Guided Wave Radar

SITRANS LG270

Foundation Fieldbus

Coax probe

-196 ... +280 °C; -196 ... +450 °C

Operating Instructions • 09/2017

SITRANS

SIEMENS

Safety Guidelines: Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel: This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Unit Repair and Excluded Liability:

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

Warning: Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.
This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Note: Always use product in accordance with specifications.

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- For a selection of Siemens level measurement manuals, go to: **www. siemens.com/processautomation**. Under Process Instrumentation, select *Level Measurement* and then go to the manual archive listed under the product family.
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Contents

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Safety instructions for Ex areas

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

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1 About this document

1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, the exchange of parts and the safety of the user. Please read this information before putting the instrument 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

Information, tip, note
This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.

Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

Ex applications
This symbol indicates special instructions for Ex applications.

- **List**
  The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence of actions**
Numbers set in front indicate successive steps in a procedure.

Battery disposal
This symbol indicates special information about the disposal of batteries and accumulators.

2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.

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

2.2 Appropriate use

SITRANS LG270 is a sensor 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 instrument 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 instrument can be impaired.

2.4 General safety instructions

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

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

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 by the user.

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 the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning looked up in this operating instructions manual.

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2.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

Electromagnetic compatibility
Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

2.6 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 instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- 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.

2.7 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 (ANSI/NFPA 70).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code

3 Product description

3.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

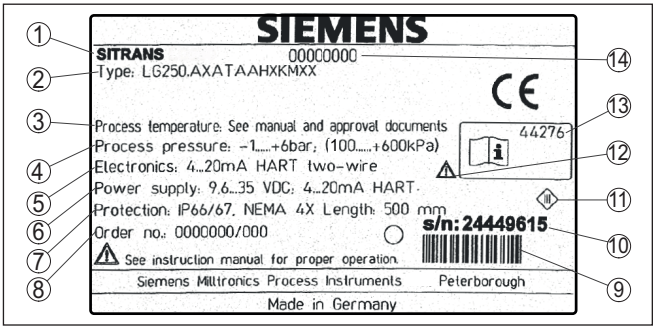

Fig. 1: Layout of the type label (example)

1 Instrument type
2 Product code
3 Process and ambient temperature, process pressure
4 Process pressure
5 Signal output electronics
6 Voltage supply
7 Protection rating
8 Order number
9 Identification code
10 Serial number of the instrument
11 Symbol of the device protection class
12 Reminder to observe the instrument documentation
13 ID numbers, instrument documentation

Scope of this operating instructions manual

This operating instructions manual applies to the following instrument versions:

- Hardware from 1.0.0
- Software from 1.3.0
- Only for instrument versions without SIL qualification

Versions

This electronics version can be determined via the product code on the type label as well as on the electronics.

- Standard electronics: Type FX80FF.-

Scope of delivery

The scope of delivery encompasses:

- Sensor
- Optional accessory
- Documentation
  - Operating instructions SITRANS LG270
  - Instructions for optional instrument features
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - If necessary, further certificates

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Information:
In this operating instructions manual, the optional instrument features are described. The respective scope of delivery results from the order specification.

3.2 Principle of operation

Application area

The SITRANS LG270 is a level sensor with coax probe for continuous level or interface measurement, suitable for applications in liquids with high temperatures up to 450 °C (842 °F).

Functional principle - level measurement

High frequency microwave pulses are guided along a steel cable or a rod. Upon reaching the product surface, the microwave pulses are reflected. The running time is evaluated by the instrument and outputted as level.

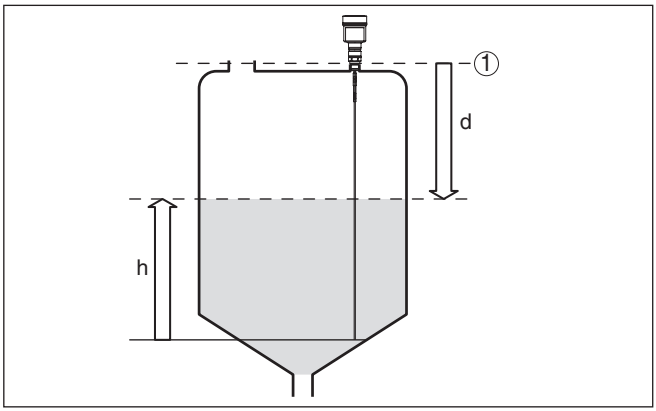


Fig. 2: Level measurement

1 Sensor reference plane (seal surface of the process fitting)
d Distance to the level
h Height - Level

Functional principle - interface measurement

High frequency microwave impulses are guided along a steel cable or rod. Upon reaching the product surface, a part of the microwave impulses is reflected. The other part passes through the upper product and is reflected by the interface. The running times to the two product layers are processed by the instrument.

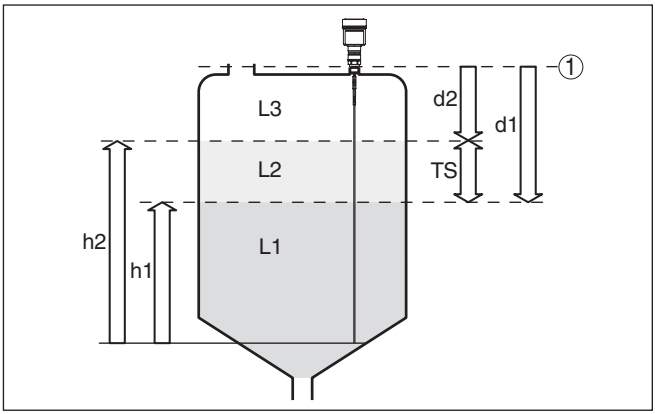


Fig. 3: Interface measurement

1 Sensor reference plane (seal surface of the process fitting)
d1 Distance to the interface
d2 Distance to the level
TS Thickness of the upper medium (d1 - d2)
h1 Height - Interface
h2 Height - Level
L1 Lower medium
L2 Upper medium
L3 Gas phase

Prerequisites for interface measurement

Upper medium (L2)

- The upper medium must not be conductive
- The dielectric constant of the upper medium or the actual distance to the interface must be known (input required). Min. dielectric constant: 1.6. You can find a list of dielectric constants on our home page: www.siemens.com/sitranslg.
- The composition of the upper medium must be stable, no varying products or mixtures
- The upper medium must be homogeneous, no stratifications within the medium
- Min. thickness of the upper medium 50 mm (1.97 in)
- Clear separation from the lower medium, emulsion phase or detritus layer max. 50 mm (1.97 in)
- If possible, no foam on the surface

Lower medium (L1)

- The dielectric constant must be 10 higher than the dielectric constant of the upper medium, preferably electrically conductive. Example: upper medium dielectric constant 2, lower medium at least dielectric constant 12.

Gas phase (L3)

- Air or gas mixture
- Gas phase - dependent on the application, gas phase does not always exist (d2 = 0)

Output signal

The instrument is always preset to the application "*Level measurement*".

For the interface measurement, you can select the requested output signal with the setup.

3.3 Packaging, transport and storage

Packaging

Your instrument 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 of standard instruments 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 humidity 20 … 85 %

Lifting and carrying

With an instrument weight of more than 18 kg (39.68 lbs) suitable and approved equipment must be used for lifting and carrying.

3.4 Accessories and replacement parts

Display and adjustment module

The display and adjustment module LG Local Display Interface is used for measured value indication, adjustment and diagnosis. It can be inserted into the sensor and removed at any time.

You can find additional information in the operating instructions manual "*LG Local Display Interface*" (Document-ID 43838).

External display and adjustment unit

The LG Remote Interface is an external display and adjustment unit for sensors with single chamber housing and Ex-d double chamber housing.

It is suitable for measured value indication and adjustment of sensors and is connected to the sensor with a four-wire standard cable up to 50 m (164 ft) long.

You can find additional information in the operating instructions manual "*LG Remote Interface*".

Flanges

Screwed flanges are available in different versions according to the following standards: DIN 2501, EN 1092-1, ASME B 16.5, JIS B 2210-1984, GOST 12821-80.

You can find additional information in the supplementary instructions manual "*Flanges according to DIN-EN-ASME-JIS*" (Document-ID 47574).

Electronics module

The electronics module SITRANS series LG is a replacement part for TDR sensors of SITRANS series LG. There is a different version available for each type of signal output.

You can find further information in the operating instructions manual "*Electronics module SITRANS series LG*".

4 Mounting

4.1 General instructions

Screwing in

On instruments with threaded process fitting, the hexagon must be tightened with a suitable wrench. For the proper wrench size see chapter "*Dimensions*".

Warning:
The housing must not be used to screw the instrument in! Applying tightening force can damage internal parts of the housing.

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "*Connecting to power supply*")
- Tighten the cable gland
- When mounting horizontally, turn the housing so that the cable gland points downward
- Loop the connection cable downward in front of the cable gland

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Make sure that the degree of contamination specified in chapter "*Technical data*" meets the existing ambient conditions.

Cable glands

Metric threads
In the case of instrument housings with metric thread, the cable glands are screwed in at the factory. They are sealed with plastic plugs as transport protection.

You have to remove these plugs before electrical connection.

NPT thread
In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection. The dust protection caps do not provide sufficient protection against moisture.

Prior to setup you have to replace these protective caps with approved cable glands or close the openings with suitable blind plugs.

Suitability for the process conditions

Make sure before mounting that all parts of the instrument 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

You can find detailed information on the process conditions in chapter "*Technical data*" as well as on the type label.

Suitability for the ambient conditions

The instrument is suitable for standard and extended ambient conditions acc. to DIN/EN/IEC/ANSI/ISA/UL/CSA 61010-1.

4.2 Mounting instructions

Installation position

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead band) is stated in chapter "*Technical data*".

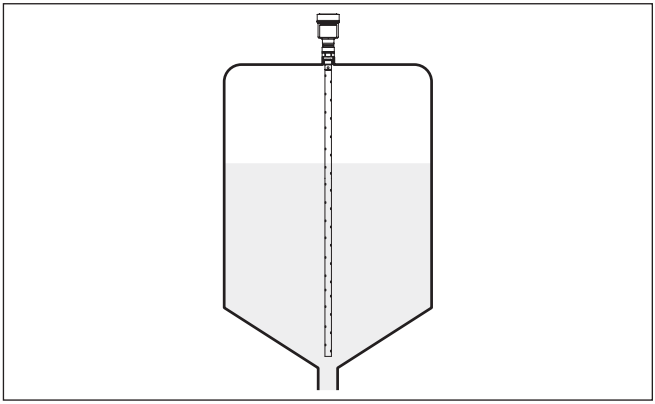


Fig. 4: Vessel with conical bottom

Welding work

Before beginning the welding work, remove the electronics module from the sensor. By doing this, you avoid damage to the electronics through inductive coupling.

