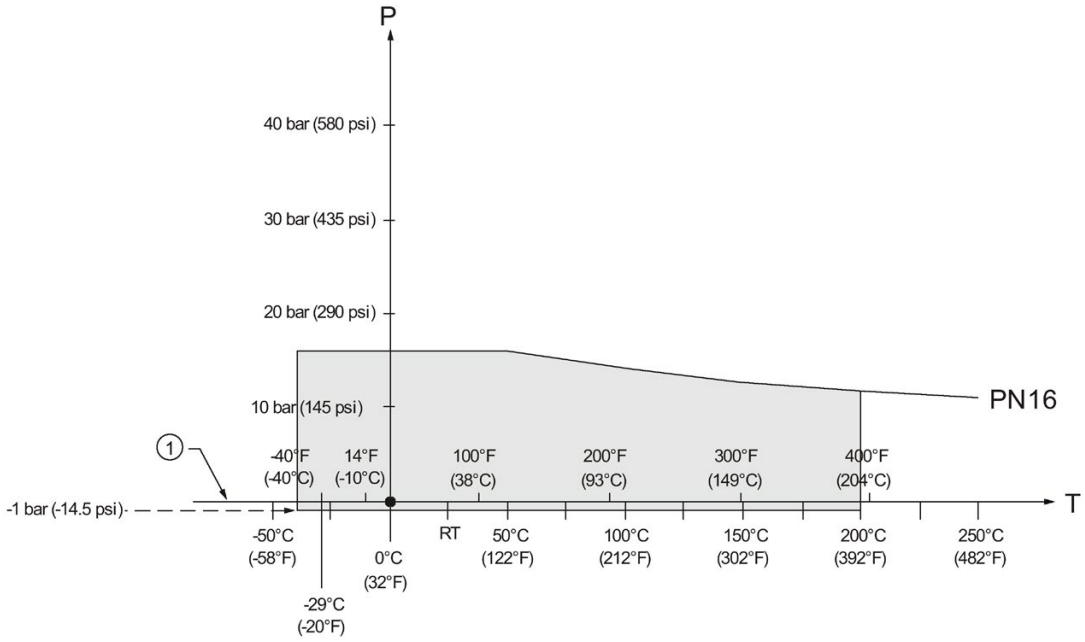


① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

EN1092-1, PN16: DN50, DN80, DN100, and DN150

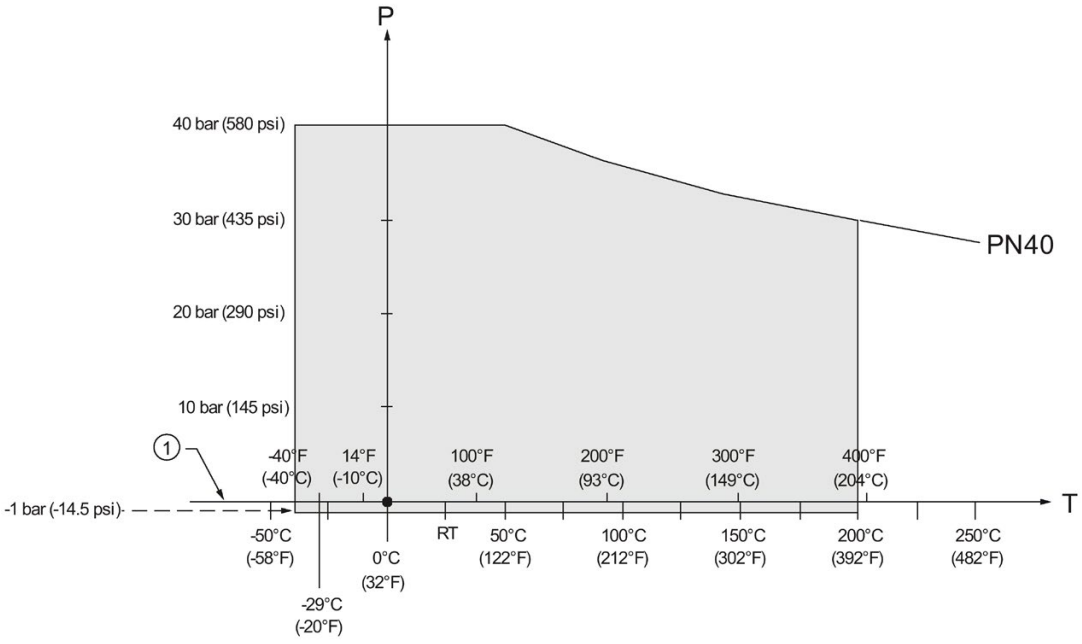


① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

EN1092-1, PN40: DN50, DN80, DN100, and DN150

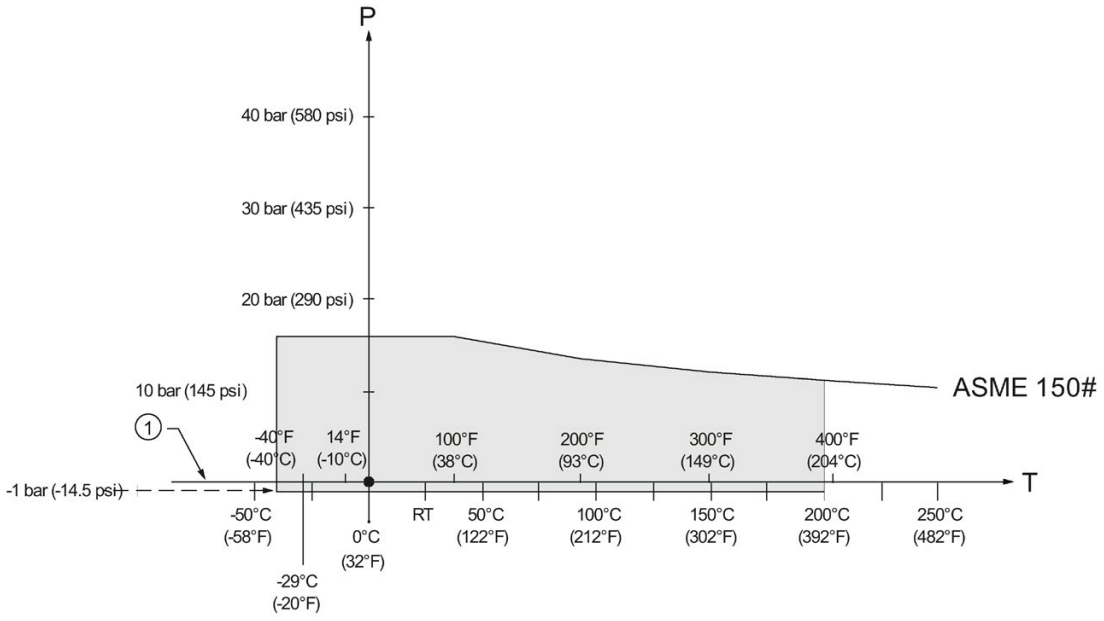


① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

ASME B16.5, Class 150: 2", 3", and 4" NPS

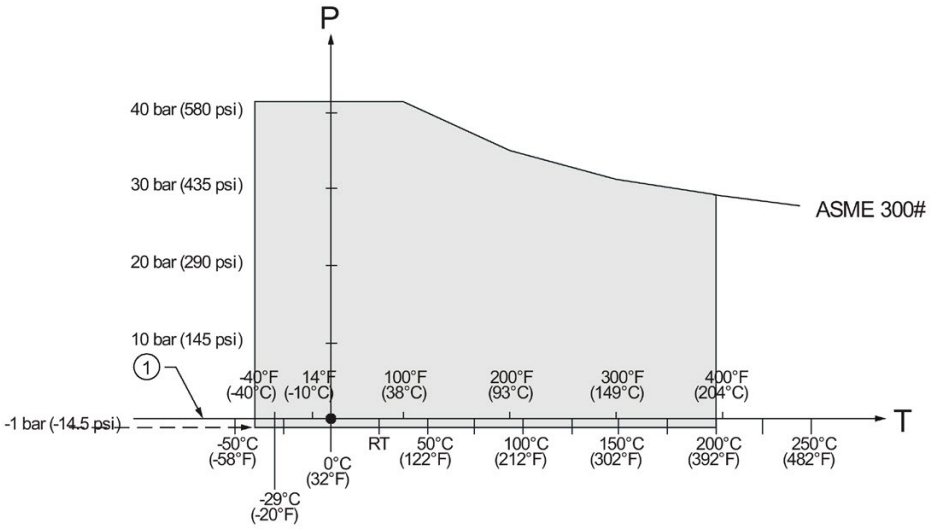


① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

ASME B16.5, Class 300: 2", 3", and 4" NPS



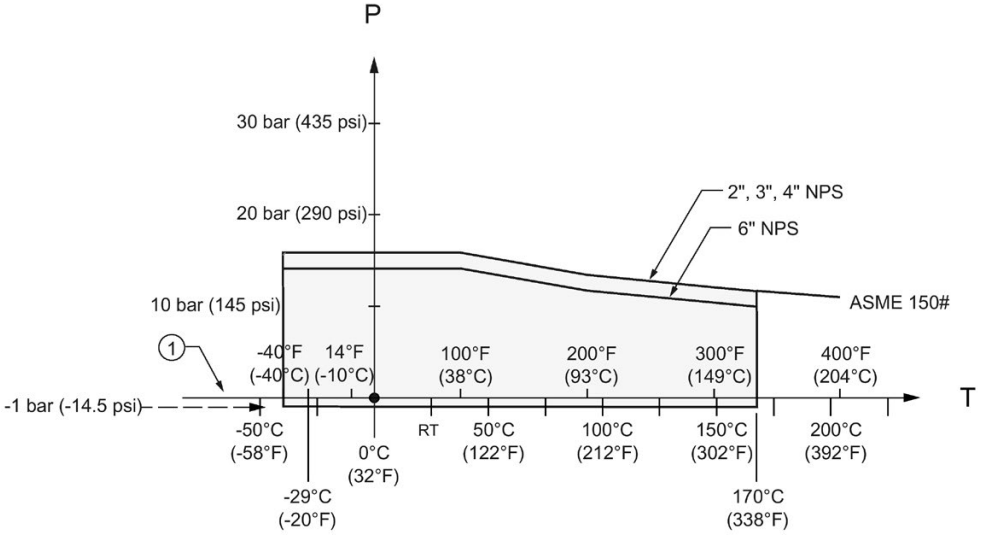
① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

