SIEMENS

SITRANS L

Radar Transmitters SITRANS LR200 with PROFIBUS PA

Operating Instructions

7ML5422 (Polypropylene rod antenna)
7ML5423 (Rod antenna)
7ML5425 (Horn antenna)

05/2019
A5E32337680-AE

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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Introduction

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1.1 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.

1.2 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.

1.3 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: https://www.siemens.com/industrialsecurity.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends you apply product updates as soon as available and 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
https://www.siemens.com/industrialsecurity.

1.4 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.

NOTICE
Insufficient protection during storage The packaging only provides limited protection against moisture and infiltration. • Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical data (Page 135).

1.5 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.

NOTICE
Use in a domestic environment This Class B Group 1 equipment is intended for use in industrial areas. In a domestic environment this device may cause radio interference.

Safety notes

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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.

⚠ 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.

2.2 Laws and directives

2.2.1 Laws and directives

Observe the safety rules, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU)

2.2.2 FCC Conformity

US Installations only: Federal Communications Commission (FCC) rules

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.

2.2.3 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.

2.2.4 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.

EMC Standard	Title
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.

2.2.5 Radio Equipment Directive (RED) compliance (Europe)

Hereby, Siemens declares that the SITRANS LR200 is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. The LR200 complies with EN 302 372 for use in closed storage vessels, when installed according to the installation requirements of EN 302 372, and may be used in all EU countries.

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

2.2.6 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
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.

2.2.7 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.

2.3 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

Use in hazardous area

Risk of explosion.

- Only use equipment that is approved for use in the intended hazardous area and labeled accordingly.
- Do not use devices that have been operated outside the conditions specified for hazardous areas. If you have used the device outside the conditions for hazardous areas, make all Ex markings unrecognizable on the nameplate.

⚠WARNING

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

If the device or its components have 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 risk 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 and/or in Technical data (Page 135).

2.4 Lithium batteries

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.

Description

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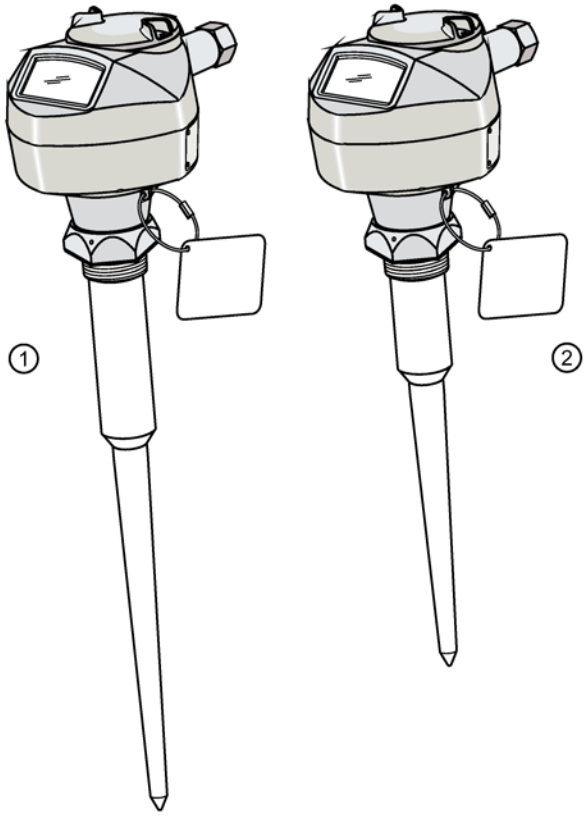
3.1 SITRANS LR200 Overview

SITRANS LR200 is a 2-wire 6 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage vessels including high pressure and high temperature, to a range of 20 meters (66 feet). The instrument consists of an electronic component coupled to an antenna and either a threaded or flange type process connection.

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



① Shield length 250 mm (10") or less in length

② Shield length 100 mm (4"): use for nozzles of 100 mm (4") or less in length

3.2 Applications

- Liquids and slurries
- Liquids bulk storage vessels
- Process vessels

3.3 Programming

SITRANS LR200 is very easy to install and configure via a graphical Human Machine Interface (HMI). 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:

- SIMATIC PDM
- Pactware/DTM
- AMS Device Manager

3.4 Approvals and certificates

SITRANS LR200 is available with General Purpose approval, or for hazardous areas. The approval rating is shown on the device nameplate. For more information see Approvals data (Page 138).

Installing/mounting

4

4.1 Basic safety notes

CAUTION

Hot surfaces resulting from hot process media

Risk of burns resulting from surface temperatures above 65 °C (149 °F).

- Take appropriate protective measures, for example contact protection.
- Make sure that protective measures do not cause the maximum permissible ambient temperature to be exceeded. Refer to the information in Operating conditions (Page 137).

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 permissible operating pressure

Risk of injury or poisoning.

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

Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical data (Page 135).

⚠ WARNING

Pressure applications

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

- Improper installation may result in loss of process pressure.

⚠ CAUTION

External stresses and loads

Damage to device by severe external stresses and loads (e.g. thermal expansion or pipe tension). Process media can be released.

- Prevent severe external stresses and loads from acting on the device.

NOTICE

Strong vibrations

Damage to device.

- In installations with strong vibrations, mount the transmitter in a low vibration environment.

NOTICE

Aggressive atmospheres

Damage to device through penetration of aggressive vapors.

- Ensure that the device is suitable for the application.

NOTICE

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 Operating conditions (Page 137).

WARNING

Insufficient air supply

The device may overheat if there is an insufficient supply of air.

- Install the device so that there is sufficient air supply in the room.
- Observe the maximum permissible ambient temperature. Refer to the information in the section Operating conditions (Page 137).

4.2 Mounting

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.

4.2.1 Mounting location

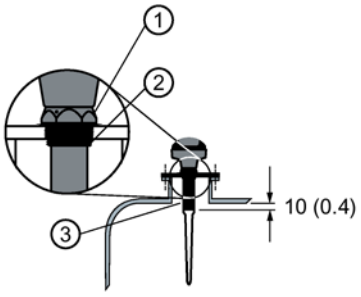
Note

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

4.2.1.1 Nozzle design

- For nozzles 100 mm (4") in length or shorter use the 100 mm (4") shield.
- For nozzles 250 mm (10") in length or shorter use the 250 mm (10") shield.

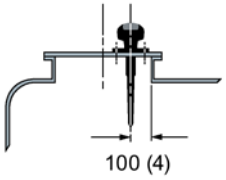
The end of the shield section or end of the horn should protrude a minimum of 10 mm (0.4”) to avoid false echoes being reflected from the nozzle.



① Locking ring secured by three 2 mm Allen set-screws
② Threaded connection
③ Shield

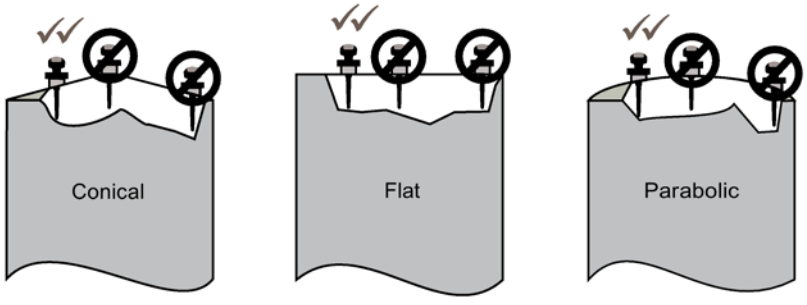
Location on a manhole cover

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



Avoid central locations on vessels

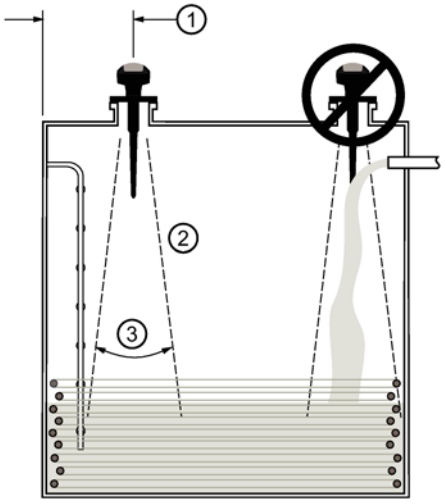
For vessels with conical or parabolic tops, avoid mounting the device at the center. The concavity of the top can focus echoes into the center, giving false readings.



4.2.1.2 Nozzle location

Beam angle

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



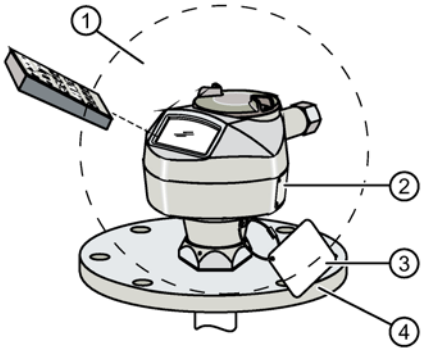
① Min. 300 mm (1 ft) per 3 m (10') of vessel height
② Emission cone
③ Beam angle 28°

Emission cone

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

4.2.1.3 Access for programming

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



① Ambient temperature (surrounding enclosure volume)
-40 to +80 °C (-40 to +176 °F)

② Device nameplate

③ Process device tag

④ Process temperature

- Polypropylene rod: -40 to +80 °C (-40 to +176 °F)
- PTFE or SS horn: –40 °C to +200 °C (–40 °F to +392 °F)

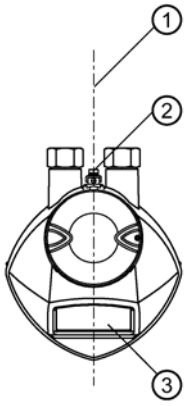
For more detail on maximum interface and process temperatures, refer to Maximum process temperature chart (Page 167).

For other configurations, refer to Maximum process temperature chart (Page 167) and Process pressure/temperature derating curves (Page 169).

4.2.1.4 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, refer to Mounting on a stillpipe or bypass pipe (Page 26).



① Polarization axis
② Polarization reference point
③ Display

Mounting on a stillpipe or bypass pipe

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

Stillpipe or bypass pipe requirements

- The pipe diameter must be matched with the horn size. Use the largest horn size that will fit the stillpipe/bypass pipe (refer to Flanged horn dimensions (Page 146)).
- Suitable pipe diameters are between 50 mm (2") and 200 mm (8”).
- One continuous length of metallic pipe is preferred, without joints[2)].
- Joints (if unavoidable) must be machined to ± 0.25 mm (± 0.010”) and must have a welded connecting sleeve on the outside.
- Bypass vent required at the upper end of the bypass[3)].
- Propagation factor depends on pipe diameter. For a table of pipe diameters, refer to Propagation factor (2.5.3.) (Page 93).

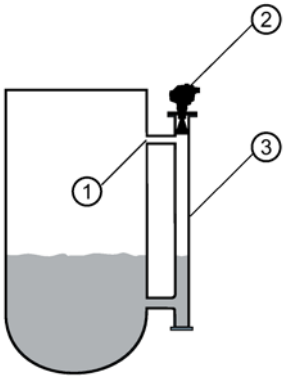
[1)] Refer to Performance (Page 135).

[2)] Bad joints create reflections.

[3)] Required to equalize pressure and keep the liquid level in the bypass constant with the liquid level in the vessel.

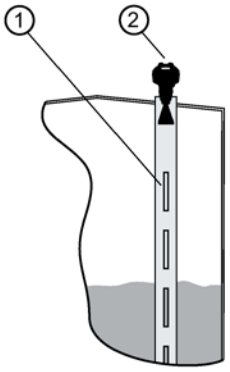
Device orientation

Bypass installation



① Vent
② Align front or back of device with vents
③ Optimum diameter 80 mm (3")

Stillpipe installation



① Slots
② Align front or back of device with stillpipe slots

4.3 Installation

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 1/8).

Note

Process device tag

The Process Device Tag shall remain with the process pressure boundary assembly[1)]. In the event the instrument package is replaced, the Process Device Tag shall be transferred to the replacement unit.

The serial numbers stamped in each process connection body provide a unique identification number indicating date of manufacture. Example: MMDDYY – XXX (where MM = month, DD = day, YY = year, and XXX= sequential unit produced). Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.

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

4.3.1 Installation instructions

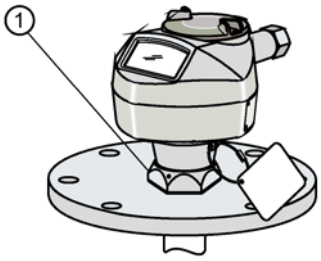
Note

- For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.
- There is no limit to the number of times the device can be rotated without damage.
- When mounting, orient the front or back of the device towards the closest wall.
- Do not rotate the enclosure after programming and device configuration, otherwise an error may occur, caused by a polarity shift of the transmit pulse.

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

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

3. If you want to rotate the enclosure, use a 2 mm Allen key to loosen the set screws that secure the locking ring[1)].
4. Once the enclosure is in a suitable position, tighten the set screws.



① Locking ring[1)] over threaded connection; secured by three 2 mm Allen set screws

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

4.4 Disassembly

⚠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 notes

⚠ 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.
- 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

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.

⚠ 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

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

- Protect unused cable ends in accordance with IEC/EN 60079-14.

WARNING

Improper laying of shielded cables

Risk of explosion through compensating currents between hazardous area and the non-hazardous area.

- Shielded cables that cross into hazardous areas should be grounded only at one end.
- If grounding is required at both ends, use an equipotential bonding conductor.

Note

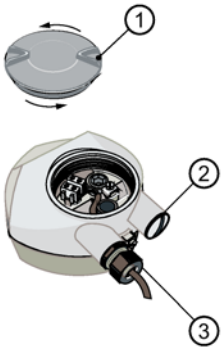
Electromagnetic compatibility (EMC)

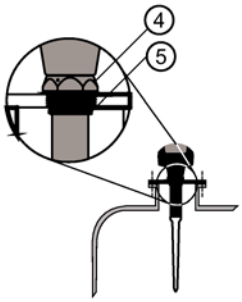
For metal housings there is an increased electromagnetic compatibility compared to high-frequency radiation. This protection can be increased by grounding the housing, see Connecting SITRANS LR200 (Page 31).

5.2 Connecting SITRANS LR200

Note

- Check the nameplate on your instrument, to verify the approval rating.
- Use appropriate conduit seals to maintain IP or NEMA rating.
- See Device nameplate (ATEX/IECEX/INMETRO/RCM) (Page 35).
- Use a twisted pair cable: AWG 22 to 14 (0.34 mm^2 to 2.5 mm^2).
- Separate cables and conduits may be required to conform to standard instrumentation wiring practices or electrical codes.





① Use a 2 mm Allen key loosen the lid-lock set screw.

② Plug

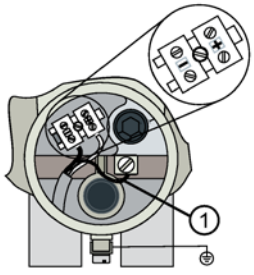
③ Optional cable gland[1) 2)] (or NPT cable entry[2)])

④ Locking ring

⑤ Threaded connection

If you want to rotate the enclosure, use the 2 mm Allen key to loosen the locking ring.

1. Strip the cable jacket for approximately 70 mm (2.75") from the end of the cable, and thread the wires through the gland[2)].
2. Connect the wires to the terminals as shown: the polarity is identified on the terminal block.
3. Ground the instrument according to local regulations.
4. Tighten the gland to form a good seal.
5. Close the lid and secure the locking ring before programming and device configuration



① Cable shield (if used)

[1)] May be shipped with the device.

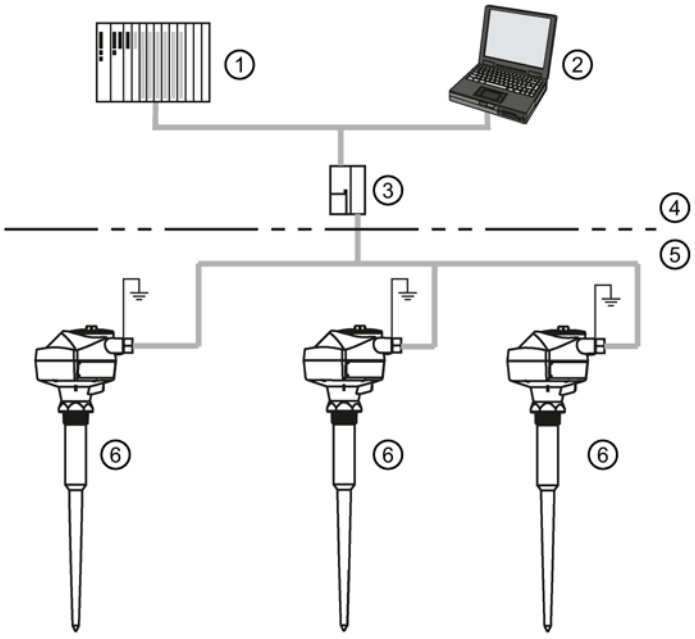
[2)] If cable is routed through conduit, use only approved suitable-size hubs for waterproof applications.

Note

For devices with Profibus PA:

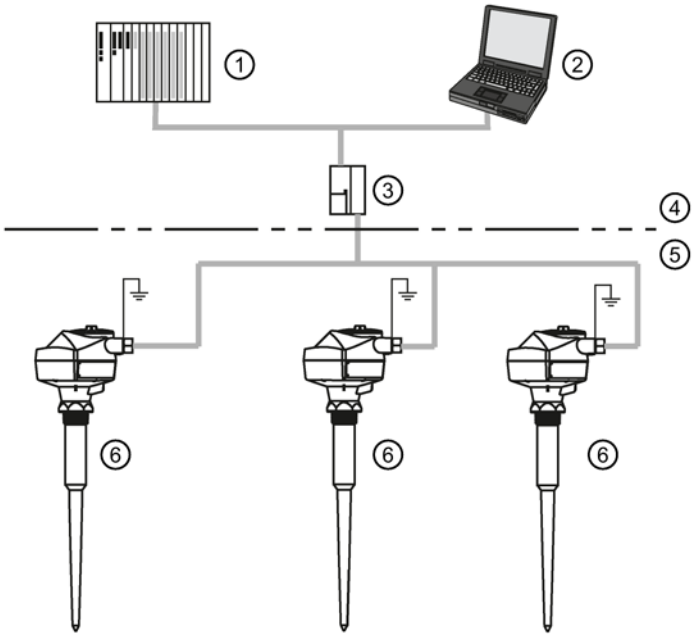
- PROFIBUS PA must be terminated at both extreme ends of the cable for it to work properly.
- For more information on installing Profibus devices, see www.profibus.com (www.profibus.com).

5.2.1 Basic PLC configuration with PROFIBUS PA



① Active PLC
② PDM on PC/laptop
③ DP/PA coupler
④ PROFIBUS DP
⑤ PROFIBUS PA
⑥ LR200

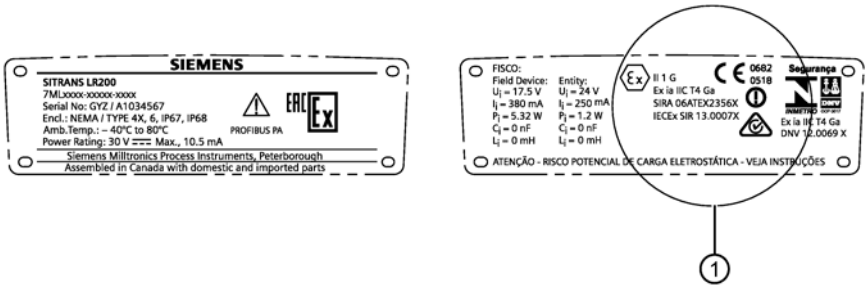
5.2.2 PLC configuration with PROFIFBUS PA for hazardous areas



① Active PLC
② PDM on PC/laptop
③ EEx ia type DP/PA coupler
④ Non-hazardous area
⑤ Hazardous area
⑥ EEx ia device

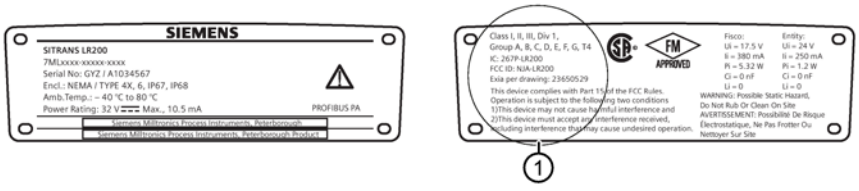
5.3 Nameplates for hazardous area installations

5.3.1 Device nameplate (ATEX/IECEX/INMETRO/RCM)



① The ATEX certificate can be downloaded from the product page of our website at LR200 (www.siemens.com/LR200). Go to Support > Approvals / Certificates.
The IECEx certificate listed on the nameplate can be viewed on the IECEx website. Go to: http://iecex.iec.ch (http://iecex.iec.ch) and click on Ex Equipment Certificates of Conformity then enter the certificate number IECEx SIR 13.0007X.

5.3.2 Device nameplate (FM/CSA)



① The FM/CSA Intrinsically Safe connection drawing number 23650529 can be downloaded from the product page of our website at LR200 (www.siemens.com/LR200). Go to Support > Approvals/Certificates.

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

5.3.3 Entity concept

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

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

Entity concept

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

FISCO concept

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

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

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.

5.4 Instructions specific to hazardous area installations

5.4.1 (Reference European ATEX Directive 2014/34/EU, Annex II, 1.0.6)

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

1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 1G equipment per SIRA 06ATEX2356X, and Category 3G equipment per SIRA 09ATEX4152X.
3. The equipment may be used with flammable gases and vapors with apparatus group IIC, IIB, and IIA, and temperature classes T1, T2, T3, and T4.
4. The equipment is certified for use in an ambient temperature range of –40 °C to +80 °C.

5. The equipment has not been assessed as a safety related device (as referred to by Directive 2014/34/EU Annex II, clause 1.5).
6. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
7. The equipment contains no user-replaceable parts and is not intended to be repaired by the user. Repair of the equipment is to be carried out by the manufacturer, or their approval agents, in accordance with the applicable code of practice.
8. The certificate numbers have an ‘X’ suffix, which indicates that special conditions for safe use apply. Those installing or inspecting this equipment must have access to the certificates.)
9. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

- Aggressive substances (e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials).
- Suitable precautions (e.g. establishing from the material’s data sheet that it is resistant to specific chemicals).

Specific conditions of use

- 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 LR200 is being installed in locations that specifically require Equipment Protection Level Ga
- The end user must ensure that the explosion protection and ingress protection is maintained at each entry to the enclosure by use of an appropriate blanking element or cable entry device that meets the requirements of the protection concepts type 'n' or increased safety 'e' or flameproof 'd'.

Operating

6

6.1 Basic safety notes

DANGER

Toxic gases and liquids

Danger of poisoning when venting the device: if toxic process media are measured, toxic gases and liquids can be released.

- Before venting ensure that there are no toxic gases or liquids in the device, or take the appropriate safety measures.

WARNING

Hot surfaces

Risk of burns resulting from hot surfaces.

- Take corresponding protective measures, for example by wearing protective gloves.

WARNING

Hazardous contact voltage

Risk of injury through hazardous contact voltage when the device is open or not completely closed.

The degree of protection specified on the nameplate or in Approvals data (Page 138) is no longer guaranteed if the device is open or not properly closed.

- Make sure that the device is securely closed.

WARNING

Loss of explosion protection

Risk of explosion in hazardous areas if the device is open or not properly closed.

- Close the device as described in Installing/mounting (Page 20).

6.2 Local operation

6.2.1 Activating SITRANS LR200

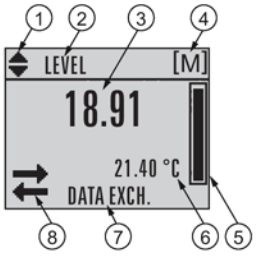
Power up the instrument. SITRANS LR200 automatically starts up in Measurement mode. A transition screen showing the current firmware revision and an incrementing line of stars is displayed while the first measurement is being processed.

Press Mode to toggle between Measurement and Program Mode.

6.2.2 The LCD display

Measurement mode display

Normal operation



① Toggle indicator [1] for linear units or %
② Selected operation: level, space, distance, or volume
③ Measured value (level, space, distance, or volume)
④ Units
⑤ Bar graph indicates level
⑥ Secondary region indicates on request [2] electronics temperature, echo confidence, loop current, or distance
⑦ Text area displays status messages
⑧ Device status indicator, see Device status icons (Page 131)

[1] Press **UP** or **DOWN** arrow to switch.

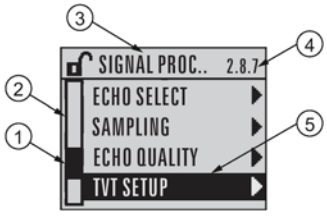
[2] In response to a key press request. For details, see Handheld Programmer (Page 41) for key functions in Measurement mode.

Fault present

① Device status indicator, see Device status icons (Page 131)
② Text area displays status messages

PROGRAM mode display

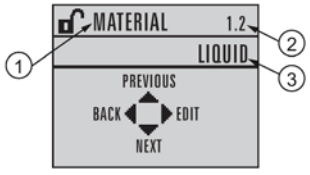
Navigation view



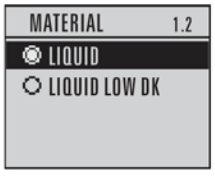
① Item band ④ Current item number
② Menu bar ⑤ Current item
③ Current menu

- 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

6.2.3 Handheld programmer

6.2.3.1 (Part No. 7ML1930-1BK)

The programmer is ordered separately.

6.2.3.2 Key functions in measurement mode

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.

6.2.4 Programming SITRANS LR200

Note

- While the device is in PROGRAM mode the output remains fixed and does not respond to changes in the device.
- SITRANS LR200 automatically returns to Measurement mode after a period of inactivity in PROGRAM mode (between 15 seconds and 10 minutes, depending on the menu level).

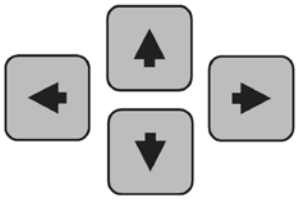
Change parameter settings and set operating conditions to suit your specific application. For remote operation see Operating via SIMATIC PDM (Page 49).

6.2.5 Parameter menus

Note

For the complete list of parameters with instructions, see Parameter assignment (Page 81).

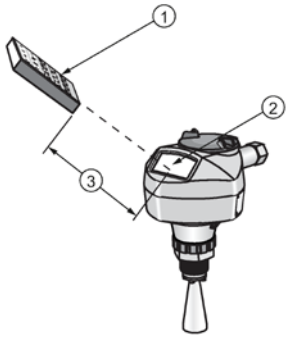
Parameters are identified by name and organized into function groups. See LCD menu structure (Page 196).



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

1. Enter PROGRAM mode

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



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

2. Navigating: key functions in Navigation mode

Note

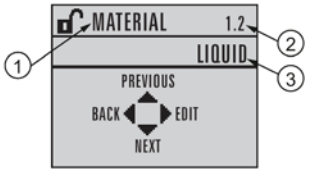
- In Navigation mode **ARROW** keys move to the next menu item in the direction of the arrow.
- For Quick Access to parameters via the handheld programmer, press Home , then enter the menu number, for example: **2.4.1.** (Volume).

