## SIEMENS

## SITRANS

## Radar Transmitters SITRANS LR200 with mA/HART

**Operating Instructions** 

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

#### 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.

#### 

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

#### 

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

#### 

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:

#### MARNING 🛦

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 <sup>®</sup> 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

#### Note

This manual applies to the SITRANS LR200 (ma/HART) only. HART is a registered trademark of the HART Communication Foundation.

#### 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.

#### 

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 146).

#### 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.

## Safety notes

## 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.

## 

#### 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

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)

#### 2.2.1 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.

#### 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.

#### 2.2.2 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 char- acteristics 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, electro-magnetic 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.

2.2 Laws and directives

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.

#### 2.2.3 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:  $\Delta d \le \pm 50 \text{ mm}$

#### 2.2.4 Conformity with European directives

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

Electromagnetic compatibil- ity 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 de- signed 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 potential- ly 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.

#### 2.2.5 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

#### 2.3.1 Qualified personnel for hazardous area applications

#### 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.

## 

#### 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.

2.4 Lithium batteries

## 

#### 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 146).

## 2.4 Lithium batteries

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

## 

#### 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

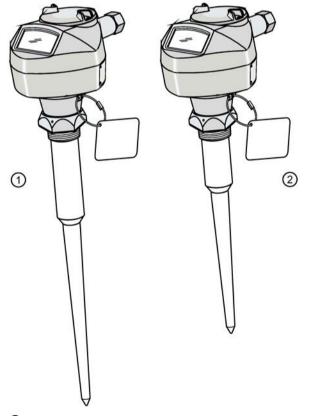
## 3.1 SITRANS LR200 Overview

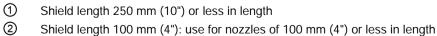
SITRANS LR200 is a 2-wire 6 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage vessels including high pressure and high temperature, to a range of 20 meters (66 feet). The instrument consists of an electronic component coupled to an antenna and either a threaded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

SITRANS LR200 supports HART communication protocol, and the following device management software options:

- SIMATIC PDM
- Pactware/DTM
- AMS Device Manager

Signals are processed using Process Intelligence which has been field-proven in over 1,000,000 applications worldwide (ultrasonic and radar).





3.2 Programming

## 3.2 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

## 3.3 Applications

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

## 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 Nameplates for hazardous area installations (Page 33).

## 3.5 Process connections

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

## Installing/mounting

## 4.1 Basic safety notes

## 

#### 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.

## 

#### 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 146).

## 

#### Pressure applications

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

Improper installation may result in loss of process pressure.

#### 

#### 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 149).

4.1 Basic safety notes

## 

#### 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.

#### 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.

#### 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 149).

## 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.

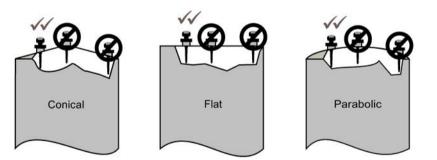
#### 4.2.1 Mounting location

#### Note

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

#### 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.

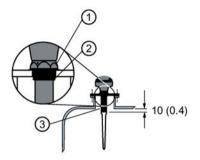


4.2 Mounting

#### 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.

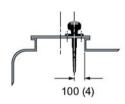
The end of the shield section or end of the horn should protrude a minimum of 10 mm (0.4") to avoid false echoes being reflected from the nozzle.



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

#### Location on a manhole cover

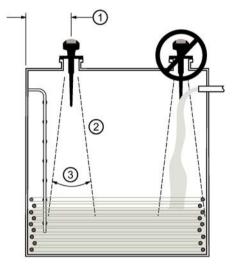
- A manhole cover is typically a covered nozzle with a diameter 610 mm (24") or greater.
- For optimum signal conditions, locate the antenna off-center, typically 100 mm (4") from the side.



#### 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°

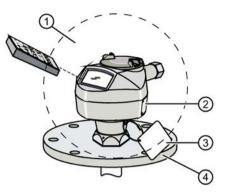
#### **Emission cone**

- 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 Mounting

#### 4.2.1.3 Access for programming

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



- 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)

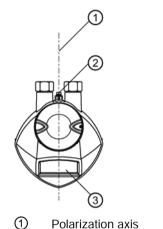
For more detail on maximum interface and process temperatures, refer to Maximum process temperature chart (Page 181).

For other configurations, refer to Process pressure/temperature derating curves (Page 182) and Maximum process temperature chart (Page 181).

#### 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 25).



Polarization reference point

③ Display

#### Mounting on a stillpipe or bypass pipe

A stillpipe or bypass is used for products with a low dK<sup>1</sup>, 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

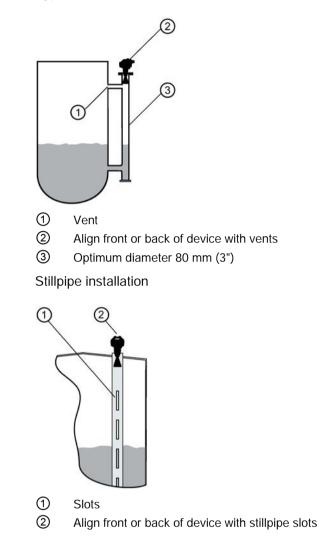
- The pipe diameter must be matched with the horn size. Use the largest horn size that will fit the stillpipe/bypass pipe (refer to Flanged horn dimensions (Page 158)).
- Suitable pipe diameters are between 50 mm (2") and 200 mm (8").
- One continuous length of metallic pipe is preferred, without joints<sup>2</sup>).
- 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<sup>3</sup>).
- Propagation factor depends on pipe diameter. For a table of pipe diameters, refer to Propagation factor (2.8.3.) (Page 111).
- <sup>1)</sup> Refer to Performance (Page 146).
- <sup>2)</sup> Bad joints create reflections.

<sup>3)</sup> Required to equalize pressure and keep the liquid level in the bypass constant with the liquid level in the vessel.

4.2 Mounting

#### **Device orientation**

Bypass installation



## 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<sup>1</sup>). 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.

<sup>1)</sup> 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).

4.4 Disassembly

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



① Locking ring<sup>1)</sup> over threaded connection; secured by three 2 mm Allen set screws

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

## 4.4 Disassembly

#### 

#### 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

## 5.1 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.

## 

#### 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.

## 

#### 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.



#### Unprotected cable ends

- Risk of explosion through unprotected cable ends in hazardous areas.
- Protect unused cable ends in accordance with IEC/EN 60079-14.

## 

#### 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

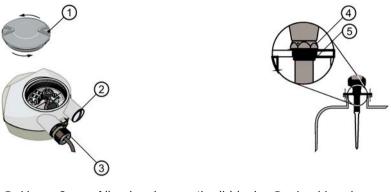
#### Electromagnetic compatibility (EMC)

For metal housings there is an increased electromagnetic compatibility compared to highfrequency radiation. This protection can be increased by grounding the housing, see Connecting (Page 29).

## 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 Nameplates for hazardous area installations (Page 33).
- Use a twisted pair cable: AWG 22 to 14 (0.34 mm<sup>2</sup> to 2.5 mm<sup>2</sup>).
- Separate cables and conduits may be required to conform to standard instrumentation wiring practices or electrical codes.



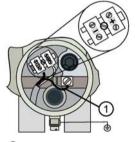
- Use a 2 mm Allen key loosen the lid-lock (4) Locking ring set screw.
- Plug

⑤ Threaded connection

(3) Optional cable gland<sup>1) 2)</sup> (or NPT cable entry<sup>2)</sup>)

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<sup>2</sup>).
- 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)

<sup>1)</sup> May be shipped with the device.

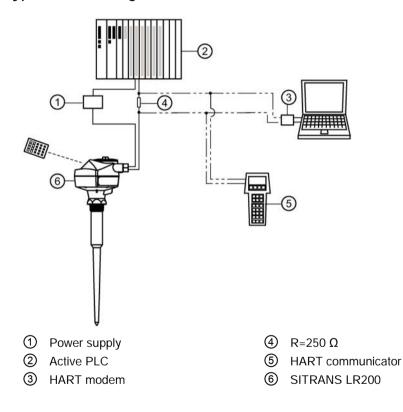
<sup>2)</sup> If cable is routed through conduit, use only approved suitable-size hubs for waterproof applications.

#### 5.2.1 Connecting HART

#### Note

- Depending on the system design, the power supply may be separate from the PLC, or integral to it.
- HART resistance (total of loop resistance, that is, cable resistance plus 250 Ohm [resistor]) must be limited according to the allowable operating area as shown in either diagram under Loop voltage versus loop resistance (Page 190).
- Do not connect more than one HART programming device at a time.

#### 5.2.2 Typical PLC configuration with HART



## 5.3 Nameplates for hazardous area installations

There are six wiring options for hazardous area installations:

- Intrinsically Safe wiring (Page 33)
- Non-Sparking wiring
- Non-incendive wiring (US/Canada only)
- Flameproof wiring
- Increased safety wiring
- Explosion-proof wiring (US/Canada only)

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

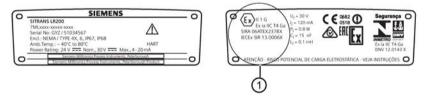
For installation across Zone 0 and Zone 1 boundary:



- Threaded nut acts as partition wall Material: Stainless steel, aluminium, and potting compound (hardness of at least 88 SHORE D; compressive strength of at least 14,000 psi)
- 2 Zone 1
- 3 Zone 0

#### 5.3.1 Intrinsically Safe wiring

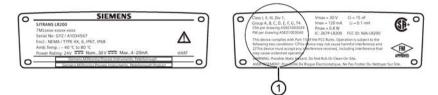
#### 5.3.1.1 Device nameplate (ATEX/IECEX/INMETRO/RCM)



① The ATEX certificate can be downloaded from the product page of our website at www.siemens.com/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 13.0006X.

#### 5.3.1.2 Device nameplate (FM/CSA)



- (1) FM Intrinsically Safe connection drawing number A5E01003040 and CSA Intrinsically Safe connection drawing number A5E01003039 can be downloaded from the product page of our website at: www.siemens.com/LR200 (www.siemens.com/LR200). Go to Support > Installation Drawings > Level Measurement > Continuous Radar.
- For power demands see Curve 1 (General Purpose, Intrinsically Safe, Non-Sparking, Non-incendive). (Page 190)
- 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.
- Refer to Instructions specific to hazardous area installations (Page 34).

#### Note

Selecting a suitable PLC input module, power supply, or barrier requires knowledge about Intrinsic Safety and the application. It is the responsibility of the installer to ensure that the intrinsically safe installation complies with both the apparatus approval requirements and the relevant national code of practice.

## 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 06ATEX2378X, SIRA 05ATEX1001X, and SIRA 09ATEX4151X:

- 1. For use and assembly, refer to the main instructions.
- The equipment is certified for use as Category 1G equipment per SIRA 06ATEX2378X, Category 1/2 equipment per SIRA 05ATEX1001X, and Category 3G equipment per SIRA 09ATEX4151X.
- 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.
- 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'.

# 6

## Operating

## 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.

## 

#### Hot surfaces

Risk of burns resulting from hot surfaces.

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

## 

#### 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 19).

## 6.2 Local operation

## 6.2.1 Operating via the handheld programmer

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

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

- locally (see Quick Start Wizard via the handheld programmer (Page 43))
- from a remote location. See Quick Start Wizard via SIMATIC PDM (Page 56), or Quick Start Wizard via AMS Device Manager (Page 80), or Operating via FDT (Field Device Tool) (Page 95))

For more complex setups see Application examples (Page 47), and for the complete range of parameters see Parameter reference (Page 97).

### 6.2.1.1 Activating SITRANS LR200

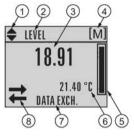
Power up the instrument. SITRANS LR200 automatically starts up in Measurement mode. A transition screen showing the current firmware revision and an incrementing line of stars is displayed while the first measurement is being processed.

Press Mode 🔳 to toggle between Measurement and Program Mode.

### The LCD display

### Measurement mode display

#### Normal operation



- ① Toggle indicator <sup>1)</sup> 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
- Secondary region indicates on request <sup>2</sup> electronics temperature, echo confidence, loop current, or distance
- ⑦ Text area displays status messages
- 8 Device status indicator, see Device status icons (Page 139)

<sup>1)</sup> Press **UP** or **DOWN** arrow to switch.

<sup>2)</sup> In response to a key press request. For details, see Handheld Programmer (Page 38) for key functions in Measurement mode.

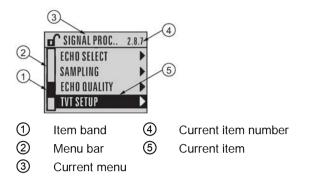
#### Fault present



- ① Device status indicator, see Device status icons (Page 139)
- ② Text area displays status messages

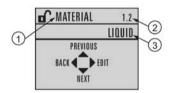
### **PROGRAM** mode display

#### Navigation view



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

#### Parameter view



### Edit view



- (1) Parameter name
- ② Parameter number
- ③ Parameter value/selection

### Handheld programmer

#### (Part No. 7ML1930-1BK)

The programmer is ordered separately.



### Key functions in measurement mode

Кеу	Function	Result
5	Updates the loop current	New value is shown in secondary region of local display.
6	Updates internal enclosure temperature reading	
8	Updates echo confidence value	New value is shown in secondary region of local display.
Ŧ	Updates distance measure- ment	
	Mode opens PROGRAM mode	Opens the menu level last displayed in this power cycle, unless power has been cycled since exiting PROGRAM mode or more than 10 minutes have elapsed since PROGRAM mode was used. Then top level menu will be displayed.
1	Home toggles local display	Local display toggles between % or linear units
•	<b>RIGHT arrow</b> opens PROGRAM mode	Opens the top level menu.
<ul> <li>•</li> <li>•</li> </ul>	UP or DOWN arrow toggles between linear units and per- cent	Local display shows measured value in either linear units or percent.

### 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 54) or Operating via AMS Device Manager (Page 76).

#### Parameter menus

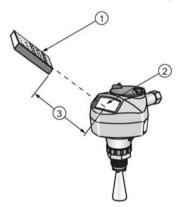
#### Note

For the complete list of parameters with instructions, see Parameter reference (Page 97).

Parameters are identified by name and organized into function groups. See LCD menu structure (Page 197).



- 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 D 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

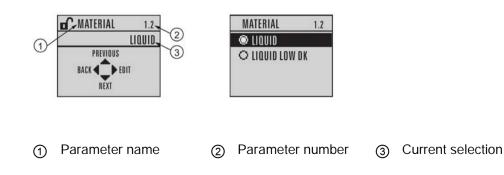
- In Navigation mode **ARROW** keys move to the next menu item in the direction of the arrow.
- For Quick Access to parameters via the handheld programmer, press Home <a>[Image: The menu number, for example: 2.7.1. (Volume).</a>

Кеу	Name	Menu level	Function
<ul> <li></li> <li><th>UP or DOWN arrow</th><th>menu or pa- rameter</th><th>Scroll to previous or next menu or parameter</th></li></ul>	UP or DOWN arrow	menu or pa- rameter	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 <b>Edit</b> mode.
	LEFT arrow	menu or pa- rameter	Open parent menu.
	Mode	menu or pa- rameter	Change to <b>MEASUREMENT</b> mode.
	Home	menu or pa- rameter	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.

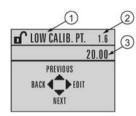
The LCD returns to parameter view and displays the new selection.

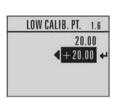


### 4. Changing a numeric value

- 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

Current selection

#### Key functions in edit mode

Кеу	Name	Function	
	UP or DOWN	Selecting options	Scrolls to item.
	arrow	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
			<ul> <li>or, with cursor on Enter sign, accepts the data and changes from Edit to Navigation mode</li> </ul>
	LEFT arrow:	Selecting options	Cancels Edit mode without changing the parameter.
		Numeric editing	<ul> <li>Moves cursor to plus/minus sign if this is the first key pressed</li> </ul>
			or moves cursor one space to the left
С	Clear	Numeric editing	Erases the display.
•	Decimal point	Numeric editing	Enters a decimal point.
∼_+	Plus or minus sign	Numeric editing	Changes the sign of the entered value.
0	Numeral	Numeric editing	Enters the corresponding character.
to			
9			

### 6.2.1.2 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 (2.8.4.2.) (Page 112) for more detail.

Options	LIQUID
	LIQUID LOW DK <sup>1)</sup> (low dielectric liquid – CLEF algorithm enabled)

<sup>1)</sup> 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 Mi- nute (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)

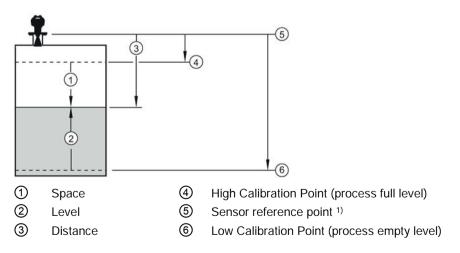
Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

#### Units

Sensor measurement units.

Options m, cm, mm, ft, in
---------------------------

#### **Operating Mode**



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

<sup>1)</sup> The point from which High and Low Calibration points are referenced: see Uni-construction polypropylene rod antenna (Page 152) and Dimension drawing (Page 152).

#### 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
values	

#### **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.

### 6.2.1.3 Auto False Echo Suppression

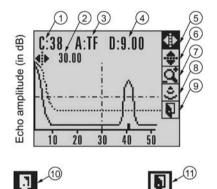
If you have a vessel with known obstructions, we recommend using Auto False Echo Suppression to prevent false echo detection. See TVT setup (2.8.7.) (Page 115) for instructions.

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.

#### 6.2.1.4 **Requesting an Echo Profile**

- In PROGRAM mode, navigate to: Level Meter >Diagnostics (3.) (Page 119) > Echo profile (3.1.) (Page 119)
- Press **RIGHT arrow** 💽 to request a profile.







- Confidence (7) Zoom (1)
- Distance from Low Calibration Point to vertical cross-(8) Measure (2)hair
- (3) Algorithm: tF (trueFirst)
- (4) Distance from flange face to target
- (5) Pan left/right selected

- Exit
- (iii) Exit icon selected
- Exit icon deselected

- Pan up/down ൭
- 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 b** arrow to increase the value, **LEFT d** 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** ress **LEFT** arrow to Zoom out.
- To update the profile, select **Measure** and press **RIGHT P** arrow.
- To return to the previous menu, select **Exit** then press **RIGHT arrow**. •

### 6.2.2 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.)

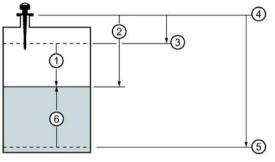
In each example, after performing a Quick Start, navigate to the other required parameters either via the handheld programmer, or using a Device Management tool (SIMATIC PDM or AMS Device Manager) and enter the appropriate values.

### 6.2.2.1 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.



- 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

#### Note

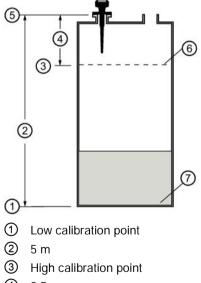
- Minimum distance from flange face to target is limited by Near range (2.8.1.) (Page 110). •
- We recommend using Auto False Echo Suppression with an empty or almost empty • vessel.

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.



④ 0.5 m

- ⑤ Sensor reference point
- 6 100% Level
- (7) 0% Level

Parameter type	Parameter no./name	<b>Options/values</b>	Function
Quick start wizard	Material (1.2.)	LIQUID	
parameters	Response Rate (1.3.)	MED	Medium =1 m/minute
	Units (1.4.)	Μ	meters
	Operating Mode (1.5.)	LEVEL	Level
	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 set- tings to device.
Independent param-	Timer (2.5.2.) (Page 103)	2	2 minutes
eters	Material Level (2.5.1.) (Page 103)	HI	Fail-safe level set to High
	Auto False Echo Suppres- sion Range (2.8.7.2.) (Page 117)	Distance <sup>1)</sup> minus 0.42 m (1.37 ft)	Sets length of learned TVT <sup>2)</sup> to use
	Auto False Echo Suppres- sion (2.8.7.1.) (Page 115)	LEARN	Enables the use of learned TVT

<sup>1)</sup> Distance to product from sensor reference point.

<sup>2)</sup> For more details, see Auto false echo suppression (2.8.7.1.) (Page 115) and Auto false echo suppression range (2.8.7.2.) (Page 117).

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

### 6.2.2.2 Horizontal vessel with volume measurement

#### Note

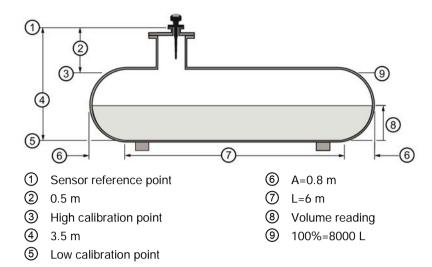
- Minimum distance from flange face to target is limited by Near range (2.8.1.) (Page 110).
- We recommend using Auto False Echo Suppression with an empty or almost empty vessel.

