SIEMENS

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Operating Instructions

SITRANS L

Radar transmitters

SITRANS LR150

https://www.siemens.com/processautomation

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SITRANS L

Radar transmitters
SITRANS LR150

Operating Instructions

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.

Table of contents

Preface

Safety instructions for Ex areas:

⬡ Ex

⚠ **WARNING**

Take note of the Ex specific safety instructions for Ex applications. These instructions are attached as documents to each transmitter with Ex approval and are part of the operating instructions.

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Introduction

1

1.1 Function

This instruction provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, safety and the exchange of parts. Please read this information before putting the transmitter into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual must be made available to the qualified personnel and implemented.

1.3 Symbols used

i	**Information, note, tip:** This symbol indicates helpful additional information and tips for successful work.
⚠	**Note:** This symbol indicates notes to prevent failures, malfunctions, damage to devices or plants.
⚠	**Caution:** Non-observance of the information marked with this symbol may result in personal injury.
⚠	**Warning:** Non-observance of the information marked with this symbol may result in serious or fatal personal injury.
⚠	**Danger:** Non-observance of the information marked with this symbol results in serious or fatal personal injury.
⟨Ex⟩	**Ex applications** This symbol indicates special instructions for Ex applications.
•	**List** The dot set in front indicates a list with no implied sequence.

1	**Sequence of actions**
	Numbers set in front indicate successive steps in a procedure.
	Disposal
	This symbol indicates special instructions for disposal.

Safety notes

2

2.1 Authorised personnel

All operations described in this documentation must be carried out only by trained and authorized personnel.

During work on and with the device, the required personal protective equipment must always be worn.

2.2 Appropriate use

SITRANS LR150 is a transmitter for continuous level measurement.

You can find detailed information about the area of application in chapter ""*Product description*".

Operational reliability is ensured only if the transmitter is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

2.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the transmitter can be impaired.

2.4 General safety instructions

This is a state-of-the-art transmitter complying with all prevailing regulations and directives. The transmitter must only be operated in a technically flawless and reliable condition. The operating company is responsible for the trouble-free operation of the transmitter. When measuring aggressive or corrosive media that can cause a dangerous situation if the transmitter malfunctions, the operating company has to implement suitable measures to make sure the transmitter is functioning properly.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by us. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by us must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed.

The low transmitting power of the radar transmitter is far below the internationally approved limits. No health impairments are to be expected with intended use. The band range of the measuring frequency can be found in chapter ""*Technical data*".

2.5 Radar frequencies for worldwide use

Country or region specific settings for the radar signals are determined via the frequency. The operating mode must be set in the operating menu via Sitrans mobile IQ App at the beginning of the setup.

⚠ **WARNING**

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

2.6 Installation and operation in the USA and Canada

This information is only valid for USA and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (NEC - NFPA 70) (USA).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code (CEC Part I) (Canada).

2.7 Security information

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

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

Siemens products and solutions undergo continous 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/industrialsecurity

3

Description

3.1　Configuration

Scope of delivery

The scope of delivery encompasses:

- SITRANS LR150 radar transmitter
- Information sheet ""*Documents and software*" with:
  - Transmitter serial number
  - QR code with link for direct scanning
- Information sheet ""*Device Bluetooth and Parameter Access Codes*" with:
  - Bluetooth PIN
  - Bluetooth PUK
  - Device Access PUK

The further scope of delivery encompasses:

- Documentation
  - Ex-specific ""*Safety instructions*" (with Ex versions)
  - Radio licenses
  - If necessary, further certificates

Note

Optional transmitter features are also described in this operating instructions manual. The respective scope of delivery results from the order specification.

Constituent parts
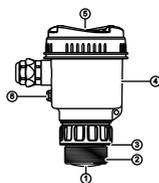
① Radar antenna
② Process fitting

③ Process seal (G type threaded connections only)
④ Electronics housing
⑤ Display and adjustment unit
⑥ Ventilation/pressure compensation

Figure 3.1   Components of SITRANS LR150 (Example process fitting G1½)

Nameplate

The nameplate contains the most important data for identification and use of the transmitter:

• Transmitter type

• Information about approvals

• Configuration information

• Technical data

• Serial number of the transmitter

• QR code for device identification

• Numerical code for Bluetooth access (optional)

• Manufacturer information

3.2   Principle of operation

Application area

SITRANS LR150 is a radar transmitter for non-contact, continuous level measurement. It is suitable for liquids and solids in practically all industries.

Functional principle

The transmitter emits a continuous, frequency-modulated radar signal through its antenna. The emitted signal is reflected by the medium and received by the antenna as an echo with modified frequency. The frequency change is proportional to the distance and is converted into the level.

3.3   Adjustment

Local adjustment

On-site adjustment of the device is carried out via the optionally integrated HMI.

Wireless adjustment

Devices with integrated Bluetooth module can be adjusted wirelessly via Siemens mobile IQ app.

① Transmitter
② Smart device
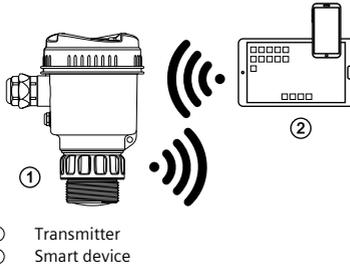
Figure 3.2   Wireless connection to standard operating devices with integrated Bluetooth LE

Adjustment via the signal cable

Devices with signal output 4 ... 20 mA/HART can also be operated via a signal cable. This is done via an interface adapter and a PC/notebook using SIMATIC PDM.

① Transmitter
② HART resistance 250 Ω (optional depending on evaluation)
③ Control system
④ Handheld
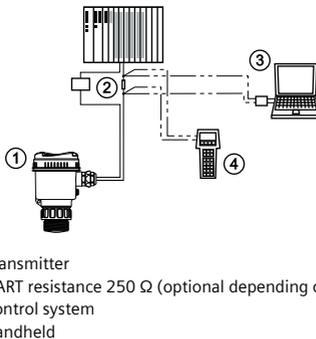
Figure 3.3   Connecting the PC to the signal cable

3.4   Packaging, transport and storage

Packaging

Your transmitter was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Transport

Transport must be carried out in due consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

• Not in the open
• Dry and dust free
• Not exposed to corrosive media
• Protected against solar radiation
• Avoiding mechanical shock and vibration

Storage and transport temperature

• Storage and transport temperature see chapter ""*Supplement - Technical data - Ambient conditions*"
• Relative moisture 20 ... 85 %

Installing/mounting

<div style="text-align: right; font-size: 3em; font-weight: bold;">4</div>

4.1 General instructions

Ambient conditions

The transmitter is suitable for standard and extended ambient conditions acc. to DIN/EN/BS EN/IEC/ANSI/ISA/UL/CSA 61010-1. It can be used indoors as well as outdoors.

Process conditions

Note

For safety reasons, the transmitter must only be operated within the permissible process conditions. You can find detailed information on the process conditions in chapter ""*Technical data*" of the operating instructions or on the nameplate.

Hence make sure before mounting that all parts of the transmitter exposed to the process are suitable for the existing process conditions.

These are mainly:

*   Active measuring component
*   Process fitting
*   Process seal

Process conditions in particular are:

*   Process pressure
*   Process temperature
*   Chemical properties of the medium
*   Abrasion and mechanical influences

4.2 Mounting instructions

Polarisation

Radar transmitters for level measurement emit electromagnetic waves. The polarization is the direction of the electrical component of these waves.

The polarization direction is marked on the housing, see following drawing:
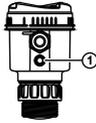
①   Marking of the polarisation

Figure 4.1   Position of the polarisation

Note

When the housing is rotated, the direction of polarization changes and hence the influence of the false echo on the measured value. Please keep this in mind when mounting or making changes later.

Reference point

The centre of the antenna lens is the beginning of the measuring range and at the same time the reference point for the min./max. adjustment, see following diagram:
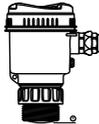
①   Reference point

Figure 4.2   Reference point

Installation position

When mounting the device, keep a distance of at least 200 mm (7.874 in) from the vessel wall. If the device is installed in the center of dished or round vessel tops, multiple echoes can arise. However, these can be suppressed by an appropriate adjustment (see chapter ""*Set up*").

If you cannot maintain this distance, you should carry out a auto false echo suppression during setup. This applies particularly if buildup on the vessel wall is expected. In such cases, we recommend repeating the auto false echo suppression at a later date with existing buildup.
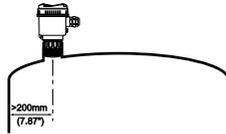
Figure 4.3   Mounting of the radar transmitter on round vessel tops

In vessels with conical bottom it can be advantageous to mount the device in the centre of the vessel, as measurement is then possible down to the bottom.
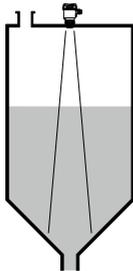
Figure 4.4   Mounting of the radar transmitter on vessels with conical bottom

Inflowing medium

Do not mount the transmitters in or above the filling stream. Make sure that you detect the medium surface, not the inflowing product.
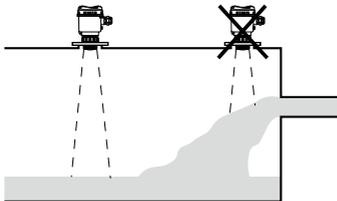
Figure 4.5   Mounting of the radar transmitter with inflowing medium

Threaded nozzle und nozzle piece

With threaded connection, the antenna end should protrude at least 5 mm (0.2 in) out of the nozzle.
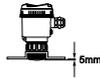
Figure 4.6   Thread mounting

If the reflective properties of the medium are good, you can mount SITRANS LR150 on nozzles longer than the antenna. The nozzle end should be smooth and burr-free, if possible also rounded.

You will find recommended values for nozzle heights in the following illustration or the table. The values come from typical applications. Deviating from the proposed dimensions, also longer nozzles are possible, however the local conditions must be taken into account.
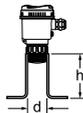
Figure 4.7   Nozzle mounting

Nozzle diameter d		Nozzle length h	
40 mm	1½"	≤ 150 mm	≤ 5.9 in
50 mm	2"	≤ 200 mm	≤ 7.9 in
80 mm	3"	≤ 300 mm	≤ 11.8 in
100 mm	4"	≤ 400 mm	≤ 15.8 in
150 mm	6"	≤ 600 mm	≤ 23.6 in

Note

When mounting on longer nozzles, we recommend carrying out a auto false echo suppression (see chapter ""*Parameter adjustment*").

Alignment - Liquids

In liquids, direct the device as perpendicular as possible to the medium surface to achieve optimum measurement results.
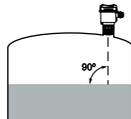
Figure 4.8   Alignment in liquids

Agitators

If there are agitators in the vessel, a auto false echo suppression should be carried out with the agitators in motion. This ensures that the interfering reflections from the agitators are saved with the blades in different positions.
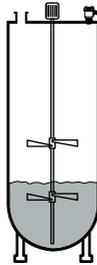
Figure 4.9   Agitators

Foam generation

Through the action of filling, stirring and other processes in the vessel, compact foams which considerably damp the emitted signals may form on the medium surface.

Note

If foams lead to measurement errors, you should use the biggest possible radar antennas or as an alternative, transmitters with guided radar.

4.3   Measurement setup - Flow

Mounting

In general, the following must be observed while mounting the device:

*   Mounting the transmitter on the upstream or inlet side

*   Installation in the centre of the flume and vertical to the liquid surface

*   Distance to the overfall orifice or Venturi flume

*   Distance to the max. height of the orifice or flume for optimum accuracy: > 250 mm (9.843 in)[1]

*   Requirements from approvals for flow measurement, e.g. MCERTS

---

[1] The value given takes into account the block distance. At smaller distances, the measuring accuracy is reduced, see ""*Technical data*".

Flume

Predefined curves:

A flow measurement with these standard curves is very easy to set up, as no dimensional information of the flume is required.

- Palmer-Bowlus flume ($Q = k \times h^{1.86}$)
- Venturi, trapezoidal weir, rectangular flume ($Q = k \times h^{1.5}$)
- V-Notch, triangular overfall ($Q = k \times h^{2.5}$)

Channel with dimensions according to ISO standard:

When selecting these curves, the dimensions of the flume must be known and entered via the assistant. As a result, the accuracy of the flow measurement is higher than with the specified curves.

- Rectangular flume (ISO 4359)
- Trapezoidal flume (ISO 4359)
- U-shaped flume (ISO 4359)
- Triangular overfall thin-walled (ISO 1438)
- Rectangular flume thin-walled (ISO 1438)
- Rectangular weir broad crown (ISO 3846)

Flow formula:

If the flow formula of your flume is known, you should select this option, as the accuracy of the flow measurement is highest here.

- Flow formula: $Q = k \times h^{exp}$

Manufacturer definition:

If you use a Parshall flume from the manufacturer ISCO, this option must be selected. This gives you a high accuracy of flow measurement with easy configuration.

Alternatively, you can also take over Q/h table values provided by the manufacturer here.

- ISCO-Parshall-Flume
- Q/h table (assignment of height with corresponding flow in a table)

Note

Detailed project planning data can be found at the channel manufacturers and in the technical literature.

The following examples serve as an overview for flow measurement.