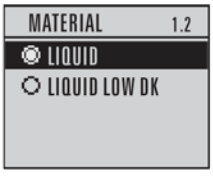
Key	Name	Menu level	Function
	**UP** or **DOWN arrow**	menu or parameter	Scroll to previous or next menu or parameter
	**RIGHT arrow**	menu	Go to first parameter in the selected menu, or open next menu.
		parameter	Open **Edit** mode.
	**LEFT arrow**	menu or parameter	Open parent menu.
	**Mode**	menu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



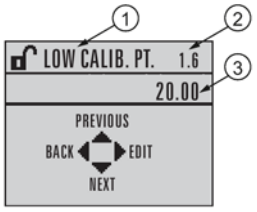


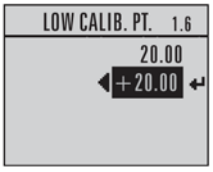
① Parameter name ② Parameter number ③ Current selection

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 selection

Key functions in edit mode

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

6.2.6 Quick Start Wizard via the handheld programmer

1. Quick Start

1.1. Quick Start Wiz

- 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.

Language

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

Options	English, Deutsch, Français, Español

Material

Selects the appropriate echo processing algorithms for the material. See Position detect (2.5.7.2.) (Page 94) for more detail.

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

[1] dK < 3.0

Response Rate

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

Options	**Response Rate (2.4.1.)**	**Fill rate per Minute (2.4.2.)/Empty rate per Minute (2.4.3.)**
	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)

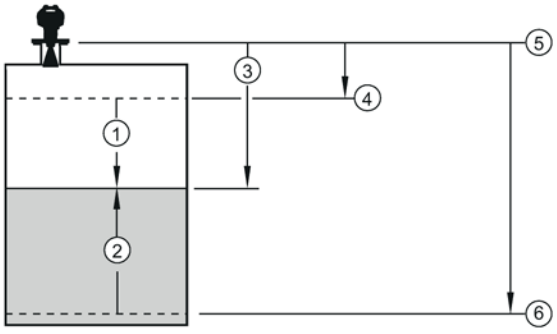
Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

Units

Sensor measurement units.

Options	m, cm, mm, ft, in

Operating Mode



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

Operation	Description
NO SERVICE	Measurement and associated loop current are not updated, and the device defaults to Fail-safe mode.
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

[1] The point from which High and Low Calibration points are referenced: see Dimension drawing (Page 140) and Flange adapter versions (Page 142).

Low Calibration Point

Distance from Sensor Reference to Low Calibration Point: usually process empty level. [See Operation (1.5.) for an illustration.]

Values	Range: 0.00 to 20.00 m

High Calibration Point

Distance from Sensor reference point to High Calibration Point: usually process full level. [See Operation (1.5.) for an illustration.]

Values	Range: 0.00 to 20.00 m

Apply? (Apply changes)

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

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

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

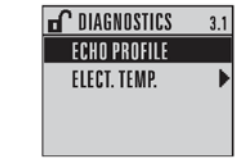
6.2.7 Auto False Echo Suppression

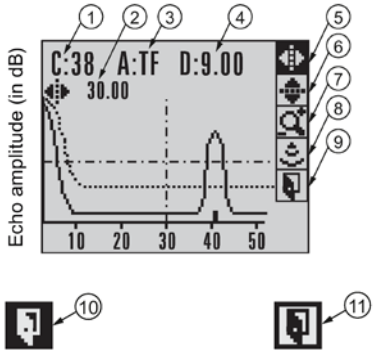
If you have a vessel with known obstructions, we recommend using Auto False Echo Suppression to prevent false echo detection. See TVT setup (2.5.10.) (Page 96) for instructions.

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

6.2.8 Requesting an Echo Profile

- In **PROGRAM** mode, navigate to: Level Meter >Diagnostics (3.) (Page 105) > Echo profile (3.1.) (Page 105)
- Press **RIGHT arrow** to request a profile.





① Confidence
② Distance from Low Calibration Point to vertical cross-hair
③ Algorithm: t**F** (trueFirst)
④ Distance from flange face to target
⑤ Pan left/right - selected
⑥ Pan up/down
⑦ Zoom
⑧ Measure
⑨ Exit
⑩ Exit icon selected
⑪ Exit icon deselected

- 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.**

6.2.9 Device address

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 > Communication (5.) > Device address (5.1.)**
2. Press RIGHT arrow twice 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 Remote operation

6.3.1 Operating via SIMATIC PDM

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

6.3.2 Functions in SIMATIC PDM

Note

- For a complete list of parameters see Parameter assignment (Page 81).
- While the device is in PROGRAM mode the output remains fixed and does not 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 196) for a chart[1)] and Changing parameter settings using SIMATIC PDM (Page 59) for more details.

See Parameters accessed via pull-down menus (Page 59) for parameters that do not appear in the menu structure in SIMATIC PDM.

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

6.3.2.1 Features of SIMATIC PDM Rev. 6.0, SP4

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

Feature	Function
Quick Start Wizard via SIMATIC PDM (Page 51)	Device configuration for simple applications
Echo profile utilities (Page 60)	Easy access to echo profile viewing/comparison, TVT shaping, auto false echo suppression and echo setup
Auto false echo suppression (Page 63)	Screen out false echoes
TVT Shaper (Page 62)	Manual TVT adjustment
Linearization (Page 56)	Volume measurement in an irregular vessel
Process variables (Page 69)	Monitor process variables and level trend
Security (Page 73)	Protect security and communication parameters from modification by the maintenance user

6.3.2.2 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.

6.3.3 Initial setup

6.3.3.1 Electronic device description (EDD)

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

LR200 (www.siemens.com/LR200)

6.3.3.2 Configuring a new device

Note

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

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

To set Device Address via SIMATIC PDM

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

6.3.4 Quick start wizard

6.3.4.1 Quick Start Wizard via SIMATIC PDM

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

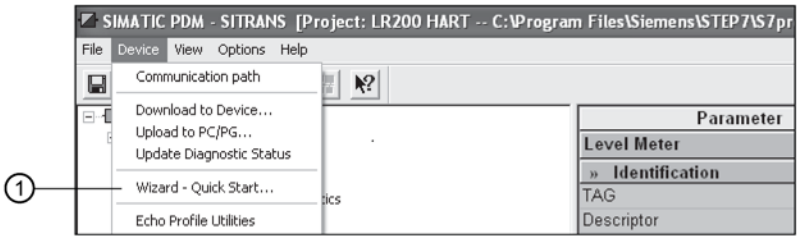
Please consult the operating instructions or online help for details on using SIMATIC PDM.

1. If you have not already done so, check that you have the most up-to-date EDD for your instrument. (See Updating the Electronic Device Description (EDD) (Page 50)above.)
2. Launch SIMATIC Manager and create a new project for LR200. (Application Guides for setting up HART and PROFIBUS PA devices with SIMATIC PDM can be downloaded from the product page of our website at: www.siemens.com/LR200 (www.siemens.com/LR200)).
3. Open the menu **Device – Master Reset** and click on **OK** to perform a reset to Factory Defaults.
4. After the reset is complete upload parameters to the PC/PG.
5. Configure the device.

Note

- The Quick Start Wizard settings are inter-related and changes apply only after you click on **FINISH AND DOWNLOAD** at the end of step 5 to save settings offline and transfer them to the device.
- Do not use the Quick Start Wizard to modify individual parameters. For quick access to echo profile parameters see Echo Setup (Page 65), or see Parameter Reference (Page 81) for a complete list.
- 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 (Page 63).

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



① Quick Start

6.3.4.2 Step 1 - Identification

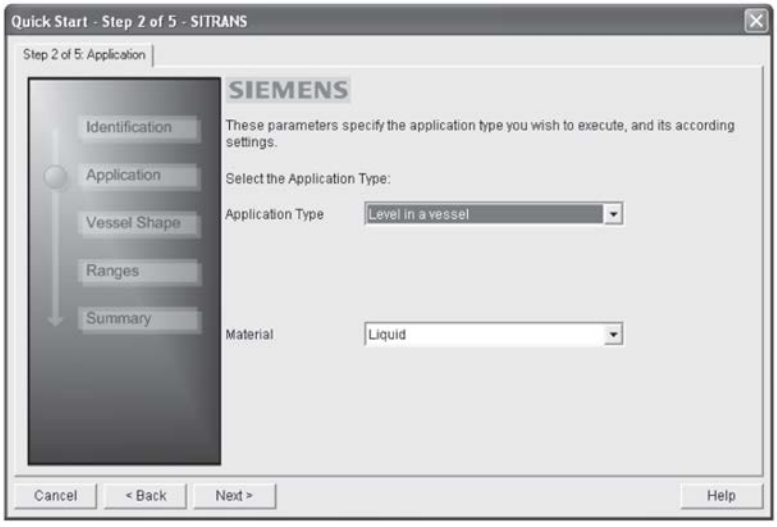
Note

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

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

6.3.4.3 Step 2 - Application

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

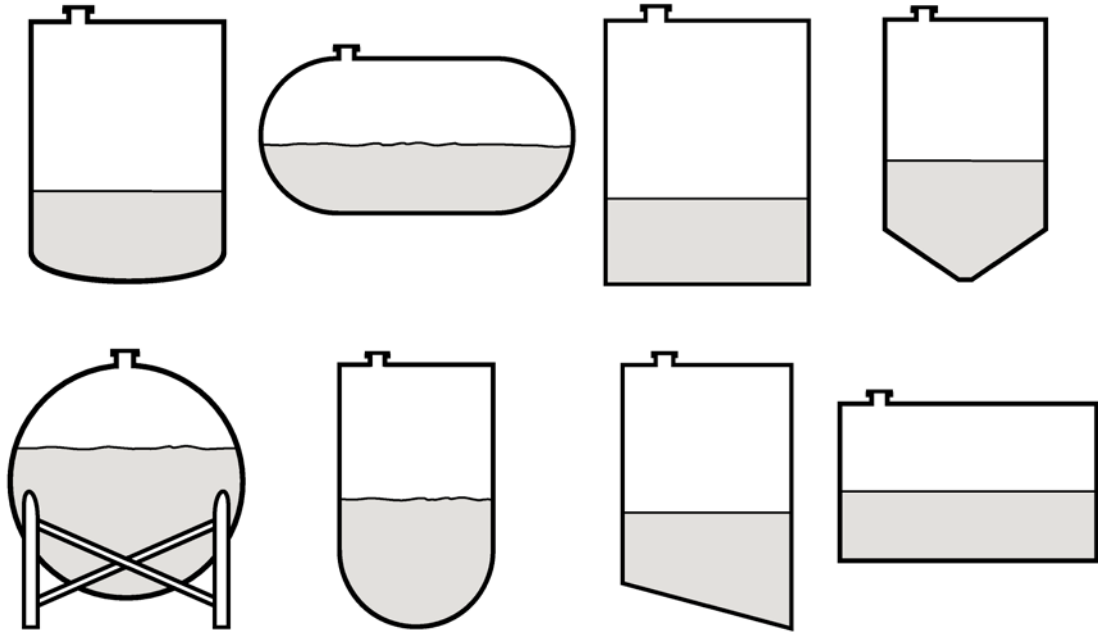


[1)] See Application with Stillpipe (Page 58) for a Low Dielectric Liquid application.

6.3.4.4 Step 3 - Vessel Shape

The vessel shapes shown are predefined. To describe a more complex shape see Using Linearization via the Quick Start Wizard (Page 56).

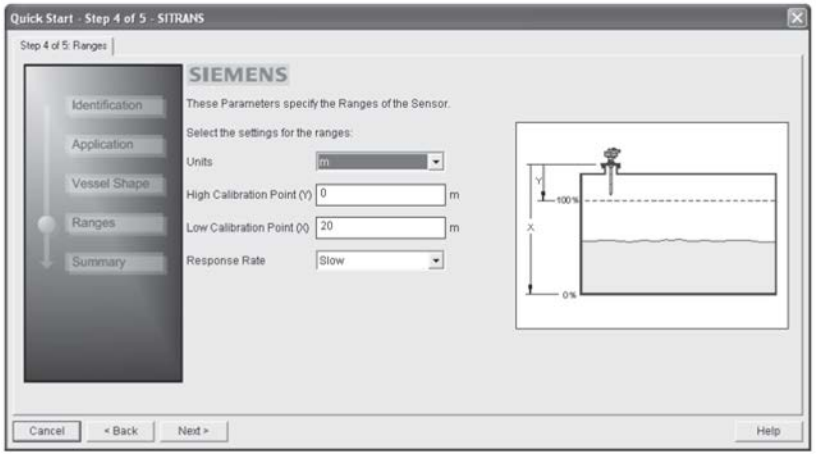
For a vessel with obstructions, see Auto False Echo Suppression. (Page 63)



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

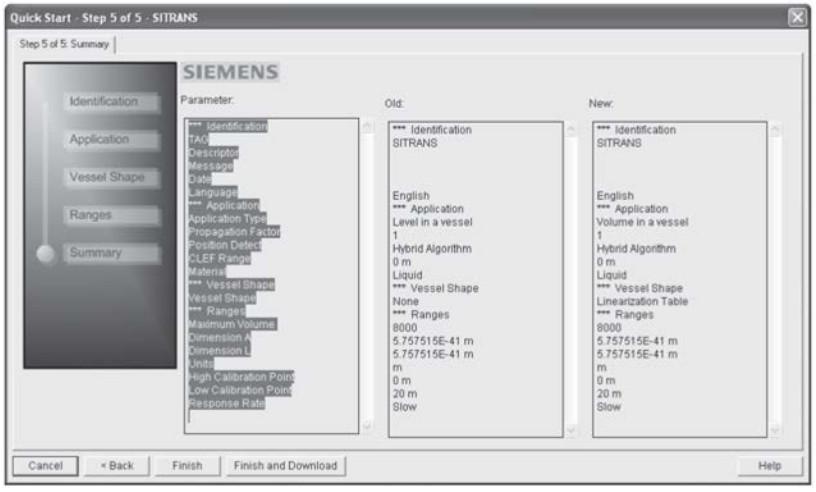
6.3.4.5 Step 4 - Range

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



6.3.4.6 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.

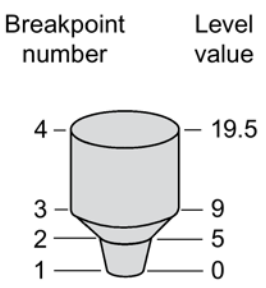


The message **Quick Start was successful** will appear. Click on **OK**.

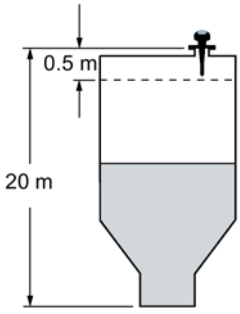
6.3.4.7 Linearization

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

Example (values for example purposes only)



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



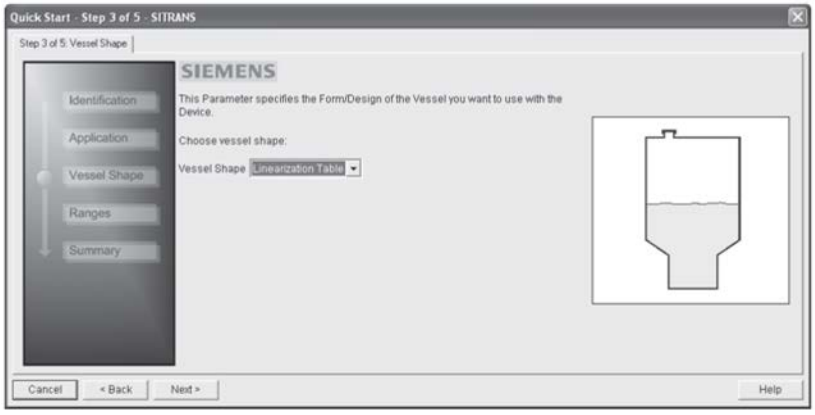
6.3.4.8 Using Linearization via the Quick Start Wizard

Open the menu Device - Wizard - Quick Start:

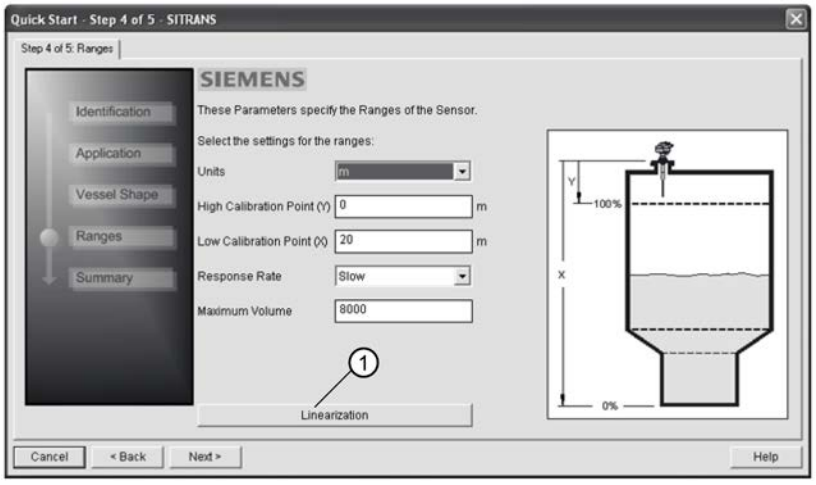
In **Step 1 - Identification**, click on **Read Data from Device**, select language, and click on **Next**.

In **Step 2 – Application**, select a volume application, for example **Volume in a vessel**, and click on **Next**.

In **Step 3 – Vessel Shape**, choose the vessel shape option **Linearization Table**, and click on **Next**.



In **Step 4 - Ranges**

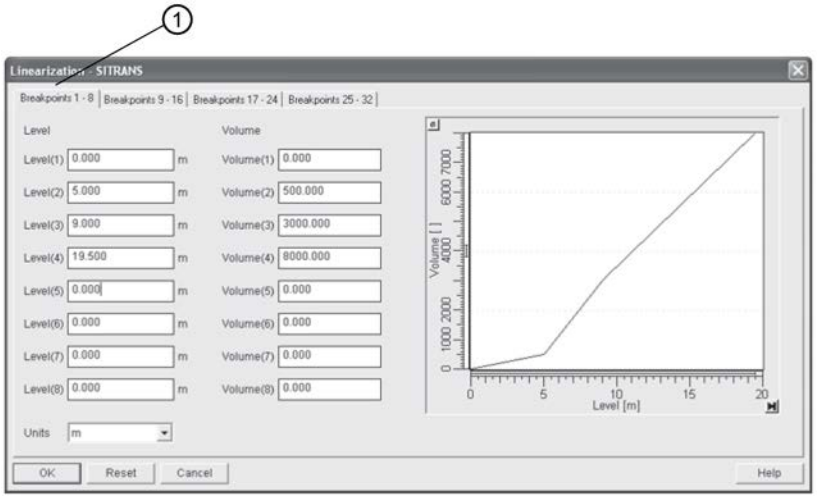


① Linearization

- Enter parameter values.
- Click on **Linearization**
- In the **Linearization** window click on the appropriate **Breakpoint** tab to open the dialog window.
- Enter the desired level and associated volume values[1)], and click on **OK**.

Note

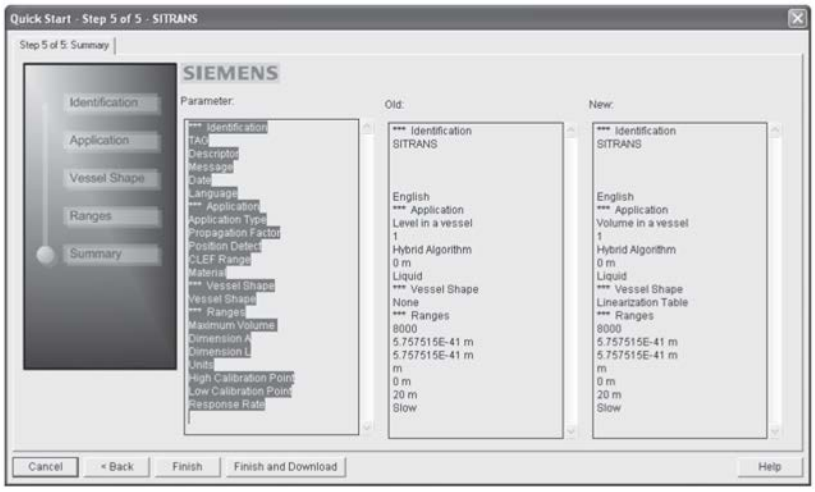
The **Reset** button resets values to the values in the offline table.



① Breakpoints 1-8

- In the Step 4 window, click on **NEXT**.

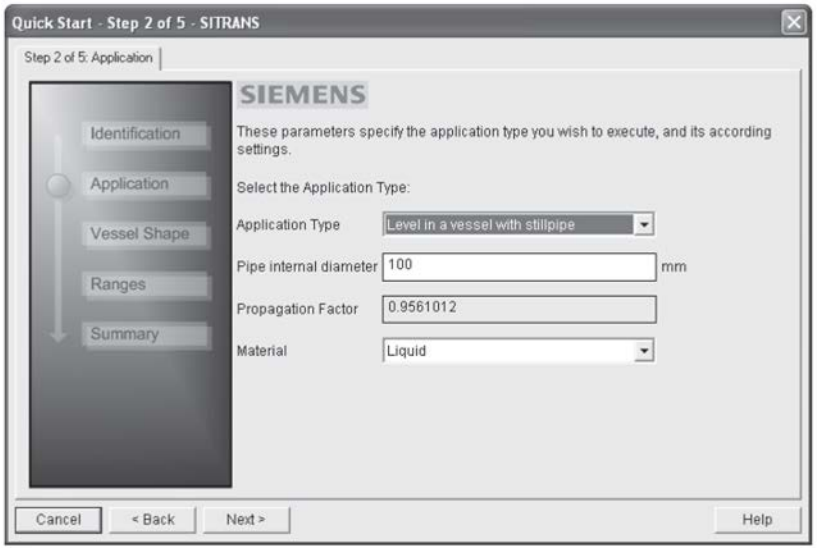
In **Step 5 – Summary**, check parameter values. Click on **BACK** to return and revise values, **FINISH** to save settings offline, or **FINISH AND DOWNLOAD** to save settings offline and transfer them to the device.



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

6.3.4.9 Configuring a stillpipe application

- Launch the Quick Start wizard and follow steps 1 to 2.
- In step 2, select **Application Type – Level in a vessel with stillpipe, Material – Liquid Low dK**, and set the stillpipe diameter as desired.
- The wizard updates the propagation factor according to the pipe diameter, and enables the CLEF algorithm for low dK liquids [see Propagation factor (2.5.3.) (Page 93) for more detail].



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

6.3.5 Changing parameter settings using SIMATIC PDM

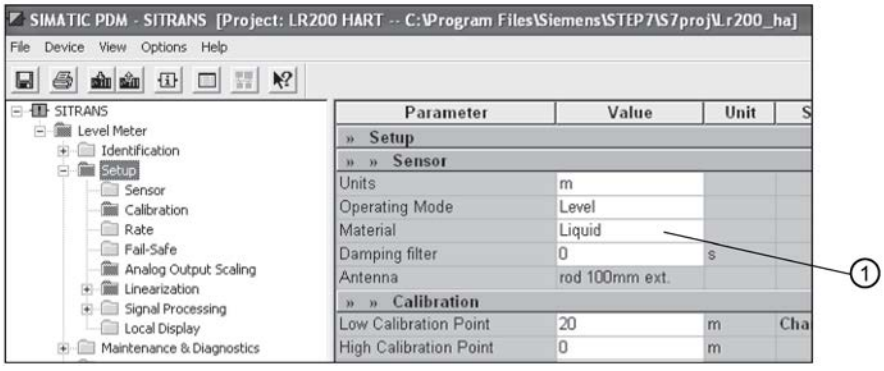
6.3.5.1 Changing parameter settings using SIMATIC PDM

Note

- For a complete list of parameters, see Parameter Reference (Page 81).
- 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 59) for others.

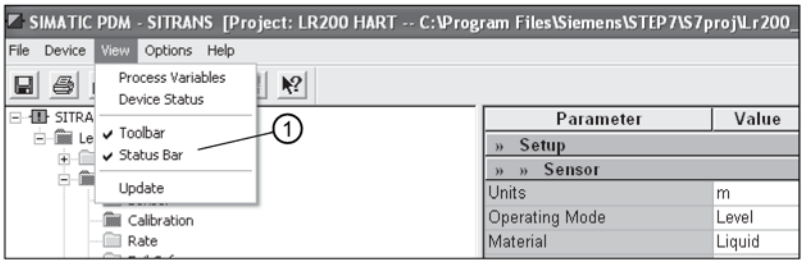
1. Launch SIMATIC PDM, connect to device, and upload data from device.
2. Adjust parameter values in the parameter value field then **Enter**. The status fields read **Changed**.
3. Open the Device menu, click on **Download to device**, then use **File - Save** to save settings offline. The status fields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



① Value fields

6.3.6 Parameters accessed via pull-down menus

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



① Pull-down menus

6.3.6.1 Pull-down menus

Device menus	View menus
Communication path	Process variables (Page 69)
Download the device	Device diagnostics
Upload to PC/PG	Toolbar
Update diagnostic status	Device Status (Page 72)
Set address (Page 60)	Update (Page 73)
Wizard - Quick start	
Echo profile utilities (Page 60)	
Maintenance (Page 66)	
Acknowledge faults (Page 67)	
Wear (Page 67)	
Simulation (Page 67)	
Write Locking (Page 70)	
Master reset (Page 70)	

6.3.6.2 Set address

Note

Reset address

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

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

Values	0 to 126
Factory setting	126

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

6.3.6.3 Echo profile utilities

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

- Echo profile (Page 61)
- View Saved Echo Profiles (Page 61)
- TVT Shaper (Page 62)
- Auto False Echo Suppression (Page 63)
- Echo Setup (Page 65)

6.3.6.4 Echo profile

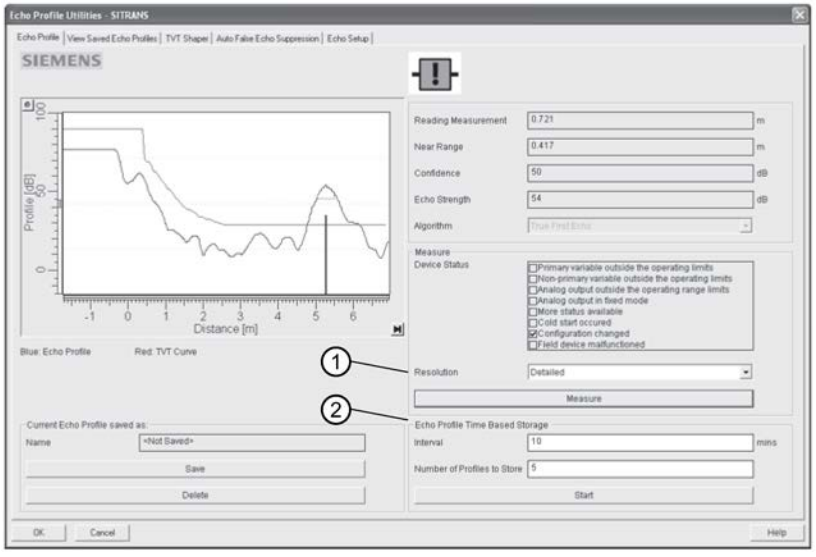
Note

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

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

6.3.6.5 View Saved Echo Profiles

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



① Resolution
② Echo Profile Time Based Storage

6.3.6.6 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:

1. Enter the desired interval between stored profiles.
2. Enter the desired number of profiles to be stored (maximum 60).