Inflowing medium

Do not mount the instruments in or above the filling stream. Make sure that you detect the product surface, not the inflowing product.

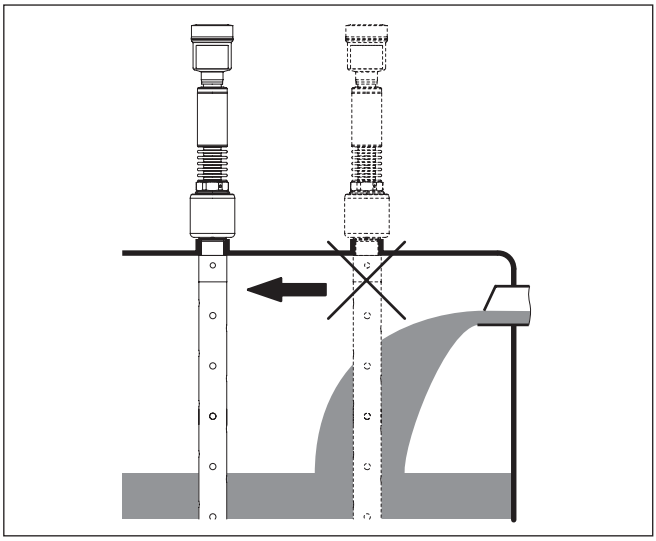


Fig. 5: Mounting of the sensor with inflowing medium

Measuring range

The reference plane for the measuring range of the sensors is the sealing surface of the thread or flange.

Keep in mind that a min. distance must be maintained below the reference plane and possibly also at the end of the probe - measurement in these areas is not possible (dead band). These dead bands are listed in chapter "*Technical data*". Keep in mind for the adjustment that the default setting for the measuring range refers to water.

Pressure

The process fitting must be sealed if there is gauge or low pressure in the vessel. Before use, check if the seal material is resistant against the measured product and the process temperature.

The max. permissible pressure is specified in chapter "*Technical data*" or on the type label of the sensor.

Fasten

If there is a risk of the coaxial probe touching the vessel wall during operation due to product movements or agitators, etc., the measuring probe should be securely fixed.

Avoid undefined vessel connections, i.e. the connection must be either grounded reliably or isolated reliably. Any undefined change of this condition can lead to measurement errors.

If there is a danger of the coaxial probe touching the vessel wall, then the probe must be fastened at the bottom end.

Keep in mind that measurement is not possible below the fastening point.

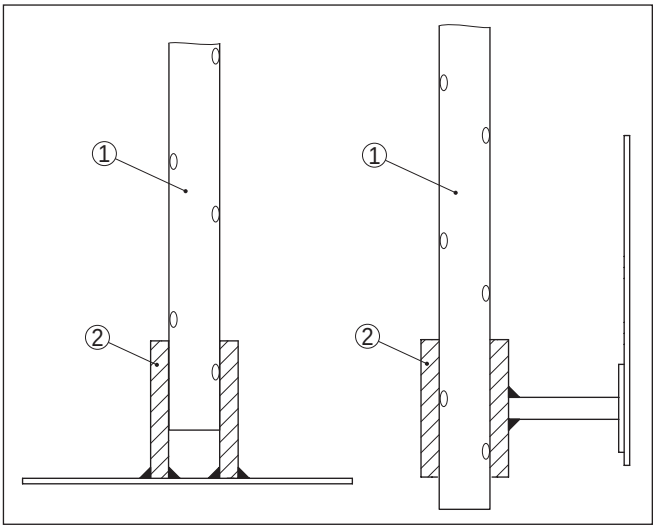


Fig. 6: Fasten the probe

1 Coax probe
2 Retaining sleeve

Mounting in the vessel insulation

Instruments for a temperature range up to +280 °C (536 °F) or up to +450 °C (842 °F) have a distance piece between process fitting and electronics housing. Ths distance piece is used for thermal decoupling of the electronics against high process temperatures.

Information:
The spacer may be incorporated in the vessel insulation up to max. 50 mm (2 in). Only then is a reliable temperature decoupling guaranteed.

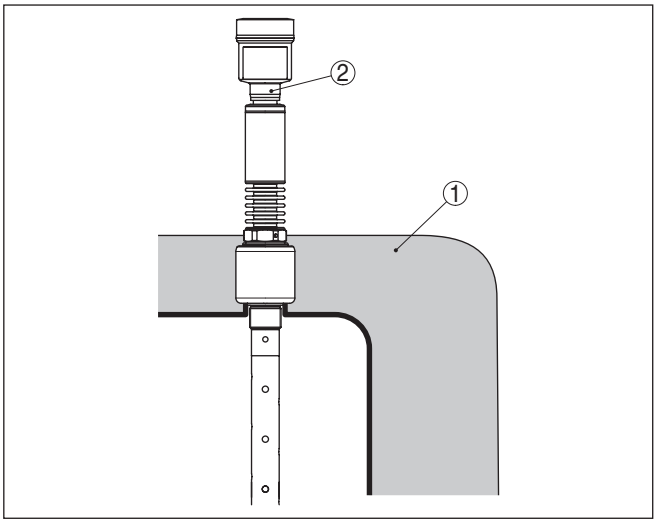


Fig. 7: Mounting the instrument on insulated vessels.

1 Temperature insulation
2 Ambient temperature on the housing

Steam boiler applications

Vapours, superimposed gases, high pressures and temperature differences can change the spreading speed of radar impulses.

There are two possibilities to correct these deviations.

Corrective value in the process control system

In the technical data under "Influence of superimposed gas and pressure on accuracy" you can find a table with deviation values in some typical gases or in steam.

In the control system (DCS) you can correct the measurement results of the SITRANS LG270 with these values.

The prerequisite is constant temperature and pressure in the vessel.

Automatic correction via the reference distance

The SITRANS LG270 can be equipped optionally with a running time correction via reference distance. The probe can carry out an automatic running time correction with it.

The reference distance can be overfilled. Make sure that the last measured corrective value is used in case of overfilling.

Length - Reference distance (7)	Length - Blocking distance (4)	Probe length min. (2)	Deviation max.
260 mm (10.24 in)	450 mm (17.72 in)	> 1000 mm (39.37 in)	± 10 %
500 mm (19.69 in)	690 mm (27.17 in)	> 1250 mm (49.21 in)	± 5 %
750 mm (29.53 in)	940 mm (37.01 in)	> 1500 mm (59.06 in)	± 3 %

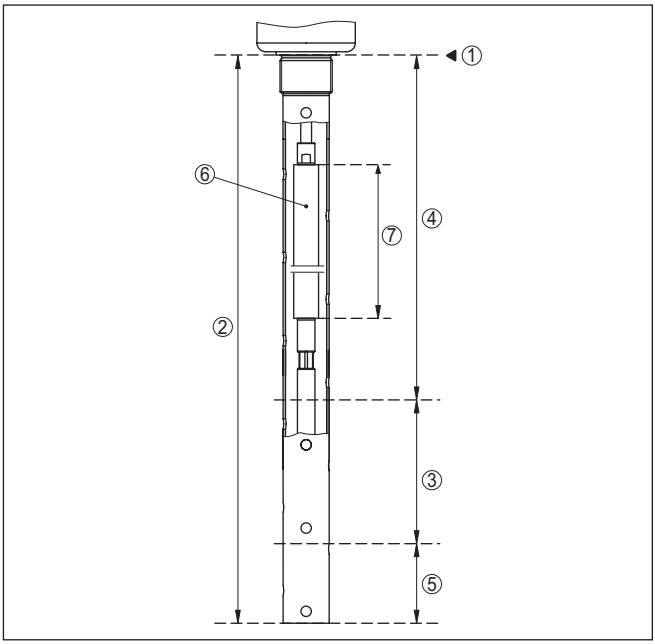


Fig. 8: Measuring ranges - SITRANS LG270 with steam compensation

1 Reference plane
2 Probe length L
3 Measuring range
4 Upper blocking distance with steam compensation
5 Lower dead band
6 Reference measurement distance to steam compensation
7 Length of the reference measuring distance

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

Warning:
Connect only in the complete absence of line voltage.

- The electrical connection must only be carried out by trained personnel authorised by the plant operator.
- If overvoltage surges are expected, overvoltage arresters should be installed.

Voltage supply

The instrument requires a operating voltage of 9 … 32 V DC. Operating voltage and the digital bus signal are carried on the same two-wire connection cable. Power is supplied via the H1 power supply.

Connection cable

Connection is carried out with screened cable according to Fieldbus specification.

Use cable with round cross section for instruments 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.

Make sure that the cable used has the required temperature resistance and fire safety for max. occurring ambient temperature

Use a cable gland fitting the cable diameter.

Make sure that the entire installation is carried out according to the Fieldbus specification. In particular, make sure that the bus is terminated with suitable terminating resistors.

Cable glands

Metric threads
In the case of instrument housings with metric thread, the cable glands are screwed in at the factory. They are sealed with plastic plugs as transport protection.

You have to remove these plugs before electrical connection.

NPT thread
In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection.

Prior to setup you have to replace these protective caps with approved cable glands or close the openings with suitable blind plugs.

On plastic housings, the NPT cable gland or the Conduit steel tube must be screwed into the threaded insert without grease.

Max. torque for all housings, see chapter "*Technical data*".

Cable screening and grounding

Make sure that the cable screen and grounding are carried out according to Fieldbus specification. We recommend to connect the cable screen to ground potential on both ends.

In systems with potential equalisation, connect the cable screen directly to ground potential at the power supply unit, in the connection box and at the sensor. The screen in the sensor must be connected directly to the internal ground terminal. The ground terminal outside on the housing must be connected to the potential equalisation (low impedance).

5.2 Connecting

Connection technology

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

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.

