SIEMENS

SITRANS L

Radar level transmitters SITRANS LR500 series with mA/ HART

Operating Instructions

7ML571..(LR500 Threaded lens antenna) 7ML573.. (LR500 Flanged encapsulated antenna) 7ML575.. (Polymeric horn antenna) 7ML578..(Flanged lens antenna)

03/2024
A5E51099898-AA

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 Aktiengesellschaft. 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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Getting started

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1.1 Getting started

Condition

You have read the following safety instructions:

- General safety information (Page 19)
- Basic safety information: Installing/mounting (Page 35)
- Basic safety information: Connecting (Page 49)
- Basic safety information: Commissioning (Page 61)

Read the entire document in order to achieve the optimum performance of the device.

Procedure

1. **Install/mount the device.**
   Installing/mounting (Page 35)
2. **Connect the device.**
   Connecting (Page 49)
3. **Power up the device.**
   Activating SITRANS LR500 series (Page 64)
4. **Configure the device via quick commissioning wizard:**
   Quick commissioning (Page 69)

You can find additional functions in the section Parameter assignment. (Page 113)

Introduction 2

2.1 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, connecting and commissioning the device, as well as service and maintenance engineers.

2.2 Document history

The following table shows major changes in the documentation compared to the previous edition.

Edition	Remark
03/2024	First edition

2.3 FW revision history

Sensor

Firmware revision	PDM EDD revision	Date	Changes
1.00.00	1.00.00	March 2024	• Initial release

HMI

Firmware revision	Date	Changes
1.00.00	March 2024	• Initial release

2.4 Product compatibility

The following table describes compatibility between manual edition, device revision, engineering system and associated Electronic Device Description (EDD).

Manual edition	Remarks	Device revision	Compatible version of device integration package	
03/2024	First edition	**HART** FW: 1.00.00 or later HW: 1.00.00 or later Device revision 1 or later	SIMATIC PDM V9.2	EDD: 1.00.00 or later

2.5 Designated use

Use the device in accordance with the information on the nameplate and in the Technical specifications (Page 169).

2.6 Checking the consignment

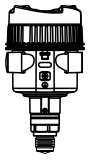
1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.
3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

WARNING
Using a damaged or incomplete device Risk of explosion in hazardous areas. • Do not use damaged or incomplete devices.

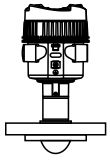
2.7 Items supplied

- SITRANS LR500 series radar level transmitter

LR510 threaded lens antenna

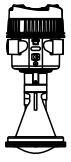


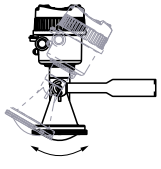
LR530 Flanged encapsulated antenna



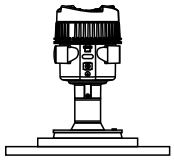
LR550 polymeric horn antenna

With mounting bracket (optional)





LR580 flange lens antenna



- HMI display (optional)

- Siemens Process Instrumentation documentation disk containing certificates, and manuals for ATEX approved devices

Note

Scope of delivery might vary, depending on version and add-ons. Ensure the scope of delivery and the information on the nameplate correspond to your order and the delivery note.

2.8 Industrial use note

NOTICE
Use in a domestic environment
This Class A Group 2 equipment is intended for use in industrial areas.
In a domestic environment this device may cause radio interference.

2.9 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 constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the 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/cert (https://www.siemens.com/cert).

2.10 Security note

NOTICE
Unauthorized product information or software Use only authorized Siemens websites when accessing any product information or software, including firmware updates, device integration files (EDD, for example), as well as other product documentation. Using unauthorized product information or software could result in a security incident, such as breach of confidentiality, or loss of integrity and availability of the system. For more information, see Product documentation and support (Page 199).

2.11 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 specifications (Page 169).

2.12 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

3

3.1 Preconditions for 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.

3.1.1 Warning symbols on the device

Symbol	Explanation
	Consult operating instructions
	Dispose of in an environmentally safe manner, and according to local regulations.

3.1.2 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 Part I) (Canada)

Further provisions for hazardous area applications are for example:

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

3.1.3 Conformity with European directives

The product described in this document is in conformity with the relevant harmonization legislation, and its amendments, of the European Union.

Explosive atmospheres directive 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
Radio equipment directive 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
Restriction of hazardous substances directive RoHS 2011/65/EU	Directive of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The applicable directives can be found in the EU Declaration of Conformity of the specific device.

3.1.4 Conformity with UK regulations

The UKCA marking on the device symbolizes the conformity with the following UK regulations:

Explosive atmospheres regulation UKEX SI 2016/1107	Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016
Radio equipment regulation RER SI 2017/1206	Radio Equipment Regulations 2017
Restrictions of hazardous substances regulation RoHS SI 2012/3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The applicable regulations can be found in the UKCA declaration of conformity of the specific device.

3.1.5 Improper device modifications

⚠ WARNING

Improper device modifications

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

- Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals. Do not operate the device after unauthorized modifications.

3.1.6 Industry Canada

The SITRANS LR500 complies with Industry Canada standard RSS211 (March 2024).

1. The installation of the SITRANS LR500 shall be done by trained installers, in strict compliance with the manufacturer's instructions.
2. 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.
3. The installer/user of this device shall ensure that it is at least 10 km from the Penticton radio astronomy station (British Columbia latitude: 49° 19' 12" N, longitude: 119° 37'12" W). For devices not meeting this 10 km separation (e.g. the Okanagan Valley, British Columbia) the installer/ user must coordinate with and obtain the written concurrence of the Director of the Penticton radio astronomy station before the equipment can be installed or operated. The Director of the DRAO may be contacted at 250-497-2300 or at NRC.DRAO-OFR.CNRC@nrc-cnrc.gc.ca. (Alternatively, the Manager, Regulatory Standards, Industry Canada, may be contacted.)

3.1.7 Industry Canada conformity note

Note

- This device has been tested and found to comply with the limits RS- 211 - Level Probing Radar Equipment. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- This device is certified to measure levels in fixed enclosed tanks made from metal, concrete or materials with similar RF attenuating properties.
- Devices equipped with the a 2 inch lens antenna or larger, may be used to measure levels in open air environments or outside enclosed tanks, subject to the following conditions:
  - Devices shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna’s main beam.
  - Devices shall be installed only at fixed locations. Devices shall not operate while being moved or while inside a moving container.
  - Hand-held applications and residential use are prohibited.

3.2 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.

3.3 Proper use

NOTICE
Protection from the device may become impaired The equipment is to be used only in the manner outlined in this manual, otherwise protection provided by the device may be impaired.

3.4 Local governing regulations

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

3.5 Use in hazardous areas

Qualified personnel for hazardous area applications

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

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

⚠ WARNING

Use in hazardous area

Risk of explosion.

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

⚠ WARNING

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

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

- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.
- Observe the specifications for the electrical data on the certificate and/or in Technical specifications (Page 169).

⚠ WARNING

Substitution of components

Substitution of components may impair Intrinsic Safety.

WARNING

Signal wiring

Input/output connections to the transmitter are required to be protected by intrinsic safe barriers at all times.

WARNING

Equipment used in hazardous areas

Equipment used in hazardous areas must be Ex-approved for the region of installation and marked accordingly. It is required that the special conditions for safe use provided in the manual and in the Ex certificate are followed!

3.6 Radar frequencies for worldwide use

Country specific settings for the radar signals are determined via the frequency. The operating mode must be set in the operating menu via the respective adjustment tool at the beginning of the setup. For more information, see Parameter assignment (Page 113)

WARNING

Selecting the frequency for your country group

Operating the device without selecting the frequency for the appropriate country group constitutes a violation of the regulations of the radio approvals of the respective country.

3.7 FCC Conformity

US Installations only: Federal Communications Commission (FCC) rules

Note

- This device has been tested and found to comply with the limits Class A digital device 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 device has also been tested and found to comply with the limits §15.256, Subpart C-Intentional radiators, 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 device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications, in which case the user will be required to correct the interference at his/her own expense.
- This device is certified to measure levels in fixed enclosed tanks made from metal, concrete or materials with similar RF attenuating properties.
- Devices equipped with a 2 inch lens antenna or larger, may be used to measure levels in open air environments or outside enclosed tanks, subject to the following conditions:
  - Devices shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna's main beam.
  - Devices shall be installed only at fixed locations. Devices shall not operate while being moved or while inside a moving container.
  - Hand-held applications and residential use are prohibited.

3.8 Information for radio approval FCC and ISED

Canada Regulatory Information

Fulfilled standards/Normes respectées

This device complies with Innovation, Science and Economic Development Canada's applicable license-exempt RSSs. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage; (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Canada Class A statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

RF Exposure Requirements\Déclaration d'exposition aux radiations

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

Operating condtions/Conditions d'exploitation

This device has been approved for both closed containers and openair environments with the following limitations:

- Closed Containers: For installations utilizing a tilt during installation: This device is limited to installation in a completely enclosed container made of metal, reinforced fiberglass or concrete to prevent RF emissions, which can otherwise interfere with aeronautical navigation
- Open Air Environment: For operation outside of closed vessels, the following condition must be fulfilled: This device shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna's main beam. Furthermore, the use of any mechanism that does not allow the main beam of the transmitter to be mounted vertically downward is prohibited
- The installation of the LPR/TLPR device shall be done by trained installers, in strict compliance with the manufacturer's instructions.
- This device shall be installed only at fixed locations. The LPR device shall not operate while being moved or while inside a moving container
- Hand-held applications are prohibited.
- Marketing to residential consumers is prohibited.
- 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
- The installer/user of this device shall ensure that it is at least 10 km from the Dominion Astrophysical Radio Observatory (DRAO) near Penticton, British Columbia. The coordinates of the DRAO are latitude 49°19′15″ N and longitude 119°37′12″ W. For devices not meeting this 10 km separation (e.g., those in the Okanagan Valley, British Columbia,) the installer/user must coordinate with, and obtain the written concurrence of, the Director of the DRAO before the equipment can be installed or operated. The Director of the DRAO may be contacted at 250-497-2300 (tel.)or 250-497-2355 (fax). (Alternatively, the Manager, Regulatory Standards, Industry Canada, may be contacted.)

Cet appareil est homologué pour une utilisation dans les cuves fermées et les environnements ouverts avec les restrictions suivantes:

- Cuves fermées : Pour les installations impliquant une inclinaison lors de l'installation : cet appareil ne doit être installé que dans une cuve totalement fermée en métal ou en béton, pour empêcher les émissions RF susceptibles d'interférer avec la navigation aéronautique
- Environnement ouvert : Pour l'utilisation hors des cuves fermées, la condition suivante doit être remplie : L'appareil doit être installé et entretenu de manière à garantir une orientation verticale vers le bas du faisceau principal de l’antenne émettrice. De plus, l’utilisation de tout mécanisme ne permettant pas l’orientation verticale vers le bas du faisceau principal de l’émetteur est interdite
- L’installation d’un dispositif LPR ou TLPR doit être effectuée par des installateurs qualifiés, en pleine conformité avec les instructions du fabricant
- Cet appareil ne doit être installé qu'à des emplacements fixes. L’appareil LPR ne doit pas être utilisé pendant qu’il est en train d’être déplacé ou se trouve dans un conteneur en mouvement
- Les applications portables sont interdites
- La vente à des particuliers est interdite
- Ce dispositif ne peut être exploité qu'en régime de non-brouillage et de non-protection, c'est-à-dire que l'utilisateur doit accepter que des radars de haute puissance de la même bande de fréquences puissent brouiller ce dispositif ou même l'endommager

- D'autre part, les capteurs de niveau qui perturbent une exploitation autorisée par licence de fonctionnement principal doivent être enlevés aux frais de leur utilisateur
- La personne qui installe/utilise ce capteur de niveau doit s'assurer qu'il se trouve à au moins 10 km de l'Observatoire fédéral de radioastrophysique (OFR) de Penticton en Colombie-Britannique. Les coordonnées de l'OFR sont : latitude N 49° 19′ 15″, longitude O 119° 37′ 12″. La personne qui installe/utilise un dispositif ne pouvant respecter cette distance de 10 km (p. ex. dans la vallée de l'Okanagan [Colombie-Britannique]) doit se concerter avec le directeur de l'OFR afin d'obtenir de sa part une autorisation écrite avant que l'équipement ne puisse être installé ou mis en marche. Le directeur de l'OFR peut être contacté au 250-497-2300 (tél.) ou au 250-497-2355 (fax). (Le Directeur des Normes réglementaires d'Industrie Canada peut également être contacté).

USA Regulatory Information

Fulfilled standards

FCC 15.19 Labelling requirements

This device complies with part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation

FCC 15.21 Information to user

"Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

FCC 15.105 statement

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

FCC 15.256 statement

This device is approved for unrestricted use only inside closed, stationary vessels made of metal, reinforced fiberglass or concrete.

For operation outside of closed vessels, the following conditions must be fulfilled:

- This device shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna's main beam. Furthermore, the use of any mechanism that does not allow the main beam of the transmitter to be mounted vertically downward is prohibited
- This device shall be installed only at fixed locations. The LPR device shall not operate while being moved or while inside a moving container
- Hand-held applications are prohibited
- Marketing to residential consumers is prohibited

RF Exposure Requirements

To comply with FCC RF exposure compliance requirements, the device must be installed to provide a separation distance of at least 20 cm from all persons.

3.9 Radio equipment compliance (Europe)

Hereby, Siemens declares that the SITRANS LR500 series is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EC. The declaration of conformity may be consulted here (http://www.craf.eu/radio-observatories-in-europe/).

Standards

The instrument was tested according to the latest issue of the following harmonized standards:

- EN 302372 - Tank Level Probing Radar
- EN 302729 - Level Probing Radar

Receiver test

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

- Performance criterion: Variation of the measured value during distance measurement under interference conditions
- Performance level: $\Delta d \leq \pm 50$ mm

Operating conditions

For operation inside of closed vessels, points a to f in annex E of EN 302372 must be fulfilled.

For operation outside of closed vessels, the following conditions must be fulfilled:

- The instrument must be stationary mounted and the antenna directed vertically downward
- The mounting location must be at least 4 km away from radio astronomy stations, unless special permission was granted by the responsible national approval authority
- When installed within 4 to 40 km of a radio astronomy station, the instrument must not be mounted higher than 15 m above the ground

Radio astronomy stations

The following table shows the geographic position of the radio astronomy stations in Europe:

Country	Name of the Station	Latitude	Longitude
Finland	Metsähovi	60°13'04" N	24°23'37" E
France	Plateau de Bure	44°38'01" N	05°54'26" E
Germany	Effelsberg	50°31'32" N	06°53'00" E
Italy	Sardinia	39°29'50" N	09°14'40" E
Spain	Yebes	40°31'27" N	03°05'22" W
	Pico Veleta	37°03'58" N	03°23'34" W
Sweden	Onsala	57°23’45" N	11°55’35" E

RF exposure guidance

RF Exposure guidance to the user on what separation distance to the body/limbs the SITRANS LR500 must be operated in order to comply with RED Directive RF Exposure requirements.

For example, if the device is operated near the body of a human and the SITRAN LR500 has undergone RF Exposure/MPE assessment at a user-device separation distance of 20 cm, then the following guidance can be provided:

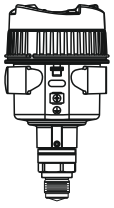
- This device must be installed to provide a separation distance of at least 20 cm from people to ensure compliance with the RF exposure requirements.

Description

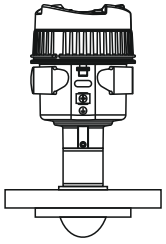
4

4.1 Description

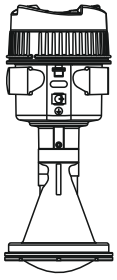
SITRANS LR500 series radar level transmitter with HART, 4 to 20 mA is ideal for level and volume measurements. It is suitable for liquids, slurries, and bulk solids.



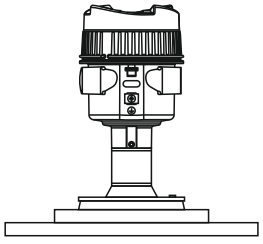
LR510 threaded lens antenna



LR530 flanged encapsulated antenna

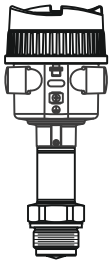


LR550 polymeric horn antenna



LR580 flanged lens antenna

A thermal extension part is supplied between the housing and the process connection, yielding extended process temperature capability. See image below of LR510 with extension as a reference.



4.2 Applications

SITRANS LR500 series is a 80 GHz advanced radar level device designed to measure **liquids, slurries and solids** in a variety of applications:

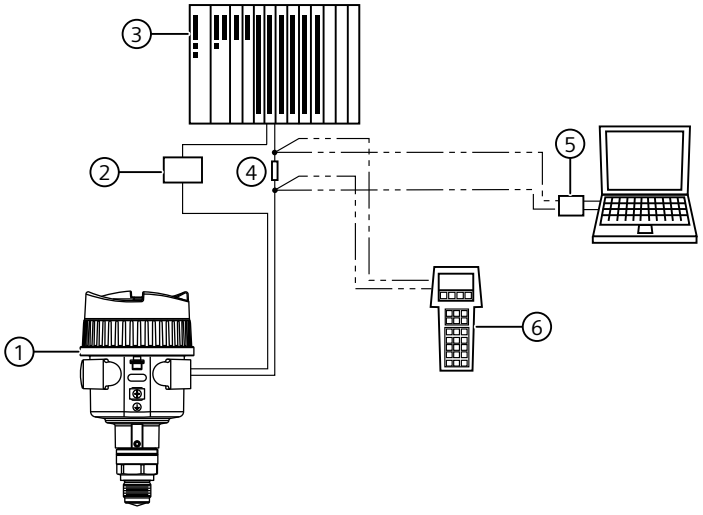
Liquids

- Storage: Device is optimized for inventory measurement of liquid bulk storage vessels. Slow filling and emptying cycles, calm surfaces.
- Process: Device is optimized for process control measurement of liquid applications. Fast filling and/or emptying cycles, turbulent surfaces including agitation.
- Open air: Device is optimized for open applications, for example river levels.

Solids

- Storage: Device is optimized for inventory measurement of large solid bulk storage silos. Slow filling and emptying cycles, calm surfaces.
- Process: Device is optimized for fast moving solid applications. Typically short range fast filling and/or emptying cycles, for example crusher level control or surge bin.
- Open air: Device is optimized for open applications, for example aggregate material piles or bunker bins.

4.3 System configuration



① LR510
② power supply
③ PLC
④ R=250 Ohms
⑤ HART modem
⑥ HART communicator

4.4 Communication

This device supports various communication protocols. For more information, see Communication (Page 205).

Hart communication

Use shielded cables when HART communications applications are in a harsh EMC environment. For more information, see HART communications (Page 205)

Installing/mounting

5

5.1 Basic safety notes

5.1.1 Handling the device

⚠ CAUTION

Do not lift a heavy device by the housing

If your device comes with a heavy flange, do not lift it by the housing. Instead, lift the device by the neck of the antenna or the flange itself.

⚠ CAUTION

Damage to antenna surface

Take special care of antenna surface to prevent damage. Any damage to the antenna surface, particularly to the tip/lens, could affect performance. (For example, do not sit device on its lens antenna.)

5.1.2 Pressure Equipment Directive (PED) 2014/68/EU

Note

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. Therefore, they do not come under the Pressure Equipment Directive as pressure or safety accessories (see EU Commission Guideline A-08 and A-20).

⚠ DANGER

Pressure applications

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

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

WARNING

Wetted parts unsuitable for the process media

Risk of injury or damage to device.

Hot, toxic and corrosive media could be released if the wetted parts are unsuitable for the process medium.

- Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in Technical specifications (Page 169).

Note

Material compatibility

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

WARNING

Unsuitable connecting parts

Risk of injury or poisoning.

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

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

WARNING

Exceeded maximum permissible operating pressure

Risk of injury or poisoning.

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

Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical specifications (Page 169).

⚠ CAUTION

Hot surfaces resulting from hot process media

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

- Take appropriate protective measures, for example contact protection.
- Make sure that protective measures do not cause the maximum permissible ambient temperature to be exceeded. Refer to the information in Technical specifications (Page 169).

⚠ CAUTION

External stresses and loads

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

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

NOTICE

Installation regulations

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

5.1.3 Installation location requirements

⚠ WARNING

Insufficient air supply

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

- Install the device so that there is sufficient air supply in the room.
- Observe the maximum permissible ambient temperature. Refer to the information in the section Technical specifications (Page 169).

NOTICE

Aggressive atmospheres

Damage to device through penetration of aggressive vapors.

- Ensure that the device is suitable for the application.

5.1.3.1 Direct sunlight

NOTICE
Direct sunlight Damage to device. The device can overheat or materials can deteriorate due to UV exposure. • Protect the device from direct sunlight. Consider use of optional sunshield. • Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Technical specifications (Page 169).

5.1.4 Proper mounting

⚠ WARNING
Incorrect mounting at Zone 0 Risk of explosion in hazardous areas. • Ensure sufficient tightness at the process connection. • Observe the standard IEC/EN 60079-14.

NOTICE
Incorrect mounting The device can be damaged, destroyed, or its functionality impaired through improper mounting. • Before installing ensure there is no visible damage to the device. • Make sure that process connectors are clean, and suitable gaskets and glands are used. • Mount the device using suitable tools. Refer to the information in Technical specifications (Page 169).

5.1.5 Incorrect disassembly

⚠ WARNING

Incorrect disassembly

The following risks may result from incorrect disassembly:

- 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.

5.2 Proper materials

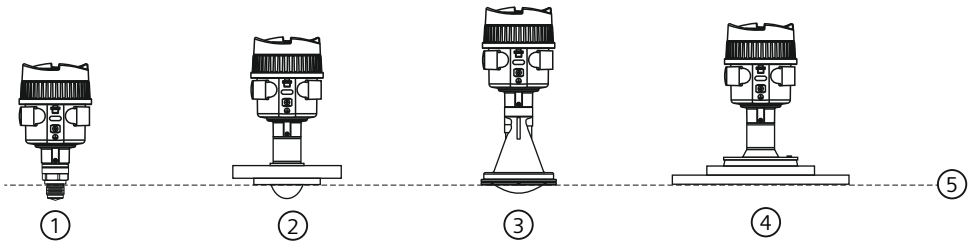
NOTICE

Proper materials

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

5.3 Sensor reference point

The measuring range of LR500 series devices begins at the end of the sensor reference point. The reference point is different depending on the sensor version.



① LR510 threaded lens antenna
② LR530 flanged encapsulated antenna
③ LR550 polymeric horn antenna[1)]
④ LR580 flanged lens antenna
⑤ Sensor reference point

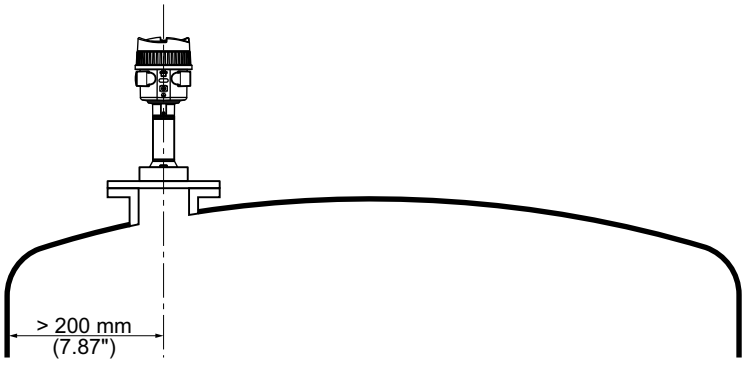
[1)] When the LR550 is supplied with a flange, the sensor reference point is at the bottom of the flange.

5.4 Nozzle mounting

Nozzle location

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

Place the mounting location of the radar sensor where no other equipment or fixtures cross the path of the radar signals. Vessel installations, such as ladders, limit switches, heating spirals, struts, and so forth, can cause false echoes and impair the material echo. Ensure when planning your measuring point that the radar sensor has a " clear view" to the measured product. In case of existing vessel installations, an auto false echo suppression should be carried out during setup when the vessel is empty.



Beam angle

Note

- Beam width depends on antenna size and is approximate: see below.
- For details on avoiding false echoes, see Auto False Echo Suppression (Page 238).

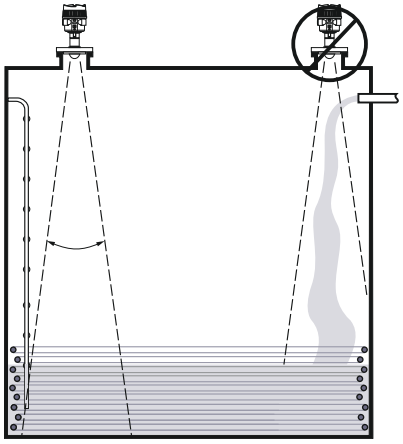
Beam angle is the width of the cone where, the energy density is half of the peak energy density.

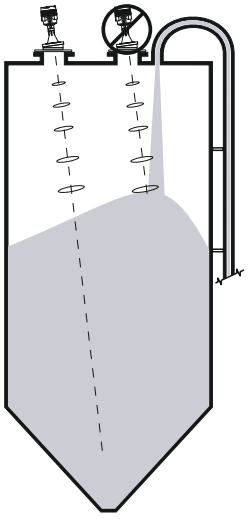
The peak energy density is directly in front of, and in line with, the antenna.

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

Inflowing medium

The instrument should not be mounted too close to the inflowing medium, as the radar signal could be disrupted.





Silo with filling from top

The optimal mounting position is opposite the filling point. To avoid heavy soiling, the distance to any filter or dust collector should be as far as possible.

Version	Size	Beam angle
LR510	G¾, ¾ NPT	14°
	G1, 1 NPT	10°
	G1½, 1½ NPT (250 °C)	10°
	G1½, 1½ NPT (150/200 °C)	7°
LR550	DN 80, 3"	3°
	DN 100, 4"	
	DN 150, 6"	
	DN 200, 8"	
	DN 250	

Version	Size	Beam angle
LR530	≥ DN 25	10°
	≥ DN 50, 2"	6°
	≥ DN 80, 3"	3°
LR580	DN 80, 3"	3°
	DN 100, 4"	
	DN 150, 6"	

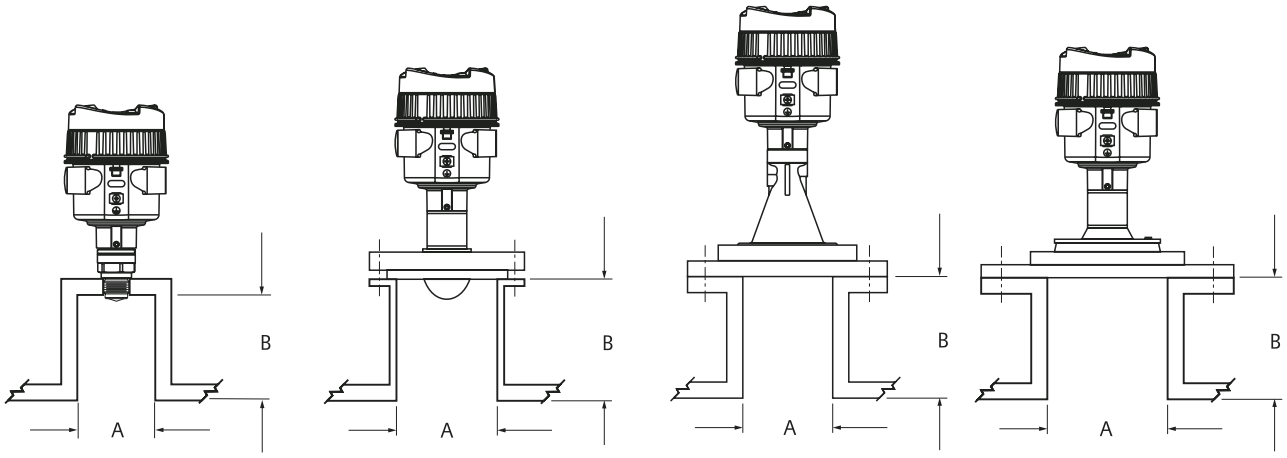
5.4.1 Nozzle mounting

For nozzle mounting, the nozzle should be as short as possible and its end rounded. This reduces false reflections from the nozzle.

With threaded connection, the antenna end should protrude at least 5 mm (0.2 in) out of the nozzle.

If the reflective properties of the medium are good, you can mount the device on nozzles longer than the antenna. The nozzle end should be smooth, burr-free, and rounded, if possible.

When mounting on longer nozzles, we recommend carrying out an auto false echo suppression. Recommended values for nozzles heights are found in the following illustration or the tables. The values come from typical applications. Deviating from the proposed dimensions (using longer nozzles, for example) is possible. However, local conditions must be taken into account.



LR510 LR530 LR550 LR580

LR510 threaded connection

Nozzle diameter "A"		Nozzle height "B"	
40 mm	1 1/2"	≤ 150 m	≤ 5.9"
50 mm	2"	≤ 200 mm	≤ 7.9"
80 mm	3"	≤ 300 mm	≤ 11.8"

Nozzle diameter "A"		Nozzle height "B"	
100 mm	4"	≤ 400 mm	≤ 15.8"
150 mm	6"	≤ 600 mm	≤ 23.6"

LR530 flanged encapsulated PTFE antenna

Nozzle diameter "A"		Nozzle height "B"	
50 mm	2"	≤ 200 mm	≤ 7.9"
80 mm	3"	≤ 400 mm	≤ 15.8"
100 mm	4"	≤ 500 mm	≤ 19.7"
150 mm	6"	≤ 800 mm	≤ 31.5"

LR550 polymeric horn antenna

Nozzle diameter "A"		Nozzle height "B"	
80 mm	3"	≤ 400 mm	≤15.8"
100 mm	4"	≤ 500 mm	≤19.7"
150 mm	6"	≤ 800 mm	≤31.5"

LR580 lens antenna, aimer flange

Nozzle diameter "A"		Nozzle height "B"	
80 mm	3"	≤ 400 mm	≤15.8"
100 mm	4"	≤ 500 mm	≤ 19.7"
150 mm	6"	≤ 800 mm	≤ 31.5"

5.4.2 Thread sealing

⚠ WARNING

Thread sealing

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

Note

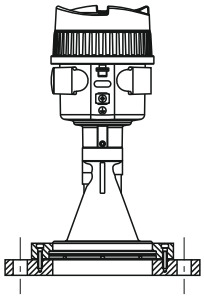
G thread types

G thread types are supplied with a Klingersil flat seal.

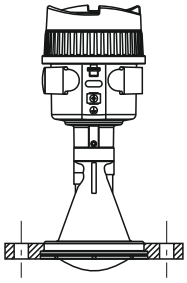
5.5 LR550 polymeric horn, liquids, and solids

LR550 design

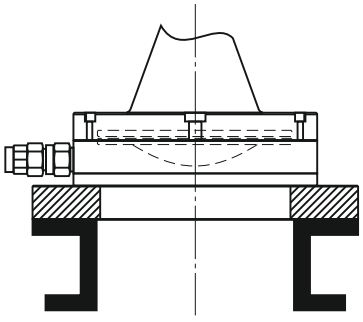
LR550 with adapter flange



LR550 with DN80/3" Universal flange



LR550 purging connection with adaptor flange, mounted on a nozzle

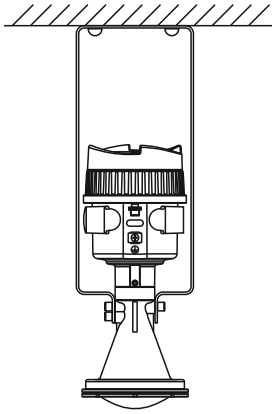


5.5.1 Mounting bracket

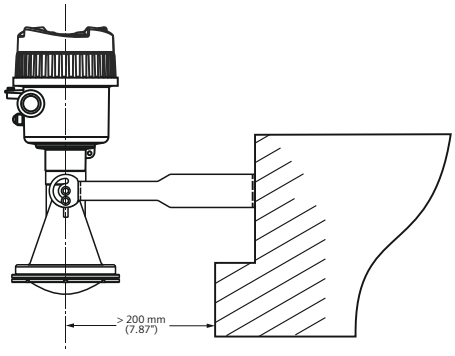
Mounting bracket

The optional mounting bracket allows simple mounting of the LR550 on a wall or ceiling. Especially in the case of open vessels, this is a simple and effective way to align the sensor to the surface of the bulk solid material.

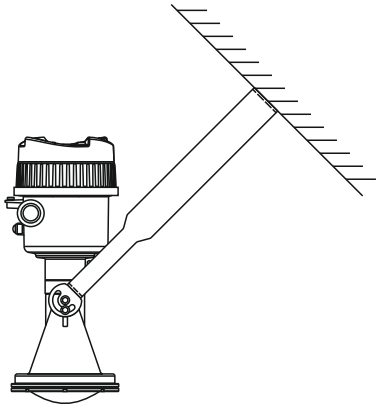
Ceiling mounting



Wall mounting



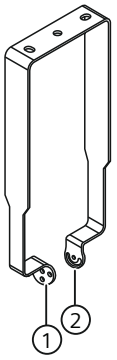
Inclined wall mounting



Mounting preparation

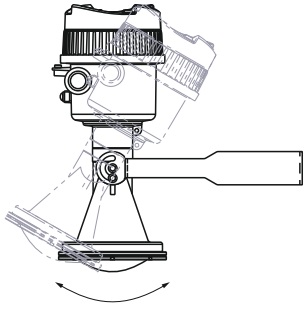
The mounting bracket is supplied unassembled (optionally) and must be screwed to the sensor before setup.

Required tools: Allen wrench size 4. There are two different ways of screwing the bracket to the sensor, see following illustration:



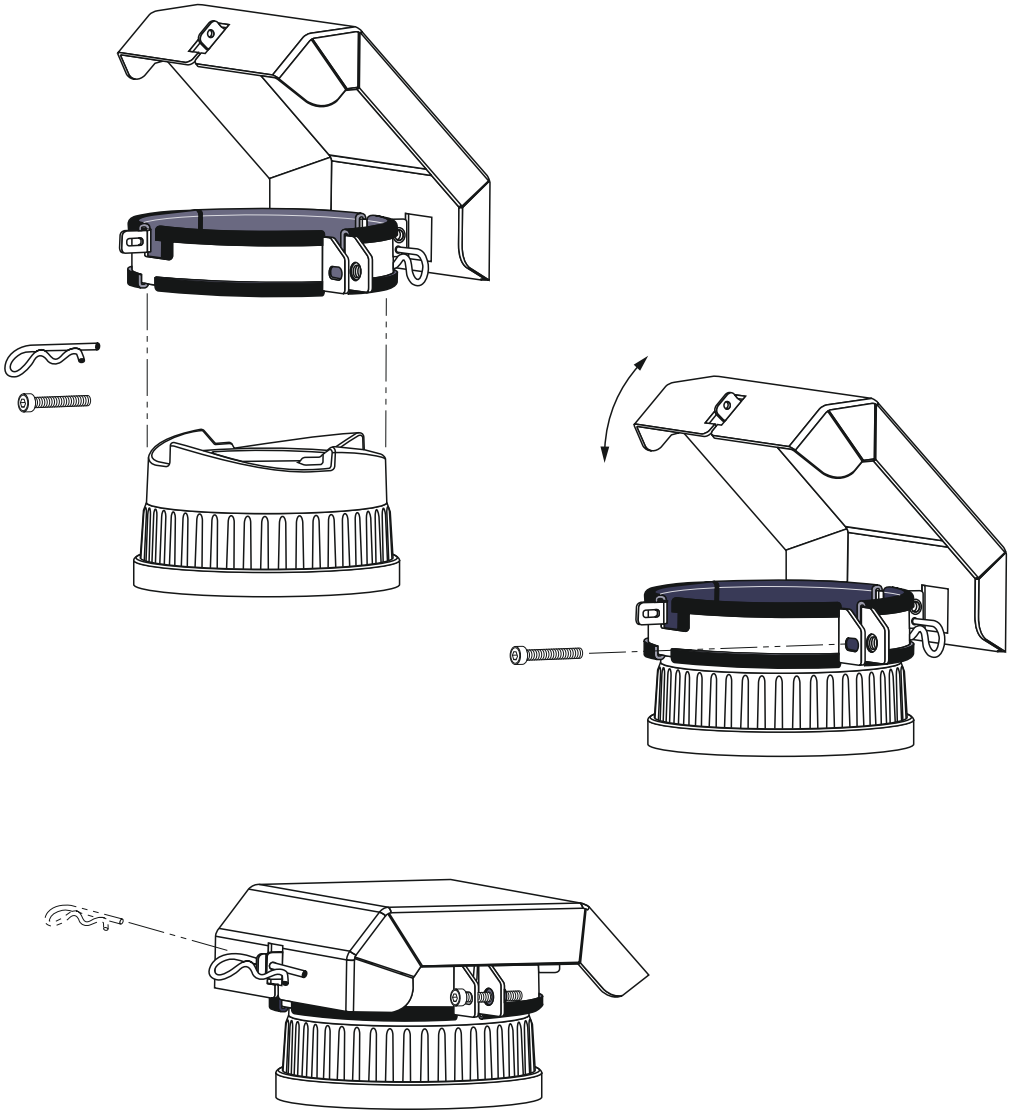
① For angle of inclination, in steps
② For angle of inclination, infinitely variable

Mounting bracket aiming



5.6 Sunshield

There is an optional sunshield to protect the display, if the device is mounted in direct sunlight.