3. 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.
4. Click on the tab **View Saved Echo Profiles** to view the stored profiles

6.3.6.7 TVT Shaper

Note

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

This feature allows you to manually adjust the TVT to avoid false echoes caused by obstructions. [For an explanation see Auto False Echo Suppression (Page 164)]

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

① TVT
② Cursor
③ Echo profile

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

6.3.6.8 Auto false echo suppression

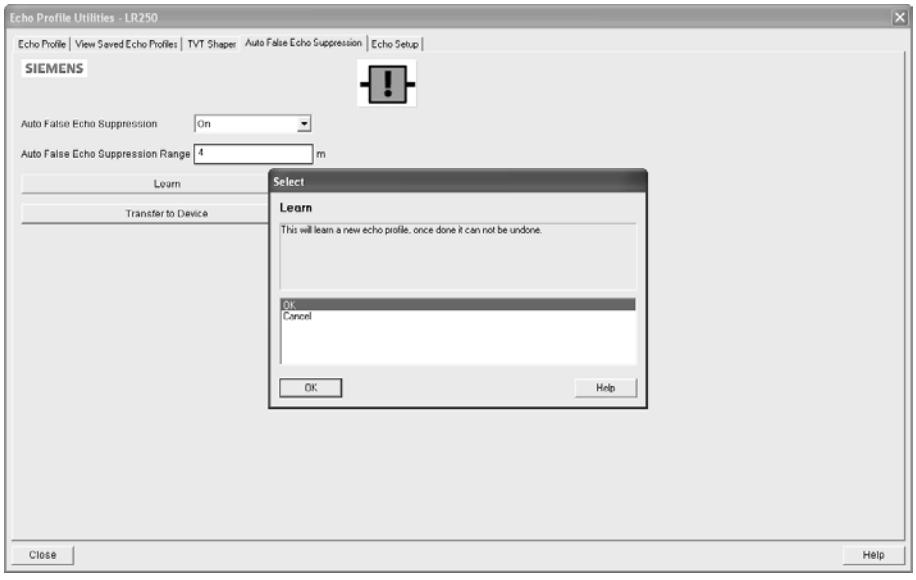
Note

- 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 164) for a more detailed explanation.

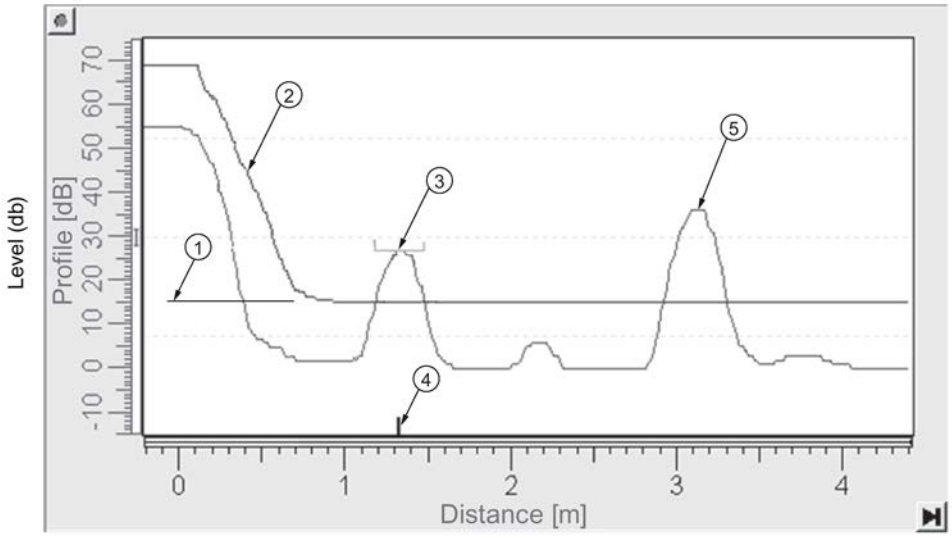
The learned TVT will be applied over a specified range. The default TVT is applied over the remainder of the measurement range.



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**.

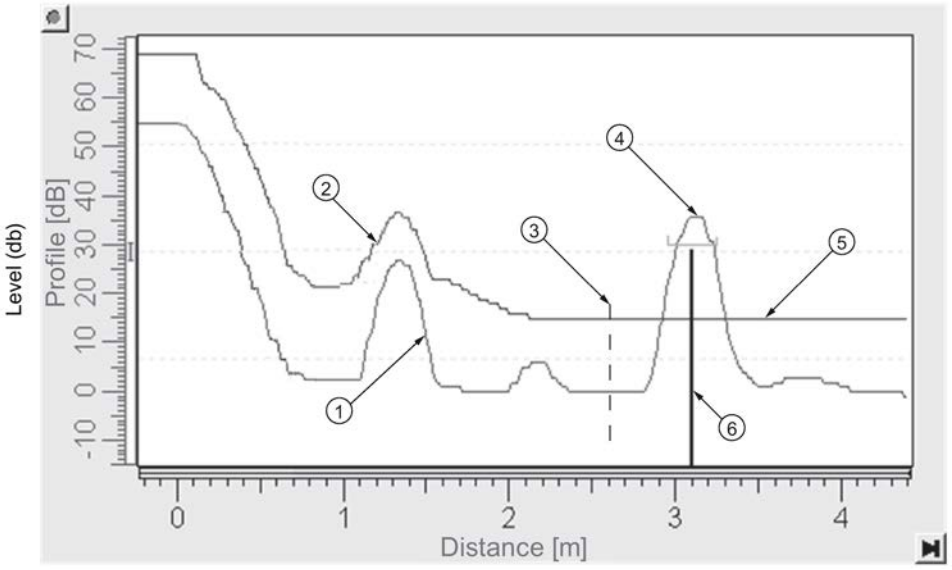
4. Make sure **Auto False Echo Suppression Range** is **On**.
5. Enter the value for **Auto False Echo Suppression Range.**
6. Click **Learn**. The message appears: **'This will learn a new echo profile. Once done it cannot be undone'**. Click **OK**.
7. Once Auto TVT is complete click **Transfer to 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

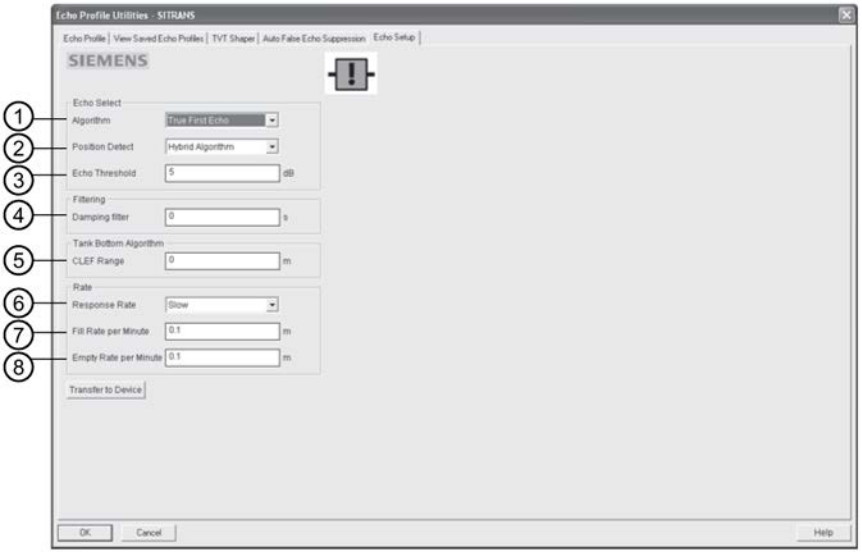
After Auto False Echo Suppression



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

6.3.6.9 Echo Setup

Provides quick access to echo profile parameters:

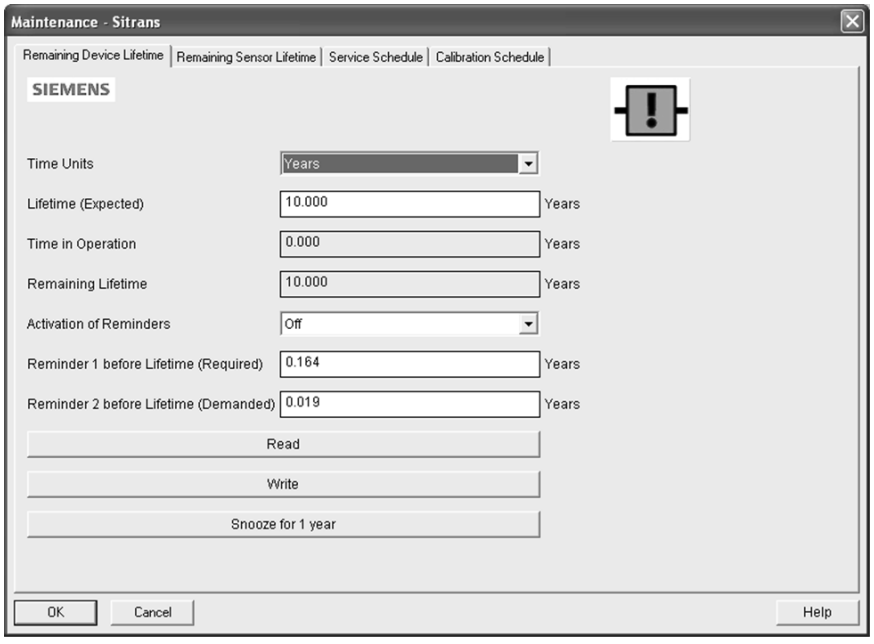


①	Algorithm	⑤	CLEF Range
②	Position Detect	⑥	Response Rate
③	Echo Threshold	⑦	Fill Rate/min.
④	Damping Filter	⑧	Empty Rate/min.

6.3.6.10 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.

6.3.6.11 Acknowledge faults

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

6.3.6.12 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

6.3.6.13 Simulation

Note

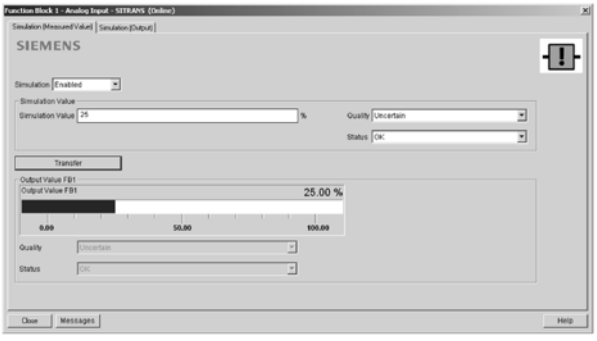
The Simulation parameter influences output to the control system.

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 179).

Simulate analog input to AIFB1 and AIFB2

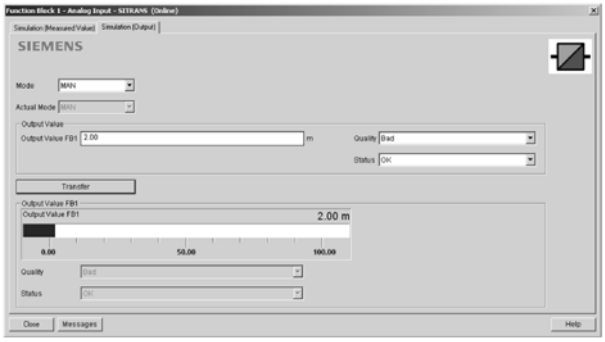
Allows you to input a simulated measured value, status, and quality, in order to test the functioning of an Analog Input Function Block.

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 status1), and click on Transfer.

4. The Output value from the desired function block is displayed in PDM, and the LCD displays the substitute value. See Simulate Output below, to set the output mode.
5. After simulation is complete, disable simulation and click on Transfer.



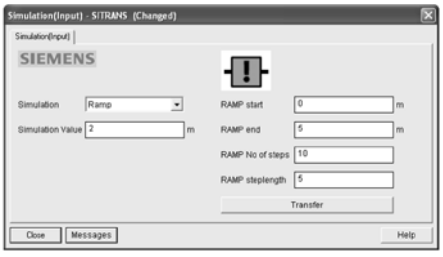
Simulate output

1. Open the menu Device – Simulation, select function block 1 or 2, and click on the tab Simulation (Output).
2. Select Manual Mode (from options AUTO, Manual, or Out of Service) and click on Transfer.
3. Enter simulated value and click on Transfer.
4. After simulation is complete, select AUTO mode and click on Transfer.

Simulate input

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

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

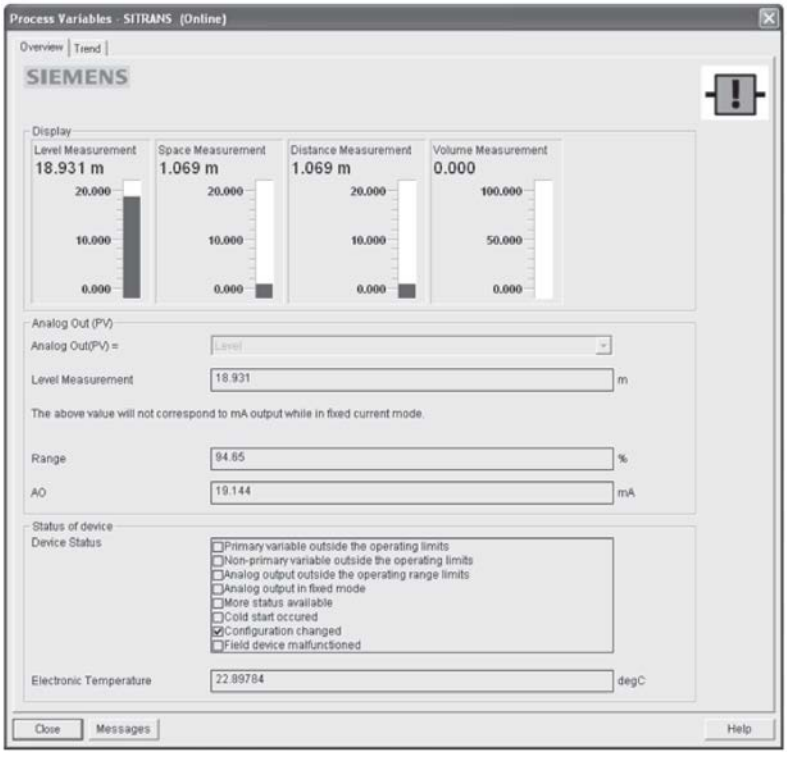


2. To enable simulation select Fixed or Ramp.
3. If you select Ramp, enter the step length and number of steps.
4. Enter the simulated value and click on Transfer.
5. After simulation is complete, disable simulation and click on Transfer.

6.3.6.14 Process variables

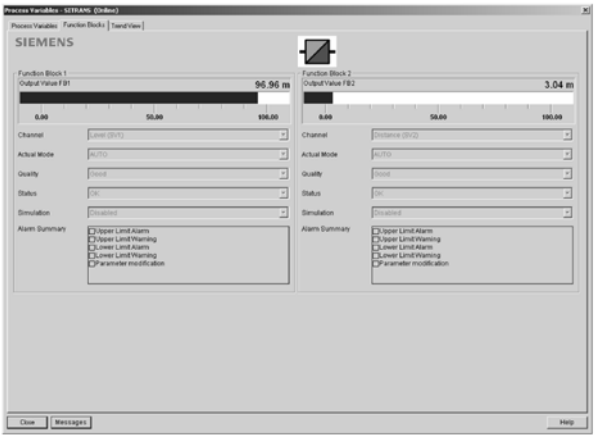
To compare outputs in real time open the menu **View – Process Variables** and click on **Overview** to see reading (level, space, distance, volume); analog output; device status; and current electronics temperature.

To see highest and lowest electronics temperatures, navigate to **Level Meter > Maintenance and Diagnostics > Electronics Temperature**.



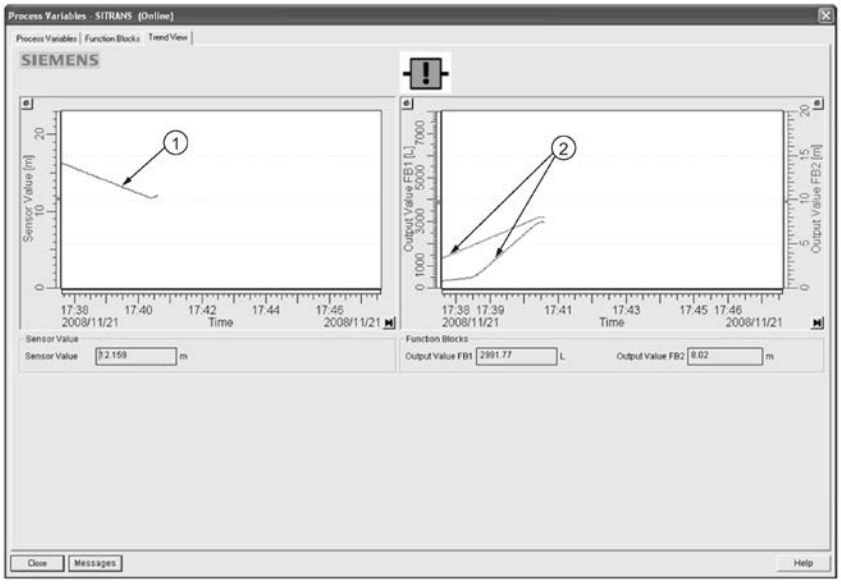
Function Blocks

Open the menu **View – Process Variables** and click on **Function Blocks** to view the channel (level 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

6.3.6.15 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 Protection:

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

6.3.6.16 Master reset

Options	Results
Factory defaults	Resets all parameters to the manufacturer's default settings, with certain exceptions: see Factory Defaults (Page 71)
Standard defaults	Resets all parameters excluding device addresses to the PROFIBUS default settings
Informational	Resets parameters such as Tag and Description
Functional	Resets parameters that control device behavior, such as Low Calibration Pt.
Warm start	Has the same effect as recycling power to the device
Reset address to 126	• Resets the PROFIBUS device address to 126 • If the address lock was on, resetting the address will disable the lock.

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

6.3.6.17 Factory Defaults

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

- Tag
- Message
- Description
- Installation Data
- Device Address
- Write Protect and PIN to Unlock
- Auto False Echo Suppression Range
- Learned TVT

To perform a reset to factory defaults:

1. Open the menu **Device – Master Reset** and click on **OK** to perform a reset to Factory Defaults.
2. After the reset is complete 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.

6.3.6.18 Diagnostics

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

6.3.6.19 Diagnostics

Device status

Open the menu **View - Device Diagnostics > Device Status** to view Diagnostics, Device Status, Extended Diagnostics, and Maintenance

Diagnostics

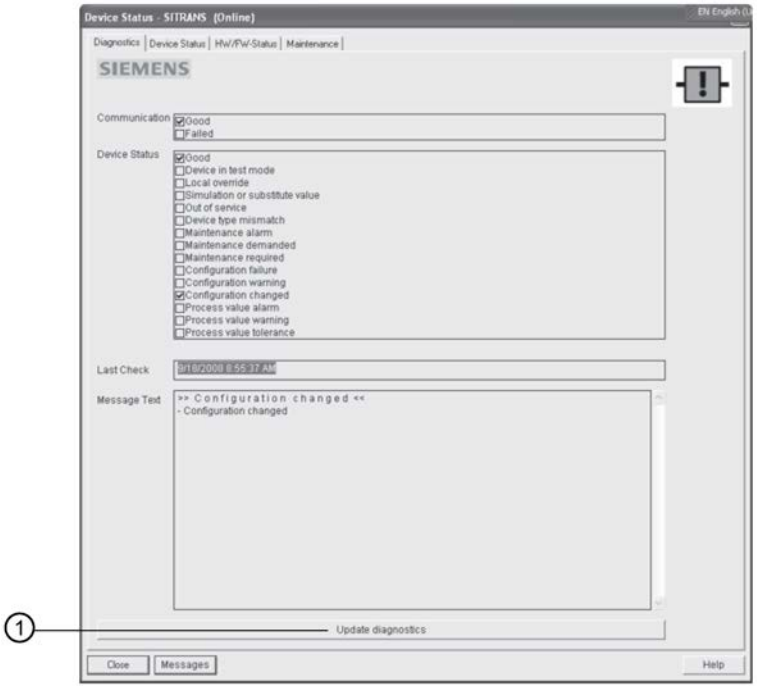
In the Device Status window, click on the **Diagnostics** tab, then on **Update diagnostics** to update diagnostic information and refresh linked icons.

Status

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

6.3.6.20 Device Status

Open the menu **View – Device Status** to view Diagnostics, Device Status, Hardware/ Firmware (HW/FW) Status, and Maintenance status.

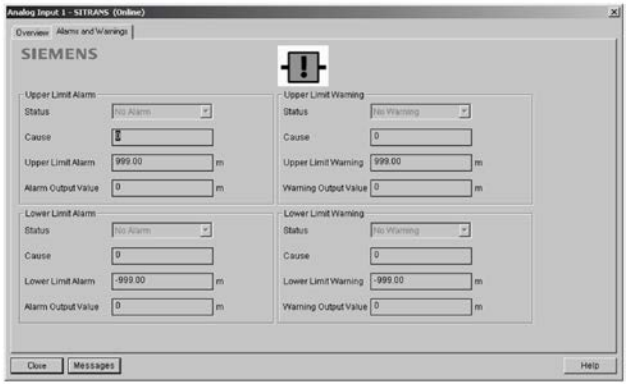


① Update diagnostics

In the Diagnostics window, click on **Update diagnostics** to update diagnostic information and refresh linked icons.

6.3.6.21 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.



6.3.6.22 Update

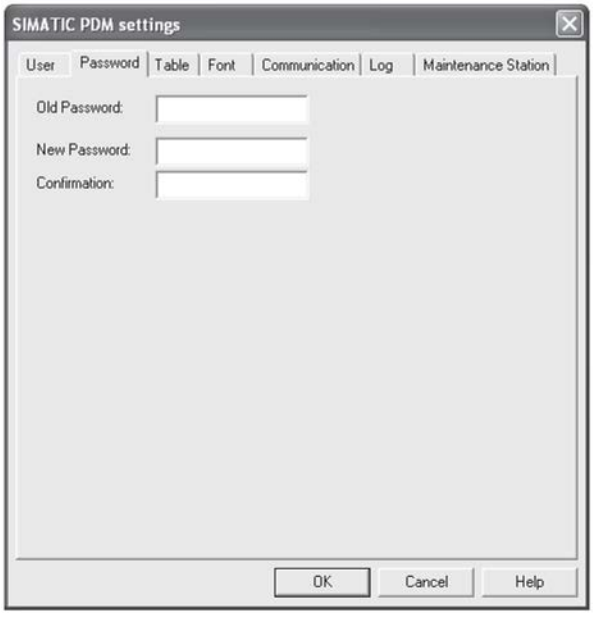
Open the menu **View – Update** to refresh the screen.

6.3.6.23 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**.



6.3.7 Operating via FDT (Field Device Tool)

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

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

Device Type Manager (DTM)

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

SITRANS DTM

- SITRANS DTM is an EDDL interpreter developed by Siemens to interpret the EDD for that device.
- To use SITRANS DTM to connect to an instrument, you must first install SITRANS DTM on your system and then install the instrument EDD written for SITRANS DTM.
- You can download SITRANS DTM from the Siemens service and support website at Siemens Industry Online Support (https://support.industry.siemens.com/cs).

The instrument EDD

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

Configuring a new device via FDT

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

6.4 Application examples

6.4.1 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 last step.)

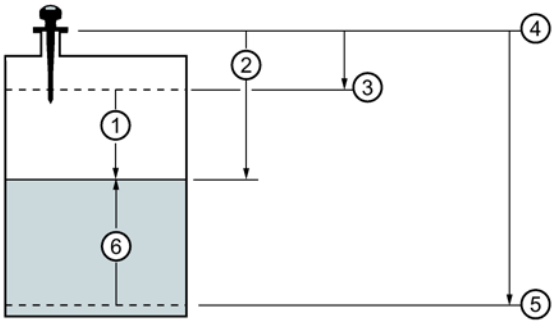
In each example, after performing a Quick Start, navigate to the other required parameters either via the handheld programmer, or using a Device Management tool (SIMATIC PDM or AMS Device Manager) and enter the appropriate values.

6.4.2 Level application example

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

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

Therefore SLOW response rate (0.1 m/minute) can be selected.



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

Quick Start Parameter	Setting	Description
Vessel	STEEL	Selects vessel construction material.
Response Rate	SLOW	Resets fill rate and empty rate to 0.1 m/minute.
Units	m	Sensor measurement units.
Operation	LEVEL	Material level referenced from low calibration point
Low Calibration Point	15.5	Process empty level.
High Calibration Point	1.0	Process full level.
Wizard Complete	FINISH	Save new settings and exit Wizard

6.4.3 Liquid resin in storage vessel, level measurement

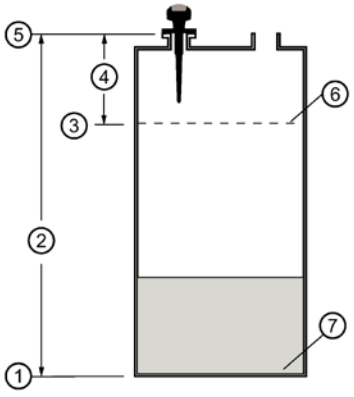
Note

- Minimum distance from flange face to target is limited by Near range (2.5.1.) (Page 92).
- We recommend using Auto False Echo Suppression with an empty or almost empty vessel.

To obtain level measurement/4 to 20mA output proportional to resin levels:

- Low Calibration Pt. = 5 m (16.5 ft) from sensor reference point
- High Calibration Pt.= 0.5 m (1.64 ft) from sensor reference point
- Max.fill/empty rate = 0.2 m/min (0.65 ft/min)

In the event of a loss of echo:
SITRANS LR200 is to go into Fail-safe High after 2 minutes.



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

6.4.4 Liquid resin in storage vessel

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

6.4.5 Horizontal vessel with volume measurement

Note

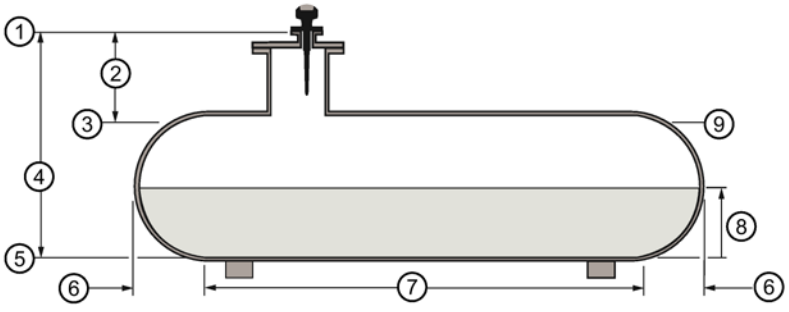
- Minimum distance from flange face to target is limited by Near range (2.5.1.) (Page 92).
- We recommend using Auto False Echo Suppression with an empty or almost empty vessel.

To obtain level measurement/4 to 20 mA output 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 LR200 is to go into Fail-safe High after 2 minutes.



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

Parameter type	Parameter name/No.	Options/Values	Function
Quick start wizard parameters	Material (1.2.)	LIQUID	
	Response Rate (1.3.)	MED	Medium=1 m/minute
	Units (1.4.)	M	meters
	Operating Mode (1.5.)	LEVEL	Level is reported as Volume when a vessel shape is selected
	Low calibration point (1.6.)	5	3.5 m (11.48 ft)
	High calibration point (1.7.)	0.5	0.5 m (1.64 ft)
	Apply? (apply changes) (1.8.)	YES	Transfers Quick Start settings to device

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

6.4.6 Application with stillpipe

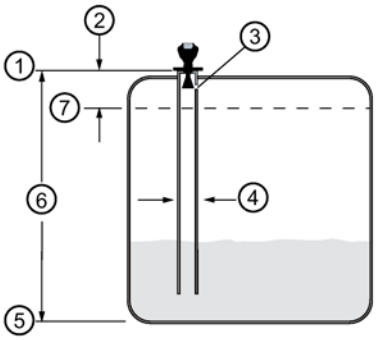
A stillpipe is recommended for products with a dK of less than 3, or if extremely turbulent or vortex conditions exist. This mounting arrangement can also be used to provide optimum signal conditions on foaming materials.