Information:
The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

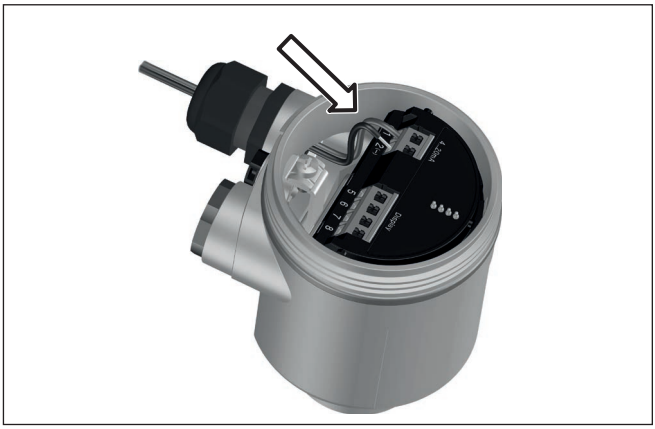


Fig. 9: Connection steps 5 and 6 - Single chamber housing

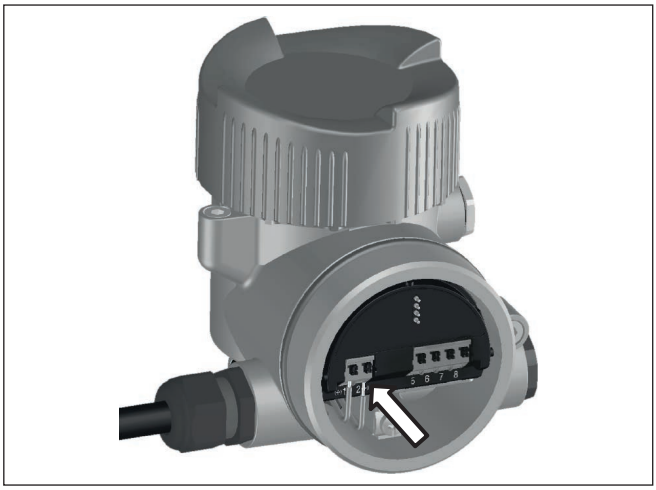


Fig. 10: Connection steps 5 and 6 - Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan

Information:
Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

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

7. Check the hold of the wires in the terminals by lightly pulling on them
8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
10. Reinsert the display and adjustment module, if one was installed
11. Screw the housing lid back on

The electrical connection is finished.

5.3 Wiring plan, single chamber housing

The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and terminal compartment

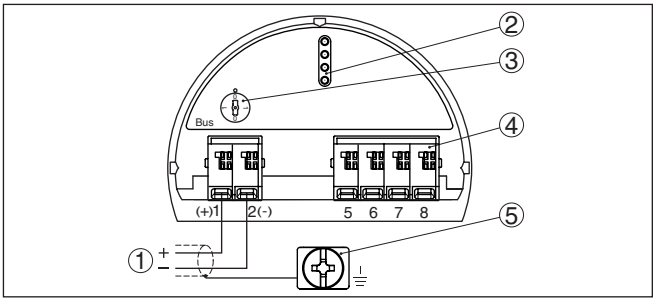


Fig. 11: Electronics and terminal compartment - single chamber housing

1 Voltage supply, signal output
2 Contact pins for the display and adjustment module or interface adapter
3 Simulation switch ("1" = mode for simulation release)
4 For external display and adjustment unit
5 Ground terminal for connection of the cable screen

5.4 Wiring plan, double chamber housing

The following illustrations apply to the non-Ex as well as to the Ex-ia version.

Electronics compartment

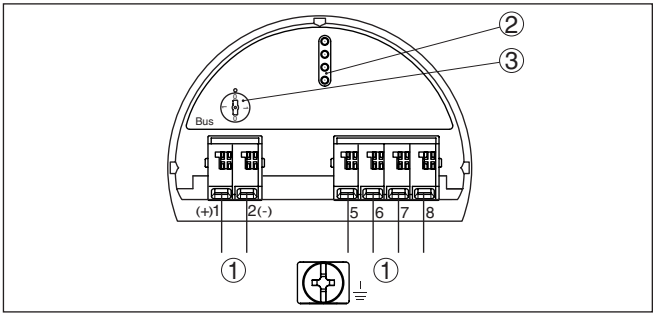


Fig. 12: Electronics compartment - double chamber housing

1 Internal connection to the terminal compartment
2 Contact pins for the display and adjustment module or interface adapter
3 Simulation switch ("1" = mode for simulation release)

Terminal compartment

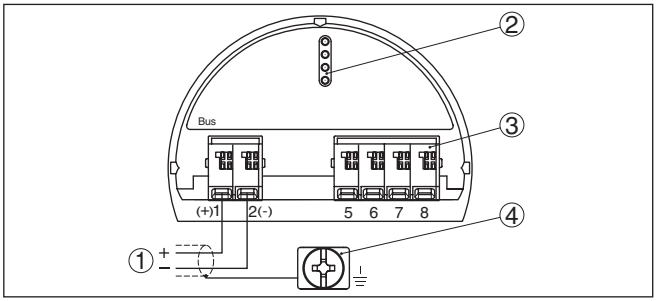


Fig. 13: Terminal compartment - double chamber housing

1 Voltage supply, signal output
2 For display and adjustment module or interface adapter
3 For external display and adjustment unit
4 Ground terminal for connection of the cable screen

5.5 Switch-on phase

After SITRANS LG270 is connected to the bus system, the instrument carries out a self-test for approx. 30 seconds. The following steps are carried out:

- Internal check of the electronics
- Indication of a status message, e.g. "*F 105 Determine measured value*" on the display or PC
- Status byte goes briefly to fault value

Then the actual measured value is outputted to the signal cable. The value takes into account settings that have already been carried out, e.g. default setting.

6 Set up with the display and adjustment module

6.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.

Fig. 14: Insertion of the display and adjustment module with single chamber housing

Note:
If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

6.2 Adjustment system

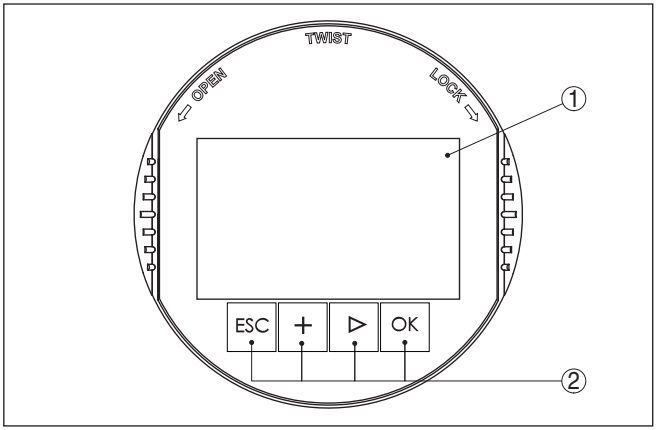


Fig. 15: Display and adjustment elements

1 LC display
2 Adjustment keys

Key functions

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- ***[->]*** key:
  - Change measured value presentation
  - Select list entry
  - Select editing position
- ***[+]*** key:
  - Change value of the parameter
- ***[ESC]*** key:
  - Interrupt input
  - Jump to next higher menu

Adjustment system

The sensor is operated via the four keys of the display and adjustment module. The individual menu items are shown on the LC display. You can find the function of the individual keys in the previous illustration.

When the ***[+]*** and ***[->]*** keys are pressed quickly, the edited value, or the cursor, changes one value or position at a time. If the key is pressed longer than 1 s, the value or position changes continuously.

When the ***[OK]*** and ***[ESC]*** keys are pressed simultaneously for more than 5 s, the display returns to the main menu. The menu language is then switched over to "*English*".

Approx. 60 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with ***[OK]*** will not be saved.

Switch-on phase

After switching on, the SITRANS LG270 carries out a short self-test where the device software is checked.

The output signal transmits a fault signal during the switch-on phase.

The following information is displayed on the display and adjustment module during the startup procedure:

- Instrument type
- Device name
- Software version (SW-Ver)
- Hardware version (HW-Ver)

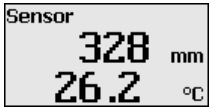
Measured value indication

With the ***[->]*** key you can move between three different indication modes.

In the first view, the selected measured value is displayed in large digits.

In the second view, the selected measured value and a corresponding bar graph presentation are displayed.

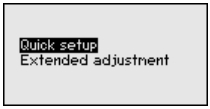
In the third view, the selected measured value as well as a second selectable value, e.g. the temperature, are displayed.



6.3 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "*Quick setup*" in the start graphic on the display and adjustment module.



The following steps for the quick setup can be reached also in the "Extended adjustment".

- Instrument address
- Measurement loop name
- Medium type (optional)
- Application
- Max. adjustment
- Min. adjustment
- False signal suppression

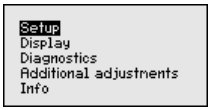
You can find the description of the individual menu items in the following chapter "*Parameter adjustment - Extended adjustment*".

6.4 Parameter adjustment - Extended adjustment

For technically demanding measuring points, you can carry out extended settings in "*Extended adjustment*".

Main menu

The main menu is divided into five sections with the following functions:



Setup: Settings, e.g. medium, application, vessel, adjustment, damping, device units, unit SV 2, false signal suppression, linearization

Display: Language setting, settings for the measured value indication as well as lighting

Diagnosis: Information, e.g. on instrument status, pointer, measurement certainty, simulation, echo curve

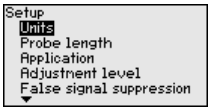
Additional adjustments: e.g. date/time, reset, copy sensor data

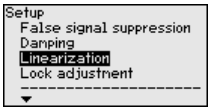
Info: Instrument name, hardware and software version, date of manufacture, device ID, instrument features

Note:
For optimum adjustment of the measuring point, the individual submenu items in the main menu item "*Setup*" should be selected one after the other and provided with the correct parameters. If possible, go through the items in the given sequence.

The procedure is described below.

The following submenu points are available:

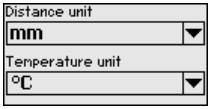




The submenu points are described below.

Setup - Units

In this menu item you select the distance unit and the temperature unit.

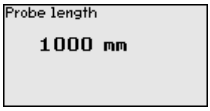


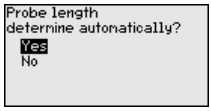
For the distance units you can choose between m, mm and ft and for the temperature units °C, °F and K.

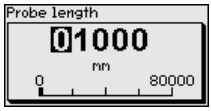
Setup - Probe length

In this menu item you can enter the probe length or have the length determined automatically by the sensor system.

When choosing "*Yes*", then the probe length will be determined automatically. When choosing "*No*", you can enter the probe length manually.