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.



Parameter type	Parameter no./name	Options/values	Function
Quick Start	Material (1.2.)	LIQUID	
Wizard pa-	Response Rate (1.3.)	MED	Medium =1 m/minute
rameters	Units (1.4.)	Μ	meters
	Operating Mode (1.5.)	LEVEL	Level is reported as Volume when a vessel shape is selected.
	Low Calibration Point (1.6.)	3.5	3.5 m (11.48 ft)
	High Calibration Point (1.7.)	0.5	0.5 m (1.64 ft)
	Apply? (Apply changes) (1.8.)	YES	Transfers Quick Start settings to device.
Independent parameters	Vessel Shape (2.7.1.1.) (Page 107)	PARABOLIC ENDS	Defines vessel shape
	Maximum Volume (2.7.1.2.) (Page 108)	8000	8000 liters
	Dimension A (2.7.1.3.) (Page 108)	0.8	0.8 m (2.62 ft)
	Dimension L (2.7.1.4.) (Page 109)	6	6 m (19.68 ft)
	Timer (2.5.2.) (Page 103)	2	2 minutes
	Material Level (2.5.1.) (Page 103)	н	Fail-safe level set to High
	Auto False Echo Suppression Range (2.8.7.2.) (Page 117)	[Distance <sup>1</sup> minus 0.42 m]	Sets length of learned TVT curve <sup>2</sup> to use
	Auto False Echo Suppression (2.8.7.1.) (Page 115)	LEARN	Enables the use of learned TVT curve <sup>2</sup>

<sup>1)</sup> Distance to product from sensor reference point.

<sup>2)</sup> For more details, refer to Auto false echo suppression (2.8.7.1.) (Page 115) and Auto false echo suppression range (2.8.7.2.) (Page 117).

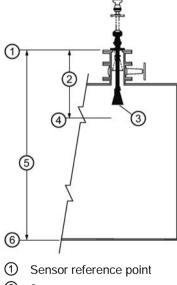
### 6.2.2.3 Sliding waveguide on anaerobic digesters

#### Note

- Minimum distance from the flange face to the target is limited by Far range (2.8.2.) (Page 111).
- We recommend adjusting Auto False Echo Suppression parameters with an empty or almost empty vessel.

This application is to obtain a level measurement and corresponding 4 to 20 mA output proportional to the sludge level on a digester.

- The raised position is for installation and maintenance.
- The lowered position is for operation.
- Program the instrument for operation in the lowered position.
- Low Cal. Pt. is the bottom of the digester (10 m/33 ft from sensor reference point when the instrument is lowered to its normal operating position).
- High Cal.Pt. is 2 m (6.56 ft) from sensor reference point.
- The maximum rate of filling or emptying is about 0.1 m (4")/min.



2 m3 Horn

- ④ High calibration point
- (5) 10 m
- 6 Low calibration point

Parameter type	Parameter name (number)	Value	Function
Quick start	Material (1.2.)	LIQUID	
wizard parame-	Response Rate (1.3.)	MED	1 m/min. (3.28 ft/min.)
ters	Units (1.4.)	Μ	meters
	Operating Mode (1.5.)	LEVEL	Level
	Low Calibration Point (1.6.)	10	10 m/33 ft)
	High Calibration Point (1.7.)	2	2 m (6.56 ft)

Parameter type	Parameter name (number)	Value	Function
	Apply? (Apply changes) (1.8.)	YES	
Independent	Timer (2.5.2.) (Page 103)	2	2 minutes
parameters	Material Level (2.5.1.) (Page 103)	HI	Hi
	Auto False Echo Suppression Range (2.8.7.2.) (Page 117)	[Distance <sup>1)</sup> mi- nus 0.42 m]	Sets length of learned TVT curve <sup>2)</sup> to use
	Auto False Echo Suppression (2.8.7.1.) (Page 115)	LEARN	Enables the use of learned TVT curve <sup>2)</sup>

<sup>1)</sup> Distance to product from sensor reference point.

<sup>2)</sup> For more details, refer to Auto false echo suppression (2.8.7.1.) (Page 115) and Auto false echo suppression range (2.8.7.2.) (Page 117).

Return to Measurement mode: press Mode 🔳 to start normal operation.

### 6.2.2.4 Application with stillpipe

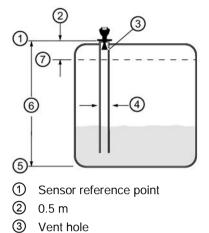
A stillpipe is recommended for products with a dK of less than 3, or if extremely turbulent or vortex conditions exist. This mounting arrangement can also be used to provide optimum signal conditions on foaming materials.

#### Note

- Near range (2.8.1.) (Page 110) (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 158)).
- For installation guidelines, refer to Mounting on a stillpipe or bypass pipe (Page 25).

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.



④ 50 mm I.D.

- **(5)** Low calibration point
- 6 5 m
- ⑦ High calibration point

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.)	Μ	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 (2.8.3.) (Page 111) <sup>1)</sup>	0.990	P.F. for a 50 mm (1.96") I.D. stillpipe
	Position detect (2.8.4.2.) (Page 112)	HYBRID	
	CLEF range (2.8.4.4.) (Page 112) <sup>1)</sup>	4.3	4.3 m (14.10 ft)

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

### 6.2.2.5 Propagation factor/Stillpipe diameter

Nominal Pipe Size <sup>1)</sup>	40 mm (1.5″)	50 mm (2")	80 mm (3″)	100 mm (4")
Propagation Fac- tor	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

<sup>1)</sup> Since pipe dimensions may vary slightly, the propagation factor may also vary.

## 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).

### 6.3.1.1 Functions in SIMATIC PDM

#### Note

- For a complete list of parameters see Parameter reference (Page 97).
- 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 197) for a chart<sup>1)</sup> and Changing parameter settings using SIMATIC PDM (Page 63) for more details.

See Parameters accessed via pull-down menus (Page 64) for parameters that do not appear in the menu structure in SIMATIC PDM.

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

### Features of SIMATIC PDM Rev. 5.2, SP1

SIMATIC PDM Rev. 5.2 SP1 is supported only for basic configuration and troubleshooting. For advanced features such as the Quick Start wizard, Rev. 6.0 SP3 HF2 or higher is required.

### Features of SIMATIC PDM Rev. 6.0, SP4

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

Feature	Function
Quick Start (Page 57)	Device configuration for simple applications
Echo profile utilities (Page 65)	Easy access to echo profile viewing/comparison, TVT shaping, auto false echo suppression and echo setup
Auto false echo suppression (Page 67)	Screen out false echoes
TVT Shaper (Page 66)	Manual TVT adjustment
Linearization (Page 60)	Volume measurement in an irregular vessel
Process variables (Page 73)	Monitor process variables and level trend
Security (Page 76)	Protect security and communication parameters from modification by the maintenance user

### 6.3.1.2 Initial Setup

To ensure that SIMATIC PDM connects properly, please complete the two processes outlined below:

- 1. De-activating Buffers
- 2. Updating the Electronic Device Description (EDD)

### **Deactivating buffers**

This deactivation is required to align SIMATIC PDM with the HART modem for Windows  $2000^{\circ 1}$  and Windows<sup> $\circ$ </sup> XP operating systems.

#### Note

- SIMATIC PDM operates only in the Windows XP Professional version, not in the Home version.
- You need administrative rights on your operating system to deactivate buffers.
- 1. Click Start/Settings/Control Panel to begin configuration.
- 2. Double click System, select the Hardware tab, and click the Device Manager button.
- 3. Open **Ports** folder and double click the COM Port used by the system to open the **Communications Port Properties** window.
- 4. Select the **Port Settings** tab and double click the **Advanced** button.
- 5. If the Use FIFO buffers radio box is selected, click to deselect.

Select lower settings to correct connection problems. Select higher settings for faster performance.	
	Cance
	Default
Receive Butter: Low (1)	-
TransmitBuffer: Low (1)	

- ① Deselect Use FIFO buffers radio box
- 6. Click OK to close out. Close all screens and then reboot.
- <sup>1)</sup> ® Windows is a registered trademark of the Microsoft Corporation

### Updating the Electronic Device Description (EDD)

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

#### To install a new EDD:

- 1. Download the EDD from the product page of our website at www.siemens.com/LR200 (www.siemens.com/LR200) and save the files to your computer.
- 2. Extract the zipped file to an easily accessed location.
- 3. Launch **SIMATIC PDM Manage Device Catalog**, browse to the unzipped EDD file and select it.

#### 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 update it [see Updating the Electronic Device Description (EDD) (Page 55)].
- Launch SIMATIC Manager and create a new project for LR200. Application Guides for setting up HART 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 via the Quick Start wizard.

### 6.3.1.3 Quick Start Wizard via SIMATIC PDM

#### **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.

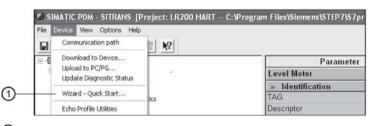
Please consult the operating instructions or online help for details on using SIMATIC PDM.

- 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 55)above.)
- 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 69), or see Parameter Reference (Page 97) 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 67).

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



Quick Start

#### 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.
- Click on NEXT to accept the default values. (Description, Message, and Installation Date fields can be left blank.)

Application data f	arameters are used to identify this device. The TAO should be unique in your on To identify and get all wicard parameters of the device, you can transfer the mithe device to SIMATIC POM.
Vessel Shape	Read Data from Device
Ranges	In device:
Summary Desc	tor
Mess	•
Date	
Order	umber [786.5422ex10
Sølec	te language for local user indeflace: ge English

## Step 2 - Application

Select the application type (level or volume) and the material<sup>1</sup>), then click on **NEXT**.

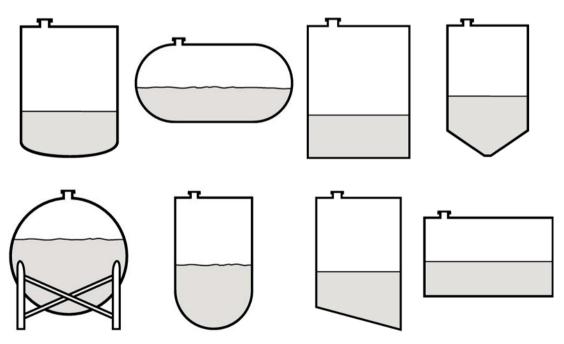
	SIEMENS	S
Identification	These parameters settings.	specify the application type you wish to execute, and its accord
Application	Select the Application	on Type:
Vessel Shape	Application Type	Level in a vessel
Ranges		
Summary	Material	Liquid

<sup>1)</sup> See Application with Stillpipe (Page 52) for a Low Dielectric Liquid application.

#### 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 61).

For a vessel with obstructions, see Auto False Echo Suppression. (Page 67)



Select the vessel shape and click on NEXT.

SIEMENS Identification This Parameter specifies the Form/Design of the Vessel you want to use with the	p 3 of 5: Vessel Shape		
Application     Device.       Application     Choose vessel shape:       Vessel Shape     Vessel Shape       Ranges     summary	Identification Application Vessel Shape Ranges	This Parameter specifies the Form/Design of the Vessel you want to use with the Dence.	

# Step 4 - Range

Set the parameters, and click on NEXT.

Step 4 of 5: Ranges SIEMENS Identification Application Select the settings for the ranges:	
Verseel Shape Ranges Summary Units High Calibration Point (1) 0 m Low Calibration Point (2) 20 m Response Rate Slow	

### 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.

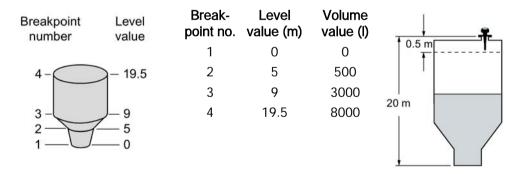
SIEMEN	IS		
Identification Parameter.	Old:	New:	
Application TAG Descriptor	In Identification SITRANS	SITRANS	1
Vessel Shape Date Language	and the second	1000	
Ranges Application		English *** Application Volume in a vessel	
Propagation F	actor 1	1 Hybrid Algorithm	
Summary CLEF Range	0 m	0 m Liquid	
*** Vessel Sh Vessel Shape	Vessel Shape None	*** Vessel Shape Linearization Table	
*** Ranges Maximum Volu	+++ Danger	*** Ranges 8000	
Dimension A Dimension L	5.757515E-41 m 5.757515E-41 m	6.757515E-41 m 5.757515E-41 m	
Units High Calibration	m	m	
Low Calibratio Response Ra	n Point 20 m	20 m Slow	
1	-	U. I.	

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

### Linearization

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

Example (values for example purposes only)



### 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.

	SIEMENS	
Identification	This Parameter specifies the Form/Design of the Vessel you want to use with the Device.	
Application	Choose vessel shape:	_ <b>r</b>
Vessel Shape	Vessel Shape Understandin Table 💌	
Ranges		
Summary		

In Step 4 - Ranges

1000	SIEMENS				
Identification	These Parameters specif	y the Ranges of the	Sensor.		
Application	Select the settings for the Units	ranges:			-#
Vessel Shape	High Calibration Point (Y)		m	Y-100%	Î
Ranges	Low Calibration Point (0)	20	m		
Summary	Response Rate	Slow	•	×	
	Maximum Volume	8000			
		1			
	_ /	rization		L 0% -	

- 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<sup>1</sup>), and click on **OK**.

#### Note

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

sarization - SITRANS			
eakpoints 1 · 8   Breakpoints evel	s 9 - 16   Bi	eakpoints 17 · 24   Breakpoints 25 · 32   Volume	
evel(1) 0.000	m	Volume(1) 0.000	
evel(2) 5.000	m	Volume(2) 500.000	
evel(3) 9.000	m	Volume(3) 3000.000	
evel(4) 19.500	m	Volume(4) 8000.000	Volume 1
evel(5) 0.000	m	Volume(5) 0.000	
evel(6) 0.000	m	Volume(6) 0.000	800 200
evel(7) 0.000	m	Volume(7) 0.000	
evel(8) 0.000	m	Volume(8) 0.000	] 0 5 10 15 2 Level [m]
nits m	*		1 Constitut

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.

1000	SIEMENS		
Identification	Parameter:	Old.	New:
Application Vessel Shape	TAO TAO Descriptor Message	SITRANS	SITRANS
	Language	English	English
	•••• Application	*** Application	*** Application
Ranges	Application Type	Level in a vessel	Volume in a vessel
	Propagation Factor	1	1
Summary	Position Detect CLEF Range Materia	Hybrid Algorithm 0 m	Hybrid Algorithm 0 m
	*** Vessel Shape Vessel Shape	Liquid *** Vessel Shape None	Liquid *** Vessel Shape Linearization Table
	*** Ranges	*** Ranges	*** Ranges
	Madmum Volume	8000	8000
	Dimension A	5.757515E-41 m	5.757515E-41 m
	Dimension L	5.757515E-41 m	5.757515E-41 m
	Units	m	m
	High Calibration Point	0 m	0 m
	Low Calibration Point	20 m	20 m
	Response Rate	Slow	Slow

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

### 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 Position detect (2.8.4.2.) (Page 112) for more detail].

Quick Start - Step 2 of 5 - SITRANS	×
Step 2 of 5: Application	
SIEMENS	
Identification These parameters specify the application type you wish to execute, and its accordin settings.	g
Application Select the Application Type:	
Vessel Shape Application Type Level in a vessel with stillpipe	
Pipe internal diameter 100 mm	
Propagation Factor 0.9561012	
Material Liquid	
Cancel < Back Next > He	lp

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

### 6.3.1.4 Changing parameter settings using SIMATIC PDM

#### Note

- For a complete list of parameters, see Parameter Reference (Page 97).
- 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 64) 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.

ile Device View Options Help						
I SITRANS	Parameter	Value	Unit	S		
Evel Meter     Identification     Setup	» Setup	» Setup				
	» » Sensor					
Sensor	Units	m				
Calibration	Operating Mode	Level				
Rate	Material	Liquid 🔍				
Fail-Safe	Damping filter	0	s	-		
Analog Output Scaling	Antenna	rod 100mm ext.				
Image: Linearization     Image: Signal Processing	» » Calibration					
Local Display	Low Calibration Point	20	m	Cha		
Maintenance & Diagnostics	High Calibration Point	0	m			

1 Value fields

### 6.3.1.5 Parameters accessed via pull-down menus

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

File Device	View Options Help			
	Process Variables Device Status			
In SITRA     Violbar     Violbar     Violbar     Violbar     Violbar     Violbar     Violbar	Parameter	Value		
	» Setup » » Sensor			
	Calibration	Operating Mode	Level	
	Rate	Material	Liquid	

① Pull-down menus

### Pull-down menus

Device menus	View menus
Communication path	Process Variables (Page 73) Device Status (Page 75)
Download to device Upload to PC/PG Update Di- agnostic Status	Toolbar Status bar
Wizard - Quick Start (Page 57)	Update
Echo Profile Utilities (Page 65) Maintenance (Page 70) Wear (Page 72)	
Select Analog Output (Page 71)	
Self Test (Page 71) Loop-Test (Page 71)	
Configuration Flag Reset (Page 71) Master Reset (Page 72)	
HART Communication (Page 72)	

### Echo profile utilities

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

- Echo profile (Page 65)
- View Saved Echo Profiles (Page 65) •
- TVT Shaper (Page 66)
- Auto False Echo Suppression (Page 67)
- Echo Setup (Page 69)

### 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.

### View Saved Echo Profiles

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



Echo Profile Time Based Storage

### 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:

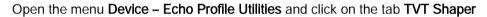
- 1. Enter the desired interval between stored profiles.
- 2. Enter the desired number of profiles to be stored (maximum 60).
- 3. Click on **Start**. A message appears warning of the time delay and warning that all previous saved profiles will be overwritten. Click on **OK** to proceed. The new profiles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

### **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 67)]





- 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.

#### 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 176) for a more detailed explanation.

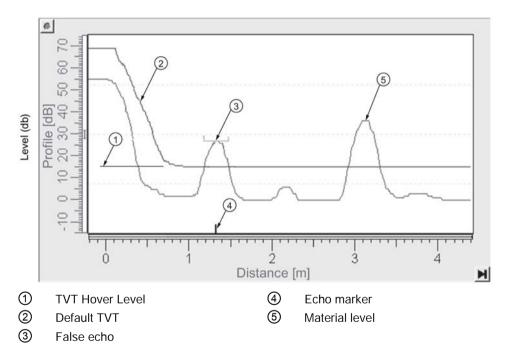
The learned TVT will be applied over a specified range. The default TVT is applied over the remainder of the measurement range.

Echo Profile Utilities - LR250		×
Echo Profile   View Saved Echo Profiles   TVT Shaper Auto	False Echo Suppression   Echo Setup	
SIEMENS	-II-	
Auto False Echo Suppression On	-	
Auto False Echo Suppression Range 4	m	
Learn	Select	
Transfer to Device	Learn This will learn a new scho profile, once done it can not be undone. Concel OK Help	
Close		Help

- 1. Make sure the material level is below all known obstructions.
- 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**.

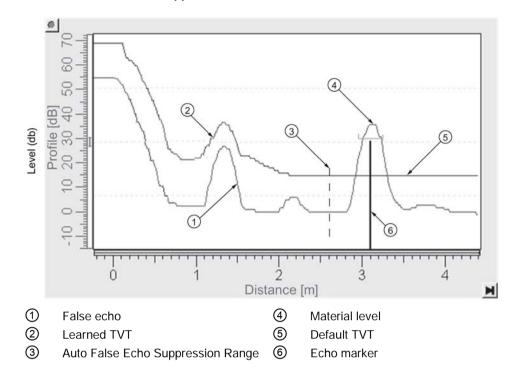
- 4. Make sure Auto False Echo Suppression Range is On.
- 5. Enter the value for Auto False Echo Suppression Range.
- 6. Click Learn. The message appears: 'This will learn a new echo profile. Once done it cannot be undone'. Click OK.
- 7. Once Auto TVT is complete click **Transfer to Device**. To exit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



#### Before Auto False Echo Suppression

After Auto False Echo Suppression



### Echo Setup

Provides quick access to echo profile parameters:

	Echo Profile Utilities - SITRANS				
0	Echo Prolle   Vew Saved Echo Prolles   1 SIEMENS Echo Salect		the Suppression Echo Selue		
	Algorithm FURTERST Position Detect Hybrid Algor Echo Threshold 5 Fittering				
(4)- (5)-	Damping filter 0 Tank Bottom Algorithm CLEF Range 0	n International			
6 7 8	Rate Response Rate Fill Rate per Minute Empty Rate per Minute Transfer to Device	m m			
	OK Cancel				Help
1 2 3	Algorithm Position Dete Echo Thresh			5 6 7	CLEF Range Response Rate Fill Rate/min.
4	Damping Filte			8	Empty Rate/min.