Note

- Near range (2.5.1.) (Page 92) (blanking) will be set at the factory. Check the Process Device Tag for specific values.
- Suitable pipe diameters are 40 mm (1.5”) to 100 mm (4”).
- The pipe diameter must be matched with the horn size. Use the largest horn size that will fit the stillpipe/bypass pipe (see Flanged horn dimensions (Page 146)).
- For installation guidelines, refer to Mounting on a stillpipe or bypass pipe (Page 26).

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 (16.5 ft) from the sensor reference point.
- High Calibration Pt. is 0.5 m (1.65 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 0.5 m
③ Vent hole
④ 50 mm I.D.
⑤ Low calibration point
⑥ 5 m
⑦ High calibration point

6.4.7 Stillpipe table

Parameter type	Parameter no./name	Options/Values	Function
Quick start wizard	Material (1.2.)	LIQUID LOW DK	
	Response Rate (1.3.)	MED	Medium =1 m/minute
	Units (1.4.)	M	meters
	Operating Mode (1.5.)	LEVEL	Level is reported as Volume when a vessel shape is selected.
	Low Calibration Point (1.6.)	5	5 m (16.5 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.) (Page 93)[1)]	0.990	P.F. for a 50 mm (1.96") I.D. stillpipe
	Position detect (2.5.7.2.) (Page 94)	HYBRID	
	CLEF range (2.5.7.4.) (Page 94)[1)]	4.3	4.3 m (14.10 ft)

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

6.4.8 Propagation factor/Stillpipe diameter

Nominal Pipe Size[1)]	40 mm (1.5”)	50 mm (2”)	80 mm (3”)	100 mm (4”)
Propagation Factor	0.9828	0.990	0.991	0.9965
CLEF Range (2.8.4.4.) settings	Low Cal Pt. – 700 mm	Low Cal Pt. – 700 mm	Low Cal Pt. – 1000 mm	Low Cal Pt. – 1000 mm

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

Parameter assignment 7

7.1 Parameter reference

Note

- Parameter names and menu structure are almost identical for SIMATIC PDM and the local display interface (LDI).
- To enter Program mode using the device buttons, press ▶. Press ◀ to return to Measurement mode.
- **Mode** toggles between **PROGRAM** and **Measurement** Modes via the handheld programmer.
- 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 196) for a chart. For AMS Device Manager the structure varies slightly.

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 49)

7.2 Quick start (1.)

The Quick Start wizard provides an easy step-by-step procedure to configure the device for a simple application. From measurement screen, press **RIGHT arrow** ▶ twice to open the Quick Start Wizard menu. Select a wizard, press **RIGHT arrow** ▶ to open the first step, and follow the instructions.

Note

Do not use the Quick Start Wizard to modify individual parameters. Perform customization only after the Quick Start has been completed.

1.1. Language

1.2. Material

1.3. Response Rate

1.4. Units

1.5. Operating Mode

1.6. Low Calibration Point

1.7. High Calibration Point

1.8. Apply? (apply changes)

7.3 Setup (2.)

7.3.1 Identification (2.1)

7.3.1.1 Identification (2.1.)

2.1.1. Tag

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

Note

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

2.1.2. Descriptor

Text that can be used in any way. Limited to 2 ASCII characters. No specific recommended use.

2.1.3. Message

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

7.3.2 Device (2.2.)

7.3.2.1 Device (2.2.)

2.2.1. Hardware revision

Read only. Corresponds to the electronics hardware of the device.

2.2.2. Firmware revision

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

2.2.3. Loader revision

Read only. Corresponds to the software used to update the device.

2.2.4. Order option

Read only. Displays the device type.

7.3.3 Sensor (2.3.)

7.3.3.1 Units (2.3.1.)

Description	sensor measurement units
Options	m, cm, mm, ft, in
Factory setting	m

7.3.3.2 Level unit (2.3.2.)

Description	Select engineering units for Level.
Options	m, cm, mm, ft, in, %
Factory setting	%

7.3.3.3 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 How the transducer block works (Page 178) and Transducer Block function groups (Page 177) for more details.

Description	Select units for either volume or level.
Level values	m, cm, mm, ft, in
Volume values	liter, gal
Percent value	%
Factory setting	%

7.3.3.4 Temperature units (2.3.4.)

Description	Selects the engineering unit to be displayed with the value representing temperature.
Options	DEG C, DEG F, RANKINE, KELVIN
Factory setting	DEG C

7.3.3.5 Material (2.3.5.)

Description	Automatically configures the device to operate in the chosen application type, by changing one or more of the following parameters: **Propagation Factor**, **Position Detect**, and/or **CLEF Range**.
Options	LIQUID
	LIQUID LOW DK[1] (low dielectric liquid - CLEF algorithm enabled
Factory setting	LIQUID
Related parameters	Propagation factor (2.5.3.) (Page 93) Position detect (2.5.7.2.) (Page 94) CLEF range (2.5.7.4.) (Page 94)

[1] dK < 3.0

7.3.3.6 LOE timer (2.3.6.)

Description	Sets the time to elapse since the last valid reading, before the Fail-safe Material Level is reported.
Values	Range: 0.00 to 720 seconds
Factory setting	100 s

Note

When a Loss of Echo occurs, Value (2.6.9.2.) (Page 104) determines the material level to be reported when the Fail-safe timer expires. For more detail, refer to Loss of Echo (LOE) (Page 167).

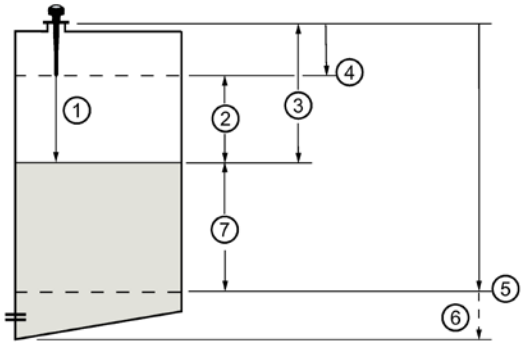
7.3.3.7 Calibration (2.3.7.)

Note

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

Low calibration point (2.3.7.1.)

Description	Distance from sensor reference point[1] to **Low Calibration Point**. Units are defined in **Units**.
Values	0 to 20 m
Factory setting	20.00 m
Related parameters	Far range (2.5.2.) (Page 92) Units (2.3.1.) (Page 83)



① Sensor value
② Space
③ Distance
④ High calibration point
⑤ Low calibration point
⑥ Far range
⑦ Level

[1] The point from which level measurement is referenced. Refer to Uni-construction polypropylene rod antenna (Page 140) and Flange adapter versions (Page 142).

High calibration point (2.3.7.2.)

Description	Distance from Sensor Reference to High Calibration Point (corresponding to High Level Point). Unit is defined in **Unit (2.3.1.)**.
Values	0 to 20 m
Factory setting	0.000 m
Related parameters	Near range (2.5.1.) (Page 92) Units (2.3.1.) (Page 83)

Note

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

Sensor offset (2.3.7.3.)

Description	Sensor Offset is a constant offset that can be added to or subtracted from sensor value[1)] to compensate if the sensor reference point has shifted. For example, this could result from adding a thicker gasket or reducing the standoff/nozzle height. The units are defined in Units (2.3.1.) (Page 83).
Values	-99.999 to +99.999
Factory setting	0.00
Related parameters	Units (2.3.1.) (Page 83)

The value produced by the echo processing which represents the distance from sensor reference point to the target. Refer to Calibration (2.3.7.) (Page 85) for an illustration.

Low level point (2.3.7.4.)

Description	The level when the material is at Low Calibration Point. The unit is defined in Level units.
Factory setting	0%

High level point (2.3.7.5.)

Description	The level when the material is at Low Calibration Point. The unit is defined in Level units.
Factory setting	100%

Level offset (2.3.7.6.)

Description	A constant offset that can be added to Level. The unit is defined in Level units.
Factory setting	0%

Antenna (2.3.7.7.)

Read only. Identifies antenna configuration (Near Range [blanking] distance is automatically adjusted to suit).

7.3.3.8 Rate (2.3.8.)

Response rate (2.3.8.1.)

Response Rate sets the reaction speed of the device to measurement changes. Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

Note

Changing Response Rate resets Fill rate/min (2.3.8.2.) (Page 87), Empty rate/min (2.3.8.3.) (Page 88) and Filter time constant (2.6.8.1.) (Page 103).

Response rate	Fill rate/min (2.3.8.2.) (Page 87)	Empty rate/min (2.3.8.3.) (Page 88)	Filter time constant (2.6.8.1.) (Page 103)
slow (factory setting)	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

Fill rate/min (2.3.8.2.)

Fill rate defines the maximum rate at which the reported sensor value[1)] is allowed to increase. Allows you to adjust the device's response to increases in the actual material level. **Fill rate** is automatically updated whenever Response rate (2.3.8.1.) (Page 87) is altered.

Note

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

Response rate (2.3.8.1.) (Page 87)		**Fill rate (2.4.2.)**
Options	slow (factory setting)	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)
Range	0 to 99999 m / min.	
Related parameter	Level unit (2.3.2.) (Page 83)	

[1)] The value produced by the echo processing which represents the distance from sensor reference point to the target.

Empty rate/min (2.3.8.3.)

Empty rate defines the maximum rate at which the reported sensor value[1)] is allowed to increase. Allows you to adjust the device's response to increases in the actual material level. **Empty rate** is automatically updated whenever Response rate (2.3.8.1.) (Page 87) is altered.

Note

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

Response rate (2.3.8.1.) (Page 87)		**Empty rate**
Options	**slow** (factory setting)	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)
Range	0 to 99999 m / min.	
Related parameters	Level unit (2.3.2.) (Page 83)	

[1)] The value produced by the echo processing which represents the distance from sensor reference point to the target.

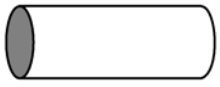
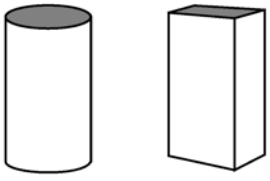
7.3.4 Linearization (2.4.)

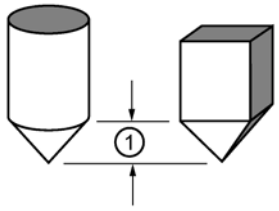
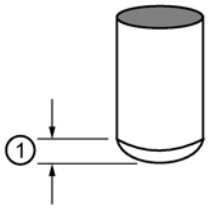
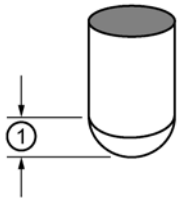
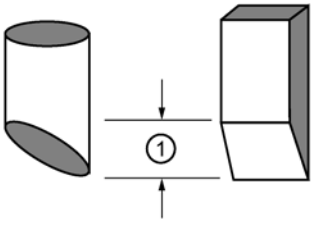
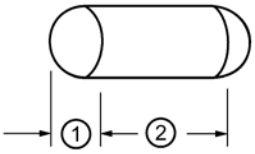
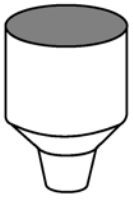
7.3.4.1 Volume (2.4.1.)

Carries out a volume conversion from a level value.

7.3.4.2 Vessel shape (2.4.1.1.)

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

Vessel shape	**LCD Display/ description**	**Also required**
None	NONE No volume calculation required	N/A
	CYLINDER/ Flat end horizontal cylinder	maximum volume
	SPHERE	maximum volume
	LINEAR Upright, linear (flat bottom)	maximum volume

Vessel shape	LCD Display/ description	Also required
	CONICAL BOTTOM/ Conical or pyramidal bottom	maximum volume, dimension A
	PARABOLIC BOTTOM	maximum volume, dimension A
	HALF SPHERE BOTTOM	maximum volume, dimension A
	FLAT SLOPED BOTTOM	maximum volume, dimension A
	PARABOLIC ENDS Parabolic end horizontal cylinder	maximum volume, dimension A, dimension L
	LINEAR TABLE[1)] Linearization table (level/volume/breakpoints)	maximum volume, tables 1-32 level and volume breakpoints

Linearization Table must be selected in order for level/volume values to be transferred. For more detail, refer to XY index (2.4.1.5.) (Page 91).

7.3.4.3 Maximum volume (2.4.1.2.)

Description	The maximum volume of the vessel. Enter the vessel volume corresponding to High Calibration Point. For example, if your maximum vessel volume is 8000 L, enter a value of 8000. Volume units are defined by the user but are not explicitly stated in the device.
Values	Range: 0.0000 to 99999
Factory setting	100.0
Related parameters	Low calibration point (2.3.7.1.) (Page 85) High calibration point (2.3.7.2.) (Page 86) Vessel shape (2.4.1.1.) (Page 88)

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.

7.3.4.4 Dimension A (2.4.1.3.)

Description	The height of the vessel bottom when the bottom is conical, pyramidal, parabolic, spherical, or flat -sloped. If the vessel is horizontal with parabolic ends, the depth of the end. For an illustration, refer to Vessel shape (2.4.1.1.) (Page 88).
Values	0.0000 to 999999 mm in Level Units
Factory setting	0.0
Related parameters	Vessel shape (2.4.1.1.) (Page 88)

7.3.4.5 Dimension L (2.4.1.4.)

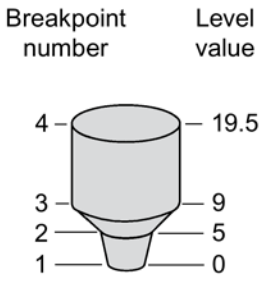
Description	Length of the cylindrical section of a horizontal parabolic end vessel, in Level Units. For an illustration, refer to Vessel shape (2.4.1.1.) (Page 88).
Values	Range: 0.0000 to 999999 in Level Units
Factory setting	0.0
Related parameters	Vessel shape (2.4.1.1.) (Page 88)

7.3.4.6 XY index (2.4.1.5.)

Description	If your vessel shape is more complex than any of the preconfigured shapes, you can define the 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.1)
Level values See Level unit (2.3.2.) (Page 83)	Range: 0.0000 to 99999 (m, cm, mm, ft, in, %) Factory setting: 0.0
Volume values See PV units (volume/level) (2.3.3.) (Page 84)	Range: 0.0000 to 99999 (% or volumetric units) Factory setting: 0.0

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

Example (values are for example purposes only)



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

To enter breakpoints via the handheld 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.)

Entering breakpoints via PDM:

See Using Linearization via the Quick Start Wizard (Page 56) for detailed instructions.

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

7.3.5 Signal processing (2.5.)

7.3.5.1 Near range (2.5.1.)

Description	The range in front of the device (measured from the sensor reference point) within which any echoes will be ignored. This is sometimes referred to as blanking or a dead zone. The factory set range is dependent on the antenna type.
Values	Range: 0 to 20 m (0 to 65.6 ft)
Factory setting	Depends on the antenna: • 0.3 m (1 ft), plus any shield length, from the sensor reference point[1)] • 100 mm shield version default is 0.42 m (0.3 m plus 0.12 m from device reference to the end of the shield) Refer to minimum detectable distance in Performance (Page 135)

[1)] For the reference point for each configuration, refer to Uni-construction polypropylene rod antenna (Page 140) for the standard version, or Flange adapter versions (Page 142) for other versions.

7.3.5.2 Far range (2.5.2.)

Description	Allows the material level to drop below **Low Calibration Point** without generating a Loss of Echo (LOE) state. Use this feature if the measured surface can drop below the Low Cal. Point in normal operation. For an illustration, refer to Low calibration point (2.3.7.1.) (Page 85).
Values	0 to 23 m (75.4 ft). Min. value depends on the setting for Low calibration point (2.3.7.1.) (Page 85).
Factory setting	Low calibration point (2.3.7.1.) (Page 85) setting + 1 m (3.2 ft)

Note

Far Range can extend beyond the bottom of the vessel.

7.3.5.3 Propagation factor (2.5.3.)

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

Note

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

Values	Range: 0.3 to 1.5 depending on pipe size			
	Default: 1.000			
Nominal pipe size[1)]	40 mm (1.5")	50 mm (2")	80 mm (3")	100 mm (4")
Propagation factor	0.9828	0.990	0.991	0.9965
CLEF Range (2.5.7.4.)	Low cal pt 700 mm	Low cal pt 700 mm	Low cal pt 1000 mm	Low cal pt 1000 mm

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

7.3.5.4 Minimum sensor value (2.5.4.)

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

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

7.3.5.5 Maximum sensor value (2.5.5.)

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

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

7.3.5.6 Shots (2.5.6.)

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

Values	Range: 1 to 25
	Default: 25

7.3.5.7 Echo select (2.5.7.)

Algorithm (2.5.7.1.)

Description	Selects the algorithm to be applied to the echo profile to extract the true echo.	
Options	**tF** (factory setting)	**t**rue **F**irst echo
	L	**L**argest echo
	BLF	**B**est of **F**irst or **L**argest echo

Position detect (2.5.7.2.)

Description	Defines where on the echo the distance measurement is determined. Refer to "Position detect" under Echo selection (Page 161) for more detail.
Options	Center
	Hybrid (center and CLEF)
	CLEF (Constrained Leading Edge Fit)
Factory setting	Hybrid (center and CLEF)
Related parameters	CLEF range (2.5.7.4.) (Page 94)

Note

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, set Position detect to **Hybrid** and CLEF range (2.5.7.4.) (Page 94) to 0.5 m (1.64 ft).

Echo threshold (2.5.7.3.)

Description	Sets the minimum echo confidence that the echo must meet in order to prevent a Loss of Echo condition and the expiration of the LOE timer. When Confidence (2.5.9.1.) (Page 96) exceed Echo Threshold, the echo is accepted as a valid echo and is evaluated. Use this feature when an incorrect material level is reported.
Values	Range: 0 to 99
Factory default	5
Related parameter	LOE timer (2.3.6.) (Page 84)

CLEF range (2.5.7.4.)

Note

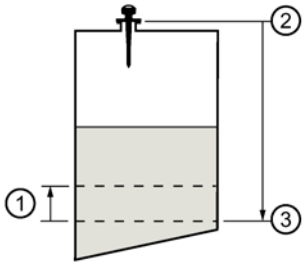
- CLEF Range is referenced from Far Range.
- The value for CLEF Range must include the difference between Far Range and Low Calibration Point, plus any level above the Low Calibration Point to be managed by the CLEF algorithm.

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

It is used from Far Range up to the level defined by CLEF range (see illustration below). Above that point the Center algorithm is used. For more detail see CLEF range (Page 163).

Values	Range: 0 to Far range (2.5.2.)
	Default: 0.0 m
Related parameters	Position detect (2.5.7.2.) Far range (2.5.2.)[1)]

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



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

7.3.5.8 Sampling (2.5.8.)

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

Echo lock (2.5.8.1.)

Description	Selects the measurement verification process. For more details, refer to Echo Lock (Page 164).
Options	Lock Off
	Maximum Verification (not recommended for radar)
	Material Agitator (factory setting)
	Total Lock (not recommended for radar)
Related parameters	Up sampling (2.5.8.2.) (Page 96) Down sampling (2.5.8.3.) (Page 96) Fill rate/min (2.3.8.2.) (Page 87) Empty rate/min (2.3.8.3.) (Page 88)

Note

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

Up sampling (2.5.8.2.)

Description	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
Factory setting	5

Down sampling (2.5.8.3.)

Description	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
Factory setting	2

7.3.5.9 Echo quality (2.5.9.)

Confidence (2.5.9.1.)

Description	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.) (Page 94) defines the minimum criterion for echo confidence.	
Values (view only)	0 to 99	
Factory setting	---	shot not used
Related parameters	Echo threshold (2.5.7.3.) (Page 94)	

Echo strength (2.5.9.2.)

Description	Displays the absolute strength (in dB above 1 µV rms) of the echo selected as the measurement echo.
Values (view only)	–20 to 99

7.3.5.10 TVT setup (2.5.10.)

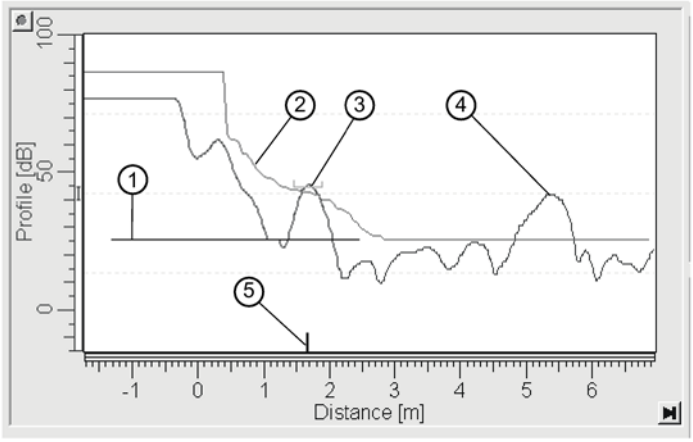
Auto false echo suppression (2.5.10.1.)

Auto false echo suppression is used together with Auto false echo suppression range (2.5.10.2.) (Page 99) 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. For a more detailed explanation, refer to Auto False Echo Suppression (Page 164).

Notes

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

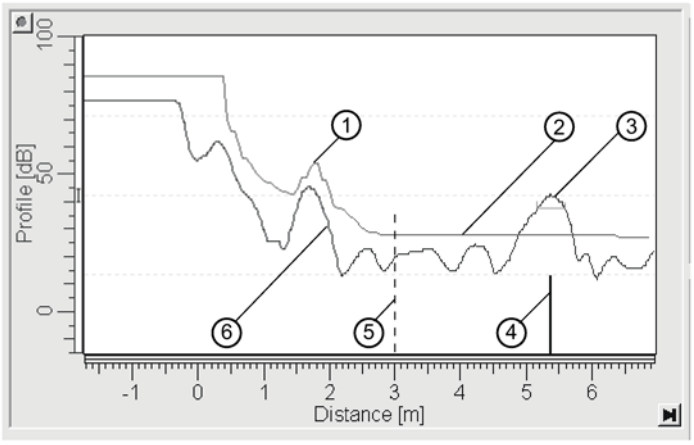
Before Auto False Echo Suppression



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

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.

After Auto False Echo Suppression



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

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, refer to Auto false echo suppression (Page 63).

To set Auto False Echo Suppression via the handheld programmer:

Options	OFF	Default TVT will be used
	ON (factory setting)	'Learned' TVT will be used
	LEARN	'Learn' the TVT

3. Go to Auto false echo suppression range (2.5.10.2.) (Page 99) and enter the value calculated in step 2.

4. Go to Auto false echo suppression (2.5.10.1.) (Page 96) 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.)

Description	Specifies the range within which Learned TVT is used. For more detail, refer to Auto false echo suppression (2.5.10.1.) (Page 96).
Values	Range: 0.00 to 20.00 m
Factory setting	1.00 m
Related parameters	Units (2.3.1.) (Page 83)

1. Calculate range according to Auto false echo suppression (2.5.10.1.) (Page 96) steps 1) and 2).
2. Press **RIGHT arrow** to open Edit mode.
3. Enter the new value and press **RIGHT arrow** to accept it.
4. Set Auto false echo suppression (2.5.10.1.) (Page 96).

Hover level (2.5.10.3.)

Description	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. Refer to Auto false echo suppression (2.5.10.1.) (Page 96) for an illustration.
Values	Range: 0 to 100%
Factory setting	40%

Note

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.)

Description	Enables/disables the TVT shaper.
Options	ON
	OFF (factory setting)

7.3.5.11 TVT shaper (2.5.11.)

Breakpoint 1-9 (2.5.11.1.)

Values	Range: –50 to 50 dB
Factory setting	0 dB

Breakpoint 10-18 (2.5.11.2.)

Values	Range: –50 to 50 dB
Factory setting	0 dB

Breakpoint 19-27 (2.5.11.3.)

Values	Range: –50 to 50 dB
Factory setting	0 dB

Breakpoint 28-36 (2.5.11.4.)

Values	Range: –50 to 50 dB
Factory setting	0 dB

Breakpoint 37-40 (2.5.11.5.)

Values	Range: –50 to 50 dB
Factory setting	0 dB

7.3.6 AIFB1 (2.6.)

7.3.6.1 Static revision no. (2.6.1.)

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

7.3.6.2 Mode (2.6.2.)

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

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

Allows you to put the SITRANS LR200 into Out of Service Mode and then reset it to Automatic Mode. Manual Mode is used in conjunction with Simulation. See Simulation (Page 67).

It should be used only with SIMATIC PDM in order to benefit from all the features available.

7.3.6.3 Channel (2.6.3.)

Used to select between the different Level Transducer Block outputs.

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

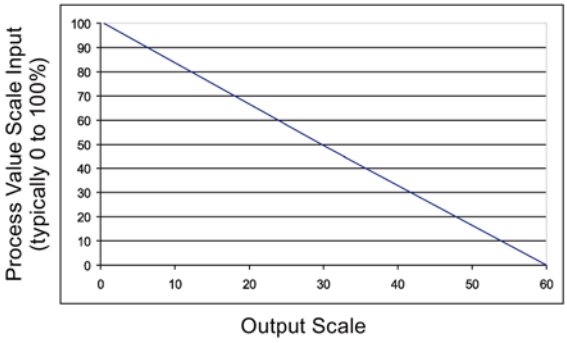
7.3.6.4 Label (2.6.4.)

User defined label

7.3.6.5 Input scaling (2.6.5.)

Upper value (2.6.5.1.)

Factory setting:	100%
Setting range:	Range: -999999 to 999999
Purpose:	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.



Lower value (2.6.5.2.)

Factory setting:	0%
Setting range:	Range: -999999 to 999999
Purpose:	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.

7.3.6.6 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.)

Factory setting:	100%
Setting range:	Range: -999999 to 999999
Purpose:	Defines the operational upper range value of the output value in AIFB1 units.

Lower value (2.6.6.2.)

Factory setting:	0%
Setting range:	Range: -999999 to 999999
Purpose:	Defines the operational lower range value of the output value in AIFB1 units.

7.3.6.7 Alarms and warnings (2.6.7.)

High limit alarm (2.6.7.1.)

Factory setting:	999
Setting range:	Range: -999999 to 999999
Purpose:	The setting for the upper alarm limit in AIFB1 units.

High limit warning (2.6.7.2.)

Factory setting:	999
Setting range:	Range: -999999 to 999999
Purpose:	The setting for the upper warning limit in AIFB1 units.

Low limit warning (2.6.7.3.)

Factory setting:	-999
Setting range:	Range: -999999 to 999999
Purpose:	The setting for the lower warning limit in AIFB1 units.

Low limit alarm (2.6.7.4.)

Factory setting:	-999
Setting range:	Range: -999999 to 999999
Purpose:	The setting for the lower alarm limit in AIFB1 units.

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.

7.3.6.8 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 (for more detail, see Damping (Page 167)).

Values	Range 0 to 600 s
	Default: 0 s

Unit (2.6.8.2.)

Note

Additional units are available in SIMATIC PDM.