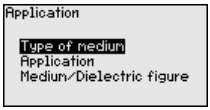


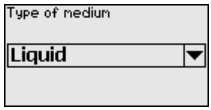




Setup - Application - Type of medium

Coax probes can be only used in liquids. In this menu item, the fixed adjusted medium type "*Liquid*" is displayed.



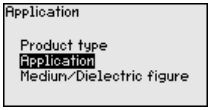


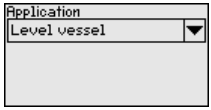
Setup - Application - Application

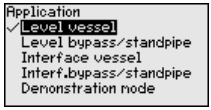
In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Note:
The selection of the application has a considerable influence on all other menu items. Keep in mind that as you continue with the parameter adjustment, individual menu items are only optionally available.

You have the option of choosing the demonstration mode. This mode is only suitable for test and demonstration purposes. In this mode, the sensor ignores the parameters of the application and reacts immediately to any change.



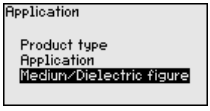


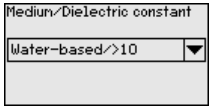


Setup - Application - Medium, dielectric constant

In this menu item, you can define the type of medium (product).

This menu item is only available if you have selected level measurement under the menu item "*Application*".





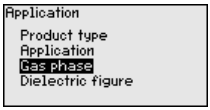
You can choose between the following medium types:

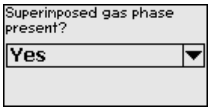
Dielectric constant	Type of medium	Examples
> 10	Water-based liquids	Acids, alcalis, water
3 … 10	Chemical mixtures	Chlorobenzene, nitro lacquer, aniline, isocyanate, chloroform
< 3	Hydrocarbons	Solvents, oils, liquid gas

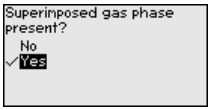
Setup - Application - Gas phase

This menu item is only available, if you have chosen interface measurement under the menu item "*Application*". In this menu item you can enter if there is a superimposed gas phase in your application.

Only set the function to "*Yes*", if the gas phase is permanently present.

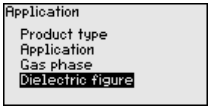


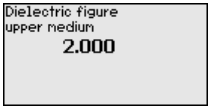


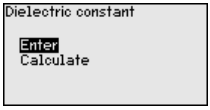


Setup - Application - Dielectric constant

This menu item is only available if you have selected interface measurement under the menu item "*Application*". In this menu item you can enter the dielectric constant of the upper medium.

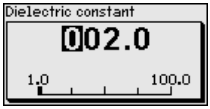


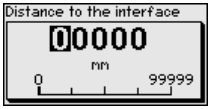




You can directly enter the dielectric constant of the upper medium or have the value determined by the instrument.

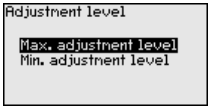
If you want the dielectric constant to be determined by the instrument, you have to enter the measured or known distance to the interface.

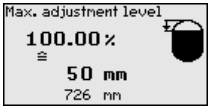




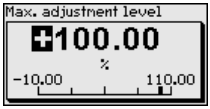
Setup - Max. adjustment Level

In this menu item you can enter the max. adjustment for the level. With interface measurement this is the maximum total level.

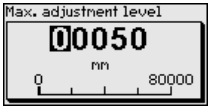




Adjust the requested percentage value with ***[+]*** and store with ***[OK]***.

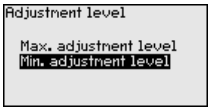


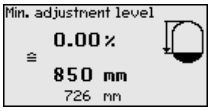
Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead band.



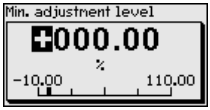
Setup - Min. adjustment Level

In this menu item you can enter the min. adjustment for the level. With interface measurement this is the minimum total level.

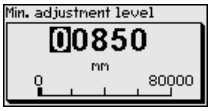




Adjust the requested percentage value with ***[+]*** and store with ***[OK]***.

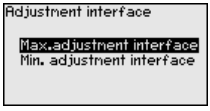


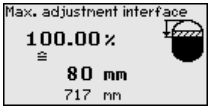
Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).



Setup - Max. adjustment - Interface

This menu item is only available if you have selected interface measurement under the menu item "*Application*".

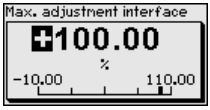


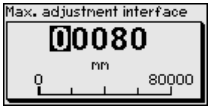


Enter the requested percentage value for the max. adjustment.

As an alternative, you have the possibility taking over the adjustment of the level measurement also for the interface.

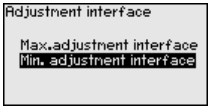
Enter the respective distance value in m for the surface of the upper medium corresponding to the percentage value.

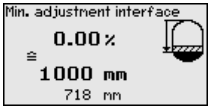




Setup - Min. adjustment - Interface

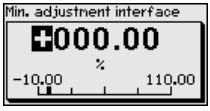
This menu item is only available if you have selected interface measurement under the menu item "*Application*".

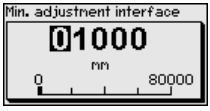




Enter the requested percentage value for the min. adjustment (interface).

Enter the respective distance value in m for the interface corresponding to the percentage value of the interface.





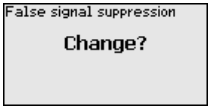
Setup - False signal suppression

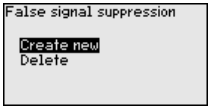
The following circumstances cause interfering reflections and can influence the measurement:

- High mounting sockets
- Vessel internals such as struts

Note:
A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

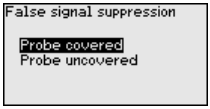
Proceed as follows:

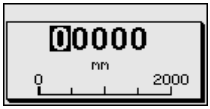




Select first if the probe is covered or uncovered.

If the probe is covered, enter the actual distance from the sensor to the product surface.



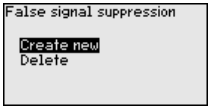


All interfering signals in this section are detected by the sensor and stored.

Keep in mind that with covered probe only false signals in the uncovered area of the probe are detected.

Note:
Check the distance to the product surface, because if an incorrect (too large) value is entered, the existing level will be saved as a false signal. The level would then no longer be detectable in this area.

If a false signal suppression has already been created in the sensor, the following menu window appears when selecting "*False signal suppression*":



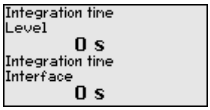
The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.

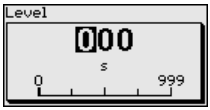
The menu item "*Delete*" is used to completely delete an already created false signal suppression. This is useful if the saved false signal suppression no longer matches the metrological conditions in the vessel.

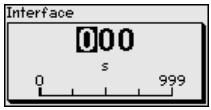
Setup - Damping

To damp process-dependent measured value fluctuations, set an integration time of 0 … 999 s in this menu item.

If you have selected interface measurement under the menu item "*Application*", you can adjust the damping for the level and the interface separately.





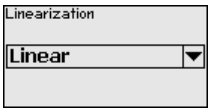


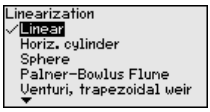
The default setting is a damping of 0 s.

Setup - Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearisation applies to the measured value indication and the current output. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "*Display*".





Warning:
If a linearisation curve is selected, the measuring signal is no longer necessarily linear to the filling height. This must be considered by the user especially when setting the switching point on the limit signal transmitter.

In the following, you have to enter the values for your vessel, for example the vessel height and the socket correction.

For non-linear vessel forms, enter the vessel height and the socket correction.

For the vessel height, you have to enter the total height of the vessel.

For the socket correction you have to enter the height of the socket above the upper edge of the vessel. If the socket is lower than the upper edge of the vessel, this value can also be negative.

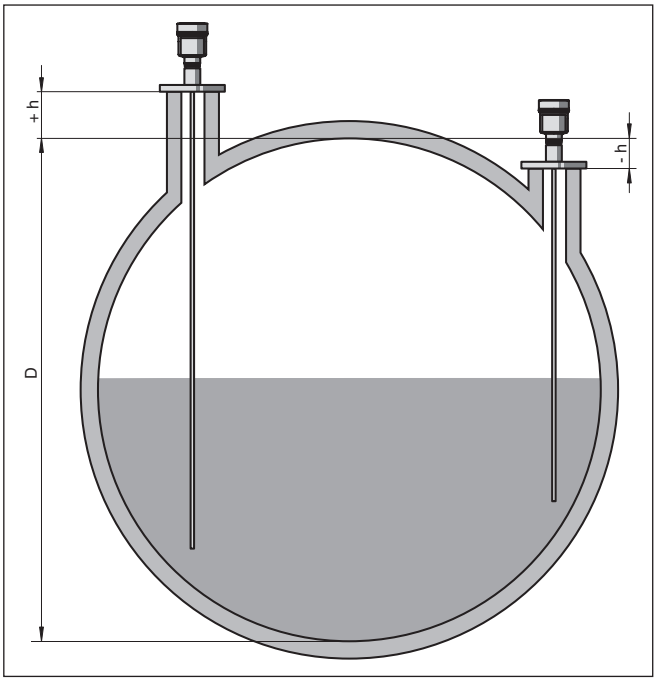
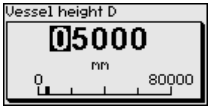
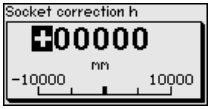
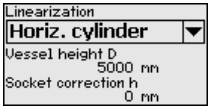


Fig. 16: Vessel height and socket correction value

D Vessel height
+h Positive socket correction value
-h Negative socket correction value





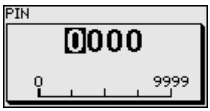


Lock/unlock setup - Adjustment

In the menu item "*Lock/unlock adjustment*", you can protect the sensor parameters against unauthorized or inadvertent modification. The PIN is activated/deactivated permanently.

With active PIN, only the following adjustment functions are possible without entering a PIN:

- Select menu items and show data
- Read data from sensor into the display and adjustment module.



Caution:
When the PIN is active, adjustment via PACTware/DTM as well as other systems is also blocked.

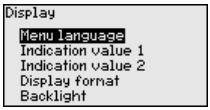
In delivery status, the PIN is **0000**.

Call our service department if you have modified and forgotten the PIN.

Display

In the main menu point "*Display*", the individual submenu points should be selected one after the other and provided with the correct parameters to ensure optimum adjustment of the display options. The procedure is described in the following.