Connecting 6

6.1 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.
- Tighten the cable glands in accordance with the torques specified in Technical specifications (Page 169).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands, only use cable glands of the same type.
- After installation, check that the cables are seated firmly.

⚠ WARNING

Incorrect conduit system

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

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

6.1.1 Missing PE/ground connection

⚠ WARNING

Missing PE/ground connection

Risk of explosion in hazardous area

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

- **Connecting terminals**: Connect the terminals according to the terminal connection diagram. First connect the PE/ground conductor.

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

Insufficient isolation of intrinsically safe and non-intrinsically safe circuits

Risk of explosion in hazardous areas.

- When connecting intrinsically safe and non-intrinsically safe circuits ensure that isolation is carried out properly in accordance with local regulations for example IEC 60079-14.
- Ensure that you observe the device approvals applicable in your country.

6.1.2 Connecting or disconnecting in explosive environments

WARNING

Connecting or disconnecting in explosive environments

Connecting or disconnecting a powered device in explosive environments can lead to an explosion.

- Connect and disconnect in **non**-explosive environments.
  - or-
- Remove power to the device before connecting or disconnecting in explosive atmosphere.

WARNING

Connecting or disconnecting device in energized state

Risk of explosion in hazardous areas.

- Connect or disconnect devices in hazardous areas only in a de-energized state.
- Install a suitable switch-off device.

Exceptions:

- Devices having the type of protection "Intrinsic safety Ex i" may also be connected in energized state in hazardous areas.

⚠ WARNING

Incorrect selection of type of protection

Risk of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

1. Decide in favor of one type of protection.
2. Connect the device in accordance with the selected type of protection.
3. In order to avoid incorrect use at a later point, make the types of protection that are not used permanently unrecognizable on the nameplate.

NOTICE

Ambient temperature too high

Damage to cable sheath.

- At an ambient temperature ≥ 60 °C (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20 °C (36 °F) higher.

NOTICE

Condensation in the device

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

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

6.1.3 Note on electromagnetic compatibility

Note

Electromagnetic compatibility (EMC)

You can use this device in commercial, industrial or business environments.

Metal enclosures ensure improved protection from electromagnetic radiation. This protection can be increased by grounding the enclosure.

6.1.4 Improvement of interference immunity

Note

Improvement of interference immunity

- Lay signal cables separate from cables with voltages > 60 V.
- Use cables with twisted wires.
- Keep device and cables at a distance from strong electromagnetic fields.
- Take account of the conditions for communication specified in the Technical specifications (Page 169).

Note

Conduit seals

Use appropriate conduit seals to maintain applicable IP and NEMA ratings.

Note

DC input terminals

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, SELV source.

Note

All field wiring must have insulation suitable for rated voltages.

6.2 Connecting SITRANS LR500 series

6.2.1 Wiring instructions

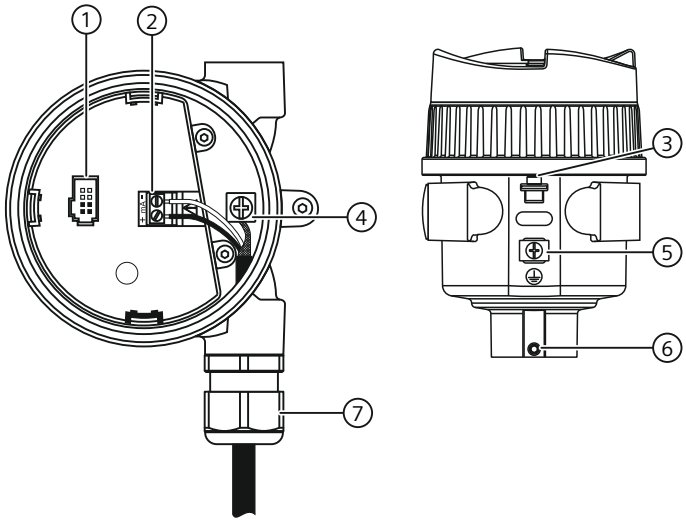
Note

Initial connection when display ordered separately from the device

Only follow the display wiring instructions if the display is ordered separately from the device. The display is connected when ordered at the same time as the device.

1. To remove lid from the device, turn by hand in a counter-clockwise direction.
2. Strip cable jacket for approximately 70 mm (2.75 inch) from end of cable, and thread wires through gland.

3. Connect wires to terminals as shown below: polarity is identified on terminal block.



①	HMI connection	⑤	Ground connection
②	Instrument connection	⑥	Housing rotation lock screw
③	Lid lock screw	⑦	Cable gland (or NPT cable entry)
④	Cable shield/ground connection		

4. Tighten gland to form a good seal.
5. Press socket end of cable from optional display onto four-pin connector plug.
6. Set optional HMI into enclosure. Buttons on HMI should sit over terminal block. Replacing the HMI (Page 152)
7. Replace device lid. Thread onto enclosure, turning clockwise. Hand tighten until mechanical stop is reached.

Note

Housing can be rotated

Housing can be rotated beyond 360° without damaging the device.

6.2.2 Input supply cable note

Note

Insulation thickness

The input supply cable should have an insulation thickness of at least 0.5 mm.

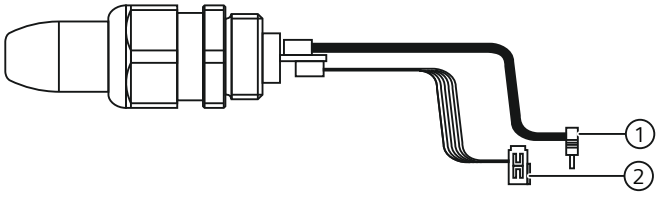
6.2.3 Connecting field device and SITRANS AW050 Bluetooth adapter

Procedure

NOTICE
General purpose use SITRANS AW050 Bluetooth module is only approved for use with general purpose non-hazardous devices

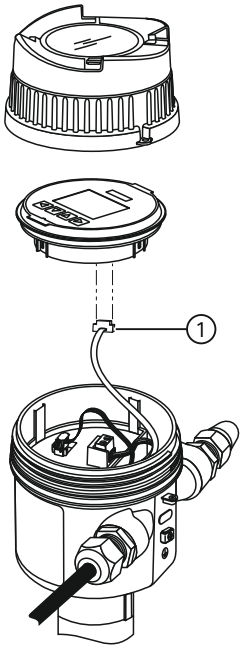
When the HMI adapter is already installed, follow these steps to connect the field device:

1. Remove the current HMI cable.
2. Connect the black cable to the HMI display.
3. Connect the grey cable to the device.



① To the optional HMI
② To the electronics

The cables are best run separately inside the enclosure as shown in the figure following. Take care when installing the display to be sure that the cables are not pinched or torn. Excessive force should not be necessary for installation of the display mounting.



① To optional HMI

Use of the display while the AW050 is installed

When power is applied to the device, the display remains activated as long as there is no bluetooth connection.

When the AW050 connection is made through SITRANS mobile IQ, the display is not be accessible. When the AW050 Bluetooth connection is disconnected, the display is activate again.

6.2.3.1 Installing or replacing Bluetooth adapter

Procedure

To install or replace the Bluetooth adapter, follow these steps. For more information, refer to illustrations in Connecting field device and SITRANS AW050 Bluetooth adapter (Page 54).

1. Run both cables through conduit entry where Bluetooth adaptor will be installed.
2. Install cable gland and tighten against enclosure. Ensure the adapter cables are not pinched inside the housing.
3. Slide the adapter into the gland against the O-ring.
4. Tighten the gland to the adapter, without twisting the cables.
5. Plug the cables into the display and electronics.

6.3 Hazardous area installations

WARNING

Improper power supply

Risk of explosion in hazardous areas as result of incorrect power supply.

- Connect the device in accordance with the specified power supply and signal circuits. The relevant specifications can be found in the certificates, in Technical specifications (Page 169) or on the nameplate.

6.3.1 Nameplates for hazardous area installation

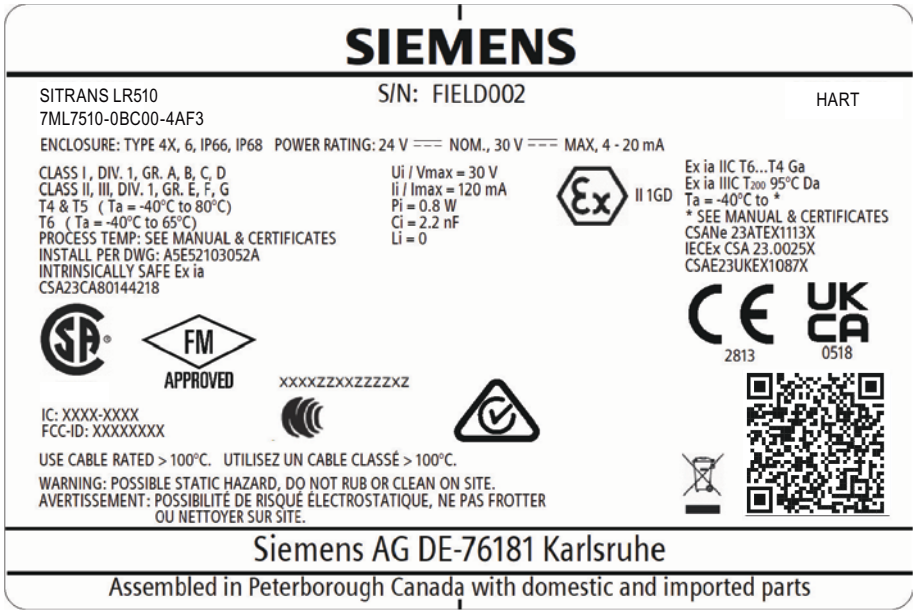
6.3.1.1 Intrinsically safe

Device nameplate

Note

Sample nameplate

This nameplate is given as an example only.



The ATEX certificate number (CSANe 23ATEX1113X) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

The UKEX certificate number (CSAE 23UKEX1087X) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

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

The IECEx certificate number (IECEx CSA 23.0025X) listed on the nameplate can be viewed on the IECEx website:

(https://www.iecex-certs.com/)

Under the "Certificates & Licenses" tab, select "View Certificates & Licenses", then enter the following number: IECEx CSA 23.0025X.

The FM certificate (FM23US0007X) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

The CSA certificate (CSA23CA80144218) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

For more information on hazardous area installations, refer to Instructions specific to hazardous area installation (Page 59).

Connection drawing (FM/CSA)

The FM/CSA connection drawing number (A5E52103052A) listed on the device nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

Go to **Technical Info > Images, graphics, drawings**.

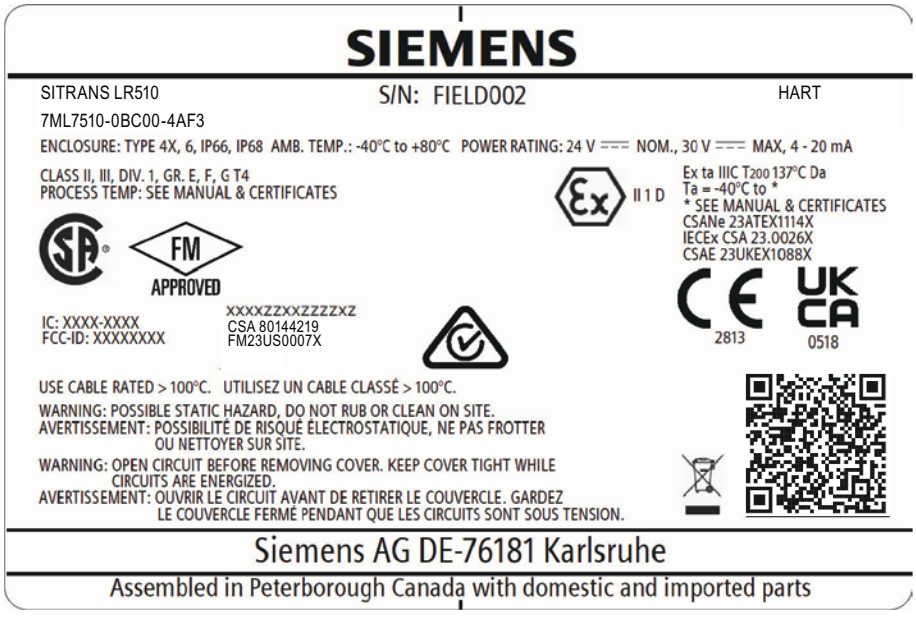
6.3.1.2 Dust ignition

Device nameplate DI

Note

Sample nameplate

This nameplate is given as an example only.



The ATEX certificate number (CSANe 23ATEX1114X) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

The UKEX certificate number (CSAE 23UKEX1088X) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

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

The IECEx certificate (IECEx CSA 23.0026X) listed on the nameplate can be viewed on the IECEx website:

https://www.iecex-certs.com/ (https://www.iecex-certs.com/)

Under the "Certificates & Licenses" tab, select "View Certificates & Licenses", then enter the following number: IECEx CSA 23.0026X.

The FM certificate (FM23US0007X) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

The CSA certificate (80144219) listed on the nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

For more information on hazardous area installations, refer to Hazardous area installations (Page 56).

6.3.1.3 Non-incendive

Connection drawing (FM)

The FM connection drawing number (A5E52277176) listed on the device nameplate can be downloaded from our website:

Product page (www.siemens.com/sitransLR500)

Go to **Technical info > Images, graphics, drawings**.

6.3.2 Further information related to hazardous area installations

- For power demands see Loop power (Page 203).
- For wiring requirements follow local regulations.
- Use approved cable gland/conduit seal to maintain Type 4X, Type 6, IP66, IP68 ratings.
- For hazardous area approvals, see Certificates and approvals (Page 176).

6.3.3 Instructions specific to hazardous area installation

6.3.3.1 Specific conditions of use (denoted by X after the certificate number)

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.
- The enclosure shall be protected from mechanical impact or friction.
- For dust application, apply 3 to 4 turns of PTFE tape to seal conduit entries.

Dust ignition proof / Dust protection by Enclosure Ex 't'

- The equipment shall only be powered by an SELV source; not exceeding 30 Vdc.
- Disconnect power source before opening in the presence of explosive concentration of ignitable gas.
- The supply to the SITRANS LR510, LR530, LR550, LR580 equipment shall be rated for a prospective short-circuit current of not more than 1.5 kA and shall be protected by a suitably rated fuse.

6.3.3.2 Instructions specific to hazardous area installations (Reference ATEX Directive 2014/34/EU, Annex II, 1.0.6 and UK Regulations SI 2016/1107))

The following instructions apply to equipment covered by certificate number CSANe 23ATEX1113X, CSANe 23ATEX1114X, CSAE 23UKEX1087X and CSAE 23UKEX1088X.

1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 1GD equipment per CSANe 23ATEX1113X and CSAE 23UKEX1087X; Category 1D equipment per CSANe 23ATEX1114X and CSAE 23UKEX1088X.
3. As Category 1GD equipment per CSANe 23ATEX1113X and CSAE 23UKEX1087X, the equipment may be used with flammable gases and vapors with apparatus group IIC, IIB and IIA or with flammable dusts with apparatus group IIIC, IIIB, IIIA with the temperature classes as specified per Temperature. (Page 169)
4. As Category 1D equipment per CSANe 23ATEX1114X and CSAE 23UKEX1088X, the equipment has a degree of ingress protection of IP66/68 and may be used with flammable dusts with apparatus group IIIC, IIIB, IIIA with the temperatures as specified per Temperature (Page 169).
5. The equipment has not been assessed as a safety related device (as referred to by Directive 2014/34/EU, clause 1.5 and UK Regulation SI 2016/1107).
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 and the UK).
7. The equipment is non-repairable.
8. The certificate numbers have an 'X' suffix, which indicates that special conditions for safe use apply. Those installing or inspecting this equipment must have access to the certificates.
9. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.
   - Aggressive substances: for example, acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.
   - Suitable precautions: for example, establishing from the material's data sheet that it is resistant to specific chemicals.

Commissioning 7

7.1 Basic safety notes

DANGER

Toxic gases and liquids

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

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

WARNING

Improper commissioning in hazardous areas

Device failure or risk of explosion in hazardous areas.

- Do not commission the device until it has been mounted completely and connected in accordance with the information in Technical specifications (Page 169).
- Before commissioning take the effect on other devices in the system into account.

WARNING

Commissioning and operation with error message

If an error message displays, correct operation is no longer guaranteed.

- Check the severity of the error.
- Correct the error.
- If the error still exists:
  - Take the device out of operation.
  - Do not restart the device.

The same risk continues to apply when error messages are switched off or disabled.

WARNING

Hot surfaces

Risk of burns resulting from hot surfaces.

- 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.

- Close the device as described in Installing/mounting (Page 35).

⚠ WARNING

Opening device in energized state

Risk of explosion in hazardous areas

- Only open the device in a de-energized state.
- Check prior to commissioning that the cover, cover locks, and cable inlets are assembled in accordance with the directives.

Exception: Devices having the type of protection "Intrinsic safety Ex i" may also be opened in energized state in hazardous areas.

7.2 General requirements

Before commissioning, check the following:

- The device is installed and connected in accordance with the guidelines provided in Installing/mounting (Page 35) and Connecting (Page 49).
- The device meets the local governing codes and good engineering practises for use in a critical application, with applicable backup systems and alarms.

7.3 Local operation

The device is built for easy operation, making it possible to be commissioned quickly. Its parameters are menu-driven and can be modified through local operation, using the display and buttons, also known as the Human Machine Interface (HMI).

For details on how to use the interface, see Operating (Page 85).

Note

Update of process value on display when commissioning wizard run via EDD

Process values shown in **measurement view** on local display will not automatically update to reflect a change made remotely via "Wizard - Quick start...".

- To have device process values update when configured remotely, use local buttons to take device in and out of **measurement view** (i.e. go to **parameter view** then back to **measurement view**).

Note

Local display timeout

If no button is pressed for 10 minutes, display switches to operation view.

7.4 Device startup

Condition

- The following have been reviewed: Basic safety notes (Page 61).
- Device has been properly installed and connected, including the connection of any remote sensors.

Note

Set radio approval region.

It is a requirement to set the radio approval region first.

Procedure

1. Power-on the device.
   For an initial startup, prompts for each of the following steps appear after power-on.
2. Set the language.
   The first time the device is configured, you are prompted to set the language. The parameter "Language" always appears in English. To change the language again (after initial setup), see parameter Language (6) (Page 148).
3. Run the "Quick commissioning wizard" or accept the default values of the device.
   Essential parameters should be considered before using the device for the first time.
   - Choose "Yes" (recommended) to start the "Quick commissioning" wizard.
   - Choose "No", you accept the default values of the device (no sensors are configured). The next HMI view will be the operation view 1.

For any subsequent startup, after power-on, the device automatically starts in operation view. A transition screen showing first the Siemens logo and then the current firmware revision of the product is displayed while the first measurement is being processed.

- If configured, measurement values in operation view will show as dashes (----) during the startup process until a valid measurement is obtained from remote sensors.
- Measurement values in operation view will also shows dashes (----) when:
  - There is no measurement available from the sensor

7.5 Gather parameter values before running quick start wizards

Before initiating a Quick start wizard to configure the device, you may wish to gather the necessary parameter values. Parameter configuration charts that list all parameters and available options for each application type are available on our website.

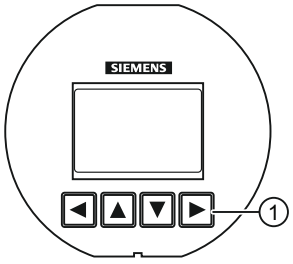
Go to Product page (www.siemens.com/sitransLR500).

Click **"Support > Application Guides".**

Record data and select from options on the chart that apply to your application, then with this data on hand, complete the quick start wizards.

7.6 Local commissioning

SITRANS LR500 series can be quickly commissioned using wizards, and menu driven parameters. The parameters can be modified locally using the device display and buttons, also known as the Human Machine Interface (HMI).



① Local device buttons

The quick start wizards provide an easy step-by-step procedure to help you configure the device for a simple application. We recommend that you configure your application in the following order:

- First, run the "Quick commissioning wizard" for your application.
- Next, if there are known false echoes present, run the "Auto false echo suppression wizard" (optional) to prevent false echo detection when the vessel is empty or below the false echo level.
- After completing the wizards, configure any custom parameters via the parameter menus.

You can access the quick commissioning wizards:

- Locally via HMI
- From a remote location via mobile IQ, app with AW050 module or SIMATIC PDM EDD

7.6.1 Activating SITRANS LR500 series

Power up the device.

SITRANS LR500 series runs through an initialization routine for approximately 30 seconds or less. Next, the device name and then firmware revision appear. The display goes into **measurement view** (measured process values show as "- - - - -" before the first measurement

is completed). The "Distance" measurement (displayed in meters) appears first by default. Press ▼ button to scroll through other values in **measurement view**.

The device is now ready for operation.

7.6.2 Local HMI

Note

Low temperature affects local display

The operating temperature of the display is -40 °C to +80 °C; -40 °C to -25 °C with reduced readability.

Note

Backlight is always on

The SITRANS LR500 series has a backlight which is always on to assist viewing in very low light conditions. This backlight switches off if the voltage is less than 14v.

Note

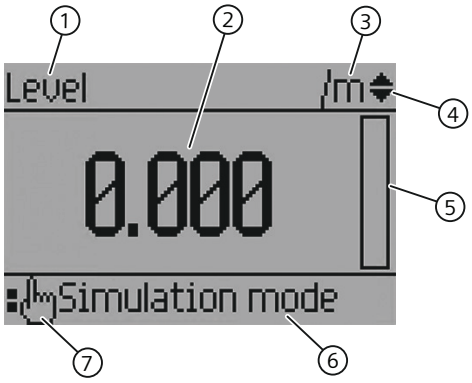
Show menu numbers on local display

To view menu numbers on the device, parameter "Service view" must be enabled. (Go to menu "**Setup > Local display**".)

- The item number of the current selection appears in the **info field**.
- The menu number, in which the current selection resides, appears on the **title line** (thus, no menu numbers appear for top-level menu items, such as "QUICK START", "SETUP", etc.).

7.6.2.1 The LCD display

Measurement mode display[1)2)]: Normal operation

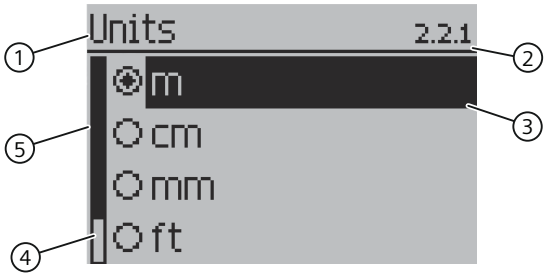


①	Selected view: level, space, distance, volume, or custom	⑤	Bar graph indicates level
②	Measured value	⑥	Text area displays status mode, fault code and an error message
③	Units	⑦	Device status indicator or service required icon appears
④	Navigates menu views		

PROGRAM mode display

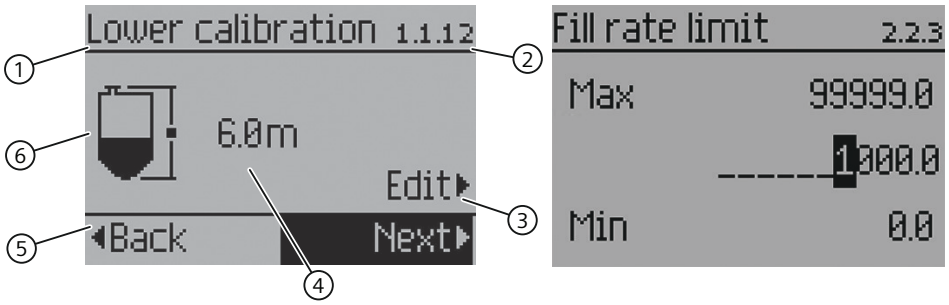
Navigation view

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



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

Parameter view **Edit view**



①	Parameter name	④	Parameter value/selection
②	Parameter number	⑤	Parameter navigation to the previous or next parameter in the menu
③	Parameter edit	⑥	Parameter icon

[1] Press UP or DOWN arrow to switch
[2] In response to a key press request. For details, see measurement mode.

7.6.3 Programming

From **measurement view**, press ▶ to enter **parameter view** and open the first menu level.

To select a listed option:

1. Navigate to the desired parameter.
2. Press ▶ to open **edit view**.
   The current selection is highlighted.
3. Scroll to a new selection using ▲ and ▼ .
4. Press ▶ to accept it. The display returns to **parameter view** and shows the new selection.

To change a numeric value:

1. Navigate to the desired parameter.
2. When selected, the current value is displayed.
3. Press ▶ to configure it.
   The "EDIT" symbol flashes.
4. Use ▲ and ▼ to increase or decrease the value. Press and hold button to increase scrolling speed.
5. To escape without saving your changes, press ◀ to return to **parameter view**.
6. Press ▶ to accept the new value.
   The display returns to **parameter view** ("EDIT" symbol is no longer flashing) and shows the new selection. Review for accuracy.

Button functions for editing

Button	Name		Function
	UP or DOWN arrow	Selecting parameter settings	Scrolls to item
		Alpha-numeric editing	Increases or decreases value. Pressing and holding increases scrolling speed through values.
	RIGHT arrow	Selecting parameters	Accepts the data (writes the parameter setting)
	LEFT arrow	Selecting parameter settings	Cancels **edit view** without changing the parameter setting.

7.6.4 Wizards

7.6.4.1 Wizard overview

Note

Important information regarding the use of commissioning wizard

- Settings for quick start wizard are inter-related and changes apply only after "Finish" is set to "Yes" in final step.
- Do not use quick start wizard to modify individual parameters.
  Perform customization for your application only *after* "Quick start" wizard has been completed.

Note

Parameter settings properly stored

To ensure parameter settings are properly stored in the device, wait 30 seconds after any configuration change before removing power from the device.

Note

No user-relevant data is lost in the event of a power failure.

1. Press ▶ to enter the "Quick start" menu, and again to start the "Quick start" wizard.
2. Configure each parameter per step, then select "Next" to proceed. In the final step, when asked to "Finish", choose "Yes" to save changes.
3. Next, "Exit" the wizard. After exiting the wizard, press ◀ to return to operation view.

In the upper left corner of each view, the wizard name appears, followed by each step name. In the upper right corner, the view number is shown. The number of steps depends on the actual device variant ordered.

A wizard provides an easy step-by-step procedure to guide you through a quick setup of various parameters.

Use the ▲ and ▼ to highlight the Quick start wizard and press the ▶ to enter the wizard.

The first view in the wizard (About) is a description of which settings/actions can be performed using the wizard.

The last view in the wizard (Finish) allows user to apply selected settings.

Note

Parameter visibility

Some of the parameters and settings shown in the operation instructions might not appear on the actual device, visibility is based on the application and configuration selected.

Button	Function
◀	Leave menu without saving changes
▲	Scroll up in list of options
▼	Scroll down in list of options
▶	Select option. Confirm selection and save setting.

7.6.4.2 Quick commissioning

Quick commissioning wizards

A wizard provides an easy step-by-step procedure that configures the device for a simple application. To configure the device for applications of level, space, distance, or volume, use the "Quick commissioning wizard" via HMI. It is possible to configure custom applications employing more complex vessel shapes via the HMI, but we suggest using a remote engineering system, such as SIMATIC PDM.

Quick commissioning wizards are also available remotely using various software packages:

- SIMATIC PDM

Quick commissioning wizard

This device provides a single quick commissioning wizard that can be used for various applications.

The initial wizard steps are common for all application types. Subsequent wizard parameters will vary depending on the application you choose. For the purpose of documenting, two

separate lists follow. These lists include the wizard parameters available to commission each application type (see links below).

1. From **measurement view**, press ▶ to enter **parameter view**.
   The first level menu (Quick start) displays. Press ▶ to enter this menu.
2. Press ▶ again to enter "Quick commissioning wizard" (Commission).
   In the wizard, it is not necessary to press ▼ to navigate to the next step. In each step, you are taken directly to **edit view**.
3. Set "Operation", "Material type", and "Application type".
   Subsequent wizard parameters vary depending on the application you choose. See links below to step you through the wizard appropriate to your application.
4. Select "Yes" to confirm all parameter changes as the final step in the quick commissioning wizard, and return to **parameter view**.
   "DONE" appears on the main line of the display.
5. Press ◀ three times to return to **measurement view**.

Note

Important information regarding the use of commissioning wizard

- Perform a reset to factory default before running "Quick commissioning wizard" if the device has been used in a previous application. See Parameter assignment (Page 113).
- Settings for quick commissioning wizard are inter-related and changes apply only after "Confirm" is set to 'Yes' in final step.
- Do not use quick commissioning wizard to modify individual parameters. (See instead chapter Quick start (1) (Page 113).)
  Perform customization for your application only *after* "Quick commissioning wizard" has been completed.

Note

Commissioning wizard may fail due to invalid configuration

Device might show "ERROR" if the commissioning wizard completes with some invalid configurations. Invalid value(s) might be stored in the parameter(s).

- To clear the invalid configuration, review application parameters, then perform a "Factory reset" or re-run the "Quick commissioning wizard" with proper values.

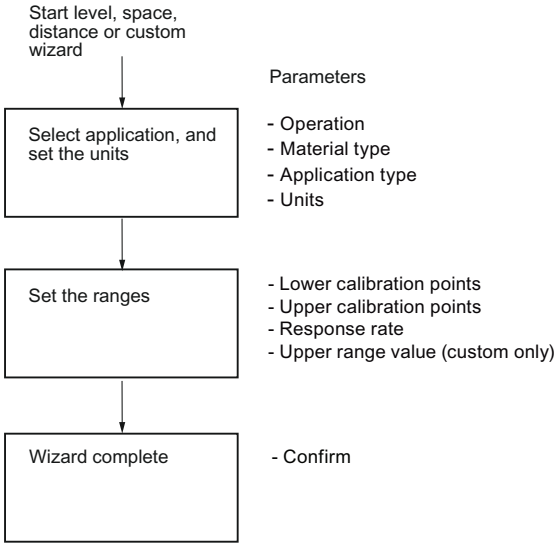
Note

Update of process value on display when commissioning wizard run via EDD

Process values shown in **measurement view** on local display will not automatically update to reflect a change made remotely via "Wizard - Quick start...".

- To have device process values update when configured remotely, use local buttons to take device in and out of **measurement view** (i.e. go to **parameter view** then back to **measurement view**).

Quick commissioning: Level/Space/Distance/Custom



Note

Distance and Custom applications

- When "Operation" is set to "Distance", setting the upper calibration point is not required (does not display in the wizard).
- Only when "Operation" is set to "Custom", is the upper range value required (does display in the wizard).

Note

Output remains active

While the device is being configured, the output remains active and continues to respond to changes in the process.

Note

Parameter options

In the following wizard steps, a full list of options for each parameter is shown. However, some options may not appear on the device, based on the application selected.

Operation

Sets operation mode which defines output and local display.

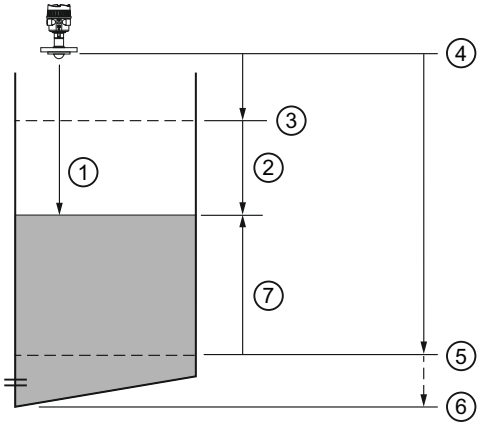
Setting	Level
	Space
	Distance
	Volume
	Custom
Default	Level

Note

Completing a Custom setup

For a custom application ("Operation" set to "Custom"), at least one pair of input and output breakpoints (parameters "X-value" and "Y-value") must be defined, *after* the wizard is complete. See Customized characteristic curve (2.6.2) (Page 126).

Operation_Level and Volume illustration



① Distance
② Space
③ Upper calibration point
④ Sensor reference point
⑤ Lower calibration point
⑥ Far range
⑦ Level

Setting	Description	Reference point
Level	Height of material	Lower calibration point (process empty level)
Space	Distance to material surface	Upper calibration point (process full level)
Distance		Sensor reference point
Custom	Linearization table (level/volume breakpoints)	Lower calibration point

Material type

Used to optimize performance based on material type.

Setting	Liquid
	Solid
Default	Liquid

Application type

Used to optimize performance based on application type.

Setting	Storage
	Process
	Open
Default	Storage

Units

Sets units used by the device.

			Default
Setting	Meters	m	3 decimal places
	Centimeters	cm	1 decimal place
	Millimeters	mm	0 decimal places
	Feet	ft	3 decimal places
	Inches	in	2 decimal places
Default	Meters	m	3 decimal places

Note

Dynamic decimal places

Each setting for parameter "Units" has a default number of decimal places used to show the process value on the local display. However, if the value is too large to show on the segment display, the decimal places will be automatically adjusted to show the process value.

Note

Process value too large to display

In some cases, even with dynamic decimal places, it is possible that the process value will be too large to show on the local display, "**#####**" shows instead.

If this occurs in a typical application:

- Adjust parameter "Units" so that a smaller value can be shown, e.g. use meters instead of millimeters.

If this occurs in a custom application:

- Adjust parameter "Custom units" so that a smaller value can be shown, e.g. use tons instead of pounds.
- Note that a change to custom units also requires a scaling adjustment (see Upper range value (2.4.5) (Page 121)).

Lower calibration point

Sets distance from sensor reference point to lower calibration point: usually process empty level.

Setting	0 to 120 m
Default	0

Defined in parameter "Units".

Upper calibration point

Sets distance from sensor reference point to upper calibration point: usually process full level.

Setting	0 to 120 m
Default	0

Defined in parameter "Units".

Response rate

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

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

Setting	Slow	0.1 m/min (fill/empty rate limit)
	Medium	1.0 m/min (fill/empty rate limit)
	Fast	10.0 m/min (fill/empty rate limit)
Default	Slow	

Damping value

Used in the damping (filtering) of process values to smooth out response to sudden changes in measurement. Sets time after which output signal reaches 63% of final value.

An increase of damping increases response time of device, and affects digital value and loop current. If output values are noisy, increase parameter "Damping value". For faster response time, decrease parameter "Damping value". Find a value that meets requirements of signal stability and response time.

Setting	Slow	100 sec
	Medium	10 sec
	Fast	0 sec
Default	Slow	

Custom units

Sets unit text to display, in a custom application. Limited to 16 characters.

The text entered is simply for display purposes. No unit conversion occurs.

Note

Rate parameters

The rate parameters "Fill rate limit", "Empty rate limit", and "Damping value" work in conjunction, and are affected by parameter "Response rate" (set in the "Quick commissioning" wizard). The rate parameters automatically adjust when parameter "Response rate" is altered, but any changes made to the rate parameters following the completion of the wizard supersede the response rate setting.

Further information can be found in Technical reference (Page 201).

Upper range value

Sets the maximum value that corresponds to level "full".