Engineering unit to be displayed with the output value

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

Out unit text (2.6.8.3.)

If the desired unit is not listed in parameter Units (2.3.1.) (Page 83) you can define it in this parameter.

Decimal point (2.6.8.4.)

Factory setting:	2
Setting range:	Range: 0, 1, 2, 3, 4, 5, 6, 7
Purpose:	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.)

7.3.6.9 Fail-safe mode (2.6.9.)

Mode (2.6.9.1.)

Factory setting:	LAST VALUE	
Setting range:	SUB VALUE	Substitute value. Value (2.6.9.2.) (Page 104) used as output value.
	LAST VALUE	Last value. (Store last valid output value).
	USE BAD VALUE	Use bad value. (Calculated output value is incorrect).
Purpose:	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.	

Value (2.6.9.2.)

Note

Mode (2.6.9.1.) (Page 104) must be set to SUB VALUE before this parameter can be defined.

Factory setting:	0
Setting range:	Range: -999999 to 999999
Purpose:	User-defined default for the Output Value, if sensor or sensor electronic fault is detected. Units are defined in Unit (2.6.8.2.) (Page 103).

7.3.7 AIFB2 (2.7.)

See AIFB1 (2.6.) (Page 100): the parameters for AIFB2 are identical.

7.3.8 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 OUPUT (PV-Primary Value) (2.8.1.)

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

OUTPUT, NO LINEARIZATION (SV1- 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

7.4 Diagnostics (3.)

7.4.1 Echo profile (3.1.)

Allows you to request the current echo profile either locally via the handheld programmer, or remotely.

To request a profile via the handheld programmer:

1. In PROGRAM mode, navigate to Diagnostics (3.) > Echo profile (3.1.).
2. Press **RIGHT arrow** to request a profile.

For more detail, refer to Requesting an Echo Profile (Page 48).

To request a profile via SIMATIC PDM:

1. Open the menu **Device – Echo Profile Utilities**.
2. For more detail, refer to Echo profile utilities (Page 60).

7.4.2 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.

7.4.3 Electronics temperature (3.3.)

7.4.3.1 Minimum value (3.3.1.)

The minimum recorded internal electronics temperature of the SITRANS LR200.

7.4.3.2 Maximum value (3.3.2.)

The maximum recorded internal electronics temperature of the SITRANS LR200.

7.4.4 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.

7.4.5 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.

7.4.6 Features supported (3.4.2.)

Read only. Features supported are:

- Condensed Diagnostics
- Extended Diagnostics
- Application Relationships

7.4.7 Features enabled (view only) (3.4.3.)

Read only. Lists those features that have been enabled.

7.4.8 Allocation (3.5.)

7.4.8.1 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[1)]
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

[1)] See General fault codes (Page 129) 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.

7.4.8.2 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 (3.4.) (Page 106) 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.

7.4.8.3 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 190) 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.

7.4.9 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 Status (Page 72).

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.

7.5 Service (4.)

7.5.1 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[1)]	Resets all user parameters to the manufacturer's default settings, with certain exceptions. The list of exceptions includes, but is not limited to: • Tag • Message • Description • Installation Data • Device Address • Write Protection • Auto False Echo Suppression Range • Learned TVT
Standard Defaults[1)]	Resets all parameters excluding device addresses to the PROFIBUS standard default settings.
Informational	Resets parameters such as Tag and Description
Functional	Resets parameters that control device behavior and functionality (such as calibration points)
Warm start	Has the same effect as recycling power to the device
Device address[2)]	• Resets the PROFIBUS device address to 126 • If the address lock was on, will disable the lock

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

[2)] This option only resets the address to 126. Use Device Address (5.1.) for other addresses.

To access via SIMATIC PDM:

Open the menu Device – Master Reset. For more detail see Master reset (Page 70)

To access 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.

7.5.2 Remaining device lifetime (4.2.)

Note

- 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 Remaining sensor lifetime (4.3.) (Page 113), Service schedule (4.4.) (Page 116), and Calibration schedule (4.5.) (Page 119).
- 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.) (Page 111).

Factory setting:	years
Setting range[1]:	hours, days, years
Purpose:	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.
Description:	The maintenance warnings and reminders are available through HART communications. 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: 1. Open the menu **Device** – **Maintenance** and select the **Remaining Device Lifetime** tab. 2. After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change. 3. Click on **Snooze** to add a year to the **Total Expected Device Life**.

1) Selectable only via SIMATIC PDM.

7.5.2.1 Lifetime expected (4.2.1.)

Note

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

Factory setting:	10.00 years
Setting range:	0 to 20 years
Purpose:	Allows you to override the factory default.
Description:	Units: hours, days, years, are selectable only via SIMATIC PDM.

7.5.2.2 Time in operation (4.2.2.)

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

7.5.2.3 Remaining lifetime (4.2.3.)

Read only. Lifetime expected (4.2.1.) (Page 111) less Time in operation (4.2.2.) (Page 111).

7.5.2.4 Reminder activation (4.2.4.)

Factory setting:	OFF
Setting range:	Reminder 1 (Maintenance Required), Reminder 2 (Maintenance Demanded), Reminders 1 and 2, OFF
Purpose:	Allows you to enable a maintenance reminder.
Description:	To modify this parameter via SIMATIC PDM: • Go to menu **Device** – **Maintenance**.

7.5.2.5 Reminder 1 (required) (4.2.5.)

Factory setting:	0.164 years
Setting range:	0 to 20 years
Purpose:	If Remaining lifetime (4.2.3.) (Page 112) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	1. Modify values as required. 2. Set Reminder activation (4.2.4.) (Page 112) to the desired option.

7.5.2.6 Reminder 2 (demanded) (4.2.6.)

Factory setting:	0.019 years
Setting range:	0 to 20 years
Purpose:	If Remaining lifetime (4.2.3.) (Page 112) is equal to or less than this value, the device generates a Maintenance Demanded reminder.
Description:	1. Modify values as required. 2. Set Reminder activation (4.2.4.) (Page 112) to the desired option.

7.5.2.7 Maintenance status (4.2.7.)

Indicates which level of maintenance reminder is active.

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

7.5.2.8 Acknowledge status (4.2.8.)

Indicates which level of maintenance reminder has been acknowledged.

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

7.5.2.9 Acknowledge (4.2.9.)

Purpose:	Acknowledges the current maintenance reminder.
Description:	To acknowledge a reminder via SIMATIC PDM: • Open the menu **Diagnostics** > **Device Diagnostics** and click on the tab Maintenance. • In the Calibration Schedule section, click on Acknowledge Warnings. To acknowledge a reminder via the local control buttons or hand-held programmer: • Press **RIGHT** arrow twice to open parameter view and activate Edit Mode. • Press **RIGHT** arrow to acknowledge the reminder.

7.5.3 Remaining sensor lifetime (4.3.)

Note

- 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 Remaining device lifetime (4.2.) (Page 111), Service schedule (4.4.) (Page 116), and Calibration schedule (4.5.) (Page 119).
- 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 (4.3.1.) (Page 114).

Factory setting:	years
Setting range[1]:	hours, days, years
Purpose:	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.
Description:	To access these parameters via SIMATIC PDM: 1. Open the menu **Device** – **Maintenance** and select the **Remaining Sensor Lifetime** tab. 2. After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change. 3. Click on **Snooze** to add a year to the **Total Expected Sensor Life**. 4. Click on **Sensor Replaced** to restart the timer and clear any fault messages.

[1] Selectable only via SIMATIC PDM.

7.5.3.1 Lifetime expected (4.3.1.)

Note

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

Factory setting:	10.00 years
Setting range:	0 to 20 years
Purpose:	Allows you to override the factory default.
Description:	Units: hours, days, years, are selectable only via SIMATIC PDM.

7.5.3.2 Time in operation (4.3.2.)

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

7.5.3.3 Remaining lifetime (4.3.3.)

Read only. Lifetime expected (4.3.1.) (Page 114) less Time in operation (4.3.2.) (Page 114).

7.5.3.4 Reminder activation (4.3.4.)

Factory setting:	OFF
Setting range:	Reminder 1 (Maintenance Required), Reminder 2 (Maintenance Demanded), Reminders 1 and 2, OFF
Purpose:	Allows you to enable a maintenance reminder.
Description:	To modify this parameter via SIMATIC PDM: • Go to menu **Device** – **Maintenance**.

7.5.3.5 Reminder 1 (required) (4.3.5.)

Factory setting:	0.164 years
Setting range:	0 to 20 years
Purpose:	If Remaining lifetime (4.3.3.) (Page 114) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	1) Modify values as required. 2) Set Reminder activation (4.3.4.) (Page 114).

7.5.3.6 Reminder 2 (demanded) (4.3.6.)

Factory setting:	0.019 years
Setting range:	0 to 20 years
Purpose:	If Remaining lifetime (4.3.3.) (Page 114) is equal to or less than this value, the device generates a Maintenance Demanded reminder.
Description:	1) Modify values as required. 2) Set Reminder activation (4.3.4.) (Page 114).

7.5.3.7 Maintenance status (4.3.7.)

Indicates which level of maintenance reminder is active.

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

7.5.3.8 Acknowledge status (4.3.8.)

Indicates which level of maintenance reminder has been acknowledged.

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

7.5.3.9 Acknowledge (4.3.9.)

Purpose:	Acknowledges the current maintenance reminder.
Description:	To acknowledge a reminder via SIMATIC PDM: • Open the menu **Diagnostics > Device Diagnostics** and click on the tab Maintenance. • In the Calibration Schedule section, click on Acknowledge Warnings. To acknowledge a reminder via the local control buttons or hand-held programmer: • Press **RIGHT** arrow twice to open parameter view and activate Edit Mode. • Press **RIGHT** arrow to acknowledge the reminder.

7.5.4 Service schedule (4.4.)

Note

- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule, see also Remaining sensor lifetime (4.3.) (Page 113), Remaining device lifetime (4.2.) (Page 111), and Calibration schedule (4.5.) (Page 119).
- 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.) (Page 116).

Factory setting:	years
Setting range[1]:	Hours, days, years
Purpose:	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 reminders are communicated to the end user through status information. 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.
Description:	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.

[1] Selectable only via SIMATIC PDM.

7.5.4.1 Service interval (4.4.1.)

Note

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

Factory setting:	1.0 year
Setting range:	0 to 20 years
Purpose:	User-configurable recommended time between product inspections.
Description:	Units: hours, days, years, are selectable only via SIMATIC PDM.

7.5.4.2 Time since last service (4.4.2.)

Time elapsed since last service. Can be reset to zero after performing a service. Can be reset locally by entering 0 in this parameter.

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 to zero.

7.5.4.3 Time until next service (4.4.3.)

Read only. Service interval (4.4.1.) (Page 116) less Time since last service (4.4.2.) (Page 117).

7.5.4.4 Reminder activation (4.4.4.)

Note

Modifications via SIMATIC PDM

Parameter is accessed via the menus **Device** – **Maintenance**.

Factory setting:	Timer OFF
Setting range:	Timer OFF
	ON NO LIMITS
	ON REMinders 1 and 2 checked
	ON REMinder 2 (Maintenance Demanded) checked
Purpose:	Allows you to enable a maintenance reminder.
Description:	1. First set the values in Reminder 1 (required) (4.4.5.) (Page 117) / Reminder 2 (demanded) (4.4.6.) (Page 118). 2. Select the desired Reminder Activation option.

7.5.4.5 Reminder 1 (required) (4.4.5.)

Factory setting:	0.164 years
Setting range:	0 to 20 years
Purpose:	If Time until next service (4.4.3.) (Page 117) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	1. Modify values as required. 2. Set Reminder activation (4.4.4.) (Page 117) to the desired option.

7.5.4.6 Reminder 2 (demanded) (4.4.6.)

Factory setting:	0.019 years
Setting range:	0 to 20 years
Purpose:	If Time until next service (4.4.3.) (Page 117) is equal to or less than this value, the device generates a Maintenance Demanded reminder.
Description:	1. Modify values as required. 2. Set Reminder activation (4.4.4.) (Page 117) to the desired option.

7.5.4.7 Maintenance status (4.4.7.)

Indicates which level of maintenance reminder is active.

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

7.5.4.8 Acknowledge status (4.4.8.)

Indicates which level of maintenance reminder has been acknowledged.

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

7.5.4.9 Acknowledge (4.4.9.)

Purpose:	Acknowledges the current maintenance reminder.
Description:	To acknowledge a reminder via SIMATIC PDM: • Open the menu **Diagnostics > Device Diagnostics** and click on the tab Maintenance. • In the Calibration Schedule section, click on Acknowledge Warnings. To acknowledge a reminder via the local control buttons or hand-held programmer: • Press **RIGHT** arrow twice to open parameter view and activate Edit Mode. • Press **RIGHT** arrow to acknowledge the reminder.

7.5.5 Calibration schedule (4.5.)

Note

- 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.) (Page 111), Remaining sensor lifetime (4.3.) (Page 113), and Service schedule (4.4.) (Page 116).
- 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.) (Page 119).

Factory setting:	years
Setting range[1]:	Hours, days, years
Purpose:	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.
Description:	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.

1) Selectable only via SIMATIC PDM.

7.5.5.1 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.

Factory setting:	1.0 year
Setting range:	0 to 20 years
Purpose:	User-configurable recommended time between product inspections.
Description:	Units: hours, days, years, are selectable only via SIMATIC PDM.

7.5.5.2 Time since last calibration (4.5.2.)

Time elapsed since last calibration. Can be reset to zero after performing a calibration. Can be reset locally by entering 0 in this parameter.

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 (4.8.1.)** to zero.

7.5.5.3 Time until next calibration (4.5.3.)

Read only. Calibration interval (4.5.1.) (Page 119) less Time since last calibration (4.5.2.) (Page 119).

7.5.5.4 Reminder activation (4.5.4.)

Note

Access

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

Factory setting:	Timer OFF
Setting range:	Timer OFF
	ON NO LIMITS
	ON REMinders 1 and 2 checked
	ON REMinder 2 (Maintenance Demanded) checked
Purpose:	Allows you to enable a maintenance reminder.
Description:	1. First set the values in Reminder 1 (required) (4.5.5.) (Page 120) Reminder 2 (demanded) (4.5.6.) (Page 120). 2. Select the desired Reminder Activation option.

7.5.5.5 Reminder 1 (required) (4.5.5.)

Factory setting:	0.164 years
Setting range:	0 to 20 years
Purpose:	If Time until next calibration (4.5.3.) (Page 120) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	1. Modify values as required. 2. Set Reminder activation (4.5.4.) (Page 120) to the desired option.

7.5.5.6 Reminder 2 (demanded) (4.5.6.)

Factory setting:	0.019 years
Setting range:	0 to 20 years
Purpose:	If Time until next calibration (4.5.3.) (Page 120) is equal to or less than this value, the device generates a Maintenance Demanded reminder.
Description:	1. Modify values as required. 2. Set Reminder Activation (4.8.5.) (Page 120) to the desired option.

7.5.5.7 Maintenance status (4.5.7.)

Indicates which level of maintenance reminder is active.

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

7.5.5.8 Acknowledge status (4.5.8.)

Indicates which level of maintenance reminder has been acknowledged.

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

7.5.5.9 Acknowledge (4.5.9.)

Purpose:	Acknowledges the current maintenance reminder.
Description:	To acknowledge a reminder via SIMATIC PDM: • Open the menu **Diagnostics > Device Diagnostics** and click on the tab Maintenance. • In the Calibration Schedule section, click on Acknowledge Warnings. To acknowledge a reminder via the local control buttons or hand-held programmer: • Press **RIGHT** arrow twice to open parameter view and activate Edit Mode. • Press **RIGHT** arrow to acknowledge the reminder.

7.5.6 Manufacture date (4.6.)

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

7.5.7 Powered hours (4.7.)

Displays the number of hours the unit has been powered up since manufacture. In SIMATIC PDM, open the menu **View – Wear**.

7.5.8 Power-on resets (4.8.)

The number of power cycles that have occurred since manufacture. In SIMATIC PDM, open the menu **View – Wear**.

7.5.9 LCD fast mode (4.9.)

Description	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 or OFF
Factory setting	OFF

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.

7.5.10 LCD contrast (4.10.)

Description	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)
Factory setting	10

Note

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

7.6 Communication (5.)

7.6.1 Device address (5.1.)

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

The address can be changed and locked from a remote master. Refer to PROFIBUS address (Page 183) for details on disabling the address lock and Master reset (4.1.) (Page 110) to reset Device Address to 126.

To set Device Address via the handheld programmer:

Refer to Device address (Page 49) for details on how to set Device Address via the handheld programmer.

Refer to Set address (Page 60) for details on how to set Device Address via SIMATIC PDM.

7.6.2 PROFIBUS identification number (5.2.)

Description	Identifies the device on the network. The Ident Number must match that in the GSD file (the GSD file provides information on the device to the master).	
Options	STD PROFILE	Standard Profile (uses generic GSD for 2 AIFB [ident # = 0x9701]
	MANUFACTURER	Manufacturer-specific (uses Siemens EDD and GSD file, which identifies the LR200 [PROFIBUS PA]) [ident # = 0x8150]
	STD – AIFB 1 ONL.	Standard Profile AIFB 1 only (uses generic GSD for 1 AIFB) [ident # = 0x9700]
Factory setting	MANUFACTURER	

7.7 Security (6.)

7.7.1 Remote access (6.1.)

7.7.1.1 Remote lockout (6.1.1.)

Description	Enables or disables programming via the network and PDM.
Options	OFF (remote operation enabled)
	ON (remote operation disabled
Factory setting	OFF

Note

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

7.7.2 Local access (6.2.)

7.7.2.1 Write protection (6.2.1.)

Description	Prevents any changes to parameters via PDM or the hand-held programmer.	
Handheld programmer values	Range: 0 to 99999	
	2457 (unlock value)	Off (enables programming)
	any other value	On (disables programming)

Note

Do not lose this number value.

7.7.2.2 Local operation (6.2.2.)

Description	Enables or disables programming via the hand-held programmer.
Options	ENABLED
	DISABLED
Factory setting	ENABLED

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

7.8 Language (7.)

Description	Selects the language to be used on the LCD.
Options	English (factory setting)
	Deutsch
	Français
	Español

Service and maintenance

8

8.1 Maintenance and repair

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.

8.1.1 Maintenance

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

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

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

⚠ WARNING

Impermissible repair of the device

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

8.2 Cleaning

Cleaning the enclosure

- Clean the outside of the enclosure with the inscriptions and the display window using a cloth moistened with water or a mild detergent.
- Do not use any aggressive cleansing agents or solvents, e.g. acetone. Plastic parts or the painted surface could be damaged. The inscriptions could become unreadable.

⚠ WARNING

Electrostatic charge

Risk 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.

8.3 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.

8.4 Penetration of moisture into the device

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.

8.5 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/)

8.6 Replacing the antenna

- When a new antenna is installed the propagation factor will not change.
- After replacing the antenna check the material level reported by the device against the actual material level, and if necessary use Sensor Offset (2.3.3.) (Page 86) to compensate.

Diagnosing and troubleshooting

9

9.1 Communication Troubleshooting

1. Check the following:
   - There is power at the instrument.
   - The LCD shows the relevant data.
   - The device can be programmed using the handheld programmer.
   - If any fault codes are being displayed see General fault codes (Page 129) 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.	• Ensure Write Protection (6.2.1.) is set to the unlock value.
You try to set a SITRANS LR200 parameter via remote communications but the parameter remains unchanged.	• Ensure Remote Lockout (6.1.1.) is disabled. • Ensure Write Protection (6.2.1.) is set to the unlock value • Navigate to Master Reset (4.1.) and select Reset Address to 126 to disable an address lock.
The PLC value equals the display value but does not correspond to actual material level.	• Ensure Scaling in AIFB1 is correctly entered. • Ensure High Calibration Point is correctly entered. • View the echo profile to see if the wrong echo is being selected. If so, see Operation troubleshooting (Page 133) 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 LR200. • Check the network to ensure the PCL is communicating with the LR200.

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

9.2 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. 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 Maintenance Required Limit.	Replacement is recommended
S: 4 		Device is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.
S: 6 		Sensor is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.
S: 7 		Sensor is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.
S: 8 		Service interval as defined in Maintenance Required Limit has expired.	Perform service.
S: 9 		Service interval as defined in Maintenance Demanded Limit 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 Maintenance Required Limit has expired.	Perform calibration.
S: 18 		Calibration interval as defined in Maintenance Demanded Limit has expired.	Perform calibration.
S: 28 	*	Internal device failure caused by a RAM memory error.	Replacement required: contact your local Siemens representative.
S: 29 	*	EEPROM damaged.	Replacement required: contact your local Siemens representative
S: 31 	*	Flash error.	Replacement 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.	Replacement required: contact your local Siemens representative
S: 34 	*	Factory calibration for the device has been lost.	Replacement required: contact your local Siemens representative
S: 35 	*	Factory calibration for the device has been lost.	Replacement 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.	Replacement required: contact your local Siemens representative
S: 38 	*	Failure in the device electronics.	Replacement required: contact your local Siemens representative
S: 43 	*	Factory calibration for the radar receiver has been lost.	Replacement required: contact your local Siemens representative.

9.3 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

Icon	Priority Level	Meaning
	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

9.4 Operation troubleshooting

Operating symptoms, probable causes, and resolutions.

Symptom	Cause	Action
Display shows 	level or target is out of range	• check specifications • check Low calibration point (2.3.7.1.) (Page 85) • increase Confidence (2.5.9.1.) (Page 96)
Display shows 	material build-up on antenna	• clean the antenna • relocate SITRANS LR200
Display shows 	location or aiming: • poor installation • flange not level • Auto False Echo Suppression may be incorrectly applied	• check to ensure nozzle is vertical • ensure end of antenna protrudes from end of nozzle • review Auto false echo suppression (2.5.10.1.) (Page 96). • ensure Auto False Echo Suppression Range is set correctly
Display shows 	antenna malfunction: • temperature too high • physical damage • excessive foam • multiple echoes	• check Maximum value (3.3.2.) (Page 106) • use foam deflector or stillpipe • relocate • use a defoamer • set Algorithm (2.5.7.1.) (Page 94) to **F** (First echo)
Reading does not change, but the level does	SITRANS LR200 processing wrong echo, for example, vessel wall, or structural member	• re-locate SITRANS LR200 • check nozzle for internal burrs or welds • rotate device 90° • use Auto false echo suppression (2.5.10.1.) (Page 96)
Measurement is consistently off by a constant amount	• setting for Low calibration point (2.3.7.1.) (Page 85) not correct • setting for Sensor offset (2.3.7.3.) (Page 86) not correct	• check distance from sensor reference point to Low calibration point (2.3.7.1.) (Page 85) • check Sensor offset (2.3.7.3.) (Page 86)
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.) (Page 96) • use Auto false echo suppression (2.5.10.1.) (Page 96) and Auto false echo suppression range (2.5.10.2.) (Page 99) • use foam deflector or stillpipe

Symptom	Cause	Action
	liquid surface vortexed	• decrease Fill rate/min (2.3.8.2.) (Page 87) • relocate device to side pipe • increase confidence threshold in Echo threshold (2.5.7.3.) (Page 94)
	material filling	• relocate SITRANS LR200
Reading response slow	Fill rate/min (2.3.8.2.) (Page 87) 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.) (Page 96) and Auto false echo suppression range (2.5.10.2.) (Page 99)
Level reading lower than actual material level	• material is within Near Range zone • multiple echoes processed	• decrease Near range (2.5.1.) (Page 92) (minimum value depends on antenna type) • raise SITRANS LR200 • ensure Algorithm (2.5.7.1.) (Page 94) is set to 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.) (Page 94) to Hybrid • set CLEF range (2.5.7.4.) (Page 94) to 0.5 m

Technical data

10

10.1 Performance

Reference operating conditions according to IEC 60770-1		
	Ambient temperature	+15 to +25 °C (+59 to +77 °F)
	Storage temperature	+15 to +25 °C (+59 to +77 °F)
	Humidity	45% to 75% relative humidity
	Ambient pressure	860 to 1060 mbar g (86000 to 106000 N/m^2 g)
Measurement accuracy (measured in accordance with IEC 60770-1) Maximum measured error (including hysteresis and non-repeatability)		
	From end of antenna to 600 mm (1.96 ft)	40 mm (1.57”)
	Remainder of range	10 mm (0.4”) or 0.1% of span (whichever is greater)
Frequency		C band, approx. 6 GHz
Max. measurement range[1)]		20 m (65.6 ft)
Min. detectable distance[1)]		
	3", 4", and 6" horn[2)]	300 mm (11.8")
	8" horn	330 mm (12.9")
	PP rod, 100 mm internal shield	417 mm (16.4")
	417 mm (16.4") • PP rod, 250 mm internal shield	567 mm (22.3")
	PTFE rod, unshielded	417 mm (16.4")
	PTFE rod, 100 mm external shield	474 mm (18.6")
	PTFE rod, 250 mm external shield	624 mm (24.5")
Update time[1)]		
	Minimum 1 second, depending on settings for Response rate (2.3.8.1.) (Page 87) and LCD fast mode (4.9.) (Page 122).	
Influence of ambient temperature		
	< 0.003%/K (average over full temperature range, referenced to maximum range)	
Dielectric constant of material measured		
	dK > 3 (for < 3 use waveguide antenna or stillpipe)	
Memory		
	• non-volatile EEPROM • no battery required	

[1)] From sensor reference point. For the sensor reference point for each configuration, refer to Uni-construction polypropylene rod antenna (Page 140) for the standard version, or Flange adapter versions (Page 142) for other configurations.

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

10.2 Power

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

10.3 Interface

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).

10.4 Construction

Process connections

Threaded connection		
	Polypropylene rod antenna	• 1.5” NPT (ANSI/ASME B1.20.1) • R (BSPT, EN 10226-1) • or, G (BSPP, EN ISO 228-1)
	PTFE antenna, 316L/1.4404 stainless steel or 316L/1.4435 stainless steel	• 2" NPT (ANSI/ASME B1.20.1) • R (BSPT, EN 10226-1) • or, G (BSPP, EN ISO 228-1)
Flange connection (flat face)	316L /1.4404 stainless steel or 316L/1.4435 stainless steel	• 2", 3", 4" (ASME 150 lb, 300 lb) • DN50, DN80, DN100, DN150, DN200 (PN16, PN40) • 50A, 80A, 100A (JIS 10K)
Flange connection (raised face)	316L /1.4404 stainless steel or 316L/1.4435 stainless steel	• DN80, DN100, DN150 (PN16, PN40) per EN 1092-1 B1 • DN200 (PN16) per EN 1092-1 B1

Antenna

Polypropylene rod	hermetically sealed construction standard 100 mm (4") shield for maximum 100 mm (4") nozzle, or optional 250 mm (10") long shield
PTFE rod	refer to Flange adapter versions (Page 142)
Horns/waveguide	refer to Flange adapter versions (Page 142)

Enclosure

Construction	aluminum, polyester powder-coated
Conduit entry	2 x M20x1.5, or 2 x ½" NPT
Ingress protection	Type 4X, Type 6, IP 67, IP68

Weight (excluding extensions)

100 mm threaded polypropylene rod antenna	approx. 3.5 kg (7.7 lb)
DN50/PN16 or 2" ASME 150 lb flat-face flange, rod or horn	approx. 8 kg (17.6 lb)
DN100/PN16 or 4" ASME 150 lb flat-face flange, rod or horn	approx. 10.5 kg (23.1 lb)
DN200/PN16 or 8" ASME 150 lb flat-face flange, rod or horn	approx. 19 kg (41.8 lb)
DN100/PN16 raised-face flange, rod or horn	approx. 10 kg (22 lb)
DN200/PN16 raised-face flange, rod or horn	approx. 20.8 kg (45.9 lb)

10.5 Operating conditions

Note

- Check Approvals data (Page 138) for the specific configuration you are about to use to install.
- 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, Type 6, IP67, IP68
Installation category	I
Pollution degree	4

10.6 Process

Process temperature[1)]	
Polypropylene rod	40 to +80 °C (40 to +176 °F)
PTFE rod or SS horn	40 to +200 °C (40 to +392 °F)
Pressure (vessel)	up to 40 bar, gauge (580 psi, gauge)[1)]

[1)] The maximum temperature is dependent on the process connection, antenna materials, and vessel pressure. For more detail, or for other configurations, see Maximum process temperature chart (Page 167) and Process pressure/temperature derating curves (Page 169) onwards.