Rectangular overfall
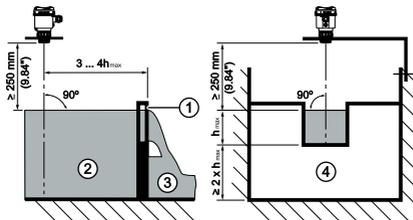
①   Overfall orifice (side view)
②   Upstream water
③   Tailwater
④   Overfall orifice (view from tailwater)

Figure 4.10   Flow measurement with rectangular flume: $h_{max.}$ = max. filling of the rectangular flume

Khafagi-Venturi flume
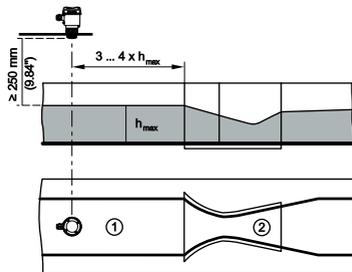
①   Position transmitter
②   Venturi flume

Figure 4.11   Flow measurement with Khafagi-Venturi flume: $h_{max.}$ = max. filling of the flume; B = tightest constriction in the flume

Connecting

5

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

- Carry out electrical connection by trained, qualified personnel authorised by the plant operator

> ⚠ **WARNING**
>
> Only connect or disconnect in de-energized state.

Voltage supply

The data for power supply are specified in chapter ""*Technical data*".

> **Note**
>
> Power the transmitter via an energy-limited circuit (power max. 100 W) acc. to IEC 61010-1, e.g.

- Class 2 power supply unit (acc. to UL1310)
- SELV power supply unit (safety extra-low voltage) with suitable internal or external limitation of the output current

Keep in mind the following additional factors that influence the operating voltage:

- Lower output voltage of the power supply unit under nominal load (e.g. with a transmitter current of 20.5 mA or 22 mA in case of fault signal)
- Influence of additional transmitters in the circuit (see load values in chapter ""*Technical data*")

Connection cable

Use cable with round cross section for transmitters with housing and cable gland. To ensure the seal effect of the cable gland (IP protection rating), find out which cable outer diameter the cable gland is suitable for.

Shielded, two-wire cable is recommended for connecting the device.

Note

Shielded cable generally necessary in HART multidrop mode.

Note

If the temperatures are too high, the cable insulation can be damaged. Hence keep apart from the ambient temperature also the self-heating of the transmitter for the temperature resistance of the cable in the connection compartment in mind (With an ambient temperature ≥ 50 °C (122 °F) the connection cable should be suitable for a temperature which is at least 20 °C (36 °F) higher.).

Cable screening and grounding

It is recommended to connect the cable screening to ground potential on the supply side.

Cable gland

Metric threads

In the case of transmitter housings with metric thread, the cable gland is screwed in at the factory. It is sealed with plastic plugs as transport protection.

You have to remove this plug before electrical connection.

NPT thread

In the case of transmitter housings with self-sealing NPT threads, it is not possible to have the cable entry screwed in at the factory. The cable gland is therefore covered with a red dust protection cap as transport protection.

Note

To ensure the housing protection class, you must replace this protective cap with an approved NPT cable gland before setup.

Note

Do not use grease when screwing in the NPT cable gland or a conduit steel pipe.

Maximum torque see chapter ""*Technical data*".

5.2 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Note

Fixed conductors and flexible conductors with ferrules can be inserted directly into the terminal openings. In the case of flexible conductors for opening the terminals, use a screwdriver (3 mm blade width) to push the actuator lever away from the terminal opening. When released, the terminals are closed again.

Note

Wires must have insulation thickness of 0.5 mm or greater.

Figure 5.1   Connection

You can find further information on the max. wire cross-section under ""*Technical data - Electromechanical data*".

5.3   Wiring plan

Electronics and connection compartment

① Voltage supply, signal output
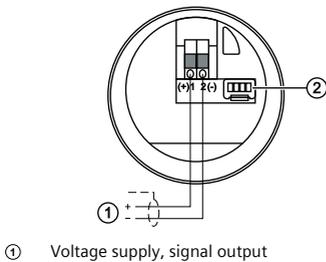
②   Plug connector for HMI

Figure 5.2   Connection compartment SITRANS LR150

5.4   Connecting HMI to electronic module
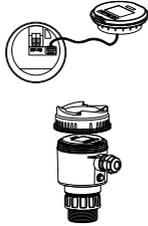
5.5   Switch-on phase

After connection to the power supply, the device carries out a self-test:

- Internal check of the electronics
- Output signal is set to failure

The current measured value is then output on the signal cable.

Access protection

6

6.1 Bluetooth radio interface

Devices with a Bluetooth radio interface are protected against unwanted access from outside. This means that only authorized persons can receive measured and status values and change device settings via this interface.

Bluetooth PIN

A Bluetooth PIN is required to establish Bluetooth communication via the adjustment tool (smartphone/tablet/notebook). This code must be entered once when Bluetooth communication is established for the first time in the adjustment tool. It is then stored in the adjustment tool and does not have to be entered again.

The Bluetooth PIN is individual for each device. It is supplied with the device in the information sheet ""*Device Bluetooth and Parameter Access Codes*". It can be changed by the user after the first connection has been established. If the Bluetooth PIN has not been entered correctly, a new entry can only be made after a waiting period has elapsed. The waiting time increases with each additional incorrect entry.

Bluetooth PUK

The Bluetooth PUK enables Bluetooth communication to be established in the event that the Bluetooth PIN is no longer known. It can't be changed. The Bluetooth PUK can be found in information sheet ""*Device Bluetooth and Parameter Access Codes*". If this document is lost, the Bluetooth PUK can be retrieved from your personal contact person after legitimation. The storage and transmission of Bluetooth access codes is always encrypted (SHA 256 algorithm).

6.2 Protection of the parameterization

The settings (parameters) of the device can be protected against unwanted changes. The parameter protection is deactivated on delivery, all settings can be made.

user PIN

To protect the parameterization, the device can be locked by the user with the aid of a freely selectable user PIN. The settings (parameters) can then only be read out, but not changed. The user PIN is also stored in the adjustment tool. However, unlike the Bluetooth PIN, it must be re-entered for each unlock. When using the adjustment app or EDD, the stored user PIN is then suggested to the user for unlocking.

Device Access PUK

The Device Access PUK allows unlocking the device in case the user PIN is no longer known. It can't be changed. The Device Access PUK can also be found on the supplied information sheet ""*Device Bluetooth and Parameter Access Codes*". If this document is lost, the Device Access PUK can be retrieved from your personal contact person after legitimation. The storage and transmission of the user PIN is always encrypted (SHA 256 algorithm).

Setup with the integrated HMI

<div style="text-align: right; font-size: 3em;">7</div>

7.1 Adjustment system

Function

The transmitter is operated via the four keys of the integrated display and adjustment unit. The respective menu items are shown on the HMI. You can find the function of the individual keys in the following overview.

Display and adjustment elements
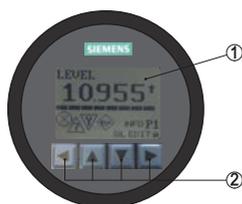
① HMI
② Adjustment keys

Figure 7.1 Elements of the integrated display and adjustment unit

Key functions

Key	Function
◀	All views: return to the measured value view Editing view: Selecting the parameter settings Editing view: return to the parameter view without changing the parameter setting
▲	Measured value view: Select the desired measured value Parameter view: Select parameter Editing view: Change parameter value upwards

Key	Function
▼	Measured value view: Select the desired measured value Parameter view: Select parameter Editing view: Change parameter value downwards
▶	Measured value view: Navigate to main menu or parameter view Parameter view: Navigate to edit view Editing view: confirm selected parameter value

Time functions

If the respective key is pushed, the scrolling speed or the parameter change rate increases. 10 minutes after the last key is pressed, an automatic return to the measured value view is triggered. Parameter changes that have not yet been confirmed are lost.

7.2 Structure and views of the display

Structure of the display
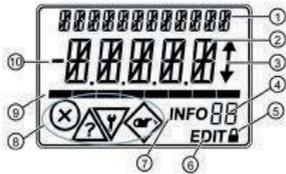
①	Title line
②	Main line
③	UP/DOWN navigation arrows
④	INFO field
⑤	Locking symbol
⑥	EDIT indicator
⑦	INFO indicator
⑧	NE 107 diagnostic states
⑨	Bar graph
⑩	Sign of the process value

Figure 7.6   Structure of the display

Display symbols

INFO field	Symbol	Meaning
LP		Device is write protected via parameter ""*User PIN*".
Co		Loop test in operation
	EDIT	When the symbol flashes, you can edit the parameter.
	INFO	Diagnostic message. The ID next to the INFO symbol is used to identify the diagnostic message.

In the following, the different views of the indication are shown and described.

Note

The display will return to measurement view after ten minutes of inactivity.

Measured value view

The measured value view shows the current measured values of the device as well as status and diagnostic messages. Process value name and unit are displayed alternately.

① Process value name
② Process value unit
③ Process value (If the process value is too large to be shown on the display (value has more than 5 digits), hashes "#####" will be shown instead.)
④ Process value number
⑤ Diagnosis symbol

Figure 7.8   Measured value view

The following measured value views are offered:

Setting	Description	
P1	LEVEL	Level
P2	SPACE	Space
P3	DIST	Distance
P4[a]	VOL	Volume
P5[b]	VFLOW	Volume flow
P6	LOOPC	Loop current
P7	PERCENT	Percent

Setting	Description	
P8	STEMP	Electronics temperature

[a] If the mode of operation is set accordingly

[b] If the mode of operation is set accordingly

Note

If the measured value cannot be shown in the display, ""*99999*" appears flashing. In this case the selected unit or scaling must be adapted.

Parameter view

The parameter view shows the parameters, parameter values and the wizards of the device.
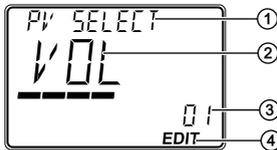
①   Parameter name
②   Parameter value
③   Parameter number
④   "*EDIT*" symbol (permanently activated)

Figure 7.9   Parameter view

Editing view

Parameter values can be changed in this view. Wizards are available for certain parameters.

Note

While the device is in the editing view, the output remains active and continues to respond to changes.
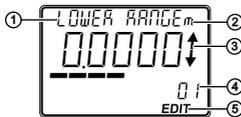
①   Parameter name
②   Unit of the measured value (no. 1 and 2 are displayed alternately)
③   Arrows for scrolling (only within an option list)
④   Parameter number

⑤   "*EDIT*" symbol (flashing)

Figure 7.10   Editing view

Ten minutes after the last key is pressed, an automatic return to the measured value view is triggered. Parameter changes that have not yet been confirmed are lost.

7.3   Menu overview

Table 7.1: QUICK START

Menu item	Parameter	Setting		Default
COMMISSION	OPERATION			LEVEL
	OPERATION = LEVEL			
	MATERIAL TYPE LIQUID	STRGE	Vessel	STRGE
		PRCSS	Process vessel with agitation	
		WTWLL	Wet well	
		PLSTC	Outside of Plastic Tank	
		OPEN	Level of open liquid	
		DEMO	Demonstration	
	MATERIAL TYPE SOLID	SILO	Silo	SILO
		BIN	Buffer, surge bin	
		OPEN	Heap, pile	
	UNITS = DeviceUnits, Physical Value Unit	mm, m, in, ft		m
	LOWER CAL PT	Level Adjustment Data		15 m
	UPPER CAL PT	Level Adjustment Data		0 m
	CONFIRM			
COMMISSION	**OPERATION = SPACE**			
	MATERIAL TYPE LIQUID	STRGE	Vessel	STRGE
		PRCSS	Process vessel with agitation	
		WTWLL	Wet well	
		PLSTC	Outside of Plastic Tank	
		OPEN	Level of open liquid	
		DEMO	Demonstration	
	MATERIAL TYPE SOLID	SILO	Silo	SILO
		BIN	Buffer, surge bin	
		OPEN	Heap, pile	
	UNITS, LOWER CAL PT, UPPER CAL PT, CONFIRM	See OPERATION = LEVEL		
COMMISSION	**OPERATION = DISTANCE**			
	MATERIAL TYPE LIQUID	STRGE	Vessel	STRGE
		PRCSS	Process vessel with agitation	
		WTWLL	Wet well	

Menu item	Parameter	Setting		Default
		PLSTC	Outside of Plastic Tank	
		OPEN	Level of open liquid	
		DEMO	Demonstration	
	MATERIAL TYPE SOLID	SILO	Silo	SILO
		BIN	Buffer, surge bin	
		OPEN	Heap, pile	
	UNITS, LOWER CAL PT, UPPER CAL PT, CONFIRM	See OPERATION = LEVEL		
COMMISSION	**OPERATION = VOLUME**			
	MATERIAL TYPE LIQUID	STRGE	Vessel	STRGE
		PRCSS	Process vessel with agitation	
		WTWLL	Wet well	
		PLSTC	Outside of Plastic Tank	
		OPEN	Level of open liquid	
		DEMO	Demonstration	
	MATERIAL TYPE Solid	SILO	Silo	SILO
		BIN	Buffer, surge bin	
		OPEN	Heap, pile	
	UNITS = DeviceUnits, Physical Value Unit	mm, m, in, ft		m
	VESSEL SHAPE	LINR	Linear	LINR
		CONIC	Conical Bottom	
		FLAT	Inclined bottom	
		CYLIN	Horizontal cylindrical vessel	
		CUSTM	User programmable	
	VESSEL DIM A	Linearization Curve, Intermediate Height		0 mm
	LOWER CAL PT	Level Adjustment Data		15 m
	UPPER CAL PT	Level Adjustment Data		0 m
	VOL UNITS	Level Scaling: Scaling Unit		Liter
	SCALE FORMAT	Level Scaling: Decimal Places Display		0
	UPPER RANGE	Level Scaling: Max Scaled Value		100
COMMISSION	**OPERATION = VFLOW**			
	MATERIAL TYPE LIQUID = Application: MediumType	Level of open water, DEMO		OPEN
	UNITS = DeviceUnits: Physical Value Unit	mm, m, in, ft		m
	PRIM MEASDEV = Linearization Curve: Curve Type	PBFLM	Palmer-Bowlus flume	PBFLM
		RWRC	Venturi-, trapezoidal weir, rectangle weir	
		TPVWR	VNotch-, triangle weir	
		CUSTM	User programmable	
	LOWER CAL PT	Level Adjustment Data		15 m
	UPPER CAL PT	Level Adjustment Data		0 m

