

SIEMENS

SITRANS

Radar transmitters SITRANS LR200

Compact Operating Instructions

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Legal information

Warning notice system

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

WARNING

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

Trademarks

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

Disclaimer of Liability

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

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Introduction

1.1 Purpose of this documentation


These instructions are a brief summary of important features, functions and safety information, and contain all information required for safe use of 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 who install and commission the device.

To realize optimum performance from the device, read the complete operating instructions.

1.2 Checking the consignment

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

 WARNING
Using a damaged or incomplete device Risk of explosion in hazardous areas. <ul style="list-style-type: none">• 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.
<ul style="list-style-type: none">• Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Performance (Page 39).

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.

1.6 Industrial use

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

1.7 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.

1.8 Communication protocol mA/HART and Profibus PA

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

- SIMATIC PDM
- Pactware/SITRANS 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).

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.

WARNING

Improper device modifications

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

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

2.2 Laws and directives

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)

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
<p>Use on a "no-interference, no-protection" basis</p> <p>The installation of the LPR/TLPR device shall be done by trained installers, in strict compliance with the manufacturer's instructions.</p> <ul style="list-style-type: none"> 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.

2.2.1 CE Electromagnetic Compatibility (EMC) Conformity

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

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

2.2.2 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: $\Delta d \leq \pm 50$ mm

2.2.3 Conformity with European directives

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

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
Low voltage directive LVD 2014/35/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
Atmosphère explosible ATEX 2014/34/EU	Directive of the European Parliament and the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
RED 2014/53/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC

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

2.2.4 Requirements for special applications

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

Note

Operation under special ambient conditions


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


2.3 Use in hazardous areas

Qualified personnel for hazardous area applications

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

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

 WARNING
Use in hazardous area Risk of explosion. <ul style="list-style-type: none">• Only use equipment that is approved for use in the intended hazardous area and labeled accordingly.• Do not use devices that have been operated outside the conditions specified for hazardous areas. If you have used the device outside the conditions for hazardous areas, make all Ex markings unrecognizable on the nameplate.

 WARNING
Loss of safety of device with type of protection "Intrinsic safety Ex i" If the device or its components have already been operated in non-intrinsically safe circuits or the electrical specifications have not been observed, the safety of the device is no longer ensured for use in hazardous areas. There is a risk of explosion. <ul style="list-style-type: none">• 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 38).

2.4 Lithium batteries

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



WARNING


Potential hazard

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

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

Installing/mounting


3.1 Basic safety notes


 CAUTION
Hot surfaces resulting from hot process media Risk of burns resulting from surface temperatures above 65 °C (149 °F). <ul style="list-style-type: none">• 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 Technical data (Page 38).


Note


Material compatibility

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

 WARNING
Unsuitable connecting parts Risk of injury or poisoning. In case of improper mounting, hot, toxic, and corrosive process media could be released at the connections. <ul style="list-style-type: none">• Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

 WARNING
Exceeded maximum permissible operating pressure Risk of injury or poisoning. The maximum permissible operating pressure depends on the device version, pressure limit and temperature rating. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released. Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical data (Page 38).

 WARNING
Pressure applications Danger to personnel, system and environment can result from improper installation. <ul style="list-style-type: none">• Improper installation may result in loss of process pressure.

 CAUTION
External stresses and loads Damage to device by severe external stresses and loads (e.g. thermal expansion or pipe tension). Process media can be released. <ul style="list-style-type: none">• Prevent severe external stresses and loads from acting on the device.

3.2 Installation location requirements

NOTICE
Strong vibrations Damage to device. <ul style="list-style-type: none">• In installations with strong vibrations, mount the transmitter in a low vibration environment.

NOTICE
Aggressive atmospheres Damage to device through penetration of aggressive vapors. <ul style="list-style-type: none">• Ensure that the device is suitable for the application.

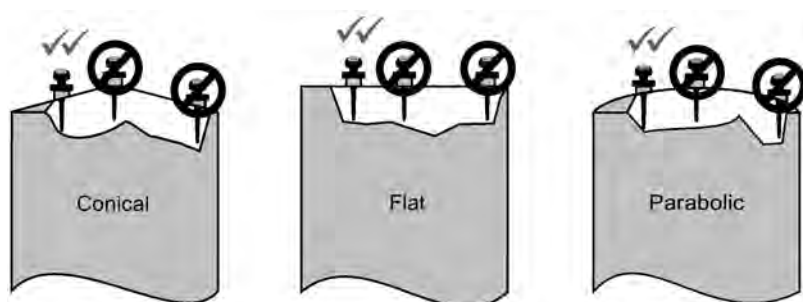
NOTICE
Direct sunlight Device damage. The device can overheat or materials become brittle due to UV exposure. <ul style="list-style-type: none">• Protect the device from direct sunlight.• Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Operating conditions (Page 41).