A.4.4 Flanged encapsulated antenna

ASME B16.5, Class 150: 2", 3", 4", and 6" NPS

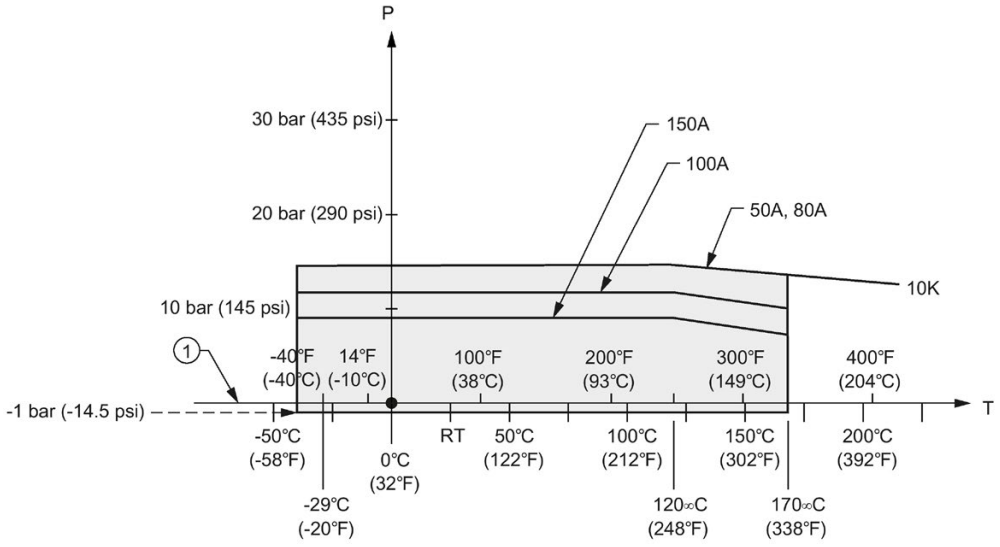


① Atmospheric

P Allowable operating pressures

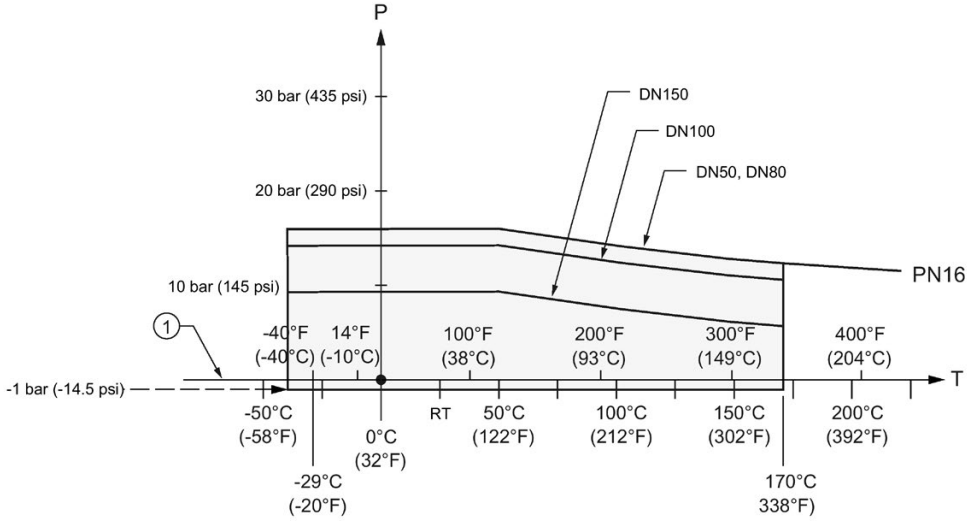
T Allowable operating temperatures

JIS B 2220, 10K: 50A, 80A, 100A, and 150A



① Atmospheric
P Allowable operating pressures
T Allowable operating temperatures

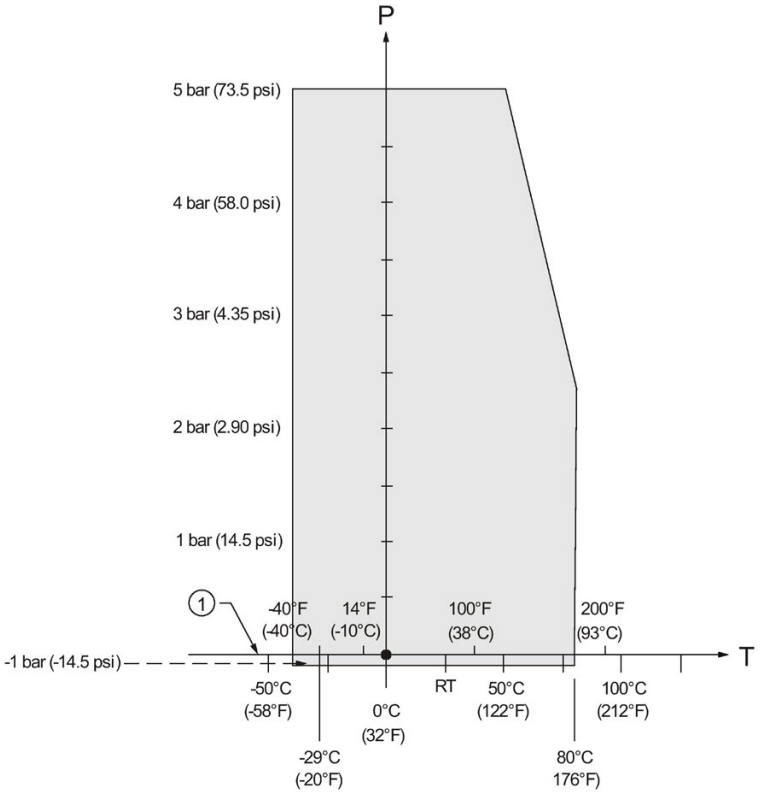
EN1092-1, PN10/16: DN50, DN80, DN100, and DN150