Setting	0 to 9999999
Default	100 <Custom units>

Note

"Upper range value" (URV) versus "Upper scaling point"

- When parameter "Upper range value" is set within the "Quick commissioning wizard", the parameter "Upper scaling point" is automatically adjusted to the same value.
- Setting a value for either parameter *outside* of the wizard will not automatically adjust the other value.

Note

Changing custom units

If a change is made to custom units, be sure to rescale the output, as rescaling for custom units is not handled automatically by the device.

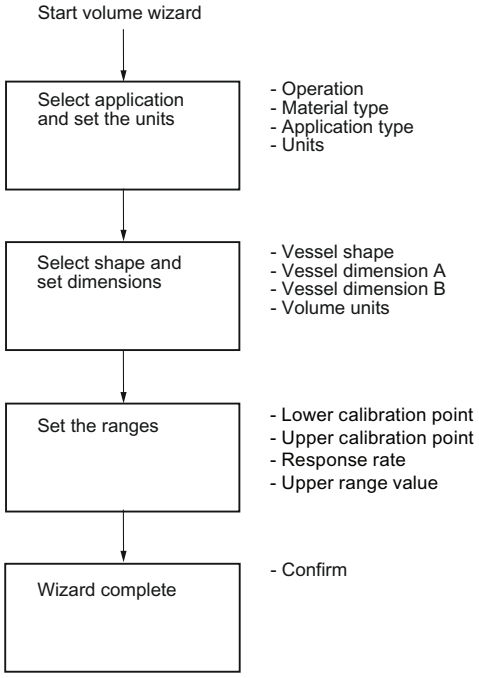
- To rescale output, use parameters "Upper range value" and "Upper scaling point".

Confirm

Applies settings as last step in wizard.

Setting	Yes	Wizard completes and settings are applied.
	No	Returned to start of wizard. (Settings are saved to perform wizard again, but not applied until "Confirm" set to "Yes".)
Default	No	

Quick commissioning: Volume



Note

Output remains active

While the device is being configured, the output remains active and continues to respond to changes in the process.

Note

Parameter options

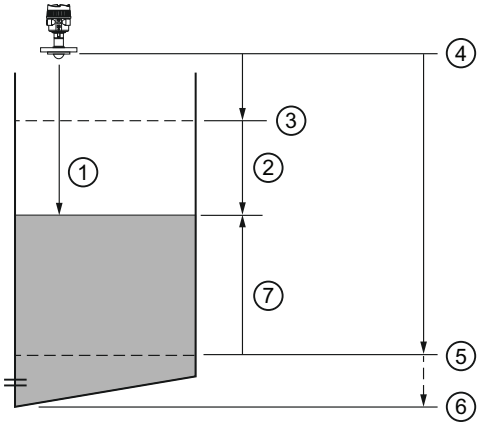
In the following wizard steps, a full list of options for each parameter is shown. However, some options may not appear on the device, based on the application selected.

Operation

Sets operation mode which defines output and local display.

Setting	Level
	Space
	Distance
	Volume
	Custom
Default	Level

Operation_Level and Volume illustration



① Distance
② Space
③ Upper calibration point
④ Sensor reference point
⑤ Lower calibration point
⑥ Far range
⑦ Level

Setting	Description	Reference point
Volume	Volume of material in Volume units (based on level)	Lower calibration point

Material type

Used to optimize performance based on material type.

Setting	Liquid
	Solid
Default	Liquid

Application type

Used to optimize performance based on application type.

Setting	Storage
	Process
	Open
Default	Storage

Units

Sets units used by the device.

			Default
Setting	Meters	m	3 decimal places
	Centimeters	cm	1 decimal place
	Millimeters	mm	0 decimal places
	Feet	ft	3 decimal places
	Inches	in	2 decimal places
Default	Meters	m	3 decimal places

Note

Dynamic decimal places

Each setting for parameter "Units" has a default number of decimal places used to show the process value on the local display. However, if the value is too large to show on the segment display, the decimal places will be automatically adjusted to show the process value.

Note

Process value too large to display

In some cases, even with dynamic decimal places, it is possible that the process value will be too large to show on the local display, "**#####**" shows instead.

If this occurs in a typical application:

- Adjust parameter "Units" so that a smaller value can be shown, e.g. use meters instead of millimeters.

If this occurs in a custom application:

- Adjust parameter "Custom units" so that a smaller value can be shown, e.g. use tons instead of pounds.
- Note that a change to custom units also requires a scaling adjustment (see Upper range value (Page 80)).

Vessel shape

Sets vessel shape, and allows device to calculate volume in addition to level.

Settings	Linear vessel
	Conical bottom vessel
	Parabolic bottom vessel
	Half sphere bottom vessel
	Flat sloped bottom vessel
	Horizontal cylinder parabolic ends vessel
	Horizontal cylinder flat ends vessel
	Parabolic ends vessel
	Sphere vessel
Default	Linear vessel

Vessel dimension A

Sets height of vessel bottom when bottom is conical, parabolic, half spherical, or flat sloped. If horizontal parabolic ends vessel, sets depth of end.

Setting	0 to 99.999 m
Default	0

See Vessel shape and dimensions (Page 89) for illustration.

Vessel dimension L

Sets length of cylindrical section of horizontal parabolic ends vessel.

Setting	0 to 99.999 m
Default	0

See Vessel shape and dimensions (Page 89) for illustration.

Lower calibration point

Sets distance from sensor reference point to lower calibration point: usually process empty level.

Upper calibration point

Sets distance from sensor reference point to upper calibration point: usually process full level.

Response rate

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

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

Setting	Slow	0.1 m/min (fill/empty rate limit)
	Medium	1.0 m/min (fill/empty rate limit)
	Fast	10.0 m/min (fill/empty rate limit)
Default	Slow	

Note

Rate parameters

The rate parameters "Fill rate limit", "Empty rate limit", and "Damping value" work in conjunction, and are affected by parameter "Response rate" (set in the "Quick commissioning" wizard). The rate parameters automatically adjust when parameter "Response rate" is altered, but any changes made to the rate parameters following the completion of the wizard supersede the response rate setting.

Further information can be found in Technical reference (Page 201).

Volume units

Sets volume measurement units.

Custom units

Sets unit text to display, in a custom application. Limited to 16 characters.

The text entered is simply for display purposes. No unit conversion occurs.

Upper range value

Sets the maximum value that corresponds to level "full".

Setting	0 to 9999999
Default	100 liters

Note

"Upper range value" (URV) versus "Upper scaling point"

- When parameter "Upper range value" is set within the "Quick commissioning wizard", it automatically sets the "Upper scaling point" to the same value.
- Setting a value for either parameter *outside* of the wizard, will not automatically adjust the other value.

Note

Changing custom units

If a change is made to custom units, be sure to rescale the output, as rescaling for custom units is not handled automatically by the device.

- To rescale output, use parameters "Upper range value" and "Upper scaling point".

Confirm

Applies settings as last step in wizard.

Setting	Yes	Wizard completes and settings are applied.
	No	Returned to start of wizard. (Settings are saved to perform wizard again, but not applied until "Confirm" set to "Yes".)
Default	No	

7.6.4.3 Demo wizard

Used to optimize the device for demonstration purposes, increasing measurement response time.

Units

Sets units used by the device.

			Default
Setting	Meters	m	3 decimal places
	Centimeters	cm	1 decimal place
	Millimeters	mm	0 decimal places
	Feet	ft	3 decimal places
	Inches	in	2 decimal places
Default	Meters	m	3 decimal places

Lower calibration point

Sets distance from sensor reference point to lower calibration point: usually process empty level.

Confirm

Applies settings as last step in wizard.

Setting	Yes	Wizard completes and settings are applied.
	No	Returned to start of wizard. (Settings are saved to perform wizard again, but not applied until "Confirm" set to "Yes".)
Default	No	

7.6.4.4 AFES wizard

Used to prevent false echo detection over a specified range.

Use AFES wizard if there are known obstructions in the application and if false echoes are anticipated. Perform the AFES wizard when the material level is low.

To run the wizard, enter the auto false echo suppression range.

Auto false echo suppression range

Sets end point of the learned TVT distance.

To calculate value

1. Determine the auto false echo suppression range by measuring 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.

Note

For best results with AFES

- Set up auto false echo suppression during commissioning if possible, by running "Auto false echo suppression wizard".
- Ensure material level is below all known obstructions at the moment when "Auto false echo suppression wizard" learns the TVT. Ideally the vessel should be empty or almost empty.
- Use auto false echo suppression only if target is greater than one meter from sensor reference point
- Note the distance to material level when learning the echo profile, and set value in parameter "Auto false echo suppression range" to a shorter distance to avoid the material echo being screened out.
- If the vessel contains an agitator, it should be running.

Once the wizard completes successfully, parameter "Auto false echo suppression" is set to "Enabled" and the learned TVT will be used.

For more information about auto false echo suppression, see Auto false echo suppression and Custom TVT (Page 202).

Confirm

Applies settings as last step in wizard.

Confirm - settings

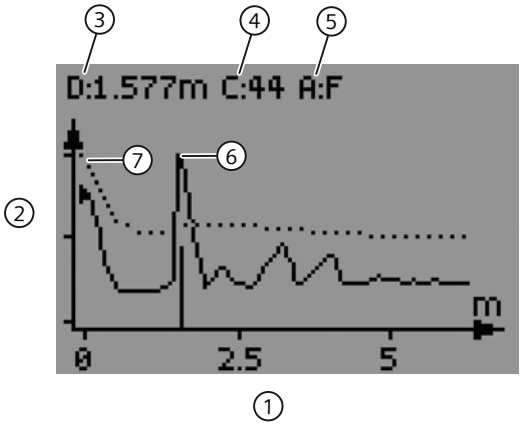
Setting	Yes	Wizard completes and settings are applied.
	No	Returned to start of wizard. (Settings are saved to perform wizard again, but not applied until "Confirm" set to "Yes".)
Default	No	

7.6.5 Requesting an echo profile

Procedure

After commissioning the device, an echo profile may be viewed on the HMI or using a remote engineering system, such as SIMATIC PDM.

For details, see SIMATIC PDM (Page 207).



①	X-axis: Distance Distance units can be set to: m, cm, mm, ft, in.	⑤	Algorithm used [2]
②	Y-axis: Echo amplitude (in dB)	⑥	Echo
③	Distance from sensor face to target	⑦	TVT [3]
④	Echo confidence [1]		

[1] See Confidence (Page 202)

[2] See Auto false echo suppression and Custom TVT (Page 202)

[3] Where AFES has been learned, AFES curve replaces TVT curve (see Auto false echo suppression (Page 98)).

1. In measurement view, press ▶ to navigate to parameter view Maint. and diag.▶ Diagnostics ▶ Echo profile (3.2.1) (Page 130).
2. Press ▶ to start wizard and request a profile.
3. To update to current profile, press ◀ and ▶
4. To exit and return to the previous menu, press ◀ button.

7.6.6 Device address

Setting a device address is not necessary for local operation, but must be set if configuring the device for use on a HART network. See Polling address (4.1) (Page 145).

7.6.7 Testing the configuration

After configuring the device, it is recommended that you test the device to ensure that it performs to your specifications. This test can be run in simulation mode or by varying the actual process value in the application. The latter is preferred, as it more accurately represents operating conditions. However, if it is not possible to do a physical test, a simulation will ensure that control programming is correct. For more details, see Simulation (Page 89).

Operating

8

This chapter provides details on the general operation and functionality of the SITRANS LR500 series. For instructions on the use of the device local display HMI, refer to Local HMI (Page 65).

For a complete list of parameters, see Parameter assignment (Page 113) or Parameter assignment (Page 113).

8.1 Starting measurement

After startup, the **measurement view** reports a list of measurement values in the order shown below.

Process value	Text as shown in measurement view of device
Level	LEVEL
Space	SPACE
Distance	DISTANCE
Volume*	VOLUME
Custom*	CUSTOM
Loop current**	LOOP CURRENT

* "Volume" and "Custom" are not visible until configured.

** Measurements based on primary variable (PV) selection. Default PV is set to "Distance" at startup. (See "Operation" in quick commissioning wizard, or parameter "PV selection" in menu "Setup > Select output" to change this default.)

The following information will help you configure your device for optimal performance and reliability.

Response Rate

The response rate of the device influences the measurement stability. Use the slowest rate possible with the application requirements.

Dimensions

Dimensions of the vessel, wet well, or reservoir (other than lower and upper calibration points) are only important if you require volume readings. In this case, all dimensions are used to calculate the volume value in terms of level.

Fail-safe

The fail-safe parameters ensure that the device defaults to an appropriate state when a valid level reading is not available. (See Fault codes and corrective actions (Page 159) for a list of fault codes related to fail-safe.)

- Parameter "Fault current" defines the behavior (mA output value to report) when an error condition, such as loss of echo, is detected.
- A fail-safe timer also activates when an error condition is detected. "Fail-safe LOE timer" sets the amount of time the loss of echo will persist before device enters fail-safe mode.
- Upon expiration of the timer, and if device is still in an error condition, the mA output value reported is based on value set in parameter "Fail-safe loss of echo".

If fail-safe operation activates frequently, see Diagnostics and troubleshooting (Page 155).

8.2 mA control

Parameter	Default value	Description
Lower saturation limit	3.8	Set lower limit for saturation range, past which the loop current cannot decrease.
Upper saturation limit	20.5	Set upper limit for saturation range, past which the loop current cannot increase.

Verifying the mA range

Check that the external device can track the entire 4 to 20 mA range sent by the device. Follow the steps below if actual mA readings differ between the device (shown under "Loop current" in **measurement view** of device) and an external device (such as a PLC).

1. To test the loop current, run the "Loop test wizard". Select a constant mA value to use in the test from a list of mA values, or set a custom mA value by selecting option "User", then set a value.
2. Check that the external device displays the same mA reading as the mA value set above.
3. If external device reading differs from the value manually set on the device, adjust the reading on the external device to match the reading on the device.

8.3 Characterization chart

If you wish to measure volume and you cannot use a pre-defined vessel (Vessel shape (2.5.1) (Page 123)), you must configure a custom application.

Configure a custom application by setting parameter "Operation" (in quick commissioning wizard), or "PV selection" (in **navigation view**) to option "Custom", then define your vessel/PMD using Customized characteristic curve (2.6.2) (Page 126).

Up to 32 breakpoints, each consisting of an input and output value (X- and Y-value), are available to define your vessel shape.

- For a custom volume characteristic curve, X-values refer to level, Y-values refer to volume.

1. Plot a chart. Usually a vessel supplier will provide this chart. However, if you have a custom-built vessel, then you will need access to complete drawings, or accurate measurements.
2. Enter the curve values from this chart using "X-value n", "Y-value n" breakpoints, where 'n' is the breakpoint number 1 to 32.

   Note

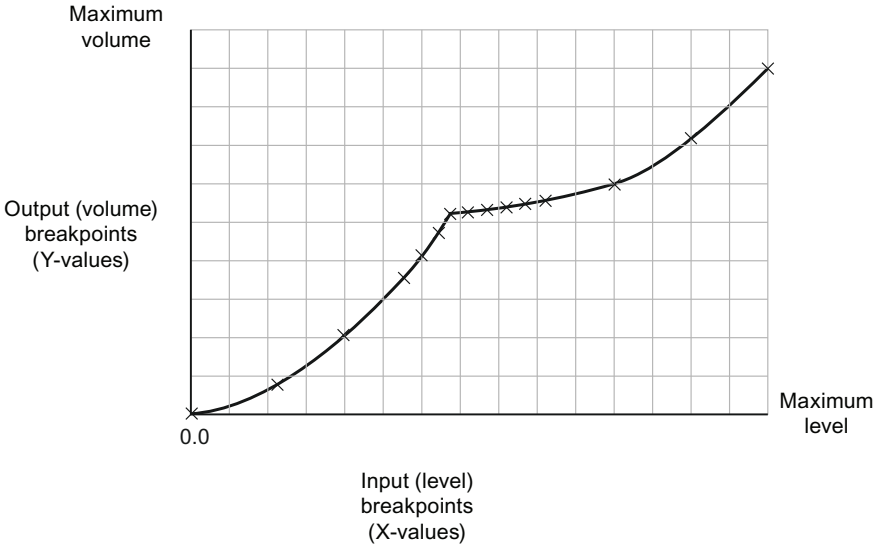
   If breakpoints are entered via local display, then an upload is performed via SIMATIC PDM, a second upload via PDM may be necessary to transfer the breakpoint values.

3. Ensure extra points are added around sharp transitions in the vessel (for example, steps in a vessel wall).

   Note

   The end points in the curve are 0,0 (fixed), and the point defined by parameter "Upper scaling point" for maximum volume or maximum flow.
   ("Upper scaling point" is set by parameter "Upper range value" in "Quick commissioning wizard".)

Example chart for custom volume characterization (with 15 of possible 32 breakpoints defined):



Parameter	Value	Description
X-value 1	0.0	Determines the level breakpoints at which the volume breakpoints are known.
X-value 2	0.8	
X-value 3	2.0	
X-value 4	3.5	
X-value 5	4.1	
X-value 6	4.7	
X-value 7	5.1	
X-value 8	5.2	
X-value 9	5.3	
X-value 10	5.4	
X-value 11	5.5	
X-value 12	5.6	
X-value 13	6.0	
X-value 14	7.2	
X-value 15	9.0	

Parameter	Value	Description
Y-value 1	0.0	Determines the volume breakpoints which correspond to the level breakpoints.
Y-value 2	2.1	
Y-value 3	4.0	
Y-value 4	5.6	
Y-value 5	5.9	
Y-value 6	6.3	
Y-value 7	6.7	
Y-value 8	7.1	
Y-value 9	7.8	
Y-value 10	8.2	
Y-value 11	8.8	
Y-value 12	9.2	
Y-value 13	10.9	
Y-value 14	13.0	
Y-value 15	15.0	

For more details regarding characterization, refer to Vessel shape and dimensions (Page 89).

8.4 Vessel shape and dimensions

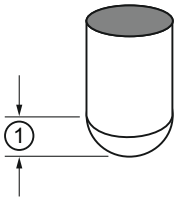
The device can be configured to suit many common vessel shapes. See Vessel shape (2.5.1) (Page 123). Whenever possible, use one of the pre-defined selections. If one of the pre-defined selections is not applicable, a custom volume calculation can be used. (Configure a custom application by setting parameter "Operation" or "PV selection" to option "Custom", then define your vessel shape using Custom (2.6) (Page 126).) For more details, see Technical reference (Page 201).

Each vessel shape uses the empty distance value in its calculations of volume. See PV selection (2.1.1) (Page 114) for an illustration.

Some vessel shapes also require extra dimensions to calculate the volume. Do not estimate these values as they must be exact to ensure the accuracy of your volume calculations.

Example:

To configure volume for a vessel with a half-sphere bottom, set the following:



① Vessel dimension A

Parameter	Sample value	Description
Vessel shape	Half sphere bottom vessel	Sets correct vessel shape
Upper scaling point	100	Sets upper scaling at 100 (defined in "Volume units")
Vessel dimension A	1.3	Sets dimension A to 1.3 m

Note

Example outcome

- The default reading changes to a range from 0 to 100, which is the value in parameter Upper scaling point (2.5.5) (Page 125).
- The process empty value is still measured to the bottom of the vessel (value in parameter "Lower calibration point"), not the top of dimension A.

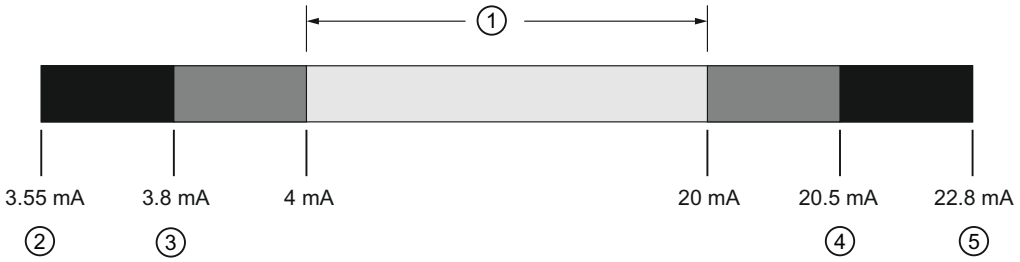
8.5 Simulation

Process values, loop current, and diagnostics can be simulated with this device. Distance process value can be simulated via the HMI, or via an engineering system such as SIMATIC PDM. Process values and diagnostics can be simulated via a remote engineering system.

Current output simulation

The current output can also be simulated using Loop test (3.8.1) (Page 143).

A simulated value (from a preset selection, or a value set by customer) can be set to test the functioning of the mA connections during commissioning or maintenance of the device. The range is 3.55 mA to 22.8 mA.



① Normal operation

② Lower fault current (factory setting)

③ Lower saturation limit (factory setting)

④ Upper saturation limit (factory setting)

⑤ Upper fault current (factory setting)

Note

Simulated current output

The simulated current output value influences output to the control system.

In general, to simulate current output:

1. Run the "Loop test wizard" from the menu "Maintenance and diagnostics > Loop test" on the device (or from the **Device** menu in SIMATIC PDM).
   - Select a preset mA value, or enter a custom value. (Custom value can be entered by selecting "User" option on device, or "Other" option in PDM.)
2. Start the loop test.
3. When you are ready to end the simulation, stop the loop test by exiting the wizard. The device returns to the actual output value.

8.5.1 Simulation - Process value (Operating chapter)

Process value simulation

Process value simulation is an iterative process whereby parameters are adjusted and corresponding results are displayed. Process values can be simulated using a remote

engineering system, and locally, using device HMI. When a simulation is active, it is represented by the fault code "Cb" and corresponding symbol appearing on the device display.

Note

Simulation enabled

- Simulation fault code "Cb" shows on local display, even if other faults are present.
- Simulation fault code and corresponding symbol are shown with a cyan background in the EDD.

When Simulation is enabled, some of the device's configured functionality will respond to the simulated value, including:

- **Limit monitoring:** Any warnings and process alarms that have been configured, activate based on the simulated value.
- **Logging:** Log files reflect the simulated values.
- **Milliamp output:** The loop current output also tracks the corresponding process value it is being configured to read.

The following function will not respond to the simulated value when simulation is enabled:

- **Fault conditions:** The device never enters the fail-safe state when in simulation mode. Faults that normally cause a fail-safe condition (such as a broken cable) may still occur, but a fail-safe condition is not reported on the device during simulation.

In general, to simulate a process value via PDM:

1. Go to the **Device** menu in PDM, and choose "**Simulation** > **Process values**". (For parameter details, see SIMATIC PDM (Page 207)).
2. Set a simulation mode.
3. Set simulation value, and any parameters for a ramp simulation.
4. Start simulation (click "Transfer" button).

(The status of the simulation can be monitored in the PDM menu "**View > Process values**".)

To stop simulation at any time, change parameter "Simulation mode" to "Disabled"**.**

Simulating a fixed process value

1. Set parameter "Simulation mode" to "Enabled" to simulate a **fixed** process value.
2. Set parameter "Simulation value" to the desired fixed value for the simulation.
3. Set parameter "PV status" to the status to simulate.
4. Click "Transfer" button to start the simulation.
5. Set parameter "Simulation mode" to "Disabled" to stop the simulation.

Simulating a changing process value

1. Set parameter "Simulation mode" to "Ramp" to simulate a changing process value.
2. Set parameter "Simulation value" to the desired starting value for the simulation.
3. Set parameter "PV status" to the status to simulate.

4. Set parameter "Ramp end" to stop the simulation when the process value reaches the ramp end value.
5. Set parameter "Ramp steps" to set the number of steps in the ramp simulation.
6. Set parameter "Ramp duration" to set the time interval (in seconds) for each step in the simulation.
7. Click "Transfer" button to start the simulation.

The simulated level will initially begin ramping up from the simulation value. When the process value rises to 100% or falls to 0%, it reverses direction at the same rate. The simulation will stop based on the ramp end value, but ensure parameter "Simulation mode" is set to "Disabled" before the current output is returned to automatic control.

Note

Only distance is simulated

Only distance is simulated. Level, space, volume, custome, and mA are derived from the simulated distance. Echo strength and confidence are set to fixed values during simulation.

8.5.2 Simulation - Application test (Operating chapter)

Application test

You can test the application by varying the actual process value (the preferred test method), or by simulating changes to the process value.

When simulating a changing process value, run a complete cycle to verify that device operates as expected. Monitor system performance carefully, under all anticipated operating conditions.

1. When the device performs exactly as required, programming is complete.
2. If alternate measurement units, or fail-safe action is desired, update the parameters for the new functionality.
3. If you experience problems with system performance, see Diagnostics and troubleshooting (Page 155).

If you cannot observe all possible operating conditions by varying the process value, use the simulation process above to verify programming.

Retest the system each time you adjust any parameters.

8.5.3 Simulation - Diagnostic (Operating chapter)

Diagnostic simulation

Diagnostics can be simulated via a remote engineering system. Diagnostics related to "Device status", "Limit monitoring and event counter", and "HART status" can be chosen from a select list to simulate.

In general, to simulate diagnostics via PDM:

1. Go to the menu "Device" in PDM and choose "Simulation > Diagnostics".
2. On the tab "Diagnostics simulation", click button "Enable" (button toggles between "Enable" and "Disable") to put the device in simulation mode.
3. Select the diagnostics to simulate from the drop-down list provided for the "Diagnostics" field.
4. For each diagnostic selected, set the "Action" to be simulated: "Set" or "Reset".
5. Start simulation (click "Transfer" button).

The status of the simulation for each diagnostic selected, can be seen on the remaining tabs in the dialogue window. The diagnostic being simulated will show a checked box.

End simulation on the tab "Diagnostics simulation":

- To end simulation of a specific diagnostic, click the button "Enable/Disable Simulation" (below the "Action" field).
- To stop device simulation at any time, click the toggle button at the top of the window from "Enable" to "Disable".

8.6 Remote operation

8.6.1 Operating via SIMATIC PDM

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

8.6.1.1 PDM function overview

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 Changing parameter settings using SIMATIC PDM (Page 97) for more details. The menu structure for SIMATIC PDM is almost identical to that for the LCD.

See Parameters accessed via pull-down menus (Page 98) for parameters that do not appear in the menu structure in SIMATIC PDM.

8.6.1.2 SIMATIC PDM Version

Check the support page of our website to make sure you have the latest version of SIMATIC PDM, the most recent Service Pack (SP) and the most recent hot fix (HF): Siemens Industry Online Support (https://support.industry.siemens.com/cs/?lc=en-WW) Browse to **Automation Technology > Process control systems >SIMATIC PCS 7 > SIMATIC PCS 7 system software > Plant Device Management > SIMATIC PDM.**

8.6.1.3 Updating the Electronic Device Description (EDD)

You can locate the EDD in Device Catalog, under **Sensors/Level/Echo/Siemens AG/SITRANS LR500.** The EDD revision must match the Firmware revision in the device.

Note

SITRANS LR500 series standard PDM EDD and Field Device Integration (FDI) EDD

FDI EDD may have limited functionality in comparison to the standard PDM EDD.

To install a new EDD:

1. Go to Product page (www.siemens.com/LR500) > **Support** > **Software downloads** to download the most up-to-date EDD.
2. Save the zip file to your computer.
3. Launch **SIMATIC PDM – Device Integration Manager**, select "Read device descriptions from a compressed source" and navigate to the downloaded file.

Note

PDM EDD and FDI EDD can be installed simultaneously

Both PDM EDD and FDI EDD can be installed at the same time, but you can choose to only install one. If installing simulateously, FDI EDD will take precedence if automatic selection is chosen. Once installed, both PDM EDD and FDI EDD are under the same folder and available features perform the same.

8.6.1.4 Configuring a new device

Note

- Clicking on **Cancel** during an upload from device to SIMATIC PDM will result in some parameters being updated.
- Application Guides for setting up HART devices with SIMATIC PDM can be downloaded from our website:
  Product page (www.siemens.com/LR500).

1. Check that you have the most recent EDD, and if necessary update it. See Updating the Electronic Device Description (EDD) (Page 94).
2. Launch SIMATIC Manager and create a new project for the device.
3. Configure the device via the Quick Start wizard.

8.6.1.5 Quick Start Wizard via SIMATIC PDM

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

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

1. If you have not already done so, check that you have the most up-to-date Electronic Device Description (EDD) for your device. [See Configuring a new device (Page 94).]
2. Launch SIMATIC Manager and create a new project. Application examples for setting up HART and PROFIBUS PA devices with SIMATIC PDM can be downloaded from the Product page of our website:
   Product page (www.siemens.com/LR500)

8.6.1.6 Quick start note

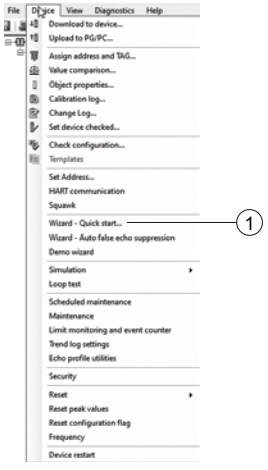
Quick start

Note

- A reset to **Factory Defaults** should be performed before running the Quick Start Wizard if device has been used in a previous application. See Master Reset via SIMATIC PDM (Page 105).
- The Quick Start wizard settings are inter-related and changes apply only after you click on **FINISH AND DOWNLOAD** at the end of the last step to save settings offline and transfer them to the device.
- Do not use the Quick Start Wizard to modify individual parameters: for quick access to echo profile parameters, see Echo Profile via SIMATIC PDM (Page 207) or see Parameter Reference (Page 113) for a complete list. (Perform customization only after the Quick Start has been completed.)
- Click on **BACK** to return and revise settings or **CANCEL** to exit the Quick Start.
- For a vessel with obstructions see Auto False Echo Suppression via SIMATIC PDM (Page 98).

8.6.1.7 Quick start menu and instruction

Launch SIMATIC PDM, open the menu **Device – Wizard - Quick Start**, and follow steps 1 to 4.



① Quick start wizard

Step 1 – Identification

Note

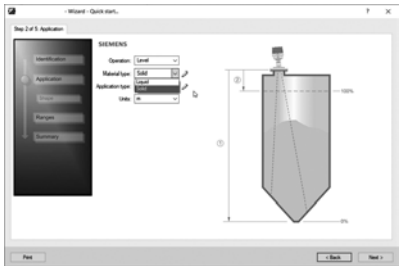
The layout of the dialog boxes shown may vary according to the resolution setting for your computer monitor.

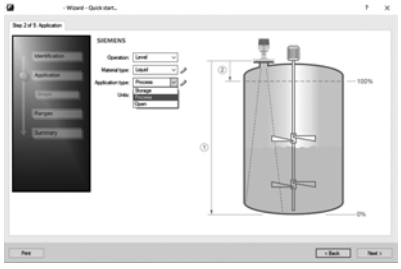
1. Click on **Read Data from Device** to upload Quick Start parameter settings from the device to the PC/PG and ensure PDM is synchronized with the device.
2. If required, change the language for the local user interface.
3. Click on **NEXT** to accept the default values. (Description, Message, and Installation Date fields can be left blank.)
4. Select Operation
5. Select material type, liquid or solid[1)].
6. Select application type storage, process, or open (no vessel top)[1)].
7. Select units, click on next.
8. Enter lower and upper calibration points and response rate[2)].

[1)] Liquid setting is optimized for highest accuracy on liquid or flat targets. Solid setting is optimized for highest reliability on sloped irregular shaped solid surfaces. Solid setting enables the reform filter and uses the rising edge detection method.

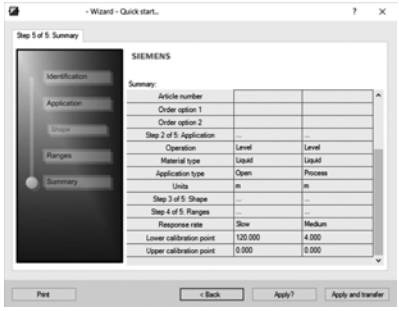
[2)] Choose a response rate setting which is slightly faster than the actual process rate. This setting will affect other parameters such as the fill and empty rate, damping and window discrimination method.

Step 2 – Application



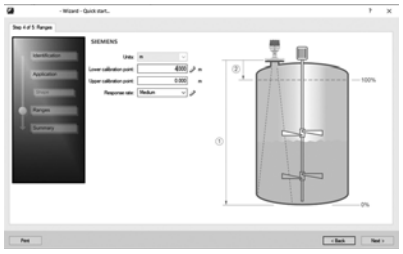


Step 3 – Ranges



Step 4 – Summary

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



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

8.6.1.8 Changing parameter settings using SIMATIC PDM

Note

- For a complete list of parameters, see Parameter Reference (Page 113).
- 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 98) for others.

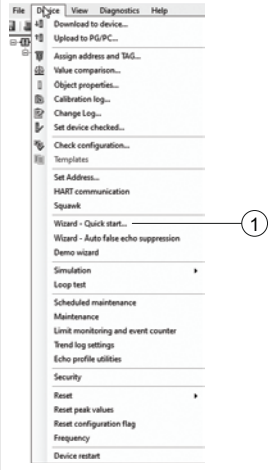
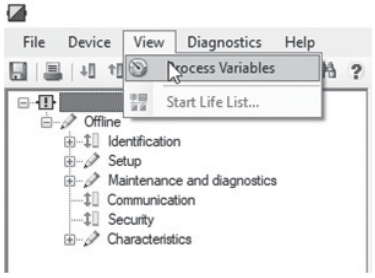
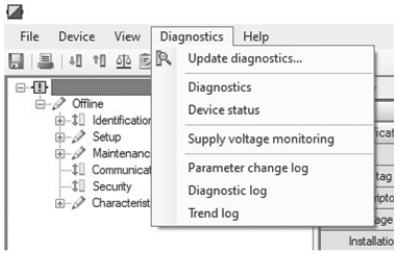
1. Launch SIMATIC PDM, connect to device, and upload data from device.
2. Adjust parameter values in the parameter value field then **Enter**. The status fields read **Changed**.
3. Open the Device menu, click on **Download to device**, then use **File - Save** to save settings offline. The status fields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

8.6.1.9 Parameters accessed via pull-down menu

Parameters accessed via pull-down menus

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

Pull-down menus

Device menu	View menu	Diagnostics menu
 ① Quick start wizard menu		

Auto false echo suppression

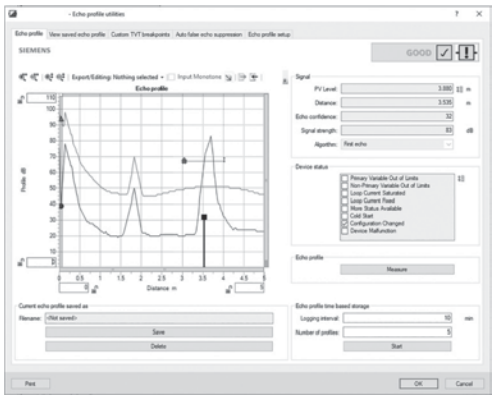
Note

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

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

The device learns the echo profile over the whole measurement range and the TVT is shaped around all echoes present at that moment. See Auto False Echo Suppression (Page 202) for a more detailed explanation.

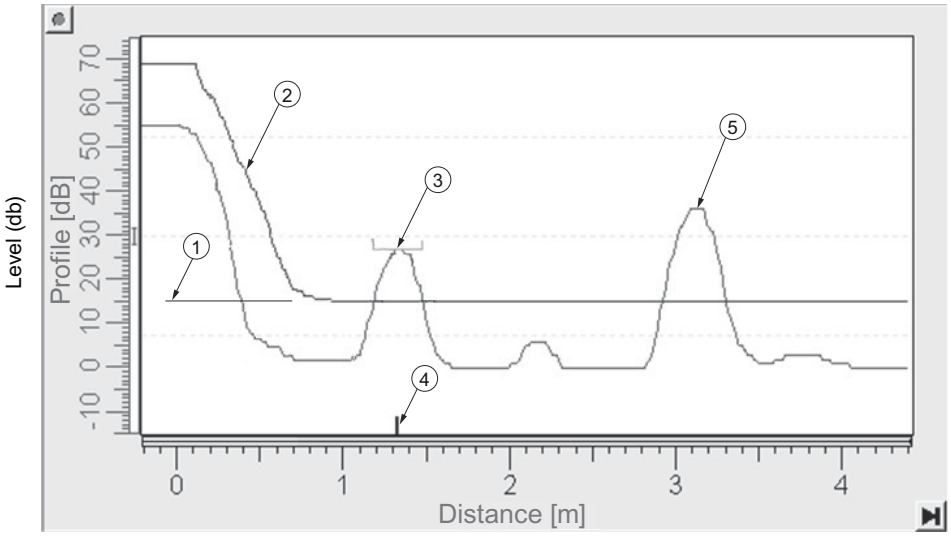
The learned TVT will be applied over a specified range. The default TVT is applied over the remainder of the measurement range.