#### Maintenance

You can set schedules and reminders for:

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

Maintenance - Sitrans		Σ
Remaining Device Lifetime Remaining Sensor	lifetime Service Schedule Calibration Schedul	
SIEMENS		
Time Units	Years	
Lifetime (Expected)	10.000	Years
Time in Operation	0.000	Years
Remaining Lifetime	10.000	Years
Activation of Reminders	Off	
Reminder 1 before Lifetime (Required)	0.164	Years
Reminder 2 before Lifetime (Demanded)	0.019	Years
R	ead	
N	rite	
Snooze	for 1 year	
OK Cancel		Help

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.

### Select analog output

Allows you to set the mA Output to report Level, Distance, Space, or Volume. See **Current Output Function (2.6.1.)** for an illustration.

If a volume application is selected, mA Output is automatically set to **Volume**. See Analog Output (Page 178) for more details.

- 1. Open the menu Device Select Analog Output.
- 2. Select Analog Output window displays the current setting: click OK.
- 3. Select a different setting and click OK.
- 4. Select Analog Output window displays the new setting: click OK.

### Self Test

Checks memory (RAM and Flash). If there are no errors, returns the message 'Self Test OK.' If errors are found, returns the message 'Self Test Fails'.

Open the menu Device - Self Test, select the option Yes and click on OK.

#### Loop test

#### Note

The simulated AO (Analog Output) value influences output to the control system.

Allows you to input a simulated value (4 mA, 20 mA, or a user-defined value) in order to test the functioning of the mA connections during commissioning or maintenance of the device. The range is 3.56 mA to 22.6 mA, see **mA Output Value (2.6.6.)**.

To simulate a user-defined mA value:

- 1. Open the menu Device Loop Test.
- 2. Select **Other**, enter the new value, and click on **OK**. The message 'Field Device fixed at [new value]' appears. Click on **OK**. The Loop Test window remains open.
- 3. When you are ready to end simulation, select **End** and click on **OK** to return the device to the actual output value.

#### Configuration flag reset

To reset the configuration flag to zero, open the menu **Device – Configuration Flag Reset** and perform a reset.

### Master Reset

### **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.

### Wear

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

Open the menu Device - Wear to view:

- Powered Days
- Power-on Resets

#### Note

Powered days are whole days only. Fractional days are truncated.

### HART Communication

Allows you to set the number of request/response preambles (minimum 5).

Open the menu **Device – HART Communication**.

# Diagnostics

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

#### **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.

cess Variables - SITF	UNS (Online)				
verview Trend					
SIEMENS					-
Display					
Level Measurement 18.931 m 20.000	Space Measurement 1.069 m 20.000	Distance Measurement 1.069 m 20.000	Volume Measurement 0.000 100.000		
10.000	10.000	10.000	50.000		
0.000	0.000	0.000	0.000		
Analog Out (PV)					
Analog Out(PV) =	Level				
Level Measurement	18.931			m	
The above value will n	of correspond to mA outpu	it while in fixed current mode			
Range	94.65			%	
AO	19.144			mA	
Status of device					
Desident Distance		riable outside the operating ry variable outside the opera			
Device Status	□Analog ou □Analog ou □More statu □Cold start ☑Configurat	put outside the operating rar put in fixed mode s available occured			

# Trend

# Open the menu View – Process Variables and click on Trend.

Four trend lines can be monitored (distinguished by color in SIMATIC PDM):

Overview Trend	
SIEMENS	
	111
на станка и	3 4 4 5 15 15 15 15 15 15 15 15 15
Level Measurement 1.665 m	
Level Measurement 1.665 m	
Level Measurement 1.665 m Distance Measurement 1.335 m	
Level Measurement 1.655 m Distance Measurement 1.335 m Volume Measurement 4557.979	
Level Measurement 1.655 m Distance Measurement 1.335 m Volume Measurement 4557.979	
Level Measurement 1.655 m Distance Measurement 1.335 m Volume Measurement 4557.979	
Level Measurement 1.655 m Distance Measurement 1.335 m Volume Measurement 4557.979	

- ① Space
- 2 Distance
- 3 Level
- ④ Volume

## **Device Status**

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

Diagnostics Dev	ice Status   HW/FW-Status   Maintenance		
SIEME	NS		-0
Communicatio	Person Praited		
Device Status	Oood     Device in test mode     Docal orenide     Device in orenide     Device in orenide     Device in orenidation     Device in orenin     Device in orenidation     D		
Last Check	2/10/2000 0555 7/44		
Message Text	D≫ Configuration changed ≪	6	
-	Update diagnostics		
-			

① Update diagnostics

1

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

# Update

Open the menu View – Update to refresh the screen.

## Security

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

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

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

MATI	C PDM set	tings						
New	Password Password: Password: irmation:	Table	Font	Commu	nication	Log	Mainter	ance Statior

## 6.3.2 Operating via AMS device manager

AMS Device Manager is a software package that monitors the process values, alarms and status signals of the device. Please consult the operating instructions or online help for details on using AMS Device Manager. You can find more information at:

Emerson (http://www.emersonprocess.com/AMS/)

## 6.3.2.1 Functions in AMS Device Manager

#### Note

While the device is in PROGRAM mode the output remains fixed and does not respond to changes in the device.

#### AMS function overview

AMS Device Manager monitors the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data.

Parameters organized into three main function groups allow you to configure and monitor the device:

- Configure/Setup
- Device Diagnostics (read only)
- Process Variables (read only)

See AMS Menu Structure (Page 92) for a chart and Changing parameter settings using AMS Device Manager (Page 82) for more details. The menu structure for AMS Device Manager is almost identical to that for the LCD.

## Features of AMS Device Manager

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

Feature	Function
Quick Start (Page 57)	Device configuration for simple applications
Echo Profile (Page 87)	Echo profile viewing
TVT (Page 87)	Screen out false echoes
Linearization (Page 81)	Volume measurement in an irregular vessel
Process Variables (Page 90)	Monitor process variables and level trend
Security (Page 76)	Protect security and communication parameters from modification by the maintenance user

## **Electronic Device Description (EDD)**

SITRANS LR200 requires the EDD for AMS Device Manager version 9.0.

You can locate the EDD in Device Catalog, under **Sensors/Level/Echo/Siemens Milltronics/SITRANS LR200**. Check the product page of our LR200 (www.siemens.com/LR200), under **Support** > **Software Downloads**, to make sure you have the latest version of the EDD for AMS Device Manager. If you need to install a new EDD, see Configuring a new device (Page 77) below.

## Configuring a new device

- Check our website to make sure you have the most recent EDD. www.siemens.com/LR200 (www.siemens.com/LR200) Go to Support > Software Downloads and if necessary download it. Save the files to your computer, and extract the zipped file to an easily accessed location.
- 2. Launch AMS Device Manager– Add Device Type, browse to the unzipped EDD file and select it.

## Startup

- Launch AMS Device Manager. (Application Guides for setting up HART devices with AMS Device Manager can be downloaded from our website: www.siemens.com/LR200 (www.siemens.com/LR200)
- 2. In **Device Connection View** right-click on the device icon and select **Scan Device** to upload parameters from the device.
- 3. Double click the device icon to open the startup screen. The startup screen shows device identification details and a navigation window on the left side of the screen.

Configure/Setup	Identification					
Configure Schop     More discovery     Wound     Operation     Schop     Communication     Social     Social	Descriptor [ Message [	STFRANS		Ŷ	Orvice Salus GOOD	
	Device		Manhana	E		
Testing Star	Manufacturer	Siemens Milltonic:	Hardware Revision	0.00.00		
	Manufacturer	Siemens Milltonici SITRANS LR200	Hardware Revision Firmware Revision			
∑ Configure/Setup & Device Diagnostics ■ Process Variables	Manufacturer Product Name		Revision			

## Master reset

## Note

**Device Address (5.1.)** remains unchanged if the reset command is sent remotely (via AMS, PDM, DTM, FC375) but is reset to 0 if the reset command is sent via HMI.

- Navigate to Configure/Setup > Operation
- In the General field click on Master Reset and accept the option Factory Defaults.

## Pull-down menu access

/15/2009 09:04:43.53	) LR200 Rev. 2]			
Heb Configure/Setup Compare Der Offline Device Diagnostics Process Variables Scan Device Calibration Management. + Rename Unasrop	Identification SIEMENS Identification TAG	S	<u></u>	Device Solus
Replace Audit Tral Record Manual Event Drawings/Notes Help	Descriptor Message Date	01.01.71920	Y	GOOD

1 Action menu items

A pull-down menu under Actions gives alternative access to several features.

## Scan Device

- Open the menu Actions Scan Device.
- Scan Device uploads parameters from the device (synchronizes parameters).

#### **Device configuration**

1. Navigate to **Configure/Setup > Operation** and click to open the dialog window.

Configure/Setup	Operation	
Configuration Hoterdid Configuration South South Methomore & Diagnostics Communication Socially	SIEMENS TAG BITRANS General Select Analog Output Master Reset Senulation (Text Loop-Text	Device Status
Configure/Setup		
Device Diagnostics		

- 1 Master Reset
- 2. In the General field, click on Master Reset. and perform a reset to Factory Defaults.
- 3. Open the pull-down menu **Actions Scan Device** to synchronize parameters (upload parameters from the device to AMS).
- 4. Configure the device via the Quick Start wizard.

## Quick Start Wizard via AMS Device Manager

#### Note

- The layout of the dialog boxes shown may vary according to the resolution setting for your computer monitor
- At each step, you can accept the default values without modification and click on the next step to proceed.
- After modifying parameters click on **Apply** inside the Quick Start window to write the new values to the device.
- Click on OK only if you wish to update all parameters to the device and close AMS.

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

## **Quick Start**

## Step 1 - Identification

- 1. Navigate to Configure/Setup > Wizard > Quick Start.
- 2. Click on Step 1.
- 3. You can accept the default values without modification. (Description, Message, and Installation Date fields can be left blank.) If desired, make changes then click on **Apply**.

Actors Hep Configure/Settup Configure/Settup Configure/Settup Configure/Settup Configure/Settup Configure/Settup Sep 1: Marchination 2 Sep 1: Section 2 Sep 1: Section 2 Sep 1: Section 2 Sep 2: Application 2 Sep 2: Section 2 Sep 3: Section 2 Section 2 Security	Step 1 of 5: Identification dentification Application Vessel Shape Ranges Summary	SIEMENS These parameters are used to identify the denoise. The Tai's should be unque in your agekaroon. Tai PITRANS Denoiptor Message Date PITRANS Date PITRANS Date PITRANS Date PITRANS				
Configure/Setup		Select the languinterface:	age of the local use	٣	- 1	
🖗 Device Diagnostics			fe			
Process Variables		Language	English	-		
۳¢						
	Time: Current	OK	Cancel	Apply	Print	Help

## Step 2 - Application Type

- 1. Click on Step 2.
- 2. Select the application type (Level, Space, Distance, or No Service<sup>1)</sup>) and the material (Liquid or Low dielectric liquid).
- 3. Click on Apply.
- <sup>1)</sup> For details see Sensor Mode (Page 99).

## Step 3 - Vessel Shape

- 1. Click on Step 3.
- 2. Select a predefined vessel shape. (To describe a more complex shape see Linearization below.)
- 3. Click on Apply.

## Step 4 - Range

- 1. Click on Step 4.
- 2. Change units if desired (in meters by default).
- 3. Set High and Low Calibration points.
- 4. To convert the reading from level to volume enter a value for Maximum Volume.
- 5. If a vessel shape with parabolic ends has been selected, set dimensions A and L.
- 6. Click on Apply.

#### Step 5 - Summary

Check parameter settings, and click on **Cancel** to abort, or **Apply** to transfer values to the device.

#### 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.

## Using linearization via the Quick Start wizard

- 1. Navigate to Configure/Setup > Wizard > Quick Start.
- 2. In Step 1 Identification, make any desired modifications and click on Apply.
- 3. In Step 2 Application, select a level application and liquid as a material.
- 4. In Step 3 Vessel Shape, choose the vessel shape option Linearization Table.

5. In Step 4 – Ranges, enter a value for maximum volume.

Configure/Setup Sort/Seta Settle Settle Settle Set Set Set Set Set Set Set Se	Step 1 of 5: Rangers   Breadpoints     Identification   Application   Vessel Shape   Ranges   Summary	SIEMENS These Parameters specifies the Ranges of the Sensor and the dimensions of the Vessel. Under	<u></u>
🏸 Configure/Setup		Dimension L.	
Device Diagnostics	ର	1	
Process Variables	C		
ap.			

- 1 Breakpoints
- ② Maximum volume
- 6. Click on the **Breakpoints** tab and enter values for level and volume for up to **32** breakpoints.
- Navigate to Configure/Setup > Setup > Linearization and click on Characteristic to preview the characteristic curve of the vessel breakpoints. (The conversion will function correctly even if not all breakpoints are entered, but the curve will display correctly only if all breakpoints are entered.)
- 8. In Step 5 Summary, check parameter values. Click on the appropriate step menu to return and revise values, or click on a different menu to exit **Quick Start**.

#### Changing parameter settings using AMS Device Manager

#### Note

For a complete list of parameters, see Parameter reference (Page 97).

For more detailed explanations of the parameters listed below see the pages referenced.

- 1. Adjust parameter values in the parameter value field in Configure/Setup view, then click on **Apply** to write the new values to the device. The parameter field will display in yellow until the value has been written to the device.
- 2. Click on **OK** only if you wish to update all parameters and exit AMS.

# Operation

onfigure/Setup			
Conference Shape Start Color Start Color Start - Start - Start Color Start - Start	SHEMENS TAG STRANS General Select Analog Matter Reset Sendation / Tex Loop-Test	GOOD	
Configure/Setup			
🖗 Device Diagnostics			
Process Variables			

Navigate to **Configure/Setup > Operation** and click on **Operation** to open the dialog window for access to:

## General

- Select Analog Output, see Select analog output (Page 71)
- Master Reset, see Master Reset (Page 72)

#### Simulation/Test

- Self Test, see Self Test (Page 71)
- Loop Test, see Loop test (Page 71)

#### Setup

#### Note

For more detailed explanations of the parameters listed below see the pages referenced.

#### Sensor

Identification     Wzard	Sensor						
Configuration Section Sector	SIEMENS TAG General Units Operating Mode Material Danging Filter Arterna Calibration Filter Calibration	SITRANS m [Level [Liquid [10:00 s [rod 100mm ext.	Rate Response Rate Fill Rate per Minute Engly Rate per Minute Fall safe Material Level Timer Level	0100 m	- Device Sc -	GOOD	
/* Configure/Setup	High Calibration Point (V)	0.000 m					
O Device Diagnostics	Sensor Offset	0.000 m					
Process Variables	5						

Navigate to **Configure/Setup > Setup** and click on **Sensor** for access to:

General, see Sensor (2.2.)

- Units
- Operating Mode
- Material
- Damping Filter

Calibration, see Calibration (2.3.)

- Low Calibration Point
- High Calibration Point
- Sensor Offset

Rate, see Rate (2.4.)

- Response Rate
- Fill Rate per Minute
- Empty Rate per Minute

Fail-safe, see Fail-safe (2.5.)

- Material level
- Timer
- Level

#### Analog output scale

Configure/Setup Crefque/Setup Crefque/Setup Mand Setup	Analog Output Scaling           SIE MENS           TAG         BITRANS           mA Dutput         Level           Flaction         Change Anal           State 45 size (+4)         0.00 m           mAI         2000 m           mAI         2000 m           Change Anal         2000 m	log Bon GOOD
Configure/Setup     Device Diagnostics     Process Variables		

Navigate to Configure/Setup > Setup and click on Analog Output Scaling for access to:

- Current Output Function
- 4 mA Setpoint
- 20 mA Setpoint
- Minimum mA Limit
- Maximum mA Limit

## Signal processing

Configure/Setup Configure/Setup Identification Wated Setup Setup Setup Analog Optic Scaling Universition Security Configure/Scaling Manual Processing Configure/Scaling Manual Processing Configure/Scaling Manual Processing Commission Commission Security Security Security	General SIEMENS TAG Rage Rage New Rage Control Rage Far Range Control Rage Control	Sempling Echo Lock Institutato - Sempling to 5 Sempling down 2 Signal Quality Confidence 12 dB Echo Shength 73 dB Noire Average 35 dB	GOOD
🎾 Configure/Setup 🕼 Device Diagnostics 🗊 Process Variables	Echo Threshold 5 dB CLEF Range 0.000 m		

#### General

Navigate to Configure/Setup > Setup > Signal Processing and click on General for access to:

Range, see Signal Processing (2.8.)

- Near Range
- Far Range
- Propagation Factor

Echo Select, see Echo Select (2.8.4.)

- Algorithm
- Position Detect
- Echo Threshold
- CLEF Range

Sampling, see Sampling (2.8.5.)

- Echo Lock
- Sampling Up
- Sampling Down

Signal Quality, see Echo Quality (2.8.6.)

- Confidence
- Echo Strength
- Noise Average

TVT

Modify the TVT to screen out false echoes [see Auto False Echo Suppression (2.8.7.1.) (Page 115)].

6 CA 19						
Configure/Statup	TVT Setue   TVT Shaper   SIEMENS TAG   SITRANS Auto Falue Eche   On Auto Falue Eche   On Supereixion Range   0.500 m How Level   40 g Shaper Mode   On			Devi	GOOD	]
⑦ Configure/Setup ⑦ Device Diagnostics 〗 Process Variables ◎						
	Time: Current	ОК	Cancel	Apply	Print	Help

Navigate to **Configure/Setup > Setup > Signal Processing** and click on **TVT**. Click on one of the two tabs to access the parameters listed.

#### TVT Setup [see TVT setup (2.8.7.)]

- Auto False Echo Suppression
- Auto False Echo Suppression Range
- Hover Level
- Shaper Mode

#### **TVT Shaper**

• Shaper breakpoints 1 to 40. (Turn TVT Setup/Shaper Mode on to activate.)

#### Manual TVT Curve

Displays the effects of the TVT shaper modifications. Navigate to Configure/Setup > Setup > Signal Processing and click on Manual TVT Curve.

#### **Echo Profile**

- Navigate to Configure/Setup > Setup > Signal Processing and click on Echo Profile.
- Select **Standard** operation for faster display.

## Local Display

Navigate to Configure/Setup > Setup > Local Display for access to:

- Language
- LCD Fast Mode [see LCD Fast Mode (4.9.)]
- LCD Contrast [see LCD Contrast (4.10.)]

## 6.3.2.2 Maintenance and diagnostics

Navigate to Maintenance and Diagnostics for access to:

## Remaining Device Lifetime [see Remaining Device Lifetime (4.2.)]

- Lifetime (expected)
- Time in Operation
- Remaining Lifetime
- Activation of Reminders
- Reminder 1 before Lifetime (Required)
- Reminder 2 before Lifetime (Demanded)

## Remaining Sensor Lifetime [see Remaining Sensor Lifetime (4.3.)]

- Lifetime (expected)
- Time in Operation
- Remaining Lifetime
- Activation of Reminders
- Reminder 1 before Lifetime (Required)
- Reminder 2 before Lifetime (Demanded)

#### Service Schedule [see Service Schedule (4.4.)]

- Service Interval
- Time Since Last Service
- Time Until Next Service
- Activation of Reminders
- Reminder 1 before Service (Required)
- Reminder 2 before Service (Demanded)

#### Calibration Schedule [see Calibration Schedule (4.5.)]

- Calibration Interval
- Time Since Last Calibration
- Time Until Next Calibration
- Activation of Reminders
- Reminder 1 before Calibration (Required)
- Reminder 2 before Calibration (Demanded)

#### **Electronic Temperature**

- Electronic Temperature
- Lowest Value
- Highest Value

#### Wear

- Powered Days
- Poweron Resets

See Wear via SIMATIC PDM (Page 72) for more detail.

#### 6.3.2.3 Communication

Navigate to Communication to read the following:

Tag; Manufacturer's ID; Device ID; Product ID; Device Revision; EDD Revision; Universal Command

## 6.3.2.4 Security

Navigate to Configure/Setup > Security to access:

Remote Access [see Remote Access (6.1.)]

#### Note

If access control is changed to limit remote access, it can only be reset via the handheld programmer. See **Access Control (6.1.1.)**.

- Write Protect (read only)
- Access Control

#### Local Access [see Local Access (6.2.)]

- Local Write Protected
- PIN to Unlock

See also Password Protection (Page 91).