① Atmospheric
P Allowable operating pressures
T Allowable operating temperatures

A.4.5 PVDF antenna

ASME B1.20.1 2" NPT, EN ISO 228-1 2" G (BSPP), EN 10226-1 2" R (BSPT)



① Atmospheric

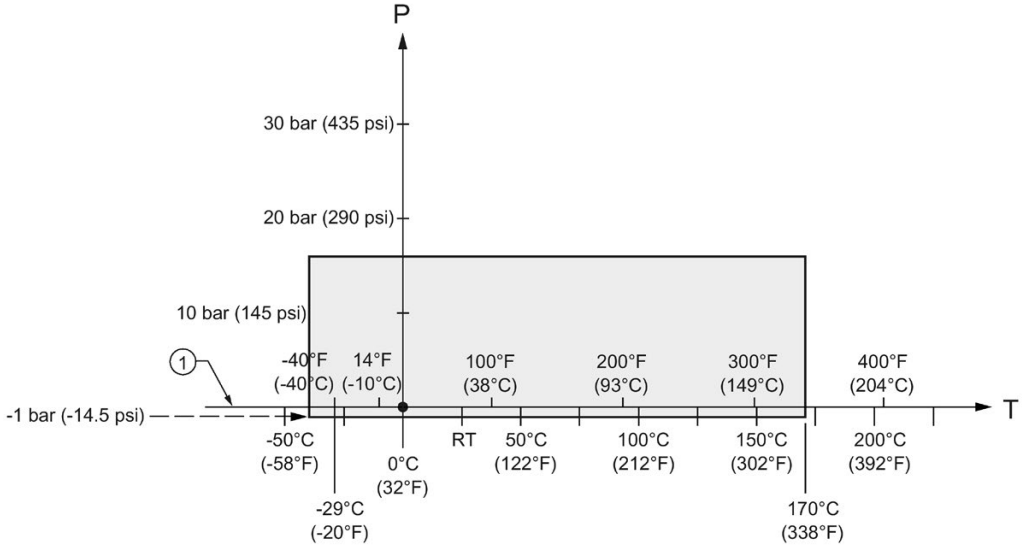
P Allowable operating pressures

T Allowable operating temperatures

A.4.6 Hygienic encapsulated antenna

DIN 11851 Sanitary/Hygienic nozzle/slotted nut: DN50, DN80, and DN100

DIN 11864-1 Aseptic/Hygienic nozzle/slotted nut: DN50, DN80, and DN100

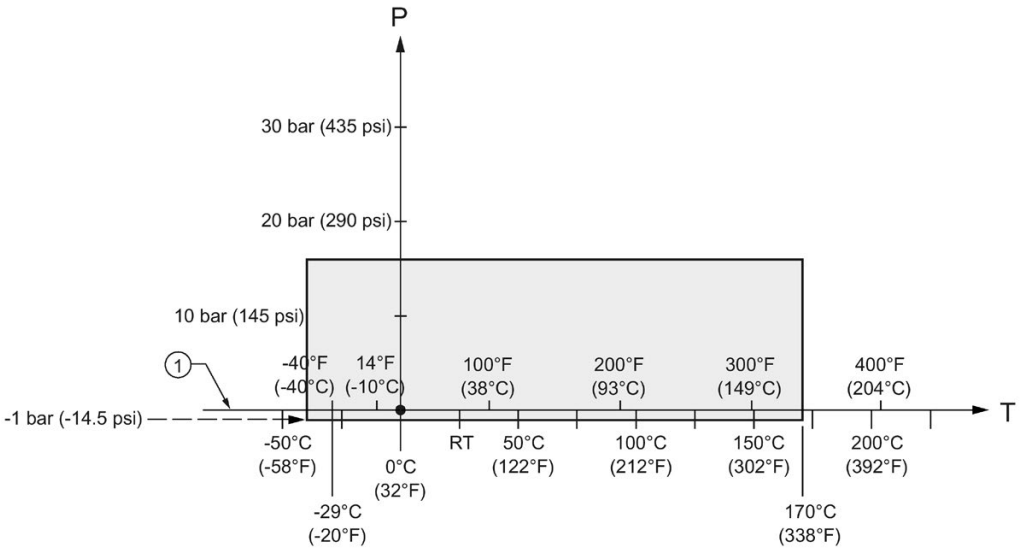


① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

DIN 11864-2 Aseptic/Hygienic flanged: DN50, DN80, and DN100



① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

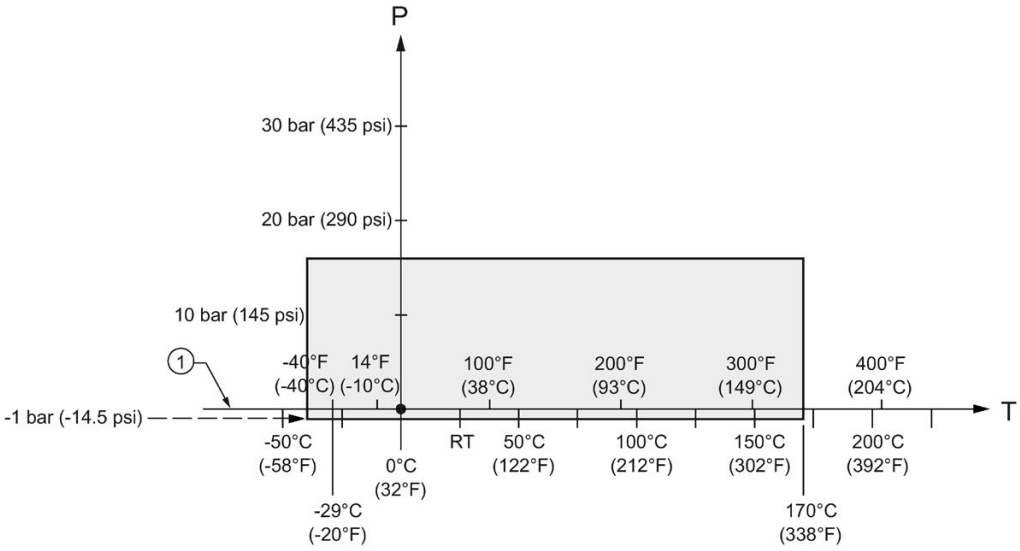
Note

For pressure applications, all attachment hardware must be suitably rated.