Menu item	Parameter	Setting	Default
	VFLOW UNITS = Level Scaling: ScalingUnit	l/s, l/min, l/h, Ml/d, m^3/s, m^3/min, m^3/h, m^3/d, lb/s, lb/min, lb/h, gal/s, gal/min, gal/h, gal/d, Mgal/d, ft^3/s, ft^3/min, ft^3/h, ft^3/d, bbl/s, bbl/min, bbl/h, bbl/d, ImpGal/s, ImpGal/min, Imp/Gal/h, ImpGal/d	l/s
	SCALE FORMAT	Level Scaling: Decimal Places Display	0
	UPPER SCALNG	Level Scaling: Max Scaled Value	100 l/s
AFES	AFES RANGE	Distance	00000
	CONFIRM		

Table 7.2: SETUP

Menu item	Parameter	Setting		Default
SELECT OUTPUT	SELECTION = Hart Dynamic Variable Channel: Device Variable Code For SV	LEVEL	Level	DIST
		SPACE	Space	
		DIST	Distance	
		VOL	Scaled value	
		VFLOW	Scaled value	
		CONF	Measurement reliability	
		STEMP	Transmitter temperature	
	LINEARIZTYPE = Linearization Curve Type	LINR	Linear	Linear
		CYLIN	Horizontal cylindrical vessel	
		VENTU	Venturi-, trapezoidal weir, rectangle weir	
		PALM	Flow Palmer-Bowlus flume	
		V-NOT	Flow VNotch-, triangle weir	
		CONIC	Conical Bottom	
		FLAT	Inclined Bottom	
SENSOR	UNITS = Device Units: Physical Value Unit	mm, m, in, ft		m
CALIBRATION	LOWER CAL PT	Level Adjustment Data		15 m
	UPPER CAL PT	Level Adjustment Data		0 m
	SENSR OFFSET	Offset Application Value		0 m
CURRENT OUT	LOOP CUR MDE = Display_Read Write Hart Parameter. Loop Current Mode	ON = Enabled (4 ... 20 mA)		ON
		OFF = Disabled (4 mA fixed)		
	DAMPING = Level_Integration Time. Responsetime	0 ... 999 s		0 s
	OUT CHARACT = Main Current Output_ Configuration: Gradient Type	4 ... 20 mA = rising gradient, 20 ... 4 mA = falling gradient		4 ... 20 mA
	SATURATE CUR = Main Current Output_Configuration: Current Limits	3.8 ... 20.5 mA, 4 ... 20 mA		3.8 ... 20.5 mA

Menu item	Parameter	Setting		Default
	FAULT CUR = Main Current Output_Configuration1: Current Limits	≤ 3.6 mA, ≥ 21 mA		≤ 3.6 mA
	FAIL SAFE LOE = Echo Loss Detection: Mode	HOLD = off		HOLD
		FAULT = Failure		
	LOE TIMER	Echo Loss Detection: Echo Loss Time		15 s
VOLUME	VESSEL SHAPE	LINR	Linear	LINR
		CONIC	Conical Bottom	
		FLAT	Inclined bottom	
		CYLIN	Horizontal cylindrical vessel	
		USER	User programmable	
	VESSEL DIM A	Intermediate Height		0 mm
	VOL UNITS	Level Scaling: Scaling Unit		l
	UPPER SCALNG	Level Scaling: Max Scaled Value		100 l
VOLUME FLOW	PRIM MEASDEV	PBFLM	Flow Palmer-Bowlus flume	PBFLM
		RWRC	Venturi-, trapezoidal weir, rectangle weir	
		TPVWR	Flow VNotch-, triangle weir	
		CUSTM	User programmable	
	VFLOW UNITS = Level Scaling: ScalingUnit	l/s, l/min, l/h, Ml/d, m^3/s, m^3/min, m^3/h, m^3/d, lb/s, lb/min, lb/h, gal/s, gal/min, gal/h, gal/d, Mgal/d, ft^3/s, ft^3/min, ft^3/h, ft^3/d, bbl/s, bbl/min, bbl/h, bbl/d, ImpGal/s, ImpGal/min, Imp/Gal/h, ImpGal/d		l/s
	SCALE FORMAT	Level Scaling: Decimal Places Display		0
	UPPER SCALNG	Level Scaling: Max Scaled Value		100 l/s
CUSTOM	UPPER SCALNG	Level Scaling: Max Scaled Value		100 l
	CUSTOM CURVE = Linearization Points: Level Value, Volume Value	X VALUE 1, Y VALUE 1, X VALUE 2, Y VALUE 2, ... X VALUE 32, Y VALUE 32		0 %, 0 ... 100 %, 100 %
LOCL DISPLAY	START VIEW	Display Config: Picture Selection		LEVEL

Table 7.3: MAINT/DIAGS

Menu item	Parameter	Setting		Default
SIGNAL	SIG QUALITY	CONFIDENCE	Level Reliability Value: Unit	CONFIDENCE
		ECHO SIG STR	Level Echo Info: Amplitude	
		NOISE AVG	Noise Detection Info: Noise Level Abs	
	ECHO CONFIG	NEAR RANGE	Measuring Range	OFF
		ON	Active	
		OFF	Inactive	

Menu item	Parameter	Setting		Default
	TVT CONFIG	AFES ON	False Signal Calculation: Manual Curve active	ON
		AFES OFF	False Signal Calculation: Manual Curve not active	
		AFES RANGE	False Signal Manual Action: Distance	0 mm
PEAK VALUES	MIN DISTANCE	Min Level Distance		-
	MAX DISTANCE	Max Level Distance		-
	TR TEMP MIN	Min Electronic Temperature		-
	TR TEMP MAX	Max Electronic Temperature		-
LOOP TEST	LOOP TEST	Current Output Simulation		OFF
RESETS	DEVICE RSTRT = Warmstart	CANCL	No restart	CANCL
		OK	Make restart	
	RESET	NO	No Reset	NO
		FACT	Basic settings	
		RSTR CUST CFG	Factory settings	
	RESET PEAK	NO	No Reset	NO
		DIST	Reset User Min Max Level Distance. Reset Action = Both values	
		STEMP	Reset User Min Max Electronic Temperature. Reset Action = Both values	
FREQUENCY	1: EU, Albania, Andorra, Azerbaijan, Australia, Belarus, Bosnia and Herzegovina, Canada, United Kingdom, Iceland, Liechtenstein, Maroc, Moldova, Monaco, Montenegro, New Zealand, Northern Macedonia, Norway, San Marino, Saudi Arabia, Switzerland, Serbia, Turkey, Ukraine, USA	Radar Mode country selection		1
	2: Brazil, Japan, South Korea, Taiwan, Thailand			
	3: India, Malaysia, South Africa			
	4: Russia, Kazakhstan			

Table 7.4: COMMUNICATE

Menu item	Parameter	Setting	Default
POLLING ADDR		Display Read Write Hart Parameter, Polling Address	0

Table 7.5: SECURITY

Menu item	Parameter	Setting	Default
USER PIN		ACTIVATE, CANCEL	ENABLE
BLUETOOTH PIN		Bluetooth Access Code	Individual

7.4 Parameterization

Starting

From the measured value view, you can access the parameter view with the → key, and by pressing → again you can access the first menu level.

Select

1. Navigate to the desired parameter.
2. Press → to open the edit view. The current selection is highlighted.
3. Scroll to a new selection with ↓ and ↑ .
4. Press → to confirm. The display returns to the parameter view and shows the new selection.

Change numeric value

1. Navigate to the desired parameter.
2. When selected, the current value is displayed.
3. Press → for configuration. The symbol ""*EDIT*" flashes.
4. Use ↑ and ↓ to increase or decrease the value. Press and hold the button to increase the scroll speed.
5. To cancel without saving your changes, press ← to return to the parameter view.
6. Press → to confirm the new value. The display returns to the parameter view (the ""*EDIT*" symbol is permanently displayed) and shows the new selection. Check that the value is correct.

7.5 Quick setup

### 7.5.1 Wizards for quick setup

Overview

A wizard provides a simple step-by-step procedure to configure your device for a basic application.

To configure the SITRANS LR150 for level, space, distance, volume or volume flow applications, use the ""*Quick Commissioning Wizard*" via the display.

Procedure

The first steps of the wizard are the same for all application types. The subsequent parameters of the wizard differ depending on the selected application. Three separate lists follow for documentation purposes. These lists contain the parameters of the wizard that are available for setting up each type of application.

1. In the measured value view, press key → to reach the parameter view. The first menu level (QUICK START) appears. Push key → to call up this menu.
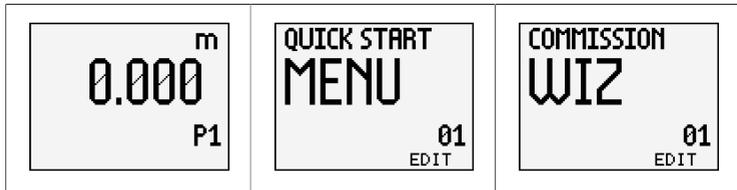
2. Press the → button again to start the ""*Quick Commissioning Wizard*". (COMMISSION). In the wizard, it is not necessary to press the ↓ button to navigate to the next step. In each step you will be taken directly to the edit view.

3. Set ""*Operation*" followed by ""*Material type*". The following parameters of the wizard vary depending on the selected application.
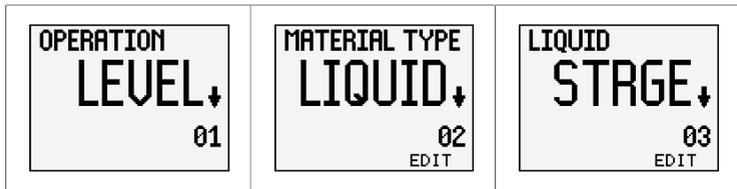
4. Select ""*Yes*" to confirm all parameter changes as the final step in the Quick Commissioning Wizard and return to the parameter view. The main line of the display shows ""*DONE*".

5. Press the ← key three times to return to the measured value view.

Note

> A reset to factory settings should be carried out before starting the ""*Quick Commissioning Wizard*" if the device was previously used in another application.
>
> The settings for the wizard are interrelated and changes only take effect if you set ""*Confirm*" to ""*Yes*" in the last step.
>
> Do not use the ""*Quick Commissioning Wizard*" to change individual parameters. Only carry out the adaptation to your specific application after completing the wizard.
>
> While the device is being configured using the assistant, the output remains active and continues to respond to changes in the device.
>
> In the following steps of the assistant, a complete list of options appears for each parameter. Depending on the selected application, certain options may not appear on the device.

7.5.2 Quick setup level, space, distance

Mode

**OPERATION: LEVEL, SPACE, DIST**

Sets the mode of operation that determines the output and display:
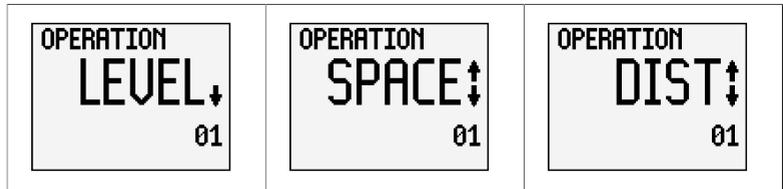
Setting	Description
LEVEL	Level
SPACE	Space
DIST	Distance
VOL	Volume
VFLOW	Volume flow
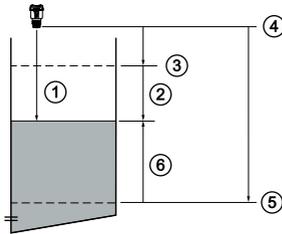
① Distance
② Space
③ Upper calibration point
④ Transmitter reference point
⑤ Lower calibration point
⑥ Level

Figure 7.20   Overview quick setup level, ullage, distance, user-specific

Setting	Description	Reference point
LEVEL	Material height	Lower calibration point (zero point of the process)
SPACE	Distance from the Upper calibration point to the material surface	Upper calibration point (full point of the process)
DIST	Distance to the material surface	Lower calibration point

Material type

Used to optimize the device function depending on the type of material and vessel or application:

Setting	Selection	Selection	Vessel
MATERIAL TYPE	LIQUID	STRGE	Process vessel with agitation
		PRCSS	Wet well
		WTWLL	Outside of Plastic Tank
		PLSTC	Level of open liquid
		OPEN	Demonstration
		DEMO MODE	Silo
	SOLID	SILO	Buffer, surge bin
		BIN	Heap, pile
		OPEN	Heap profile

Unit

UNITS:

Sets the measuring unit used (default setting in brackets):

- Meter ""*m*" (3 decimal places)
- Centimeter ""*cm*" (1 decimal place)
- Feet ""*ft*" (3 decimal places)
- Inches ""*in*" (2 decimal places)

Lower calibration point

LOWER CAL PT:

Sets the distance from the transmitter reference point to the lower calibration point: usually corresponds to the zero point of the process.