# 6.3.2.5 Device Diagnostics

Device Diagnostics	Device Status   Hill-@W-Status					
ti ⊒i lovie fugnetics s∰ 2000	SIEMENS	TAG	ETTANS	Devic	GOOD	]
Cooligure/Setup						
Device Diagnostics						
Process Variables						

Click on the **Device Diagnostics** bar at the bottom of the navigation window, for access to:

- Device Status
- Hardware/Firmware Status

# **Process variables**

Process Variables	talues Analog Output   Trend	Ves	
<ul> <li>Thouse smaller</li> <li>Process matching</li> <li>Process matching</li> <li>Couch offe</li> </ul>	SIEMENS Priney tracking	TAG DITANS Quaternary statular Volume	GOOD
🖉 Configure/Setup	Secondary Vanable	Tertery tanable	
Process Variables	I II	I III	

To compare outputs in real time click on **Process Variables** at the bottom of the navigation window for access to:

#### **Process Variables**

- Values (level, volume, space, distance)
- Analog Output
- Trend View
- Echo Profile

## 6.3.2.6 Password Protection

An AMS Device Manager administrator can configure the user to require a password. The use of passwords is recommended. A password should be assigned to the 'admin' username immediately after installing AMS Device Manager.

Each user is given an AMS Device Manager username and password and required to enter them when they start AMS Device Manager. Access to functions depends on the level of permissions granted.

#### Login types

• standard, local, or domain

A standard user can change their password in AMS Device Manager. A Local or Domain Windows user cannot change their password using AMS Device Manager and must request their network administrator to do so.

## 6.3.2.7 User Manager utility

Usernames, passwords, and permissions, are assigned to users by an AMS Device Manager administrator, using the User Manager utility on the Server Plus Station. Only a user with AMS Device Manager System Administration rights can log in to User Manager.

#### To configure a new user/edit existing user:

1. From the Windows taskbar select: Start > AMS Device Manager > User Manager.

2. In the User Manager window click on Add User.

The Add User Wizard dialog allows you to:

- select a user type, standard (AMS Device Manager) or Window user.
- enter the username and password, and set permissions
- edit existing users

Edit User	?×
Username: 🕞	dmin
Password:	ниж
Confirm Password:	IN MIR.
Г	Make inactive
Device	Calibration Management
Vite Vite	Administration
I SIS Write I Assignment	🔽 Test Results Write
	SNAP-ON Applications
Administration	✓ ValveLink
Help	OK Cancel

# 6.3.2.8 AMS device menu

Configure/setup Identification Identification Tag Description Message Date Device Manufacturer Product name Order number Final assembly number Hardware revision Firmware revision Loader revision EDD number Wizard Quick start Step 1 (Identification) Step 2 (Application type) Step 3 (Vessel shape) Step 4 (Range) Step 5 (Summary) Operation General Select analog output Master reset

Simulation/test Self test Loop test Setup Sensor General Units Operating mode Material Damping filter

- Antenna
- Calibration

Low calibration point High calibration point Sensor offset Rate Response rate Fill rate/minute Fail-safe Timer Material level Level Analog output scaling Analog output scaling mA output function Start of scale Full scale Control range lower limit Control range upper limit Linearization Linearization Vessel shape Vessel dimensions Max. volume **Dimension A Dimension L** Characteristic Signal processing General Range Near range Far range Propagation factor Echo select Algorithm Position detect Echo threshold CLEF range Sampling Echo lock Sampling up Sampling down Echo lock window

Signal quality Confidence Echo strength Noise average Noise peak

## TVT

TVT setup Auto false echo suppression range Auto false echo suppression Hover level Shaper mode TVT shaper Manual TVT curve Echo profile Local display Maintenance and diagnostics Remaining device lifetime Lifetime expected **Remaining Lifetime** Time in Operation Activation of Reminders Reminder 1 before Lifetime (Required) Reminder 2 before Lifetime (Demanded) **Remaining Sensor Lifetime** Lifetime expected **Remaining Lifetime** Time in Operation Activation of Reminders Reminder 1 before Lifetime (Required) Reminder 2 before Lifetime (Demanded) Service Schedule Service Interval Time since last Service Total Service Interval minus Time Since Last Service Activation of Reminders Reminder 1 before Service (Required) Reminder 2 before Service (Demanded) **Calibration Schedule** Calibration Interval Time since last Calibration

**Total Until Next Calibration** 

Activation of Reminders Reminder 1 before Calibration (Required) Reminder 2 before Calibration (Demanded) Electronic Temperature **Electronic Temperature** Lowest Value **Highest Value** Wear Powered days **Poweron Resets** Communication Security Remote access Write protect Access control Local access Local write protected PIN to unlock

# 6.3.3 Operating via FDT (Field Device Tool)

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

Functionally FDT is very similar to PDM. See Operating via SIMATIC PDM (Page 54) for more detail.

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

## 6.3.3.1 Device Type Manager (DTM)

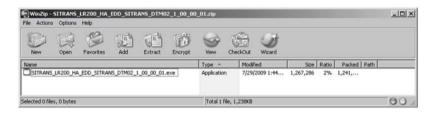
A DTM is a type of software that 'plugs into' FDT. It contains the same information as an EDD but an EDD is independent of the operating system.

## 6.3.3.2 SITRANS DTM

- SITRANS DTM is an EDDL interpreter developed by Siemens to interpret the EDD for that device.
- To use SITRANS DTM to connect to a device, you must first install SITRANS DTM on your system and then install the device EDD written for SITRANS DTM.
- You can download SITRANS DTM from the Siemens service and support website. Go to Siemens Industry Online Support (<u>https://support.industry.siemens.com/cs/?lc=en-WW</u>), click on Product Support, and drill down to Product Information/Automation Technology/Sensor systems/Process Instrumentation/Software & Communications.

# 6.3.3.3 The instrument EDD

The SITRANS LR200 HART EDD for SITRANS DTM can be downloaded from the product page of our website at www.siemens.com/LR200 (www.siemens.com/LR200). Go to **Support** > **Software Downloads**.



# 6.3.3.4 Configuring a new device via FDT

The full process to configure a field device via FDT is outlined in an Application Guide which can be downloaded from our website under **Support > Application Guides**.

LR200 (www.siemens.com/LR200)

# 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.</li>
- 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 197) 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 Operating via SIMATIC PDM (Page 54)
- Operating via Operating via AMS device manager (Page 76)

# 7.1 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)

# 7.2 Setup (2.)

#### Note

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

#### 2.1. Device

#### 2.1.1. Hardware Revision

Corresponds to the electronics hardware of the device.

#### 2.1.2. Firmware Revision

Corresponds to the firmware that is embedded in the device.

#### 2.1.3. Loader Revision

Corresponds to the software used to update the device.

#### 2.1.4. Order Option

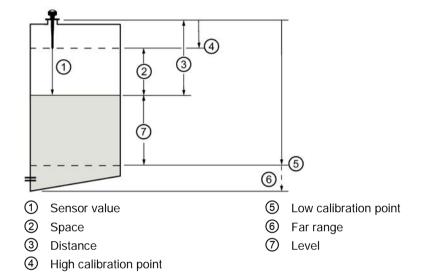
Read only. Displays the device type: standard of NAMUR NE 43-compliant.

# 7.2.1 Sensor (2.2.)

# 7.2.1.1 Units (2.2.1.)

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

# 7.2.1.2 Sensor mode (2.2.2.)



Mode	Description	Reference point
NO SERVICE	Measurement and associated loop current are not updated, and the device defaults to Fail-safe mode <sup>1)</sup> .	N/A
LEVEL	Distance to material surface	Low Calibration Point (process empty
(factory setting)		level)
SPACE	]	High Calibration Point (process full level)
DISTANCE		Sensor Reference Point

<sup>1)</sup> For more detail, refer to Material level (2.5.1.) (Page 103).

# 7.2.1.3 Material (2.2.3.)

Description	Automatically configures the device to operate in the chosen application type, by changing one or more of the following parameters: <b>Propagation Factor</b> , <b>Position Detect</b> , and/or <b>CLEF Range</b> .
Options	LIQUID
	LIQUID LOW DK <sup>1)</sup> (low dielectric liquid - CLEF algorithm enabled
Factory setting	LIQUID
Related	Propagation factor (2.8.3.) (Page 111)
parameters	Position detect (2.8.4.2.) (Page 112)
	CLEF range (2.8.4.4.) (Page 112)

<sup>1)</sup> dK < 3.0

# 7.2.1.4 Damping filter (2.2.4.)

Description	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, refer to Damping (Page 178).
Values	Range: 0 to 100.000 s
Factory setting	10.000 s

## 7.2.1.5 Antenna (2.2.5.)

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

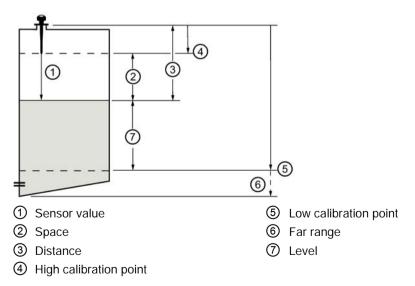
# 7.2.2 Calibration (2.3.)

Note

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

# 7.2.2.1 Low calibration point (2.3.1.)

Description	Distance from sensor reference point <sup>1)</sup> to <b>Low Calibration Point</b> . Units are defined in <b>Units</b> .
Values	0 to 20 m
Factory setting	20.00 m
Related	Units (2.2.1.) (Page 99)
parameters	Far range (2.8.2.) (Page 111)



<sup>1)</sup> The point from which level measurement is referenced. Refer to Uni-construction polypropylene rod antenna (Page 152) and Dimension drawing (Page 152).

# 7.2.2.2 High calibration point (2.3.2.)

Description	Distance from sensor reference point <sup>1)</sup> to High Calibration Point. Units are de- fined in Units (2.2.1.).
Values	0 to 20 m
Factory setting	0.00 m
Related	Units (2.2.1.) (Page 99)
parameters	Near range (2.8.1.) (Page 110)

<sup>1)</sup> The value produced by the echo processing which represents the distance from sensor reference point to the target. For more details, refer to Sensor mode (2.2.2.) (Page 99).

#### Note

When setting the High Calibration Point value, echoes are ignored within Near Range. For details, refer to Near range (2.8.1.) (Page 110).

## 7.2.2.3 Sensor offset (2.3.3.)

Description	Sensor Offset is a constant offset that can be added to or subtracted from sen- sor value <sup>1)</sup> 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 (2.2.1.) (Page 99).
Values	-99.999 to +99.999
Factory setting	0.00
Related parame- ters	Units (2.2.1.) (Page 99)

The value produced by the echo processing which represents the distance from sensor reference point to the target. Refer to Sensor mode (2.2.2.) (Page 99) for an illustration.

# 7.2.3 Rate (2.4.)

## 7.2.3.1 Response rate (2.4.1.)

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 (2.4.2.) (Page 102), Empty rate/min (2.4.3.) (Page 102) and Damping filter (2.2.4.) (Page 100).

Response rate	Fill rate/min (2.4.2.) (Page 102)	Empty rate/min (2.4.3.) (Page 102)	Damping filter (2.2.4.) (Page 100)
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

# 7.2.3.2 Fill rate/min (2.4.2.)

**Fill rate** defines the maximum rate at which the reported sensor value<sup>1)</sup> 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 (2.4.1.) (Page 101) is altered.

#### Note

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

Response rate (2.4.1.) (Page 101)		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	Units (2.2.1.) (Page 99)	

<sup>1)</sup> The value produced by the echo processing which represents the distance from sensor reference point to the target.

# 7.2.3.3 Empty rate/min (2.4.3.)

**Empty rate** defines the maximum rate at which the reported sensor value<sup>1</sup>) 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 (2.4.1.) (Page 101) is altered.

#### Note

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

Response rate (2.4.1.) (Page 101)		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	Units (2.2.1.) (Page 99)	

<sup>1)</sup> The value produced by the echo processing which represents the distance from sensor reference point to the target.

# 7.2.4 Fail-safe (2.5.)

# 7.2.4.1 Material level (2.5.1.)

Material Level defines the mA output to use when the Fail-safe Timer expires.

STANDARD DEVICE		
Options	Н	20.5 mA (max. mA Limit)
	LO	3.8 mA (min. mA Limit)
	HOLD (factory setting)	Last valid reading (default 22.6 mA)
	VALUE	User-selected value (defined in LEVEL (2.5.3.)

## NAMUR NE 43-COMPLIANT DEVICE

Options	HI	20.5 mA (max. mA Limit)
	LO	3.8 mA (min. mA Limit)
	HOLD	Last valid reading
	VALUE	User-selected value (defined in LEVEL (2.5.3.): default 3.58 mA)

#### Note

The default setting depends whether your device is a standard or NAMUR NE 43-compliant device.

# 7.2.4.2 Timer (2.5.2.)

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, Material level (2.5.1.) (Page 103) determines the material level to be reported when the Fail-safe timer expires. For more detail, refer to Loss of Echo (LOE) (Page 179).

#### Note

- The default setting depends whether your device is a standard or NAMUR NE 43compliant device.
- Material Level (2.5.1.) must be set to VALUE to enable the Level value to be reported.

Allows the user to define the mA value to be reported when the Fail-safe timer expires.

Device type	STANDARD	NAMUR NE43-COMPLIANT
Values	3.56 mA to 22.6 mA	3.56 mA to 22.6 mA
Factory setting	22.60 mA	3.58 mA

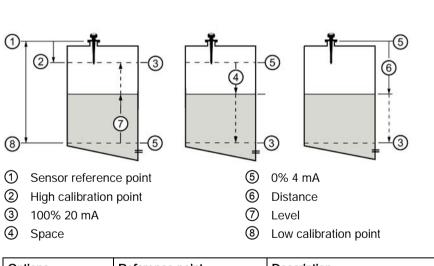
# 7.2.5 Analog output scaling (2.6.)

## 7.2.5.1 Current output function (2.6.1.)

Level

Allows CURRENT OUTPUT FUNCTION (2.6.1.) to be set independently from SENSOR MODE (2.2.2.). For example, Sensor Mode may be set to Level and Current Output Function set to Distance.

Distance



Space

Options	Reference point	Description
Level	Low Calibration Point	measured as a percentage of the difference be-
Space	High Calibration Point	tween High Calibration Point and Low Calibration Point
Distance	sensor reference point	measured as a percentage of Low Calibration Point
Volume	converts a level measurement to a volume output	
Manual <sup>1)</sup>	allows mA OUTPUT VALUE (2.6.6.) to be set to a user-defined value	

<sup>1)</sup> Current Output Function must be set to Manual before modifying mA OUTPUT VALUE (2.6.6.). Remember to restore the previous Current Output Function setting after modifying mA Output Value.

#### Notes:

- Level, space, and distance, have different reference points.
- Sensor Mode resets Current Output Function to the same setting. To select a different option, do so after Sensor Mode has been set.
- Use caution when changing Current Output Function while the device is connected to a HART network. Current Output Function controls the primary value and the loop current for the device.
- Current Output Function also affects the secondary, tertiary and quaternary variables in a HART network.
- To modify Current Output Function via SIMATIC PDM, open the menu **Device Select Analog Output**. For more detail, refer to Select analog output (Page 71).

#### 7.2.5.2 Start of scale (4 mA setpoint) (2.6.2.)

Description	Sets the process level corresponding to the 4 mA value. 4 mA always defaults to 0, and Current Output Function determines whether this is a Level, Space, Distance, or Volume measurement. For an illustration, refer to Current output function (2.6.1.) (Page 104).
Values	Range: -999999 to +999999
Factory setting	0.00 m (set to value corresponding to 0% as defined by Current Output Func- tion)
Related	Units (2.2.1.) (Page 99)
parameters	Current output function (2.6.1.) (Page 104)

#### Note

Enter the reading that is to correspond to a 4 mA output. Units are defined in Units (2.2.1.) (Page 99) for Level, Space, or Distance. Units are unspecified for Volume.

#### 7.2.5.3 Full scale (20 mA setpoint) (2.6.3.)

Description	Sets the process level corresponding to the 20 mA value. 20 mA always defaults to 100%, and Current Output Function determines whether this is a Level, Space, or Distance measurement. For an illustration, refer to Current output function (2.6.1.) (Page 104).
Values	Range: -999999 to +999999
Factory setting	20.00 m (set to value corresponding to 100% as defined by Current Output Function)
Related	Units (2.2.1.) (Page 99)
parameters	Current output function (2.6.1.) (Page 104)

#### Note

Enter the reading that is to correspond to a 20 mA output. Units are defined in **Units (2.2.1.)** for Level, Space, or Distance. Units are unspecified for Volume.

# 7.2.5.4 Control range; lower limit (min mA limit) (2.6.4.)

Description	Prevents the mA output from dropping below this minimum level for a measure- ment value. This does not restrict the Fail-safe or Manual settings.
Values	Range: 3.8 to 20.5 (mA)
Factory setting	3.80 (mA)

# 7.2.5.5 Control range; upper limit (max mA limit) (2.6.5.)

Description	Prevents the mA output from rising above this maximum level for a measure- ment value. This does not restrict the Fail-safe or Manual settings.
Values	Range: 3.8 to 20.5 (mA)
Factory setting	20.50 (mA)

## 7.2.5.6 mA output value (2.6.6.)

Description	Allows you to use a simulated value to test the functioning of the loop. You can enter 4 mA, 20 mA, or any other user-defined value within the range.
Values	Range: 3.56 mA to 22.6 mA
Factory setting	Read Only unless CURRENT OUTPUT FUNCTION (2.6.1.) is set to Manual
Related	Current output function (2.6.1.) (Page 104)
parameters	

#### How to test loop function:

- 1. Set CURRENT OUTPUT FUNCTION (2.6.1.) to Manual.
- 2. Enter the desired mA value in mA Output Value.
- 3. After completing the test, remember to reset **CURRENT OUTPUT FUNCTION (2.6.1.)** to the previous setting.

To test loop function via SIMATIC PDM, open the menu **Device – Loop Test**. For more detail, refer to Loop test (Page 71).

# 7.2.6 Linearization (2.7.)

# 7.2.6.1 Volume (2.7.1.)

Carries out a volume conversion from a level value.

# 7.2.6.2 Vessel shapes (2.7.1.1.)

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
	CONICAL BOTTOM/ Conical or pyramidal bottom	maximum volume, dimension A
	PARABOLIC BOTTOM	maximum volume, dimension A
	HALF SPHERE BOTTOM	maximum volume, dimension A

Vessel shape	LCD Display/ description	Also required
	FLAT SLOPED BOTTOM	maximum volume, dimension A
	PARABOLIC ENDS Parabolic end horizontal cylinder	maximum volume, dimension A, dimension L
	LINEAR TABLE <sup>1)</sup> Linearization table (lev- el/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 Table 1-8 (2.7.2.) (Page 109).

# 7.2.6.3 Maximum volume (2.7.1.2.)

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	Low calibration point (2.3.1.) (Page 100)
parameters	High calibration point (2.3.2.) (Page 101)
	Vessel shapes (2.7.1.1.) (Page 107)

# 7.2.6.4 Dimension A (2.7.1.3.)

Description	The height of the vessel bottom when the bottom is conical, pyramidal, parabol- ic, spherical, or flat -sloped. If the vessel is horizontal with parabolic ends, the depth of the end. For an illustration, refer to Vessel shapes (2.7.1.1.) (Page 107).
Values	0.0000 to 999999 mm
Factory setting	0.0
Related parame-	UNITS (1.4.)
ters	Vessel shapes (2.7.1.1.) (Page 107)

## 7.2.6.5 Dimension L (2.7.1.4.)

Description	Length of the cylindrical section of a horizontal parabolic end vessel. For an illustration, refer to Vessel shapes (2.7.1.1.) (Page 107).
Values	Range: 0.0000 to 999999 mm
Factory setting	0.0
Related	UNITS (1.4.)
parameters	Vessel shapes (2.7.1.1.) (Page 107)

## 7.2.6.6 Table 1-8 (2.7.2.)

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. Level values are defined in <b>Units (2.2.1.)</b> . Volume units are defined by the user but are not explicitly stated in the device.
Level values	Range: 0.0000 to 99999 mm
	Factory setting: 0.0
Volume values	Range: 0.0000 to 99999
	Factory setting: 0.0

Enter up to 32 level breakpoints, where the corresponding volume is known. The values corresponding to 100% and 0% levels must be entered. The breakpoints can be ordered from top to bottom, or the reverse. Breakpoints are grouped into four tables: Table 1-8, Table 9-16, Table 17-24, and Table 25-32.

To enter breakpoints via SIMATIC PDM, refer to Using Linearization via the Quick Start Wizard (Page 61).