DIN 11864-3 Aseptic/Hygienic clamp: DN50, DN80, and DN100

IS0 2852 Sanitary/Hygienic clamp: 2", 3", and 4"

Tuchenhagen Varivent face seal clamp: Type N (68 mm) and Type F (50 mm)



① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

Note

For pressure applications, all clamps must be rated accordingly.

Appendix B: PROFIBUS PA profile structure

B

B.1 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.

B.2 Block Model

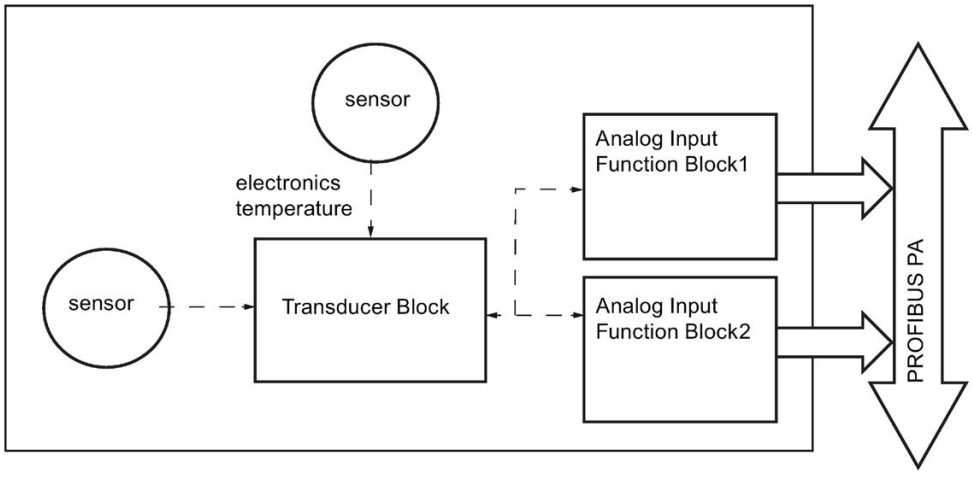
The Block Model represents how measured values are recorded and processed. All data is viewed from the perspective of the DCS or PLC, so information from the sensor is an input.

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

B.2.1 Description of the blocks

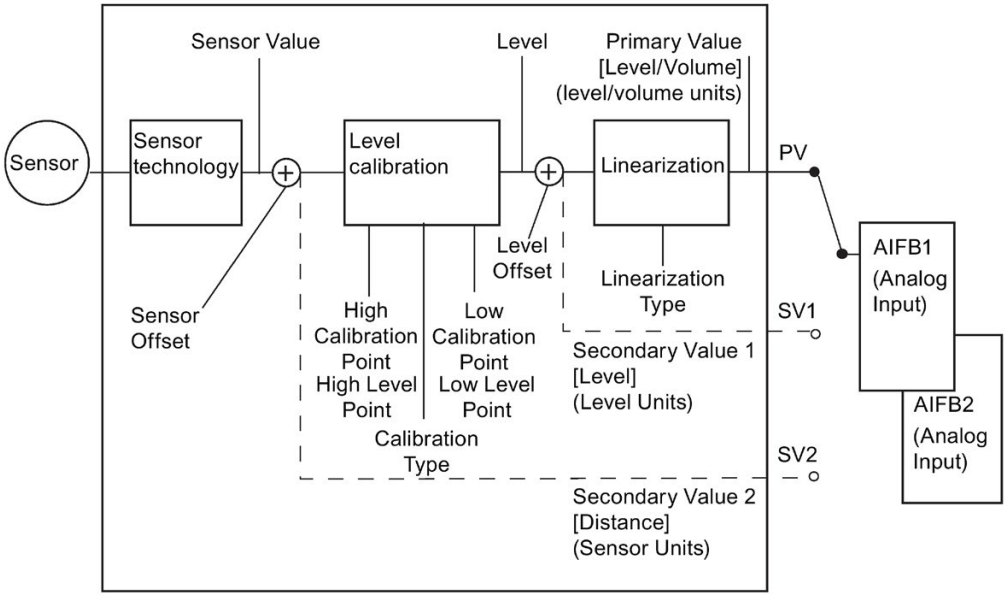
B.2.1.1 Transducer Block function groups