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.

**NOTICE****Incorrect mounting**

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

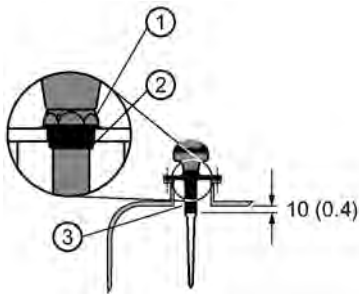
- Before installing ensure there is no visible damage to the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools.

3.3 Installation instructions

3.3.1 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.

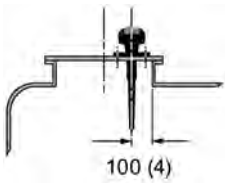
The end of the shield section or end of the horn should protrude a minimum of 10 mm (0.4") to avoid false echoes being reflected from the nozzle.



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

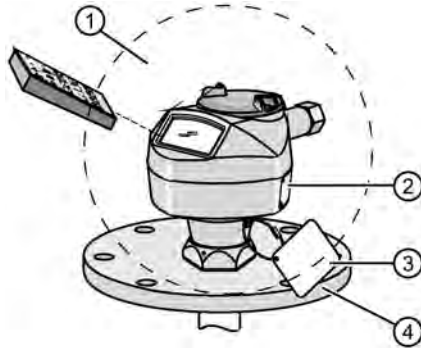
Location on a manhole cover

- 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.



3.3.2 Access for programming

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



- ① Ambient temperature (surrounding enclosure volume)
-40 to +80 °C (-40 to +176 °F)
- ② Device nameplate
- ③ Process device tag
- ④ Process temperature
 - Polypropylene rod: -40 to +80 °C (-40 to +176 °F)
 - PTFE or SS horn: -40 to +200 °C (-40 to +392 °F)

3.3.3 Installation instructions

Note

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

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

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

3.3 Installation instructions

- 3. If you want to rotate the enclosure, use a 2 mm Allen key to loosen the set screws that secure the locking ring¹⁾.
- 4. Once the enclosure is in a suitable position, tighten the set screws.



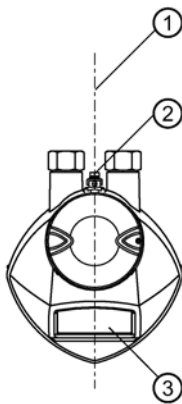
① Locking ring¹⁾ over threaded connection; secured by three 2 mm Allen set screws

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

3.3.4 Orientation in a vessel with obstructions

3.3.4.1 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 more detail, refer to section "Mounting on a stillpipe or bypass pipe" in the full operating instructions.



- ① Polarization axis
- ② Polarization reference point
- ③ Display

3.4 Disassembly

3.4.1 Incorrect disassembly

 WARNING
Incorrect disassembly The following risks may result from incorrect disassembly: <ul style="list-style-type: none">- 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: <ul style="list-style-type: none">• 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

4.1 Basic safety notes

 **WARNING**

Unsuitable cables, cable glands and/or plugs

Risk of explosion in hazardous areas.

- Use only cable glands/plugs that comply with the requirements for the relevant type of protection.
- Close unused cable inlets for the electrical connections.
- When replacing cable glands use only cable glands of the same type.
- After installation check that the cables are seated firmly.

 **WARNING**

Missing PE/ground connection

Risk of electric shock.

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

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

 **WARNING**

Incorrect connection to power source

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

- The DC input terminals shall be supplied from a source providing electrical isolation between the input and output, in order to meet the applicable safety requirements of IEC 61010-1. For example, Class 2 or Limited Energy Source.
- All field wiring must have insulation suitable for rated voltages.