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

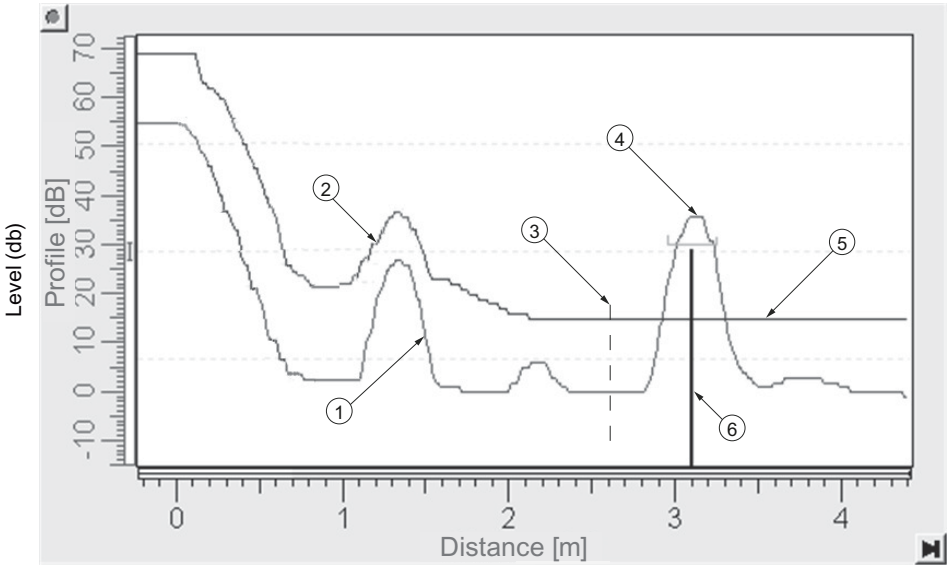
Before and after AFES example

Before Auto False Echo Suppression



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

After Auto False Echo Suppression



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

TVT Shaper

Note

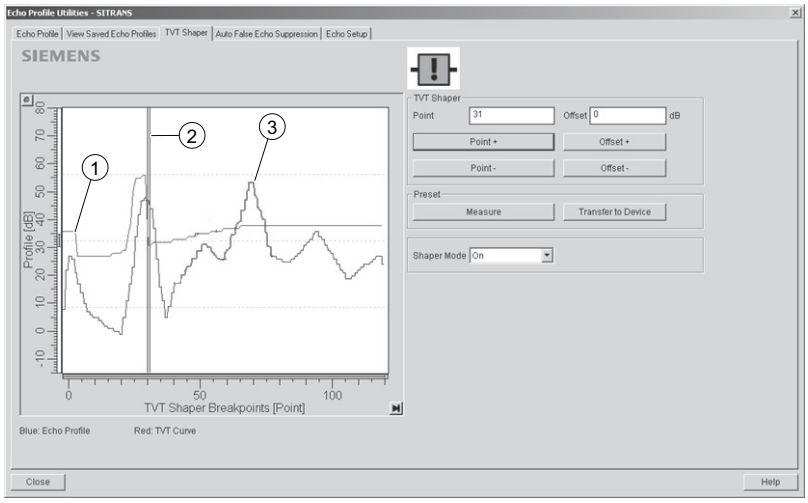
Double click on each axis to see the X scale and data scale values. Right-click or Left-click on the axis and drag to reposition the scale.

This feature allows you to manually adjust the TVT to avoid false echoes caused by obstructions. For an explanation see Auto False Echo Suppression (Page 202).

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

- Turn Shaper Mode **On**.
- Initial profile graph is blank upon entry to dialog. Click on **Measure** to view and upload the current TVT from device.
- Change the position of the cursor on the TVT using the **Point+** and **Point–** buttons: raise and lower the TVT using **Offset+** and **Offset**-.
- Alternatively, enter values for **Point** and **Offset** directly into the dialog boxes.
- Click on **Transfer to Device**.

TVT shaper in PDM



① TVT ② cursor ③ echo profile

Note

Transferring the new values to the device

If the TVT Shaper tab is closed without transferring new values to the device, the new values will appear in the PDM list even though they have not been transferred to the device.

Echo profile utilities

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

- Echo profile (Page 102)
- View Saved Echo Profiles (Page 102)
- TVT Shaper (Page 101)
- Auto False Echo Suppression (Page 202)
- Echo Setup (Page 103)

Echo profile

Note

- Double click on each axis to see the Xscale and Data Scale values.
- To zoom in to a section of the profile, left-click and drag a marquee around it. Right click inside the window to zoom out.
- Expand or compress the x and/or y axes:
  - Left-click on the axis and drag in either direction to reposition the low end of the scale.
  - Right-click on the axis and drag in either direction to reposition the high end of the scale.
- After saving a profile click on **OK**, not the **x** button, to close the Echo Profile Utilities window, otherwise the profile will not be saved.

- In the **Echo Profile Utilities** window click the **Echo Profile** tab.
- Initial profile graph is blank upon entry to dialog. Click **Measure** to update the profile.
- Click **Save** and in the new window enter a name and click **OK**.
- Click **OK** to exit.

View saved echo profiles

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

Echo profile data logging

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

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

Echo setup

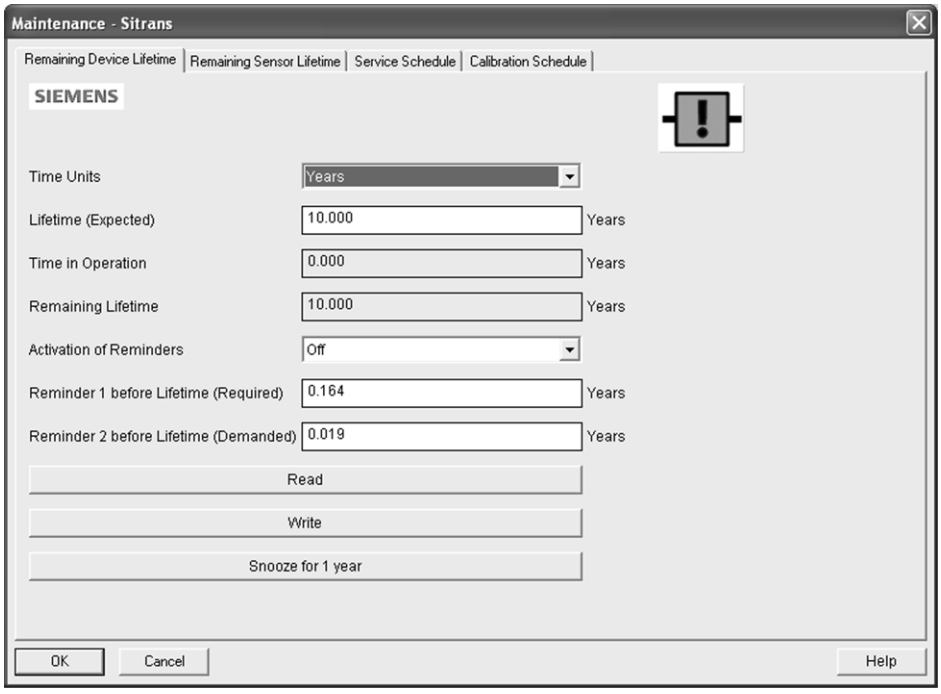
Provides quick access to echo selection, filtering, and response rate parameters.

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

Maintenance

You can set schedules and reminders for:

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



To set Device/Sensor Maintenance schedules:

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

To set Service/Calibration schedules:

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

Select analog output

Allows you to set the mA Output to report Level, Distance, or Space.

If a volume application is selected, mA Output is automatically set to **Volume**.

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**.

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

Factory Defaults resets all parameters to the default settings with the following exceptions:

- Device Address
- Write Protection
- Learned TVT curve
- Auto False Echo Suppression Range
- Frequency

1. Open the menu **Device – Master Reset**, select **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).

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

Sets the number of request/response preambles (default 5).

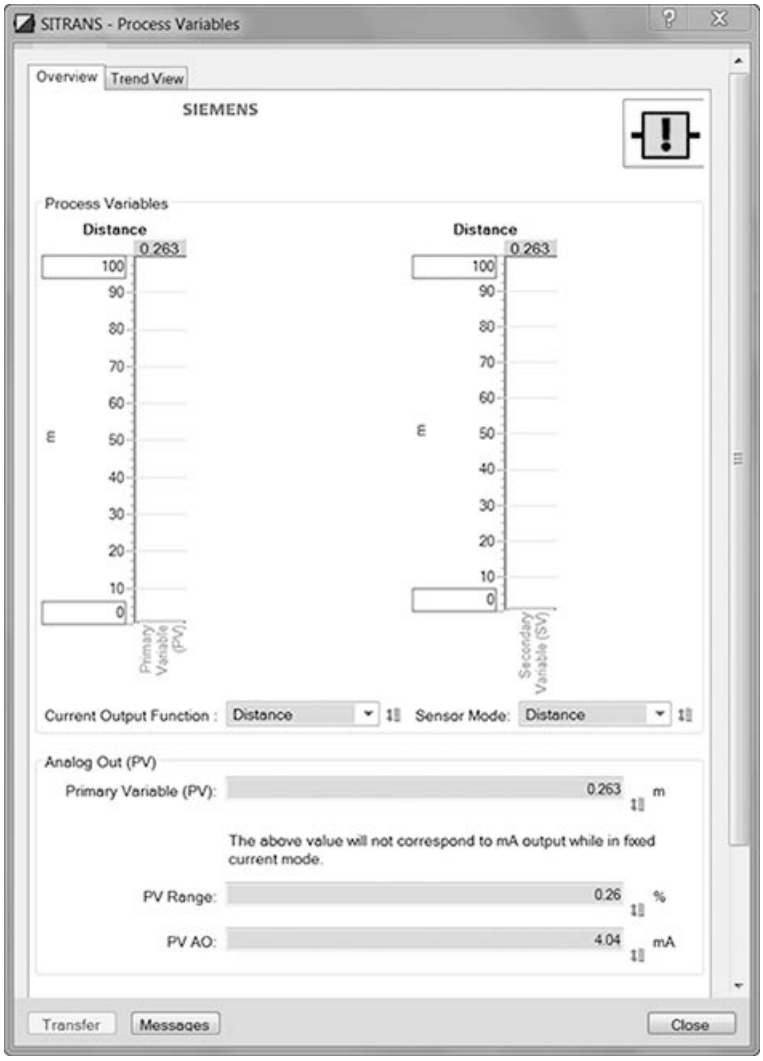
The preamble consists of three or more hexadecimal FF characters (all 1s). This allows the receiving modem to get its frequency-detection circuits synchronized to the signal after any pause in transmission.

We recommend you do not change the default value (5).

Process variables

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

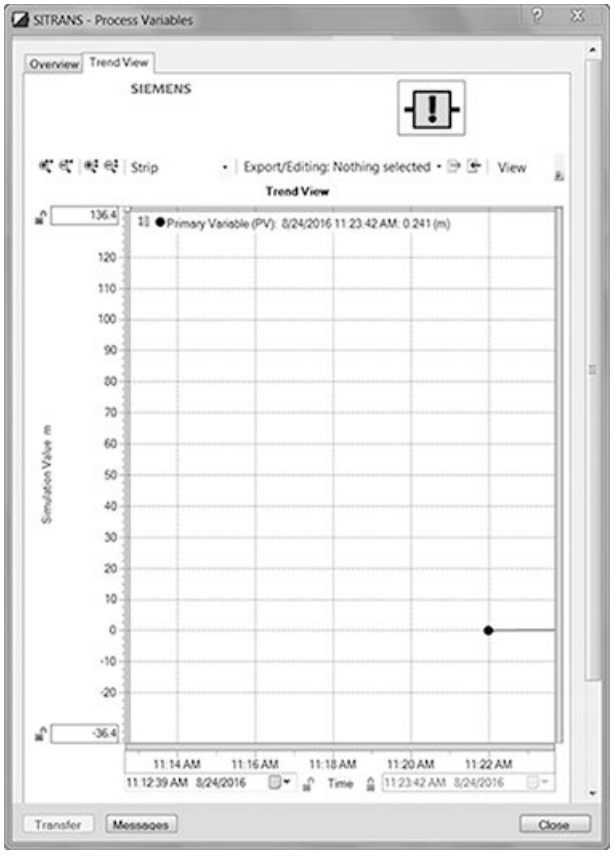
To see highest and lowest electronics temperatures, navigate to **Level Meter > Maintenance and Diagnostics > Electronics Temperature**.



Trend

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

The mA Output follows Primary Value (PV), and can be set to either Level, Space, or Distance.
PV selection (2.1.1) (Page 114)



Device status

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

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

Diagnostic functions

Limit monitoring and event counter

Introduction

With the limit monitoring and event counter function, the following options are available to you via remote operation (e.g. SIMATIC PDM):

- Monitoring process values
- Counting events based on configured limits
- Triggering, acknowledging and resetting process value alarms and warnings.

Configuring limit monitoring

Procedure

1. Select the menu command "Device > Limit monitoring and event counter".
   The "Limit monitoring" tabs are displayed.
2. To trigger a process value alarm each time the value falls below or exceeds the limit, set the "Limit monitoring" text box to "Enabled".
3. Select the process value (e.g. sensor temperature) that you want to monitor from the "Monitored value" drop-down list.
   Configure only one process value per tab.
4. In the "Upper limit", "Lower limit" and "Hysteresis" text boxes, enter the values that trigger an event.
   If the process value rises above the upper limit (overrun) or falls below the lower limit (underrun), an event is counted based on the configured value for the hysteresis.
   Hysteresis (Page 110)
5. If necessary, configure the event counter.
   Configuring the event counter (Page 108)
6. Click on "Transfer".

Result

The process value alarm is displayed as a symbol for the status in the "Diagnostics > Device state" dialog of the engineering system and on the device screen.

It is not necessary to acknowledge the process value alarms.

If the monitored process value is again within the limit values, the process value alarm is reset.

Configuring the event counter

Condition

You have configured the following values in limit monitoring:

- Upper limit
- Lower limit
- Hysteresis

Configuring limit monitoring (Page 108)

Procedure

1. In the "Limit" text box, enter the number of underrun and overrun events that must be reached in order to trigger the action for underrun and overrun respectively.
2. From the "Action" drop-down list, select whether process value alarms or warnings (maintenance demanded and maintenance required) are triggered.
   - If you set the action to "Disabled", no new process value alarms or warnings for the set limit values are triggered, although the counter remains in operation.
     All process value alarms and warnings that were triggered before the action was set to Disabled remain pending until the event counter is reset.
3. Click on "Transfer".

Result

The configured diagnostics are triggered after the specified number of limit violations has been reached (e.g. Maintenance required).

Process value alarms and warnings are displayed as symbols for the status in the "Diagnostics > Device state" dialog in the engineering system and on the device screen.

These process value alarms and warnings must be acknowledged.

Acknowledgement process value alarms and warnings (Page 109)

Acknowledgement process value alarms and warnings

Requirement

You have configured the event counter.

Configuring the event counter (Page 108)

Procedure

1. Select the menu command "Device > Limit monitoring and event counter".
2. Click "Reset and acknowledge".

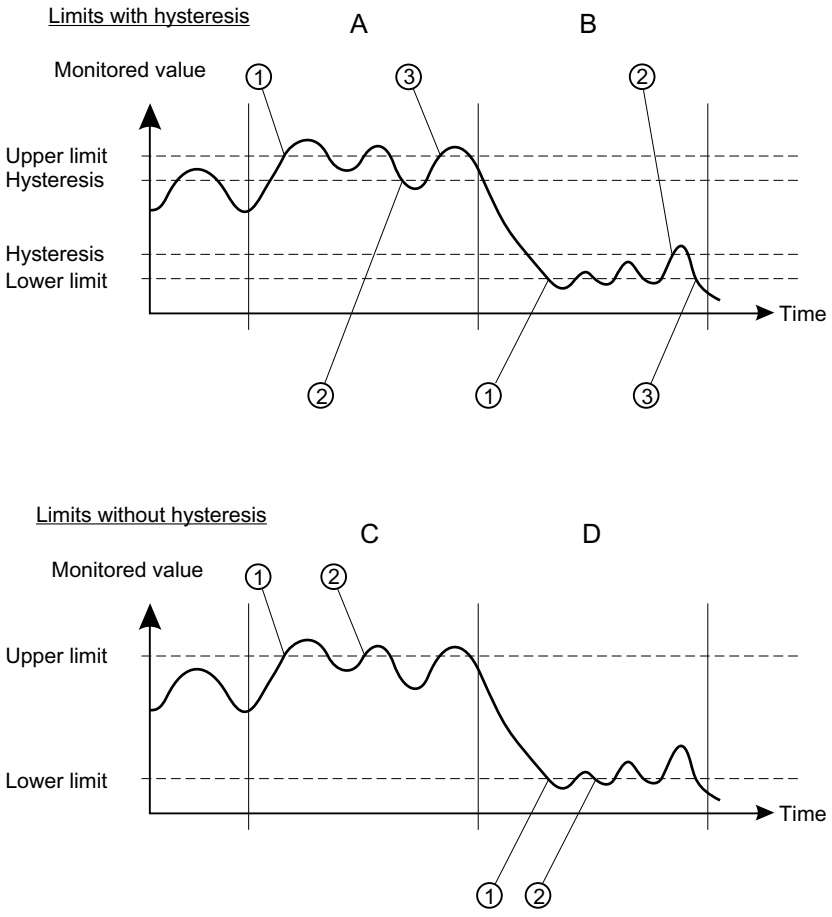
Result

Process value alarms and warnings are acknowledged and deleted.

The event counter is reset.

Hysteresis

The hysteresis works as follows:



Limits with hysteresis

If you enter a non-zero value in the "Hysteresis" text box, the hysteresis is disabled.

Upper limit with hysteresis (A)

An overrun event is counted when the process value rises above the upper limit ①.

The next overrun event is counted when the process value falls below the lower limit minus the entered hysteresis② and then rises above the upper limit③.
Two events are counted in the displayed time period within 'A'.

Lower limit with hysteresis (B)

An underrun event is counted when the process value falls below the lower limit ①.

The next underrun event is counted when the process value first rises above the lower limit plus the entered hysteresis②, and then falls below the lower limit③.

Within 'B', two events are counted in the displayed period.

Limits without hysteresis

If you enter the value "zero" in the "Hysteresis" text box, the hysteresis is disabled.

Upper limit without hysteresis (C)

An overrun event is counted when the process value rises above the upper limit①.

The next overrun event is counted when the process value falls below the upper limit② by any value, and then rises above the upper limit②.

Within 'C', three events are counted in the displayed period.

Lower limit without hysteresis (D)

An underrun event is counted when the process value falls below the lower limit① by any value.

If the process value falls below the lower limit by any value ②, the next underrun event is counted again.
Two events are counted in the displayed period within 'D'.

Trend log

Set trend log

1. Select the menu command "Device > Trend log settings".
2. Define the number of process values you wish to log.
3. Use the "Logging behavior" parameter to define the buffer behavior.
   - To fill the buffer with a variable number of logging points between 1 to 735 per process value, select "Fill and stop".
     The buffer is deleted and filled up to the number of set logging points. Then logging is stopped.
   - If you select the buffer behavior "Overwrite", the buffer is completely deleted. After the buffer size of 735 logging points per process value has been reached, the 15 oldest logging points are cyclically replaced with 15 new logging points.
4. In the "Logging interval" parameter, enter the interval in seconds between the logging points.
5. Select the process values you want to record.
6. Click on "Transfer" to write the log settings to the device.
   The buffer with the existing logging points is deleted and overwritten with new logging points.

Show trend log

1. Select the menu command "Diagnostics > Trend log".
2. Click on "Read".
   - The number of available process values is displayed.
   - The current number of logging points per process value that are already in the buffer is displayed.
   - The time stamp for the start time is displayed.
3. To show the first or second process value in the chart, enable the associated check box.
4. Click on "Read".
   - The logging points in the buffer are read from the device and shown in the chart.
   - The process values for pressure and sensor temperature are shown in different colors in the chart.

   When you click on "Reset", the buffer is deleted and trend logging starts again.

Note

Trend logging via EDD and HMI

There are 100,000 points for trend logging, with the capability to log up to eight variables simultaneously. To access trend logging see parameter Trend log settings (3.6) (Page 139) and EDD.

Operating hours counter

Operating hours counter for transmitter electronics

- Monitors the number of operating hours during which the transmitter remained in continuous operation.
- Starts with the first commissioning at the factory.
- The operating hours counter cannot be reset or adjusted.

Operating hours counter for sensor electronics

- Is only displayed when the measuring transducer electronics was replaced.
- Monitors the number of operating hours during which the sensor electronics remained in continuous operation.

Procedure

1. Use remote operation (e.g. SIMATIC PDM) to select the menu command "Diagnostics > Device status".
2. Select the "HART status" tab.
   The operating time and, if available, the sensor operating time is displayed.

Parameter assignment

9

This chapter includes all parameters accessible via local operation.

Note

Parameter visibility

A full list of available parameters and settings for each are shown in the manual. However, some parameters and settings may not appear on the device, as visibility is based on the application and configuration selected.

Parameters are identified by name (followed by parameter number in parenthesis), and organized into function groups within a menu structure.

Note

- In Navigation view, local buttons **(▲▼ ▶◀)** navigate in the direction of the arrow.
- Press ▶ button to open **Edit** Mode, or to save a modification.

9.1 Quick start (1)

From **measurement view**, press ▶ button to enter **parameter view**, then press▼ button to select the "Quick commissioning wizard". Press ▶ button to open the first step, and follow the instructions.

Note

Do not use a quick commissioning wizard to modify individual parameters. (Perform customization for your application only *after* "Quick commissioning wizard" has been completed).

- See Quick commissioning via HMI (Page 69).
- See Quick commissioning via SIMATIC PDM (Page 207).

Note

No user-relevant data is lost in the event of a power failure.

9.1.1 Quick commissioning (1.1)

Provides step-by-step procedure to set up common applications easily.

9.1.2 Demo wizard (1.2)

Used to optimize the device for demonstration purposes, increasing measurement response time.

9.1.3 AFES wizard (1.3)

Used to prevent false echo detection over a specified range.

9.2 Setup (2)

The following parameters relate to device setup.

9.2.1 Select output (2.1)

9.2.1.1 PV selection (2.1.1)

Sets the primary variable by selecting a process value that corresponds to the loop current.

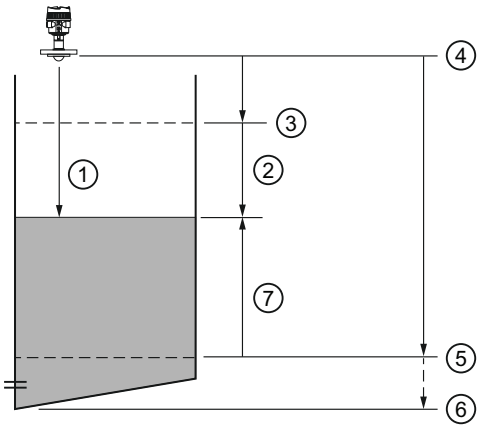
Setting	Level
	Space
	Distance
	Volume
	Custom
Default	Distance

Note

Start view set automatically by wizard

The process value to display on device after power on is set automatically by the "Quick commissioning wizard".

- When parameter "Operation" is set in the wizard, the value is written to parameter "Start view".
- If a change is made to parameter "Start view" or parameter "PV selection" after running the wizard, the last one set will apply.
- Options "Volume" and "Custom" are not visible in **measurement view** until configured. If one of these unconfigured options is selected in parameter "Start view", **measurement view** will show the next visible process value.



① Distance
② Space
③ Upper calibration point
④ Sensor reference point
⑤ Lower calibration point
⑥ Far range
⑦ Level

Option	Description	Reference point
Level	Distance to material surface	Lower calibration point (process empty level)
Space	Distance to material surface	Upper calibration point (process full level)
Distance	Distance to material surface	Sensor reference point
Volume	Volume of material in Volume units (based on level)	Lower calibration point

9.2.1.2 SV selection (2.1.2)

Sets the secondary variable by selecting a process value that corresponds to the loop current.

Setting	Level
	Space
	Distance
	Signal strength
	Confidence
	Volume
	Custom
	Electronics temperature
Default	Distance

9.2.1.3 TV selection (2.1.3)

Sets the tertiary variable by selecting a process value that corresponds to the loop current.

Setting	Level
	Space
	Distance
	Signal strength
	Confidence
	Volume
	Custom
	Electronics temperature
Default	Signal strength

9.2.1.4 QV selection (2.1.4)

Sets the quaternary variable by selecting a process value that corresponds to the loop current.

Setting	Level
	Space
	Distance
	Signal strength
	Confidence
	Volume
	Custom
	Electronics temperature
Default	Electronics temperature

9.2.1.5 Linearization type (2.1.5)

Sets type of linearization used to calculate volume.

Setting	None
	Volume
	Custom
Default	None

9.2.2 Sensor (2.2)

9.2.2.1 Units (2.2.1)

Sets units used by the device.

			Default
Setting	Meters	m	3 decimal places
	Centimeters	cm	1 decimal place
	Millimeters	mm	0 decimal places
	Feet	ft	3 decimal places
	Inches	in	2 decimal places
Default	Meters	m	3 decimal places

Note

Dynamic decimal places

Each setting for parameter "Units" has a default number of decimal places used to show the process value on the local display. However, if the value is too large to show on the segment display, the decimal places will be automatically adjusted to show the process value.

Note

Process value too large to display

In some cases, even with dynamic decimal places, it is possible that the process value will be too large to show on the local display, "**#####**" shows instead.

If this occurs in a typical application:

- Adjust parameter "Units" so that a smaller value can be shown, e.g. use meters instead of millimeters.

If this occurs in a custom application:

- Adjust parameter "Custom units" so that a smaller value can be shown, e.g. use tons instead of pounds.
- Note that a change to custom units also requires a scaling adjustment (see Custom units (Page 75)).

9.2.2.2 Temperature units (2.2.2)

Sets temperature units used by the device.

Setting	• °C (degrees Celcius) • K (Kelvin) • °F (degrees Fahrenheit) • °R (degrees Rankine)
Default	°C (degrees Celcius)

9.2.2.3 Fill rate limit (2.2.3)

Sets the maximum fill rate the device can track.

Setting	0 to 99999
Default	1.0 m/min

Note

Rate parameters

The rate parameters "Fill rate limit", "Empty rate limit", and "Damping value" work in conjunction, and are affected by parameter "Response rate" (set in the "Quick commissioning" wizard). The rate parameters automatically adjust when parameter "Response rate" is altered, but any changes made to the rate parameters following the completion of the wizard supersede the response rate setting.

9.2.2.4 Empty rate limit (2.2.4)

Sets the maximum empty rate the device can track.

Setting	0 to 99999
Default	1.0 m/min

Note

Rate parameters

The rate parameters "Fill rate limit", "Empty rate limit", and "Damping value" work in conjunction, and are affected by parameter "Response rate" (set in the "Quick commissioning" wizard). The rate parameters automatically adjust when parameter "Response rate" is altered, but any changes made to the rate parameters following the completion of the wizard will supersede the response rate setting.

9.2.3 Calibration (2.3)

9.2.3.1 Lower calibration point (2.3.1)

Sets distance from sensor reference point to lower calibration point: usually process empty level.

Setting	0 to 120 m
Default	30 m

9.2.3.2 Upper calibration point (2.3.2)

Sets distance from sensor reference point to upper calibration point: usually process full level.

Setting	0 to 120 m
Default	0

9.2.3.3 Lower level point (2.3.3)

Sets level value when material is at lower calibration point.

Setting	-99999 to 99999 m
Default	0.0 m

9.2.3.4 Upper level point (2.3.4)

Sets level value when material is at upper calibration point.

Setting	-99999 to 99999 m
Default	30 m

9.2.3.5 Sensor offset (2.3.5)

Sets offset to compensate for changes in sensor reference point.

Changes to sensor reference point may result from adding a thicker gasket or reducing the standoff/nozzle height.

Setting	-99.999 to 99.999 m
Default	0

If amount of parameter "Sensor offset" is known, enter the constant that can be added to or subtracted from sensor value[1)] to compensate if the sensor reference point has shifted.

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

9.2.3.6 Low-level cutoff (2.3.6)

Sets lower limit on measured value (before any offset applied).

For example, set value to zero to prevent a negative level measurement.

Setting	-999 to 0.0
Default	0.0

Note

Default value disables parameter

By using the default value of -999, or a lower value, the parameter "Low-level cutoff" is disabled.

9.2.3.7 Propagation factor (2.3.7)

Sets value that represents reduction in propagation velocity as a result of the wave travelling through a pipe.

Setting	0.3 to 1.1
Default	1.0

9.2.3.8 Antenna offset (2.3.8)

Sets offset required if electronics module is replaced. Consult your local Siemens representative for support.

Setting	-0.2 to 0.2 m
Default	0.0 m

9.2.4 Current output (2.4)

9.2.4.1 Loop current mode (2.4.1)

Sets operation of Loop current for HART multidrop mode.

Setting	Enabled
	Disabled
Default	Enabled

The device is in loop current mode by default. Disabling parameter "Loop current mode" will result in a fixed loop current setting for multidrop operation (see Loop current value in multidrop mode (2.4.2) (Page 120)).

9.2.4.2 Loop current value in multidrop mode (2.4.2)

Sets mA value for loop current in HART multidrop mode.

Setting	3.6 to 22.8 mA
Default	4 mA

9.2.4.3 Damping value (2.4.3)

Sets the damping (filtering) of the PV to smooth out response to sudden changes in measurement.

An increase of damping increases response time of device, and affects digital value and loop current. If output values are noisy, increase parameter "Damping value". For faster response time, decrease parameter "Damping value". Find a value that meets requirements of signal stability and response time.

Setting	0 to 1500 s
Default	10 s

9.2.4.4 Lower range value (2.4.4)

Sets process value that corresponds to 4 mA loop current.

Setting	-99999 to +99999 (based on PV, setting for PV of Level shown here)
Default	0 ("Units" based on PV)

Note

Setting for parameter "Lower range value" is based on selected PV

- PV set to Level, Space - Setting based on parameter "Lower level point"
- PV set to Distance - Setting based on parameter "Upper calibration point"
- PV set to Volume - Setting based on parameter "Upper scaling point" in "Volume" menu
- PV set to Custom - Setting based on parameter "Upper scaling point" in "Custom" menu

Note

Parameter "Lower range value" is limited when PV set to Level or Space

When PV is set to Level or Space, the setting for parameter "Lower range value" is limited by the setting for parameter "Lower level point".

- If desired setting for parameter "Lower range value" is greater than the current setting in parameter "Lower level point", it is necessary to *first* set parameter "Lower level point" to a value equal to, or greater than the desired value for parameter "Lower range value".

9.2.4.5 Upper range value (2.4.5)

Sets process value that corresponds to 20 mA loop current.

Setting	-99999 to +99999 (based on PV, setting for PV of Level shown here)
Default	30 ("Units" based on PV)

Note

Setting for parameter "Upper range value" is based on selected PV

- PV set to Level, Space - Setting based on parameter "Upper level point"
- PV set to Distance - Setting based on parameter "Lower calibration point"
- PV set to Volume - Setting based on parameter "Upper scaling point" in "Volume" menu
- PV set to Custom - Setting based on parameter "Upper scaling point" in "Custom" menu

Note

Parameter "Upper range value" is limited when PV set to Level or Space

When PV is set to Level or Space, the setting for parameter "Upper range value" is limited by the setting for parameter "Upper level point".

- If desired setting for parameter "Upper range value" is greater than the current setting in parameter "Upper level point", it is necessary to *first* set parameter "Upper level point" to a value equal to, or greater than the desired value for parameter "Upper range value".

Note

"Upper range value" (URV) versus "Upper scaling point"

- When parameter "Upper range value" is set within the "Quick commissioning wizard", it automatically sets the "Upper scaling point" to the same value.
- Setting a value for either parameter *outside* of the wizard, will not automatically adjust the other value.

Note

Changing custom units

If a change is made to custom units, be sure to rescale the output, as rescaling for custom units is not handled automatically by the device.

- To rescale output, use parameters "Upper range value" and "Upper scaling point".

9.2.4.6 Lower saturation limit (2.4.6)

Sets lower limit for saturation range (4 mA to parameter "Lower saturation limit"), past which the loop current cannot decrease.

Setting	3.55 to 4 mA
Default	3.8 mA

9.2.4.7 Upper saturation limit (2.4.7)

Sets upper limit for saturation range (20 mA to parameter "Upper saturation limit"), past which the loop current cannot increase.

Setting	20 to 22.8 mA
Default	20.5 mA

9.2.4.8 Lower fault current (2.4.8)

Sets Lower fault current in Non-safety mode.

Setting	3.55 to 4.0 mA
Default	3.55 mA

9.2.4.9 Upper fault current (2.4.9)

Sets Upper fault current in Non-safety mode.

Setting	20.0 to 22.8 mA
Default	22.8 mA

9.2.4.10 Fault current (2.4.10)

Defines behavior when Fail-safe is initiated.

Setting	Upper fault current
	Lower fault current
Default	Lower fault current

See Fault codes and corrective actions (Page 159) for a list of faults that initiate **Fail-safe**, causing "Fault current".

9.2.4.11 Fail-safe loss of echo (2.4.11)

Defines fail-safe behavior when fail-safe loss of echo occurs and fail-safe LOE timer expires.

Setting	Hold	Last valid reading
	Fault current	Value set in parameter "Fault current"
Default	Hold	

9.2.4.12 Fail-safe LOE timer (2.4.12)

Sets amount of time loss of echo will persist before device enters fail-safe state.

Setting	0 to 720 s
Default	100 s

9.2.5 Volume (2.5)

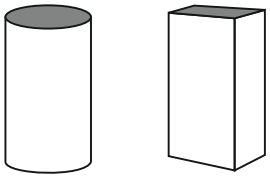
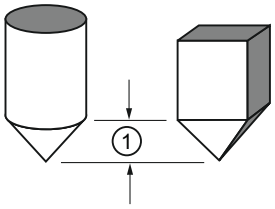
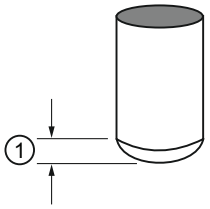
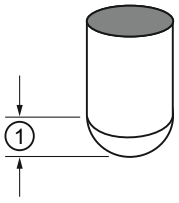
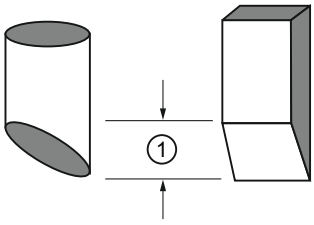
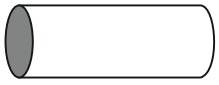
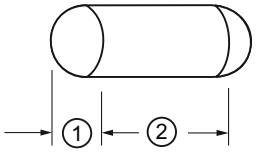
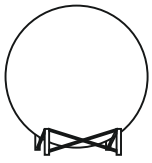
Note

Menu visibility

This menu will not appear on device unless it is configured.

9.2.5.1 Vessel shape (2.5.1)

Sets vessel shape, and allows device to calculate volume in addition to level.

	Display name/description	Vessel shape	Other parameter settings required
Setting	Linear Linear vessel		Upper scaling point
	Conical bottom Conical bottom vessel		Upper scaling point, Vessel dimension A
	Parabolic bottom Parabolic bottom vessel		Upper scaling point, Vessel dimension A
	Half sphere bottom Half sphere bottom vessel		Upper scaling point, Vessel dimension A
	Flat sloped bottom Flat sloped bottom vessel		Upper scaling point, Vessel dimension A
	Horiz. cyl. flat ends Horizontal cylinder flat ends vessel		Upper scaling point
	Horiz.cyl.parab.ends Horizontal cylinder parabolic ends vessel		Upper scaling point, Vessel dimension A, Vessel dimension L
	Sphere Sphere vessel		Upper scaling point
Default	Linear		

① Dimension A ② Dimension L

9.2.5.2 Vessel dimension A (2.5.2)

Sets height of vessel bottom when bottom is conical, parabolic, half spherical, or flat sloped. If horizontal parabolic ends vessel, sets depth of end.