Upper calibration point

UPPER CAL PT:

Sets the distance from the transmitter reference point to the upper calibration point: usually corresponds to the full level.

Confirm

CONFIRM:

Accepts the settings as the last step in the wizard.

Setting Yes:

The wizard is closed and settings are applied.

Setting No:

The wizard is closed and settings are not applied. They must be entered again when the wizard is run again.

7.5.3   Quick setup volume

Mode

OPERATION:

Sets the mode of operation that determines the output and display:
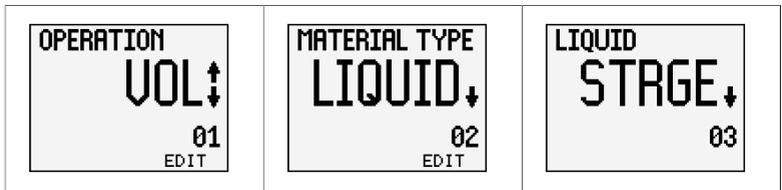
Setting	Description
LEVEL	Level
SPACE	Space
DIST	Distance
VOL	Volume
VFLOW	Volume flow
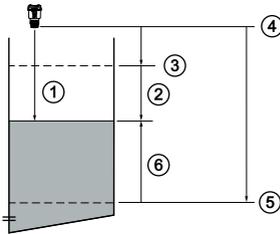
① Distance
② Space
③ Upper calibration point
④ Transmitter reference point
⑤ Lower calibration point
⑥ Level

Figure 7.24   Overview quick setup volume

Setting		Description	Reference point
Volume	VOL	Volume of the material in volume unit (related to the level)	Lower calibration point

Material type

Used to optimize the device function depending on the type of material and vessel or application:

Setting	Selection	Selection	Selection
MATERIAL TYPE	LIQUID	STRGE	Vessel
		PRCSS	Process vessel with agitation
		WTWLL	Wet well
		PLSTC	Outside of Plastic Tank
		OPEN	Level of open liquid
		DEMO MODE	Demonstration
	SOLID	SILO	Silo
		BIN	Buffer, surge bin
		OPEN	Heap, pile

Unit

UNITS:

Sets the measuring unit used (default setting in brackets):

- Meter ""*m*" (3 decimal places)
- Centimeter ""*cm*" (1 decimal place)
- Feet ""*ft*" (3 decimal places)
- Inches ""*in*" (2 decimal places)

Vessel shape

VESSEL SHAPE:

Sets the vessel shape and allows the device to calculate the volume instead of the level:

- Linear vessel (LINR)
- Conical vessel bottom (CONIC)
- Container with flat sloping bottom (FLAT)
- Cylindrical vessel (CYLIN)
- User-specific (USER)

Vessel dimension A

VESSEL DIM A:

Adjusts the height of the vessel bottom in the case of a conical or flat inclined bottom.

Lower calibration point

LOWER CAL PT:

Sets the distance from the transmitter reference point to the lower calibration point: usually corresponds to the zero point of the process.

Upper calibration point

UPPER CAL PT:

Sets the distance from the transmitter reference point to the upper calibration point: usually corresponds to the full level.

Volume unit

VOL UNITS:

Sets the measuring units for the volume.

- Litre (l)
- Hectolitre (hl)
- Cubic meters (m^3)
- Cubic inches (in^3)
- Gallons (gal)
- Cubic foot (ft^3)
- Barrel (bbl)

Confirm

CONFIRM:

Accepts the settings as the last step in the wizard.

Setting Yes:

The wizard is closed and settings are applied.

Setting No:

The wizard is closed and settings are not applied. They must be entered again when the wizard is run again.

7.5.4   Quick setup volume flow

Mode

OPERATION:

Sets the mode of operation that determines the output and display:

Setting	Description	
	Level	LEVEL
	Space	SPACE
	Distance	DIST
	Volume	VOL
	Volume flow	VFLOW
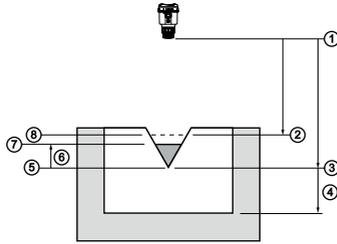
① Transmitter reference point
② Upper calibration point
③ Lower calibration point
④ Far range
⑤ Zero level (head)
⑥ Level (head)
⑦ Material surface
⑧ Upper scaling point (max. volume/flow)

Figure 7.28   Overview quick setup volume flow

Setting		Description	Reference point
Volume flow	VFLOW	Flow measurement in open channel in volume flow unit	Zero point level, zero point flow

Material type

Used to optimize the device function depending on the type of material or application:

Setting	Selection	Selection	Selection
MATERIAL TYPE	LIQUID	OPEN	Open basin
		FLOW	Open flume
		DEMO	Demonstration

Unit

UNITS:

Sets the measuring unit used (default setting in brackets):

- Meter ""*m*" (3 decimal places)
- Centimeter ""*cm*" (1 decimal place)
- Feet ""*ft*" (3 decimal places)
- Inches ""*in*" (2 decimal places)

Measuring structure

PRIM MEASDEV:

Sets the version of the measuring structure used.

- Palmer Bowlus flume (PBFLM)
- Flow Venturi-, trapezoidal weir, rectangle weir (RWRC)
- Flow VNotch-, triangle weir (TPVWR)
- User programmable (USER)

Lower calibration point

LOWER CAL PT:

Sets the distance from the transmitter reference point to the lower calibration point: usually corresponds to the zero point of the process.

Upper calibration point

UPPER CAL PT:

Sets the distance from the transmitter reference point to the upper calibration point: usually corresponds to the full level.

Volume flow unit

FLOW UNITS:

Sets the measuring units for the volume.

- Litres per second (l/s)
- Litres per minute (l/m)
- Litres per hour (l/h)
- Mega litres per day (Ml/d)
- Cubic metres per second (m^3/s)
- Cubic metres per minute (m^3/min)
- Cubic metres per hour (m^3/h)
- Cubic metres per day (m^3/d)
- lbs per second (lb/s)
- lbs per minute (lb/min)
- lbs per hour (lb/h)
- US gallons per minute (gal/min)
- US gallons per hour (gal/h)
- US gallons per day (gal/d)

- US mega gallons per day (Mgal/d)
- Cubic feet per second (Ft^3/s)
- Cubic feet per minute (Ft^3/min)
- Cubic feet per hour (Ft^3/h)
- Cubic feet per day (Ft^3/d)
- Barrel per second (bbl/s)
- Barrel per minute (bbl/min)
- Barrel per hour (bbl/h)
- Barrel per day (bbl/d)
- British gallons per second (ImpGal/s)
- British gallons per minute (ImpGal/m)
- British gallons per day (ImpGal/d)

Scaling format

SCALE FORMAT:

Sets the decimal places with which the process value is displayed.

Final scaling value

UPPER SCALNG:

Sets the process value that corresponds to a loop current of 20 mA.

Confirm

CONFIRM:

Accepts the settings as the last step in the wizard.

Setting Yes:

The wizard is closed and settings are applied.

Setting No:

The wizard is closed and settings are not applied. They must be entered again when the wizard is run again.

7.5.5 Quick setup auto false echo suppression

Use

Used to prevent the detection of false echoes in a specified range.

AFES WIZ 02	m 00.000 01	CONFIRM NO↑ 02 EDIT
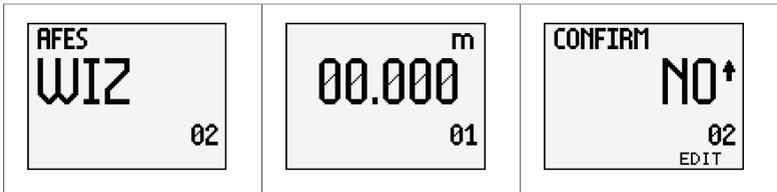
Use the AFES wizard if there are known installations in the application and if false echoes are to be expected.

Notes

If possible, set the automatic false echo suppression (AFES) during commissioning by executing the ""*Auto false echo suppression wizard*".

Make sure that the material level is below all known installations when using the ""*Auto false echo suppression wizard*" to determine the TVT. Ideally the vessel should be empty or almost empty.

Note the distance to the material level when determining the echo profile and set the value in parameter ""*auto false echo suppression*" to a smaller distance to avoid suppression of the material echo.

If an agitator (whisk) is available, it should be in operation.

As soon as the wizard is successfully completed, parameter ""*Auto false echo suppression*" is set to ""*Activated*" and the determined TVT curve is used.

Confirm

CONFIRM:

Accepts the settings as the last step in the wizard.

Setting Yes:

The wizard is closed and settings are applied.

Setting No:

The wizard is closed and settings are not applied. They must be entered again when the wizard is run again.

7.6 Application examples

7.6.1 Application example level

① Distance (5.5 m)
② Space (4.5 m)
③ 1.0 m
④ Upper calibration point
⑤ Transmitter reference point
⑥ 9.0 m far range
⑦ Lower calibration point
⑧ Level
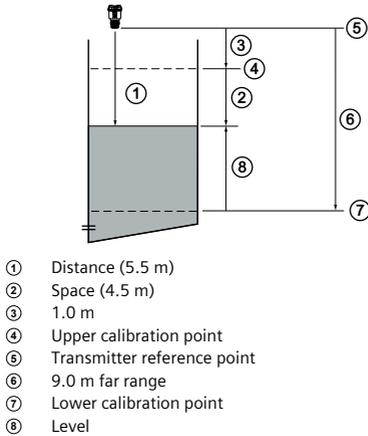
Figure 7.32   Application example level

Quick commissioning parameter	Setting/value	Description
Operation	Level	Material level with reference to the ""*Lower calibration point*"
Material type	Liquid	
Unit	m	Measuring unit of the transmitter
Lower calibration point	9.0 m	Zero point of the process
Upper calibration point	1.0 m	Full point of the process

### 7.6.2 Application example volume flow

In this example, a 12 inch (0.305 m) venturi flume is installed in an open channel. According to the manufacturer's data sheet, the maximum nominal flow rate of the device is 1143 m^3 per hour at a maximum level of 0.6 m. The SITRANS LR150 was installed at a height of 1.6 m above the channel.

① Transmitter
② 2/3 of the dimension of the converging
③ Measure of the converging
④ Direction of flow
⑤ Zero level (head)
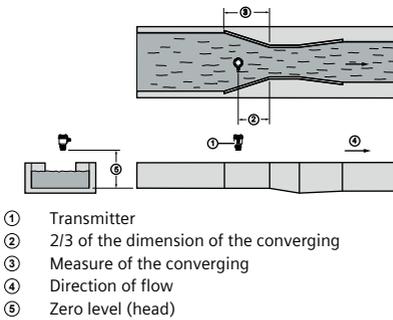
Figure 7.33   Application example volume flow

① Upper calibration point (1.0 m)
② Lower calibration point (1.6 m)
③ Upper scaling point (0.6 m)
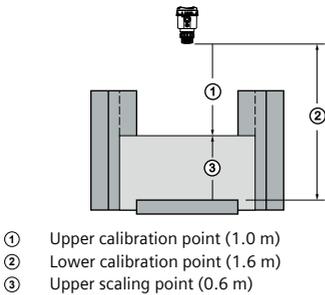
Figure 7.34   Application example volume flow

Quick commissioning parameter	Setting/value		Description
Operation	Volume flow	VFLOW	
Material type	Liquid	LQD	
Measuring structure	Liquid	RWRC	Venturi flume
Lower calibration point		1.6	Distance to the empty point or bottom of the measuring channel. Adjusts the material level at 4 mA.
Upper calibration point		1	Distance to maximum level. Sets the ""*Measurement end*".
Volume flow unit		VFLOW UNITS	Setting according to the requirements of the end user.
Unit		SCALE FORMAT	Unit which corresponds to the level (head).

Quick commissioning parameter	Setting/value		Description
Measurement end		UPPER SCALNG	To be taken from the data sheet of the manufacturer of the measuring structure.

7.7 Settings

7.7.1 Selection HART variable
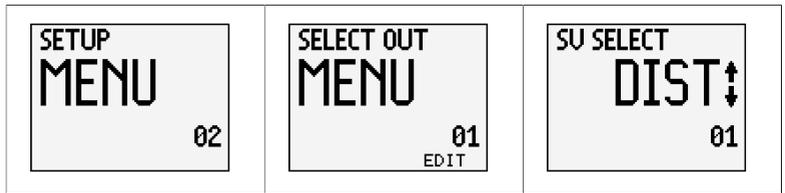
Secondary value

Sets a process value as secondary variable.

Setting	Selection	Selection	Description
SELECT OUT	SELECT OUT	LEVEL	Level
		SPACE	Space
		DIST	Distance
		VOL	Volume
		VFLOW	Volume flow
		STEMP	Electronics temperature

Linearization type

Sets the type of linearization to calculate the volume or volume flow.

7.7.2 Transmitter

Units

Sets the measuring unit used.