 **WARNING**

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

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

 **WARNING**

Improper laying of shielded cables

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

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

Note

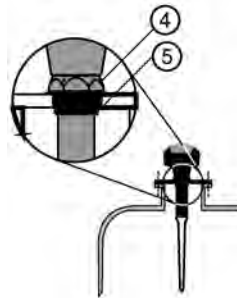
Electromagnetic compatibility (EMC)

For metal housings there is an increased electromagnetic compatibility compared to high-frequency radiation. This protection can be increased by grounding the housing, see Connecting SITRANS LR200 (Page 21).

4.2 Connecting SITRANS LR200

Note

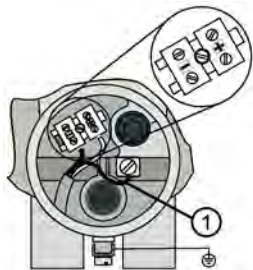
- Check the nameplate on your instrument, to verify the approval rating.
 - Use appropriate conduit seals to maintain IP or NEMA rating.
 - See Nameplates for hazardous area installations (Page 23).
 - Use a twisted pair cable: AWG 22 to 14 (0.34 mm² to 2.5 mm²).
 - Separate cables and conduits may be required to conform to standard instrumentation wiring practices or electrical codes.
-



- ① Use a 2 mm Allen key to loosen the lid-lock set screw. ④ Locking ring
- ② Plug ⑤ Threaded connection
- ③ Optional cable gland^{1) 2)} (or NPT cable entry²⁾)

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 gland²⁾.
2. Connect the wires to the terminals as shown: the polarity is identified on the terminal block.
3. Ground the instrument according to local regulations.
4. Tighten the gland to form a good seal.
5. Close the lid and secure the locking ring before programming and device configuration



- ① Cable shield (if used)

¹⁾ May be shipped with the device.

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

Note

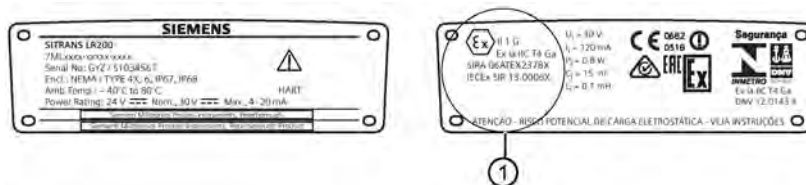
For devices with Profibus PA:

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

4.3 Nameplates for hazardous area installations

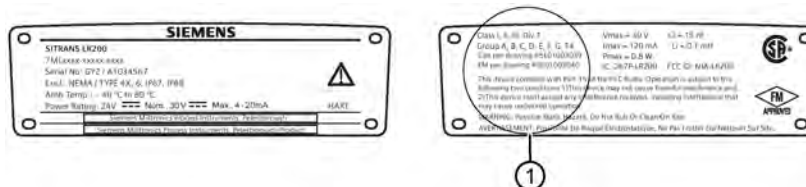
4.3.1 mA HART

4.3.1.1 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.

4.3.1.2 Device nameplate (FM/CSA)



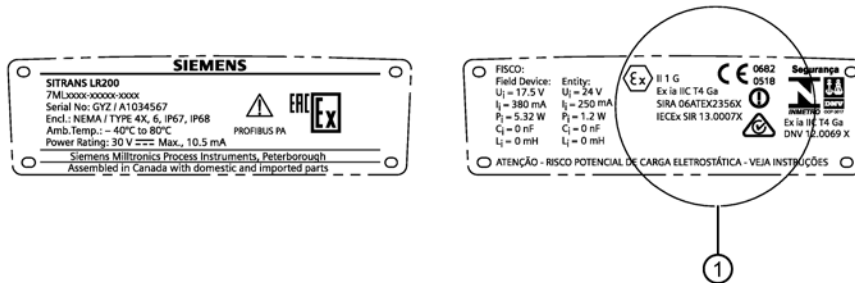
- ① FM Intrinsically Safe connection drawing number **A5E01003040** and CSA Intrinsically Safe connection drawing number **A5E01003039** can be downloaded from the product page of our website at: www.siemens.com/LR200 (www.siemens.com/LR200). Go to Support > Installation Drawings > Level Measurement > Continuous - Radar.
- For 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 25).

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.

4.3.2 PROFIBUS PA

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



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

4.3.2.2 Device nameplate (FM/CSA)



- ① The FM/CSA Intrinsically Safe connection drawing number 23650529 can be downloaded from the product page of our website at LR200 (www.siemens.com/LR200). Go to Support > Approvals/Certificates.
- For wiring requirements: follow local regulations.
 - Approved dust-tight and water-tight conduit seals are required for outdoor Type 4X / Type 6, IP67, IP68 locations.