Setting	0 to 99.999 m
Default	0

See Vessel shape (2.5.1) (Page 123) for illustration.

9.2.5.3 Vessel dimension L (2.5.3)

Sets length of cylindrical section of horizontal parabolic ends vessel.

Setting	0 to 99.999 m
Default	0

See Vessel shape (2.5.1) (Page 123) for illustration.

9.2.5.4 Volume units (2.5.4)

Sets volume measurement units.

Setting	Cubic meters	m^3
	Hectoliters	hl
	Cubic inches	in^3
	Cubic feet	ft^3
	Bushels	bu
	Cubic yards	yd^3
	42 US gallon barrels	bbl
	31.5 US gallon barrels	bbl (US)
	Normal liters	Nl
	Normal cubic meters	Nm^3
	Standard cubic feet	SCF
Default	Cubic meters	m^3

9.2.5.5 Upper scaling point (2.5.5)

Sets maximum scaled measurement value.

Setting	0 to 9999.999 m^3
Default	1000.0 m^3

Note

"Upper range value" (URV) versus "Upper scaling point"

- When parameter "Upper range value" is set within the "Quick commissioning wizard", it automatically sets the "Upper scaling point" to the same value.
- Setting a value for either parameter *outside* of the wizard, will not automatically adjust the other value.

9.2.6 Custom (2.6)

Note

Menu visibility

This menu will not appear on device unless it is configured.

9.2.6.1 Upper scaling point (2.6.1)

Sets maximum scaled measurement value.

Setting	0 to 9999999
Default	100 <Custom units>

Note

"Upper range value" (URV) versus "Upper scaling point"

- When parameter "Upper range value" is set within the "Quick commissioning wizard", it automatically sets the "Upper scaling point" to the same value.
- Setting a value for either parameter *outside* of the wizard, will not automatically adjust the other value.

9.2.6.2 Customized characteristic curve (2.6.2)

Used to enter Level and Output breakpoints.

If the shape of vessel (volume) 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 input (level) breakpoint and a corresponding value is assigned to each output (volume) breakpoint.

- Level values are defined in Units (2.2.1) (Page 116).
- Volume values are defined in Volume units (2.5.4) (Page 125).

For more information, see Volume units (2.5.4) (Page 125).

See also

Volume units (2.5.4) (Page 125)

X-value 1 (2.6.2.1) ... X-value 32 (2.6.2.63)

Sets level breakpoints for which output is known.

Setting	-9999999 to +9999999
Default	0

Y-value 1 (2.6.2.2)...Y-value 32 (2.6.2.64)

Sets output corresponding to each input breakpoint entered.

Setting	-9999999 to +9999999
Default	0

9.2.7 Local display (2.7)

9.2.7.1 Start view (2.7.1)

Sets process value shown first on display after power on.

Setting	Level
	Space
	Distance
	Volume
	Custom
	Loop current
	Primary variable
	Percent of range
	Electronics temperature
Default	Level

Note

Start view set automatically by wizard

The process value to display on device after power on is set automatically by the "Quick commissioning wizard".

- When parameter "Operation" is set in the wizard, the value is written to parameter "Start view".
- If a change is made to parameter "Start view" or parameter "PV selection" after running the wizard, the last one set will apply.
- Options "Volume" and "Custom" are not visible in **measurement view** until configured. If one of these unconfigured options is selected in parameter "Start view", **measurement view** will show the next visible process value.

9.2.7.2 Contrast (2.7.2)

Sets contrast level on local display.

Setting	• 0 % • 10 % • 20 % • 30 % • 40 % • 50 % • 60 % • 70 % • 80 % • 90 % • 100 %
Default	50 %

9.2.7.3 Display test (2.7.3)

Used to test device display.

9.3 Maintenance and diagnostics (3)

The following parameters relate to device maintenance and diagnostics.

9.3.1 Identification (3.1)

9.3.1.1 Tag (3.1.1)

Displays a unique tag name for device or measurement point. Limited to 8 characters, and can only be defined via remote operation.

9.3.1.2 Long tag (3.1.2)

Defines a unique tag name for device or measurement point. Limited to 32 characters.

9.3.1.3 Descriptor (3.1.3)

Displays a unique description for device or measurement point. Limited to 16 characters, and can only be defined via remote operation.

9.3.1.4 Message (3.1.4)

Displays a unique message for device or measurement point. Limited to 32 characters, and can only be defined via remote operation.

9.3.1.5 Device (3.1.5)

Manufacturer (3.1.5.1)

Displays manufacturer of device.

Product name (3.1.5.2)

Displays product name.

Article number (3.1.5.3)

Displays the article number (MLFB) of the device.

Serial number (3.1.5.4)

Displays unique serial number of device, set by factory.

HW version (3.1.5.5)

Displays version number corresponding to electronics hardware of device.

FW version (3.1.5.6)

Displays version number corresponding to software or firmware embedded in device.

Final assembly number (3.1.5.7)

Sets a number for user to identify the device. It is normally changed when electronics or other device components are upgraded in the field.

9.3.1.6 Local display (3.1.6)

HW version (3.1.6.1)

Displays version number corresponding to local display of device.

FW version (3.1.6.2)

Displays version number corresponding to software or firmware embedded in local display.

9.3.2 Diagnostics (3.2)

9.3.2.1 Echo profile (3.2.1)

Initiates and displays an echo profile.

9.3.2.2 Device status 1 (3.2.2)

Displays the status of the device.

Setting	[ ] Simulation mode [ ] Non-volatile memory check failure [ ] Volatile memory check failure [ ] Internal power supply is out of allowable range [ ] Process conditions out of specification [ ] Electronics defect [ ] Diagnotics simulated [ ] Sensor break [ ] Out of service [ ] Invalid device configuration [ ] Sensor fail-safe timer expired
Default	[ ] indicates active device status [ ] indicates inactive device status

9.3.2.3 Device status 2 (3.2.3)

Displays the status of the device.

Setting	[ ] Alarm sensor limit exceeded [ ] Incorrect PIN entered [ ] User PIN unchanged [ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Number overruns above threshold [ ] Number underruns above threshold
Default	[ ] indicates active device status [ ] indicates inactive device status

9.3.2.4 Device status 3 (3.2.4)

Displays the status of the device.

Setting	[ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Number overruns above threshold [ ] Number underruns above threshold [ ] Loop current fixed [ ] Loop current in saturation [ ] Device restart due to unexpected program error [ ] Device startup [ ] PV status: uncertain [ ] PV status: bad [ ] Device lifetime: maintenance required [ ] Device lifetime: maintenance demended
Default	[ ] Indicates active device status [ ] Indicates inactive device status

9.3.2.5 Device status 4 (3.2.5)

Displays the status of the device.

Setting	[ ] Service: maintenance demended [ ] Service: maintenance required [ ] Calibration: maintenance demanded [ ] Calibration: maintenance required [ ] Terminal voltage below limit [ ] Terminal voltage above limit [ ] Above limit [ ] Below limit [ ] Above limit [ ] Below limit [ ] Above limit [ ] Below limit [ ] Connection failure to sensor electronics
Default	[ ] Indicates active device status [ ] Indicates inactive device status

9.3.2.6 Device status 5 (3.2.6)

Displays the status of the device.

Setting	[ ] Loop current read back error
Default	[ ] Indicates active device status [ ] Indicates inactive device status

9.3.3 Signal (3.3)

9.3.3.1 Signal quality (3.3.1)

Confidence (3.3.1.1)

Displays echo quality: higher values represent better echo quality.

Echo signal strength (3.3.1.2)

Displays strength of selected echo, in dB.

Noise average (3.3.1.3)

Displays the average ambient noise.

9.3.3.2 Echo configuration (3.3.2)

Near range (3.3.2.1)

Sets minimum distance from sensor reference point, beyond which an echo should be considered valid.

This is sometimes referred to as blanking or a dead zone.

Setting	0 to 126 m
Default	0 m

Far range (3.3.2.2)

Sets maximum distance from sensor reference point, within which an echo should be considered valid.

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

Setting	0 to 126 m
Default	32 m

9.3.3.3 Echo select (3.3.3)

Algorithm (3.3.3.1)

Sets algorithm (applied to the echo profile) to extract the true echo.

Setting	First echo	F
	Largest echo	L
	Echo area	A
	Best echo of the first and largest echo	BLF
	Area largest first echo	ALF
	True first echo	TF
Default	First echo	F

Echo threshold (3.3.3.2)

Sets minimum echo confidence. Only echoes above this threshold are evaluated.

Setting	-20 to 70
Default	1 to 70

Position detect (3.3.3.3)

Sets algorithm used to calculate the position of the echo.

Defines where on the echo the distance measurement is determined.

Setting	Rising edge percentage	Rising edge of echo (calculated using echo peak to echo floor percentage): Yields highest stability on solid materials
	Center	Calculated center of the echo peak: service only
	Rising 2	Service only
	Center 2	High accuracy center for flat targets
Default	Center 2	Liquids, rising edge percentage for solids

Echo marker (3.3.3.4)

Defines the point of measurement on the echo.

Setting	5% to 95%
Default	75 (%)

Applicable only when using "Rising" algorithm, set in parameter "Position detect".

9.3.3.4 Filtering (3.3.4)

Reform echo (3.3.4.1)

Used to smooth jagged peaks in the echo profile. Reforms fragmented echoes into one echo.

Setting	0 to 50 intervals (greater = wider)
Default	0 (off) liquids, 15 solids

Use this feature when monitoring solids if the reported level fluctuates slightly though the monitored surface is still. Enter the amount of smoothing required to the echo profile. When a value is entered, the nearest acceptable interval value, in microseconds, is set.

Near range suppression (3.3.4.2)

Used to automatically suppress signal from sensor reference point to near range suppression distance (0 = off).

Setting	0 to 255
Default	0

Note

If Near range suppression is enabled, Auto false echo suppression (Page 98) must be disabled.

Near range suppression distance (3.3.4.3)

Sets distance for near range suppression.

Setting	0.0 to 50 m
Default	2 m

Near range suppression distance threshold (3.3.4.4)

Sets minimum distance of selected echo for near range suppression.

Setting	0.0 to 12.0 m
Default	1.2 m

Near range suppression echo strength threshold (3.3.4.5)

Sets minimum amplitude of selected echo for near range suppression.

Setting	0 to 99
Default	40 dB

Near range suppression expiry time (3.3.4.6)

Defines the time (in hours) to disable near range suppression, if conditions not met (0 = never).

Setting	0 to 65 535
Default	168 hrs

Number of shots (3.3.4.7)

Sets number of shots to be fired (and results averaged) per transmit pulse.

Setting	1 to 25
Default	10

A higher number of shots may result in a reduction in variation of the reported measurement value, but can increase the update time between measurements.

9.3.3.5 Sampling (3.3.5)

Echo lock (3.3.5.1)

Sets measurement verification process. When echo lock set to "Total lock", parameter "Echo lock window" is preset to 0 for automatic width and cannot be changed.

Setting	Disabled
	Maximum verification
	Material agitator
	Total lock
Default	Material agitator

Use "Material agitator" option to prevent false echoes from agitator blades.

"Maximum verification" option can be used if experiencing frequent loss of echo (LOE). However, it is recommended that you contact your Siemens representative before activating.

Echo lock window (3.3.5.2)

Sets distance window (centered on echo) used to derive reading. When new measurement is in window, window is recentered and reading is calculated.

Setting	0 to 126 m
Default	0

Gain factor (3.3.5.3)

Used to increase or decrease the signal amplitude.

Setting	0.0 ... 1000.0
Default	Liquids: 1 Solids: 10

9.3.3.6 TVT configuration (3.3.6)

TVT type (3.3.6.1)

Sets TVT curve for echo processing.

Setting	TVT short, curved
	TVT long, smooth 2
Default	TVT short, curved

Select the TVT type which gives the highest confidence under all level conditions.

Hover level (3.3.6.2)

Defines how high the TVT curve is placed above the profile, relative to the largest echo.

Setting	0 to 100%
Default	40%

Auto false echo suppression (3.3.6.3)

Displays false echoes in a vessel with known obstructions.

Auto false echo suppression range (3.3.6.4)

Sets end point of the learned TVT distance.

To calculate value

1. Determine the auto false echo suppression range by measuring 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.

Custom TVT shaper mode (3.3.6.5)

Sets operation mode of custom TVT shaper.

Setting	Enabled
	Disabled
Default	Disabled

The TVT breakpoints are only visible when parameter "Custom TVT shaper mode" is enabled.

Custom TVT breakpoints 1...30 (3.3.6.6)

Breakpoint 1 (3.3.6.6.1) ... Breakpoint 30 (3.3.6.6.30)

Sets TVT offset for breakpoint on TVT. Shaping points can be raised (positive number) or lowered (negative number).

Setting	Offset -50 to 50 dB
Default	0 dB

Custom TVT breakpoints 31...60 (3.3.6.7)

Breakpoint 31 (3.3.6.7.1) ... Breakpoint 60 (3.3.6.7.30)

Sets TVT offset for breakpoint on TVT. Shaping points can be raised (positive number) or lowered (negative number).

Setting	Offset -50 to 50 dB
Default	0 dB

Custom TVT breakpoints 61...90 (3.3.6.8)

Breakpoint 61 (3.3.6.8.1) ... Breakpoint 90 (3.3.6.8.30)

Sets TVT offset for breakpoint on TVT. Shaping points can be raised (positive number) or lowered (negative number).

Setting	Offset -50 to 50 dB
Default	0 dB

Custom TVT breakpoints 91...120 (3.3.6.9)

Breakpoint 91 (3.3.6.9.1) ... Breakpoint 120 (3.3.6.9.30)

Sets TVT offset for breakpoint on TVT. Shaping points can be raised (positive number) or lowered (negative number).

Setting	Offset -50 to 50 dB
Default	0 dB

9.3.4 Peak values (3.4)

Displays peak measured values.

9.3.4.1 Minimum electronics temperature (3.4.1)

Displays minimum electronics temperature value.

9.3.4.2 Maximum electronics temperature (3.4.2)

Displays maximum electronics temperature value.

9.3.4.3 Minimum distance (3.4.3)

Displays minimum distance value. Value may reset when units are changed.

9.3.4.4 Maximum distance (3.4.4)

Displays maximum distance value. Value may reset when units are changed.

9.3.4.5 Minimum echo signal strength (3.4.5)

Displays minimum echo signal strength value.

9.3.4.6 Maximum echo signal strength (3.4.6)

Displays maximum echo signal strength value.

9.3.4.7 Minimum confidence (3.4.7)

Displays minimum confidence value.

9.3.4.8 Maximum confidence (3.4.8)

Displays maximum confidence value.

9.3.5 Non-resettable peak values (3.5)

Displays statistics on non-resettable peak measured values.

9.3.5.1 Minimum electronics temperature (3.5.1)

Displays minimum electronics temperature value.

9.3.5.2 Maximum electronics temperature (3.5.2)

Displays maximum electronics temperature value.

9.3.5.3 Minimum terminal voltage (3.5.3)

Displays minimum terminal voltage value.

9.3.5.4 Maximum terminal voltage (3.5.4)

Displays maximum terminal voltage value.

9.3.6 Trend log settings (3.6)

9.3.6.1 Number of logging values (3.6.1)

Sets number of process values to log.

Setting	Disabled
	1
	2
	3
	4
	5
	6
	7
	8
Default	2

9.3.6.2 Number of logged points (3.6.2)

Sets number of data points to capture.

Setting	10 to 100 000
Default	50 000

Maximum number of logged points per the following table:

Number of PV inputs	**Maximum points**
8	10 002
7	13 336
6	16 670
5	20 004
4	23 338
3	33 340
2	50 010
1	100 020

9.3.6.3 Logging interval (3.6.3)

Sets interval in seconds between log entries.

Setting	10 to 600
Default	600

9.3.6.4 Logging behavior (3.6.4)

Defines behavior when log is full.

Setting	Overwrite oldest
	Fill and stop
Default	Overwrite oldest

Note

Log entries not immediately visible using "Overwrite oldest"

When setting "Overwrite oldest" is used, 30 log entries must be stored internally before any are visible in the Trend log.

For example, to log Level and Sensor temperature every 10 minutes, it will take 2.5 hours for the first log entries to appear.

Number of logging values = 2

Logging interval = 600

Logging behavior = Overwrite oldest

Logging value 1 = Level

Logging value 2 = Sensor temperature

The Trend log will appear empty until the first 30 entries (15 Level + 15 Sensor temperature) are stored internally, then written to the log:

- A total of 30 log entries required, divided by the Number of logging values (2), stored at a Logging interval of 600 seconds (10 minutes)
  30/2 * 10 = 150 minutes or 2.5 hours

9.3.6.5 Logging value 1 (3.6.5) ... Logging value 8 (3.6.12)

Sets value to log.

Setting	Level
	Space
	Distance
	Echo signal strength
	Confidence
	Volume
	Custom
	Electronics temperature
	Loop current
Default	Distance
	Echo strength

To edit the logging values, trend logging must be disabled.

9.3.7 Simulation (3.7)

9.3.7.1 Simulation mode (3.7.1)

Defines whether the simulated value is fixed or in the shape of a ramp.

Setting	Disabled
	Enabled
	Ramp
Default	Disabled

Set to "Enabled" to hold the simulation at a specific value. Set to "Ramp" to have the simulation continuously sweep through the measurement range.

9.3.7.2 Simulation value (3.7.2)

Sets starting value for ramp or fixed simulation.

Setting	Not limited
Default	Not applicable

9.3.7.3 PV status (3.7.3)

Sets status of the PV to simulate.

Setting	Good
	Bad
	Uncertain
Default	Good

9.3.7.4 Ramp end (3.7.4)

Sets end value for ramp simulation.

Setting	Not limited
Default	Not applicable

9.3.7.5 Ramp steps (3.7.5)

Sets number of stair steps between ramp start (parameter "Simulation value") and end of ramp simulation.

Setting	0 to 65535
Default	10

9.3.7.6 Ramp duration (3.7.6.)

Sets total time from ramp start (parameter "Simulation value") to end of ramp simulation.

Setting	0 to 65535
Default	5

9.3.8 Current loop (3.8)

9.3.8.1 Loop test (3.8.1)

Provides step-by-step procedure to simulate the loop current.

A loop test can be initiated via local operation (with any errors reported through diagnostic icons on the local display), or remotely, using an engineering system such as SIMATIC PDM.

Note

Simulated current output

The simulated current output value influences output to the control system.

A simulated value can be set to test the functioning of the mA connections during commissioning or maintenance of the device.

Setting	3.55
	4.0
	12.0
	20.0
	22.8
	User (Set any mA value between 3.6 and 22.8)
Default	4.0 mA

Select a preset mA value, or enter a custom value (under option "User") to run the wizard.

Press ◀ button to stop and exit the loop test.

For more information, see mA control (Page 86).

9.3.8.2 Terminal voltage (3.8.2)

Displays the voltage present at the device terminals.

9.3.9 Resets (3.9)

9.3.9.1 Device restart (3.9.1)

Used to restart device without disconnecting power.

Simulation will be terminated. Stored configurations are not reset.

Setting	Cancel
	Ok
Default	Cancel

9.3.9.2 Resets (3.9.2)

Used to provide various device reset options.

Setting	Factory reset
Default	Factory reset

Note

Factory reset requires reprogramming

Following a reset to factory defaults, the device is in a "Not configured" state, and shows the fault "Configuration error" (code SC). The fault code remains until the device is reprogrammed.

Choosing option "Factory reset" will reset all parameters to factory defaults, with the following exceptions:

- "Device address" remains unchanged
- "User PIN" (write protection) value is not reset
- "Peak values" and "Operating time" are not reset
- "Auto false echo suppression" is reset to default (Disabled), but learned TVT is not lost
- "Auto false echo suppression range" is not reset
- "Custom TVT shaper mode" is reset to default (Disabled), but "Custom TVT breakpoints" are not lost

To perform a "Factory reset" via SIMATIC PDM, go to menu "**Device > Reset > Factory reset**".

Note

AFES disabled

Although learned TVT is not lost, parameter "Auto false echo suppression" is reset to its default value of "Disabled" when "Factory reset" is performed.

In SIMATIC PDM, go to menu "**Device > Reset > Factory reset**".

9.3.9.3 Reset peak values (3.9.3)

Resets all recorded Peak values.

Setting	No
	Electronics temperature
	Distance
	Echo signal strength
	Confidence
	Peak values (Resets recorded minimum and maximum values for Distance, Electronics temperature, Echo signal strength, and Confidence.)
Default	No

9.3.10 Frequency (3.10)

Sets the country specific settings for radar signals.

Setting	• Mode 1	EU, Albania, Andorra, Azerbaijan, Australia, Belarus, Bosnia and Herzegovina, Canada, Liechtenstein, Moldavia, Monaco, Montenegro, New Zealand, Northern Macedonia, Norway, San Marino, Saudi Arabia, Serbia, Switzerland, Turkey, Ukraine, United Kingdom, USA
	• Mode 2	Kazakhstan
	• Mode 3	Brazil, South Korea, Taiwan, Thailand, Japan
	• Mode 4	India, Malaysia
Default	Mode 1	

9.3.11 Audit trail (3.11)

9.3.11.1 Configuration change counter (3.11.1)

Displays number of times device configuration or calibration changed, locally or via engineering system.

9.3.12 Firmware update (3.12)

9.3.12.1 Data transfer (3.12.1)

Analog output set to 22.8 mA during firmware update.

9.3.12.2 Firmware update (3.12.2)

9.4 Communication (4)

The following parameters relate to device Communication.

9.4.1 Polling address (4.1)

Sets poll ID on a HART network.

For point-to-point configurations, the standard address is zero (0). For multidrop configurations, use a non-zero HART address.

Setting	0 to 63
Default	0

9.4.2 Identify the device (4.2)

Used to arm device locally to respond to HART Command 73 "Find Device" issued by remote host using the device Long Tag.

Setting	Enabled
	Disabled
Default	Disabled

9.5 Security (5)

9.5.1 User PIN

Used to enable/disable user PIN. When user PIN is enabled, changes to parameter settings require a PIN to be entered.

Note

User PIN

Device is shipped unlocked. If device is locked unintentionally (user PIN enabled), enter PIN 2457 to unlock device (disabled user PIN).

The following parameters relate to device Security.

9.5.2 Change user PIN (5.1)

Used to change PIN code that enables user access level.

Setting	0 to 65535
Default	0

9.5.3 Recovery ID (5.2)

Displays recovery ID that must be provided to Technical Support to obtain the PIN-Unlock-Key (PUK) required to recover the PIN(s).

Record the number shown in parameter "Recovery ID", and the serial number of the device. (Serial number can be found on device nameplate, or via remote operation if data was previously uploaded from device to EDD and saved in offline table, e.g. PDM **Structure view**.)

When you provide this information to Siemens Technical Support, a PUK (PIN Unlock Key) will be supplied to you. Enter this PUK in parameter "PIN recovery" to reset the user PIN to factory default value.

Note

Parameter visibility

Parameter "Recovery ID" will only show on the local display if parameter "User PIN" is enabled.

9.5.4 PIN recovery (5.3)

Used to enter PIN unlock key (PUK) which resets PIN(s) to factory default value. The PUK is available from Technical Support.

For more information, see Recovery ID (5.2) (Page 146).

Note

Parameter visibility

Parameter "PIN recovery" will only show on the local display if parameter "User PIN" is enabled.

9.5.5 User PIN (5.4)

Used to enable/disable user PIN. When user PIN is enabled, changes to parameter settings require a PIN to be entered.

Note

Factory PIN

Device is shipped unlocked. If device is locked unintentionally (user PIN enabled), enter PIN 2457 to unlock device (disabled user PIN).

Setting	Enabled
	Disabled
Default	Disabled

In **Parameter view**, the local display shows the action that can be performed:

- If display shows "Enabled", this means that security is currently disabled
- If display shows "Disabled", this means that security is currently enabled.

Note

Effectivity of change to user PIN setting

When the setting for parameter "User PIN" is changed, it will not take effect immediately. Once setting is changed, a power cycle of the device or ten (10) minutes from last key press, must pass before the change will take effect. (This delay applies only when a change is made to this parameter on the local device, not via remote operation.)

9.5.6 Button lock (5.5)

Sets access to device buttons. When lock enabled, device operation is only possible via engineering system.

To disable lock locally press ▶ for 5 seconds, or use engineering system to disable remotely.

Setting	Enabled	Button lock is enabled
	Disabled	Button lock is disabled
Default	Disabled	

9.6 Language (6)

Sets the language for the local display.

Setting	• English • Deutsch • Français • Italiano • Español • 汉语
Default	Based on user configuration at initial startup.

Service and maintenance 10

10.1 Basic safety notes

Note

The device is maintenance-free.

10.1.1 Maintenance

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

An inspection can include:

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

⚠ WARNING

Use of a computer in a hazardous area

If the interface to the computer is used in the hazardous area, there is a risk of explosion.

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

NOTICE

Penetration of moisture into the device

Damage to device.

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

10.2 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.

10.3 Maintenance and repair work

⚠ WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

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

⚠ WARNING

Maintenance during continued operation in a hazardous area

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

- Isolate the device from power.

- or -

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

⚠ WARNING

Impermissible accessories and spare parts

Risk of explosion in areas subject to explosion hazard.

- Only use original accessories or original spare parts.
- Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.

10.3.1 Enclosure open

⚠ WARNING

Enclosure open

Risk of explosion in hazardous areas.

To open the device in a hazardous area, isolate the device from power.

Exception: Devices exclusively having Intrinsic safety (Ex i) may be opened in an energized state in hazardous areas.

⚠ WARNING

Improper connection after maintenance

Risk of explosion in areas subject to explosion hazard.

- Connect the device correctly after maintenance.
- Close the device after maintenance work.

Refer to Connecting (Page 49).

⚠ WARNING

Hot, toxic, or corrosive process media

Risk of injury during maintenance work.

When working on the process connection, hot, toxic, or corrosive process media could be released.

- As long as the device is under pressure, do not loosen process connections and do not remove any parts that are pressurized.
- Before opening or removing the device ensure that process media cannot be released.

⚠ CAUTION

Hot surfaces

Risk of burns during maintenance work on parts having surface temperatures exceeding 70 °C (158 °F).

- Take corresponding protective measures, for example, by wearing protective gloves.
- After carrying out maintenance, remount touch protection measures.

10.4 Replacing the HMI

10.4.1 Remove existing HMI

To remove HMI for wiring or to replace a damaged display, follow steps below:

1. Turn lid by hand in a counter-clockwise direction while lifting to remove it from device.
2. Pull up to disconnect HMI cable from connector. The HMI is now free to lift out of enclosure. (Dispose of a damaged HMI according to local regulations.)

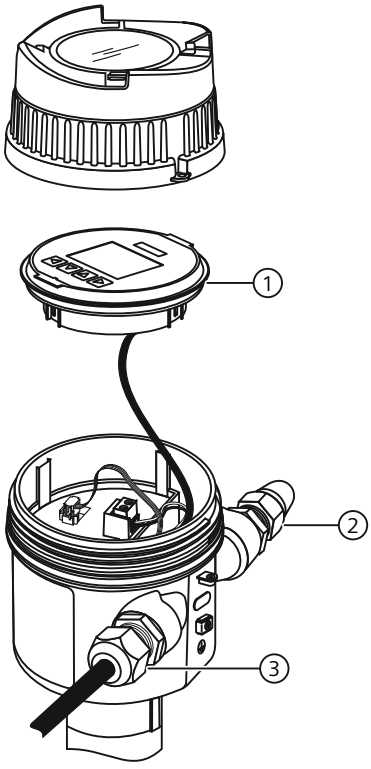
10.4.2 Install HMI

Note

Mounting orientation to HMI

The HMI can be rotated to any position. It will snap and hold into 90° intervals for easy viewing after installation.

1. Press the female end of cable from replacement display onto male four-pin connector.
2. Set replacement HMI into enclosure approximately one quarter turn counter-clockwise from the desired final orientation. Gently turn HMI one quarter turn clockwise to secure the HMI in the enclosure.
3. Replace device lid. Thread onto enclosure, turning clockwise. Hand tighten until mechanical stop is reached.



① HMI
② Bluetooth module
③ Cable gland

10.5 Return procedure

To return a product to Siemens, see Return goods delivery note (https://www.siemens.com/processinstrumentation/returngoodsnote).

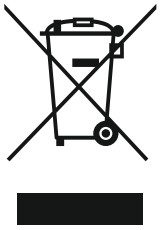
Contact your Siemens representative to clarify if a product is repairable, and how to return it. They can also help with quick repair processing, a repair cost estimate, or a repair report/ cause of failure report.

NOTICE
Decontamination The product may have to be decontaminated before it is returned. Your Siemens contact person will let you know for which products this is required.

See also

Decontamination declaration (https://www.siemens.com/sc/declarationofdecontamination)

10.6 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 and UK, 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/)

Note

Special disposal required

The device includes components that require special disposal.

- Dispose of the device properly and environmentally through a local waste disposal contractor.

Diagnostics and troubleshooting 11

11.1 Device status symbols

Device status is shown using symbols on the local display. Additionally, the symbol and respective text message for each device status can be seen in remote engineering, asset management or process control systems.

Locally, alarms are shown as a symbol in the lower line of the display. If several diagnostic states are active at the same time, the symbol for the most critical state is shown.

Device status characteristics

The following table provides possible cause of device status and actions for the user or service.

The symbols used on the local display are based on NAMUR status signals, whereas symbols used in SIMATIC PDM are based on Siemens standard alarm classes.

Note

Device status priority conflict - Namur vs Siemens standard

When more than one diagnostic event is active simultaneously, a conflict in priorities may arise. In this case, the Namur symbol on the local display will differ from that shown in SIMATIC PDM.

- For example: if both diagnostic states "Maintenance demanded" and "Configuration error" are active,
  - Local display (using Namur symbols) will show "Configuration error" as higher priority.
  - SIMATIC PDM (using Siemens standard symbols) will show "Maintenance demanded" as higher priority.

Be aware of the priority for each device status, depending on the interface used.

11.2 Communication troubleshooting

Note

Understanding radar technologies

- Many parameters referenced and techniques described here require a good understanding of radar technologies and Siemens echo processing software. Use this information with caution.
- If setup becomes too confusing, perform a device reset and start again.
- As a further resource, "Understanding Radar Level Measurement" is available on our website.
  Go to:
  www.siemens.com/level (www.siemens.com/level)
  Select "**Training center** > **E-Learning** > **epubs**".

Generally

1. Check the following:
   - Power is available at device.
   - Optional display shows relevant data.
   - Device can be programmed using local buttons.
   - If any fault codes show on display, see Fault codes and corrective actions (Page 159) for a detailed list.
2. Verify that wiring connections are correct.

Specifically

1. If the device is set to communicate via a HART modem but no communication is returning to the master, check that the device address is set correctly for the HART network.
2. If a device parameter is set via remote communication, but the parameter remains unchanged, try setting the parameter using local buttons. If it cannot be set locally, ensure Button lock (5.5) (Page 148) is set to "Off", and that User PIN is deactivated.

If you continue to experience problems, go to:

Product page (www.siemens.com/LR500)

Check the FAQs for this device, or contact your Siemens representative.

11.3 Device status symbols

11.3.1 Device status symbols (chart)

Device status symbols

Local display - NAMUR NE 107		NAMUR - HCF	SIMATIC PDM/PLC		
Symbol	**Device status**	**Priority ***	**Symbol**	**Device status**	**Priority ****
	Failure	1		Maintenance alarm	1
Cause: Output signal invalid due to fault in the field device or in the peripherals. **Action:** Maintenance is required immediately.					
	Maintenance required	4		Maintenance demanded	2
Cause: Output signal is still valid, but wear reserve is almost exhausted and/or a function will be limited soon. **Action:** Maintenance is strongly recommended as soon as possible.					
	Maintenance required	4		Maintenance required	3

Local display - NAMUR NE 107		NAMUR - HCF	SIMATIC PDM/PLC		
Symbol	**Device status**	**Priority ***	**Symbol**	**Device status**	**Priority ****
Cause: Output signal is still valid. No functional restriction detected but end of wear reserve expected in next weeks. **Action:** Maintenance of device should be planned.					
	Function check	2		Manual operation	4
Cause: Output signal temporarily invalid (e.g. frozen) due to work being performed on the device. **Action:** Disable manual mode via HMI or engineering system.					
	Function check	2		Simulation or substitute value	5
Cause: Output signal temporarily does not represent the process because output based on a simulation value. **Action**: Disable simulation mode via HMI or engineering system or restart device.					
	Failure	1		Out of service	6
Cause: Output signal does not represent process value. Device mode is set to "Out of service". **Action:** Disable “out of service” and enable normal operation.					
	Failure	1	 (red)	Configuration error	7
Cause: Output signal invalid due to a parameter setting, connection error or a configuration error in the HW. **Action:** Check hardware configuration or parameter settings of the device via HMI or engineering system.					
	Out of specification	3		Process value alarm	8
Cause: Deviations from permissible ambient or process conditions detected by the device (through self-monitoring, or warnings / faults in the device) indicate that the measured value is unreliable or deviations from the set value in the actuators is most likely greater than anticipated under normal operating conditions. Process or ambient conditions will damage the device or result in unreliable output. **Action:** Check ambient temperature or process conditions. If possible, install device at different location.					
	Function check	2	 (yellow)	Configuration warning	9
Cause: Device can operate, but one or more parameters are incorrectly configured. **Action:**					
	Out of specification	3		Process value warning	10

Local display - NAMUR NE 107		NAMUR - HCF	SIMATIC PDM/PLC		
Symbol	**Device status**	**Priority ***	**Symbol**	**Device status**	**Priority ****
Cause: Deviations from permissible ambient or process conditions detected by the device (through self-monitoring, or warnings / faults in the device) indicate that the measured value is unreliable or deviations from the set value in the actuators is most likely greater than anticipated under normal operating conditions. Process or ambient conditions can damage the device or result in unreliable output. **Action:** Check ambient temperature or process conditions. If possible, install device at different location.					
No symbol shown				Process value tolerance	11
Cause: At least one process value has exceeded or fallen below a process tolerance limit parameter set in device. **Action:** Check that limit parameter settings are suitable for application.					
No symbol shown			No symbol shown	Configuration changed	12
Cause: The device configuration has changed due to a work process. **Action:** Reset configuration flag to clear diagnostic message.					
No symbol shown	Good - OK		No symbol shown	No assignment	13
Cause: Device status ok. No active diagnostic errors. **Action:** No action required.					

* Lowest priority number equals highest fault severity.

** Both the Siemens standard symbol and its corresponding Namur symbol (from device display) will be shown in SIMATIC PDM.

11.4 Device information symbols

11.4.1 Device information symbols

Information symbols

In addition to device status symbols, information symbols appear on the local display.

See The LCD display (Page 66).

11.5 Fault codes and corrective actions

11.5.1 Fault codes and corrective actions

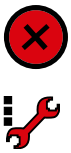
ID	Symbols	Message	Cause/action
A0		Event counter 1 Number overruns above threshold Maintenance alarm	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
A1		Event counter 1 Number underruns above threshold Process value alarm	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
A2		Event counter 1 Number underruns above threshold Maintenance required	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
A3		Event counter 1 Number underruns above threshold Maintenance alarm	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
A4		Event counter 2 Number overruns above threshold Process value alarm	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
A6		Event counter 2 Number overruns above threshold Maintenance required	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
A7		Event counter 2 Number overruns above threshold Maintenance alarm	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.