Setting	Selection	Selection	Description
Transmitter	UNITS	mm	Millimetre

Setting	Selection	Selection	Description
		m	Meter
		in	Inch
		ft	Feet

7.7.3 Adjustment
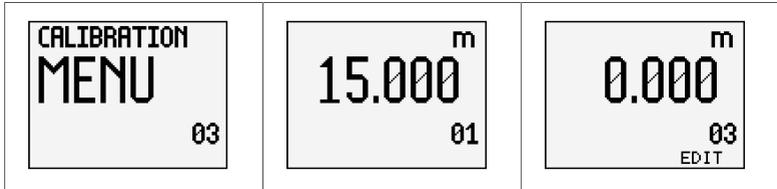
Lower calibration point

LOWER CAL POINT:

Sets the distance from the transmitter reference point to the lower calibration point.

Upper calibration point

UPPER CAL POINT:

Sets the distance from the transmitter reference point to the upper calibration point.

Transmitter offset

SENSOR OFFSET:

Sets an offset to compensate for changes in the transmitter reference point.

Changes in the transmitter reference point can be caused, for example, by using a thicker seal or reducing the height of the mounting nozzle.

7.7.4 Current output
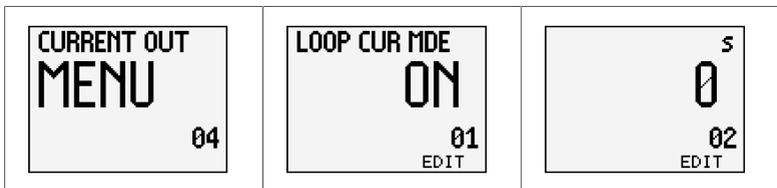
Loop current mode

Sets the operation of the current output as loop current 4 ... 20 mA, or as fixed current value 4 mA for the HART multidrop mode.

Setting	Selection	Selection	Description
CURRENT OUT	LOOP CUR MDE	ON	4 ... 20 mA
		OFF	4 mA fix

Damping value

DAMPING:

Adjusts the damping (filtering) of the PV to smooth sudden fluctuations in measured values.

An increase in damping increases the reaction time of the device and affects the digital value and loop current. For noisy output values increase parameter ""*Damping value*". For faster reaction times reduce parameter ""*Damping value*". Determine a value that meets the requirements for signal stability and reaction time.

The process value set as the primary variable (PV) for the application is damped using the value in parameter ""*Damping value*".

Characteristics current output

Sets the current output as rising characteristics 4 ... 20 mA or as falling characteristics 20 ... 4 mA.

Setting	Selection	Selection	Description
CURRENT OUT	OUT CHARACT	4 ... 20 mA	Rising
		20 ... 4 mA	Falling

Saturation limits

Sets the lower and upper saturation limits. The lower saturation limit is the value below which the loop current cannot fall. The upper saturation limit is the value above which the loop current cannot rise.

Setting	Selection	Selection	Description
CURRENT OUT	SATURATE CUR	3.8 ... 20.5 mA	-
		4 ... 20 mA	-

Fault current

Sets the current value that is output in case of an error.

Setting	Selection	Selection	Description
CURRENT OUT	FAULT CUR	≤ 3.6 mA	-
		≥ 21 mA	-

Safety function with echo loss

Defines the behavior of the safety function in case of echo loss and expiration of the LOE timer. This defines which current value is output in case of echo loss.

Setting	Selection	Selection	Description
CURRENT OUT	FAILSAFE LOE	HOLD	Last valid measured value
		FAULT	Value adjusted in the parameter ""*Fault current*"

Safety function LOE timer

LOE TIMER:

Sets the duration of how long an echo loss must be present before the device triggers the set safety function.

7.7.5 Volume
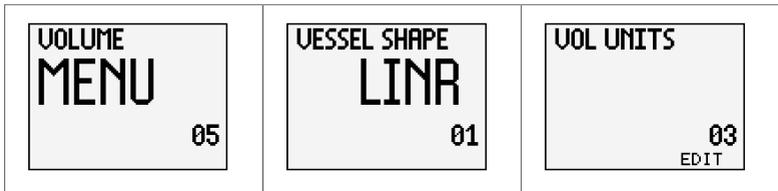
Note

This menu is only visible on the device if it is configured.

Vessel shape

Sets the vessel shape and allows the device to calculate the volume instead of the level.

Setting	Selection	Selection	Description
			Other required parameters
VOLUME	VESSEL SHAPE	LINR	Linear vessel
			Upper scaling point
		CONIC	Conical vessel bottom
			Upper scaling point, vessel dimension A
		FLAT SLOPE	Container with flat sloping bottom
			Upper scaling point, vessel dimension A
		CYLIN	Cylindrical vessel

Setting	Selection	Selection	Description
			Other required parameters
			Upper scaling point
		CUSTM	Custom

Vessel dimension A

VESSSEL DIM A:

Adjusts the height of the vessel bottom in case of a conical, parabolic, spherical or flat sloping bottom. Sets the height of the end piece for a horizontal tank with parabolic ends.

Volume unit

Sets the measuring units for the volume.

Setting	Selection	Selection	Description
VOLUME	VOLUME UNITS	m^3	Cubic metre
		L	Litres
		Ga	US gallons
		IGa	British Gallons

Upper scaling point

Sets the maximum scaled measured value.

7.7.6 Volume flow
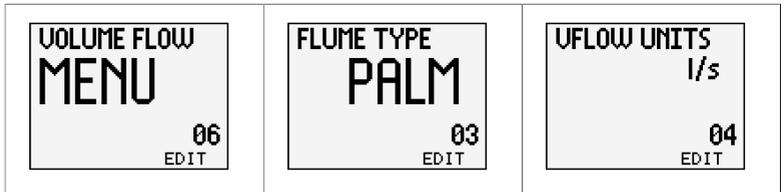
Note

This menu is only visible on the device if it is configured.

Lower calibration point

LOWER CAL POINT:

Sets the distance from the transmitter reference point to the lower calibration point.

Upper calibration point

UPPER CAL POINT:

Sets the distance from the transmitter reference point to the upper calibration point.

Measuring structure

Sets the version of the measuring structure used.

Setting	Selection	Selection	Description
			Other required parameters
VOLUME FLOW	FLUME TYPE	PBFLM	Palmer-Bowlus flume
		RWRC	Venturi flume, trapezoidal weir, rectangular overfall
		TPVWR	V-Notch, triangular weir
		CUSTM	Custom

Flow unit

Sets the measurement units for the volume flow.

Setting	Selection	Selection	Description
VOLUME FLOW	VFLOW UNITS	m^3/h	Cubic metre
		L/min	Litres
		Ga/min	US gallons
		IGa/min	British Gallons

Upper scaling point

UPPER SCALING:

Sets the maximum scaled measured value.

Note

If the parameter ""*Measurement end*" is set in the ""*Quick commissioning wizard*", parameter ""*Upper scaling point*" is automatically set to the same value.

If the value for one of these parameters is set outside the wizard, the other value is not automatically adjusted.

7.7.7 Custom

This menu is only visible on the device if the vessel shape ""*Custom specific*" is configured for the volume flow mode or if the measuring structure ""*Custom specific*" is configured for the volume flow mode.

Upper scaling point

UPPER SCLNG:

Sets the maximum scaled measured value.

Note

If the parameter ""*Measurement end*" is set in the ""*Quick commissioning wizard*",
parameter ""*Upper scaling point*" is automatically set to the same value.

If the value for one of these parameters is set outside the wizard, the other value is
not automatically adjusted.

Custom specific characteristics

CUSTOM CURVE:

Is used to enter the index markers level and output for universal measuring
structures.

If the vessel shape (volume) or the measuring structure (volume flow) is more
complex than the standard shapes, the shape can be determined section by section.
Each input index marker (level) is assigned a value and each output index marker
(volume or volume flow) a corresponding value.

- Level values are determined in units
- Volume values are determined in volume units
- Volume flow values are determined in volume flow units

X-value 1 ... X-value 32

Sets level index markers for which the output is known.

Y-value 1 ... Y-value 32

Sets the output that corresponds to each input index marker entered.

7.7.8 Display

Start view

Sets the process value that appears first on the display after switching on.

Setting	Description	
LOCL DISPLAY	Level	LEVEL
	Space	SPACE
	Distance	DIST
	Volume[a]	VOL
	Volume flow[b]	VFLOW
	Loop current	LOOPC
	Percentage value	%

Setting	Description	
	Electronics temperature	STEMP

[a] If the mode of operation is set accordingly

[b] If the mode of operation is set accordingly

Note

If the parameter ""*Operation*" is set in the wizard, the value is automatically written to the parameter ""*Start view*".

If the parameter ""*Start view*" or ""*PV selector*" is changed after the wizard has been executed, the last change is valid.

The options ""*Volume*", ""*Volume flow*" and ""*Custom*" are only visible in the ""*Measured value view*" if configured. If you select an option which is not configured in the parameter ""*Start view*" then the next visible process value appears in the measured value view.

7.8 Maintenance and diagnostics

7.8.1 Signal
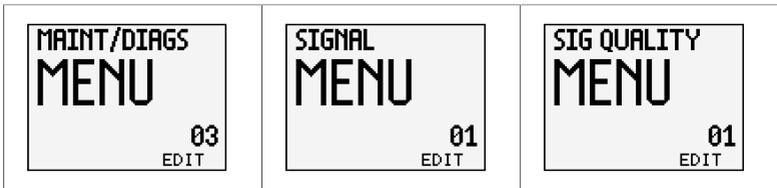
Signal quality

Echo quality:

Displays the echo quality. The higher the value, the higher the echo quality.

Echo signal strength:

Displays the strength of the valid echo in dB.

Noise average value:

Displays the average value of the noise in dB.

Setting	Selection	Selection	Description
SIGNAL	SIG QUALITY	CONFIDENCE	Echo quality
		ECHO SIG STR	Echo signal strength
		NOISE AVG	Noise average value

Echo configuration

Near range:

Sets minimum distance from transmitter reference point, beyond which an echo should be considered valid. This is sometimes referred to as blanking or a blocking distance. When the begin of the measuring range is activated, the mm value is edited by pressing the ↓ key.

Setting	Selection	Selection	Description
SIGNAL	ECHO CONFIG	NEAR RANGE ON	Measuring range begin activated
			Measuring range begin value
		NEAR RANGE OFF	Measuring range begin deactivated

TVT configuration

Defines the threshold curve below which all echoes are ignored.

The Hover Level sets the offset of the TVT (Time varying threshold) curve with respect to the basic noise of the echo profile. Specified in dB with respect to the basic noise and peak value of the largest echo.

Automatic false echo suppression (AFES) is used for false echo suppression in vessels with known installations. When AFES is activated, the effective range is selected as distance in mm by pushing the button ↓ .

A determined TVT curve replaces the preset TVT curve in the set effective range.

Procedure for optimum results with auto false echo suppression:

1. If possible, set the automatic false echo suppression during commissioning by executing the ""*Auto false echo suppression wizard*".

2. Make sure that the material level is below all known installations when using the ""*Auto false echo suppression wizard*" to determine the TVT. Ideally the vessel should be empty or almost empty.

3. Note the distance to the material level when determining the echo profile and set the value in parameter ""*Effective range of automatic false echo suppression*" to a smaller distance to avoid suppression of the material echo.

4. If an agitator is used, it should be in operation.

Note

The effective range of the automatic false echo suppression sets the end point of the determined TVT distance.

Determine the effective range of the automatic false echo suppression by measuring the actual distance from the transmitter reference point to the material surface. Use a cable or measuring tape.

Setting	Selection	Selection	Description
SIGNAL	TVT CONFIG	HOVER LEVEL	dB value of the basic noise

Setting	Selection	Selection	Description
		AFES ON	Activates the automatic auto false echo suppression
		AFES OFF	Deactivates the automatic auto false echo suppression
		AFES RANGE	Effective range of the automatic false echo suppression

7.8.2 Peak values
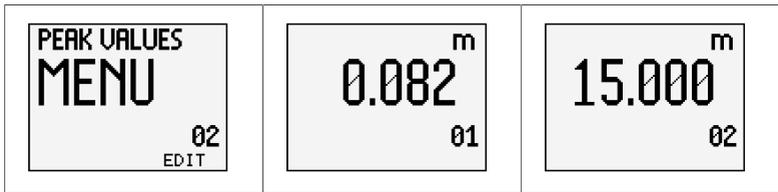
Min. measured distance

MIN DISTANCE:

Displays the value of the minimum measured distance. The value may reset if the unit is changed.

Max. measured distance

MAX DISTANCE:

Displays the value of the maximum measured distance. The value may reset if the unit is changed.

Minimum electronics temperature

TR TEMP MIN:

Displays the value of the minimum transmitter temperature.

Maximum electronics temperature

TR TEMP MAX:

Displays the value of the maximum transmitter temperature.

7.8.3 Circuit test
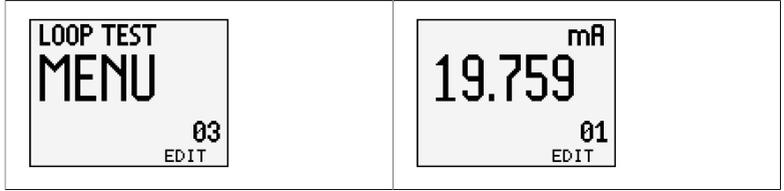
Simulation current output

LOOP TEST:

A simulated value can be set to test the operation and mA connections during setup or maintenance of the unit.

Note

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

Press the key ← to stop and terminate the circuit test.