4.4 Instructions specific to hazardous area installations

4.4.1 mA HART

4.4.1.1 (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.
2. 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 $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$.
5. The equipment has not been assessed as a safety related device (as referred to by Directive 2014/34/EU Annex II, clause 1.5).
6. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
7. The equipment contains no user-replaceable parts and is not intended to be repaired by the user. Repair of the equipment is to be carried out by the manufacturer, or their approval agents, in accordance with the applicable code of practice.
8. The certificate numbers have an 'X' suffix, which indicates that special conditions for safe use apply. Those installing or inspecting this equipment must have access to the certificates.)
9. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.
 - Aggressive substances (e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials).
 - Suitable precautions (e.g. establishing from the material's data sheet that it is resistant to specific chemicals).

Specific conditions of use

- Parts of the enclosure may be non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam), which might cause a build-up of electrostatic charge on non-conducting surfaces.
- Aluminium, magnesium, titanium or zirconium may be used at the accessible surface of the equipment. In the event of rare incidents, ignition sources due to impact and friction sparks could occur. This shall be considered when the Sitrans LR200 is being installed in locations that specifically require Equipment Protection Level Ga
- The end user must ensure that the explosion protection and ingress protection is maintained at each entry to the enclosure by use of an appropriate blanking element or cable entry device that meets the requirements of the protection concepts type 'n' or increased safety 'e' or flameproof 'd'.

4.4.2 PROFIBUS PA

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

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


1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 1G equipment per SIRA 06ATEX2356X, and Category 3G equipment per SIRA 09ATEX4152X.
3. The equipment may be used with flammable gases and vapors with apparatus group IIC, IIB, and IIA, and temperature classes T1, T2, T3, and T4.
4. The equipment is certified for use in an ambient temperature range of $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$.
5. The equipment has not been assessed as a safety related device (as referred to by Directive 2014/34/EU Annex II, clause 1.5).
6. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
7. The equipment contains no user-replaceable parts and is not intended to be repaired by the user. Repair of the equipment is to be carried out by the manufacturer, or their approval agents, in accordance with the applicable code of practice.
8. The certificate numbers have an 'X' suffix, which indicates that special conditions for safe use apply. Those installing or inspecting this equipment must have access to the certificates.)
9. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.


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


Specific conditions of use

- Parts of the enclosure may be non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam), which might cause a build-up of electrostatic charge on non-conducting surfaces.
- Aluminium, magnesium, titanium or zirconium may be used at the accessible surface of the equipment. In the event of rare incidents, ignition sources due to impact and friction sparks could occur. This shall be considered when the Sitrans LR200 is being installed in locations that specifically require Equipment Protection Level Ga
- The end user must ensure that the explosion protection and ingress protection is maintained at each entry to the enclosure by use of an appropriate blanking element or cable entry device that meets the requirements of the protection concepts type 'n' or increased safety 'e' or flameproof 'd'.

5.1 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. <ul style="list-style-type: none">• Before venting ensure that there are no toxic gases or liquids in the device, or take the appropriate safety measures.

 WARNING
Hot surfaces Risk of burns resulting from hot surfaces. <ul style="list-style-type: none">• Take corresponding protective measures, for example by wearing protective gloves.

 WARNING
Loss of explosion protection Risk of explosion in hazardous areas if the device is open or not properly closed. <ul style="list-style-type: none">• Close the device as described in Installing/mounting (Page 13).

5.2 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 32))
- from a remote location (see Operating via SIMATIC PDM (Page 34), or Operating via AMS Device Manager (Page 34))

For more complex setups, see the chapter "Application Examples" in the full operating instructions. For the complete range of parameters, see the chapter "Parameter Reference" in the full operating instructions.

5.3 Activating SITRANS LR200

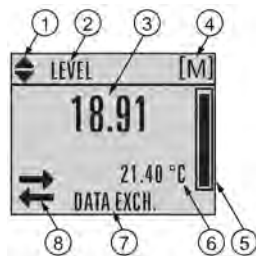
Power up the instrument. SITRANS LR200 automatically starts up in Measurement mode. A transition screen showing the current firmware revision and an incrementing line of stars is displayed while the first measurement is being processed.