ID	Symbols	Message	Cause/action
A8		Event counter 2 Number under-runs above threshold Process value alarm	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
A9		Event counter 2 Number under-runs above threshold Maintenance re-quired	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
AA		Device lifetime: maintenance demanded	Forthcoming end of configured device's lifetime. Maintenance is strongly recommended as soon as possible.
Ab		Device lifetime: maintenance re-quired	Forthcoming end of configured device's lifetime. Maintenance of device should be planned.
AE		Service: maintenance demanded	Forthcoming end of the configured service interval. Maintenance is strongly recommended as soon as possible.
AF		Service: maintenance required	Forthcoming end of the configured service interval. Maintenance of device should be planned.
AG		Calibration: maintenance demanded	Forthcoming end of the calibration interval. Maintenance is strongly recommended as soon as possible.
AH		Calibration: maintenance re-quired	Forthcoming end of the calibration interval. Maintenance of device should be planned.
AJ		Limit monitor-ing 1 Above limit Process value alarm	Monitored value is above limit (set in parameter "Upper limit").

ID	Symbols	Message	Cause/action
AL		Limit monitoring 1 Below limit Process value alarm	Monitored value is below limit (set in parameter "Lower limit").
An		Limit monitoring 2 Above limit Process value alarm	Monitored value is above limit (set in parameter "Upper limit").
Ao		Limit monitoring 2 Below limit Process value alarm	Monitored value is below limit (set in parameter "Lower limit").
AP		Limit monitoring 3 Above limit Process value alarm	Monitored value is above limit (set in parameter "Upper limit").
Ar		Limit monitoring 3 Below limit Process value alarm	Monitored value is below limit (set in parameter "Lower limit").
AU		Event counter 1 Number overruns above threshold Process value alarm	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
AY		Event counter 1 Number overruns above threshold Maintenance required	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
b0		Event counter 3 Number underruns above threshold Process value alarm	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.

ID	Symbols	Message	Cause/action
b1	 	Event counter 3 Number underruns above threshold Maintenance required	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
b2	 	Event counter 3 Number underruns above threshold Maintenance alarm	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
bE	 	Out of service Maintenance alarm	Output signal does not represent process value. Device mode is set to "Out of service". Repair is required. Contact Technical support.
bL	 	Device restart due to unexpected program error Maintenance alarm	Watchdog function has detected an internal device error. Restart the device. If the problem persists, contact Technical support.
bn	 	Alarm sensor limit exceeded Process value alarm	Process value has reached the sensor limit. Review process conditions versus product specifications.
bS	 	Event counter 2 Number underruns above threshold Maintenance alarm	The number of underruns of the process value (set in parameters "Lower limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
bt	 	Event counter 3 Number overruns above threshold Process value alarm	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
bU	 	Event counter 3 Number overruns above threshold Maintenance required	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.

ID	Symbols	Message	Cause/action
bY		Event counter 3 Number overruns above threshold Maintenance alarm	The number of overruns of the process value (set in parameters "Upper limit" and "Monitored value") has reached the threshold. Reset and acknowledge event counter. Check process conditions. Check limit monitoring and event counter settings.
CA		Simulation mode Simulated or substitute value	The device is in simulation mode and one or more of its device variables are not representative of the process. Disable the simulation to return to normal operation.
Cb		Diagnostics simulated Simulated or substitute value	The device is in simulation mode. Disable the simulation to return to normal operation.
Co		Loop current fixed Manual operation	The loop current is being held at a fixed value and is not responding to process variations. Enter the loop current output value for simulation. Disable the simulation to return to normal operation.
CP		Loop current in saturation Process value warning	The loop current has reached its upper (or lower) saturation limit and cannot increase (or decrease) any further. Adjust loop current scaling.
CU		PV status: uncertain Process value alarm	The value is outside of the physical sensor range. Accuracy may decrease. Parameter "Fail-safe loss of echo" is set to "Hold", and device is in loss of echo (LOE), or Limit is set for a negative level value, and that value is exceeded. Check for changes in process conditions or obstructions in vessel. For example, obstruction from foam material build up on the sensor. OR Potential product damage. Sensor has malfunctioned. A replacement of sensor is recommended. Contact Technical support.
CY		PV status: bad Maintenance alarm	The measured value is 10% higher than the physical sensor range. Review process conditions versus product specifications. Use a device that fulfills your process conditions.
Fb		Supply voltage below limit Maintenance demanded	The supply voltage is too low. Make sure input voltage is within product specification.
FC		Supply voltage above limit Maintenance alarm	The supply voltage is too high. Make sure input voltage is within product specification.

ID	Symbols	Message	Cause/action
FE		Loop current read back error Maintenance demanded	The loop current does not correspond to the expected value. Check DAC trim settings. Restore to factory DAC calibration. If the problem persists, contact Technical support.
FJ		Process conditions out of specification Process value warning	Uncertain values due to process conditions. Check installation for abnormal operating conditions.
Fn		Connection failure to sensor electronics Maintenance alarm	Potential product damage. Restart the device. If error continues, sensor electronics may have a defect. Repair is required. Contact Technical support.
Fo		Sensor break Maintenance alarm	Potential product damage. Sensor has malfunctioned. A replacement of sensor is recommended. Contact Technical support.
Fr		Internal power supply is out of allowable range Process value warning	A replacement of the device is recommended. Contact Technical support.
FS		Electronics defect Maintenance alarm	Defect of device electronics. A replacement of the device is recommended. Contact Technical support.
LA	No icon alert	Incorrect PIN entered	The entered PIN does not match with the pin stored in the device. If you have forgotten the PIN, please note the 'Recovery ID' and hold it ready when calling the Technical Support. Technical Support will give you a 'PUK'. Entering the 'PUK' in the device the PIN is reset to the default PIN. << check dbase text....not approved when entered here >>
Lb		User PIN unchanged	The default user PIN is being used. Enter a new user PIN to optimally protect the device.
SA		Non-volatile memory check failure Maintenance alarm	Device electronics error. Restart the device. If error continues, device electronics may have a defect. Repair is required. Contact Technical support.
Sb		Volatile memory check failure Maintenance alarm	Device electronics error. Restart the device. If error continues, device electronics may have a defect. Repair is required. Contact Technical support.

ID	Symbols	Message	Cause/action
SC	  (red)	Invalid device configuration Configuration error	One or more of parameters are set to invalid values. Review configuration values and adjust as necessary.
Sd	 	Sensor fail-safe timer expired Maintenance required	Sensor is in fail-safe mode and timer has expired, based on value set in parameter "Fail-safe LOE timer". Check for changes in process conditions or obstructions in vessel.
St	 	Safety validation mode Configuration warning	Device is in safety validation mode. Complete the function test and confirm that the function test has passed in the wizard Functional Safety.

11.6 Operation troubleshooting

11.6.1 Common problems

11.6.1.1 Communication troubleshooting

1. Check the following:
   - There is power at the instrument.
   - The local display shows the relevant data.
   - If any fault codes are being displayed see Fault codes and corrective actions (Page 159) for a detailed list.
2. Verify that the wiring connections are correct.

Symptom	Corrective action
You try to set a SITRANS LR500 parameter via remote communications but the parameter remains unchanged.	• Ensure **Write Protect (6.1.)** is set to the unlock value, then try setting the parameter via the handheld programmer.

If you continue to experience problems, go to our Product page (www.siemens.com/LR500) and check the FAQs for SITRANS LR500, or contact your Siemens representative.

11.6.2 Measurement difficulties

If the value in parameter "Fail-safe LOE timer" expires due to a measurement difficulty, the value set in parameter "Fail-safe loss of echo" displays. In rare cases, the SITRANS LR500 series may lock on to a false echo and report a fixed or wrong reading.

Loss of echo (LOE)

The value set in parameter "Fail-safe loss of echo" displays when the echo confidence is below the threshold value set in parameter "Echo threshold".

LOE occurs when:

- The echo is lost and no echo is shown above the ambient noise (resulting in low values for parameters "Confidence". For example, foaming liquids or antenna buildup are the most common cause for lost echo.
- Two echoes are too similar to differentiate (when BLF algorithm used) (resulting in low confidence and low echo signal strength)
- No echo can be detected within the programmed range (parameter "Far Range" can be used to extend range).

If value set in parameter "Fail-safe loss of echo" displays, check if the surface monitored is within the transmitter maximum range.

11.6.2.1 Adjusting aiming

For optimum performance on solid materials, adjust aiming to provide the best confidence and echo strength for all material levels within the measurement range.

Displaying echoes

To check echo profiles, use HMI, diagnostics, and view echo profile and an engineering system such as SIMATIC PDM. For instructions on how to display an echo profile, see section SIMATIC PDM (Page 207), and for details on how to interpret an echo profile, see section Echo processing (Page 201).

Increase fail-safe timer value

Increase the value in parameter "Fail-safe LOE timer" only if the fail-safe operation will not be compromised by the larger value.

Try this only if LOE exists for short periods of time.

11.6.2.2 Fixed reading

If the reading is a fixed value, regardless of the material surface distance, ensure:

- Beam is free from obstruction
- Properly aimed
- Material mixer (if used) is operating while the device is operating. If it is stopped, ensure that the mixer blade has not stopped directly below the transmitter.

11.6.2.3 Set the device to ignore the false echo

To adjust the time-varying threshold (TVT) to ignore the false echoes, use auto false echo suppression. If this does not correct the problem, enable custom TVT shaper mode and manually shape around false echoes. For more information, see:

- Near range (Page 133)
- AFES wizard (Page 82)
- Custom TVT shaper (Page 136)

11.6.3 Wrong reading

If the reading is erratic or jumps to some incorrect value periodically, ensure:

- Surface monitored is not beyond the transmitter's programmed range or the transmitter's maximum range
- Material is not falling into the transmitter's acoustic beam
- Material is not inside the blanking distance (parameter "Near range") of the transmitter.
- Algorithm is set incorrectly

Adjust the echo algorithm

Use SIMATIC PDM to view echo profiles and to make adjustments to parameter Algorithm (3.3.3.1) (Page 133).

If multiple echoes appear on the echo profile, typical of a flat material profile (especially if the vessel top is domed), use the “True first echo” algorithm. Also, if the true echo has jagged peaks, use parameter "Reform echo".

Should a stable measurement still not be attainable, contact Siemens representative.

Technical specifications

12

12.1 Power

General	
Supply voltage	30 V DC
Signal range	4 to 20 mA
Startup current	3.6 mA

Ordinary Location, Nonincendive, Dust Ignition Proof, Dust Protection by Enclosure Ex 't'	
Voltage	24 V DC Nom, 30 V DC Max
Current	4 to 20 mA

Instrinsically Safe Ex 'i'	
U_i /Vmax	30 V
I_i /Imax	120 mA
P_i	0.8 W
C_i	2.2 nF
L_i	0

12.2 Temperature

Intrinsically safe

For gas application under the intrinsically safe protection Ex ia (EPL Ga / Category 1G / Class I, Div. 1), below is the ambient temperature de-rating table for various T codes and elevated process temperatures.

T-Code	Ambient Temperature	Process Temperature
T6	-40 to +65 °C (-40 to +149 °F)	-40 to +65 °C (-40 to +149 °F)
	-40 to +45 °C (-40 to +113 °F)	-40 to +160 °C (-40 to +320 °F)
	-40 to +40 °C (-40 to +104 °F)	-40 to +250 °C (-40 to +482 °F)
T4, T5	-40 to +80 °C (-40 to +176 °F)	-40 to +80 °C (-40 to +176 °F)
	-40 to +65 °C (-40 to +149 °F)	-40 to +160 °C (-40 to +320 °F)
	-40 to +55 °C (-40 to +131 °F)	-40 to +250 °C (-40 to +482 °F)

For dust application under the intrinsically safe protection Ex ia (EPL Da / Category 1D / Class II, Div 1), below is the ambient temperature de-rating table for various elevated process temperatures.

Maximum surface temperature	Ambient Temperature	Process Temperature
T95 °C	-40 to +80 °C (-40 to +176 °F)	-40 to +80 °C (-40 to +176 °F)
	-40 to +65 °C (-40 to +149 °F)	-40 to +160 °C (-40 to +320 °F)
	-40 to +50 °C (-40 to +122 °F)	-40 to +250 °C (-40 to +482 °F)

Dust ignition proof/ Dust protection by Enclosure Ex 't'

For dust application under the dust ignition protection Ex ta (EPL Da / Category 1D), below is the ambient temperature de-rating table for various elevated process temperatures.

Maximum surface temperature	Ambient Temperature	Process Temperature
T137 °C	-40 to +80 °C (-40 to +176 °F)	-40 to +80 °C (-40 to +176 °F)
	-40 to +65 °C (-40 to +149 °F)	-40 to +160 °C (-40 to +320 °F)
	-40 to +50 °C (-40 to +122 °F)	-40 to +250 °C (-40 to +482 °F)

For dust application under Class II, III - Div 1, below is the ambient temperature de-rating table for various elevated process temperatures.

T-code	Ambient Temperature	Process Temperature
T4	-40 to +80 °C (-40 to +176 °F)	-40 to +80 °C (-40 to +176 °F)
	-40 to +65 °C (-40 to +149 °F)	-40 to +160 °C (-40 to +320 °F)
	-40 to +50 °C (-40 to +122 °F)	-40 to +250 °C (-40 to +482 °F)

Non-incendive

For gas application under Class I, Div 2, below is the ambient temperature de-rating table for various T codes and elevated process temperatures.

T-Code	Ambient Temperature	Process Temperature
T4, T5	-40 to +80 °C (-40 to +176 °F)	-40 to +80 °C (-40 to +176 °F)
	-40 to +75 °C (-40 to +167 °F)	-40 to +160 °C (-40 to +320 °F)
	-40 to +70 °C (-40 to +158 °F)	-40 to +250 °C (-40 to +482 °F)
T6	-40 to +65 °C (-40 to +149 °F)	-40 to +65 °C (-40 to +149 °F)
	-40 to +60 °C (-40 to +140 °F)	-40 to +150 °C (-40 to +302 °F)
	-40 to +55 °C (-40 to +131 °F)	-40 to +250 °C (-40 to +482 °F)

12.3 Performance

Recommended measuring range

Version	Size	Beam angle	Recommended measuring range up to	Permitted use
LR510 Threaded connection anntenna	G¾" ¾" NPT	14°	10 m (32.81 ft)	Tank only
	G1" 1" NPT	10°	20 m (65.62 ft)	Tank only
	G1½" 1½ NPT (250 °C)	10°	30 m (98.42 ft)	Tank only
	G1½" 1½ NPT (150 °C)	7°	30 m (98.42 ft)	Tank/ open air
LR530 Flanged encapsulated PTFE antenna	≥ DN 25	10°	20 m (65.62 ft)	Tank only
	≥ DN 50, 2"	6°	30 m (98.42 ft)	Tank/ open air
	≥ DN 80, 3"	3°	120 m (393.7 ft)	Tank/ open air
LR550 Polymeric horn antenna	DN 80	3°	120 m (393.7 ft)	Tank/ open air
LR580 Lens antenna	≥ DN 80, 3"	3°	120 m (393.7 ft)	Tank/ open air

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

Maximum measured error	= 1 mm (0.04")[1) 2) 3)] including hysteresis and non-repeatability	
Frequency	W band, 80GHz nominal	
Minimum detectable distance	Frequency modes 1, 2, 4	liquids: 0 m (0 ft)
	Frequency mode 3	liquids: 0.25 m (0.82 ft)
Update time	3 measurements per second[4)]	
Influence of ambient temperature	Temperature drift Digital output < 3 mm/10 K, max. 5 mm (0.2 in) over the full operating range	
Dielectric constant of material measured	dK > 1.6	
Repeatability	0.5 mm (0.02 in)	
Resolution	0.5 mm (0.02 in)	

[1)] From minimum detectable distance to 30 m (98.4 ft) range, digital value, frequency mode 1

[2)] +/- 10 mm (0.39 in) from reference point to 250 mm (9.84 in) distance

[3)] From sensor reference point: see Dimensions (Page 187).

[4)] Current output damping, number of shots averaging, fill & empty rate limit settings all reduce response time

12.4 Interface

HART 7	Standard, integral to analog output
Configuration	Local graphical display with backlight and pushbuttons. SITRANS mobile IQ App with AW050 module (non Ex devices only), Siemens SIMATIC PDM
HMI (local)[1)]	Graphical backlit liquid crystal, with bar graph (representing Level)

1) Display will be degraded below -25 °C (-13 °F) and above 65 °C (149 °F)

12.5 Outputs

Analog output	
	4 to 20 mA (3.8 min. to 20.5 max. adjustable)
	800 ohms max.
	Deviation in the current output due to digital/analogue conversion < +/-10 µA[1)] Additional deviation through electromagnetic interference: • According to EN 61326-1: none • According to EN61000-6-2: < +/-20 µA • According to NAMUR NE 21: < +/-20 µA
	Resolution of <1 µA
	Non-repeatability of <1 µA
	Startup behaviour: 3.6mA, < 25 seconds
	Influence of ambient temperature: 0.02% / 10K

1) Add error of the digital value to the analog value.

12.6 Construction

Enclosure	Body material	aluminum with polyurethane powder coat
	Ingress protection	• IP66, TYPE 4X • IP68 (2 meters, 24 hours), TYPE 6

Materials

LR510 (threaded connection)		**Options**
	Sealing material of the antenna/process connection	PEEK/FKM PEEK/FFKM Klingersil flat seal for G thread versions
	Process connection material	316/316L Alloy C22 (2.4602)
LR530 (flanged encapsulated PTFE antenna)		

	Sealing material of the antenna/process connection	PTFE/PTFE
	Process connection material	316/316L
LR550 (polymeric horn)		
	Sealing material of the antenna/process connection	PP/PP PP/FKM PP/EPDM
	Process connection material	Universal, plastic horn antenna PP/PBT
		mounting bracket 300mm / 316/316L
		Flanges: PP-GF30
LR580 (lens antenna)		
	Sealing material of the antenna/process connection	PEEK/FKM PEEK/FFKM
	Process connection material	316/316L

Weight

Instrument (depending on housing, process fitting and antenna): approx. 1.6 to 20 kg (3.5 to 44.1 lbs)

12.7 Operating conditions

12.7.1 Second line of defence (SLOD)

This option is available on the SITRANS LR510, LR530 and LR580 and provides a secondary gas tight feed-through to prevent toxic gases from permeating from the process into the housing.

12.7.2 Environmental

Location	indoor/outdoor
Altitude	5000 m (16 404 ft) maximum
Ambient, storage and transport temperature	-40 ... +80 °C (-40 ... +176 °F)
Relative humidity	Suitable for outdoor (TYPE 4X, TYPE 6, IP66, IP68 enclosure)
Installation category	I
Pollution degree	4
Storage and operation	Storage period: 12 to 18 months (if product is kept clean, dry, and within temperature specifications) Safe operation period: 15+ years

12.7.3 Process conditions

For the process conditions, please also note the specifications on the nameplate. The lowest value always applies.

12.7.4 Mechanical stress

Vibration resistance	Vibration Resistance	Shock Resistance
LR510	IEC 60068-2-6 test Fc: Vibrations (sinusoidal) 2 Hz - 200 Hz - 0.5g acceleration	IEC 60068-2-27 test Ea: Impact (test 2) 25g - 6ms
LR530		
LR550 without aiming bracket		
LR550 with aiming bracket	IEC 60068-2-6 test Fc: Vibrations (sinusoidal) 2 Hz-200 Hz - 1g acceleration	NA
LR580	IEC 60068-2-6 test Fc: Vibrations (sinusoidal) 2 Hz - 200 Hz - 0.5g acceleration	IEC 60068-2-27 test Ea: Impact (test 2) 25g - 6ms

12.7.5 Air purging system

Max. permissible pressure	6 bar (87.02 psig)
Air quality	Filtered
Air volume, depending on pressure	Dry and filtered

Note

Do not use continuous air purge

Continuous air purge is not recommended as it may result in damage to the antenna. Use a solenoid timer valve for periodic cleaning.

LR580 flange lens antenna

LR580 flange lens antenna	Air volume	
Pressure	**Without non-return valve**	**With non-return valve**
0.2 bar (2.9 psig)	1.7 m^3/h	
0.4 bar (5.8 psig)	2.5 m^3/h	
0.6 bar (8.7 psig)	2.9 m^3/h	0.8 m^3/h
0.8 bar (11.6 psig)	3.3 m^3/h	1.5 m^3/h
1 bar (14.5 psig)	3.6 m^3/h	2 m^3/h
1.2 bar (17.4 psig)	3.9 m^3/h	2.3 m^3/h
1.4 bar (20.3 psig)	4 m^3/h	2.7 m^3/h
1.6 bar (23.2 psig)	4.3 m^3/h	3 m^3/h

LR580 flange lens antenna	Air volume	
Pressure	**Without non-return valve**	**With non-return valve**
1.8 bar (20.3 psig)	4.5 m^3/h	3.5 m^3/h
2 bar (23.2 psig)	4.6 m^3/h	4 m^3/h

LR550 polymeric horn antenna

LR550 polymeric horn antenna	Air volume	
Pressure	**Without non-return valve**	**With non-return valve**
0.2 bar (2.9 psig)	3.3 m^3/h	
0.4 bar (5.8 psig)	5 m^3/h	
0.6 bar (8.7 psig)	6 m^3/h	1 m^3/h
0.8 bar (11.6 psig)		2.1 m^3/h
1 bar (14.5 psig)		3 m^3/h
1.2 bar (17.4 psig)		3.5 m^3/h
1.4 bar (20.3 psig)		4.2 m^3/h
1.6 bar (23.2 psig)		4.4 m^3/h
1.8 bar (20.3 psig)		4.8 m^3/h
2 bar (23.2 psig)		5.1 m^3/h

Connection

Thread	G⅛
Seal	Threaded plug of 316Ti

Air purging system

Material	316Ti
Thread	G⅛
Seal	FKM (SHS FPM 70C3 GLT), EPDM (COG AP310)
For connection	G⅛
Opening pressure	0.5 bar (7.25 psig)
Nominal pressure stage	PN 250

12.8 Process

Process temperature

Version	Material	Seal	Process temperature (measured on the process fitting)
LR510 Threaded connection	PEEK	FKM	-40 ... +150 °C (-40 ... +302 °F)
			-40 ... +200 °C (-40 ... +392 °F)
		FFKM	-15 ... +150 °C (5 ... +302 °F)
			-15 ... +250 °C (5 ... +482 °F)

Version	Material	Seal	Process temperature (measured on the process fitting)
LR530 Flange with encapsulated antenna	PTFE and PTFE 8 mm	PTFE	-60 ... +150 °C (-76 ... +302 °F)
			-196 ... +200 °C (-320 ... +392 °F)
LR550 Polymeric horn antenna	PP	PP	-40 ... +80 °C (-40 ... +176 °F)
		FKM	-40 ... +80 °C (-40 ... +176 °F)
		EPDM	-40 ... +80 °C (-40 ... +176 °F)
LR580 Lens antenna, solids	PEEK	FKM	-40 ... +150 °C (-40 ... +302 °F)
			-40 ... +200 °C (-40 ... +392 °F)
		FFKM	-15 ... +250 °C (-4 ... +392 °F)

Note

Device dependent

Process temperature is dependent on the device, see nameplate (Page 176) for details.

12.9 Certificates and approvals

"Intrinsic safety" type of protection	
ATEX, UKEX, IECEx	
• CSANe 23ATEX1113X • IECEx CSA 23.0025X • CSAE 23UKEX1087X	II 1 G Ex ia IIC T6...T4 Ga II 1 D Ex ia IIIC T_{200} 95°C Da
CSA & FM	
• FM 23US0007X • CSA 23CA80144218	Class I, II, III, Div 1, Group A, B, C, D, E, F, G T6... T4
China	
• Nepsi GYJ23.1297X	Ex ia IIC T6...T4 Ga Ex ia IIIC T_{200} 95°C Da
Korea	
• 2023-BO-0412 • 2023-BO-0413	Ex ia IIC T6...T4 Ga Ex ia IIIC T_{200} 95°C Da
Japan	
• CSAUK 24JPN014X • CSAUK 24JPN016X • CSAUK 24JPN017X	Ex ia IIC T4 Ga Ex ia IIC T6 Ga Ex ia IIIC T200 95°C Da
Brazil	
• INMETRO DNV 24.0019X	Ex ia IIC T6..T4 Ga Ex ia IIIC T_{200} 95°C Da

"Dust Ignition proof" type of protection	
ATEX, UKEX, IECEx	
• CSANe 23ATEX1114X • IECEx CSA 23.0026X • CSAE 23UKEX1088X	II 1 D Ex ta IIIC T_{200} 137°C Da
CSA & FM	
• FM 23US0007X • CSA 80144219	Class II, III, Div 1, Group E, F, G, T4
China	
• Nepsi GYJ23.1297X	Ex ta IIIC T_{200} 137°C Da
Korea	
• KCs 2023-BO-0414	Ex ta IIIC T_{200} 137°C Da
Japan	
• CSAUK 24JPN018X	Ex ta IIIC T_{200} 137°C Da
Brazil	
• INMETRO DNV 24.0020X	Ex ta IIIC T_{200} 137°C Da
"Nonincendive" type of protection	
FM	
• FM23US0007X	Class I, Div 2, Group A, B, C, D T6...T5
Radio	
• Europe	CE
• United Kingdom	UKCA
• USA	LYH-LR500
• Canada	267AA-LR500
• Japan	

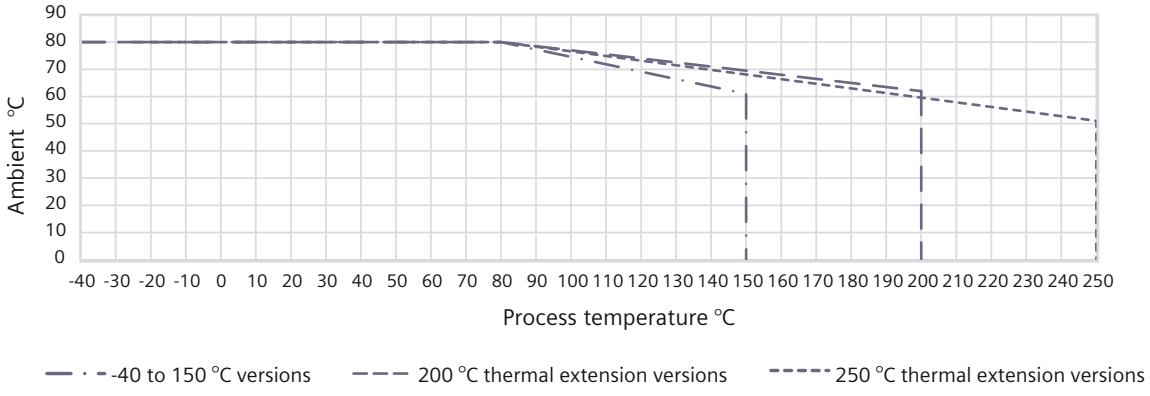
12.10 Communication

Communication type	• HART 7 • 4 to 20 mA
Supported engineering system	SIMATIC PDM

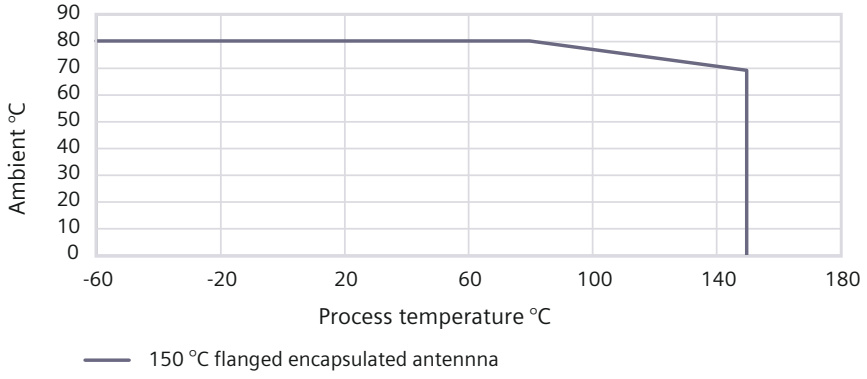
12.11 Derating curves

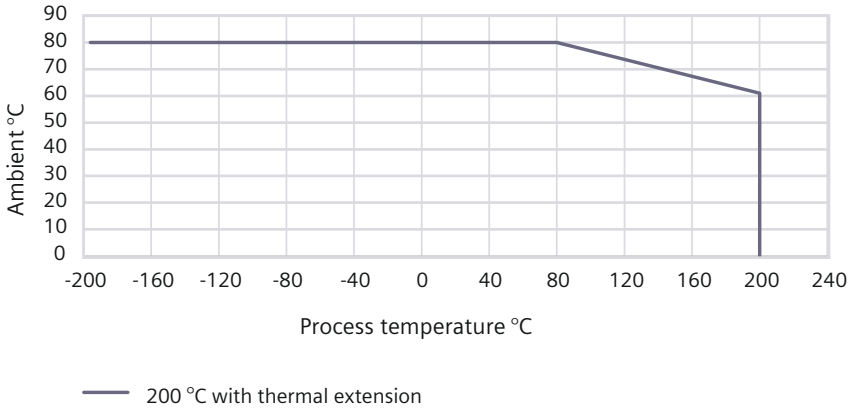
12.11.1 Temperature derating curves

LR510 threaded lens antenna

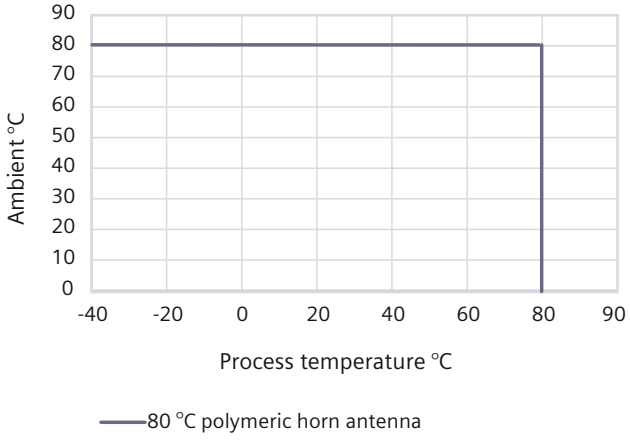


LR530 flanged encapsulated antenna

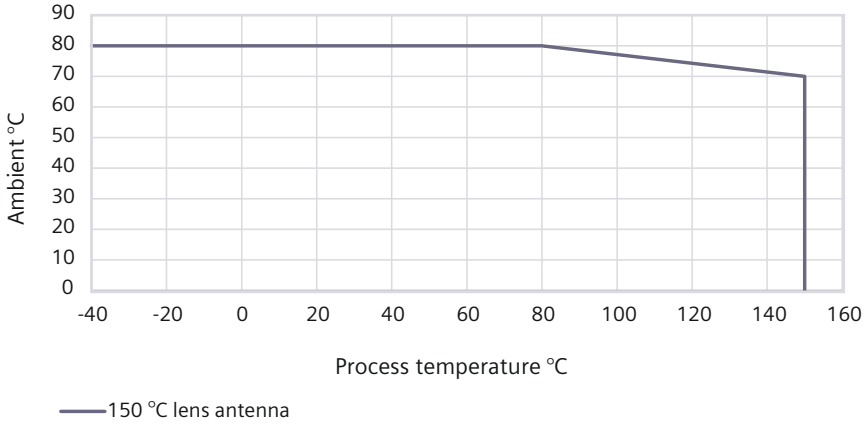


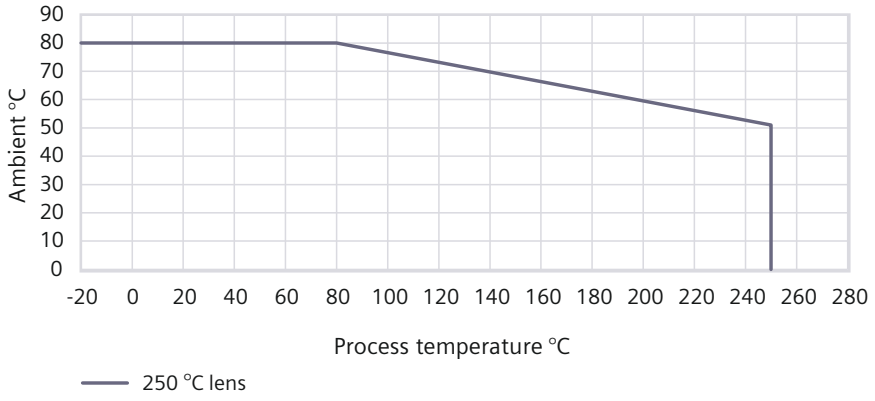


LR550 polymeric horn antenna



LR580 flanged lens antenna

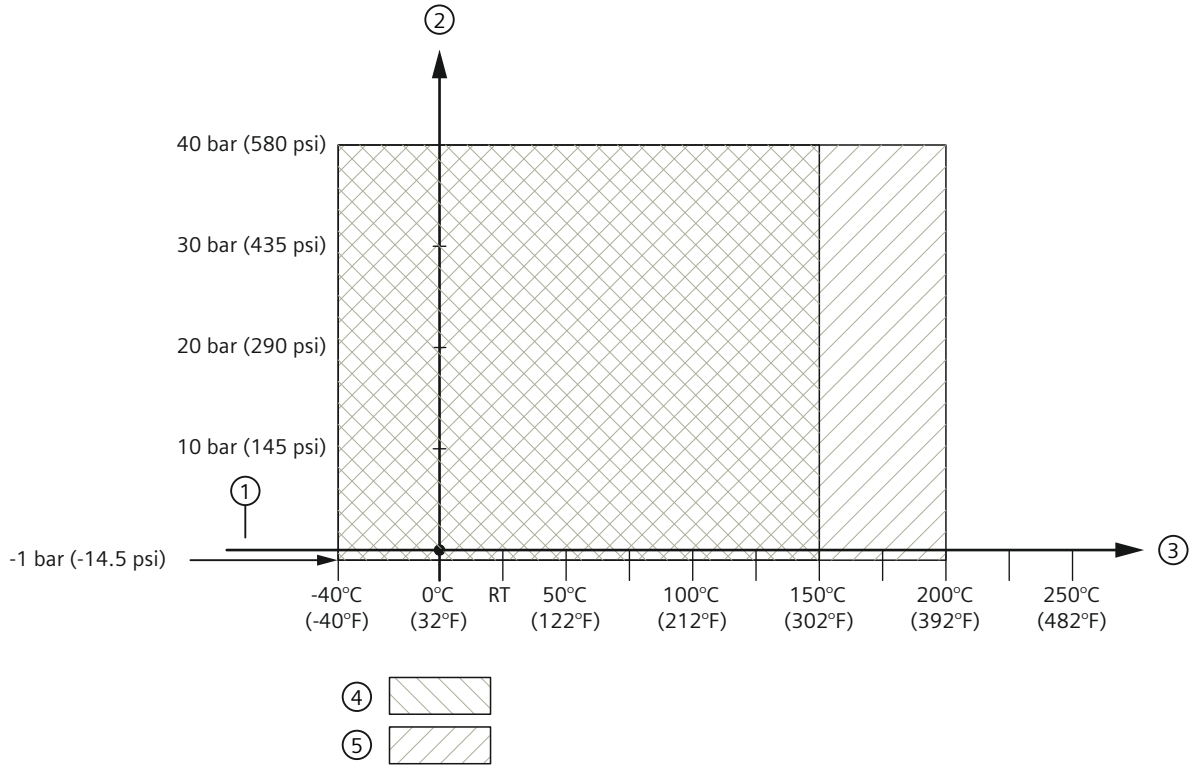




12.11.2 Temperature vs pressure derating curves

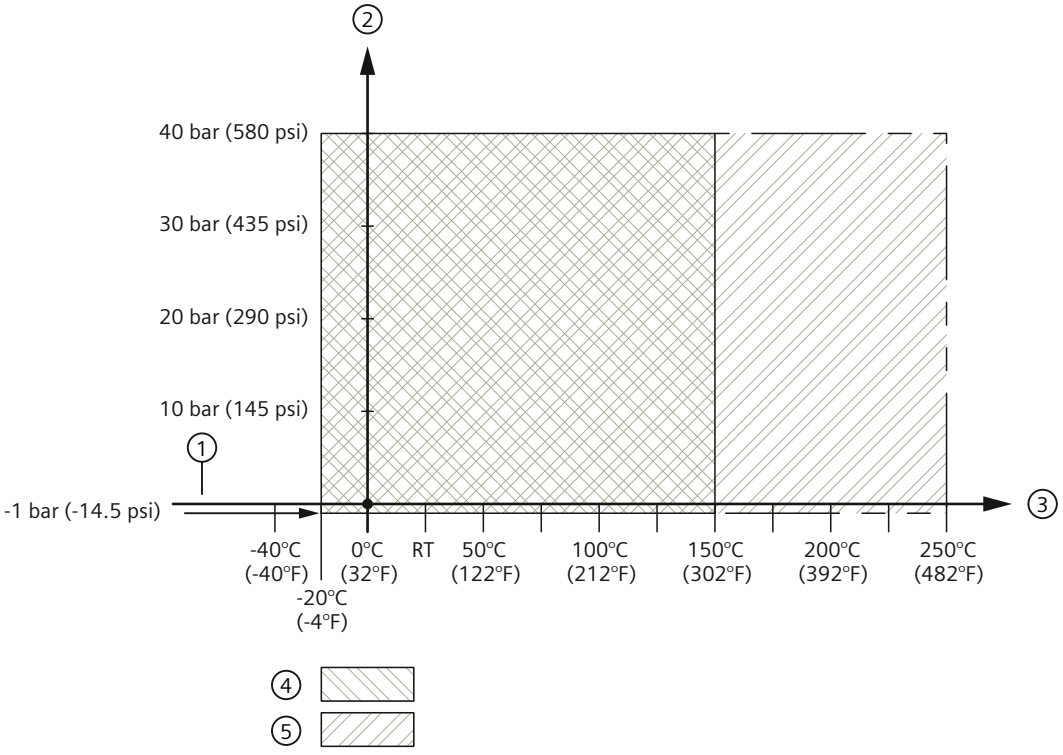
LR510 threaded lens antenna

Seal options 0 and 1



① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures
④ FKM without thermal extension
⑤ FKM with thermal extension