#### To enter breakpoints via the handheld programmer:

- 1. If required, change the unit for level values (the default unit is m). Navigate to Setup (2.) > Sensor (2.2.) > Units (2.2.1.), and select the desired unit.
- 2. Navigate to Setup (2.) > Linearization (2.7.) > Maximum volume (2.7.1.2.), and enter the value.
- 3. Go to the appropriate table for the particular breakpoint you wish to adjust: for example, go to Table 1-8 for breakpoint 1.
- 4. Under Table 1-8, go to Level 1 (2.7.2.1.) to enter the level value for the breakpoint 1.
- 5. Under Table 1-8, go to Volume 1 (2.7.2.2.) to enter the volume value for the breakpoint 1.
- 6. Repeat steps 3 to 5 until values have been entered for all required breakpoints.

## Level 1 (2.7.2.1.)

- 1. Press RIGHT arrow to open Edit mode
- 2. Enter level value and press RIGHT arrow to accept it.
- 3. Press down arrow to move to corresponding volume breakpoint.

## Volume (2.7.2.2.)

- 1. Press RIGHT arrow to open Edit mode
- 2. Enter volume value and press RIGHT arrow to accept it.
- 3. Press DOWN arrow to move to the next level breakpoint.

Example (values are for example purposes only)

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

Table 9-16 (2.7.3.)

Table 17-24 (2.7.4.)

Table 25-32 (2.7.5.)

# 7.2.7 Signal processing (2.8.)

# 7.2.7.1 Near range (2.8.1.)

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 blank- ing 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 <sup>1)</sup>
	• 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 146)

<sup>1)</sup> For the reference point for each configuration, refer to Uni-construction polypropylene rod antenna (Page 152) for the standard version, or Dimension drawing (Page 152) for other versions.

# 7.2.7.2 Far range (2.8.2.)

Description	Allows the material level to drop below <b>Low Calibration Point</b> 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 Sensor mode (2.2.2.) (Page 99).
Values	0 to 23 m (75.4 ft). Min. value depends on the setting for Low calibration point (2.3.1.) (Page 100).
Factory setting	Low calibration point (2.3.1.) (Page 100) setting + 1 m (3.2 ft)

#### Note

Far Range can extend beyond the bottom of the vessel.

# 7.2.7.3 Propagation factor (2.8.3.)

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

#### Note

When operating with a waveguide antenna or stillpipe, values for CLEF range (2.8.4.4.) (Page 112) and for the propagation factor should be set according to the antenna frequency and the antenna/pipe size (see the tables below). For reliable results the horn size must be close to the pipe size

#### 6.3 GHz Model

Values	Range: 0.3 to 1.5 depending on pipe size.				
Factory setting	1.000	1.000			
Antenna/Pipe Size (I.D.) <sup>1)</sup>	50 mm (2")	80 mm (3″)	100 mm (4")	150 mm (6″)	200 mm (8″)
Propagation Factor	0.8298	0.9372	0.9603	0.9825	0.9902

<sup>1)</sup> Since pipe dimensions may vary slightly, the propagation factor may also vary.

# 7.2.7.4 Echo select (2.8.4.)

## Algorithm (2.8.4.1.)

Description	Selects the algorithm to be applied to the echo profile to extract the true echo.		
Options	tF (factory setting)	tF (factory setting) true First echo	
	L Largest echo		
	BLF	Best of First or Largest echo	

# Position detect (2.8.4.2.)

Description	Defines where on the echo the distance measurement is determined. Refer to "Position detect" under Echo Selection (Page 172) for more detail.
Options	Center
	Hybrid (center and CLEF)
	CLEF (Constrained Leading Edge Fit)
Factory setting	Hybrid (center and CLEF)
Related	CLEF range (2.8.4.4.) (Page 112)
parameters	

### 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 (2.8.4.4.) (Page 112) to 0.5 m (1.64 ft).

## Echo threshold (2.8.4.3.)

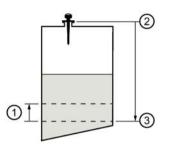
Description	Sets the minimum echo confidence that the echo must meet in order to pre- vent a Loss of Echo condition and the expiration of the LOE timer. When Con- fidence (2.8.6.1.) (Page 114) exceed Echo Threshold, the echo is accepted as a valid echo and is evaluated. Use this feature when an incorrect material level is reported.
Values	Range: 0 to 99
Factory default	5
Related	Timer (2.5.2.) (Page 103)
parameter	

## CLEF range (2.8.4.4.)

Description	The CLEF algorithm is used mainly to allow correct level reporting for low dK materials which may otherwise cause an incorrect reading in an empty or almost empty vessel. It is used from Low Calibration Point (process empty level) up to the level defined by CLEF range (see illustration below). Above that point the Center algorithm is used. For more detail, refer to CLEF Range (Page 175).
Values	Range: 0 to 20 m (0 to 65.6 ft)
Parameter reference	0.00 m
Related	Position detect (2.8.4.2.) (Page 112)
parameters	

#### Note

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



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

In applications with low dK materials, we recommend setting CLEF Range parameter to 0.5 m (1.64 ft) and Position detect parameter to Hybrid.

## 7.2.7.5 Sampling (2.8.5.)

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.

Description	Selects the measurement verification process. For more details, refer to Echo Lock (Page 175).
Options	Lock Off
	Maximum Verification (not recommended for radar)
	Material Agitator (factory setting)
	Total Lock (not recommended for radar)
Related	Fill rate/min (2.4.2.) (Page 102)
parameters	Empty rate/min (2.4.3.) (Page 102)
	Up sampling (2.8.5.2.) (Page 114)
	Down sampling (2.8.5.3.) (Page 114)

# Echo lock (2.8.5.1.)

#### Note

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

# Up sampling (2.8.5.2.)

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 (2.8.5.3.)

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

# 7.2.7.6 Echo quality (2.8.6.)

# Confidence (2.8.6.1.)

Description	Indicates echo reliability: higher values represent better echo quality. The display shows the echo confidence of the last measurement. Echo threshold (2.8.4.3.) (Page 112) defines the minimum criterion for echo confidence.	
Values (view only)	0 to 99	
Factory setting		shot not used
Related	Echo threshold (2.8.4.3.) (Page 112)	
parameters		

## Echo strength (2.8.6.2.)

Description	Displays the absolute strength (in dB above 1 $\mu V$ rms) of the echo selected as the measurement echo.
Values (view only)	-20 to 99

## Noise average (2.8.6.3.)

Noise Average displays the average ambient noise (in dB above 1  $\mu$ V rms) of a noise profile. Noise level is a combination of transient noise and receiving circuitry. After a measurement, the values from the previous noise shot will be displayed.

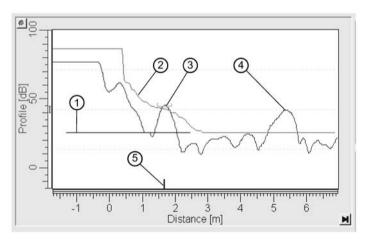
# 7.2.7.7 TVT setup (2.8.7.)

### Auto false echo suppression (2.8.7.1.)

Auto false echo suppression is used together with Auto false echo suppression range (2.8.7.2.) (Page 117) 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 176).

#### Notes

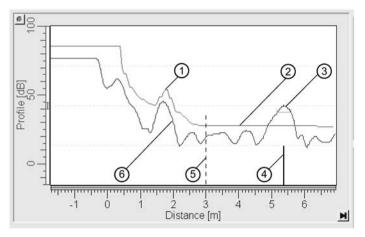
- Make sure material level is below all known obstructions at the moment Auto False Echo Suppression is used to learn the echo profile. (An empty or almost empty vessel is recommended.)
- Note the distance to material level when Auto False Echo learns the environment. Set Auto False Echo Suppression 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
- 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 67).

#### 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 (2.8.7.2.) (Page 117) and enter the value calculated in step 2.

4. Go to Auto false echo suppression (2.8.7.1.) (Page 115) 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 (2.8.7.2.)

Description	Specifies the range within which Learned TVT is used. For more detail, refer to Auto false echo suppression (2.8.7.1.) (Page 115).
Values	Range: 0.00 to 20.00 m
Factory setting	1.00 m
Related	Units (2.2.1.) (Page 99)
parameters	

- 1. Calculate range according to Auto false echo suppression (2.8.7.1.) (Page 115) 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 (2.8.7.1.) (Page 115).

#### Hover level (2.8.7.3.)

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 (2.8.7.1.) (Page 115) 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 (2.8.7.4.)

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

# 7.2.7.8 TVT shaper (2.8.8.)

**TVT Shaper** 

#### Note

- The range is -100 to 100 bits. With 2 bits per dB this gives a range of -50 to 50 dB.
- Shaper Mode (2.8.7.4.) must be turned ON in order for TVT shaper points to be transferred.

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

#### To use TVT Shaper via SIMATIC PDM:

• Open the menu **Device – Echo Profile Utilities** and click on **TVT Shaper**. For more detail see TVT Shaper (Page 117).

#### To use TVT Shaper via HMI (Human Machine Interface):

- 1. Go to Breakpoint 1-9 (2.8.8.1.) (Page 118)
- 2. Open Shaper 1 and enter the TVT Offset value (between -50 and 50).
- 3. Go to the next Shaper point and repeat steps c) and d) till all desired breakpoint values have been entered.

### Breakpoint 1-9 (2.8.8.1.)

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

### Breakpoint 10-18 (2.8.8.2.)

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

#### Breakpoint 19-27 (2.8.8.3.)

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

#### Breakpoint 28-36 (2.8.8.4.)

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

### Breakpoint 37-40 (2.8.8.5.)

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

## 7.2.7.9 Measured values (2.8.9.)

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

### LEVEL MEASUREMENT (2.8.9.1.)

The value for level

### SPACE MEASUREMENT (2.8.9.2.)

The value for space

### **DISTANCE MEASUREMENT (2.8.9.3.)**

The value for distance

### **VOLUME MEASUREMENT (2.8.9.4.)**

The value for volume

# 7.3 Diagnostics (3.)

# 7.3.1 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 46).

#### 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 65).

#### To request a profile via AMS Device Manager:

Refer to Echo Profile (Page 87).

# 7.3.2 Electronics temperature (3.2.)

## 7.3.2.1 Current internal temperature (3.2.1.)

Read only. Displays (in degrees C) the current temperature on the circuit board recorded by the internal electronics.

To access via SIMATIC PDM:

Open the menu View – Process Variables and check the field Electronics Temperature.

### 7.3.2.2 Highest value (3.2.2.)

Read only. Displays (in degrees C) the maximum temperature recorded by the internal electronics. The high and low values are maintained over a power cycle.

#### To access via SIMATIC PDM:

Navigate to Maintenance and Diagnostics > Electronics Temperature.

### 7.3.2.3 Lowest value (3.2.3.)

Read only. Displays (in degrees C) the minimum temperature recorded by the internal electronics. The high and low values are maintained over a power cycle.

#### To access via SIMATIC PDM:

Navigate to Maintenance and Diagnostics > Electronics Temperature.

# 7.4 Service (4.)

# 7.4.1 Master reset (4.1.)

Description	Resets user parameters to factory defaults, 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 and the learned TVT also remain unchanged.
Options	Idle or Done (Return to previous menu)
	Factory defaults

#### Note

Following a reset to Factory Defaults, complete reprogramming is required

#### To perform a reset to factory defaults via SIMATIC PDM:

- 1. Open the menu Device Master Reset.
- 2. Click on Factory Defaults.

# 7.4.2 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 124), Service schedule (4.4.) (Page 126), and Calibration schedule (4.5.) (Page 129).
- 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 124).

Factory setting:	years	
Setting range <sup>1)</sup> :	hours, days, years	
Purpose:	The device tracks itself based on operating hours and monitors its predict- ed 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:	
	<ol> <li>Open the menu Device – Maintenance and select the Remaining De- vice Lifetime tab.</li> </ol>	
	2. After modifying values/units as required, click on <b>Write</b> to accept the change, and <b>Read</b> to view the effect of the change.	
	3. Click on <b>Snooze</b> to add a year to the <b>Total Expected Device Life</b> .	

<sup>1)</sup> Selectable only via SIMATIC PDM.

# 7.4.2.1 Lifetime expected (4.2.1.)

Remaining Device Lifetime Remaining Sensor I	Lifetime   Service Schedule   Calibration Schedule	
SIEMENS		-1
Time in Operation	2.332	Years
Remaining Lifetime	9.883	Years
Reminder 1 before Lifetime (Required)	0.164	Years
Reminder 2 before Lifetime (Demanded)	0.019	Years
Activation of Reminders	Ott	•
Lifetime (Expected)	10.000	Years
Time Units	Years	*
	Read	
	Write	
1	Snooze for 1 year	

#### 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.

## 7.4.2.2 Time in operation (4.2.2.)

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

## 7.4.2.3 Remaining lifetime (4.2.3.)

Read only. Lifetime expected (4.2.1.) (Page 122) less Time in operation (4.2.2.) (Page 122).

# 7.4.2.4 Reminder activation (4.2.4.)

Factory setting:	OFF
Setting range:	Reminder 1 (Maintenance Required), Reminder 2 (Maintenance Demand- ed), 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.

# 7.4.2.5 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 122) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder activation (4.2.4.) (Page 122) to the desired option.</li> </ol>

# 7.4.2.6 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 122) is equal to or less than this value, the device generates a Maintenance Demanded reminder.
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder activation (4.2.4.) (Page 122) to the desired option.</li> </ol>

## 7.4.2.7 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.

## 7.4.2.8 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.

## 7.4.2.9 Acknowledge (4.2.9.)

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

# 7.4.3 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 121), Service schedule (4.4.) (Page 126), and Calibration schedule (4.5.) (Page 129).
- 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 124).

Factory setting:	years
Setting range <sup>1)</sup> :	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:
	<ol> <li>Open the menu Device – Maintenance and select the Remaining Sensor Lifetime tab.</li> </ol>
	2. After modifying values/units as required, click on <b>Write</b> to accept the change, and <b>Read</b> to view the effect of the change.
	3. Click on Snooze to add a year to the Total Expected Sensor Life.
	4. Click on <b>Sensor Replaced</b> to restart the timer and clear any fault mes- sages.

<sup>1)</sup> Selectable only via SIMATIC PDM.

## 7.4.3.1 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.

## 7.4.3.2 Time in operation (4.3.2.)

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

## 7.4.3.3 Remaining lifetime (4.3.3.)

Read only. Lifetime expected (4.3.1.) (Page 124) less Time in operation (4.3.2.) (Page 124).

## 7.4.3.4 Reminder activation (4.3.4.)

Factory setting:	OFF
Setting range:	Reminder 1 (Maintenance Required), Reminder 2 (Maintenance Demand- ed), 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.

## 7.4.3.5 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 125) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder activation (4.3.4.) (Page 125).</li> </ol>

## 7.4.3.6 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 125) is equal to or less than this value, the device generates a Maintenance Demanded reminder.
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder activation (4.3.4.) (Page 125).</li> </ol>

## 7.4.3.7 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.

## 7.4.3.8 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.

# 7.4.3.9 Acknowledge (4.3.9.)

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

# 7.4.4 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 device lifetime (4.2.) (Page 121), Remaining sensor lifetime (4.3.) (Page 124), and Calibration schedule (4.5.) (Page 129).
- 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 127).

Factory setting:	years
Setting range <sup>1)</sup> :	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 <b>Device</b> – <b>Maintenance</b> and select the Service Schedule tab.
	<ul> <li>After modifying values/units as required, click on Write to accept the change, and Read to view the effect of the change.</li> </ul>
	Click on Service Performed to restart the timer and clear any fault mes- sages.

<sup>1)</sup> Selectable only via SIMATIC PDM.

## 7.4.4.1 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.

### 7.4.4.2 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.

#### 7.4.4.3 Time until next service (4.4.3.)

Read only. Service interval (4.4.1.) (Page 127) less Time since last service (4.4.2.) (Page 127).

## 7.4.4.4 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:	<ol> <li>First set the values in Reminder 1 (required) (4.4.5.) (Page 128) / Reminder 2 (demanded) (4.4.6.) (Page 128).</li> </ol>
	2. Select the desired Reminder Activation option.

# 7.4.4.5 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 127) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder activation (4.4.4.) (Page 127) to the desired option.</li> </ol>

# 7.4.4.6 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 127) is equal to or less than this value, the device generates a Maintenance Demanded reminder.
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder activation (4.4.4.) (Page 127) to the desired option.</li> </ol>

## 7.4.4.7 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.

## 7.4.4.8 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.

# 7.4.4.9 Acknowledge (4.4.9.)

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

# 7.4.5 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 121), Remaining sensor lifetime (4.3.) (Page 124), and Service schedule (4.4.) (Page 126).
- 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 129).

Factory setting:	years
Setting range <sup>1)</sup> :	Hours, days, years
Purpose:	The device tracks calibration intervals based on operating hours and moni- tors 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:
	<ul> <li>Open the menu Device – Maintenance and select the Calibration Schedule tab.</li> </ul>
	<ul> <li>After modifying values/units as required, click on Write to accept the change, and Read to view the effect of the change.</li> </ul>
	<ul> <li>Click on Calibration Performed to restart the timer and clear any fault messages.</li> </ul>

<sup>1)</sup> Selectable only via SIMATIC PDM.

# 7.4.5.1 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.

## 7.4.5.2 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.

## 7.4.5.3 Time until next calibration (4.5.3.)

Read only. Calibration interval (4.5.1.) (Page 129) less Time since last calibration (4.5.2.) (Page 130).

## 7.4.5.4 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:	<ol> <li>First set the values in Reminder 1 (required) (4.3.5.) (Page 125) Reminder 2 (demanded) (4.3.6.) (Page 125).</li> <li>Select the desired Reminder Activation option.</li> </ol>

# 7.4.5.5 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 130) is equal to or less than this value, the device generates a Maintenance Required reminder.
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder activation (4.5.4.) (Page 130) to the desired option.</li> </ol>

# 7.4.5.6 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 130) is equal to or less than this value, the device generates a Maintenance Demanded reminder.	
Description:	<ol> <li>Modify values as required.</li> <li>Set Reminder Activation (4.8.5.) (Page 130) to the desired option.</li> </ol>	

## 7.4.5.7 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.

## 7.4.5.8 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.

## 7.4.5.9 Acknowledge (4.5.9.)

Purpose:	Acknowledges the current maintenance reminder.	
Description:	To acknowledge a reminder via SIMATIC PDM:	
	<ul> <li>Open the menu Diagnostics &gt; Device Diagnostics and click on the tab Maintenance.</li> </ul>	
<ul> <li>In the Calibration Schedule section, click on Acknowledge Warn To acknowledge a reminder via the local control buttons or hand-he mer:</li> </ul>		
	<ul> <li>Press <b>RIGHT</b> arrow twice to open parameter view and activate Edit Mode.</li> <li>Press <b>RIGHT</b> arrow to acknowledge the reminder.</li> </ul>	

# 7.4.6 Manufacture date (4.6.)

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

# 7.4.7 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**.

# 7.4.8 Power-on resets (4.8.)

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

# 7.4.9 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.

# 7.4.10 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.

# 7.4.11 Memory test (4.11)

Description	Allows verification of the RAM, EEPROM, and flash memory of the device		
LCD display	IDLE	No test in progress	
	BUSY	Test in progress	
	PASS	Memory test successful	
	FAIL	Test failed	
	Err1	Test returned unexpected results	
	P Oxcafe	Test passed with result data	
	F Oxcafe	Test failed with result data	
Handheld pro- grammer entry	<b>1</b> to <b>9</b>	Any numeric key from 1 to 9 activates test	

1. Press **RIGHT arrow** to edit then press any numeric key from 1 to 9 to activate the test.

2. The reading will display BUS and then the test result text.

# 7.5 Communication (5.)

# 7.5.1 Device address (5.1.)

Description	Sets the device address or poll ID on a HART network. Any address other than 0 will cause the output current to be a fixed value, and the current will not indicate the reading.	
Values	Range: 0 to 15	
Factory setting	0	

#### To reset Device Address via SIMATIC PDM:

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

# 7.6 Security (6.)

# 7.6.1 Remote access (6.1.)

## 7.6.1.1 Access control (6.1.1.)

Description	Enables /disables the read/write access to parameters via remote communica- tions.	
Options	Read only No changes are permitted via remote communications.	
	Read Write	Changes are permitted.
	Restricted	Sets the status to Read only, with the potential for another HART device to change this parameter only, via remote communications.
Factory setting	Read Write	

#### Note

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

# 7.6.2 Local access (6.2.)

## 7.6.2.1 Write protect (6.2.1.)

Description	Prevents any changes to parameters via the handheld programmer.		
Options	Range: 0 to 99999		
	Unlock value [stored in PIN to Unlock (6.2.2.) (Page 135)]	Lock Off	
	Any other value	Lock On	

#### Note

This lock affects only the handheld programmer. A remote master can change configuration if Access Control(6.1.1.) (Page 134) is set to allow this.