Press Mode  to toggle between Measurement and Program Mode.

5.4 The LCD display

Measurement mode display

Normal operation

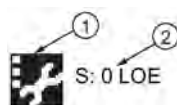


- ① Toggle indicator ¹⁾ for linear units or %
- ② Selected operation: level, space, distance, or volume
- ③ Measured value (level, space, distance, or volume)
- ④ Units
- ⑤ Bar graph indicates level
- ⑥ Secondary region indicates on request ²⁾ electronics temperature, echo confidence, loop current (for mA/HART version), or distance
- ⑦ Text area displays status messages
- ⑧ Device status indicator. For more detail, see "Device status icons" in Diagnosing and Troubleshooting chapter of full operating instructions.

¹⁾ Press **UP** or **DOWN** arrow to switch.

²⁾ In response to a key press request.

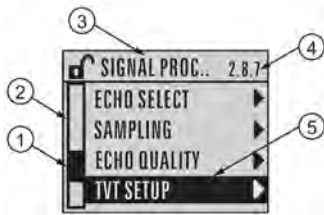
Fault present



- ① Device status indicator
- ② Text area displays status messages

PROGRAM mode display

Navigation view



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

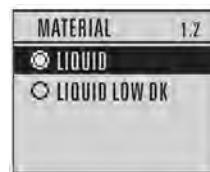
- A visible menu bar indicates the menu list is too long to display all items.
- A band halfway down the menu bar indicates the current item is halfway down the list.
- The depth and relative position of the item band on the menu bar indicates the length of the menu list, and approximate position of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

Parameter view












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

Edit view



5.5 Key functions in measurement mode






Key functions in measurement mode

Key	Function	Result
	Updates the loop current (for mA/HART version only)	New value is shown in secondary region of local display.
	Updates internal enclosure temperature reading	
	Updates echo confidence value	New value is shown in secondary region of local display.
	Updates distance measurement	
	Mode opens PROGRAM mode	Opens the menu level last displayed in this power cycle, unless power has been cycled since exiting PROGRAM mode or more than 10 minutes have elapsed since PROGRAM mode was used. Then top level menu will be displayed.
	Home toggles local display	Local display toggles between % or linear units
	RIGHT arrow opens PROGRAM mode	Opens the top level menu.
 	UP or DOWN arrow toggles between linear units and percent	Local display shows measured value in either linear units or percent.

5.6 Quick Start Wizard via the handheld programmer

1. Quick Start

1.1. Quick Start Wiz

- Point the programmer at the display from a maximum distance of 300 mm (1 ft), then press **RIGHT arrow**  to activate PROGRAM mode and open menu level 1.
- Press **RIGHT arrow**  twice to navigate to menu item 1.1 and open parameter view.
- Press **RIGHT arrow**  to open Edit mode or **DOWN arrow** to accept default values and move directly to the next item.
- To change a setting, scroll to the desired item or key in a new value.
- After modifying a value, press **RIGHT arrow**  to accept it and press **DOWN arrow**  to move to the next item.

Language

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

Options	English, Deutsch, Français, Español
---------	-------------------------------------

Material

Selects the appropriate echo processing algorithms for the material.

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

¹⁾ dK < 3.0

Response Rate

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

Options	Response Rate (2.4.1.)	Fill rate per Minute (2.4.2.) / Empty rate per Minute (2.4.3.)
	SLOW	0.1 m/min (0.32 ft/min)
	MED	1.0 m/min (3.28 ft/min)
	FAST	10.0 m/min (32.8 ft/min)

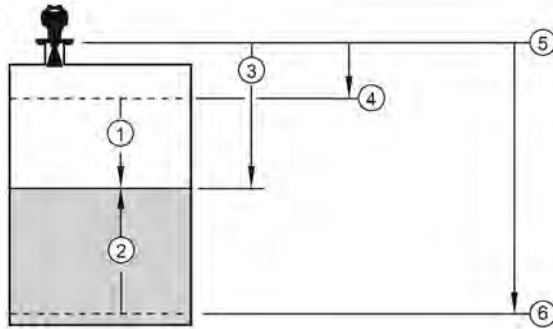
Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

Units

Sensor measurement units.

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

Operating Mode



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

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

¹⁾ The point from which High and Low Calibration points are referenced. See the chapter "Dimensions" in full operating instructions.