10.7 Approvals data

Note

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

General	$CSA_{US/C}$, FM, CE, RCM		
Radio	Europe (RED), FCC, Industry Canada		
Marine	Lloyd's Register of Shipping, ABS Type Approval		
Hazardous	**Intrinsically Safe**		
		Europe	ATEX II 1 G Ex ia IIC T4 Ga
		International	IECEx SIR 13.0007X, Ex ia IIC T4 Ga
		US/Canada	FM/CSA: • Class I, Div. 1, Groups A, B, C, D • Class II, Div. 1, Groups E, F, G • Class III T4
		Brazil	INMETRO: DNV 12.0069 X Ex ia IIC T4 Ga
		China	NEPSI Ex ia IIC T4 Ga
	Non-sparking		
		Europe	ATEX II 3 G Ex nA IIC T4 Gc
		China	NEPSI Ex nA IIC T4 Gc
	Non-incendive		
		US	FM: Class I, Div. 2, Groups A, B, C, D T5

10.8 Programmer data - 7ML1930-1BK

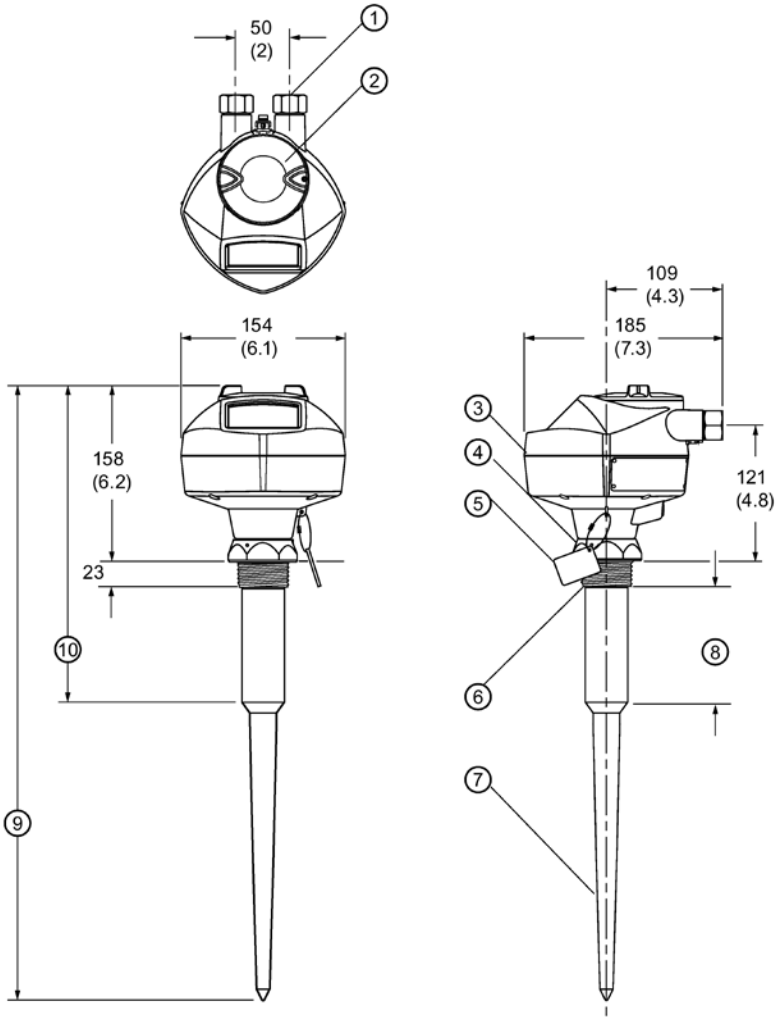
Siemens Milltronics Infrared IS (Intrinsically Safe) Handheld Programmer for hazardous and all other locations (battery is non-replaceable).

Approvals	CE FM/CSA Class I, II, III, Div. 1, Gr. A to G T6 ATEX 1 GD Ex ia op is IIC T4 Ga Ex ia op is IIIC T135°C Da IECEx Ex ia op is IIC T4 Ga Ex ia op is IIIC T135°C Da INMETRO Ex ia op is IIC T4 Ga Ex ia op is 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 drawing

11

11.1 Uni-construction polypropylene rod antenna



①	1/2 " NPT cable entry (or alternatively, M20 cable gland)	⑥	Mounting thread
②	Threaded cover	⑦	Polypropylene rod antenna with integral mounting thread and shield[1)]
③	Enclosure/electronics	⑧	Shield length (internal) Standard: 100 mm (4") Option: 250 mm (10")
④	Locking ring	⑨	Standard: 575 mm (22.6") min. Option: 725 mm (28.5") max.
⑤	Process device tag	⑩	Standard: 296 mm (11.7") min. Option: 446 mm (17.6") max.

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

Threaded connection markings

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

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

Antenna options

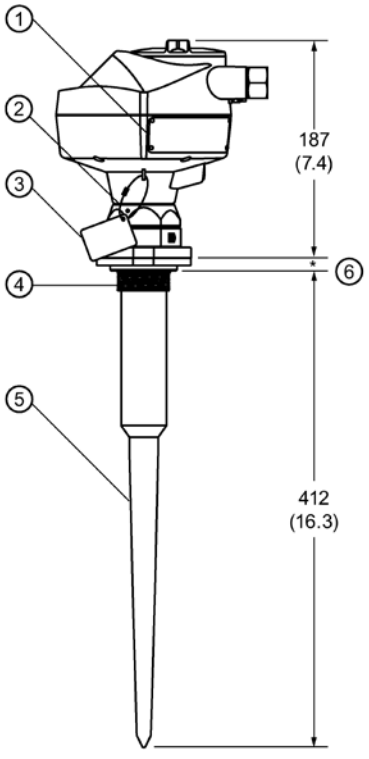
A

Note

- For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand tight.
- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the tag is available on the product page of our website at LR200 (www.siemens.com/LR200), under **More Info > Installation drawings > Level Measurement > Continous Radar > LR200**.

A.1 Flange adapter versions

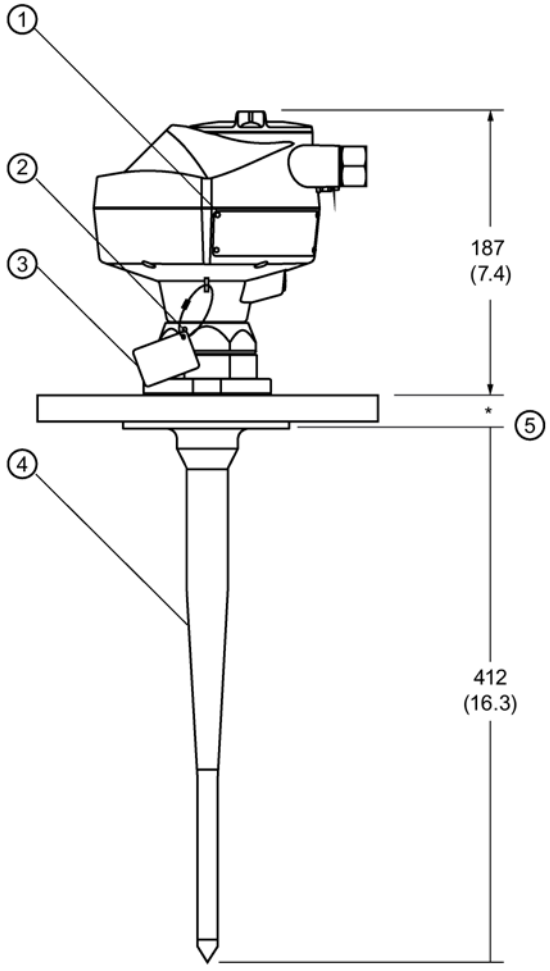
A.1.1 Threaded connection, PTFE rod



① Nameplate
② Locking ring
③ Process device tag
④ Stainless steel mounting thread
⑤ PTEE rod antenna
⑥ Sensor reference point 17 mm (0.67")

A.1.2 PFTE rod antenna, flat-face flange

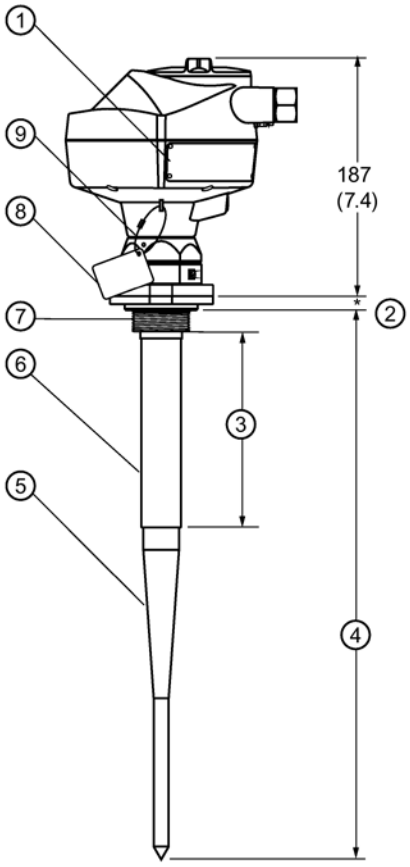
For other flange dimensions and bolt hole sizing, refer to Flat-face flange dimensions (Page 151).



① Nameplate
② Locking ring
③ Process device tag
④ PTEE rod antenna
⑤ Sensor reference point
Flange thickness:
-flat-face: 20 mm (0.80)"
-nominal raised-face flange: thickness depends on flange size

Dimensions in mm (inch)

A.1.3 Threaded connection, PFTE rod, external shield



① Nameplate
② Sensor reference point
③ Shield length
SL=min. 100 mm (4") customer-specified
④ Overall length
L=374 mm (14.7") plus shield length
⑤ Active antenna
⑥ Stainless steel antenna shield (inactive length)
⑦ Stainless steel mounting thread
⑧ Process device tag
⑨ Locking ring

Dimensions in mm (inch)

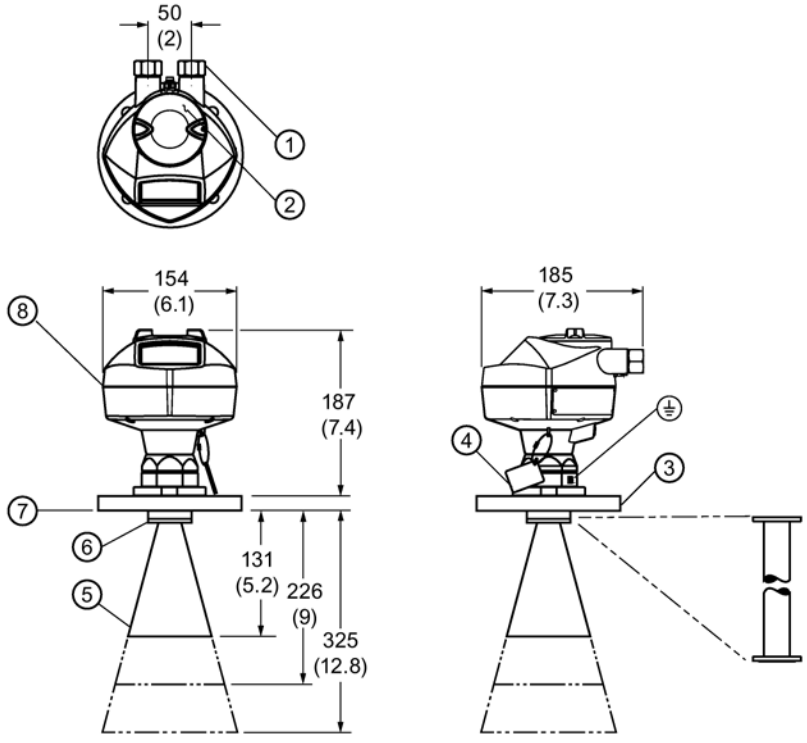
* 17 mm (0.67")

A.1.4 Flat-face flange with horn antenna and waveguide extension

Note

More information

- For other flange dimensions and bolt hole sizing, refer to Raised-face flange dimensions (Page 149) or Flat-face flange dimensions (Page 151).
- For more details, refer to Flanged horn dimensions (Page 146).
- Optional waveguide extensions and/or purging[1)] system can be installed between the flange and the antenna.



① 1/2" NPT cable entry (or alternatively, M20 cable gland)
② Threaded cover
③ Flange
④ Process device tag
⑤ Horn antenna
⑥ 80 mm (3.0") dia.
⑦ Sensor reference point
⑧ Enclosure/electronics

Dimensions in mm (inch)

[1)] A purging system is an option available for this antenna type. This provides an inlet on the flange where cooling air or cleaning fluid may be supplied. The air or liquid passes through the flange and exits the inside of the horn to clean the antenna system.

A.1.5 Flanged horn dimensions

Note

- Signal amplitude increases with horn diameter, so use the largest practical size.
- 80 mm (3") and 100 mm (4") are not recommended in vessels due to the wide beam/ poor performance. They are to be used in stillpipe applications only.

Nominal Horn Size	Horn O.D.	Height to sensor reference point[1)]	Beam Angle[2)]	Measurement Range
100 mm (4”)	95.3 mm (3.75”)	131.0 mm (5.16”)	29 degrees	20 m (65.6 ft)
150 mm (6”)	146.0 mm (5.75”)	225.8 mm (8.89”)	20 degrees	
200 mm (8”)	199.4 mm (7.85”)	325.1 mm (12.79”)	17 degrees	

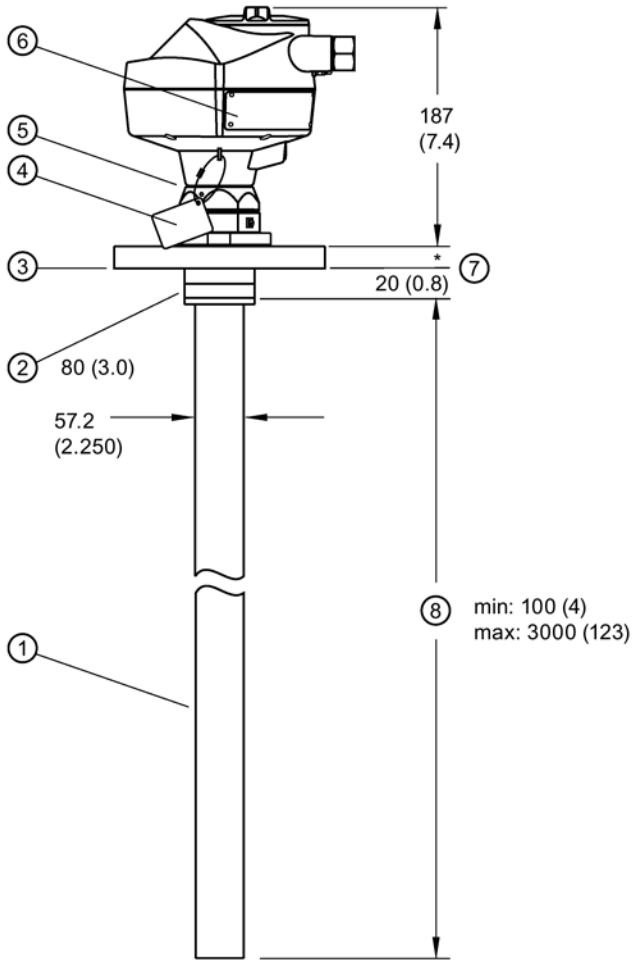
[1)] Height from bottom of horn to sensor reference point as shown: refer to Flat-face flange with horn antenna and waveguide extension (Page 145) or Raised-face or flat-face flange with waveguide (Page 146).

[2)] – 3dB in the direction of the polarization axis (for details, refer to Polarization reference point (Page 26)).

A.1.6 Raised-face or flat-face flange with waveguide

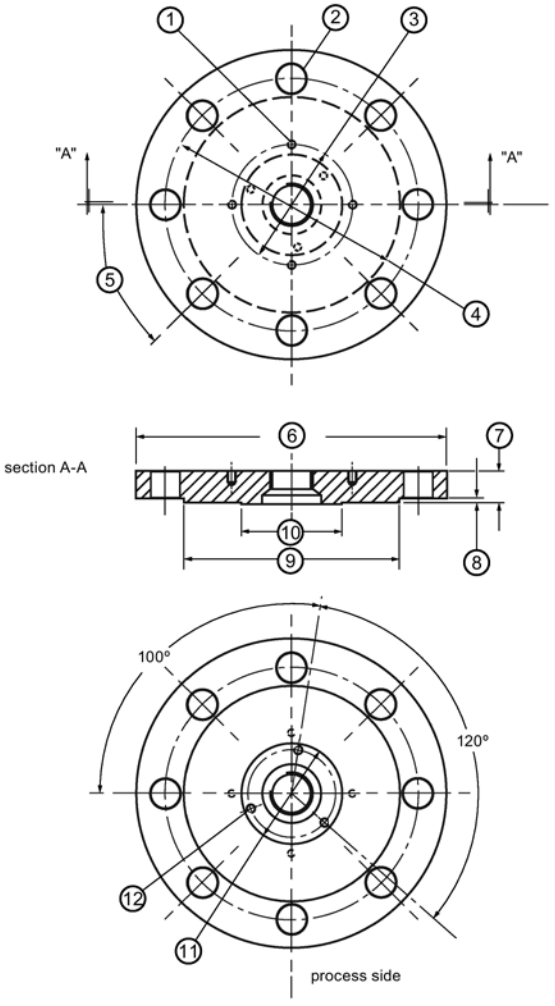
Note

- You can connect a maximum of two waveguides together.
- This option is recommended only for clean liquids on vessels without agitators or turbulence.
- Horizontal stress on this antenna must be avoided, otherwise mechanical support may be required.
- For other flange dimensions and bolt hole sizing, refer to Raised-face flange dimensions (Page 149) or Flat-face flange dimensions (Page 151).



① Waveguide
② Diameter
③ Sensor reference point
④ Process device tag
⑤ Locking ring
⑥ Nameplate
⑦ Flange thickness: See Raised-Face Flange Dimensions (Page 149) or Flat-Face Flange Dimensions (Page 151)
⑧ Variable

A.1.7 Raised-face flange per EN 1092-1



① Enclosure mounting hole (4)
② Bolt hole
③ Enclosure mounting hole circle diameter 86.36 (3.40")
④ Bolt circle diameter
⑤ Angle adjacent bolt holes
⑥ Flange O.D.
⑦ Flange thickness
⑧ Facing height 3 mm
⑨ Facing diameter
⑩ Center hub
⑪ Antenna mounting hole circle diameter 66.04 mm (2.60")
⑫ Antenna mounting hole (3)

A.1.8 Raised-face flange dimensions

Pipe size	Flange bolt hole pattern	Flange O.D. (mm)	Bolt hole circle ∅ (mm)	Bolt hole ∅ (mm)	No. of bolts	Angle of adjacent bolt holes	Facing ∅ (mm)	Thickness (mm)
DN80	PN10/PN16	200	160	18	8	45	138	20
DN100	PN10/PN16	220	180	18	8	45	158	20
DN150	PN10/PN16	285	240	22	8	45	212	22
DN200	PN10/PN16	340	295	22	12	30	268	24
DN80	PN25/PN40	200	160	18	8	45	138	24
DN100	PN25/PN40	235	190	22	8	45	162	24
DN150	PN25/PN40	300	250	26	8	45	218	28

A.1.9 Raised-face flange markings

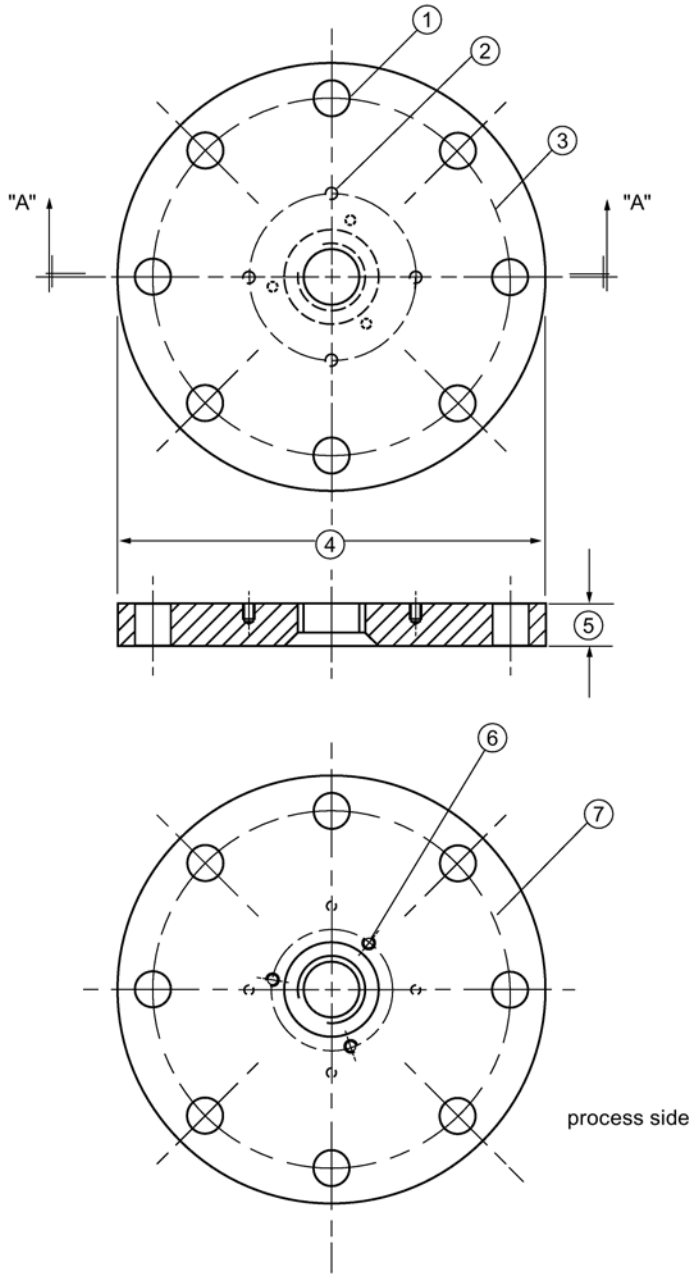
Flange Standard; Nominal Size; Material; Heat Code	Serial no.	Logo	Heat Code no.	Facing
EN 1092-1 05 'B1'; 'DN80' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyxxx		A1B2C3	RF

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

Serial number:	a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999
Flange series:	the Siemens drawing identification
Heat code:	a flange material batch code identification
Facing:	defines RF option

A.1.10 Flat-face flange (constant thickness series)

For details, refer to Flat-face flange dimensions (Page 151).



① Bolt hole
② Enclosure mounting hole
③ Bolt hole circle
④ Flange O.D.
⑤ 20 mm (0.80") nominal
⑥ Antenna mounting hole
⑦ Bolt hole circle diameter

A.1.11 Flat-face flange dimensions

Pipe size	Flange size	Flange O.D.	Bolt hole circle ∅	Bolt hole ∅	Number of bolts
2"	ASME 150 lb	6.0”	4.75”	.7”	4
3"	ASME 150 lb	7.5”	6.0”	.75”	4
4"	ASME 150 lb	9.0”	7.50”	.75”	8
6"	ASME 150 lb	11.0”	9.50”	.88”	8
8"	ASME 150 lb	13.5”	11.75”	.88”	8
2"	ASME 300 lb[1)]	6.50”	5.00”	.75”	4[1)]
3"	ASME 300 lb	8.25”	6.62”	.88”	8
4"	ASME 300 lb	10.00”	7.88”	.88”	8
6"	ASME 300 lb	12.50”	10.62”	.88”	12
8"	ASME 300 lb	15.00”	13.00”	1.00”	12
DN50	PN16	165 mm	125 mm	18 mm	4
DN80	PN16	200 mm	160 mm	18 mm	8
DN100	PN16	220 mm	180 mm	18 mm	8
DN150	PN16	285 mm	240 mm	22 mm	8
DN200	PN16	340 mm	295 mm	22 mm	12
DN200	PN25	360 mm	310 mm	26 mm	12
DN50	PN40	165 mm	125 mm	18 mm	4
DN80	PN40	200 mm	160 mm	18 mm	8
DN100	PN40	235 mm	190 mm	22 mm	8
DN150	PN40	300 mm	250 mm	26 mm	8
DN200	PN40	375 mm	320 mm	30 mm	12
50A	JIS 10K	155 mm	120 mm	19 mm	4
80A	JIS 10K	185 mm	150 mm	19 mm	8
100A	JIS 10K	210 mm	175 mm	19 mm	8
150A	JIS 10K	280 mm	240 mm	23 mm	8
200A	JIS 10K	330 mm	290 mm	23 mm	12

[1)] Due to the limited space on this flange, SITRANS LR200 can only use 4 of the standard 8 bolt holes of the 2" ASME 300 lb size.

A.1.12 Flat-face flange markings

Flange markings located around the outside edge of the flat-face flange identify the flange assembly on which the device is mounted.

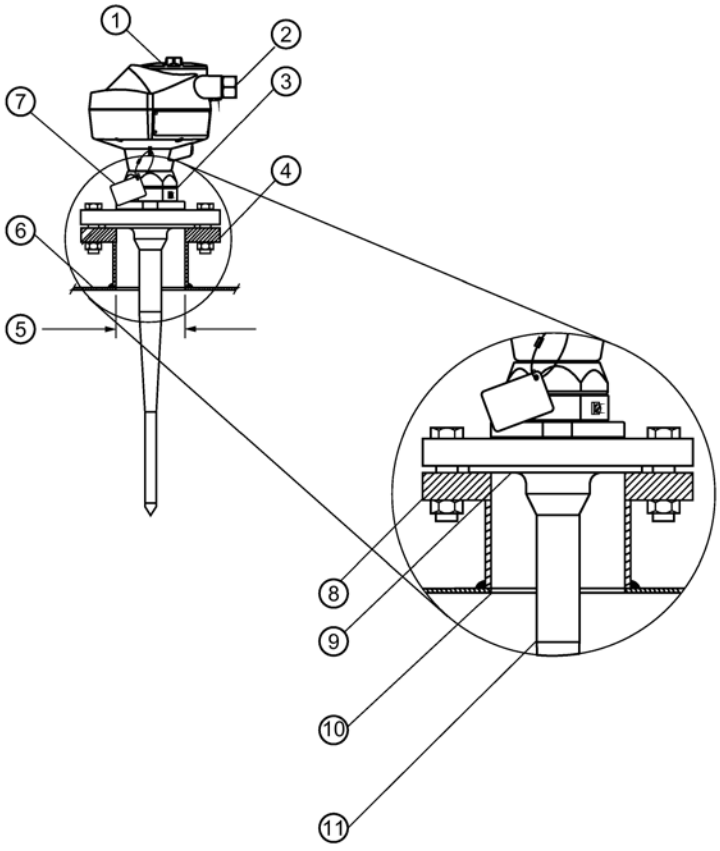
Flat Face Flange Identification							**Welded assembly identification**	
Serial no.	Logo	Flange series			Material	Heat code	Flange series	Heat code no.
		Series	Nominal size					
MMDDYY XXX		25556	2	150	316L/ 1.4404 or 316L/ 1.4435	A1B2C3	25546	A1B2C3
			DN 80	PN16				

Serial number:	a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.
Flange series:	the Siemens drawing identification.
Nominal size:	the flange size followed by the hole pattern for a particular flange class. For example: • a 2 inch ANSI B 16.5 150 lb class flange (North America) • a DN 80 EN 1092-1 PN16 class flange (Europe)
Material:	the basic flange material (AISI or EU material designation). North American material codes are followed by European ones. For example, material designation 316L/1.4404.
Heat code:	a flange material batch code identification.