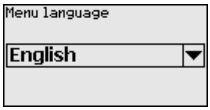
The following submenu points are available:

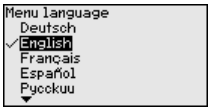


The submenu points are described below.

Display - Menu language

This menu item enables the setting of the requested national language.

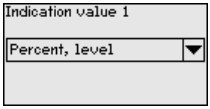


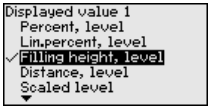


In delivery status, the sensor is set to English.

Display - Displayed value 1

In this menu item, you define the indication of the measured value on the display. You can display two different measured values. In this menu item, you define measured value 1.

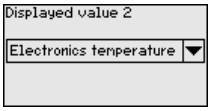


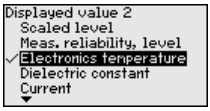


The default setting for the displayed value 1 is "*Filling height Level*".

Display - Displayed value 2

In this menu item, you define the indication of the measured value on the display. You can display two different measured values. In this menu item, you define measured value 2.



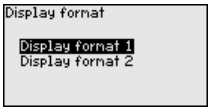


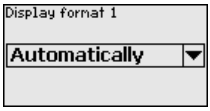
The default setting for the displayed value 2 is the electronics temperature.

Display - Display format

In this menu item, you define the display format of the measured value on the display. You can define different display formats for the two measured values.

You can thus define the number of decimal positions the measured value is displayed with.





The default setting for the display format is "*Automatic*".

Display - Backlight

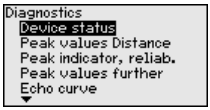
The integrated background lighting can be switched off via the adjustment menu. The function depends on the strength of the supply voltage, see "*Technical data*".

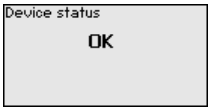
In delivery status, the lighting is switched on.

Diagnostics - Device status

In this menu item, the device status is displayed.

When the instrument displays a failure message, you can here get detailed information on the failure reason.

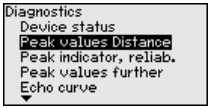


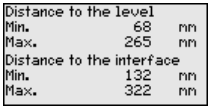


Diagnostics - Peak values, Distance

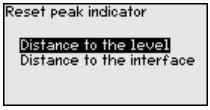
The respective min. and max. measured value is saved in the sensor. The two values are displayed in the menu item "*Peak values, distance*".

If you have selected interface measurement under the menu item "*Setup - Application*", the peak values of the interface measurement are displayed in addition to the peak values of the level measurement.





In another window you can carry out a reset of the two peak values separately.

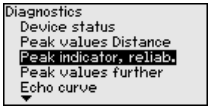


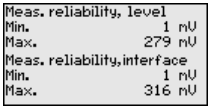
Diagnostics - Peak values Measurement certainty

The respective min. and max. measured values are saved in the sensor. The two values are displayed in the menu item "*Peak values, measurement certainty*".

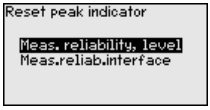
The measurement can be influenced by the process conditions. In this menu item, the measurement certainty of the level measurement is displayed in mV. The higher the value, the more reliable the measurement.

If you have selected interface measurement under the menu item "*Setup - Application*", the peak values of the interface measurement are displayed in addition to the peak values of the level measurement.





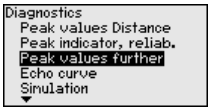
In another window you can carry out a reset of the two peak values separately.

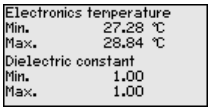


Diagnostics - Peak values, Additional

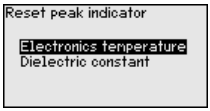
The respective min. and max. measured values are saved in the sensor. The values are displayed in the menu item "*Peak values Additional*".

This menu item displays the peak values of the electronics temperature as well as the dielectric constant.





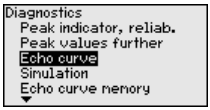
In another window you can carry out a reset of the two peak values separately.

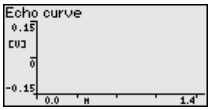


Information:
If one of the display values flashes, there is actually no valid value available.

Diagnostics - Echo curve

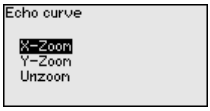
The menu item "*Echo curve*" shows the signal strength of the echoes over the measuring range in V. The signal strength enables an evaluation of the quality of the measurement.

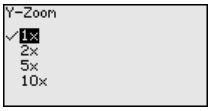




With the following functions you can zoom part sections of the echo curve.

- "X-Zoom": Zoom function for the meas. distance
- "Y-Zoom": 1, 2, 5 and 10x signal magnification in "*V*"
- "Unzoom": Reset the presentation to the nominal measuring range without magnification

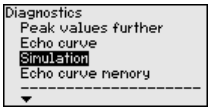


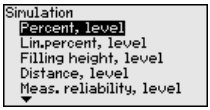


Diagnosis - Simulation

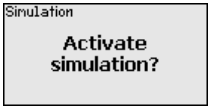
In this menu item you can simulate measured values via the current output. This allows the signal path to be tested, e.g. through downstream indicating instruments or the input card of the control system.

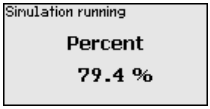
To activate the simulation, you have to set the simulation switch on the electronics module to 1.

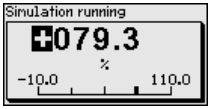




Select the requested simulation variable and set the requested value.







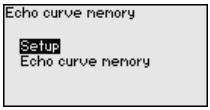
Push the ***[ESC]*** key to deactivate the simulation.

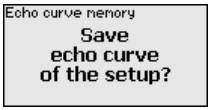
Information:
The simulation is terminated automatically 60 minutes after the activation of the simulation.

Diagnostics - Echo curve memory

With the menu item "*Setup*" the echo curve it is possible to save at the time of setup. This is generally recommended; for using the Asset Management functions it is necessary. If possible, the curve should be saved with a low level in the vessel.

With this, you can detect signal changes over the operating time. With the adjustment software PACTware and the PC, the high-resolution echo curve can be displayed and used to compare the echo curve of the setup with the actual echo curve.



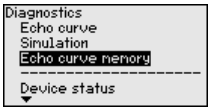


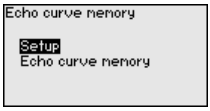
The function "*Echo curve memory*" enables storing echo curves of the measurement.

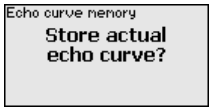
Under the sub-menu item "*Echo curve memory*" you can store the current echo curve.

Parameter settings for recording the echo curve and the settings of the echo curve itself can be carried out in the adjustment software PACTware.

With the adjustment software PACTware and the PC the high-resolution echo curve can be displayed and used later on to assess the quality of the measurement.

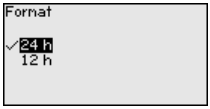


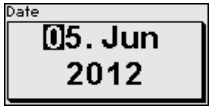


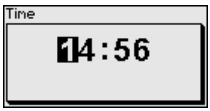


Additional settings - Date/ Time

In this menu item, the internal clock of the sensor is set.



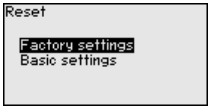




Additional settings - Reset

After a reset, certain parameter adjustments made by the user are reset.

Note:
After this menu window, the reset process is carried out. No further safety inquiry follows.



The following reset functions are available:

Delivery status: Restores the parameter settings at the time of shipment from the factory, incl. order-specific settings. Any stored false signal suppression or user-programmed linearisation curve, as well as the measured value memory, are deleted.

Basic settings: Restores the parameter settings, incl. special parameters, to the default values of the respective instrument. Any stored false signal suppression or user-programmed linearisation curve, as well as the measured value memory, are deleted.

The following table shows the default values of the instrument. Depending on the instrument version or application, all menu items may not be available or some may be differently assigned:

Menu - Setup

Menu	Menu item	Default value
Setup	Lock adjustment	Released
	Measurement loop name	Sensor
	Units	Distance unit: order-specific Temperature unit: order-specific
	Probe length	Länge der Messsonde factory setting
	Type of medium	Liquid
	Application	Level in the vessel
	Medium, dielectric constant	Water-based, > 10
	Superimposed gas phase	Yes
	Dielectric constant, upper medium (TS)	1.5
	Tube inner diameter	200 mm
Setup	Max. adjustment - Level	100 %
	Max. adjustment - Level	Distance: 0.000 m(d) - note blocking distances
	Min. adjustment - Level	0 %
	Min. adjustment - Level	Distance: Probe length - take dead band into account
	Accept adjustment of the level measurement?	No
	Max. adjustment - Interface	100 %
	Max. adjustment - Interface	Distance: 0.000 m(d) - note blocking distances
	Min. adjustment - Interface	0 %
	Min. adjustment - Interface	Distance: Probe length - take dead band into account
Setup	Integration time - Level	0.0 s
	Integration time - Interface	0.0 s
Setup	Linearisation type	Linear
	Linearisation - Socket correction	0 mm
	Linearisation - Vessel height	Probe length

Menu - Display

Menu	Menu item	Default value
Display	Language	Selected language
	Displayed value 1	Filling height Level
	Displayed value 2	Electronics temperature
	Backlight	Switched on

Menu - Diagnosis

Menu	Menu item	Default value
Diagnostics	Status signals - Function control	Switched on
	Status signals - Out of specification	Switched off
	Status signals - Maintenance	Switched off
Diagnostics	Device memory - Echo curve memory	Stopped
	Device memory - Measured value memory	Started
	Device memory - Measured value memory - Measured values	Distance level, percentage value level, reliability level, electronics temperature
	Device memory - Measured value memory - Recording in time interval	3 min.
	Device memory - Measured value memory - Recording with measured value difference	15 %
	Device memory - Measured value memory - Start with measured value	Not active
	Device memory - Measured value memory - Stop with measured value	Not active
	Device memory - Measured value memory - Stop recording when memory is full	Not active

Menu - Additional adjustments

Menu	Menu item	Default value
Additional adjustments	PIN	0000
	Date	Actual date
	Time	Actual time
	Time - Format	24 hours
	Probe type	Device-specific

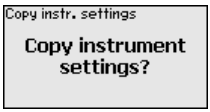
Additional settings - Copy instrument settings

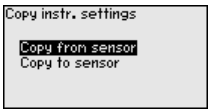
The instrument settings are copied with this function. The following functions are available:

- Read from sensor: Read data from sensor and save in the display and adjustment module
- Write to sensor: Save data from the display and adjustment module back into the sensor

The following data or settings for adjustment of the display and adjustment module are saved:

- All data of the menu "*Setup*" and "*Display*"
- In the menu "*Additional adjustments*" the items "*Reset, Date/Time*"
- Special parameters





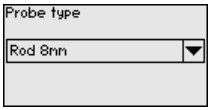
The copied data are permanently saved in an EEPROM memory in the display and adjustment module and remain there even in case of power failure. From there, they can be written into one or more sensors or kept as backup for a possible electronics exchange.