Low Calibration Point

Distance from Sensor Reference to Low Calibration Point: usually process empty level.

Values	Range: 0.00 to 20.00 m
---------------	------------------------

High Calibration Point


Distance from Sensor reference point to High Calibration Point: usually process full level.

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.

5.7 Remote operation

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

5.7.2 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/>)

Service and maintenance

6.1 Maintenance and repair

6.1.1 Unit Repair and Excluded Liability

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

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

6.1.2 Maintenance

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

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

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

 WARNING
--

Impermissible repair of the device

- | |
|--|
| <ul style="list-style-type: none"> • Repair must be carried out by Siemens authorized personnel only. |
|--|

NOTICE

Penetration of moisture into the device
--

Device damage.

- | |
|---|
| <ul style="list-style-type: none"> • Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device. |
|---|

6.2 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.

6.3 Return procedure

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

Required forms

- Delivery note
- Return goods delivery note
(<http://www.siemens.com/processinstrumentation/returngoodsnote>)
with the following information:
 - Product (item description)
 - Number of returned devices/replacement parts
 - Reason for returning the item(s)
- Decontamination declaration (<http://www.siemens.com/sc/declarationofdecontamination>)

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

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

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

6.4 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>)

6.5 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 parameter "Sensor offset" to compensate.

Technical data

7.1 Power

mA/HART

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

Profibus PA

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

7.2 HART Communication

Load	230 to 600 Ω , 230 to 500 Ω when connecting a coupling module
Max. line length	multi-wire: \leq 1500 m (4921 ft)
Protocol	HART, Version 5.1

7.3 Interface

Configuration					
	<table border="1"> <tr> <td>remote</td> <td> <ul style="list-style-type: none"> Siemens SIMATIC PDM AMS Device Manager (PC) (for HART devices) </td> </tr> <tr> <td>local</td> <td> <ul style="list-style-type: none"> Siemens infrared handheld programmer HART handheld communicator (for HART devices) </td> </tr> </table>	remote	<ul style="list-style-type: none"> Siemens SIMATIC PDM AMS Device Manager (PC) (for HART devices) 	local	<ul style="list-style-type: none"> Siemens infrared handheld programmer HART handheld communicator (for HART devices)
remote	<ul style="list-style-type: none"> Siemens SIMATIC PDM AMS Device Manager (PC) (for HART devices) 				
local	<ul style="list-style-type: none"> Siemens infrared handheld programmer HART handheld communicator (for HART devices) 				
Display (local) ¹⁾	graphic LCD with bar graph representing level				

¹⁾ Display quality will be degraded in temperatures below $-25\text{ }^{\circ}\text{C}$ ($-13\text{ }^{\circ}\text{F}$) and above $+65\text{ }^{\circ}\text{C}$ ($+149\text{ }^{\circ}\text{F}$).

7.4 Performance

Reference operating conditions according to IEC 60770-1	
Ambient temperature	15 to 25 °C (59 to 77 °F)
Storage temperature	15 to 25 °C (59 to 77 °F)
Humidity	45% to 75% relative humidity
Ambient pressure	860 to 1060 mbar g (86000 to 106000 N/m ² g)
Measurement accuracy (measured in accordance with IEC 60770-1)	
Maximum measured error (including hysteresis and non-repeatability)	
From end of antenna to 600 mm (1.96 ft)	40 mm (1.57")
Remainder of range	10 mm (0.4") or 0.1% of span (whichever is greater)
Frequency	C band, approx. 6 GHz
Max. measurement range¹⁾	20 m (65.6 ft)
Min. detectable distance¹⁾	
3", 4", and 6" horn ²⁾	300 mm (11.8")
8" horn	330 mm (12.9")
PP rod, 100 mm internal shield	417 mm (16.4")
417 mm (16.4") • PP rod, 250 mm internal shield	567 mm (22.3")
PTFE rod, unshielded	417 mm (16.4")
PTFE rod, 100 mm external shield	474 mm (18.6")
PTFE rod, 250 mm external shield	624 mm (24.5")
Update time¹⁾	
Minimum 1 second, depending on settings for parameters "Response rate" and "LCD fast mode"	
Influence of ambient temperature	
< 0.003%/K (average over full temperature range, referenced to maximum range)	
Dielectric constant of material measured	
dK > 3 (for < 3 use waveguide antenna or stillpipe)	
Memory	
<ul style="list-style-type: none"> • non-volatile EEPROM • no battery required 	

¹⁾ From sensor reference point. For the sensor reference point for each configuration, see the chapter "Dimension drawings" in the full operating instructions.