- To turn Lock On, key in any value other than the Unlock Value stored in PIN to Unlock (6.2.2.) (Page 135).
- To turn Lock Off, key in the Unlock Value stored in PIN to Unlock (6.2.2.) (Page 135).

# 7.6.2.2 Pin to unlock (6.2.2.)

Description	Stores the value to be entered in Write Protect (6.2.1.) (Page 134) to unlock programming. If Write Protect (6.2.1.) (Page 134) is set to a different value, PIN to Unlock (6.2.2.) does not display the Unlock value. Valid only for operation via the handheld programmer.	
Handheld pro- Range: 0 to 99999		to 99999
grammer values	Value when shipped: 1954.	
	Not restored by a reset to Factory Defaults.	
		Display when Lock is on

#### Note

Do not lose your Unlock Value. It cannot be displayed once Write Protect (6.2.1.) (Page 134) has been set to a different value.

# 7.7 Language (7.)

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

# Service and maintenance

# 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.

# 

#### 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.

## 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.

# 8.3 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 (<u>http://www.siemens.com/processinstrumentation/returngoodsnote</u>)

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 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/)

# 8.5 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 101) to compensate.

# **Diagnosing and troubleshooting**

# 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 141) for a detailed list.
- 2. Verify that the wiring connections are correct.
- 3. See the table below for specific symptoms.

Symptom	Corrective action
The device cannot be programmed via the handheld programmer.	• Ensure Write protect (6.2.1.) (Page 134) is set to the unlock value.
You try to set a SITRANS LR200 parameter via remote communications but the parameter remains unchanged.	• Ensure Write protect (6.2.1.) (Page 134) is set to the unlock value, then try setting the parameter via the handheld programmer.
	<ul> <li>Ensure Access control (6.1.1.) (Page 134) is set to Read/ Write.</li> </ul>
	<ul> <li>Some parameters can be changed only when the device is not scanning. Try pressing Mode to put the device into PROGRAM mode.</li> </ul>

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 Device status icons

lcon	Priority Level	Meaning	
d'	1	<ul><li>Maintenance alarm</li><li>Measurement values are not valid</li></ul>	
÷	2	<ul><li>Maintenance warning: maintenance demanded immediately</li><li>Measured signal still valid</li></ul>	

lcon	Priority Level	Meaning	
· 4	3	Maintenance required	
7		Measured signal still valid	
ŧ	1	Process value has reached an alarm limit	
÷ <b>‡</b>	2	Process value has reached a warning limit	
·ŧ	3	Process value has reached a tolerance limit	
	1	<ul> <li>Configuration error</li> <li>Device will not work because one or more parameters/components is incorrectly configured</li> </ul>	
:‼	2	<ul> <li>Configuration warning</li> <li>Device can work but one or more parameters/components is incorrectly configured</li> </ul>	
•[]	3	<ul> <li>Configuration changed</li> <li>Device parameterization not consistent with parameterization in project. Look for info text.</li> </ul>	
S.	1	<ul><li>Manual operation (local override)</li><li>Communication is good; device is in manual mode.</li></ul>	
:T	2	<ul> <li>Simulation or substitute value</li> <li>Communication is good; device is in simulation mode or works with substitute values.</li> </ul>	
ŝ	3	<ul><li>Out of operation</li><li>Communication is good; device is out of action.</li></ul>	
<b>†</b>		Data exchanged	
X		No data exchange	
₽		Write access enabled	
8		Write access disabled	

## Note

- If more than one fault is present, the device status indicator and text for each fault alternate at 2 second intervals.
- Some faults cause the device to go to Fail-safe mode (Fault 52). These are indicated with an asterisk (\*).

Code/ Icon		Meaning	Corrective Action
S: 0	*	The device was unable to get a measurement within the Fail-safe LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/other adverse process condi- tions, invalid configuration range.	<ul> <li>Ensure installation details are correct.</li> <li>Ensure no antenna material buildup. Clean if necessary.</li> <li>Adjust process conditions to minimize foam or other adverse conditions.</li> <li>Correct configuration range.</li> <li>If fault persists, contact your local Siemens representative.</li> </ul>
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 representa- tive.
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: 11		Internal temperature sensor failure.	Repair required: contact your local Siemens representa- tive.
S: 12		Internal temperature of device has exceeded specifications: it is operating outside its temperature range.	<ul> <li>Relocate device and/or lower process temperature enough to cool device.</li> <li>Inspect for heat-related damage and contact your local Siemens representative if repair is required.</li> <li>Fault code will persist until a manual reset is per- formed using SIMATIC PDM or the LCD interface.</li> </ul>
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 repre- sentative.
S: 29	*	EEPROM damaged.	Replacement required: contact your local Siemens repre- sentative
S: 31	*	Flash error.	Replacement required: contact your local Siemens repre- sentative
S: 33	*	Factory calibration for the internal temperature sensor has been lost.	Replacement required: contact your local Siemens repre- sentative
S: 34	*	Factory calibration for the device has been lost.	Replacement required: contact your local Siemens repre- sentative
S: 35	*	Factory calibration for the device has been lost.	Replacement required: contact your local Siemens repre- sentative
S: 36	*	Unable to start microwave module.	Repair required: contact your local Siemens representa- tive

Code/ Icon		Meaning	Corrective Action
S: 37	*	Measurement hardware problem.	Replacement required: contact your local Siemens repre- sentative
S: 38	*	Failure in the device electronics.	Replacement required: contact your local Siemens repre- sentative
S: 43	*	Factory calibration for the radar receiver has been lost.	Replacement required: contact your local Siemens repre- sentative.
S: 45	*	No valid boot program detected: firmware cor- rupt	Replacement required: contact your local Siemens repre- sentative.
S: 48	*	User configuration is invalid. One or more of parameters: Low Calibration Point, High Cali- bration Point, Volume breakpoints, and/or Auto False-Echo Suppression, are set to invalid values.	<ul> <li>Reconfigure the unit.</li> <li>Ensure the difference between High Calibration Point and Low Calibration Point is not less than or equal to zero; do a Master Reset.</li> </ul>
S: 49	*	EEPROM corrupt.	Replacement required: contact your local Siemens repre- sentative.
S: 50	*	EEPROM corrupt.	Replacement required: contact your local Siemens repre- sentative.
S: 51	*	EEPROM corrupt.	Replacement required: contact your local Siemens repre- sentative.
S: 52		<ul> <li>Fail-safe is activated. Possible causes:</li> <li>1. hardware failure</li> <li>2. memory failure</li> <li>3. Fail-safe LOE timer expired- possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid calibration range.</li> </ul>	<ul> <li>For 3:</li> <li>Correct configuration; ensure installation is correct;</li> <li>no antenna buildup;</li> <li>adjust process conditions to minimize foaming/other adverse conditions;</li> <li>correct calibration range.</li> <li>If fault persists, or for 1 and 2, contact your local Siemens representative.</li> </ul>
S: 53	*	Configuration lost: one or more parameter settings have been lost. This may occur after a firmware upgrade causes user parameters to be reset.	Restore user parameters using SIMATIC PDM.

# 9.4 Operation troubleshooting

Symptom	Cause	Action
Display shows	level or target is out of range	<ul> <li>check specifications</li> <li>check Low calibration point (2.3.1.) (Page 100)</li> <li>increase Confidence (2.8.6.1.) (Page 114)</li> </ul>
Display shows	material build-up on antenna	<ul><li> clean the antenna</li><li> relocate SITRANS LR200</li></ul>
Display shows	<ul> <li>location or aiming:</li> <li>poor installation</li> <li>flange not level</li> <li>Auto False Echo Suppression may be incorrectly applied</li> </ul>	<ul> <li>check to ensure nozzle is vertical</li> <li>ensure end of antenna protrudes from end of nozzle</li> <li>review Auto false echo suppression (2.8.7.1.) (Page 115).</li> <li>ensure Auto False Echo Suppression Range is set correctly</li> </ul>
Display shows	<ul> <li>antenna malfunction:</li> <li>temperature too high</li> <li>physical damage</li> <li>excessive foam</li> <li>multiple echoes</li> </ul>	<ul> <li>check Current internal temperature (3.2.1.) (Page 120)</li> <li>use foam deflector or stillpipe</li> <li>relocate</li> <li>use a defoamer</li> <li>set Algorithm (2.8.4.1.) (Page 111) to F (First echo)</li> </ul>
Reading does not change, but the level does	SITRANS LR200 processing wrong echo, for example, vessel wall, or structural member	<ul> <li>re-locate SITRANS LR200</li> <li>check nozzle for internal burrs or welds</li> <li>rotate device 90°</li> <li>use Auto false echo suppression (2.8.7.1.) (Page 115)</li> </ul>
Measurement is con- sistently off by a con- stant amount	<ul> <li>setting for Low calibration point (2.3.1.) (Page 100) not correct</li> <li>setting for Sensor offset (2.3.3.) (Page 101) not cor- rect</li> </ul>	<ul> <li>check distance from sensor reference point to Low calibration point (2.3.1.) (Page 100)</li> <li>check Sensor offset (2.3.3.) (Page 101)</li> </ul>
Screen blank	power error	<ul><li>check nameplate rating against voltage supply</li><li>check power wiring or source</li></ul>
	too much load resistance	<ul> <li>change barrier type, or</li> <li>remove something from the loop, or</li> <li>increase supply voltage</li> <li>reduce wire distance or use larger gage wire</li> </ul>
Reading erratic	echo confidence weak	<ul> <li>refer to Confidence (2.8.6.1.) (Page 114)</li> <li>use Auto false echo suppression (2.8.7.1.) (Page 115) and Auto false echo suppression range (2.8.7.2.) (Page 117)</li> <li>use foam deflector or stillpipe</li> </ul>

Operating symptoms, probable causes, and resolutions.

Symptom	Cause	Action
	liquid surface vortexed	decrease Fill rate/min (2.4.2.) (Page 102)
		relocate device to side pipe
		<ul> <li>increase confidence threshold in Echo threshold (2.8.4.3.) (Page 112)</li> </ul>
	material filling	relocate SITRANS LR200
Reading response slow	Fill rate/min (2.4.2.) (Page 102) setting incorrect	increase measurement response if possible
Reads correctly but	detecting close range echo	clean the antenna
occasionally reads high when vessel is not full	build up near top of vessel or nozzle	<ul> <li>use Auto false echo suppression (2.8.7.1.) (Page 115) and Auto false echo suppression range (2.8.7.2.) (Page 117)</li> </ul>
	nozzle problem	
Level reading lower than actual material	material is within Near Range     zone	<ul> <li>decrease Near range (2.8.1.) (Page 110) (minimum value depends on antenna type)</li> </ul>
level	multiple echoes processed	raise SITRANS LR200
		<ul> <li>ensure Algorithm (2.8.4.1.) (Page 111) is set to F (First echo)</li> </ul>
	vessel near empty and low	ensure Material (1.2.) selection is LIQUID LOW DK
	dK material	• set Position detect (2.8.4.2.) (Page 112) to Hybrid
		• set CLEF range (2.8.4.4.) (Page 112) to 0.5 m

# **Technical data**

# 10

#### Note

#### **Device specifications**

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

# 10.1 Power

General purpose Intrinsically safe: Non-sparking: Non-incendive (FM/US only)	Nominal 24 V DC at max. 550 Ohm
Flameproof: Increased safety Explosion-proof (FM/CSA US/Canada only)	Nominal 24 V DC at max. 250 Ohm

- Maximum 30 V DC
- 4 to 20 mA
- Max. startup current see Loop voltage versus loop resistance (Page 190)

# 10.2 Performance

Ref	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 <sup>2</sup> g)	
Me	Measurement accuracy (measured in accordance with IEC 60770-1)		
Ma	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		C band, approx. 6 GHz	
Max. measurement range <sup>1)</sup>		20 m (65.6 ft)	

Mir	Min. detectable distance <sup>1)</sup>			
	3", 4", and 6" horn <sup>2)</sup>	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")		
Up	date time <sup>1)</sup>			
	Minimum 1 second, depending on settings for Response rate (2.4.1.) (Page 101) and LCD fast mode (4.9.) (Page 132).			
Infl	Influence of ambient temperature			
	< 0.003%/K (average over full temperature range, referenced to maximum range)			
Die	Dielectric constant of material measured			
	dK > 3 (for < 3 use waveguide antenna or stillpipe)			
Ме	Memory			
	non-volatile EEPROM			
	no battery required			

<sup>1)</sup> From sensor reference point. For the sensor reference point for each configuration, refer to Uni-construction polypropylene rod antenna (Page 152) for the standard version, or Dimension drawing (Page 152) for other configurations.

 $^{\mbox{\tiny 2)}}$  3" and 4" horns should be used only in stillpipe applications.

# 10.3 Interface

#### Analog output

Signal range	<ul> <li>4 to 20 mA (± 0.02 mA accuracy)</li> <li>upper limit 20 to 22.6 mA adjustable</li> </ul>	
Fail signal	3.6 mA to 22.6 mA (see Fail-safe Mode (Page 180))	

#### **Communication: HART**

Load	<ul> <li>230 to 600 Ω</li> <li>230 to 500 Ω when connecting a coupling module</li> </ul>	
Max. line length	multi-wire: ≤ 1500 m (4921 ft)	
Protocol	HART, Version 5.1	

## Configuration

Remote	Siemens SIMATIC PDM or AMS Device Manager (PC)
Local	Siemens infrared handheld programmer, or HART handheld communi- cator

#### Display

Graphic LCD, with bar graph representing level. 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	<ul> <li>1.5" NPT (ANSI/ASME B1.20.1)</li> <li>R (BSPT, EN 10226-1)</li> <li>or, G (BSPP, EN ISO 228-1)</li> </ul>
	PTFE antenna, 316L/1.4404 stainless steel or 316L/1.4435 stainless steel	<ul> <li>2" NPT (ANSI/ASME B1.20.1)</li> <li>R (BSPT, EN 10226-1)</li> <li>or, G (BSPP, EN ISO 228-1)</li> </ul>
Flange connec- tion (flat face)	316L /1.4404 stainless steel or 316L/1.4435 stainless steel	<ul> <li>2", 3", 4" (ASME 150 lb, 300 lb)</li> <li>DN50, DN80, DN100, DN150, DN200 (PN16, PN40)</li> <li>50A, 80A, 100A (JIS 10K)</li> </ul>
Flange connec- tion (raised face)	316L /1.4404 stainless steel or 316L/1.4435 stainless steel	<ul> <li>DN80, DN100, DN150 (PN16, PN40) per EN 1092-1 B1</li> <li>DN200 (PN16) per EN 1092-1 B1</li> </ul>

#### 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 Dimension drawing (Page 152)
Horns/wavegui de	refer to Dimension drawing (Page 152)

#### Enclosure

Construction	aluminum, polyester powder-coated
Conduit entry	2 x M20x1.5, or 2 x ½" NPT
Ingress protec- tion	Туре 4Х, Туре 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 150) 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	1
Pollution degree	4

## 10.6 Process

Process temperature <sup>1)</sup>	
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) <sup>1)</sup>

<sup>1)</sup> 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 181) and Process pressure/temperature derating curves (Page 182) onwards.

# 10.7 Approvals data

#### Note

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

	1					
General	CSA	us/c, FM, CE, R	СМ			
Radio	Europe (RED), FCC, Industry Canada					
Marine	Lloyo	I's Register of S	Shipping, ABS Type Approval			
Hazardous	Intrin	sically Safe				
		Europe	ATEX II 1 G Ex ia IIC T4 Ga			
		International	IECEx SIR 13.0006X, 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	azil INMETRO: DNV 12.0143 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			

Flam	eproof			
	Europe	ATEX II 1/2 G Ex d mb ia IIC T4 Ga/Gb		
	China	NEPSI Ex d ia mb IIC T4 Ga/Gb		
Incre	ased safety			
	Europe	ATEX II 1/2 G Ex e mb ia IIC T4 Ga/Gb		
	China	NEPSI Ex e ia mb IIC T4 Ga/Gb		
Explo	osion proof			
	US/Canada	FM/CSA:		
		Class I, Div. 1, Groups A, B, C, D		
		Class II, Div. 1, Groups E, F, G		
		Class III T4		

# 10.8 Programmer (infrared keypad)

The battery is non-replaceable with a lifetime expectancy of 10 years in normal use. To estimate the lifetime expectancy, check the nameplate on the back for the serial number. The date of manufacture is encoded in the serial number. For example, the following was manufactured on March 5, 2016:

#### PBD/H3050001

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

3: month of manufacture

05: day of manufacture

0001: 4-digit sequential

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

# 10.9 Programmer data - 7ML1930-1BK

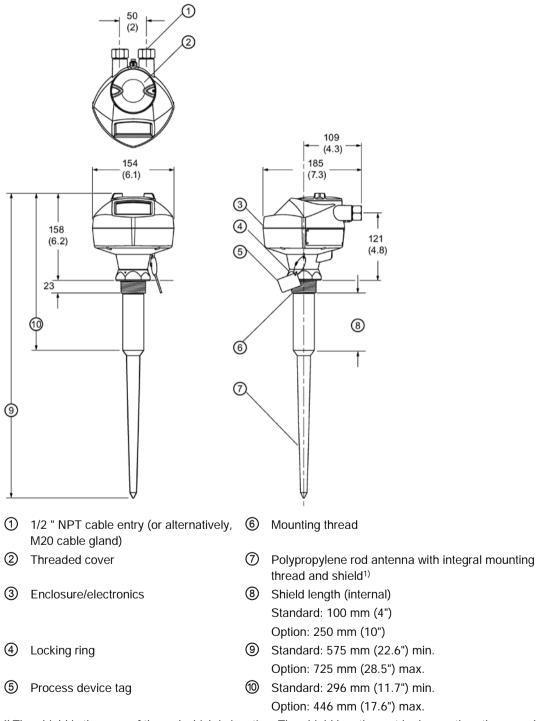
Siemens Milltronics Infrared IS (Intrinsically Safe) Handheld Programmer for hazardous and all other locations (battery is non-replaceable).

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

# 11

# **Dimension drawing**

11.1 Uni-construction polypropylene rod antenna



<sup>1)</sup> 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

#### Note

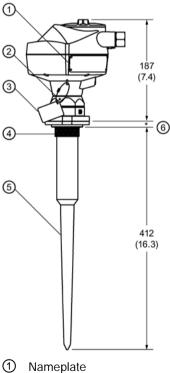
- For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand tight.
- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed 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 Threaded connection, PFTE rod

#### Note

#### Pressure applications

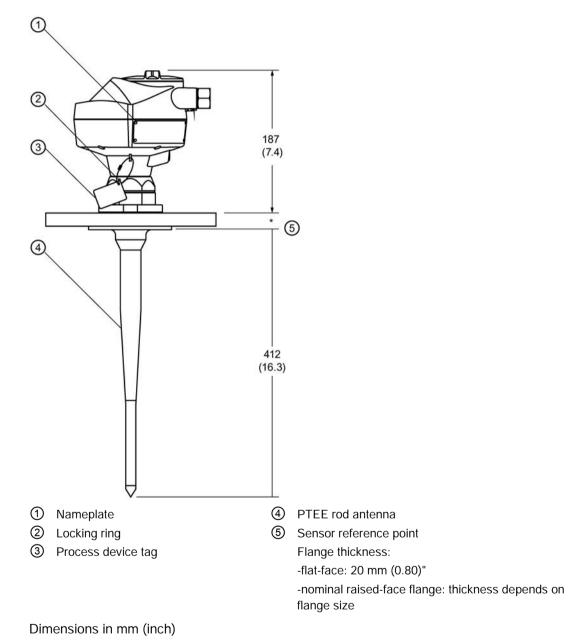
For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.



- 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.2 PTFE rod antenna, flat-face flange

For other flange dimensions and bolt hole sizing, refer to Flat-face flange dimensions (Page 163).

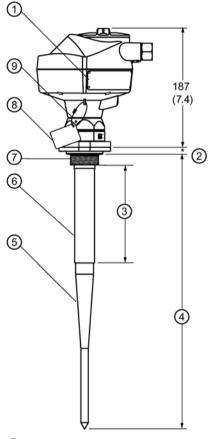


# A.3 Threaded connection, PTFE rod, external shield

# 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.



- 1 Nameplate
- ② Sensor reference point
- Shield length
   SL=min. 100 mm (4") customerspecified
- ④ Overall length
  - L=374 mm (14.7") plus shield length
- S Active antenna
- Dimensions in mm (inch)
- \* 17 mm (0.67")

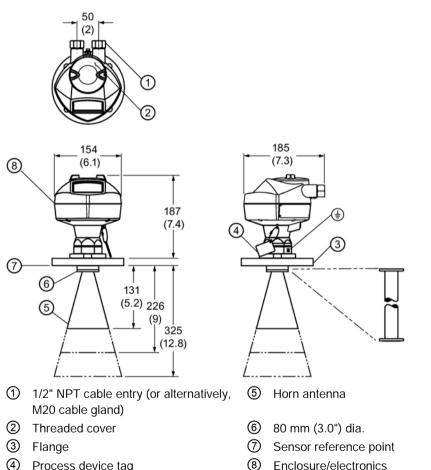
- 6 Stainless steel antenna shield (inactive length)
- ⑦ Stainless steel mounting thread
- 8 Process device tag
- ④ Locking ring

# A.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 161) or Flat-face flange dimensions (Page 163).
- For more details, refer to Flanged horn dimensions (Page 158).
- Optional waveguide extensions and/or purging<sup>1)</sup> system can be installed between the flange and the antenna.