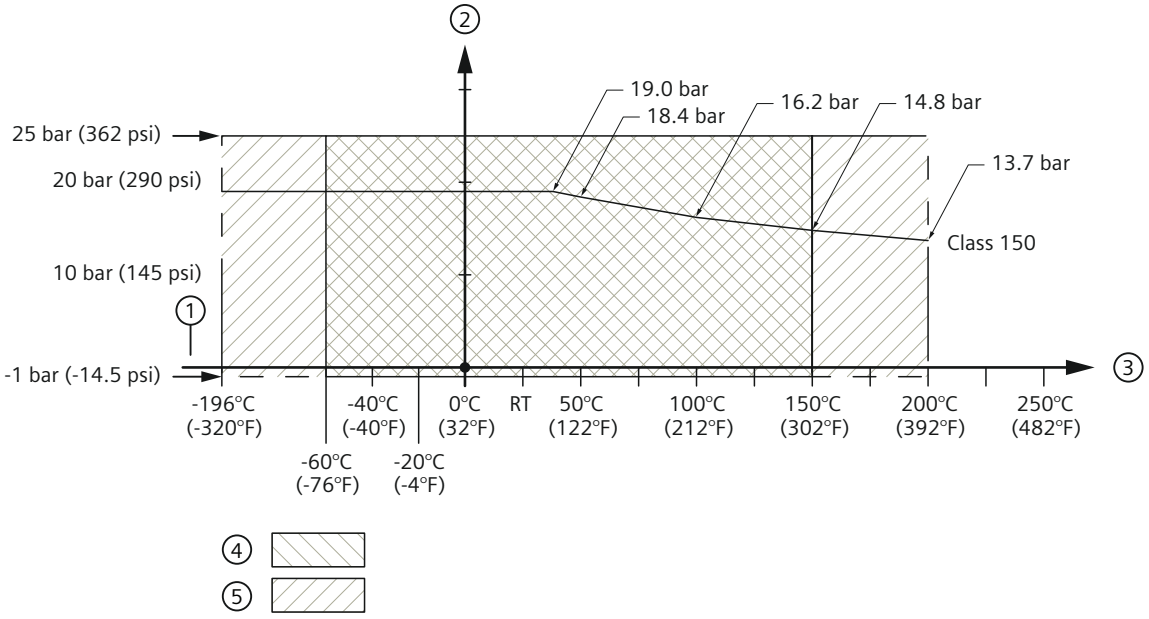
Seal options 2 & 3



① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures
④ FKM without thermal extension
⑤ FKM with thermal extension

LR530 flanged encapsulated antenna

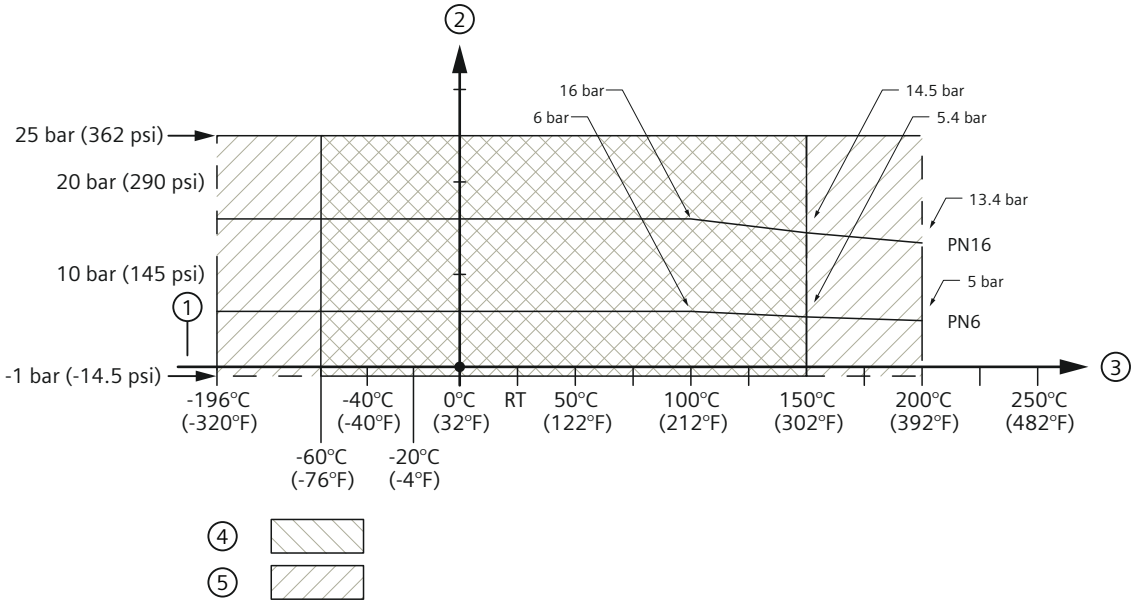
ASME B16.5



① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures
④ PTFE without thermal extension
⑤ PTFE with thermal extension

Note: Class 300 flange maximum allowable working pressure is 25 bar (362 psi).

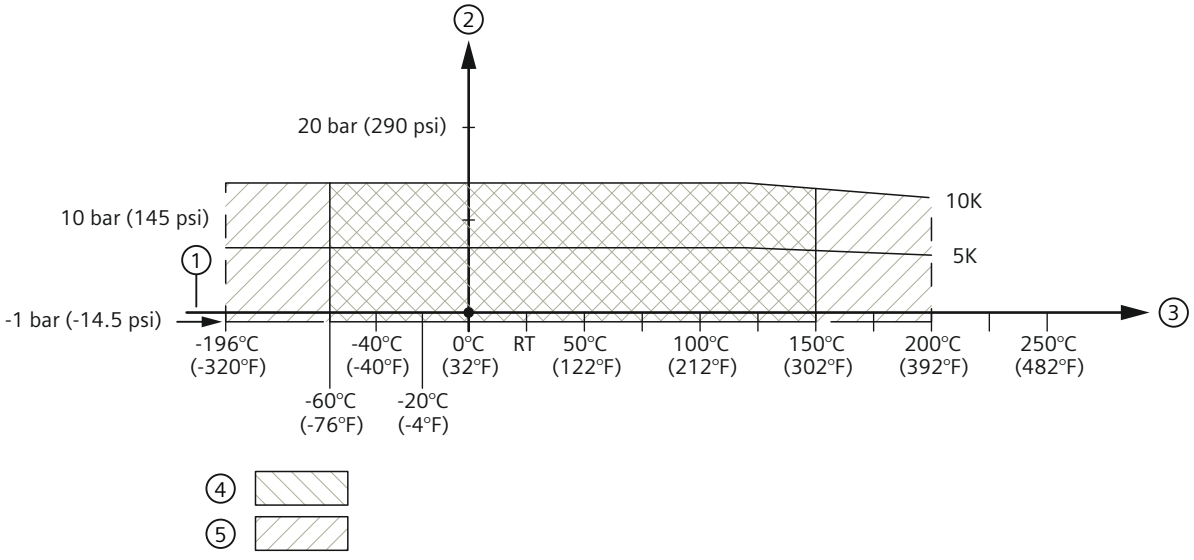
EN 1092-1



① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures
④ PTFE without thermal extension
⑤ PTFE with thermal extension

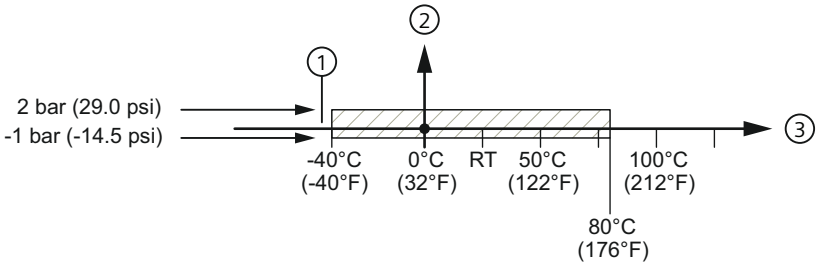
Note: PN40 flange maximum allowable working pressure is 25 bar (362 psi).

JIS B 2220



① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures
④ PTFE without thermal extension
⑤ PTFE with thermail extension

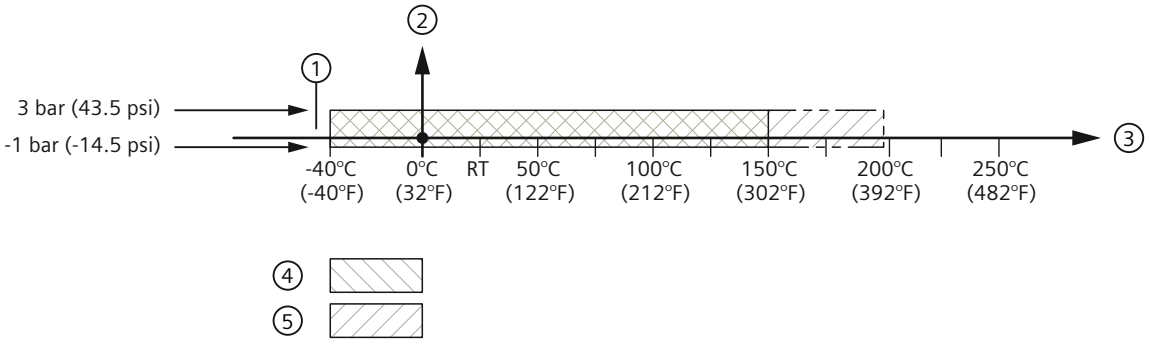
LR550 polymeric horn antenna



① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures

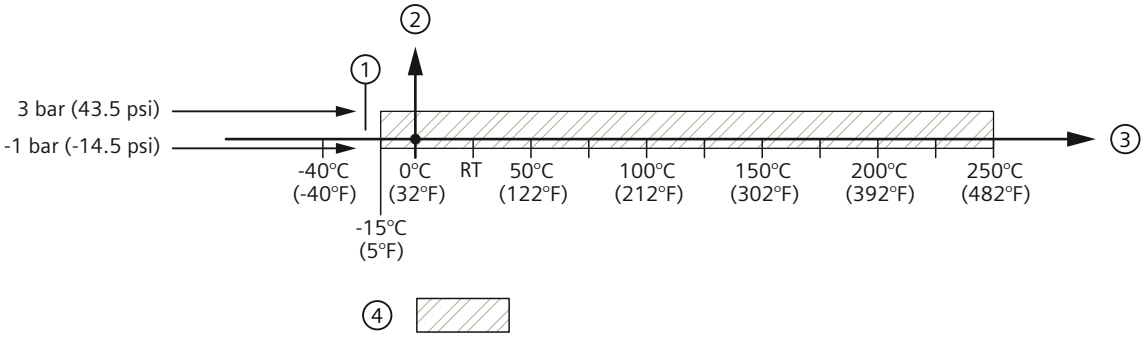
LR580 flanged lens antenna

Seal options 0 & 1



① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures
④ FKM without thermal extension
⑤ FKM with thermal extension

Seal option 2

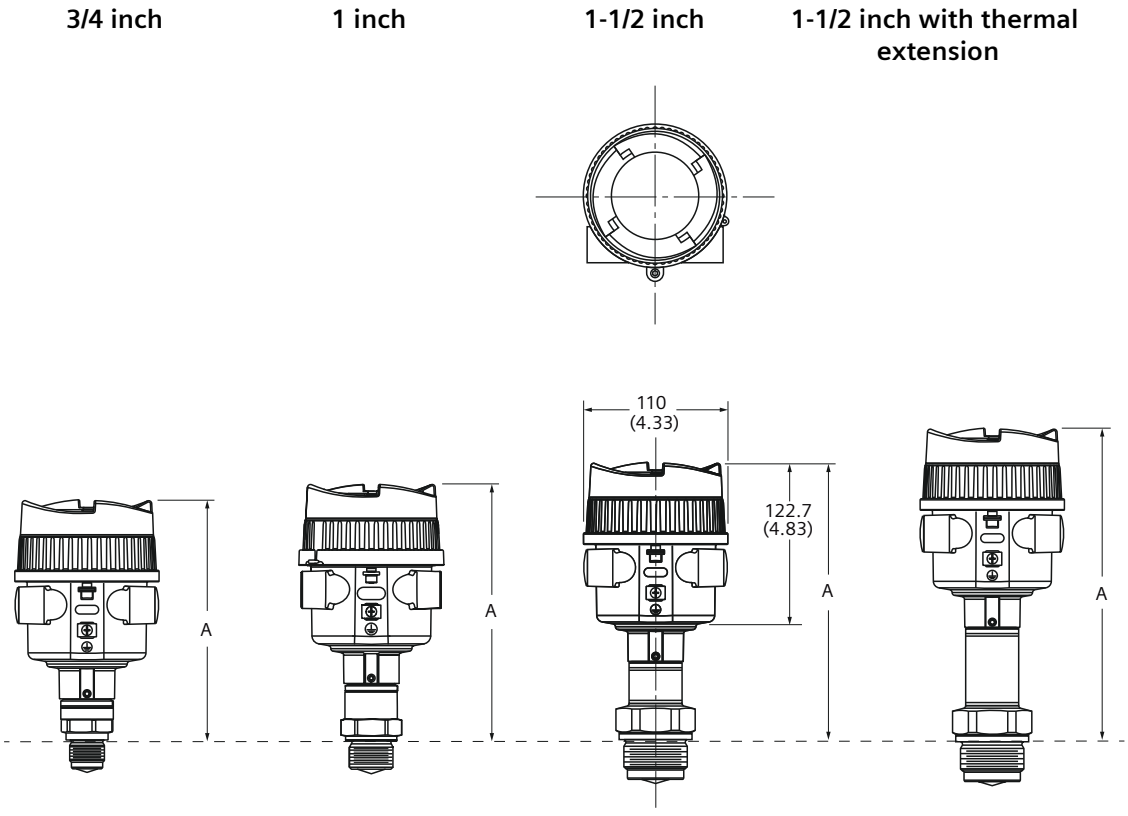


① Atmospheric pressure
② Allowable operating pressures
③ Allowable operating temperatures
④ FFKM thermal extension

Dimension drawings

13

13.1 LR510 threaded lens antenna



- - - - Sensor reference point

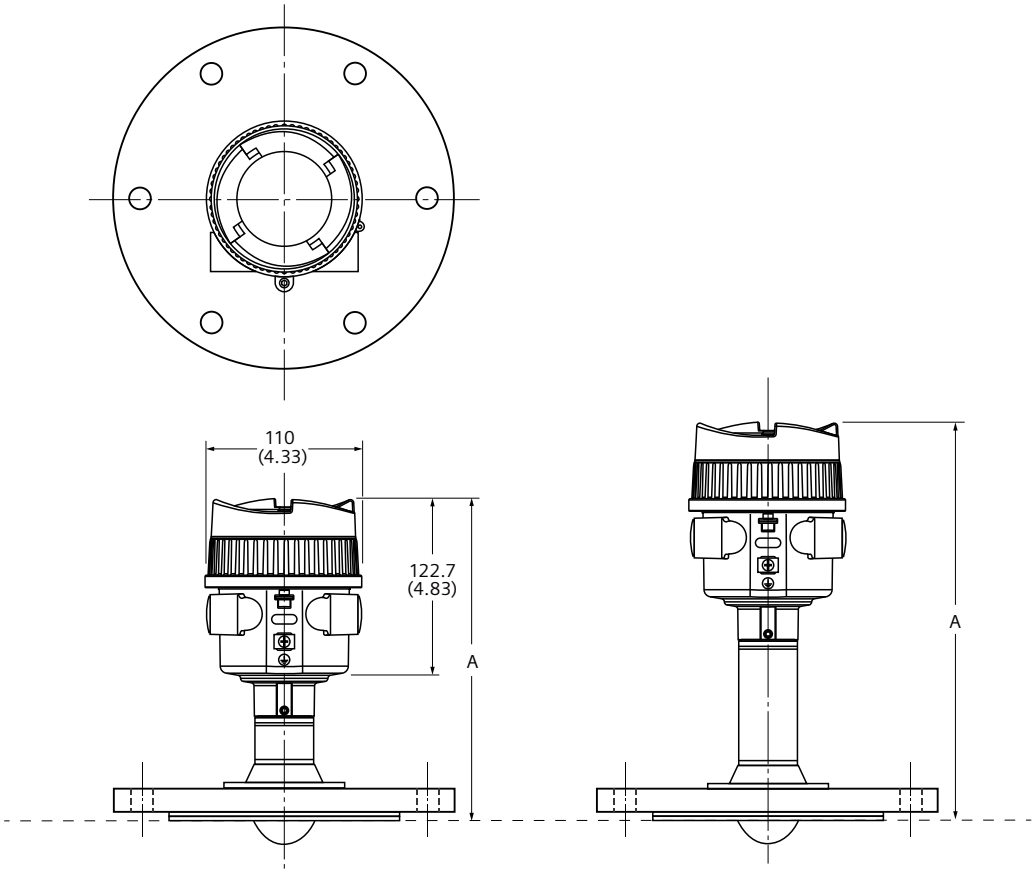
Dimensions in mm(inch)

Antenna type	A mm (inch)	Recommended max. range m (ft)	Beam angle	Process seal material	Temperature
Thread G3/4" PN40, DIN3852-A	182.3 (7.18)	10 (32.8)	14°	FKM	-40 ... +150 °C (-40 ... +302 °F)
Thread 3/4" NPT, ASME B1.20.1					

Antenna type **Thermal extension**	**A mm (inch)**	**Recommended max. range m (ft)**	**Beam angle**	**Process seal material**	**Temperature**
Thread G1" PN40, DIN3852-2-A	193.8 (7.63)	20 (65.6)	10°	FKM	-40 ... +150 °C (-40 ... +302 °F)
Thread 1" NPT, ASME B1.20.1	194 (7.64)				
Thread G1-1/2" PN40, DIN3852-2-A	213.8 (8.42)	30 (98.4)	7°		
Thread 1-1/2" NPT, ASME B1.20.1	214 (8.43)				
Thread G3/4" PN40, DIN3852-2-A	182.3 (7.18)	10 (32.8)	14°	FFKM	-20 ... +150 °C (-4 ... +302 °F)
Thread 3/4" NPT, ASME B1.20.1	182.3 (7.18)				
Thread G1" PN40, DIN3852-2-A	193.8 (7.63)	20 (65.6)	10°		
Thread 1" NPT, ASME B1.20.1	194 (7.64)				
Thread G1-1/2" PN40, DIN3852-2-A	213.8 (8.42)	30 (98.4)	7°		
Thread 1-1/2" NPT, ASME B1.20.1	214 (8.43)				
Extended temperature versions					
Thread G3/4" PN40, DIN3852-2-A	234.2 (9.22)	10 (32.8)	14°	FKM	-40 ... +200 °C (-40 ... +392 °F)
Thread 3/4" NPT, ASME B1.20.1	234.2 (9.22)				
Thread G1" PN40, DIN3852-2-A	245.8 (9.68)	20 (65.6)	10°		
Thread 1" NPT, ASME B1.20.1	245.8 (9.68)				
Thread G1-1/2" PN40, DIN3852-2-A	265.8 (10.46)	30 (98.4)	7°		
Thread 1-1/2" NPT, ASME B1.20.1	266 (10.47)				
Thread G3/4" PN40, DIN3852-2-A	234.3 (9.22)	10 (32.8)	14°	FFKM	-20 ... +250 °C (-4 ... +392 °F)
Thread 3/4" NPT, ASME B1.20.1	234.5 (9.32)				
Thread G1" PN40, DIN3852-2-A	245.8 (9.68)	20 (65.6)	10°		
Thread 1" NPT, ASME B1.20.1	246 (9.68)				
Thread G1-1/2" PN40, DIN3852-2-A	237.8 (9.36)	30 (98.4)	10°		
Thread 1-1/2" NPT, ASME B1.20.1	238 (9.37)				

13.2 LR530 flanged encapsulated antenna

LR530 **LR530 with thermal extension**



- - - - Sensor reference point

Dimensions in mm(inch)

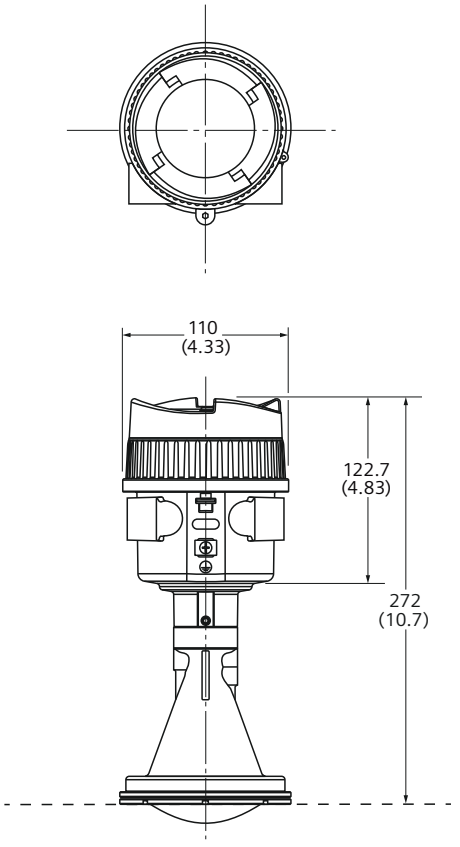
Process connection type	A mm (inch)	A with thermal extension	Beam angle	Recommended max. range [m (ft)]	Flange O.D. [mm (inch)]	Bolt hole circle Ø [mm (inch)]	Bolt hole Ø [mm (inch)]	No. of bolt holes	Flange thickness [mm (inch)]
flange DN25 PN6, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	201.7 (7.94)	221.7 (8.73)	10°	20 (65.6)	100 (3.94)	75 (2.95)	11 (0.43)	4	16 (0.63)
flange DN50 PN6, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	216.1 (8.51)	268.1 (10.56)	6°	30 (98.4)	140 (5.51)	110 (4.33)	14 (0.55)	4	20 (0.79)

Process connection type	A mm (inch)	A with thermal extension	Beam angle	Recommended max. range [m (ft)]	Flange O.D. [mm (inch)]	Bolt hole circle Ø [mm (inch)]	Bolt hole Ø [mm (inch)]	No. of bolt holes	Flange thickness [mm (inch)]
flange DN80 PN6, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	190 (7.48)	150 (5.91)	18 (0.71)	4	20 (0.79)
flange DN100 PN16, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	220 (8.66)	180 (7.09)	18 (0.71)	8	20 (0.79)
flange DN150 PN16, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	285 (11.22)	240 (9.45)	22 (0.87)	8	22 (0.87)
flange DN200 PN16, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	340 (13.39)	295 (11.61)	22 (0.87)	12	24 (0.94)
flange DN25 PN40, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	201.7 (7.94)	221.7 (8.73)	10°	20 (65.6)	115 (4.53)	85 (3.35)	14 (0.55)	4	18 (0.71)
flange DN50 PN40, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	216.1 (8.51)	268.1 (10.56)	6°	30 (98.4)	165 (6.5)	125 (4.92)	18 (0.71)	4	20 (0.79)
flange DN80 PN40, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	200 (7.87)	160 (6.3)	18 (0.71)	8	24 (0.94)
flange DN100 PN40, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	235 (9.25)	190 (7.48)	22 (0.87)	8	24 (0.94)
flange DN150 PN40, raised face, Form B1, EN1092-1, DIN2501 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	300 (11.81)	250 (9.84)	26 (1.02)	8	28 (1.1)
flange 1" 150lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	10°	20 (65.6)	108 (4.25)	79.2 (3.13)	15.7 (0.62)	4	16 (0.63)
flange 2" 150lb RF, ASME B16.5 / 316/316L	216.1 (8.51)	268.1 (10.56)	6°	30 (98.4)	152.4 (6)	120.7 (4.75)	19.1 (0.75)	4	19.1 (0.75)
flange 3" 150lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	190.5 (7.5)	152.4 (6)	19.1 (0.75)	4	23.9 (0.94)
flange 4" 150lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	228.6 (9)	190.5 (7.5)	19.1 (0.75)	8	23.9 (0.94)

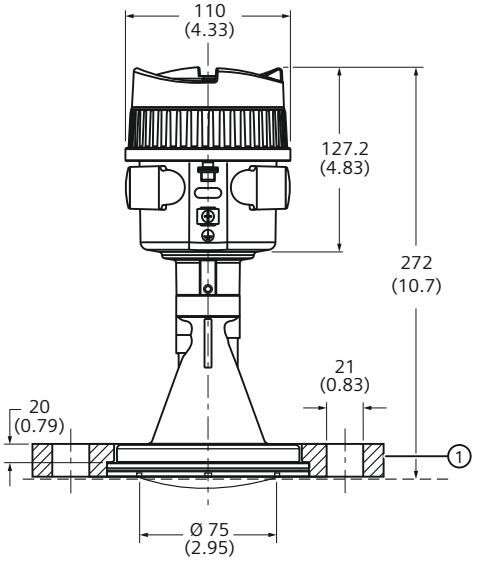
Process connection type	A mm (inch)	A with thermal extension	Beam angle	Recommended max. range [m (ft)]	Flange O.D. [mm (inch)]	Bolt hole circle Ø [mm (inch)]	Bolt hole Ø [mm (inch)]	No. of bolt holes	Flange thickness [mm (inch)]
flange 6" 150lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	279.4 (11)	241.3 (9.5)	22.4 (0.88)	8	25.4 (1)
flange 8" 150lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	342.9 (13.5)	298.5 (11.75)	22.4 (0.88)	8	28.4 (1.12)
flange 1" 300lb RF, ASME B16.5 / 316/316L	201.7 (7.94)	221.7 (8.73)	10°	20 (65.6)	124 (4.88)	88.9 (3.5)	19.1 (0.75)	4	17.5 (0.69)
flange 2" 300lb RF, ASME B16.5 / 316/316L	216.1 (8.51)	268.1 (10.56)	6°	30 (98.4)	165.1 (6.5)	127 (5)	19.1 (0.75)	8	22.4 (0.88)
flange 3" 300lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	209.5 (8.25)	168.1 (6.62)	22.4 (0.88)	8	28.4 (1.12)
flange 4" 300lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	254 (10)	200.2 (7.88)	22.4 (0.88)	8	31.8 (1.25)
flange 6" 300lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	317.5 (12.5)	269.7 (10.62)	22.5 (0.89)	12	36.6 (1.43)
flange 8" 300lb RF, ASME B16.5 / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	381 (15)	330.2 (13)	25.4 (1)	12	41.1 (1.63)
flange DN25 5K RF, JIS / 316/316L	201.7 (7.94)	221.7 (8.73)	10°	20 (65.6)	95 (3.74)	75 (2.95)	12 (0.47)	4	16 (0.63)
flange DN50 10K RF, JIS / 316/316L	216.1 (8.51)	268.1 (10.56)	6°	30 (98.4)	155 (6.1)	120 (4.72)	19 (0.75)	4	20 (0.79)
flange DN80 10K RF, JIS / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	185 (7.28)	150 (5.91)	19 (0.75)	8	20 (0.79)
flange DN100 10K RF, JIS / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	210 (8.27)	175 (6.89)	19 (0.75)	8	20 (0.79)
flange DN150 10K RF, JIS / 316/316L	243.2 (9.57)	295.2 (11.62)	3°	120 (393.7)	280 (11.02)	240 (9.45)	23 (0.91)	8	22 (0.87)

13.3 LR550 polymeric horn antenna

LR550 without flange



LR550 with Universal bolted flange 3"

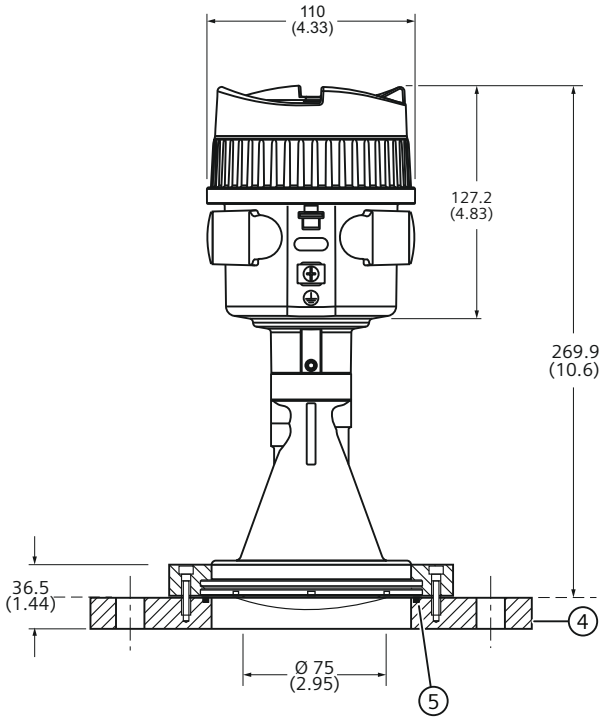


① 3" Universal bolted flange

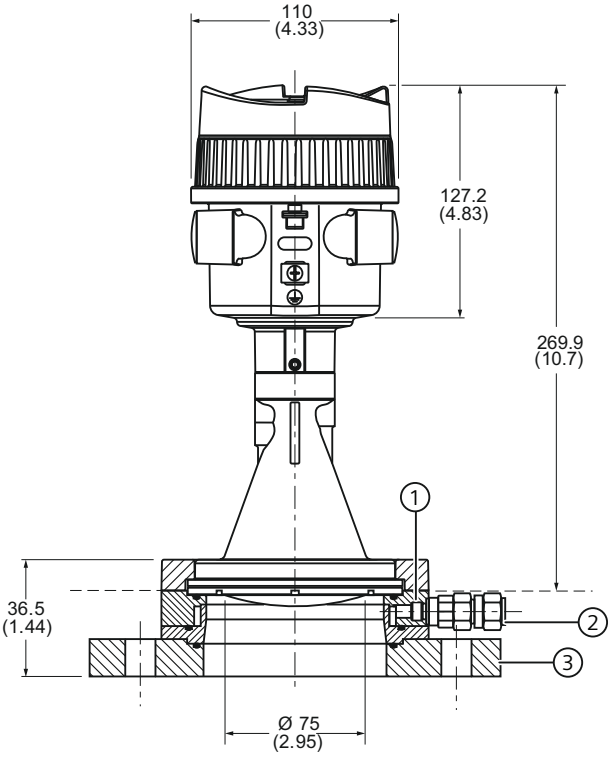
- - - - Sensor reference point

Dimensions in mm (Inch)

LR550 with flange



LR550 with flange and purge connection

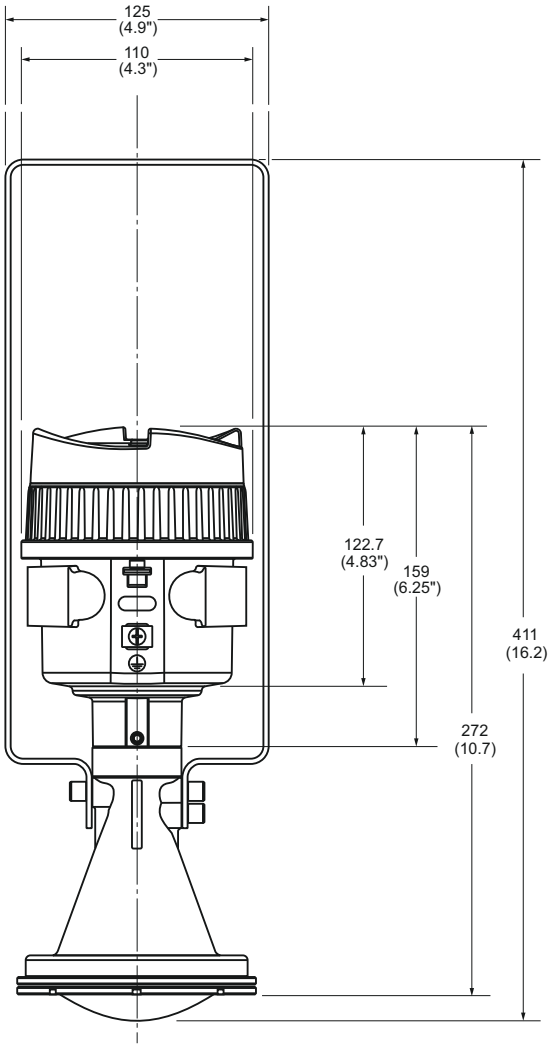


① Air purge inlet
② Non return valve
③ Device flange
④ Device flange
⑤ Process seal

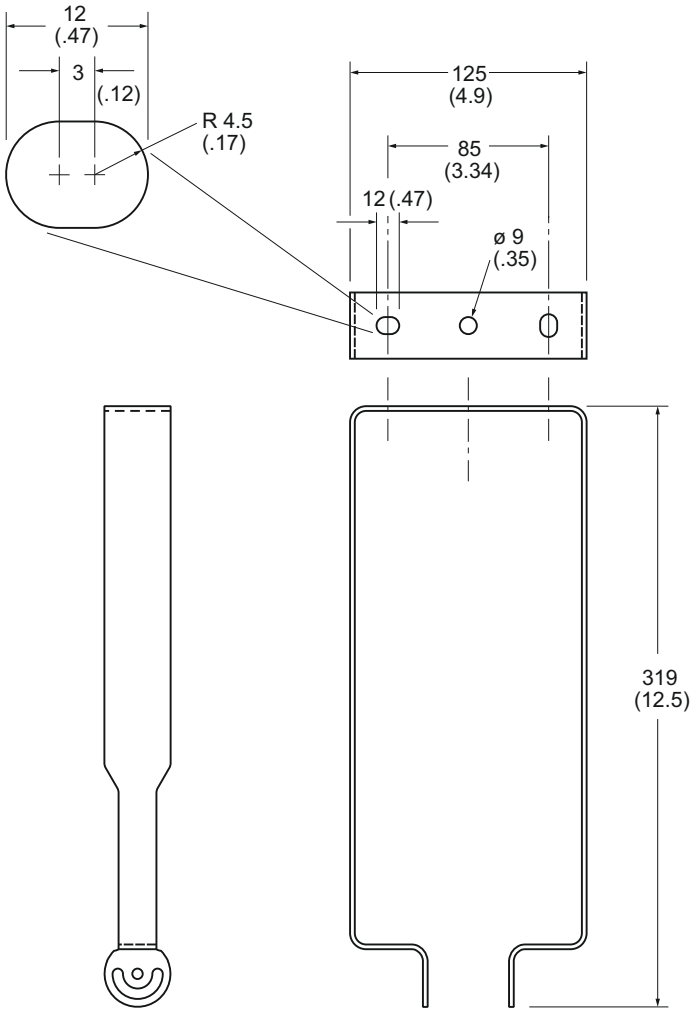
- - - - Sensor reference point

Dimensions in mm (Inch)