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

7.5 Construction

Process connections

Threaded connection		
	Polypropylene rod antenna	<ul style="list-style-type: none"> • 1.5" NPT (ANSI/ASME B1.20.1) • R (BSPT, EN 10226-1) • or, G (BSPP, EN ISO 228-1)
	PTFE antenna, 316L/1.4404 stainless steel or 316L/1.4435 stainless steel	<ul style="list-style-type: none"> • 2" NPT (ANSI/ASME B1.20.1) • R (BSPT, EN 10226-1) • or, G (BSPP, EN ISO 228-1)
Flange connection (flat face)	316L/1.4404 stainless steel or 316L/1.4435 stainless steel	<ul style="list-style-type: none"> • 2", 3", 4" (ASME 150 lb, 300 lb) • DN50, DN80, DN100, DN150, DN200 (PN16, PN40) • 50A, 80A, 100A (JIS 10K)
Flange connection (raised face)	316L/1.4404 stainless steel or 316L/1.4435 stainless steel	<ul style="list-style-type: none"> • DN80, DN100, DN150 (PN16, PN40) per EN 1092-1 B1 • DN200 (PN16) per EN 1092-1 B1

Antenna

Polypropylene rod	hermetically sealed construction standard 100 mm (4") shield for maximum 100 mm (4") nozzle, or optional 250 mm (10") long shield
PTFE rod	refer to the chapter Dimensions drawings in the full operating instructions
Horns/waveguide	refer to the chapter Dimensions drawings in the full operating instructions

Enclosure

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

7.6 Operating conditions

Note

- Check Approvals data (Page 41) for the specific configuration you are about to use to install.
- Use appropriate conduit seals to maintain IP or NEMA rating.

Location	indoor/outdoor
Altitude	5000 m (16,404 ft) max.
Ambient temperature	-40 to +80 °C (-40 to +176 °F)
Relative humidity	suitable for outdoor Type 4X, Type 6, IP67, IP68
Installation category	I
Pollution degree	4

7.7 Approvals data

Note

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

General	CSAus/c, FM, CE, RCM	
Radio	Europe (RED), FCC, Industry Canada	
Marine	Lloyd's Register of Shipping, ABS Type Approval	
Hazardous	Intrinsically Safe	
	Europe	ATEX II 1 G Ex ia IIC T4 Ga
	International	IECEX SIR 13.0006X (HART) IECEX SIR 13.0007X (PROFIBUS PA) Ex ia IIC T4 Ga
	US/Canada	FM/CSA: <ul style="list-style-type: none"> • Class I, Div. 1, Groups A, B, C, D • Class II, Div. 1, Groups E, F, G • Class III T4
	Brazil	INMETRO: DNV 12.0143X (HART) INMETRO: DNV 12.069X (PROFIBUS PA) 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

Flameproof (HART only)		
	Europe	ATEX II 1/2 G Ex d mb ia IIC T4 Ga/Gb
	China	NEPSI Ex d ia mb IIC T4 Ga/Gb
Increased safety (HART only)		
	Europe	ATEX II 1/2 G Ex e mb ia IIC T4 Ga/Gb
	China	NEPSI Ex d ia mb IIC T4 Ga/Gb
Explosion proof (HART only)		
	US/Canada	FM/CSA: Class I, Div. 1, Groups A, B, C, D Class II, Div. 1, Groups E, F, G Class III T4

7.8 Process

Process temperature¹⁾	
Polypropylene rod	40 to +80 °C (40 to +176 °F)
PTFE rod or SS horn	40 to +200 °C (40 to +392 °F)
Pressure (vessel)	up to 40 bar, gauge (580 psi, gauge) ¹⁾

¹⁾ The maximum temperature is dependent on the process connection, antenna materials, and vessel pressure. For more detail, or for other configurations, see chapter "Dimension drawings" in the full operating instructions.

7.9 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

Certificates and support

A.1 Technical support

Technical support

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

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

Internet Service & Support

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

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

Personal contact

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

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

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

Documentation

You can find documentation on various products and systems at:

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

A.2 Certificates

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

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