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

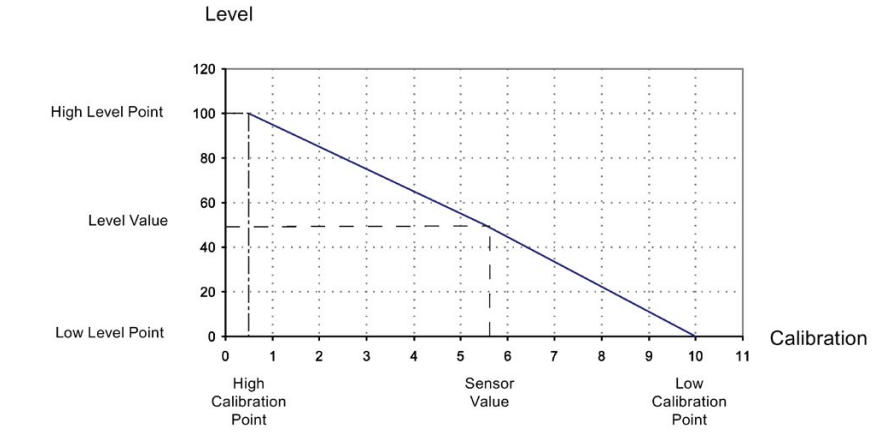
The Transducer Block implements all of the basic parameters (see diagram below), including level to volume calculation, if that option has been selected.

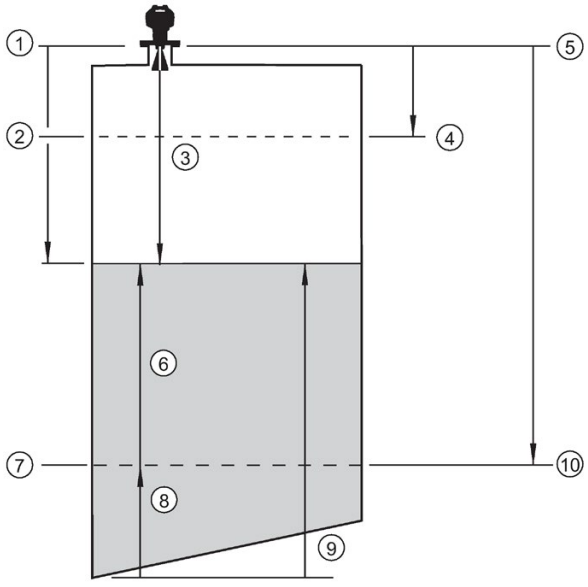
Transducer Block



B.2.1.2 How the transducer block works:

1. The sensor technology block selects the proper echo. For an explanation of sensor technology, see Appendix A: Technical Reference (Page 215).
   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.





①	Distance/SV2	⑥	Level
②	High level point (default: 100%)	⑦	Low level point (default: 0%)
③	Sensor value [a]	⑧	Level offset [c]
④	High calibration point	⑨	Secondary value 1
⑤	Sensor reference point [b]	⑩	Low calibration point

[a] Referenced from Sensor Reference Point.

[b] **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.

[c] Level Offset (default O) can compensate for specific vessel configurations.

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)

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 allow you to check the maximum and minimum temperatures that have occurred. To see peak temperature values, Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the tab **Device Status**.

B.2.1.3 Analog Input Function Blocks 1 and 2

The input to the AIFB is a value with a status. See Transducer Block function groups (Page 240) 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 (TB output value or Simulation Value) is **bad**, the fault logic can output either the last usable measured value, or a given substitute value. Set **Fail-safe Mode (2.6.9.)** and, if desired, define a value in **Value (2.6.9.2.)**.

Device/input simulation

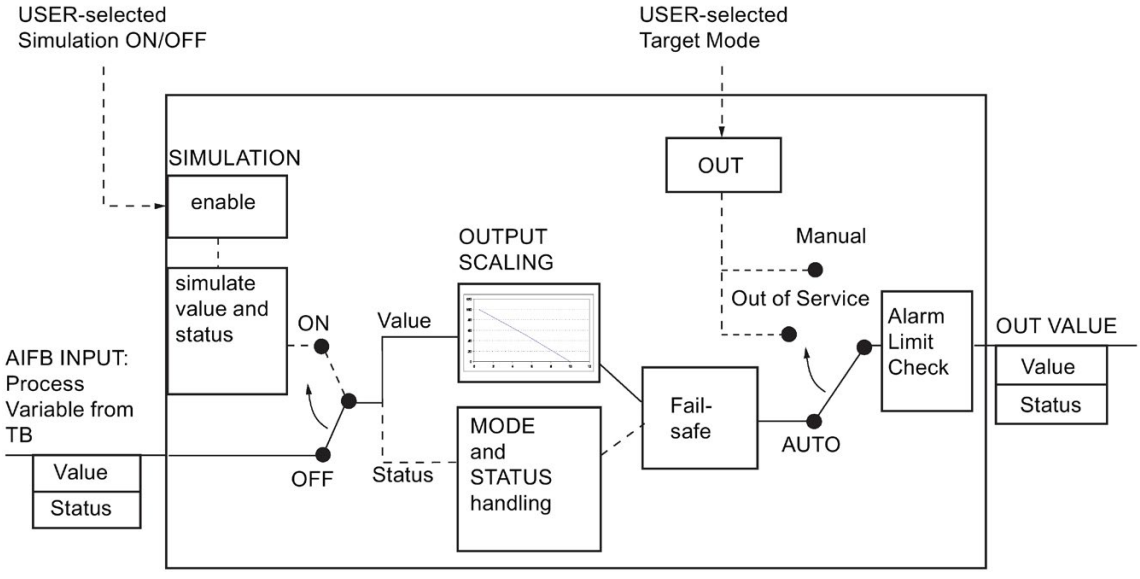
You can define a simulated value to be input to the AIFB instead of the output value from the Transducer Block. The simulated value allows the AIFB to be tested independently of the characteristics of the environment.