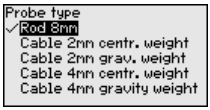
Note:
Before the data are stored in the sensor, a check is carried out to determine if the data fit the sensor. If the data do not fit, a fault signal is triggered or the function is blocked. When data are being written into the sensor, the display shows which instrument type the data originate from and which TAG-no. this sensor had.

Tip:
We recommend to save the instrument adjustments. In case of an electronics exchange the saved parameter adjustment data relieve this process.

Additional settings - Probe type

In this menu item you can select the type and size of your probe from a list of all possible probes. This is necessary to adapt the electronics optimally to the probe.

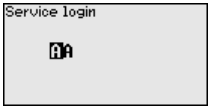




Additional settings - Special parameters

In this menu item you gain access to the protected area where you can enter special parameters. In exceptional cases, individual parameters can be modified in order to adapt the sensor to special requirements.

Change the settings of the special parameters only after having contacted our service staff.

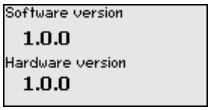


Info - Instrument name

In this menu, you read out the instrument name and the instrument serial number.

Info - Instrument version

In this menu item, the hardware and software version of the sensor is displayed.

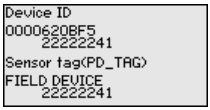


Info - Factory calibration date

In this menu item, the date of factory calibration of the sensor as well as the date of the last change of sensor parameters are displayed via the display and adjustment module or via the PC.

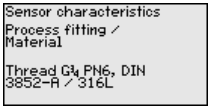
Info - Device ID

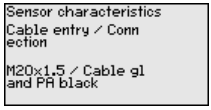
In this menu item, the identification number of the instrument in a Foundation Fieldbus system is shown.



Info - Sensor characteristics

In this menu item, the features of the sensor such as approval, process fitting, seal, measuring range, electronics, housing and others are displayed.





Example for displayed sensor features.

6.5 Saving the parameterisation data

Backup on paper

We recommended writing down the adjustment data, e.g. in this operating instructions manual, and archiving them afterwards. They are thus available for multiple use or service purposes.

Backup in the display and adjustment module

If the instrument is equipped with a display and adjustment module, the data in the sensor can be saved in the display and adjustment module. The procedure is described in menu item "*Copy device settings*" in the menu "*Additional settings*". The data remain there permanently even if the sensor power supply fails.

The following data or settings for adjustment of the display and adjustment module are saved:

- All data of the menu "*Setup*" and "*Display*"
- The items "*Sensor-specific units, temperature unit and linearisation*" in the menu "*Additional settings*".
- The values of the user-programmable linearisation curve

The function can also be used to transfer settings from one instrument to another instrument of the same type. If it is necessary to exchange a sensor, the display and adjustment module is inserted into the replacement instrument and the data are likewise written into the sensor via the menu item "*Copy device settings*".

7 Setup with PACTware

7.1 Connect the PC

Via the interface adapter directly on the sensor

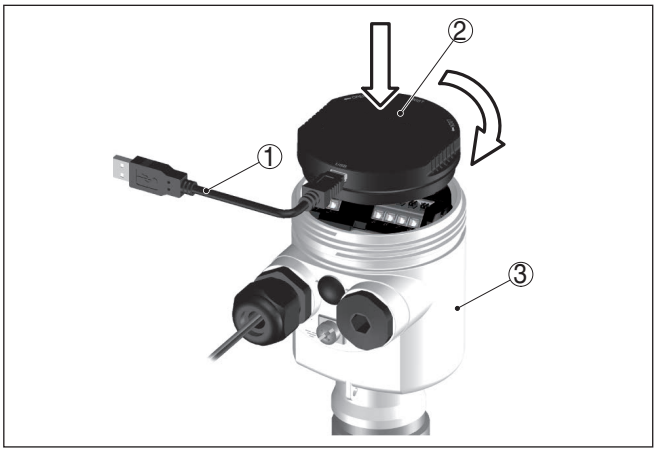


Fig. 17: Connection of the PC directly to the sensor via the interface adapter

1 USB cable to the PC
2 Interface adapter
3 Sensor

7.2 Parameter adjustment with PACTware

Prerequisites

For parameter adjustment of the sensor via a Windows PC, the configuration software PACTware and a suitable instrument driver (DTM) according to FDT standard are required. The available DTMs are compiled on a DVD. The DTMs can also be integrated into other frame applications according to FDT standard.

Note:
To ensure that all instrument functions are supported, you should always use the latest DTM. Furthermore, not all described functions are included in older firmware versions. You can download the latest instrument software from our homepage. A description of the update procedure is also available in the Internet.

The further setup steps are described in the online help of PACTware and the DTMs.

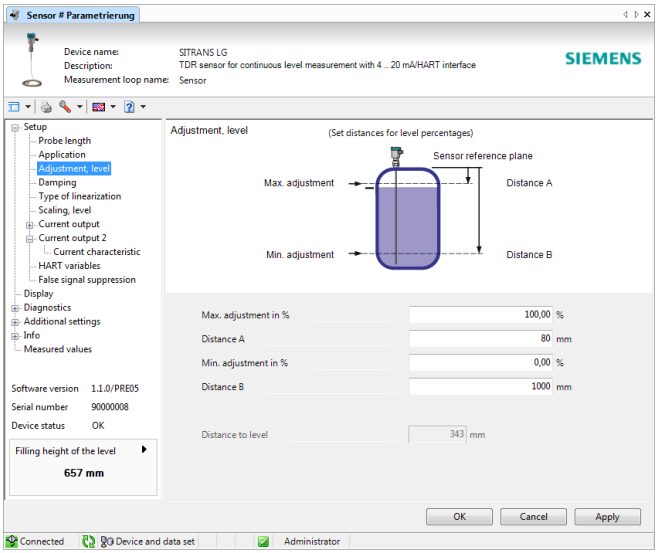


Fig. 18: Example of a DTM view

Device DTMs

The device DTM includes an assistant for simple project configuration simplifying the adjustment considerably. You can save and print your project documentation as well as import and export projects.

You can also save measured value and echo curves in the DTM. Furthermore a tank calculation program as well as a multiviewer for indication and analysis of the saved measured value and echo curves are available.

The supplied DVD includes the respective device DTM. However, you can also download the DTM from our homepage www.siemens.com/sitranslg.

7.3 Set up with the quick setup

General information

The quick setup is another option for parameter adjustment of the sensor. It allows fast, convenient adjustment of the most important parameters to adapt the sensor quickly to standard applications. To use it, select the function "*Quick setup*" in the start screen.

44583-EN-171021

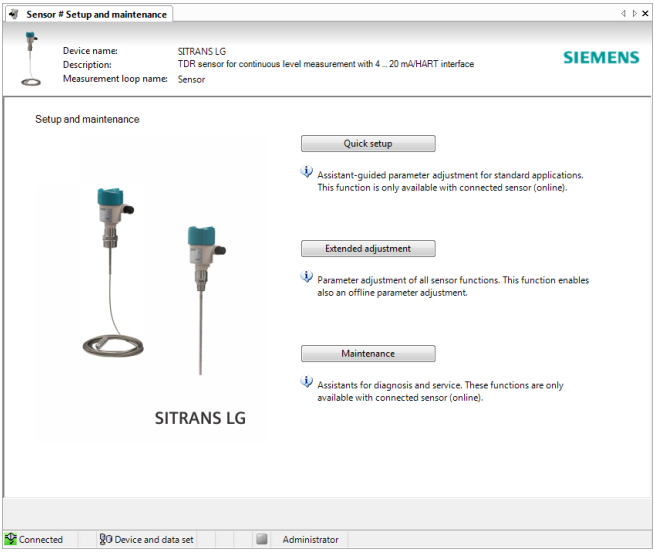


Fig. 19: Select quick setup

1 Quick setup
2 Extended adjustment
3 Maintenance

Quick setup
With quick setup you can carry out the parameter adjustment of SITRANS LG270 for your application in just a few simple steps. The assistant-driven adjustment includes the basic settings for simple, reliable setup and commissioning.

Information:
If the function is inactive, then possibly no instrument is connected. Check the connection to the instrument.

Extended adjustment
With the extended adjustment, you carry out the parameter adjustment for the instrument via the clear menu structure in the DTM (Device Type Manager). This enables additional and special settings over and above those offered by quick setup.

Maintenance
Under the menu item "*Maintenance*" you get comprehensive and important support for servicing and maintenance. You can call up diagnostic functions and carry out an electronics exchange or a software update.

Start quick setup

Click to the button "*Quick setup*", to start the assistant-driven adjustment for a simplified and reliable setup.

7.4 Saving the parameterisation data

We recommend documenting or saving the parameterisation data via PACTware. That way the data are available for multiple use or service purposes.

8 Set up with other systems

8.1 DD adjustment programs

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

8.2 Field Communicator 375, 475

Device descriptions for the instrument are available as EDD for parameterisation with Field Communicator 375 or 475.

Integrating the EDD into the Field Communicator 375 or 475 requires the "Easy Upgrade Utility" software, which is available from the manufacturer. This software is updated via the Internet and new EDDs are automatically accepted into the device catalogue of this software after they are released by the manufacturer. They can then be transferred to a Field Communicator.

9 Diagnostics and servicing

9.1 Maintenance

If the instrument is used correctly, no maintenance is required in normal operation.

9.2 Diagnosis memory

The instrument has several memories available for diagnostic purposes. The data remain there even in case of voltage interruption.

Measured value memory

Up to 100,000 measured values can be stored in the sensor in a ring memory. Each entry contains date/time as well as the respective measured value. Storable values are for example:

- Distance
- Filling height
- Percentage value
- Lin. percent
- Scaled
- Current value
- Meas. certainty
- Electronics temperature

When the instrument is shipped, the measured value memory is active and stores distance, measurement certainty and electronics temperature every 3 minutes.