7.8.4 Resets
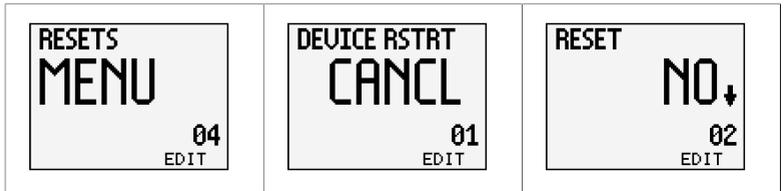
Restart transmitter

Is used to restart the device without switching off the supply voltage.

Note

The simulation is interrupted. Saved configurations are not reset

Setting	Selection	Selection	Description
RESET	DEVICE RSTRT	CANCL	Cancel
		OK	Restart transmitter

Reset

Is used to provide various reset options of the device.

If the ""*Restore factory settings*" option is selected, all parameters are reset to the default settings, except

- "*Device address*" remains unchanged
- Value of the ""*User PIN*" (write protection) is not reset
- "*Peak values*" are not reset
- "*Automatic false echo suppression*" is reset to the default setting (deactivated), but the detected TVT is not lost
- "*User-specific TVT setting*" is reset to the default setting (deactivated), but ""*User-specific TVT index markers*"" are not lost

Selecting the ""*Restore ordered configuration*" option restores the device settings ordered by the customer. The parameters that were not configured via the order are reset to their default settings.

Setting	Selection	Selection	Description
RESET	RESET	NO	Cancel
		FACT	Restore default settings
		CUST	Restore ordered configuration

Reset peak values

Resets all recorded peak values.

Setting	Selection	Selection	Description
RESET	RESET PEAK	NO	Cancel
		DIST	Distance
		STEMP	Electronics temperature

7.8.5   Frequency

Frequency

Country or regional specific settings for the radar signals are determined via the menu item frequency.
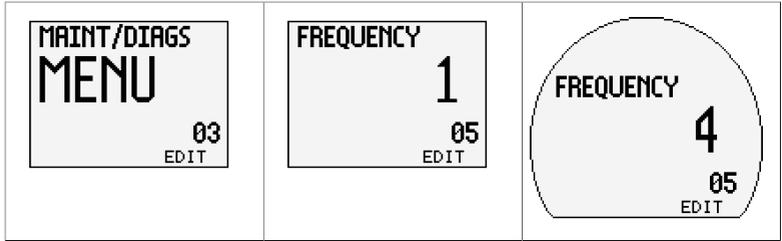
- Mode 1: EU, Albania, Andorra, Azerbaijan, Australia, Belarus, Bosnia and Herzegovina, Canada, Liechtenstein, Morocco, Moldavia, Monaco, Montenegro, New Zealand, Northern Macedonia, Norway, San Marino, Saudi Arabia, Serbia, Switzerland, Turkey, Ukraine, United Kingdom, USA

- Mode 2: Brazil, Japan, South Korea, Taiwan, Thailand

- Mode 3: India, Malaysia, South Africa

- Mode 4: Kazakhstan, Russia

Depending on the frequency, the metrological properties of the device can change (see chapter ""*Technical data, input variable*").

Further information can be found in the document ""*Regulations for radar level measuring transmitters with radio licenses*" on our homepage.

7.9 Communication

7.9.1 HART address

Function

POLLING ADR:

Sets the device address in a HART network.

For point-to-point configurations the standard address is zero (0).

For multidrop configurations, use a non-zero HART address, i.e. 1 to 63.

7.10 Safety

7.10.1 user PIN

Is used to activate/deactivate the user PIN. If the user PIN is activated, a PIN must be entered when changing parameter settings.

Note

The device is unlocked on delivery.

A change of the setting for parameter ""*User PIN*" does not take effect immediately. After changing the setting, the device must be restarted or ten (10) minutes must elapse before the change takes effect.

Setting	Selection	Selection	Description
USER PIN	USER PIN	ACTIVT	Activate User PIN
			Display = OK
		CANCL	Deactivate User PIN
			Display = ENABL

7.10.2 Bluetooth PIN

BLUETOOTH PIN:

In this menu item, you can change the factory-preset Bluetooth access code to your personal Bluetooth access code.

Note

The individual preset Bluetooth access code of the device can be found on the supplied information sheet ""*Device Bluetooth and Parameter Access Codes*". If this is changed by the user and is no longer available, access is only possible via the emergency Bluetooth unlock code on the information sheet also supplied.

7.10.2 Bluetooth PIN

Setup with smart device (Bluetooth)

8

8.1 Connecting

Connecting

Start the adjustment app. The smart device searches automatically for Bluetooth-capable transmitters in the area.

The devices found are listed.

Select the requested transmitter in the device list.

Authenticate

When establishing the connection for the first time, the operating tool and the transmitter must authenticate each other. After the first correct authentication, each subsequent connection is made without a new authentication query.

Enter Bluetooth access code

For authentication, enter the 6-digit Bluetooth PIN in the next menu window. You can find the code on the information sheet ""*Device Bluetooth and Parameter Access Codes*" in the device packaging.

Note

If an incorrect code is entered, the code can only be entered again after a delay time. This time gets longer after each incorrect entry.

Connected

After connection, the transmitter adjustment menu is displayed on the respective adjustment tool.

Setup with PC/notebook (HART modem)

9

9.1 Saving the parameterization data

We recommend documenting or saving the parameterization data via SIMATIC PDM. That way the data are available for multiple use or service purposes.

Operating

10

To configure the device:

1. Download and install the *SITRANS mobile IQ app* from the App store to your mobile device.

2. Launch the app. Devices in range will appear.

3. Click on the device you wish to connect to. On first connection, a PIN code shipped with the device needs to be entered (see *Device Bluetooth and Parameter Access Codes* sheet). Following successful PIN entry, the device cockpit will be shown.

4. Use the Setup/Quick Commissioning to configure the transmitter for your application type.
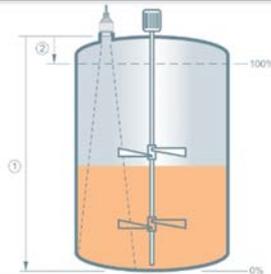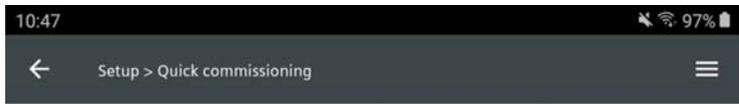
Setup > Detailed setup > Process values

Level
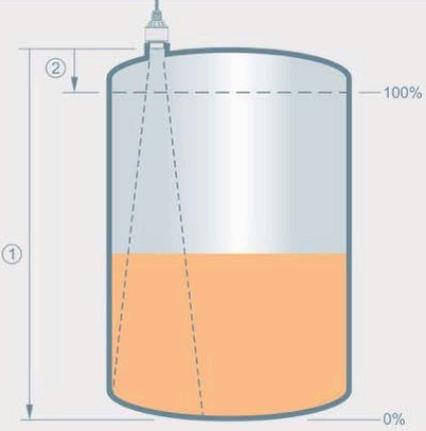
1 Lower calibration point
2 Upper calibration point

Frequency
Mode 1

Damping value
0 s

Operation
Level

Material type
Liquid

Application
Demo mode

- Mode 1: EU, Albania, Andorra, Azerbaijan, Australia, Belarus, Bosnia and Herzegovina, Canada, Liechtenstein, Morocco, Moldavia, Monaco, Montenegro, New Zealand, Northern Macedonia, Norway, San Marino, Saudi Arabia, Serbia, South Africa, Switzerland, Turkey, Ukraine, United Kingdom, USA

- Mode 2: Brazil, Japan, South Korea, Taiwan, Thailand

- Mode 3: India, Malaysia

- Mode 4: Russia, Kazakhstan

Depending on the mode, the metrological properties of the device can change (see chapter ""*Technical data, input variable*").

Further information can be found in the document ""*Regulations for radar level measuring transmitters with radio licenses*" on our homepage.

Many diagnostic tools are supported, including the echo profile viewer:

Setup with SIMATIC PDM EDD

11

11.1 Setup with SIMATIC PDM EDD

Device descriptions as Enhanced Device Description (EDD) are available for DD adjustment programs such as for example PDM.

Download

SIMATIC PDM is a software package used to commission and maintain process devices:

https://support.industry.siemens.com/cs/ww/en/view/109755005

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). Go to:

Software downloads: http://www.siemens.com/processtransmitteration/downloads

In the product tree, navigate to: ""*Automation Technology > Process Control Systems > SIMATIC PCS 7 > System Components > Plant Device Management > SIMATIC PDM*".

Start

Proceed as follows:

1. Launch SIMATIC PDM, connect to device, and upload data from the device.

2. Adjust parameter values in the parameter value field. Then click Enter. The status fields read ""*Changed*".

3. Open the menu ""*Device > Download to device...*". When complete, select ""*File > Save*" to save the settings offline. The status fields are cleared.
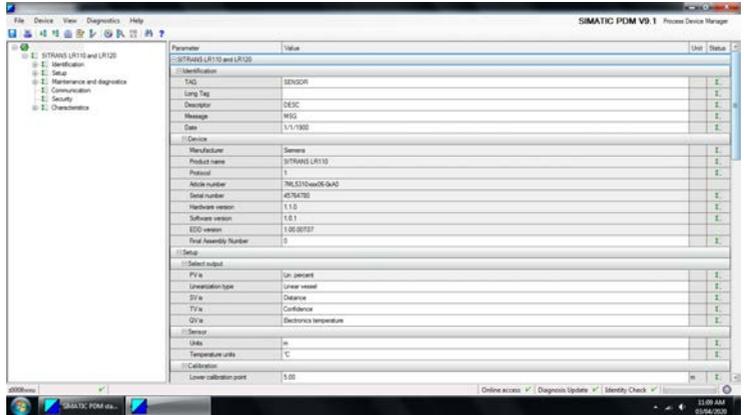
Figure 11.1   PDM structure view EDD offline, start
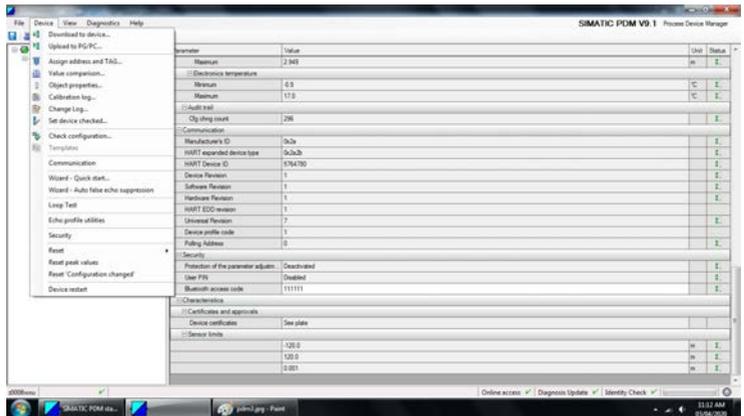
Figure 11.2   PDM structure view EDD offline, continuation

Procedure

Select ""*Device / Wizard > Quick Start*" to perform the initial commissioning. Follow the guided commissioning steps according to your specific application.
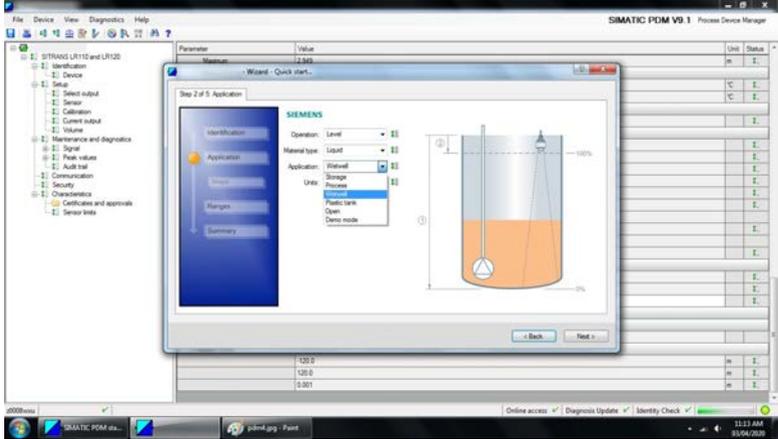
Figure 11.3   PDM quick setup wizard

Select ""*Device > Echo profile utilities*" to confirm the signal quality. Select the curves to be loaded into the echo profile view, then select ""*Load selected curves*". Curves and other diagnostic information will be loaded after approximately 45 seconds.
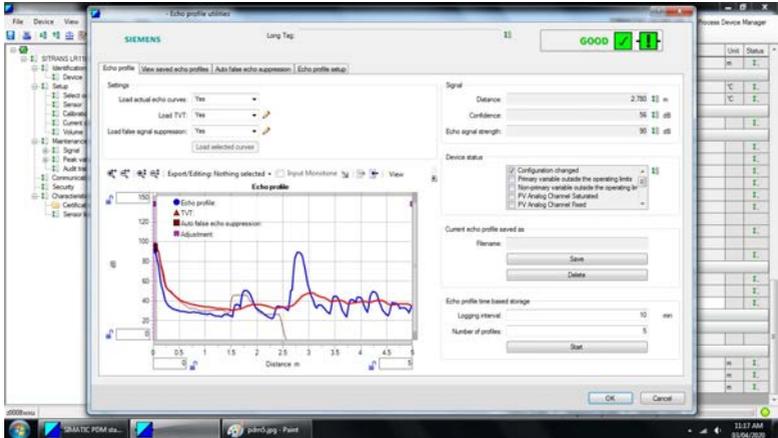
① Blue line - echo profile
② Red line - TVT
③ Brown line - auto false echo suppression (if active)

Figure 11.4   PDM echo profile view

To create a new AFES curve, use the ""*Wizard > Auto false echo suppression*" from the device menu and enter the distance to the material surface.