Actual Mode: Device / Output Simulation

Actual Mode allows you to select one of three possible outputs.

Actual 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.

AIFB function groups



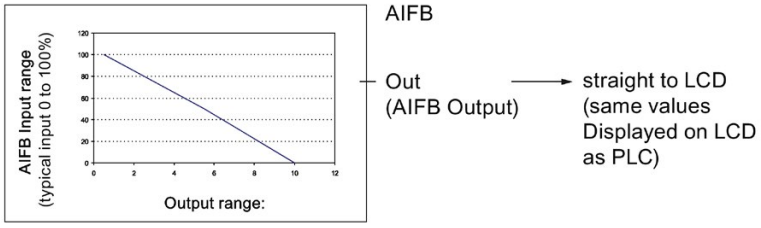
Analog Input Function Block function groups (simulation, mode and status)

Measured values are processed within an Analog Input Function Block to produce the device output. See AIFB function groups (Page 243). 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 (Page 222) 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 Failsafe Mode.
5. **Actual Mode (2.6.2.)** allows the entire AI block to be overridden by a Manual Output value. See **Actual Mode (2.6.2.)** 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.)** for details.
7. The output value (OUT) is communicated via cyclic data transfer.

Appendix C: Communications via PROFIBUS

C

SITRANS LR250 (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 LR250 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:

PROFIBUS PA (http://www.profibus.com/)

C.1 Device configuration

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:

SIMATIC PDM (www.siemens.com/simatic-pdm)

C.1.1 SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain SITRANS LR250 and other process devices. For more detail see Functions in SIMATIC PDM (Page 67).

C.1.1.1 Electronic Device Description

In order to use **Process Device Manager (PDM)** with PROFIBUS PA, you will need the Electronic Device Description for SITRANS LR250. For details see Electronic Device Description (EDD) (Page 68).

C.2 Network configuration

To configure a PROFIBUS PA Class 1 Master (for example, a PLC), you will need a **GSD** file.

C.2.1 The GSD file

The GSD file **SIEM8150.gsd** is available from the SITRANS LR250 product page on our web site. Go to the product page of our website and click on **Support > Software Downloads:**

Product page (http://www.siemens.com/LR250)

C.3 Bus termination

Note

PROFIBUS PA cable shield MUST be terminated at both 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:

PROFIBUS PA (http://www.profibus.com/)

C.4 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: 15 mA for SITRANS LR250. Allow a current reserve for safety.

C.5 PROFIBUS address

A unique PROFIBUS address identifies each device on the network. To set the PROFIBUS address see **Device Address (5.1.)**.

Note

- 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.

Resetting the PROFIBUS address to 126

- Via SIMATIC PDM:

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.

- Via the handheld programmer:

1. Navigate to **Service (4.) > Master Reset (4.1.)**. (You can enter the numeric value instead of navigating via the Arrow keys.)
2. Press **RIGHT Arrow** to open Edit Mode then scroll down to **DEV ADDRESS** and press **RIGHT Arrow** to select it. The address will be reset to 126, and if the address lock was on, it will be disabled.
3. Press **LEFT** Arrow to exit.

C.6 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 LR250 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 LR250 [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 LR250 as a profile device see **PROFIBUS Ident Number (5.2.)**.

C.6.1 Configuring a new device

See Configuring a new device (Page 68).

C.6.2 Configuring PROFIBUS PA with an S7-300/ 400 PLC

1. If SITRANS LR250 is not listed in the STEP 7 device catalog, you can download the EDD files from the Siemens Web site and add them to your computer using the device integration procedure specific to your host software (eg. Step 7, or PDM, etc.) version. Go to the product page of our website and click on **Support > Software Downloads:**
   Product page (http://www.siemens.com/LR250)
2. Add the SITRANS LR250 "rack": click and drag the SITRANS LR250 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.

C.7 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.

C.7.1 Cyclic data

When you configure SITRANS LR250 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; 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 [see Analog Input Function Blocks 1 and 2 (Page 242) for details].

AIFB1 and **AIFB2** return 5 bytes of data each:

	Floating Point				Status
AIFB1	byte 1	byte 2	byte 3	byte 4	byte 5
AIFB2	byte 6	byte 7	byte 8	byte 9	byte 10

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.