A.1.13 Flange mounting instructions

Note

- The integral process seal MUST rest on the customer-supplied flange (see the detail below).
- The straight/taper transition of the rod should extend past the nozzle/vessel opening. Add extensions as required[1)].



① Wiring access cover
② 1/2 " NPT or M20 x 1.5 cable entry
③ Locking ring
④ Customer flanged nozzle to suit
⑤ Minimum diameter 2"/DIN 50
⑥ Vessel
⑦ Process device tag
⑧ Customer-supplied flange
⑨ Integral process seal
⑩ Nozzle/vessel juncture
⑪ Straight/taper transition

[1)] Refer to Rod extension requirements (Page 155).

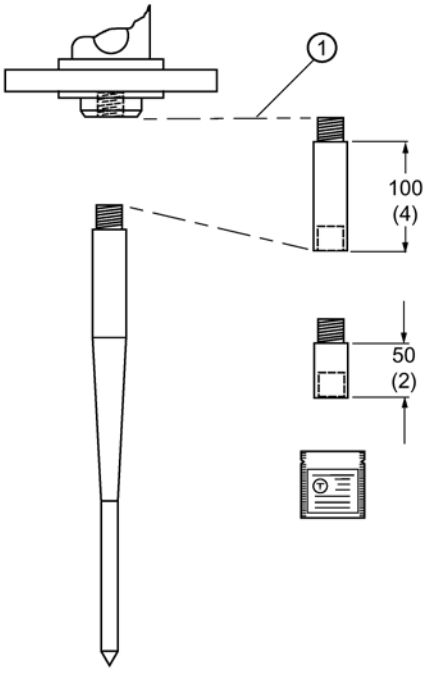
A.1.14 PTFE tape

Note

Pressure applications

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

A.1.15 Rod assembly



① Optional extension

Dimensions in mm (inch)

Note

PTFE paste is supplied with PTFE rod antenna versions (non-sanitary type).

- Water or process fluids must not enter the connecting threads: this could cause reflections at the connection, which will appear as false echoes.
- Apply a small amount of PTFE paste to the antenna threads before threading the antenna together, and tighten slowly. Ensure that the rod sections mate securely with no gaps. Do not apply too much PTFE paste or the parts will not mate securely.
- Do not use wrenches or pliers. Hand tighten only (except in pressure applications: see warning above).

A.1.16 Rod extension requirements

Nozzle I.D.	Nozzle height[1] mm (inches)		
	<100 (4)	100 to 150 (4 to 6)	150 to 200 (6 to 8)
50 mm (2”)	extension not required	Application not recommended for 50 mm (2”) I.D. nozzles longer than 100 mm (4”)[2]	
80 mm (3”)		50 mm	100 mm
100 mm (4”)		50 mm	100 mm
150 mm (6”)		50 mm	100 mm
>150 mm (6”)	extension not required		

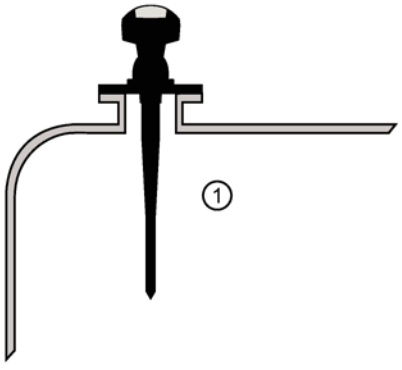
[1] Consult Siemens Milltronics for assistance with nozzle sizes not listed.

[2] Shielded rod antennas are available for these applications.

A.2 Mounting guidelines

A.2.1 Nozzle design

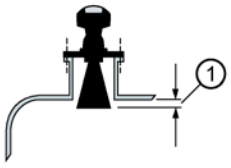
- The nozzle should be as short as possible.
- If your application requires a nozzle longer than our recommended maximum length consider using a shielded rod.



① Max. nozzle height: 100 mm (4")

A.2.2 Horn antennas

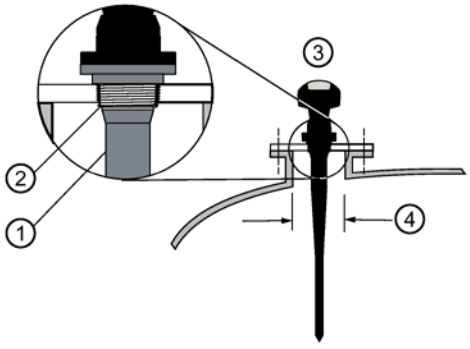
The end of the horn should protrude a minimum of 10 mm (0.4”) to avoid interference from the nozzle.



① 10 mm (0.4")

A.2.3 Threaded rod antenna

1.5” or 2” threaded process connections are available in three thread types: NPT, BSP, and G.

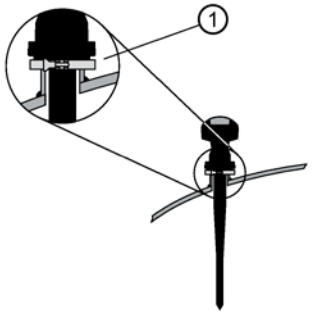


① PTFE
② 316 S.S.
③ Max. nozzle height 100 mm (4")
④ Min I.D. 100 mm (4")

For smaller diameters use a shielded rod.

A.2.4 Sanitary rod antenna

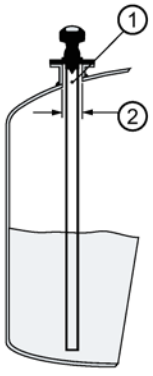
2”, 3”, and 4” sanitary fitting ferrule with integral gasket, with rod antenna



① Sanitary fitting ferrule

A.2.5 Waveguide antenna

- You can connect a maximum of two waveguides together.
- This option is recommended only for clean liquids, and only on vessels without an agitator, with no turbulence.
- Horizontal stress on this antenna must be avoided, otherwise mechanical support may be required.
- Process temperature and pressure capabilities are dependent upon information on the process device tag. The reference drawing listed on the tag can be downloaded from our website at: www.siemens.com/LR200.

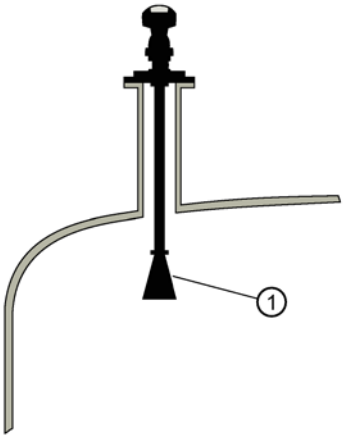


① Vent hole
② Minimum 80 mm (3")

- Recommended for products with a dK lower than 3.
- For the related propagation factor, see Propagation factor (2.5.3.) (Page 93).

A.2.6 Horn with waveguide extensions

- Recommended for long nozzles with a small diameter. For example, if the nozzle is 100 mm (4”) in diameter and 460 mm (18”) in length), the rod antenna is not suitable due to interference from the nozzle.
- Waveguide extensions are available in custom lengths.
- The horn must be connected to the SITRANS LR200 process flange.



① If horn diameter is too large for the nozzle opening, insert it from inside the vessel.

A.2.7 Nozzle fabrication

Weld seams must be on the outside of the nozzle. Seams or lips on the inside of the nozzle may cause erratic readings.

Technical reference

B

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 81) for a complete list of parameters.

B.1 Fail-safe Mode

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

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

Mode (2.6.9.1.)

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

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

Value (2.6.9.2.)

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

The two Analog Input Function blocks are set separately.

To set a user-defined value:

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

B.2 Principles of operation

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

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

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

SITRANS LR200 consists of an enclosed electronic circuit coupled to an antenna and process connection. The electronic circuit generates a radar signal that is directed to the antenna. The signal is emitted from the antenna, and the reflected echoes are digitally converted to an echo profile. The profile is analyzed to determine the distance from the material surface to the sensor reference point[2]. This distance is used as a basis for the display of material level and mA output.

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

[2] Refer to Dimension drawing (Page 140).

B.3 Echo processing

B.3.1 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.

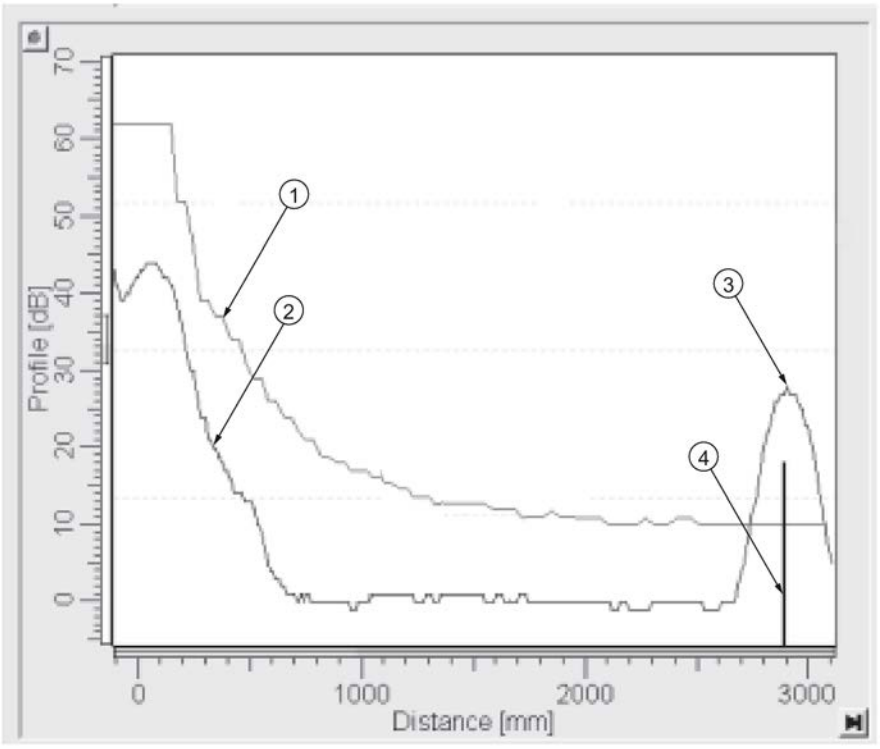
B.3.2 Echo selection

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 164) 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)

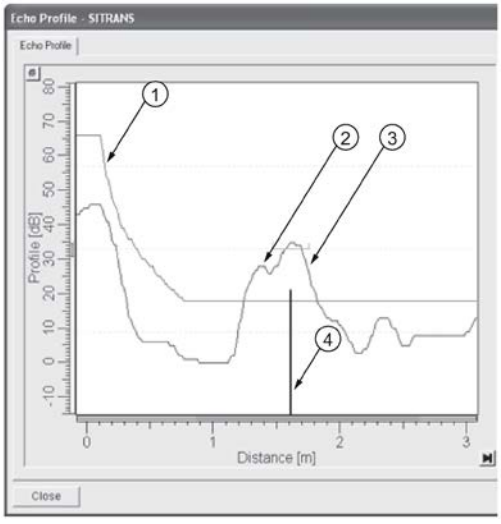
- Uses the leading edge of the echo.
- Is used mainly to process the echo from materials with a low dK value.

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

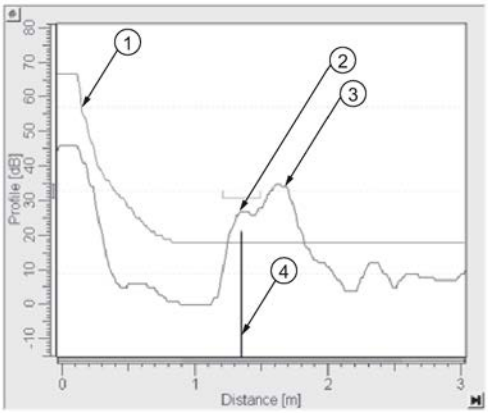
Vessel height: 1.5 m; CLEF range set to 0 (Center algorithm gives the same result.)



① Default TVT
② Material echo
③ Vessel bottom echo selected
④ Echo marker

Example: CLEF enabled

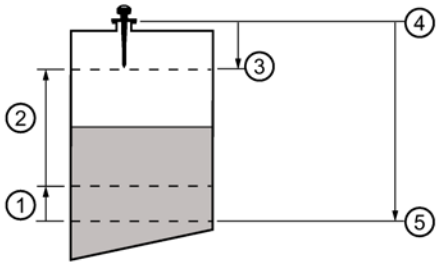
Vessel height: 1.5 m; CLEF range set to 0.5 m



① Default TVT
② Material echo selected
③ Vessel bottom echo
④ Echo marker

B.3.2.1 CLEF range

CLEF Range (2.5.7.4.) is referenced from Low Calibration Point (process empty level). When the **Hybrid** algorithm is selected in **Position Detect (2.5.7.2.)**, the CLEF algorithm will be applied up to the limit of CLEF Range. Above this limit the Center algorithm will be applied.



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

B.3.2.2 Echo 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.

B.3.2.3 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 with Echo Lock:

Lock Off

SITRANS LR200 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.

B.3.2.4 Auto False Echo Suppression

Note

- For detailed instructions on using this feature via PDM see Auto False Echo Suppression (Page 63).
- For detailed instructions on using this feature via the handheld programmer see Auto False Echo Suppression (2.8.7.1.) (Page 96).

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.

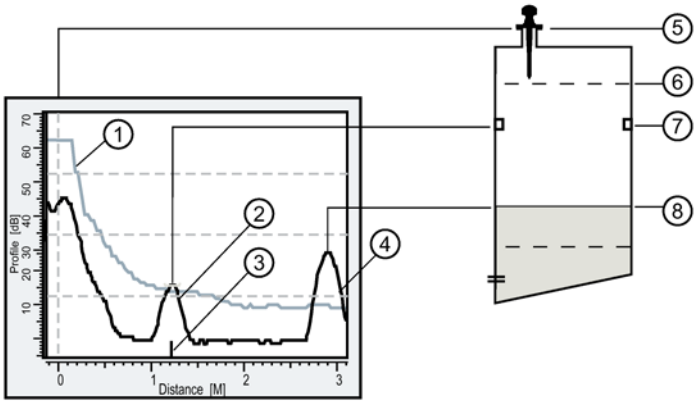
Auto False Echo Suppression Range

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.

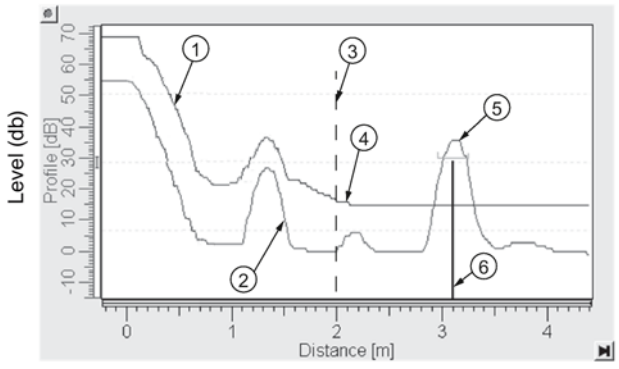
Auto False Echo Suppression Range must be set to a distance shorter than the distance to the material level when the environment was learned, to avoid the material echo being screened out.

Example before Auto False Echo Suppression



① Default TVT
② False echo
③ Echo marker
④ Material level
⑤ Sensor reference point
⑥ High calibration point=0
⑦ Obstruction at 1.2 m
⑧ Material level at 2.9 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

B.4 Measurement Range

Near range

Near Range programs SITRANS LR200 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 is generally recommended in preference to extending the blanking distance from factory values.

Far range

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.

B.5 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 per Minute (2.3.8.2.)/Empty Rate per Minute (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

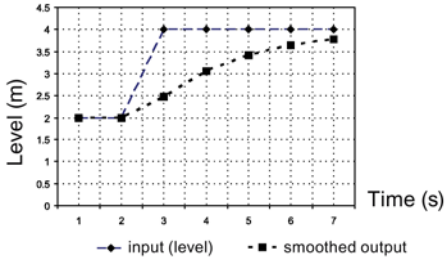
B.6 Damping

Filter time constant (2.6.8.1.) (Page 103) 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



B.7 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.) (Page 96) describes the quality of an echo. Higher values represent higher quality.

Echo threshold (2.5.7.3.) (Page 94) 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.) (Page 84) 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 Fail-safe.

S: 0 LOE

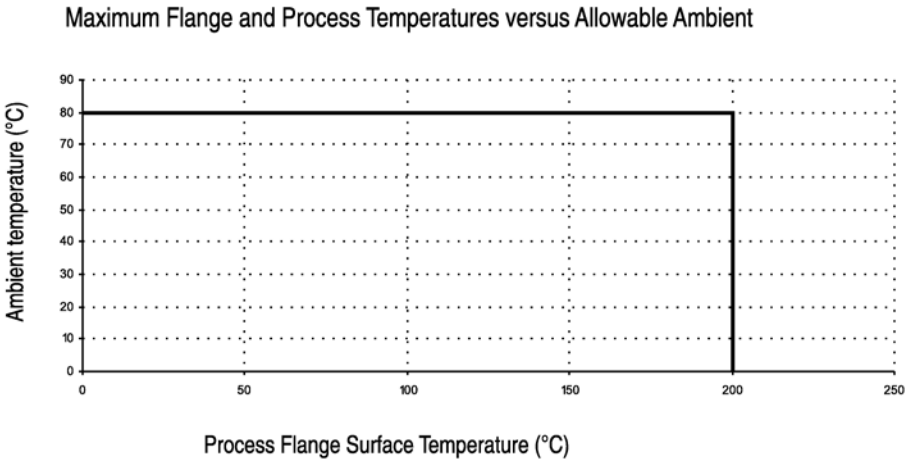
S: 52 Fail-safe

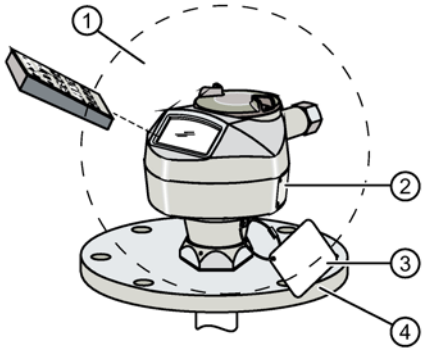
B.8 Maximum process temperature chart

CAUTION
Internal temperature
Internal temperature must not exceed 80 °C (176°F)

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 LR200 directly on a metallic vessel surface.
- The chart does not take into consideration heating from direct sunshine exposure.





① Ambient temperature
② Internal enclosure temperature
③ Process temperature

Where the chart does not apply, please use your own judgement regarding the use of SITRANS LR200. See Electronics temperature (3.3.) (Page 106) to monitor the internal temperature.

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

B.9 Process pressure/temperature derating curves

⚠ WARNING

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

⚠ CAUTION

Improper installation may result in loss of process pressure and/or release of process fluids and/or gases.

Note

- The Process Device Tag shall remain with the process pressure boundary assembly[1)]. In the event the instrument package is replaced, the Process Device Tag shall be transferred to the replacement unit.
- SITRANS LR200 units are hydrostatically tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.
- The serial numbers stamped in each process connection body, (flange, threaded, or sanitary), provide a unique identification number indicating date of manufacture. Example: MMDDYY – XXX (where MM = month, DD = day, YY = year, and XXX= sequential unit produced) Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.
- Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
- The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use and which are suitable for the service conditions.

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

B.9.1 Pressure Equipment Directive, PED, 2014/68/EU

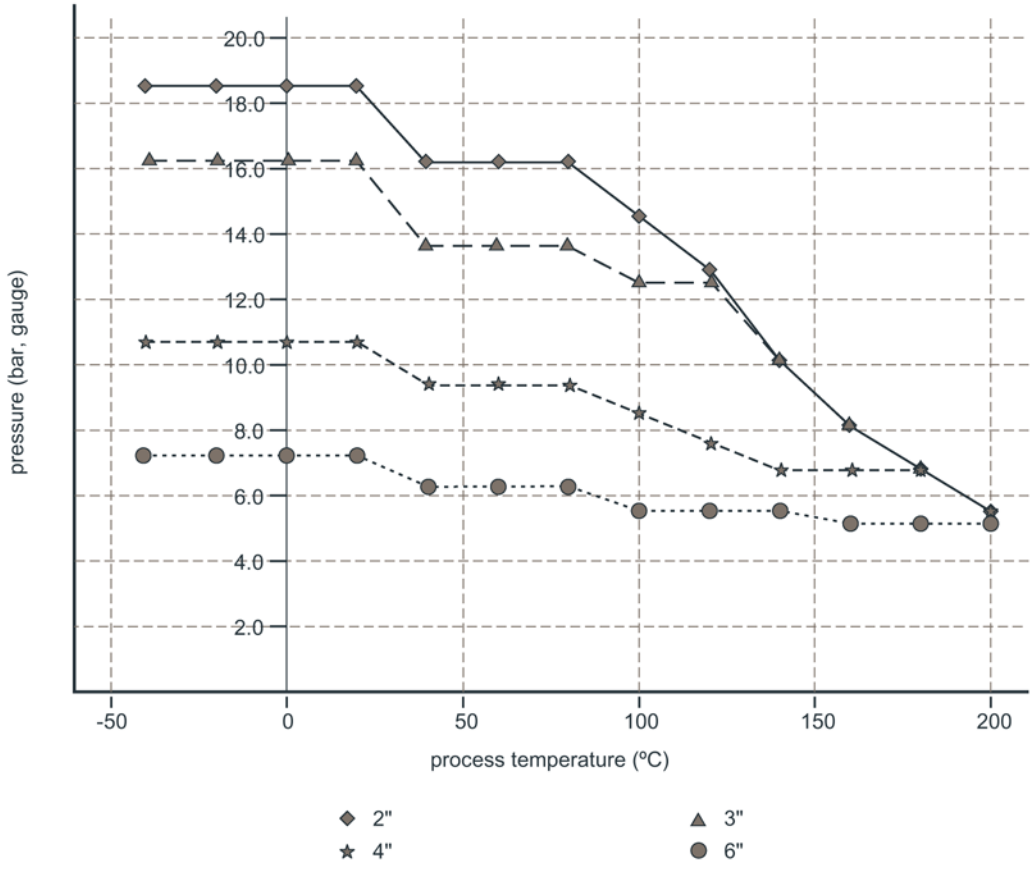
Siemens Level Transmitters with flanged, threaded, or sanitary clamp type process mounts have no pressure-bearing housing of their own and, therefore, do not come under the Pressure Equipment Directive as pressure or safety accessories, (see EU Commission Guideline 1/8).