SIMATIC PDM supports many other useful features, extensive diagnostic support and asset management. Details are found in the SIMATIC PDM manual here https://support.industry.siemens.com/cs/ww/en/view/109755005

12

Diagnostics and troubleshooting

12.1   Maintenance

Maintenance

If the device is used properly, no special maintenance is required in normal operation.

Precaution measures against buildup

In some applications, buildup on the antenna system can influence the measuring result. Depending on the transmitter and application, take measures to avoid heavy soiling of the antenna system. If necessary, clean the antenna system in certain intervals.

Cleaning

The cleaning helps that the nameplate and markings on the transmitter are visible.

Take note of the following:

*   Use only cleaning agents which do not corrode the housings, nameplate and seals
*   Use only cleaning methods corresponding to the housing protection rating

12.2   Rectify faults

Reaction when malfunction occurs

The operator of the system is responsible for taking suitable measures to rectify faults.

Causes of malfunction

The device offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

*   Transmitter
*   Process
*   Voltage supply

• Signal processing

Fault rectification

The first measures are:

• Evaluation of fault messages

• Checking the output signal

• Treatment of measurement errors

A smart device (smartphone/tablet) with the adjustment app or a PC/notebook with the PDM and the suitable EDD offer you further comprehensive diagnostic possibilities. In many cases, the causes can be determined in this way and the faults eliminated.

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter ""*Setup*" must be carried out again or must be checked for plausibility and completeness.

12.3 Diagnosis, fault messages

4 ... 20 mA signal

Connect a multimeter in the suitable measuring range according to the wiring plan. The following table describes possible errors in the current signal and helps to eliminate them:

Error	Cause	Rectification
4 ... 20 mA signal not stable	Fluctuating measured value	Set damping
4 ... 20 mA signal missing	Electrical connection faulty	Check connection, correct, if necessary
	Voltage supply missing	Check cables for breaks; repair if necessary
	Operating voltage too low, load resistance too high	Check, adapt if necessary
Current signal greater than 22 mA, less than 3.6 mA	Transmitter electronics defective	Replace device or send in for repair depending on device version

12.4 Status messages according to NE 107

The transmitter features self-monitoring and diagnostics according to NE 107 and VDI/VDE 2650. In addition to the status messages in the following tables there are

more detailed error messages available under the menu item ""*Diagnostics*" via the respective adjustment module.

Status messages

The status messages are divided into the following categories:

- Failure
- Function check
- Out of specification
- Maintenance required

and explained by pictographs:

①	Failure - red
②	Out of specification - yellow
③	Function check - orange
④	Maintenance required - blue
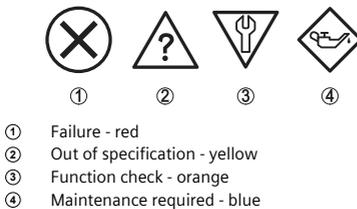
Figure 12.1   Pictographs of the status messages

Malfunction (Failure):

Due to a malfunction in the transmitter, a fault signal is output.

This status message is always active. It cannot be deactivated by the user.

Function check:

The transmitter is being worked on, the measured value is temporarily invalid (for example during simulation).

This status message is inactive by default.

Out of specification:

The measured value is unreliable because an transmitter specification was exceeded (e.g. electronics temperature).

This status message is inactive by default.

Maintenance required:

Due to external influences, the transmitter function is limited. The measurement is affected, but the measured value is still valid. Plan in maintenance for the transmitter because a failure is expected in the near future (e.g. due to buildup).

This status message is inactive by default.

Failure

| Code | Cause | Rectification | DevSpec |
Text message			State in CMD 48
F013 no measured value available	No measured value in the switch-on phase or during operation	Check or correct installation and/or parameter settings Clean the antenna system	Byte 5, Bit 0 of Byte 0 ... 5
F017 Adjustment span too small	Adjustment not within specification	Change adjustment according to the limit values (difference between min. and max. ≥ 10 mm)	Byte 5, Bit 1 of Byte 0 ... 5
F025 Error in the linearization table	Index markers are not continuously rising, for example illogical value pairs	Check linearization table Delete table/Create new	Byte 5, Bit 2 of Byte 0 ... 5
F036 No operable software	Checksum error if software update failed or aborted	Repeat software update Send transmitter for repair	Byte 5, Bit 3 of Byte 0 ... 5
F040 Error in the electronics	Limit value exceeded in signal processing Hardware error	Restart transmitter Send transmitter for repair	Byte 5, Byte 5, Bit 4 of Byte 0 ... 5
F080 General software error	General software error	Restart transmitter	Byte 5, Byte 5, Bit 5 of Byte 0 ... 5
F105 Determine measured value	The transmitter is still in the switch-on phase, the measured value could not yet be determined	Wait for the end of the switch-on phase Duration up to 3 minutes depending on the measurement environment and parameter settings	Byte 5, Byte 5, Bit 6 of Byte 0 ... 5
F260 Error in the calibration	Checksum error in the calibration values Error in the EEPROM	Send transmitter for repair	Byte 4, Bit 0 of Byte 0 ... 5
F261 Error in the transmitter settings	Error during setup Auto false echo suppression faulty Error when carrying out a reset	Repeat setup Carry out a reset	Byte 4, Bit 1 of Byte 0 ... 5
F265 Measurement function disturbed	Program sequence of the measuring function disturbed	Device restarts automatically	Byte 4, Bit 3 of Byte 0 ... 5

Function check

| Code | Cause | Rectification | DevSpec |
Text message			State in CMD 48
C700 Simulation active	A simulation is active	Finish simulation	Simulation Active" in

Code Text message	Cause	Rectification	DevSpec State in CMD 48
		Wait for the automatic end after 60 mins.	"Standardized Status 0"

Out of specification

Code Text message	Cause	Rectification	DevSpec State in CMD 48
S600 Impermissible electronics temperature	Temperature of the electronics in the non-specified range	Check ambient temperature Insulate electronics	Byte 23, Bit 4 of Byte 14 ... 24
S601 Overfilling	Danger of vessel overfilling	Make sure that there is no further filling Check level in the vessel	Byte 23, Bit 5 of Byte 14 ... 24
S603 Impermissible operating voltage	Terminal voltage too small	Check terminal voltage, increase operating voltage	Byte 23, Bit 6 of Byte 14 ... 24

Maintenance

Code Text message	Cause	Rectification	DevSpec State in CMD 48
M500 Error in the delivery status	The data could not be restored during the reset to delivery status	Repeat reset Load XML file with transmitter data into the transmitter	Bit 0 of Byte 14 ... 24
M501 Error in the non-active linearization table	Hardware error EEPROM	Send transmitter for repair	Bit 1 of Byte 14 ... 24
M507 Error in the transmitter settings	Error during setup Error when carrying out a reset Auto false echo suppression faulty	Carry out reset and repeat setup	Bit 7 of Byte 14 ... 24
M508 No executable Bluetooth software	Checksum error in Bluetooth software	Carry out software update	Bit 8 of Byte 14 ... 24
M509 Software update running	Software update running	Wait until software update is finished	Bit 9 of Byte 14 ... 24
M510 No communication	Communication between main electronics and display module disturbed	Check the connection cable to the display Send transmitter for repair	Bit 10 of Byte 14 ... 24

Code	Cause	Rectification	DevSpec
Text message			State in CMD 48
with the main controller			
M511 Inconsistent software configuration	A software unit requires a software update	Carry out software update	Bit 11 of Byte 14 ... 24

12.5 Treatment of measurement errors

The tables below give typical examples of application-related measurement errors.

The images in column ""*Error description*" show the actual level as a dashed line and the output level as a solid line.
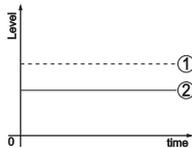
① Real level
② Level displayed by the transmitter

Figure 12.2   Treatment of measurement errors

Note

If the output level is constant, the cause could also be the fault setting of the current output to ""*Hold value*".

If the level is too low, the reason could be a line resistance that is too high

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Table 12.1: Liquids: Measurement error at constant level

Fault description	Cause	Rectification
Measured value shows a too low or too high level	Min./max. adjustment not correct	Adapt min./max. adjustment
	Incorrect linearization curve	Adapt linearization curve
Measured value jumps towards 100 %	Due to the process, the amplitude of the level echo sinks	Carry out a auto false echo suppression

Fault description	Cause	Rectification
	A auto false echo suppression was not carried out	
	Amplitude or position of a false signal has changed (e.g. condensation, buildup); auto false echo suppression no longer matches actual conditions	Determine the reason for the changed false signals, carry out auto false echo suppression, e.g. with condensation.

Table 12.2: Liquids: Measurement error during filling

Fault description	Cause	Rectification
Measured value remains unchanged during filling 	False signals in the close range too big or level echo too small Strong foam or vortex generation Max. adjustment not correct	Eliminate false signals in the close range Check measuring point: Antenna should protrude out of the threaded mounting nozzle, possible false echoes through flange nozzle? Remove contamination on the antenna In case of interferences due to installations in the close range, change polarisation direction Create a new auto false echo suppression Adapt max. adjustment
Measured value jumps towards 0 % during filling 	The level echo cannot be distinguished from the false signal at a false signal position (jumps to multiple echo)	In case of interferences due to installations in the close range: Change polarisation direction Chose a more suitable installation position
Measured value jumps towards 100 % during filling 	Due to strong turbulence and foam generation during filling, the amplitude of the level echo sinks. Measured value jumps to false signal	Carry out a auto false echo suppression
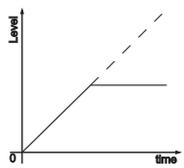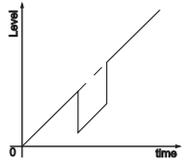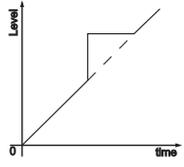
Fault description	Cause	Rectification
Measured value jumps sporadically to 100 % during filling	Varying condensation or contamination on the antenna	Carry out a auto false echo suppression or increase auto false echo suppression with condensation/contamination in the close range by editing
Measured value jumps to ≥ 100 % or 0 m distance	Level echo is no longer detected in the close range due to foam generation or false signals in the close range. The transmitter goes into overfill protection mode. The max. level (0 m distance) as well as the status message ""*Overfill protection*" are output.	Check measuring point: Antenna should protrude out of the threaded mounting nozzle, possible false echoes through flange nozzle? Remove contamination on the antenna
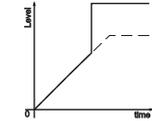
Table 12.3: Liquids: Measurement error during emptying

Fault description	Cause	Rectification
Measured value remains unchanged in the close range during emptying	False signal larger than the level echo Level echo too small	Check measuring point: Antenna should protrude out of the threaded mounting nozzle, possible false echoes through flange nozzle? Remove contamination on the antenna In case of interferences due to installations in the close range: Change polarisation direction After eliminating the false signals, the auto false echo suppression must be deleted. Carry out a new auto false echo suppression
Measured value jumps sporadically towards 100 % during emptying	Varying condensation or contamination on the antenna	Carry out auto false echo suppression or increase auto false echo suppression in the close range by editing
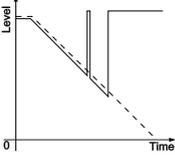
Table 12.4: Bulk solids: Measurement error at constant level

Fault description	Cause	Rectification
Measured value shows a too low or too high level	Min./max. adjustment not correct	Adapt min./max. adjustment
	Incorrect linearization curve	Adapt linearization curve
Measured value jumps towards 100 %	Due to the process, the amplitude of the product echo decreases A auto false echo suppression was not carried out	Carry out a auto false echo suppression
	Amplitude or position of a false signal has changed (e.g. condensation, buildup); auto false echo suppression no longer matches actual conditions	Determine the reason for the changed false signals, carry out auto false echo suppression, e.g. with condensation.

Table 12.5: Bulk solids: Measurement error during filling

Fault description	Cause	Rectification
Measured value jumps towards 0 % during filling	The level echo cannot be distinguished from the false signal at a false signal position (jumps to multiple echo)	Remove/reduce false signal: minimize interfering installations by changing the polarization direction Chose a more suitable installation position
	Transverse reflection from an extraction funnel, amplitude of the transverse reflection larger than the level echo	Direct transmitter to the opposite funnel wall, avoid crossing with the filling stream
Measured value fluctuates around 10 ... 20 %	Various echoes from an uneven medium surface, e.g. a material cone	Check parameter "Material Type" and adapt, if necessary Optimize installation position and transmitter orientation
	Reflections from the medium surface via the vessel wall (deflection)	Select a more suitable installation position, optimize transmitter orientation, e.g. with a swivelling holder
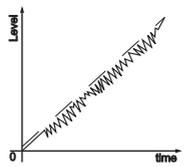
Fault description	Cause	Rectification
Measured value jumps sporadically to 100 % during filling	Changing condensation or contamination on the antenna	Carry out a auto false echo suppression or increase auto false echo suppression with condensation/contamination in the close range by editing

Table 12.6: Bulk solids: Measurement error during emptying

Fault description	Cause	Rectification
Measured value remains unchanged in the close range during emptying	False signal greater than level echo or level echo too small	Eliminate false signals in the close range. Check: Antenna must protrude out of the nozzle Remove contamination on the antenna Minimize interfering installations in the close range by changing the polarization direction After eliminating the false signals, the auto false echo suppression must be deleted. Carry out a new auto false echo suppression
Measured value jumps sporadically towards 100 % during emptying	Changing condensation or contamination on the antenna	Carry out auto false echo suppression or increase auto false echo suppression in the close range by editing
Measured value fluctuates around 10 ... 20 %	Various echoes from an uneven medium surface, e.g. an extraction funnel	Check parameter "Material Type" and adapt, if necessary
	Reflections from the medium surface via the vessel wall (deflection)	Optimize installation position and transmitter orientation
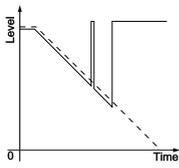
Fault description	Cause	Rectification
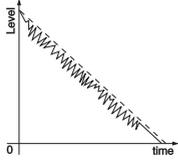
12.6 Return procedure

Enclose the delivery note, the return goods delivery note and the decontamination declaration in a clear plastic pouch and attach it firmly to the outside of the packaging. Any devices/replacement parts which are returned without a decontamination declaration will be cleaned at your expense before further processing.