C.8 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.)** 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.

C.9 Condensed status

These codes are available when Condensed Status is enabled. See **Condensed Status (3.4.)** 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 (Page 248).
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.

See Acyclic Extended Diagnostics (General Fault Codes) (Page 254).

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.

C.10 Diagnostics

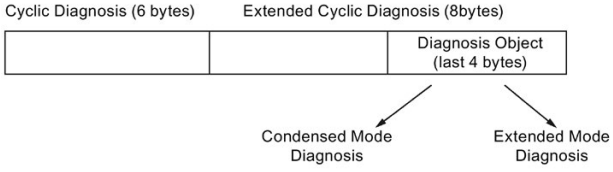
All diagnostic information shown below is viewable via PDM.

C.10.1 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 (Page 252) and Condensed Mode Diagnosis (Page 253)].

The same information is also available acyclically via the Diagnosis Object.



C.10.2 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 (Page 252)
- Condensed Mode Diagnosis (Page 253)

You can choose which of these will be returned, by enabling or disabling Condensed Status. See **Enable (3.4.1.)**. When Condensed Status is disabled **Extended Mode Diagnosis** will be returned, and the following codes will be used.

C.10.3 Extended mode diagnosis

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

C.10.4 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		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)	R
0x00100000		4	Restart carried out (Cold Start)	R
0x00200000		5	Maintenance required	R
0x00400000		6	Reserved for use within the PNO	A
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.	A
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.

C.10.5 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) (Page 251) 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.)**].

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 Failsafe LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid calibration 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 range calibration. • 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
S:7		Sensor is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.		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

Acyclic Extended Diagnostics /General Fault Codes					
LCD display		**Meaning**	**Corrective Action**	**Byte**	**Bit**
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
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
S:43		Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.	5	3

C.10.6 Acyclic data

SITRANS LR250 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 a device, 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).

Appendix D: Certificates and Support

D

D.1 Technical support

Technical Support

If this documentation does not provide complete answers to any technical questions you may have, contact Technical Support at:

- Support request (http://www.siemens.com/automation/support-request)
- More information about our Technical Support is available at Technical Support (http://www.siemens.com/automation/csi/service)

Internet Service & Support

In addition to our documentation, Siemens provides a comprehensive support solution at:

- Services & Support (http://www.siemens.com/automation/service&support)

Personal contact

If you have additional questions about the device, please contact your Siemens personal contact at:

- Partner (http://www.automation.siemens.com/partner)

To find the personal contact for your product, go to "All Products and Branches" and select "Products & Services > Industrial Automation > Process Instrumentation".

Documentation

You can find documentation on various products and systems at:

- Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation)

D.2 Certificates

You can find certificates on the Internet at Product page (http://www.siemens.com/LR250) or on an included DVD.

List of abbreviations

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Short form	Long form	Description	Units
3-A	3-A Sanitary Standards, Inc.		
AIFB	Analog Input Function Block		
CE / FM / CSA	Conformité Européene / Factory Mutual / Canadian Standards Association	safety approval	
C_i	Internal capacitance		F
D/A	Dialog to analog		
DCS	Distributed Control System	control room apparatus	
dK	dielectric constant		
EDD	Electronic Device Description		
EHEDG	European Hygienic Engineering Design Group		
FEA	Flanged Encapsulated Antenna		
FDA	Food and Drug Administration		
HEA	Hygienic Encapsulated Antenna		
I_i	Input current		mA
I_o	Output current		mA
IS	Intrinsically Safe	safety approval	
L_i	Internal inductance		mH
mH	milliHenry	10^{-3}	H
µF	microFarad	10^{-6}	F
µs	microsecond	10^{-6}	s
PED	Pressure Equipment Directive	safety approval	
pF	pico Farads	10^{-12}	F
ppm	parts per million		
PV	Primary Variable	measured value	
PVDF	Polyvinylidene fluoride		
SELV	Safety extra low voltage		
SV	Secondary Variable	equivalent value	
TB	Transducer Block		
TFM1600 PTFE	Modified PTFE	polytetrafluoroethylene with perfluoropropyl vinyl ether (PPVE) modifier	
TVT	Time Varying Threshold	sensitivity threshold	
U_i	Input voltage		V
U_o	Output voltage		V

LCD menu structure

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Note

- In Navigation mode, **ARROW keys (◄ ▲ ► ▼)** navigate the menu in the direction of the arrow. See Parameter Reference (Page 95) for detailed information and instructions.

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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 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 device 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 a device 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. 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.

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 Profile

a graphical display of a processed echo.

Echo Strength

describes the strength of the selected echo in dB referred to 1 µV rms.

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.

inductance

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.

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 RAdio Detection And Ranging. 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.

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.

stilling-well

see stillpipe.

stillpipe

a pipe that is mounted inside a vessel parallel to the vessel wall, and is open to the vessel at the bottom.

TVT (Time Varying Threshold)

a time-varying curve that determines the threshold level above which echoes are determined to be valid.

two wire radar

a low-energy radar. Can be loop powered, analog, intrinsically safe 4 to 20 mA, or a digital (BUS) transmitter.

waveguide antenna

a hollow, metallic tube that transmits a microwave signal to the product target.

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For more information

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Siemens AG
Process Industries and Drives
Process Automation
76181 Karlsruhe
Germany

Printed in Canada
A5E32221386-AF