In "Extended adjustment" you can select the respective measured values.

The requested values and recording conditions are set via a PC with PACTware/DTM or the control system with EDD. Data are thus read out and also reset.

Event memory

Up to 500 events are automatically stored with a time stamp in the sensor (non-deletable). Each entry contains date/time, event type, event description and value. Event types are for example:

- Modification of a parameter
- Switch-on and switch-off times
- Status messages (according to NE 107)
- Error messages (according to NE 107)

The data are read out via a PC with PACTware/DTM or the control system with EDD.

Echo curve memory

The echo curves are stored with date and time and the corresponding echo data. The memory is divided into two sections:

Echo curve of the setup: This is used as reference echo curve for the measurement conditions during setup. Changes in the measurement conditions during operation or buildup on the sensor can thus be recognized. The echo curve of the setup is stored via:

- PC with PACTware/DTM
- Control system with EDD

- Display and adjustment module

Further echo curves: Up to 10 echo curves can be stored in a ring buffer in this memory section. Additional echo curves are stored via:

- PC with PACTware/DTM
- Control system with EDD
- Display and adjustment module

9.3 Status messages

The instrument features self-monitoring and diagnostics according to NE 107 and VDI/VDE 2650. In addition to the status messages in the following tables, detailed error messages are available under menu item "*Diagnostics*" via the display and adjustment module, PACTware/DTM and EDD.

Status messages

The status messages are divided into the following categories:

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

and explained by pictographs:

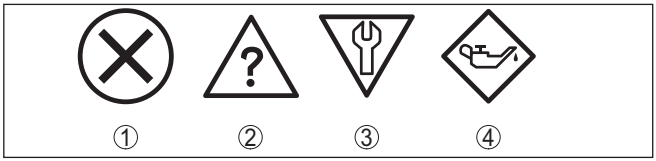


Fig. 20: Pictographs of the status messages

1 Failure - red
2 Out of specification - yellow
3 Function check - orange
4 Maintenance - blue

Failure: Due to a malfunction in the instrument, a fault message is outputted.

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

Function check: The instrument is being worked on, the measured value is temporarily invalid (for example during simulation).

This status message is inactive by default. It can be activated by the user via PACTware/DTM or EDD.

Out of specification: The measured value is unreliable because an instrument specification was exceeded (e.g. electronics temperature).

This status message is inactive by default. It can be activated by the user via PACTware/DTM or EDD.

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

This status message is inactive by default. It can be activated by the user via PACTware/DTM or EDD.

Failure (failure)

The following table shows the codes and text messages of the status message "*Failure*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
F013 no measured value available	● Sensor does not detect an echo during operation ● Antenna system dirty or defective	● Check for correct mounting and/or parameter settings ● Clean or exchange process component or antenna	Bit 0
F017 Adjustment span too small	● Adjustment not within specification	● Change adjustment according to the limit values (difference between min. and max. ≥ 10 mm)	Bit 1
F025 Error in the linearization table	● Index markers are not continuously rising, for example illogical value pairs	● Check linearisation table ● Delete table/Create new	Bit 2
F036 No operable software	● Failed or interrupted software update	● Repeat software update ● Check electronics version ● Exchanging the electronics ● Send instrument for repair	Bit 3
F040 Error in the electronics	● Hardware defect	● Exchanging the electronics ● Send instrument for repair	Bit 4
F041 Probe loss	● Cable probe broken or rod probe defective	● Check probe and exchange, if necessary	Bit 13
F080 General software error	● General software error	● Briefly separate operating voltage	Bit 5
F105 Measured value is determined	● The instrument is still in the start phase, the measured value could not yet be determined	● Wait for the end of the switch-on phase ● Duration up to approx. 3 minutes depending on the version and parameter settings	Bit 6
F113 Communication error	● Error in the internal instrument communication	● Briefly separate operating voltage ● Send instrument for repair	-
F125 Impermissible electronics temperature	● Temperature of the electronics in the non-specified range	● Check ambient temperature ● Insulate electronics ● Use instrument with higher temperature range	Bit 7
F260 Error in the calibration	● Error in the calibration carried out in the factory ● Error in the EEPROM	● Exchanging the electronics ● Send instrument for repair	Bit 8
F261 Error in the instrument settings	● Error during setup ● False signal suppression faulty ● Error when carrying out a reset	● Repeat setup ● Repeat reset	Bit 9

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
F264 Installation/Set-up error	● Adjustment not within the vessel height/measuring range ● Max. measuring range of the instrument not sufficient	● Check for correct mounting and/or parameter settings ● Use an instrument with bigger measuring range	Bit 10
F265 Measurement function disturbed	● Sensor no longer carries out a measurement ● Operating voltage too low	● Check operating voltage ● Carry out a reset ● Briefly separate operating voltage	Bit 11
F266 Impermissible operating voltage	● Wrong operating voltage	● Check operating voltage ● Check connection cables	Bit 14
F267 No executable sensor software	● Sensor cannot start	● Exchanging the electronics ● Send instrument for repair	-

Function check

The following table shows the error codes and text messages in the status message "*Function check*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Rectification	TB Diagnostics
C700 Simulation active	● A simulation is active	● Finish simulation ● Wait for the automatic end after 60 mins.	Bit 27

Out of specification

The following table shows the error codes and text messages in the status message "*Out of specification*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Rectification	TB Diagnostics
S600 Impermissible electronics temperature	● Temperature of the processing electronics in the non-specified section	● Check ambient temperature ● Insulate electronics ● Use instrument with higher temperature range	Bit 23
S601 Overfilling	● Level echo in the close range not available	● Reduce level ● 100 % adjustment: Increase value ● Check mounting socket ● Remove possible interfering signals in the close range ● Use coaxial probe	Bit 24
S602 Level within the search range, compensation echo	● Compensation echo superimposed by medium	● 100 % adjustment: Increase value	Bit 25

Code Text message	Cause	Rectification	TB Diagnostics
S603 Impermissible operating voltage	● Operating voltage below specified range	● Check electrical connection ● If necessary, increase operating voltage	Bit 26

Maintenance

The following table shows the error codes and text messages in the status message "*Maintenance*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Rectification	TB Diagnostics
M500 Error in the delivery status	● The data could not be restored during the reset to delivery status	● Repeat reset ● Load XML file with sensor data into the sensor	Bit 15
M501 Error in the non-active linearisation table	● Index markers are not continuously rising, for example illogical value pairs	● Check linearisation table ● Delete table/Create new	Bit 16
M504 Error at a device interface	● Hardware defect	● Exchanging the electronics ● Send instrument for repair	Bit 19
M505 no measured value available	● Sensor does not detect an echo during operation	● Check and correct mounting and/or parameter adjustment	Bit 20
	● Process component or probe contaminated or defective	● Clean or exchange process component or probe	Bit 20
M506 Installation/Set-up error	● Error during setup	● Check and correct mounting and/or parameter adjustment ● Check probe length	Bit 21
M507 Error in the instrument settings	● Error during setup ● Error when carrying out a reset ● False signal suppression faulty	● Carry out reset and repeat setup	Bit 22

9.4 Rectify faults

Reaction when malfunction occurs

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

Procedure for fault rectification

The first measures are:

- Evaluation of fault messages via the adjustment device
- Checking the output signal
- Treatment of measurement errors

Further comprehensive diagnostics options are available with a PC with PACTware and the suitable DTM. In many cases, the reasons can be determined in this way and faults rectified.

Treatment of measurement errors

The below tables show typical examples for application-relevant measurement errors. There are two measurement errors:

- Constant level
- Filling
- Emptying

The images in column "*Error pattern*" show the real level as a broken line and the level displayed by the sensor as a continuous line.

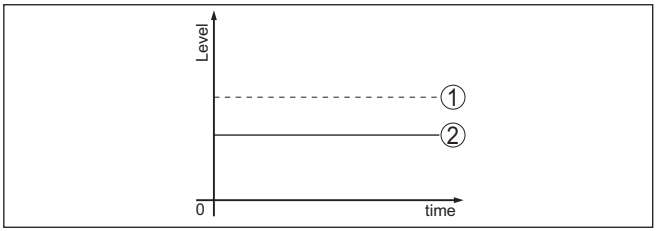
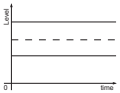
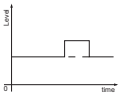


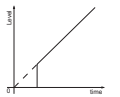
Fig. 21: The broken line 1 shows the real level, the continuous line 2 shows the level displayed by the sensor

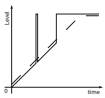
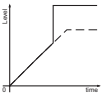
Note:
- Wherever the sensor displays a constant value, the reason could also be the fault setting of the current output to "*Hold value*"
- If the level indication is too low, the reason could be a line resistance that is too high

Measurement error with constant level

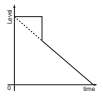
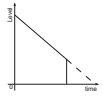
Fault description	Error pattern	Cause	Rectification
1. Measured value shows a too low or too high level		● Min./max. adjustment not correct	● Adapt min./max. adjustment
		● Incorrect linearisation curve	● Adapt linearisation curve
		● Running time error (small measurement error close to 100 %/ serious error close to 0 %)	● Repeat setup
2. Measured value jumps towards 100 %		● Due to the process, the amplitude of the product echo decreases ● A false signal suppression was not carried out	● Carry out a false signal suppression
		● Amplitude or position of a false signal has changed (e.g. buildup); false signal suppression no longer matches	● Determine the reason for the changed false signals, carry out false signal suppression, e.g. with buildup

Measurement error during filling

Fault description	Error pattern	Cause	Rectification
3. Measured value remains in the area of the bottom during filling		● Echo from the probe end larger than the product echo, for example, with products with $\varepsilon_r < 2.5$ oil-based, solvents, etc.	● Check parameter "Medium" and "Vessel height", adapt if necessary

Fault description	Error pattern	Cause	Rectification
4. Measured value remains momentarily unchanged during filling and then jumps to the correct level		● Turbulence on the product surface, quick filling	● Check parameters, change if necessary, e.g. in dosing vessel, reactor
5. Measured value jumps sporadically to 100 % during filling		● Changing condensation or contamination on the probe	● Carry out a false signal suppression
6. Measured value jumps to ≥ 100 % or 0 m distance		● Level echo is no longer detected in the close range due to false signals in the close range. The sensor goes into overfill protection mode. The max. level (0 m distance) as well as the status message "Overfill protection" are outputted.	● Eliminate false signals in the close range ● Check installation conditions ● If possible, switch off the function "Overfill protection"

Measurement error during emptying

Fault description	Error pattern	Cause	Rectification
7. Measured value remains unchanged in the close range during emptying		● False signal larger than the level echo ● Level echo too small	● Eliminate false signals in the close range ● Remove contamination on the probe. After having removed the source of the false signals, the false signal suppression must be deleted. ● Carry out a new false signal suppression
8. Measured value remains reproducible in one position during emptying		● Stored false signals in this position are larger than the level echo	● Delete false signal suppression ● Carry out a new false signal suppression

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.