Required forms:

- Delivery note

- Return goods delivery note with the following information: https://www.siemens.com/processtransmitteration/returngoodsnote

    - Product (item description)

    - Number of returned devices/replacements parts

    - Reason for returning the item(s)

- Decontamination declaration

    - https://www.siemens.com/sc/declarationofdecontamination

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

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

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

12.7 Technical support

Technical Support

If this documentation does not provide complete answers to any technical questions you may have, contact technical support at www.siemens.com/automation/support-request [https://www.siemens.com/automation/support-request].

More information about our technical support is available at www.siemens.com/automation/csi/service [https://www.siemens.com/automation/csi/service]

Internet service and support

In addition to our documentation, Siemens provides a comprehensive support solution at www.siemens.com/automation/service&support [https://www.siemens.com/automation/service&support]

Contact person

If you have additional questions about the device, please contact your Siemens personal contact at www.automation.siemens.com/partner [https://www.automation.siemens.com/partner]

To find the personal contact for your product, go to ""*All products and Branches*" and select ""*Products and services > Industrial automation > Process transmitteration*".

Documentation

Documentation on the various products and systems can be found at www.siemens.com/processtransmitteration/documentation [https://www.siemens.com/processtransmitteration/documentation].

Certificates

You can find certificates in the Internet under www.siemens.com/processtransmitteration/certificates [https://www.siemens.com/processtransmitteration/certificates] or on an included DVD.

12.8 How to proceed if a repair is necessary

If it is necessary to repair the transmitter, please contact Siemens. You find the locations on www.siemens.com/processautomation [https://www.siemens.com/processautomation].

Service and maintenance

13

13.1 Dismounting steps

To remove the device, carry out the steps in chapters ""*Mounting*" and ""*Connecting to power suplly*" in reverse.

⚠ WARNING
When dismounting, pay attention to the process conditions in vessels or pipelines. There is a risk of injury, e.g. due to high pressures or temperatures as well as aggressive or toxic media. Avoid this by taking appropriate protective measures.

13.2 Disposal

Pass the transmitter on to a specialised recycling company and do not use the municipal collecting points.

Remove any batteries in advance, if they can be removed from the device, and dispose of them separately.

If personal data is stored on the old device to be disposed of, delete it before disposal.

If you have no way to dispose of the old transmitter properly, please contact us concerning return and disposal.

Further information about devices containing batteries can be found at: (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.

14

Certificates and approvals

14.1 Radio licenses

Radar

The device has been tested and approved in accordance with the current edition of the applicable country-specific norms or standards.

Regulations for use can be found in the document ""*Regulations for radar level measuring transmitters with radio licenses*" on our homepage.

Bluetooth

The Bluetooth radio module in the device has been tested and approved according to the current edition of the applicable country-specific norms or standards.

The confirmations as well as regulations for use can be found in the document ""*Radio licenses*" supplied or on www.siemens.com/level [https://www.siemens.com/level].

14.2 Approvals for Ex areas

Approved versions for use in hazardous areas are available or in preparation for the device series.

You can find the respective documents on www.siemens.com/level [https://www.siemens.com/level].

14.3 Ship approvals

Approved versions for use on the ship sector are available or in preparation for the device series.

You can find the respective documents on www.siemens.com/level [https://www.siemens.com/level].

14.4 Approvals as overfill protection

Approved versions for use as part of an overfill protection system are available or in preparation for this device series.

You can find the respective approvals on www.siemens.com/level [https://www.siemens.com/level].

14.5 Food and pharmaceutical certificates

Versions for use in the food and pharmaceutical industries are available or in preparation.

You can find the respective certificates on www.siemens.com/level [https:// www.siemens.com/level].

14.6 Conformity

The device complies with the legal requirements of the applicable country-specific directives or technical regulations. We confirm conformity with the corresponding labelling.

You can find the corresponding conformity declarations on www.siemens.com/level [https://www.siemens.com/level].

14.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field transmitteration.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de [https://www.namur.de].

Technical data and dimensions

15

15.1 Technical data

Note for approved transmitters

Device specifications: Siemens makes every effort to ensure the accuracy of these specifications, but reserves the right to change them at any time.

Device-specific approvals: The device-specific approvals are always to be found on the nameplates on the device.

Materials and weights

Materials, wetted parts	
• Antenna, process fitting	PVDF
• Process seal[a]	FKM, EPDM
Materials, non-wetted parts	
• Housing	Plastic PBT (Polyester)
• Housing seals	O-rings (silicone)
• Cable gland	PA
• Sealing, cable gland	EPDM
• Blind plug, cable gland	PA
• Inspection window for the indication	Polycarbonate
Weight	0.7 kg (1.543 lbs)

[a] G type threaded connections only, EPDM for devices with food/pharmaceutical certification

Torques

Max. torque mounting boss	7 Nm (5.163 lbf ft)
Max. torque for NPT cable glands and Conduit tubes	10 Nm (7.376 lbf ft)

Input variable

| Measured variable	The measured variable is the distance between the antenna edge of the transmitter and the medium surface. The antenna edge is also the reference point for the measurement.
Max. measuring range[a]	15 m (49.21 ft)
Minimum measuring distance[b]	

| • Mode 1, 2, 4 | 0 mm (0 in) |
| • Mode 3 | ≥ 250 mm (9.843 in) |

[a] Depending on application and medium

[b] Depending on the operating conditions

Switch-on phase

Run-up time for U_B = 12 V DC, 18 V DC, 24 V DC	< 15 s
Starting current for run-up time	≤ 3.6 mA
Power consumption	
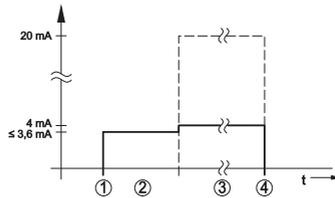
① U_B On
②   Run-up time
③   Measured value output
④ U_B Off

Figure 15.1   Run-up time and measured value output

Transmitter current	Operating voltage		
	12 V DC	**18 V DC**	**24 V DC**
≤ 3.6 mA	< 45 mW	< 65 mW	< 90 mW
4 mA	< 50 mW	< 75 mW	< 100 mW
20 mA	< 245 mW	< 370 mW	< 485 mW

Output variable

Output signal	4 ... 20 mA/HART
Range of the output signal	3.8 ... 20.5 mA/HART (default setting)
Signal resolution	0.3 µA
Resolution, digital	1 mm (0.039 in)
Fault signal, current output (adjustable)	≤ 3.6 mA, ≥ 21 mA, last valid measured value
Max. output current	22 mA
Starting current	≤ 3.6 mA; ≤ 10 mA for 5 ms after switching on
Load	545 Ohm at 24 V DC
Damping (63 % of the input variable), adjustable	0 ... 999 s
HART output values[a]	
• PV (Primary Value)	Lin. percent

• SV (Secondary Value)	Distance
• TV (Third Value)	Measurement reliability
• QV (Fourth Value)	Electronics temperature
Fulfilled HART specification	7.0
Further information on Manufacturer ID, Device ID, Device Revision	See website of FieldComm Group

[a] Default values can be assigned individually.

Deviation (according to DIN EN 60770-1)

Process reference conditions according to DIN EN 61298-1	
• Temperature	+18 ... +30 ℃ (+64 ... +86 ℉)
• Relative humidity	45 ... 75 %
• Air pressure	860 ... 1060 mbar/86 ... 106 kPa (12.5 ... 15.4 psig)
Installation reference conditions	
• Distance to installations	> 200 mm (7.874 in)
• Reflector	Flat plate reflector
• False reflections	Biggest false signal, 20 dB smaller than the useful signal
Deviation with liquids	
• Measuring distance > 0.25 m/0.8202 ft	≤ 2 mm
• Measuring distance ≤ 0.25 m/0.8202 ft	≤ 10 mm
Non-repeatability[a]	≤ 2 mm
Deviation with bulk solids	The values depend to a great extent on the application. Binding specifications are thus not possible.

[a] Already included in the meas. deviation

Variables influencing measurement accuracy[2]

Specifications apply to the digital measured value	
Temperature drift - Digital value	< 3 mm/10 K, max. 5 mm
Specifications apply also to the current output	
Temperature drift - Current output	< 0.03 %/10 K or max. 0.3 % relating to the 16.7 mA span
Deviation in the current output due to digital/ analogue conversion	< 15 µA
Additional measurement deviation through electromagnetic interference	
• According to NAMUR NE 21	< 80 µA
• According to EN 61326-1	None
• According to IACS E10 (shipbuilding)/ IEC 60945	< 250 µA

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[2] Determination of the temperature drift acc. to the limit point method

Characteristics and performance data

Measuring frequency	W-band (80 GHz technology)
Measuring cycle time[a]	≤ 250 ms
Step response time[b]	≤ 3 s
Beam angle[c]	8°
Min. dielectric constant of the medium	1.6

[a] With operating voltage U_B ≥ 24 V DC

[b] Time span after a sudden distance change from 1 m to 5 m until the output signal reaches 90 % of the final value for the first time (IEC 61298-2). Valid with operating voltage U_B ≥ 24 V DC.

[c] Outside the specified beam angle, the energy level of the radar signal is 50% (-3 dB) less.

Ambient conditions

Ambient temperature device	-40 ... +70 °C (-40 ... +158 °F)
Ambient temperature display	-25 ... +70 °C (-13 ... +158 °F)
Storage and transport temperature	-40 ... +80 °C (-40 ... +176 °F)

Mechanical environmental conditions

Vibrations (oscillations)	Class 4M8 acc. to IEC 60721-3-4 (5 g at 4 ... 200 Hz)
Impacts (mechanical shock)	Class 6M4 acc. to IEC 60721-3-6 (50 g, 2.3 ms)
Impact resistance	IK07 acc. to IEC 62262

Process conditions

For the process conditions, please also note the specifications on the nameplate. The lowest value (amount) always applies.	
Process temperature	-40 ... +80 °C (-40 ... +176 °F)
Process pressure	-1 ... 3 bar (-100 ... 300 kPa/-14.5 ... 43.51 psig)

Electromechanical data

Cable entry	
• Options	M20 x 1.5; ½ NPT
• Cable gland	M20 x 1.5 (cable diameter 5 ... 9 mm)
• Closing cap	½ NPT
Wire cross-section (spring-loaded terminals)	
• Stranded wire	0.2 mm² (AWG 24) ... 2.5 mm² (AWG 14), minimum insulation 0.5 mm or greater.

Bluetooth interface

Bluetooth standard	Bluetooth 5.0

Frequency	2.402 ... 2.480 GHz
Max. emitted power	+2.2 dBm
Max. number of participants	1
Effective range	typically 25 m (82 ft)Depending on the local conditions

Indication

Measured value and menu display	
• Optional HMI	LCD display with backlight
• Max. indicating range	-99999 ... 99999

Adjustment

Optional HMI	4 x keys for menu adjustment
PC/Notebook	SIMATIC PDM
Smart device	SITRANS mobile IQ

Voltage supply

| Operating voltage U_B	
• at 4 mA	12 ... 35 V DC
• at 20 mA	9 ... 35 V DC
Operating voltage U_B - illuminated display and adjustment unit	15 ... 35 V DC
Reverse voltage protection	Integrated

Overvoltage protection

Dielectric strength against metallic mounting parts	> 10 kV
Overvoltage resistance (test impulse voltages 1.2/50 µs at 42 Ω)	> 1000 V
Additional overvoltage arrester	Due to the floating structure of the electronics and comprehensive insulation measures generally not necessary.

Electrical protective measures

Protection rating	IP66/IP67 acc. to IEC 60529Type 4X acc. to UL 50
Altitude above sea level	5000 m (16404 ft)
Protection class	III
Pollution degree	4

15.2 Dimensions
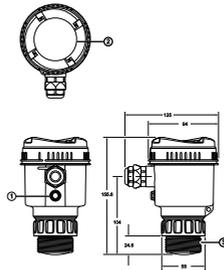
①   Ventilation/pressure compensation
②   Housing lid
③   Process fitting

Figure 15.2   Dimensions SITRANS LR150

15.3 Licensing information for open source software

Open source software components are also used in this device. A documentation of these components with the respective license type, the associated license texts, copyright notes and disclaimers can be found on our homepage.

15.4 Trademark

All the brands as well as trade and company names used are property of their lawful proprietor/originator.