Note

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

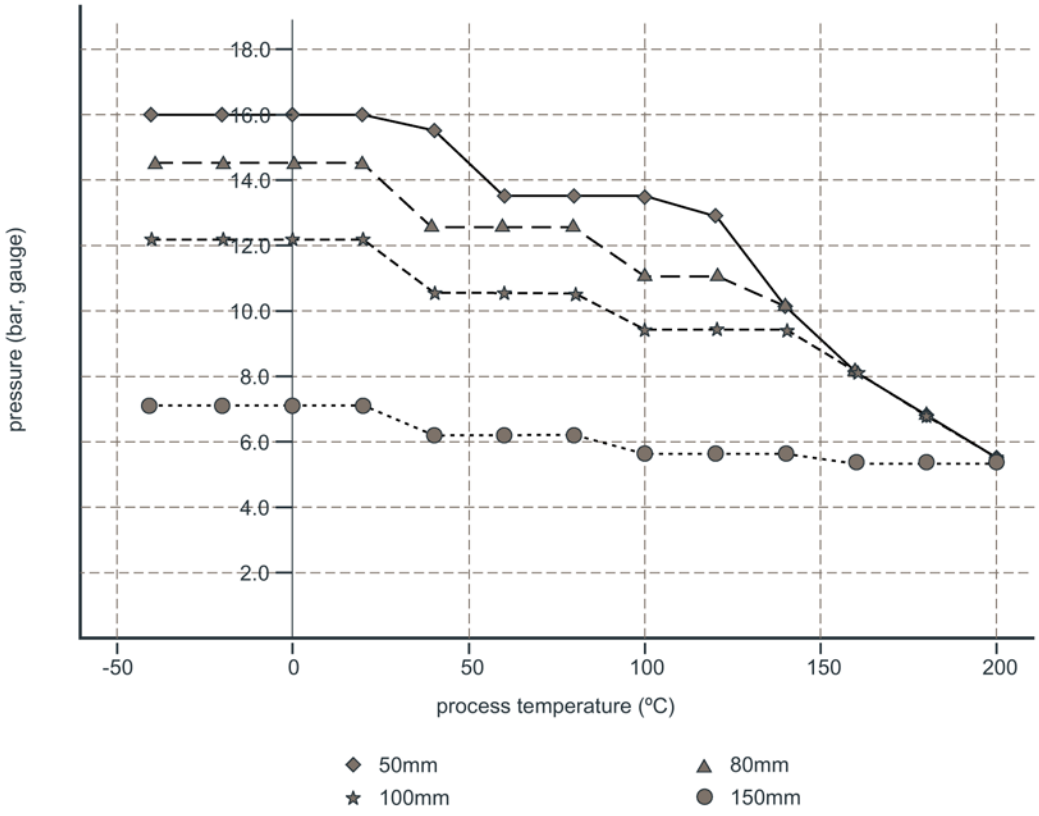
B.9.2 PTFE rod antenna ASME hole pattern, 150 lb

Flat-face flange (constant flange thickness series)

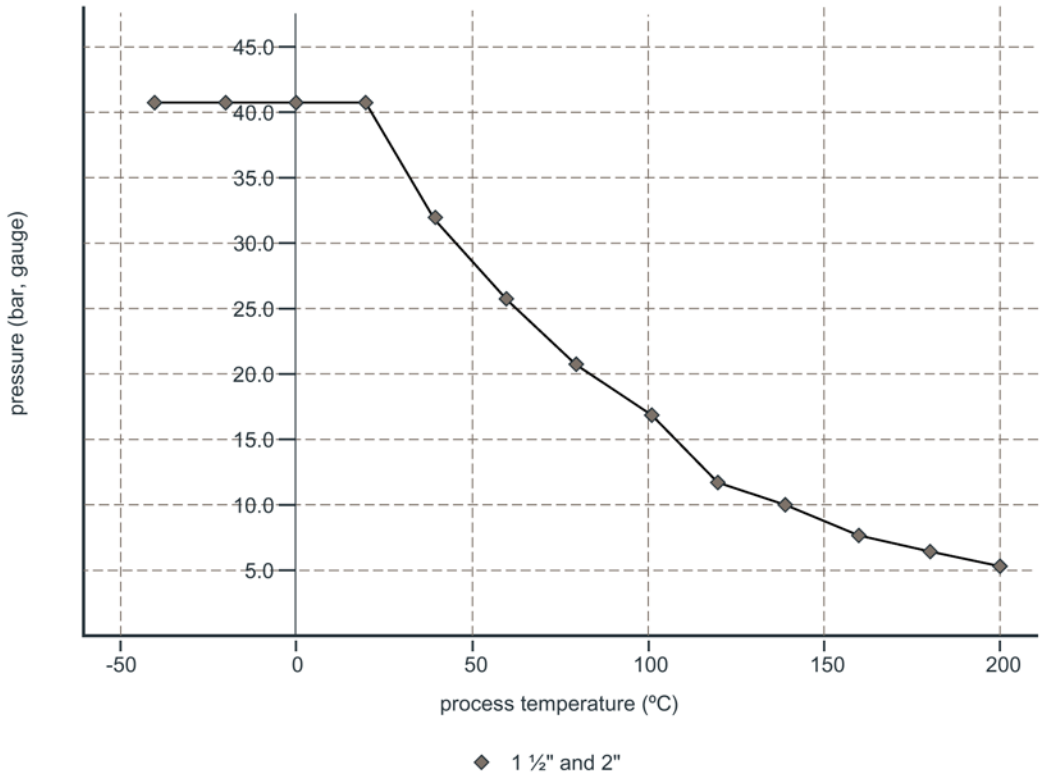


B.9.3 PTFE rod antenna, DN hole pattern, PN16

Flat-face flange (constant flange thickness series)

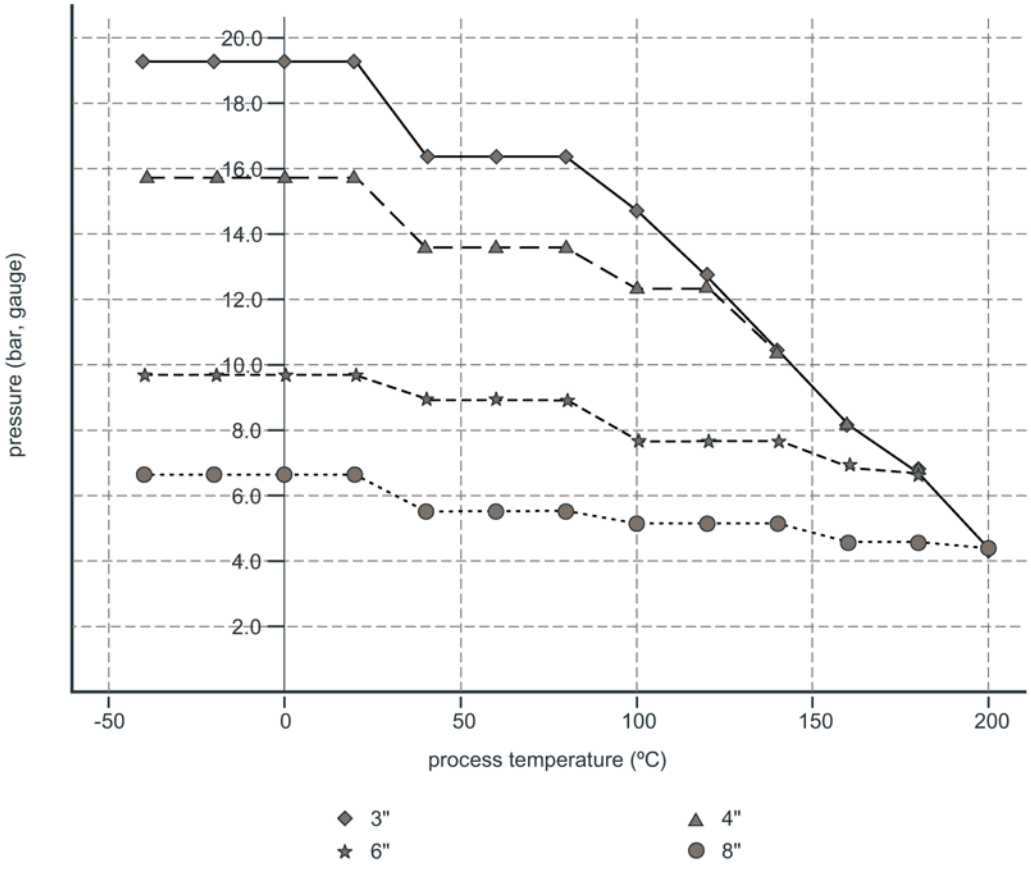


B.9.4 PFTE rod antenna threaded connection



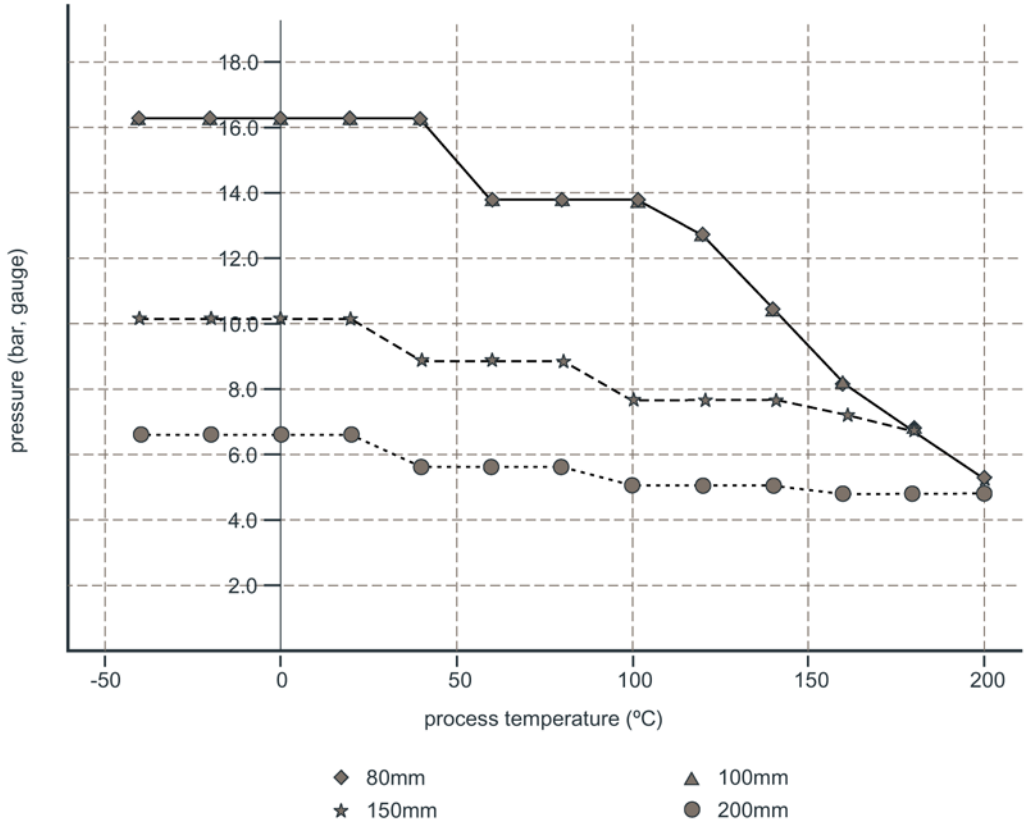
B.9.5 Horn antenna or waveguide, ASME hole pattern, 150 lb

Flat-face flange (constant flange thickness series)



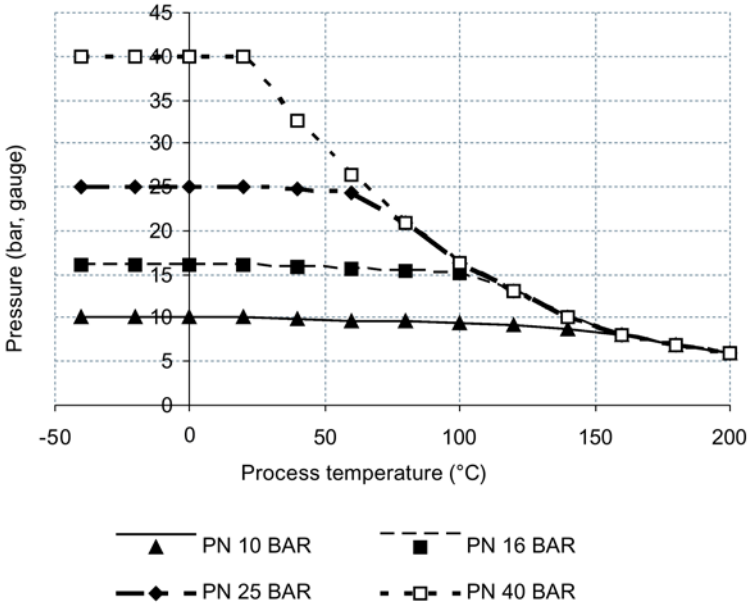
B.9.6 Horn antenna or waveguide DN hole pattern, PN16

Flat-face flange (constant flange thickness series)



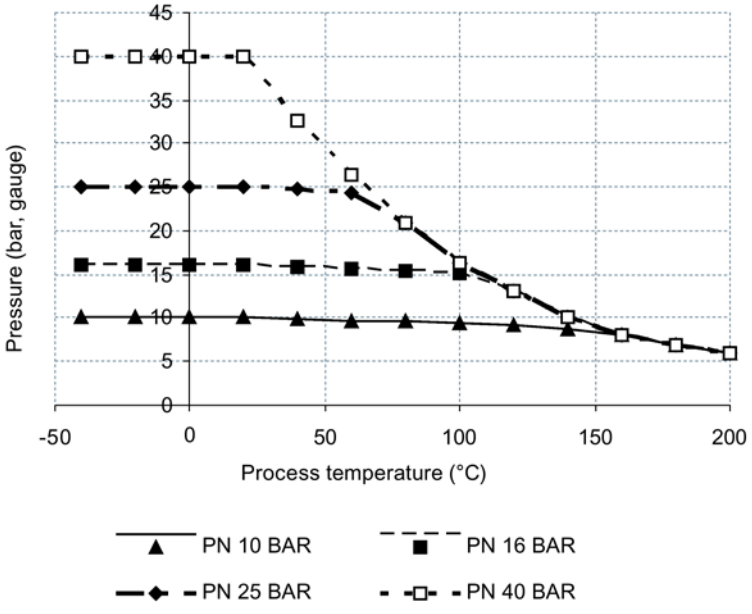
B.9.7 PFTE rod antenna, DN hole pattern, PN16, PN40

Raised Face Flange per EN 1092-1



B.9.8 Horn antenna or waveguide, DN hole pattern, PN16, PN40

Raised Face Flange per EN 1092-1



PROFIBUS PA profile structure

C

C.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.

C.2 Block Model

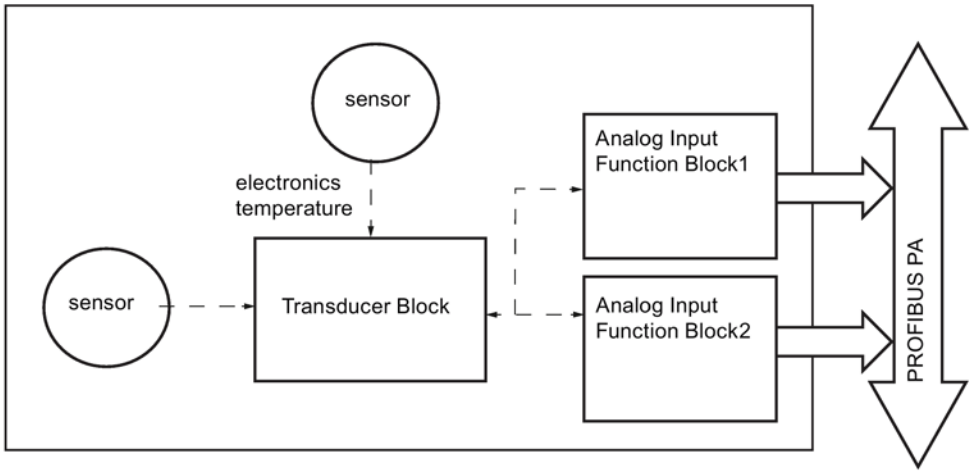
The Block Model represents how measured values are recorded and processed. All data is viewed from the perspective of the DCS or PLC, so information from the sensor is an input.

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.

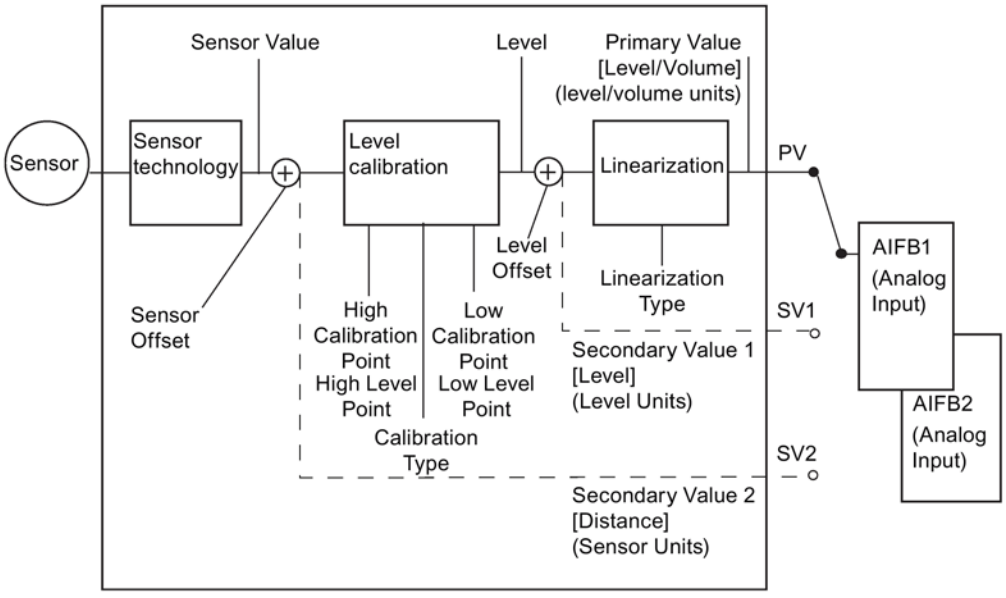
C.3 Transducer Block function groups

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



C.4 How the transducer block works

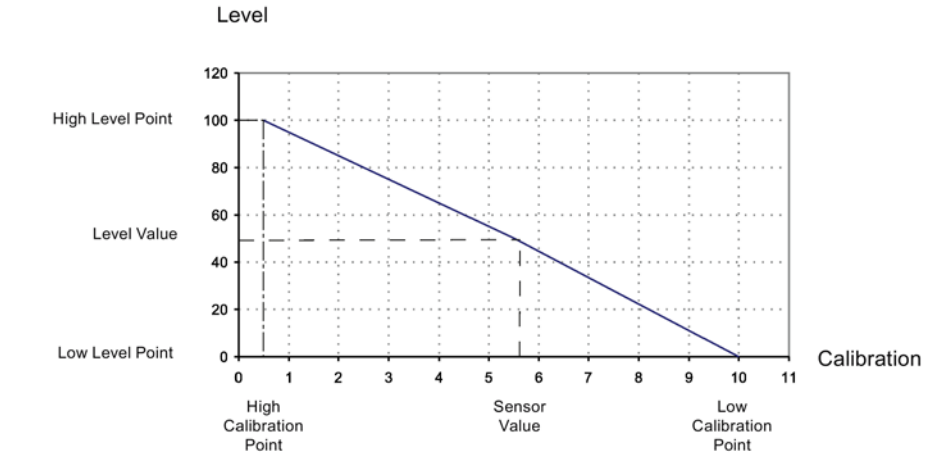
1. The sensor technology sub-block selects the proper echo. For an explanation of sensor technology, see Technical reference (Page 159).

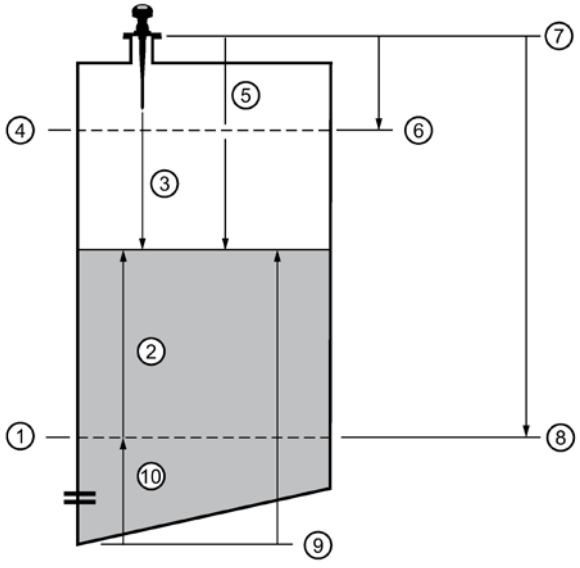
   The sensor value (in sensor units) is checked to see if it is within its measuring limits. If the limit is exceeded, this results in a **Bad** status and the error message **Failure in measurement**. The sensor value is stored in Sensor Value.

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

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 (level units)
   - Secondary Value 1 (SV1) / Level (level units)
   - Secondary Value 2 (SV2) / Distance (sensor units)

[1] Referenced from Sensor reference point

[2] Sensor offset (2.3.7.3.) (Page 86) is a constant offset (negative or positive) that can be added to sensor value to compensate if the sensor has been changed.

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

Electronics temperature

The Transducer Block monitors the internal temperature of the device electronics. A change in temperature can provide advance warning of a possible device failure, and allow for preventive maintenance.

If a temperature limit is exceeded, the output value is unchanged but the output status changes. (The permitted limits correspond to those of the permitted ambient temperature.)

Peak indicators 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**.

C.5 Analog Input Function Blocks 1 and 2

The input to the AIFB is a value with a status. See Transducer Block function groups (Page 177) for a graphic representation.

C.6 Output conversion

The Analog Input Function Blocks can modify the output value.

Scaling

Output scaling (2.6.6.) (Page 101) 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 Mode (2.6.9.1.) (Page 104) and, if desired, define a value in Value (2.6.9.2.) (Page 104).

C.7 Device/input simulation

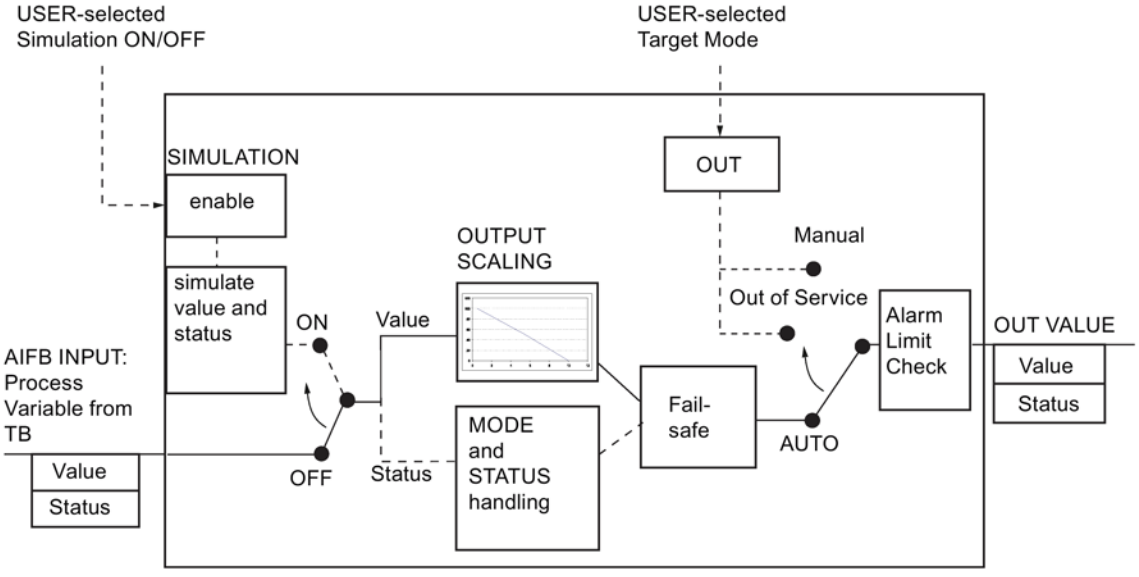
You can define a simulated value to be input to the AIFB instead of the output value from the Transducer Block. The simulated value allows the AIFB to be tested independently of the characteristics of the environment.

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.

C.8 AIFB function groups



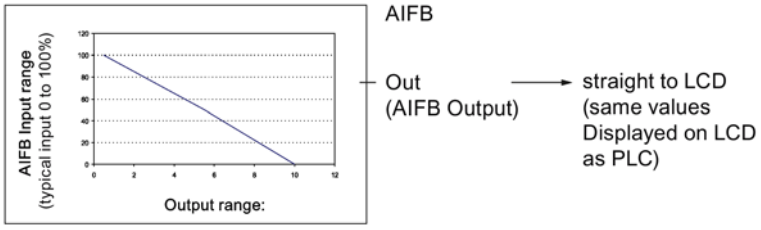
C.9 Analog Input Function Block function groups (simulation, mode and status)

Measured values are processed within an Analog Input Function Block to produce the device output. See AIFB function groups (Page 180). The output is communicated via cyclic transfer to PROFIBUS PA and displayed on the LCD.

C.10 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 167) 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.

PROFIBUS communication

D

SITRANS LR200 (PROFIBUS PA) is a Profile Version 3.01, Class B, PA device. It supports Class 1 Master for cyclic and acyclic data exchange, and Class 2 for acyclic services. The full range of SITRANS LR200 functions is available only over a PROFIBUS PA network.

PROFIBUS PA is an open industrial protocol. Full details about PROFIBUS PA can be obtained from PROFIBUS International at www.profibus.com (www.profibus.com).

D.1 Device configuration tool

To use PROFIBUS PA, you will need a PC configuration tool: we recommend SIMATIC PDM. Please consult the operating instructions or online help for details on using SIMATIC PDM. You can find more information at:

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

D.2 SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain SITRANS LR200 and other process devices. For more details, see Functions in SIMATIC PDM (Page 49).

Electronic Device Description (EDD)

Note

SITRANS LR200 requires the EDD for SIMATIC PDM Rev. 6.0 with SP4.

In order to use Process Device Manager (PDM) with PROFIBUS PA, you will need the Electronic Device Description for SITRANS LR200. For details see Electronic device description (EDD) (Page 50).

Enhanced EDD (Electronic Device Description)

The Enhanced EDD has improved usability features: for example, see Echo profile utilities (Page 60) and Quick start wizard (Page 51).

D.3 Network configuration

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

D.4 The GSD file

The GSD file **SIEM810F.gsd** is available from the SITRANS LR200 product page on our website.

www.siemens.com/LR200 (www.siemens.com/LR200) > downloads

D.5 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:

www.profibus.com (www.profibus.com)

D.6 Power demands

To determine how many devices can be connected to a bus line, calculate the combined maximum consumption of all the connected devices: 10.5 mA for each SITRANS LR200. Allow a current reserve for safety.

D.7 PROFIBUS address

A unique PROFIBUS address identifies each device on the network.

- To set PROFIBUS address, see Device address (5.1.) (Page 122).
- To reset the PROFIBUS address to 126, see Master reset (4.1.) (Page 110).

Notes:

- It is possible to change the device address via a Class 1 master (for example, a PLC) and lock the device address to prevent further changes.
- If this Address Lock is on, the PA address cannot be changed. This lock can be disabled only by performing an Address Reset.

D.8 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.

The device 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 the device as a profile device, see **PROFIBUS Ident Number (5.2.)**.

D.9 Configuring a new device

See Configuring a new device (Page 50).

D.10 Configuring PROFIBUS PA with an S7-300/ 400 PLC

1. If SITRANS LR200 is not listed in the STEP 7 device catalog, you can download the GSD file from the Siemens Web site and import it into Step 7. Go to LR200 (www.siemens.com/LR200), and click Downloads.
2. Add the SITRANS LR200 "rack", click and drag the SITRANS LR200 folder from the hardware catalog.
3. Fill the rack with the necessary 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.

D.11 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.

D.12 Cyclic data

When you configure the device 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 179) 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.

D.13 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.

D.14 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 185).
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 191).

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.

Condensed Status (BAD)		
Hex value	Status - BAD	Description
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.

D.15 Diagnostics

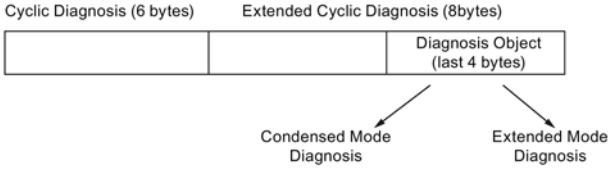
All diagnostic information shown below is viewable via PDM.

D.16 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 189) and Condensed Mode Diagnosis (Page 190)].

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



D.17 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 189)
- Condensed Mode Diagnosis (Page 190)

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.

D.18 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

D.19 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.

D.20 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 188) 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

D.21 Acyclic data

The device 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).

Certificates and support

E

E.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)

E.2 Certificates

You can find certificates on the Internet at Industry online support portal (http://www.siemens.com/processinstrumentation/certificates) or on an included DVD.

E.3 QR code label

A QR code label can be found on the device. With the use of a smart phone, the QR code provides a direct link to a website with information specific to the device, such as manuals, FAQs, certificates, etc.

LCD menu structure

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Abbreviations

G

G.1 Abbreviations

Short form	Long form	Description	Units
AIFB	Analog Input Function Block		
CE / FM / CSA	Conformité Européenne / Factory Mutual / Canadian Standards Association	safety approval	
C_i	Internal capacitance		F
D/A	Digital to analog		
DCS	Distributed Control System	control room appa-ratus	
dK	dielectric constant		
EDD	Electronic Device Description		
HART	Highway Addressable Remote Transducer		
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
µV	microvolt	10^{-6}	V
PA	Process Automation (PROFIBUS)		
PED	Pressure Equipment Directive	safety approval	
pF	pico Farads	10^{-12}	F
ppm	parts per million		
PV	Primary Variable[1)]	measured value	
rms	root mean square	a statistical measure	
SELV	Safety extra low voltage		
SV	Secondary Variable[1)]	equivalent value	
TB	Transducer Block		
TVT	Time Varying Threshold	sensitivity threshold	
U_i	Input voltage		V
U_o	Output voltage		V

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

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.

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 spreading

the divergence of a beam as it travels through a medium.

beam width

the angle diametrically subtended by the one-half power limits (-3 dB) of the microwave beam.

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.

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.

propagation factor (pf)

where the maximum velocity is 1.0, pf is a value that represents a reduction in propagation velocity as a result of the wave travelling through a pipe or
medium.

pulse radar

a radar type that directly measures distance using short microwave pulses. Distance is determined by the return transit time.

radar

radar is an acronym for **RA**dio **D**etection **A**nd **R**anging. A device that radiates electromagnetic waves and utilizes the reflection of such waves from distant objects to determine their existence or position.

range

distance between a transmitter and a target.

range extension

the distance below the zero percent or empty point in a vessel.

relative humidity

the ratio of the actual amount of moisture in the atmosphere to the maximum amount of moisture the atmosphere could hold (which varies depending on the air temperature).

relative permittivity

see dielectric constant.

repeatability

the closeness of agreement among repeated measurements of the same variable under the same conditions.

sensor value

the value produced by the echo processing which represents the distance from sensor reference point to the target. (see **Sensor Mode (2.2.2.)** for an illustration).

shot

one transmit pulse or measurement.

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.

waveguide antenna

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

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