- Process device tagDimensions in mm (inch)

<sup>1)</sup> 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.

#### 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 <sup>1)</sup>	Beam Angle <sup>2)</sup>	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	

<sup>1)</sup> Height from bottom of horn to sensor reference point as shown: refer to Flat-face flange with horn antenna and waveguide extension (Page 157) or Raised-face or flat-face flange with waveguide (Page 158).

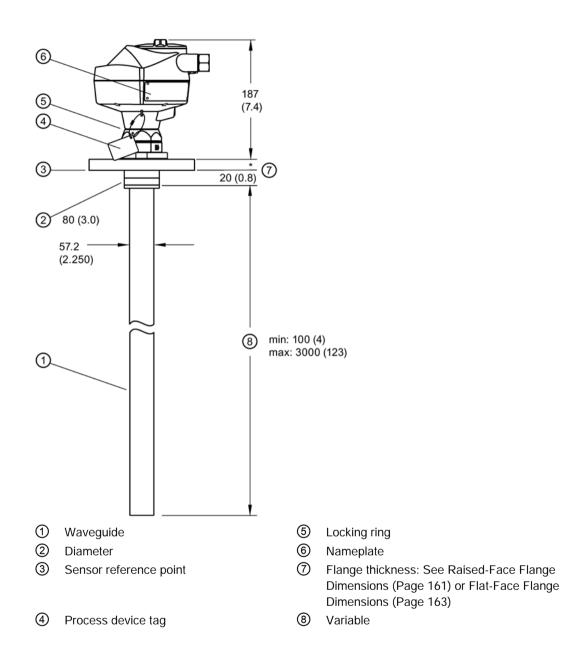
<sup>2)</sup> – 3dB in the direction of the polarization axis (for details, refer to Polarization reference point (Page 25)).

# A.6 Raised-face or flat-face flange with waveguide

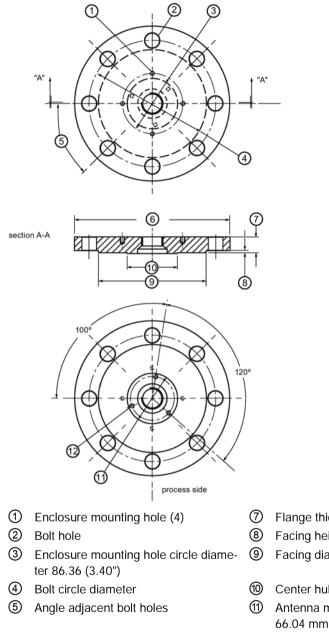
#### Note

- 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 161) or Flat-face flange dimensions (Page 163).

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#### **A**.7 Raised-face flange per EN 1092-1



6 Flange O.D.

- Flange thickness
- Facing height 3 mm
- Facing diameter
- Center hub
- ① Antenna mounting hole circle diameter 66.04 mm (2.60")
- 12 Antenna mounting hole (3)

# A.8 Raised-face flange dimensions

Pipe size	Flange bolt hole pattern	Flange O.D. (mm)	Bolt hole circle Ø (mm)	Bolt hole Ø (mm)	No. of bolts	Angle of adjacent bolt holes	Facing Ø (mm)	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.9 Raised-face flange markings

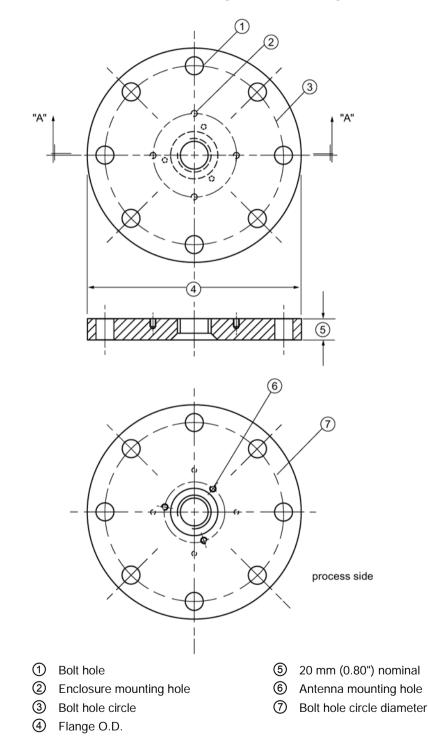
Flange Standard; Nominal Size; Material; Heat Code	Serial no.	Logo	Heat Code no.	Facing
EN 1092-1 05 'B1'; 'DN80' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyxxx		A1B2C3	RF

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.10 Flat-face flange (constant thickness series)

For details, refer to Flat-face flange dimensions (Page 163).



# A.11 Flat-face flange dimensions

Pipe size	Flange size	Flange O.D.	Bolt hole circle	Bolt hole Ø	Number of bolts
2"	ASME 150 lb	6.0″	4.75″	.7″	4
3"	ASME 150 lb	7.5″	6.0″	.75″	4
4"	ASME 150 lb	9.0″	7.50″	.75″	8
6"	ASME 150 lb	11.0″	9.50″	.88″	8
8"	ASME 150 lb	13.5″	11.75″	.88″	8
2"	ASME 300 lb1)	6.50″	5.00″	.75″	4 <sup>1)</sup>
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

<sup>1)</sup> 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.12 Flat-face markings

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

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

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.12.1 Threaded connection markings

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

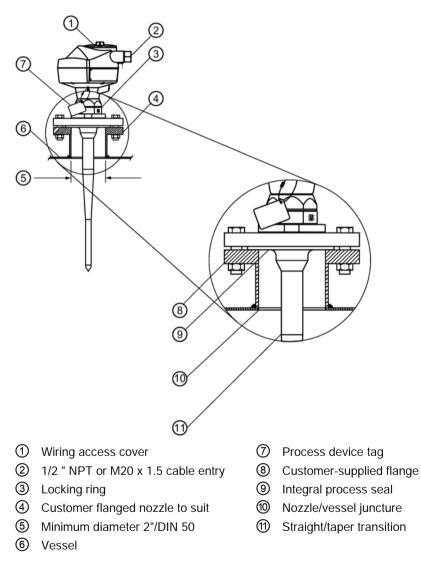
Logo	Serial number	Thread size	Thread series
	MMDDYYXXX	1.5	NPT
			BSP
			G/PF

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

# A.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<sup>1</sup>).



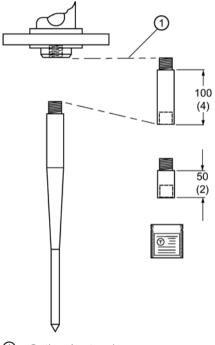
<sup>1)</sup> Refer to Rod assembly (Page 166).

# A.14 Rod assembly

#### 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.



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).

Nozzle I.D.	Nozzle height <sup>1)</sup> 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") <sup>2)</sup>	
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		

<sup>1)</sup> Consult Siemens Milltronics for assistance with nozzle sizes not listed.

<sup>2)</sup> Shielded rod antennas are available for these applications.

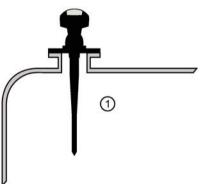
# A.15 Mounting guidelines

#### A.15.1 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.

## A.15.2 Nozzle design

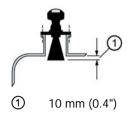
- The nozzle should be as short as possible.
- If your application requires a nozzle longer than our recommended maximum length consider using a shielded rod.



① Max. nozzle height: 100 mm (4")

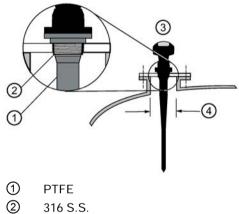
#### A.15.3 Horn antennas

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



#### A.15.4 Threaded rod antenna

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

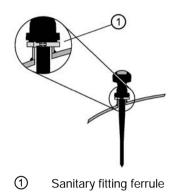


- 3 Max. nozzle height 100 mm (4")
- (4) Min I.D. 100 mm (4")

For smaller diameters use a shielded rod.

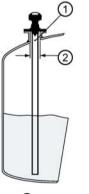
## A.15.5 Sanitary rod antenna

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



## A.15.6 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.



Vent hole
 Minimum 80 mm (3")

- Recommended for products with a dK lower than 3.
- For the related propagation factor, see Propagation factor (2.8.3.) (Page 111).

## A.15.7 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.

#### 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 97) for a complete list of parameters.

# B.1 Principles of operation

SITRANS LR200 is a 2-wire 6 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries<sup>1</sup>). 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<sup>2</sup>). This distance is used as a basis for the display of material level and mA output.

- <sup>1)</sup> The microwave output level is significantly less than that emitted from cellular phones.
- <sup>2)</sup> Refer to Dimension drawing (Page 152).

## B.2 Echo processing

#### B.2.1 Process Intelligence

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

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

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

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

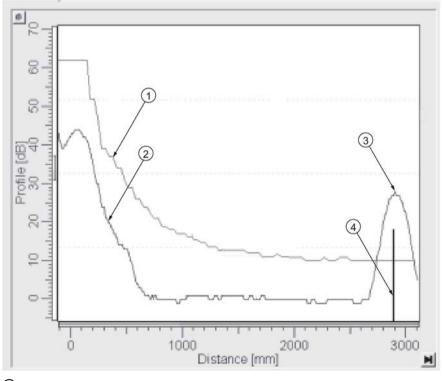
#### B.2.2 Echo Selection

#### Time Varying Threshold (TVT)

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

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

In a vessel with obstructions, a false echo may occur. See Auto False Echo Suppression (Page 115) for more details.



- default TVT
- 2 echo profile
- ③ material level
- (a) 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 (2.8.4.1.)

The true echo is selected based on the setting for the Echo selection algorithm. Options are true First Echo, Largest Echo, or best of First and Largest.

#### Position Detect (2.8.4.2.)

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 (2.8.3.)** 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)

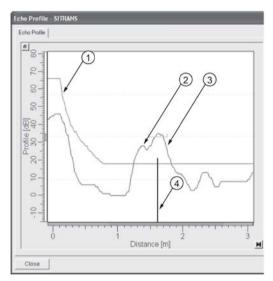
- Uses the leading edge of the echo.
- Is used mainly to process the echo from materials with a low dK value.

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

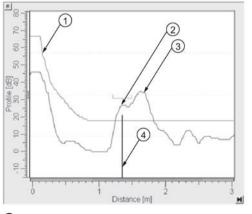
Vessel height: 1.5 m; CLEF range set to 0 (Center algorithm gives the same result.)



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

#### Example: CLEF enabled

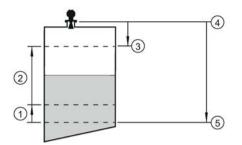
Vessel height: 1.5 m; CLEF range set to 0.5 m



- default TVT
- 2 material echo selected
- ③ vessel bottom echo
- (4) echo marker

## B.2.3 CLEF Range

**CLEF Range (2.8.4.4.)** is referenced from Low Calibration Point (process empty level ). When the **Hybrid** algorithm is selected in **Position Detect (2.8.4.2.)**, the CLEF algorithm will be applied up to the limit of CLEF Range. Above this limit the Center algorithm will be applied.



- ① CLEF Range
- (Center algorithm applied)
- 3 High Calibration Point (process full level)
- ④ Sensor reference point
- (5) Low Calibration Point (process empty level )

#### B.2.4 Echo Threshold

**Confidence (2.8.6.1.)** describes the quality of an echo. Higher values represent higher quality. **Echo Threshold (2.8.4.3.)** defines the minimum confidence value required for an echo to be accepted as valid and evaluated.

#### B.2.5 Echo Lock

If the echo selected by **Algorithm** is within the Echo Lock window, the window is centered about the echo, which is used to derive the measurement. In radar applications, two measurement verification options are used 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.2.6 Auto False Echo Suppression

#### Note

- For detailed instructions on using this feature via PDM see Auto False Echo Suppression (Page 67).
- For detailed instructions on using this feature via the handheld programmer see Auto False Echo Suppression (2.8.7.1.) (Page 115).

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.

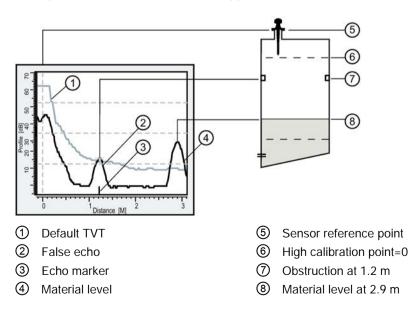
#### Auto False Echo Suppression Range

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.

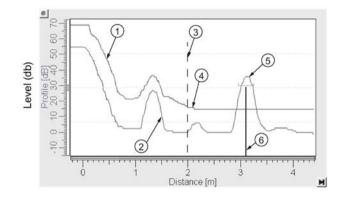
The learned TVT screens out the false echoes caused by obstructions. The default TVT allows the material echo to rise above it.

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



#### 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
- Default TVT
- (5) Material echo
- 6 Echo marker

#### B.2.7 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.2.8 Measurement Response

#### Note

Units are defined in Units (2.2.1.) and are in meters by default.

**Response Rate (2.4.1.)** 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.

		Fill Rate per Minute (2.4.2.)/Empty Rate per Minute (2.4.3.)	Damping Filter (2.2.4.)
*	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

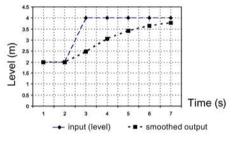
#### B.2.9 Damping

Damping filter (2.2.4.) (Page 100) 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.3 Analog output

The mA Output (current output) is proportional to material level in the range 4 to 20 mA. 0% and 100% are percentages of the full-scale reading (m, cm, mm, ft, in). Typically mA output is set so that 4 mA equals 0% and 20 mA equals 100%.

When SITRANS LR200 is put into **PROGRAM** mode (for example, by navigating through the menu) it stops updating the output of the device (local user interface and mA Output). It stores the most recent measurement, and holds the associated readings and mA signal output. The device reverts to the parameter last addressed during the previous program session.

When the device is returned to **Measurement** mode, the transceiver resumes operation. The reading and mA output default to the last measurement taken. The reading and associated outputs migrate to the current process level at a rate controlled by Response Rate (2.4.1.) (Page 101).

If the device is left in **PROGRAM** mode for 10 minutes without input, it automatically reverts to **Measurement** mode.

Two parameters affect the mA output: Operating Mode and Current Output Function.

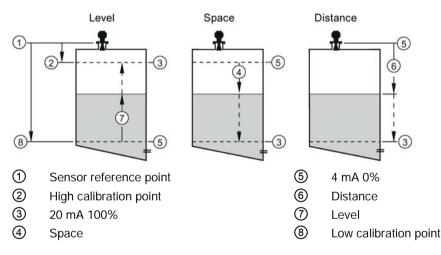
## B.3.1 Sensor Mode

This parameter controls the input. Depending on the reference point used, the measurement reports either Level, Space, or Distance. By default Sensor Mode is set to **Level**.

Operation	Description	Reference point
NO SERVICE	Measurement and associated loop current not being updated. Device defaults to Fail-safe mode <sup>1)</sup> .	
LEVEL	Distance to material surface	Low Calibration Point (pro- cess empty level)
SPACE	Distance to material surface	High Calibration Point (pro- cess full level)
DISTANCE	Distance to material surface	Sensor reference point

<sup>1)</sup> See Fail-safe Mode (Page 180).

You also have the option to put the device out of service, in which case the device defaults to Fail-safe mode, and the reported level depends on the device type. A standard device reports the last valid reading, and a NAMUR NE 43-compliant device reports the user-defined value for Material Level (3.58 mA by default).



# B.3.2 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 (2.8.6.1.) (Page 114) describes the quality of an echo. Higher values represent higher quality.

Echo threshold (2.8.4.3.) (Page 112) 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 Timer (2.5.2.) (Page 103) 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: 52 Fail-safe

### B.3.3 Current Output Function

**Current Output Function (2.6.1.)** controls the mA output and applies any relevant scaling. By default it is set to **Level**. Other options are Space, Distance, and Volume. (The device can carry out a volume calculation only after a vessel shape has been specified.)

When a volume application type is chosen, Sensor Mode remains as **Level** and the mA Output is automatically converted to **Volume**.

To view the mA reading in the secondary region of the LCD, press **1** on the handheld programmer.

#### B.3.4 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.

Timer (2.5.2.) (Page 103) determines the length of time a Loss of Echo (LOE) condition will persist before a Fail-safe state is activated. The default setting is 10 seconds.

Material level (2.5.1.) (Page 103) determines the material level to be reported when Timer (2.5.2.) (Page 103) expires, depending on the device type (standard or NAMUR NE 43-compliant.)

STANDARD DEVICE		
Options	HI	20.5 mA (max. mA Limit)
	LO	3.8 mA (min. mA Limit)
	HOLD	Last valid reading
	Factory setting	
	VALUE	User-selected value defined in Level (2.5.3.) (Page 104)

NAMUR NE 43-COMPLIANT DEVICE		
Options	HI 20.5 mA (max. mA Limit)	
	LO	3.8 mA (min. mA Limit)
	HOLD	Last valid reading
	VALUE	User-selected value defined in Level (2.5.3.) (Page 104) , de-
	Factory setting	fault 3.58 mA

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

# B.4 Maximum process temperature chart

# 

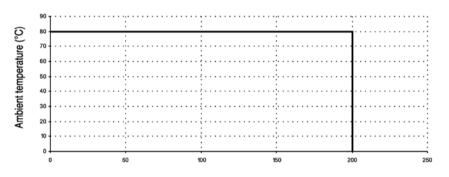
### Internal temperature

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

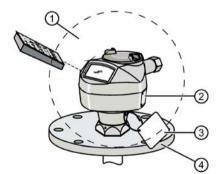
#### Note

- 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 Current internal temperature (3.2.1.) (Page 120) 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.5 Process pressure/temperature derating curves

## 

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

# 

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<sup>1</sup>). 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.

<sup>1)</sup> 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.5.1 Pressure Equipment Directive, PED, 2014/68/EU

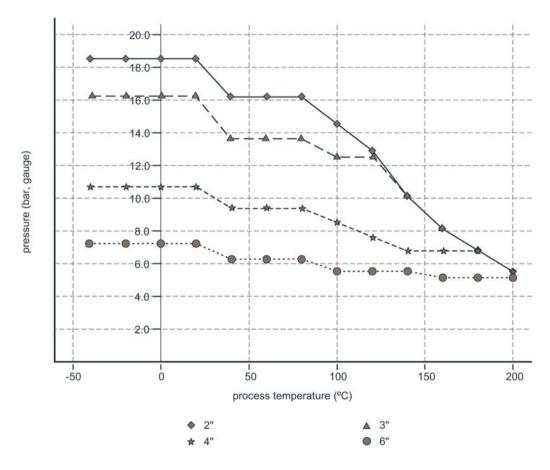
Siemens Level Transmitters with flanged, threaded, or sanitary clamp type process mounts have no pressure-bearing housing of their own and, therefore, do not come under the Pressure Equipment Directive as pressure or safety accessories, (see EU Commission Guideline 1/8).

#### Note

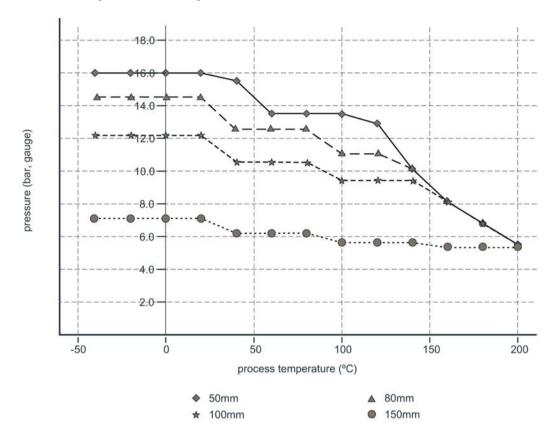
- Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.
- UHMW-PE antennas are rated to a maximum of 80°C (176°F) of continuous duty, however, they can be used for periods of up to 3 hours at temperatures up to 120°C (248°F) at 1 bar pressure.