LR550 with mounting bracket



LR550 mounting bracket side and top view



Dimensions in mm(Inch)

LR550 with flange

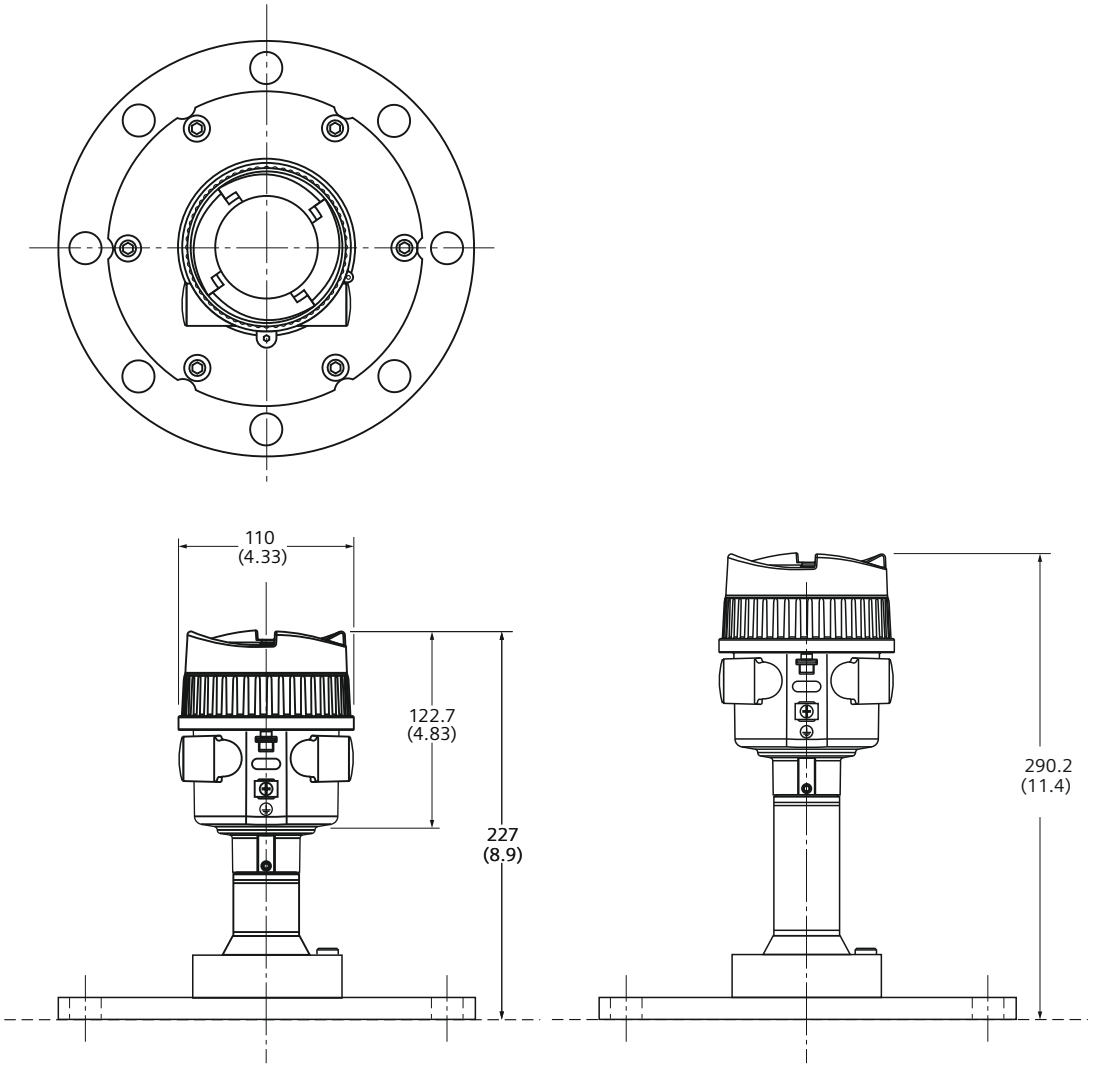
Flange	Flange O.D. [mm (inch)]	Bolt hole circle Ø [mm (inch)]	Bolt hole Ø [mm (inch)]	No. of bolt holes	Flange thickness [mm (inch)]
DN100 PN 6, flat face	210 (8.27)	170 (6.7)	18 (0.71)	4	20 (0.79)
DN100 PN16, flat face	220 (8.99)	180 (7.09)	18 (0.71)	8	
DN150 PN16, flat face	285 (11.22)	240 (9.49)	22 (0.87)	8	
DN200 PN16, flat face	340 (13.38)	295 (11.61)	22 (0.87)	12	
DN250 PN16, flat face	405 (15.94)	355 (13.98)	26 (1.02)	12	
3" 150lb FF	190.5 (7.5)	152.4 (6)	19.1 (0.75)	4	
4" 150lb FF	228.6 (9)	190.5 (7.5)	19.1 (0.75)	8	
6" 150lb FF	279.4 (11)	241.3 (9.5)	22.4 (0.88)	8	
8" 150lb FF	342.9 (13.5)	298.5 (11.75)	22.4 (0.88)	8	
DN100 10K FF, JIS	210 (8.27)	175 (6.89)	19 (0.75)	8	
DN150 10K FF, JIS	280 (11.02)	240 (9.49)	23 (0.9)	8	

Recommended max. range 120 m (393.7 ft)

Beam angle 3°

13.4 LR580 flanged lens antenna

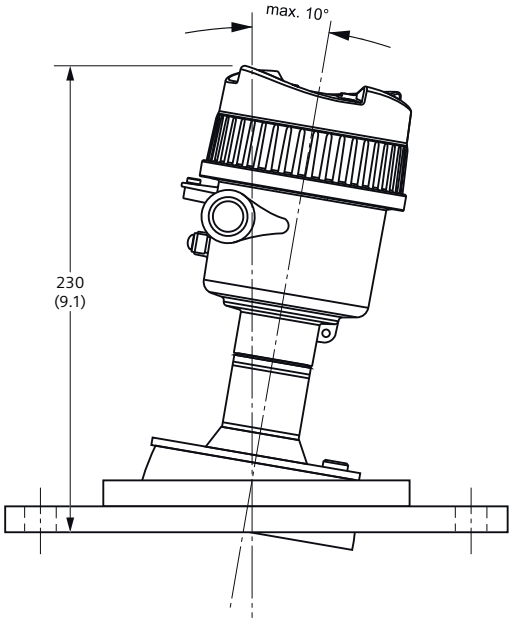
LR580 flat face flanges



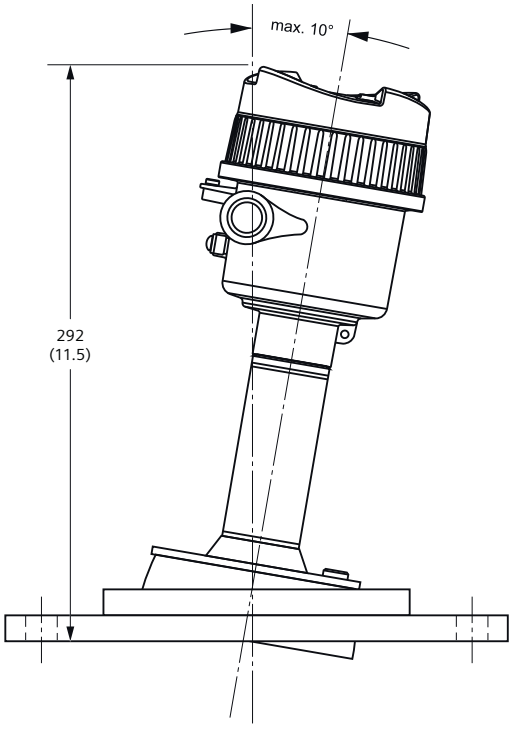
DImensions in mm (inch)

- - - - Sensor reference point

LR580 aiming flange



LR580 aiming flange with thermal extension



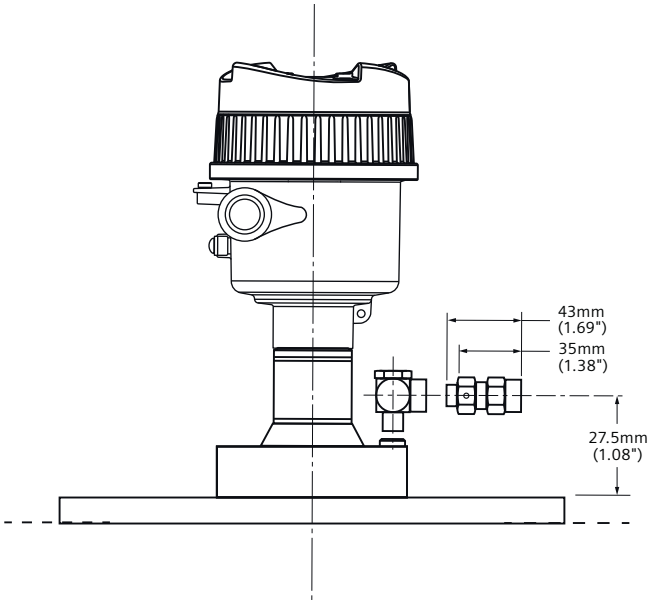
Dimension in mm (inch)

Flange	Flange O.D. [mm (inch)]	Bolt hole circle Ø [mm (inch)]	Bolt hole Ø [mm (inch)]	No. of bolt holes	Flange thickness [mm (inch)]
DN80 PN16, flat face	200 (7.87)	160 (6.93)	18 (0.06)	8	11.5 (0.04)
DN100 PN16, flat face	220 (8.66)	180 (7.09)	18 (0.06)	8	
DN150 PN16, flat face	285 (11.22)	240 (9.45)	22 (0.07)	8	
3" 150lb flat face	190.5 (7.5)	152.4 (6)	19.1 (0.06)	4	
4" 150lb flat face	228.6 (9)	190.5 (7.5)	19.1 (0.06)	8	
6" 150lb flat face	279.4 (11)	241.3 (9.5)	22.4 (0.07)	8	
DN80 10K, flat face, JIS	185 (7.28)	150 (5.9)	19 (0.06)	8	
DN100 10K, flat face, JIS	210 (8.27)	175 (6.89)	19 (0.06)	8	
DN150 10K, flat face, JIS	280 (11.02)	240 (9.45)	23 (0.07)	8	
Aiming flange universal DN100/4"	228.6 (9)	175...191	19.1 (0.06)	8	
Aiming flange universal DN150/6"	285 (11.22)	241 (9.49)	24 (0.08)	8	

Recommended max. range: 120 m (394 ft)

Beam angle: 3°

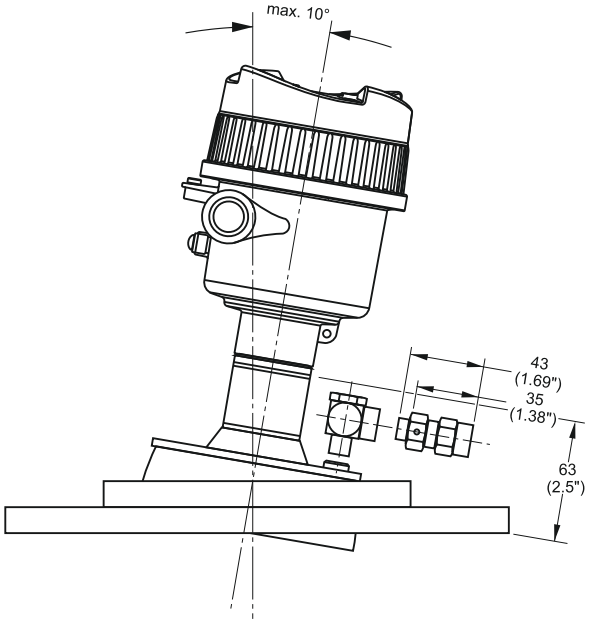
LR580 lens antenna with purge connection



- - - - Sensor reference point

DImensions in mm (inch)

LR580 lens antenna with aiming flange and purge connection



DImensions in mm (inch)

Product documentation and support

A

A.1 Product documentation

Process instrumentation product documentation is available in the following formats:

- Certificates (http://www.siemens.com/processinstrumentation/certificates)
- Downloads (firmware, EDDs, software) (http://www.siemens.com/processinstrumentation/downloads)
- Catalog and catalog sheets (http://www.siemens.com/processinstrumentation/catalogs)
- Manuals (http://www.siemens.com/processinstrumentation/documentation)
  You have the option to show, open, save, or configure the manual.
  - "Display": Open the manual in HTML5 format
  - "Configure": Register and configure the documentation specific to your plant
  - "Download": Open or save the manual in PDF format
  - "Download as html5, only PC": Open or save the manual in the HTML5 view on your PC

You can also find manuals with the Mobile app at Industry Online Support (https://support.industry.siemens.com/cs/ww/en/sc/2067). Download the app to your mobile device and scan the device QR code.

Product documentation by serial number

Using the PIA Life Cycle Portal, you can access the serial number-specific product information including technical specifications, spare parts, calibration data, or factory certificates.

Entering a serial number

1. Open the PIA Life Cycle Portal (https://www.pia-portal.automation.siemens.com).
2. Select the desired language.
3. Enter the serial number of your device. The product documentation relevant for your device is displayed and can be downloaded.

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

Scanning a QR code

1. Scan the QR code on your device with a mobile device.
2. Click "PIA Portal".

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

A.2 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (http://www.siemens.com/automation/support-request).

For help creating a support request, view this video here (www.siemens.com/opensr).

Additional information on our technical support can be found at Technical Support (http://www.siemens.com/automation/csi/service).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at service & support (http://www.siemens.com/automation/serviceandsupport).

Contact

If you have further questions about the device, contact your local Siemens representative, by doing the following:

1. Visit Contact at Siemens (http://www.automation.siemens.com/partner).
2. Select "All Products and Branches" > "Products & Services" > "Industrial automation".
3. Choose either "Process analytics" or "Process instrumentation", depending on your product.
4. Select the product category ("Pressure measurement", for example), then select your product.
5. Click "Search".
   The contacts for your product in all regions display.

Contact address for business unit:
Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

Technical reference

B

B.1 Principles of operation

SITRANS LR500 series is a 2-wire, 80 GHz FMCW (Frequency Modulated Continuous Wave) radar level transmitter for continuous monitoring of liquids, solids and slurries in vessels to a range of 100 m (329 ft)[1]. Radar level measurement uses the time of flight principle to determine distance to a material surface.

FMCW radar transmits a continuous wave. The frequency of the wave is constantly increasing: this is known as the sweep. By the time the first part of the wave has been reflected off the target and returned to the device, the part of the wave that is just being emitted is at a higher frequency. The difference in frequency between the transmitted and received signals is proportional to time of flight.

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 LR500 series consists of an enclosed electronic circuit coupled to an antenna and process connection. The electronic circuit generates a radar signal (80 GHz) that is directed to the antenna.

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

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

[2] See Dimension drawings (Page 187)

B.2 Echo processing

B.2.1 Echo processing

Echo processing consists of echo enhancement, true echo selection, and selected echo verification.

Echo enhancement is achieved by filtering [1] and reforming [2] the echo profile. The true echo (echo reflected by the intended target) is selected when that portion of the echo profile meets the evaluation criteria of Process Intelligence. Insignificant portions of the echo profile outside of the measurement range [3], below the TVT curve [4], and less than the confidence threshold [5], are automatically disregarded. The remaining portions of the echo profile are evaluated using the selected algorithm [6]. The echo profile portion providing the best echo confidence [7] is selected.

Echo verification is automatic. The position (relation in time after transmit) of the new echo is compared to that of the previously accepted echo. When the new echo is within the echo

lock window [8], it is accepted, and displays and outputs are updated per the rate parameters [9]. If the new echo is outside of the window, it is not accepted until echo lock requirements [10] are satisfied.

[1] Reform echo (3.3.4.1) (Page 134)
[2] Algorithm (3.3.3.1) (Page 133)
[3] Lower calibration point (2.3.1) (Page 118)
[4] Confidence (3.3.1.1) (Page 132)
[6] Custom TVT shaper mode (3.3.6.5) (Page 137)
[7] Echo lock window (3.3.5.2) (Page 136)
[8] Echo threshold (3.3.3.2) (Page 133)
[9] Fill rate limit (2.2.3) (Page 117) and Echo lock (3.3.5.1) (Page 135)

B.2.2 Echo selection

B.2.2.1 Confidence

Confidence describes the quality of an echo. It is used internally to select the true echo.

For more information, see Requesting an echo profile (Page 83).

B.2.2.2 Auto false echo suppression and Custom TVT

If you have a vessel with known obstructions, use auto false echo suppression (AFES) to prevent false echo detection. If the device displays a false high level, or the reading is fluctuating between the correct level and a false high level, this typically is the result of obstructions in the vessel.

False echoes can be caused by an obstruction in the sensor signal beam (such as pipes, ladders, chains). Such false echoes may rise above the default TVT curve.

The device takes a profile for the whole measurement range and the learned TVT is shaped around all echoes present at that moment.

The AFES parameter Auto false echo suppression (Page 98) specifies the range within which the learned TVT is applied. The default TVT is applied over the remainder of the measurement range.

The material level should be below all known obstructions at the moment when the TVT is learned. Ideally the vessel should be empty or almost empty.

AFES 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.

B.2.2.3 Echo selection algorithms

The echo is selected based on echo selection algorithms that ultimately use confidence to select the echo.

Preferred algorithm types are marked with an asterisk. They provide the best echo selection results in most applications. Other algorithms may prdouce better results in specialized applications, but should only be used after consulting an experienced techincal expert.

Algorithm abbreviation	Algorithm name	Echo determination	Applications
ALF	Area largest first echo	Selects the echo (average of widest, tallest, and first), with the highest confidence value.	• Solids • General purpose • Where material return echo is wide and tall, and where competing smaller echoes challenge algorithm "BLF"
A	Echo area	Selects the widest echo above the TVT curve.	• Solids • Coarse, heaped material • Distance to material must be greater than 2 m
L	Largest echo	Selects the tallest echo above the TVT curve.	• Liquids (open vessel) • Where material return echo is tall
F	First echo	Selects the first large echo above the TVT curve.	• Liquids (closed vessel)
BLF	Best echo of the first and largest echo	Selects the echo (best of first and tallest), with the highest confidence value.	• Liquids and Solids • General purpose • Where material return echo is relatively tall and sharp
TF	True first echo	Selects the first echo above the TVT curve.	• Liquids (free of obstructions) • Use to ignore multiple echoes, where confidence value of first echo is high

B.3 Loop power

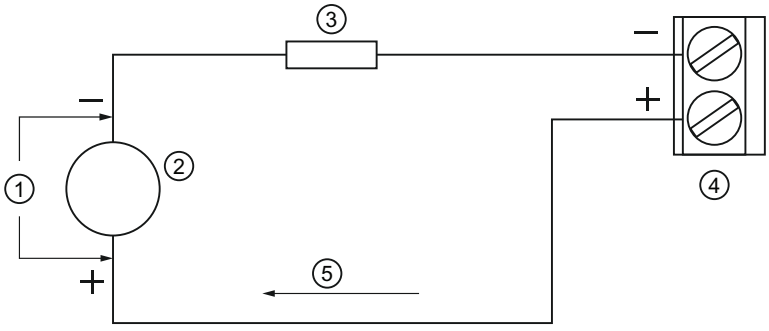
B.3.1 Loop power

Note

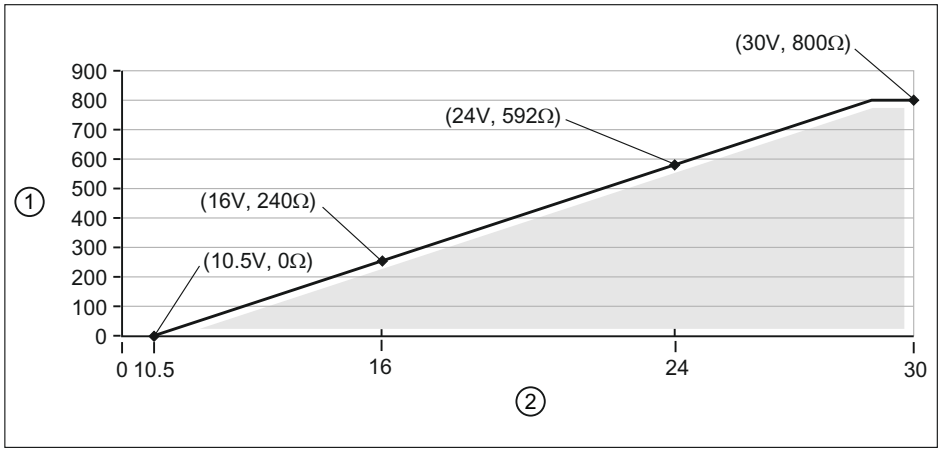
Loop voltage

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

Loop resistance versus Loop voltage



① Loop voltage V_L
② Power supply
③ Loop resistance R_L
④ SITRANS LR500
⑤ Loop current I_L



① Loop resistance - R_L
② Loop voltage - V_L

Note

HART communication

For example as per graph, when using HART communication with 240 Ohms of Loop resistance (R_L), the minimum Loop voltage (V_L) is 16 V DC.

Communication

C

C.1 HART communications

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 website:

HART Communication Foundation (https://fieldcommgroup.org/)

The radar device 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.2 HART communication protocol

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

C.3 SIMATIC PDM

This software package is designed to permit easy configuration, monitoring, and troubleshooting of HART devices. The HART EDD for this device was written with SIMATIC PDM in mind and has been extensively tested with this software. For more information, see Operating via SIMATIC PDM (Page 93).

C.4 HART Electronic Device Description (EDD)

In order to configure a HART device, the configuration software requires the HART Electronic Device Description (EDD) for the instrument in question.

You can download the HART EDD for this device from our website:

Product page (www.siemens.com/sitransLR500)

Click **Support > Software downloads.** Older versions of the library will have to be updated in order to use all the features of this device.

Remote operation

D

D.1 SIMATIC PDM

D.1.1 Simulation (under PDM appendix)

Both process values and diagnostics can be simulated in SIMATIC PDM. For more details, see Simulation (Page 89).

D.1.2 Overview SIMATIC PDM

SIMATIC PDM (Process Device Manager) is a general-purpose, manufacturer-independent tool for the configuration, parameter assignment, commissioning, diagnostics and maintenance of intelligent field devices and field components. Follow-up installations and additional information on SIMATIC PDM are available on the Internet at SIMATIC PDM (https://www.siemens.com/simatic-pdm).

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.

For information on, for example, how to install and integrate devices, commission the software, see Operating Manual 'Help for SIMATIC PDM'. The manual is delivered with SIMATIC PDM software. Once the SIMATIC PDM is installed on your computer you find the manual under: Start > All programs > Siemens Automation > SIMATIC > Documentation. Link at our website: SIMATIC PDM instructions and manuals (https://support.industry.siemens.com/cs/ww/en/ps/16983/man).

Note

Field device parameters

- For a list of parameters and additional information, consult section "Operating via SIMATIC PDM (Page 93)".
- The field device remains in measurement mode during the time you configure the field device.

D.1.3 Check SIMATIC PDM version

Procedure

1. Go to SIMATIC PDM Download (http://www.siemens.com/simaticpdm/downloads).
2. Check the support page to make sure you have:
   - The latest version of SIMATIC PDM
   - The most recent Service Pack (SP)
   - The most recent hot fix (HF)

D.1.4 Updating the Electronic Device Description (EDD) or Field Device Integration (FDI)

Procedure

1. Check that the EDD or FDI revision match the Firmware revision in the device according to the table in section Product compatibility (Page 13).
2. Go to the support page Software downloads (https://www.siemens.com/processinstrumentation/downloads).
3. Enter the product name in the field "Enter search term...".
4. Download the most current EDD or FDI of your device.
5. Save files to your computer in an easily accessed location.
6. Launch SIMATIC PDM – Device Integration Manager.
   From the File menu, click "Read device descriptions from compressed source...".
7. Browse to the compressed EDD or FDI files, select and open it.
8. From the Catalog menu, use the "Integration" function to integrate the EDD or FDI into the device catalog. The EDD or FDI is now accessible via SIMATIC Manager.

D.2 Bluetooth

D.2.1 Scope of delivery of SITRANS AW050 Bluetooth adapter kit

- SITRANS AW050 Bluetooth adapter
- Flat ribbon cable
- Cable gland

D.2.2 Connecting field device and SITRANS AW050 Bluetooth adapter

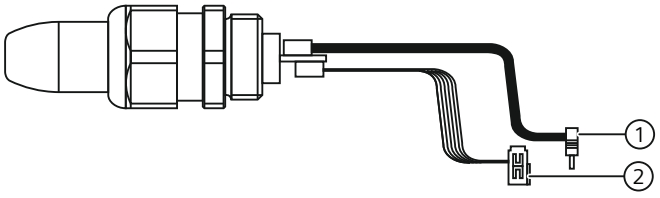
D.2.2.1 Connecting field device when Bluetooth adapter installed

Procedure

NOTICE
General purpose use SITRANS AW050 Bluetooth module is only approved for use with general purpose non-hazardous devices

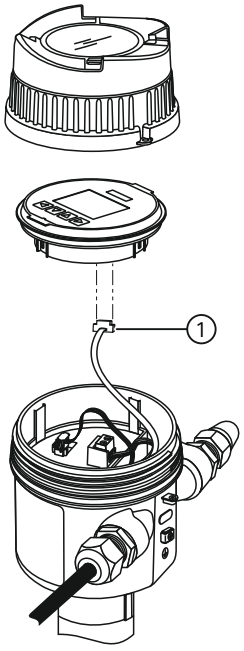
When the HMI adapter is already installed, follow these steps to connect the field device:

1. Remove the current HMI cable.
2. Connect the black cable to the HMI display.
3. Connect the grey cable to the device.



① To the optional HMI
② To the electronics

The cables are best run separately inside the enclosure as shown in the figure following. Take care when installing the display to be sure that the cables are not pinched or torn. Excessive force should not be necessary for installation of the display mounting.



① To optional HMI

Use of the display while the AW050 is installed

When power is applied to the device, the display remains activated as long as there is no bluetooth connection.

When the AW050 connection is made through SITRANS mobile IQ, the display is not be accessible. When the AW050 Bluetooth connection is disconnected, the display is activate again.

D.2.2.2 Installing or replacing Bluetooth adapter

Procedure

To install or replace the Bluetooth adapter, follow these steps. For more information, refer to illustrations in Connecting field device when Bluetooth adapter installed (Page 209).

1. Run both cables through conduit entry where Bluetooth adaptor will be installed.
2. Install cable gland and tighten against enclosure. Ensure the adapter cables are not pinched inside the housing.
3. Slide the adapter into the gland against the O-ring.
4. Tighten the gland to the adapter, without twisting the cables.
5. Plug the cables into the display and electronics.

D.2.3 Connecting field device with SITRANS mobile IQ app

SITRANS mobile IQ is an app for mobile devices that enables authorized service technicians to monitor and configure compatible field instrumentation over a Bluetooth interface. You can find information and the app for download at: Mobile app "Industry Online Support" (https://support.industry.siemens.com/cs/ww/en/sc/2067)

Requirements for establishing the first connection

1. Field device is in operation.
2. There is a line of sight to the field device.
3. You are less than 10 meters away from the field device.
4. LED on the SITRANS AW050 Bluetooth adapter flashes every 2 seconds.

Requirements for connection setup

1. Android: "Location" access is enabled in the mobile device.
2. SITRANS mobile IQ is authorized to access the location.

Procedure

NOTICE
Unauthorized access It is your responsibility to prevent unauthorized access to the field device.

1. Start the SITRANS mobile IQ app.
   The smartphone or tablet automatically searches for Bluetooth field devices in the vicinity. The field devices found are listed. Select the desired field device in the device list.
2. Enter the default delivery password "Sitrans AW050!". The delivery password must be changed for first connection setup.
3. Assign a new password. Everybody authorized to connect additional mobile devices has to know the new password.
   - To avoid potential security threads: Before assigning a password, ensure that no 2 field devices with the same serial number are displayed in the selection list.
   - Assign a new password that is not the same as the default password. The new password must consist of at least 12 characters (of any type).
   - Only use passwords with a high password strength. Avoid weak passwords for example "password1", "123456789" or similar.
   - Do not use the same password for different Bluetooth field devices.
   - If the mobile end device has device protection enabled, SITRANS mobile IQ automatically saves the password. Individually stored device passwords can be deleted in the app.

When the connection is established, the LED on the SITRANS AW050 Bluetooth adapter flashes every second.

D.2.4 Default password

The default delivery password must be changed for the first connection setup.

The default password is: "Sitrans AW050!".

Note that this password:

- Is used in the procedure to connect the field device with SITRANS Mobile IQ.
- Is the default used when the password is reset.

D.2.5 Reset Password

Procedure

1. Select "Bluetooth password reset".
2. Once you have selected "Bluetooth password reset", disconnect the ribbon cable between the SITRANS AW050 and the device within 60 seconds.
3. Wait for 30 seconds.
4. Insert the ribbon cable again.

The password is reset to the default password.

D.2.6 Technical data: SITRANS AW050 Bluetooth adapter

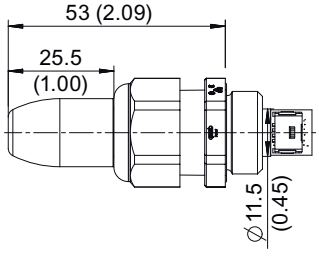
Operating conditions and structural design	
Ambient conditions	For use indoors and outdoors.
Ambient temperature	Observe the maximum permissible ambient temperature of the connected field device.
• Permissible ambient temperature for operation	-40 ... +80 °C (-40 ... +176 °F)
• Relative humidity	0 ... 100%
Degree of pollution	2
Overvoltage category	II
Weight	
• With cable gland	24 g
• Without cable gland	13 g
Degree of protection	• Type 4X, Type 6 in accordance with UL 50E • IP66, IP68 in accordance with IEC 60529
EMC	EN 61326

Operating conditions and structural design	
Input voltage range	2.2 ... 3.4 V DC
Maximum current consumption	2.5 mA
Material	Polycarbonate
Torque for cable gland	10 Nm (7.38 ft lb)
Communication, interface	Bluetooth 4.2
Range	Class 2; approx. 10 m
Radio approvals	Contains FCC ID: RYYEYSHJN Contains IC: 4389B-EYSHJN CMIIT ID: 2020DJ15120

D.2.7 Technical data: SITRANS mobile IQ

Software requirements	
Bluetooth	BLE 4.2 or higher

D.2.8 Dimensions SITRANS AW050 Bluetooth adapter



Dimension drawing SITRANS AW050 Bluetooth adapter, dimensions in mm (inch)

D.2.9 Information for radio approvals

Canada Regulatory Information

1.

This device complies with Innovation, Science and Economic Development Canada's applicable license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage;

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

2. This product is certified as type of the portable device with Innovation, Science and Economic Development Canada Rules. To maintain compliance with RF Exposure requirement, please use within specification of this product.
Ce produit est certifié comme type de l'appareil portable avec Innovation, Sciences et Développement économique Canada Règles. Pour maintenir l'acquiescement avec exigence Exposition de RF, veuillez utiliser dans spécification de ce produit.

FCC Regulatory Information

1.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

2.

FCC CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment.

3.

This product is certified as type of the portable device with FCC Rules. To maintain compliance with RF Exposure requirement, please use within specification of this product.

4.

The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

5.

This module can change the output power depending on the circumstances by the application software which is developed by module installer. Any end user cannot change the output power.

South Korea-KCC Regulatory Information

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서
가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

D.3 HART

D.3.1 HART communication

Specific device versions (6 m, 12 m) support HART communication protocol. For more information, see Communication (HART) (Page 215).

D.3.2 Communication (HART)

Highway Addressable Remote Transducer (HART) is an industrial protocol that is superimposed on the 4 to 20 mA signal. It is an open standard and full details about HART can be obtained from:

- HART Communication Foundation (https://fieldcommgroup.org/)

SITRANS LR500 can be configured over the HART network using the HART Communicator TREX by Emerson, or a software package. The recommended software package is the SIMATIC Process Device Manager (PDM) by Siemens.

HART version

SITRANS LR500 conforms to HART revision 7.6.

HART multi-drop mode

HART multi-drop mode allows the connection of multiple field devices via HART. To setup multi-drop mode via a HART network, the polling address must be set.

To set up multi-drop mode via the HMI:

1. Set the polling address (Polling address (4.1) (Page 145))
2. Set the device mode (Loop current mode (2.4.1) (Page 120))
3. Set the mA value for multi-drop mode (Loop current value in multidrop mode (2.4.2) (Page 120))

SIMATIC PDM

This software package is designed to permit easy configuration, monitoring, and troubleshooting of HART devices. The HART EDD for SITRANS LR500 was written with SIMATIC PDM in mind and has been extensively tested with this software. For more information, see Overview SIMATIC PDM (Page 207).

HART Electronic Device Description (EDD)

In order to configure a HART device, the configuration software requires the HART Electronic Device Description specific to the device. Download the HART EDD for SITRANS LR500 from the product page of our website:

- Product page (www.siemens.com/sitransLR500)

Click "**Support** > **Software Downloads**". Older versions of the library will have to be updated in order to use all the features of SITRANS LR500.

HART status

Information on HART status is outlined in an application guide **Working with HART networks**, which can be downloaded from the product page of our website:

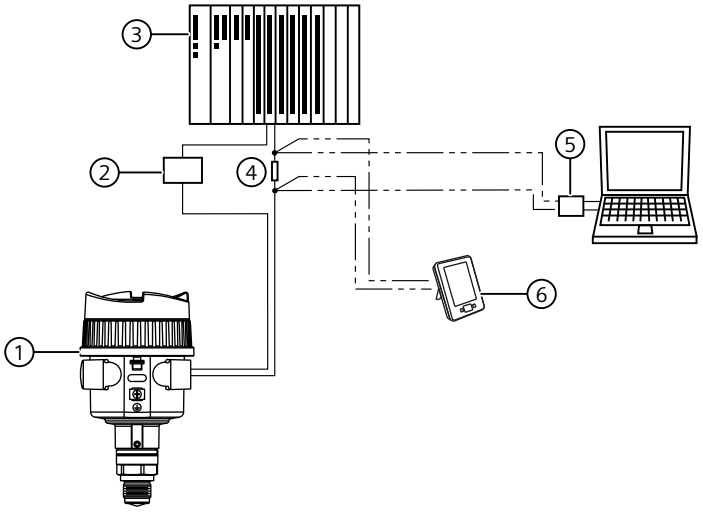
- Product page (www.siemens.com/sitransLR500)

Under **More information**, click **Application guides**.

D.3.3 Communication connections

The SITRANS LR500 can be connected to a computer system via a HART modem (connected to the mA OUT/HART terminal block).

Typical PLC/mA configuration with passive HART connection



①	Device	④	R= 250 Ω
②	Power supply	⑤	HART modem
③	PLC	⑥	HART communicator

Note

HART configuration

- Depending on the system design, the power supply may be separate from the PLC, or integral to it.
- HART resistance [total loop resistance, that is, cable resistance plus 250 Ohm (resistor)] must be limited according to the allowable operating area as shown in graph under Technical reference (Page 201).

A HART network requires a polling address be configured.

D.3.4 Configuring communication ports

Note

HART modem

It is recommended that only HCF registered modems be used.

Polling address

Polling address (4.1) (Page 145) (or poll ID) is a unique identifier for the device on a HART network.

Setting	**0 to 63** (Set within range of **0 to 15** if HART 5 master used.)
Default	**0**

Prior to HART 6, the polling address was set to 0 for point to point operation. For HART multidrop mode, the device was set to any value other than 0 within the range. (Setting a non-zero address forced the device into fixed current mode.)

With HART 6 and above (version 7.6 supported by SITRANS LR500), multidrop mode no longer depends on the polling address. However, it is recommended that a non-zero address be set to avoid confusion based on previous HART requirements.

To put SITRANS LR500 into multidrop mode, disable Loop current mode (2.4.1) (Page 120). When Loop current mode is disabled, a low fixed current is used, allowing for multiple devices to be connected. (A custom fixed current value can be entered in Loop current value in multidrop mode (2.4.2) (Page 120).)

D.3.5 Communication troubleshooting

For more information, refer to Communication troubleshooting (Page 155).

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