## B.5.2 PTFE rod antenna ASME hole pattern, 150 lb

## Flat-face flange (constant flange thickness series)

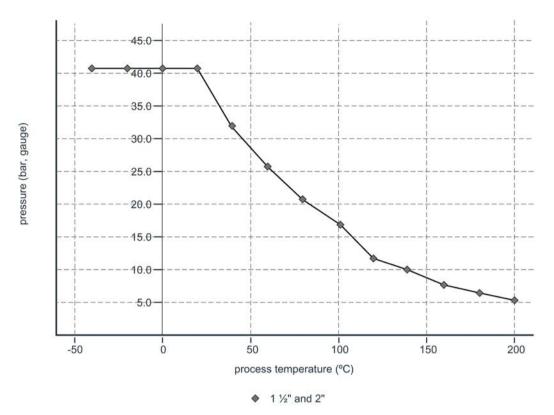


# B.5.3 PTFE rod antenna, DN hole pattern, PN16



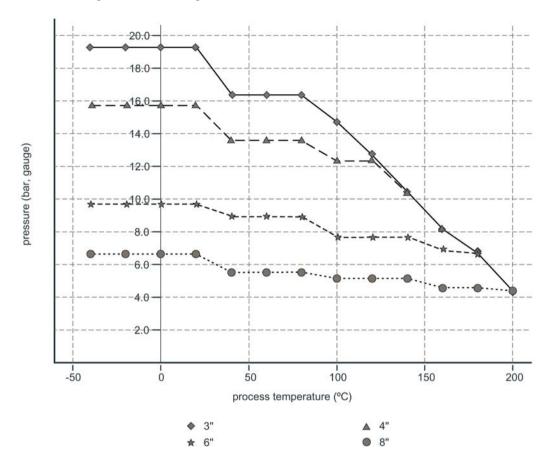
## Flat-face flange (constant flange thickness series)

# B.5.4 PFTE rod antenna threaded connection



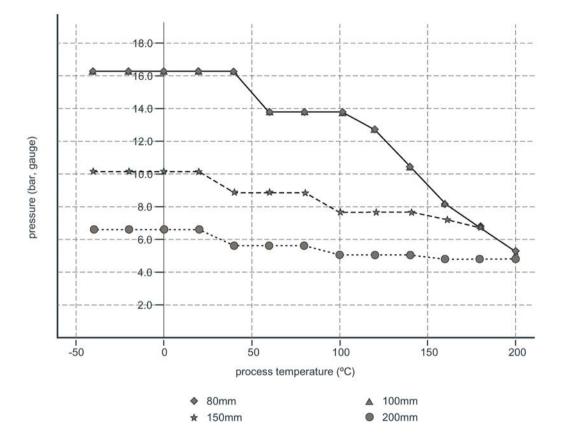
SITRANS LR200 with mA/HART Operating Instructions, 05/2019, A5E32337676-AE

# B.5.5 Horn antenna or waveguide, ASME hole pattern, 150 lb



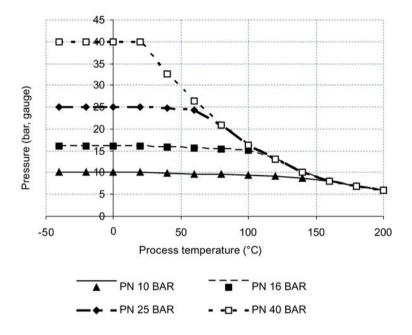
Flat-face flange (constant flange thickness series)

# B.5.6 Horn antenna or waveguide DN hole pattern, PN16



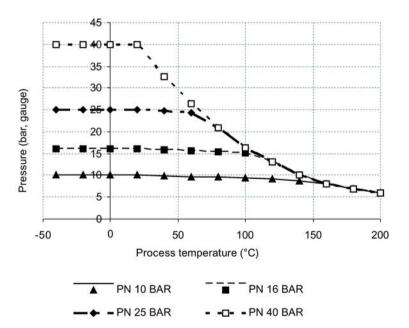
## Flat-face flange (constant flange thickness series)

## B.5.7 PFTE rod antenna, DN hole pattern, PN16, PN40



Raised Face Flange per EN 1092-1

# B.5.8 Horn antenna or waveguide, DN hole pattern, PN16, PN40 Raised Face Flange per EN 1092-1



# B.6 Startup behaviour

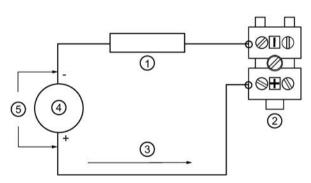
- The device draws less than 3.6 mA at startup.
- Time to first measurement is less than 50 seconds

# B.7 Loop power

## B.7.1 Typical connection drawing

#### Note

Loop voltage is the voltage at the terminals of the power supply (not the voltage at the terminals of the device).

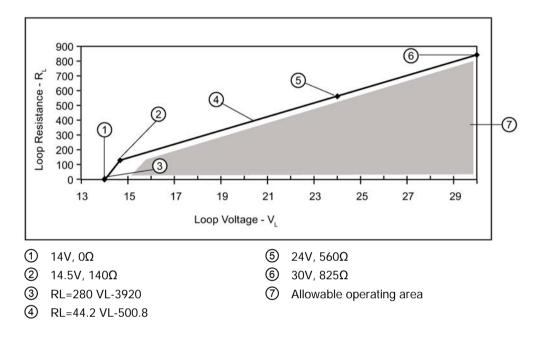


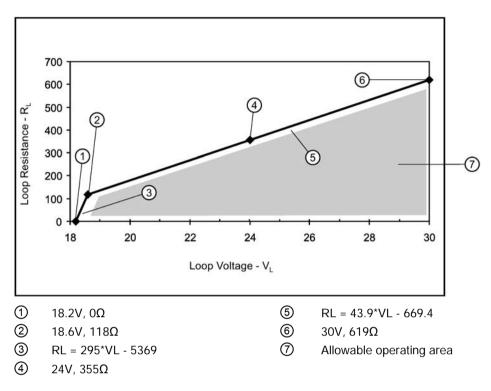
- 1 Loop resistance RL
- ② SITRANS LR200
- 3 Loop current IL
- ④ Power supply
- 5 Loop voltage VL

# B.8 Allowable operating area of SITRANS LR200

## B.8.1 Loop voltage versus loop resistance

Curve 1 (General Purpose, Intrinsically Safe, Non-sparking, Non-incendive)





Curve 2 (Flameproof, Increased Safety, Explosion-proof)

# HART communication

Highway Addressable Remote Transducer, HART, is an industrial protocol that is superimposed on the 4-20 mA signal. It is an open standard, and full details about HART can be obtained from the HART Communication Foundation at www.hartcomm.org (www.fieldcommgroup.org)

SITRANS LR200 can be configured over the HART network using either the HART Communicator 375 by Fisher-Rosemount, or a software package. The recommended software package is the SIMATIC Process Device Manager (PDM) by Siemens.

# C.1 SIMATIC PDM

This software package is designed to permit easy configuration, monitoring, and troubleshooting of HART devices. The HART EDD for SITRANS LR200 was written with SIMATIC PDM in mind and has been extensively tested with this software.

For more information, see Operating via SIMATIC PDM (Page 54).

# C.2 HART Electronic Device Description (EDD)

In order to configure a HART device, the configurator must have the HART Electronic Device Description for the instrument in question. HART EDDs are controlled by the HART Communication Foundation. Please check with the HART Communication Foundation for the availability of the HART EDD for SITRANS LR200. Older versions of the library will have to be updated in order to use all the features of SITRANS LR200.

# C.3 HART Communicator 375 Menu Structure

Note

HART Communicator 375 is supported by SITRANS LR200 HART.

LEVEL METER

- 1. **IDENTIFICATION**
- 1. TAG 2. DESCRIPTION
  - 3. MESSAGE
  - 4. INSTALLATION DATE
  - 5. DEVICE ORDER NUMBER

3.

- SETUP 2.
  - 1. DEVICE
    - 1. FIRMWARE REVISION
    - 2. LOADER REVISION
    - 3. HARDWARE REVISION
  - 2. INPUT
    - 1. SENSOR CALIBRATION
      - 1. MATERIAL
      - 2. SENSOR UNITS

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      - 5. HIGH CALIBRATION PT.
      - 6. NEAR RANGE
      - 7. FAR RANGE
      - 8. PROPAG. FACTOR
      - 9. SENSOR OFFSET
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      - 3. ECHO THRESHOLD
      - 2. SAMPLING
        - ECHO LOCK
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           SAMPLING DOWN
      - 3. FILTERING
      - 1. DAMPING FILTER 4. TANK BOTTOM ALGORITHM
      - 1. CLEF RANGE
      - 5. NOISE
- 1. ECHO CONFIDENCE
   2. ECHO STRENGTH
   3. NOISE AVERAGE

- 5. TVT SETUP
  - 1. TVT HOVER LEVEL
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    - 2. FILL RATE PER MINUTE
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- 3. OUTPUT 1
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    - 3. 20 MA SETPOINT 4. MINIMUM MA LIMIT
    - 5. MAXIMUM MA LIMIT
- 4. FAIL-SAFE
  - FAILSAFE TIMER 1.
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- 3. DIAGNOSTICS
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- TOTAL EXPECTED DEVICE LIFE 1.
- 2. TOTAL DEVICE OPERATING TIME
- REMAINING DEVICE LIFETIME 3
- MAINTENANCE REQUIRED LIFETIME 4.
- 5.
- MAINTENANCE DEMANDED LIFETIME MAINTENANCE ALERT ACTIVATION 6.
- DEVICE LIFETIME MAINTENANCE ACKNOWLEDGE 7
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  - 3. REMAINING SENSOR LIFETIME
  - MAINTENANCE REQUIRED LIMIT 4
  - MAINTENANCE DEMANDED LIMIT 5
  - MAINTENANCE ALERT ACTIVATION 6.
  - 7. SENSOR LIFETIME MAINTENANCE ACKOWLEDGE

- 3. SERVICE INTERVAL 1. TOTAL SERVICE INTERVAL
  - 2. TIME ELAPSED SINCE LAST SERVICE
  - 3.
  - REMAINING LIFETIME MAINTENANCE REQUIRED LIMIT MAINTENANCE DEMANDED LIMIT 4.
  - 5.
  - MAINTENANCE ALERT ACTIVATION 6.
  - SERVICE ACKNOWLEDGE 7.
- 4. CALIBRATION INTERVAL

  - 1. TOTAL CALIBRATION INTERVAL 2. TIME ELAPSED SINCE LAST CALIBRATION
  - **3. REMAINING LIFETIME**

  - 4. MAINTENANCE REQUIRED LIMIT 5. MAINTENANCE DEMANDED LIMIT
  - 6. MAINTENANCE ALERT ACTIVATION 7. CALIBRATION ACKNOWLEDGE
- 5. POWERED DAYS
- 6. POWER ON RESETS 7. LCD FAST MODE 8. LCD CONTRAST
- 5. COMMUNICATION

1. COMMUNICATION CONTROL

6. SECURITY

- 1. WRITE PROTECT
- 2. PIN TO UNLOCK
- 7. LANGUAGE 1. LANGUAGE

#### C.4 **HART** Version

SITRANS LR200 conforms to HART rev. 5.

#### C.5 **Burst Mode**

SITRANS LR200 does not support burst mode.

# Certificates and support

# D.1 Technical support

## **Technical support**

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

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

## Internet Service & Support

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

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

### Personal contact

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

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

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

## Documentation

You can find documentation on various products and systems at:

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

# D.2 Certificates

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

# D.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

Ε

- 1. QUICK START
  - 1.1 LANGUAGE
  - **1.2 MATERIAL**
  - **1.3 RESPONSE RATE**
  - 1.4 UNITS
  - 1.5 OPERAT. MODE
  - 1.6 LOW CALIB. PT.
  - 1.7 HIGH CALIB. PT.
  - 1.8 APPLY?
- 2. SETUP
  - 2.1 DEVICE
    - 2.1.1 HARDWARE REV
    - 2.1.2 FIRMWARE REV
    - 2.1.3 LOADER REV
    - 2.1.4 ORDER OPTION
  - 2.2 SENSOR
    - 2.2.1 UNITS
    - 2.2.2 SENSOR MODE
    - 2.2.3 MATERIAL
    - 2.2.4 DAMPING FILTER
    - 2.2.5 ANTENNA
  - 2.3 CALIBRATION
    - 2.3.1 LOW CALIB. PT.
    - 2.3.2 HIGH CALIB. PT.
    - 2.3.3 SENSOR OFFSET
  - 2.4 RATE
    - 2.4.1 RESPONSE RATE
    - 2.4.2 FILL RATE /MIN
    - 2.4.3 EMPTY RATE /MIN
  - 2.5 FAIL-SAFE
    - 2.5.1 MATERIAL LEVEL
    - 2.5.2 TIMER
    - 2.5.3 LEVEL
  - 2.6 ANALOG OUT. SCAL.
    - 2.6.1 CURR. OUT. FUNC.
      - 2.6.2 4 MA SETPOINT

2.6.3 20 MA SETPOINT 2.6.4 MIN. MA LIMIT 2.6.5 MAX. MA LIMIT 2.6.6 MA OUTPUT VALUE 2.7 LINEARIZATION 2.7.1 VOLUME 2.7.1.1 VESSEL SHAPE 2.7.1.2 MAX. VOLUME 2.7.1.3 DIMENS. A 2.7.1.4 DIMENS. L 2.7.2 TABLE 1 – 8 2.7.3 TABLE 9 - 16 2.7.4 TABLE 17 - 24 2.7.5 TABLE 25 - 32 2.8 SIGNAL PROC. 2.8.1 NEAR RANGE 2.8.2 FAR RANGE 2.8.3 PROPAG. FACTOR 2.8.4 ECHO SELECT 2.8.4.1 ALGORITHM 2.8.4.2 POS. DETECT 2.8.4.3 ECHO THRESHOLD 2.8.4.4 CLEF RANGE 2.8.5 SAMPLING 2.8.5.1 ECHO LOCK 2.8.5.2 UP SAMP. 2.8.5.3 DOWN SAMP. 2.8.6 ECHO QUALITY 2.8.6.1 CONFIDENCE 2.8.6.2 ECHO STRENGTH 2.8.6.3 NOISE AVERAGE 2.8.7 TVT SETUP 2.8.7.1 AUTO ECHO SUPP 2.8.7.2 AUTO SUPP RANGE 2.8.7.3 HOVER LEVEL 2.8.7.4 SHAPER MODE 2.8.8 TVT SHAPER 2.8.8.1 BRKPT. 1-9 2.8.8.2 BRKPT. 10-18 2.8.8.3 BRKPT. 19-27 2.8.8.4 BRKPT. 28-36

2.8.8.5 BRKPT. 37-40

2.8.9 MEAS. VALUES

2.8.9.1 LEVEL MEAS.

2.8.9.2 SPACE MEAS.

2.8.9.3 DISTANCE MEAS.

2.8.9.4 VOLUME MEAS.

3. DIAGNOSTICS

3.1 ECHO PROFILE

3.2 ELECTRONICS TEMP.

3.2.1 CURR. INTERN. TEMP.

3.2.2 HIGHEST VALUE.

3.2.3 LOWEST VALUE.

#### 4. SERVICE

4.1 MASTER RESET

4.2 REMAIN. DEV. LIFE

4.2.1 LIFETIME EXPECTE..

4.2.2 TIME IN OPER ..

4.2.3 REMAIN. LIFETIM..

4.2.4 REMINDER ACTIV.

4.2.5 REMINDER 1 (REQ)

4.2.6 REMINDER 2 (DEM)

4.2.7 MAINT STAT

4.2.8 ACK STATUS

4.2.9 ACK

4.3 REMAIN. SENS. LIFE

4.3.1 LIFETIME EXPECTE..

4.3.2 TIME IN OPER..

4.3.3 REMAIN. LIFETIM..

4.3.4 REMINDER ACTIV.

4.3.5 REMINDER 1 (REQ)

4.3.6 REMINDER 2 (DEM)

4.3.7 MAINT STAT

4.3.8 ACK STATUS

## 4.3.9 ACK

4.4 SERVICE SCHED.

4.4.1 SERV. INTERVAL

4.4.2 TIME SINCE LAST

4.4.3 TIME UNTIL NEXT

4.4.4 REMINDER ACTIV.

4.4.5 REMINDER 1 (REQ)

4.4.6 REMINDER 2 (DEM)

4.4.8 ACK STATUS 4.4.9 ACK 4.5 CALIB.SCHED. 4.5.1 CALIB. INTERVAL 4.5.2 TIME SINCE LAST 4.5.3 TIME UNTIL NEXT 4.5.4 REMINDER ACTIV. 4.5.5 REMINDER 1 (REQ) 4.5.6 REMINDER 2 (DEM) 4.5.7 MAINT STAT 4.5.8 ACK STATUS 4.5.9 ACK 4.6 MANUF. DATE **4.7 POWERED HOURS 4.8 POWERON RESETS** 4.9 LCD FAST MODE 4.10 LCD CONTRAST 4.11 MEM. TEST 5. COMMUNICATION 5.1 DEVICE ADDRESS 6. SECURITY **6.1 REMOTE ACCESS** 6.1.1 ACCESS CONTROL **6.2 LOCAL ACCESS** 6.2.1 WRITE PROTECT 6.2.2 PIN TO UNLOCK 7. LANGUAGE

4.4.7 MAINT STAT

# Abbreviations

Short form	Long form	Description	Units
CE / FM / CSA	Conformité Européenne / Factory Mutual / Canadian Standards Association	safety approval	
Ci	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		
li	Input current		mA
lo	Output current		mA
IS	Intrinsically Safe	safety approval	
Li	Internal inductance		mH
mH	milliHenry	10 <sup>-3</sup>	Н
μF	microFarad	10-6	F
μs	microsecond	10 <sup>-6</sup>	S
PED	Pressure Equipment Directive	safety approval	
pF	pico Farads	10 <sup>-12</sup>	F
ppm	parts per million		
PV	Primary Variable	measured value	
SV	Secondary Variable	equivalent value	
ТВ	Transducer Block		
TVT	Time Varying Threshold	sensitivity threshold	
Ui	Input voltage		V
Uo	Output voltage		V

# Glossary

accuracy	degree of conformity of a measure to a standard or a true value.		
agitator	mechanical apparatus for mixing or aerating. A device for creating turbulence.		
algorithm	a prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.		
ambient temperature			
	the temperature of the surrounding air that comes in contact with the enclosure of the device.		
antenna	an aerial which sends out and receives a signal in a specific direction. There are four basic types of antenna in radar level measurement, horn, parabolic, rod, and waveguide.		
attenuation			
	a term used to denote a decrease in signal magnitude in transmission from one point to another. Attenuation may be expressed as a scalar ratio of the input magnitude to the output magnitude or in decibels.		
Auto False-Echo Suppression			
	a technique used to adjust the level of a TVT to avoid the reading of false echoes. (See TVT.)		
Auto False-Echo Suppression Distance			
	defines the endpoint of the TVT distance. (See TVT.) This is used in conjunction with auto false echo suppression.		
beam 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  $1 \,\mu V$  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.

## HART

Highway Addressable Remote Transducer. An open communication protocol used to address field instruments.

Hertz (Hz):	unit of frequency, one cycle per second. 1 Gigahertz (GHz) is equal to 109 Hz.
horn antenna	a conical, horn-shaped antenna which focuses microwave signals. The larger the horn diameter, the more focused the radar beam.
inductance	the property of an electric circuit by virtue of which a varying current induces an electromotive force in that circuit or in a neighboring circuit. The unit is a Henry.
microwaves	the term for the electromagnetic frequencies occupying the portion of the radio frequency spectrum from 1 GHz to 300 GHz.
multiple echoes	secondary echoes that appear as double, triple, or quadruple echoes in the distance from the target echo.
Near Blanking	see Blanking.
nozzle	a length of pipe mounted onto a vessel that supports the flange.
parameters	in programming, variables that are given constant values for specific purposes or processes.
polarization	the property of a radiated electromagnetic wave describing the time-varying direction and amplitude of the electric field vector.
polarization error	the error arising from the transmission or reception of an electromagnetic wave having a polarization other than that intended for the system.

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 <b>RA</b> dio <b>D</b> etection <b>And R</b> anging. A device that radiates electromagnetic waves and utilizes the reflection of such waves from distant objects to determine their existence or position.		
range			
0	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 permittivi	ity		
·	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 <b>Sensor Mode (2.2.2.)</b> for an illustration).		
shot			
	one transmit pulse or measurement.		

## speed of light

the speed of electromagnetic waves (including microwave and light) in free space. Light speed is a constant 299, 792, 458 meters per second.

#### stilling-well

see stillpipe.

### stillpipe

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

## TVT (Time Varying Threshold)

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

### two wire radar

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

#### waveguide antenna

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

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