9.5 Exchanging the electronics module

If the electronics module is defective, it can be replaced by the user.

In Ex applications, only instruments and electronics modules with appropriate Ex approval may be used.

If there is no electronics module available on site, the electronics module can be ordered through the agency serving you. The electronics modules are adapted to the respective sensor and differ in signal output or voltage supply.

The new electronics module must be loaded with the default settings of the sensor. These are the options:

- In the factory
- Or on site by the user

In both cases, the serial number of the sensor is needed. The serial numbers are stated on the type label of the instrument, on the inside of the housing as well as on the delivery note.

When loading on site, the order data must first be downloaded from the Internet (see operating instructions manual "*Electronics module*").

Caution:
All application-specific settings must be entered again. That's why you have to carry out a fresh setup after exchanging the electronics.

If you saved the parameter settings during the first setup of the sensor, you can transfer them to the replacement electronics module. A fresh setup is then not necessary.

9.6 Software update

The following components are required to update the sensor software:

- Sensor
- Voltage supply
- PC with PACTware
- Current sensor software as file

You can find the actual sensor software as well as detailed information of the procedure in the download area on our homepage: www.siemens.com/sitranslg.

You can find information about the installation in the download file.

Caution:
Instruments with approvals can be bound to certain software versions. Therefore make sure that the approval is still effective after a software update is carried out.

You can find detailed information in the download area on our homepage: www.siemens.com/sitranslg.

9.7 How to proceed if a repair is necessary

If it is necessary to repair the instrument, please contact Siemens Milltronics Process Instruments. You find the locations on "www.siemens.com/sitranslg".

10 Dismount

10.1 Dismounting steps

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel or pipeline, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

10.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronics to be easily separable.

Correct disposal avoids negative effects on humans and the environment and ensures recycling of useful raw materials.

Materials: see chapter "*Technical data*"

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

WEEE directive 2012/19/EU
This instrument is not subject to the WEEE directive 2012/19/EU and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

11 Supplement

11.1 Technical data

General data

Material 316L corresponds to 1.4404 or 1.4435	
Materials, wetted parts	
– Process fitting - rod version	316L, 904L (1.4539), Alloy C22 (2.4602) and Aluminium oxide-ceramic 99.7 % (Al_2O_3) or Alloy C22 (2.4602) and Aluminium oxide-ceramic 99.7 % (Al_2O_3)
– Tube: ø 42.2 mm (1.661 in)	316L or Alloy C22 (2.4602)
– Process seal on the instrument side (cable/rod leadthrough)	Aluminium oxide-ceramic 99.7 % (Al_2O_3) and graphite
– Process seal	On site
– Inner conductor (up to the separation rod)	Alloy C22 (2.4602)
– Spacer	AL_2O_3
Materials, non-wetted parts	
– Plastic housing	Plastic PBT (Polyester)
– Aluminium die-cast housing	Aluminium die-casting AlSi10Mg, powder-coated - basis: Polyester
– Stainless steel housing (precision casting)	316L
– Stainless steel housing (electropolished)	316L
– Second Line of Defense	Borosilicate glass GPC 540
– Seal between housing and housing lid	Silicone SI 850 R
– Inspection window in housing cover (optional)	Polycarbonate (with Ex d version: glass)
– Ground terminal	316L
– Cable gland	PA, stainless steel, brass
– Sealing, cable gland	NBR
– Blind plug, cable gland	PA
Second Line of Defense	
– The Second Line of Defense (SLOD) is a second level of the process separation in the form of a gas-tight feedthrough in the lower part of the housing, preventing product from penetrating into the housing.	
– Supporting material	316L
– Glass potting	Borosilicate glass GPC 540
– Contacts	Alloy C22 (2.4602)
– Helium leak rate	$< 10^{-6}$ mbar l/s

– Pressure resistance	See process pressure of the sensor
Process fittings	
– Pipe thread, cylindrical (DIN 3852-A)	G1½
– Pipe thread, conical (ASME B1.20.1)	1½ NPT
– Flanges	DIN from DN 50, ASME from 2"
Weight	
– Instrument weight (depending on process fitting)	approx. 6 … 12 kg (13.23 … 26.46 lbs)
– Tube: ø 42.2 mm (1.661 in)	approx. 3100 g/m (33.3 oz/ft)
Probe length L (from seal surface)	
– Tube: ø 42.2 mm (1.661 in)	up to 6 m (19.69 ft)
– Trimming accuracy - tube	±1 mm
Lateral load	
– Tube: ø 42.2 mm (1.661 in)	300 Nm (221 lbf ft)
Torque for process fitting, thread	
– -196 … +280 °C (-321 … +536 °F)	max. 450 Nm (332 lbf ft)
– -196 … +450 °C (-321 … +842 °F)	max. 400 Nm (295 lbf ft)
Torque for NPT cable glands and Conduit tubes	
– Plastic housing	max. 10 Nm (7.376 lbf ft)
– Aluminium/Stainless steel housing	max. 50 Nm (36.88 lbf ft)

Input variable

Measured variable	Level of liquids
Min. dielectric constant of the medium	$\varepsilon_r \geq 1.4$

Output variable

Output	
– Signal	digital output signal, Foundation Fieldbus protocol
– Physical layer	according to IEC 61158-2
Damping (63 % of the input variable)	0 … 999 s, adjustable
Channel Numbers	
– Channel 1	Process value
– Channel 8	Electronics temperature
Transmission rate	31.25 Kbit/s
Current value	
– Non-Ex and Ex ia instrument	12 mA, ±0.5 mA
– Ex-d-ia instruments	16 mA, ±0.5 mA
Resolution, digital	> 1 mm (0.039 in)

Accuracy (according to DIN EN 60770-1)

Process reference conditions according to DIN EN 61298-1	
– Temperature	+18 … +30 °C (+64 … +86 °F)

– Relative humidity	45 … 75 %
– Air pressure	+860 … +1060 mbar/+86 … +106 kPa (+12.5 … +15.4 psig)
Mounting, reference conditions	
– Min. distance to internal installations	> 500 mm (19.69 in)
– Vessel	metallic, ø 1 m (3.281 ft), centric mounting, process fitting flush with the vessel ceiling
– Medium	Water/Oil (dielectric constant ~2.0)[1)]
– Mounting	Probe end does not touch the vessel bottom
Sensor parameter adjustment	No gating out of false signals carried out

[1)] With interface measurement = 2.0

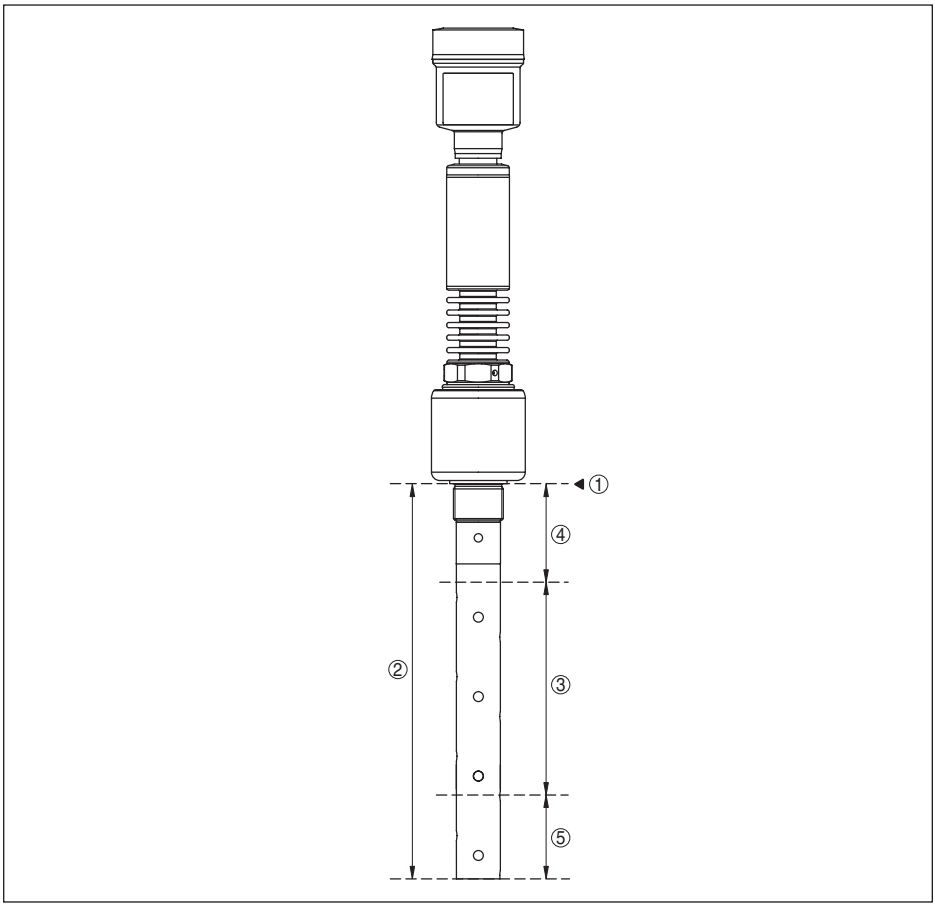


Fig. 30: Measuring ranges - SITRANS LG270

1 Reference plane
2 Probe length L
3 Measuring range (default setting refers to the measuring range in water)
4 Upper dead band (see following diagrams - grey section)
5 Lower dead band (see following diagrams - grey section)

Typical deviation - Interface measurement	± 5 mm (0.197 in)
Typical deviation - Total level interface measurement	See following diagrams
Typical deviation - Level measurement[2)3)]	See following diagrams

[2)] Depending on the mounting conditions, deviations can occur which can be rectified by adapting the adjustment or changing the measured value offset in the DTM service mode.
[3)] The dead bands can be optimized via a false signal suppression.

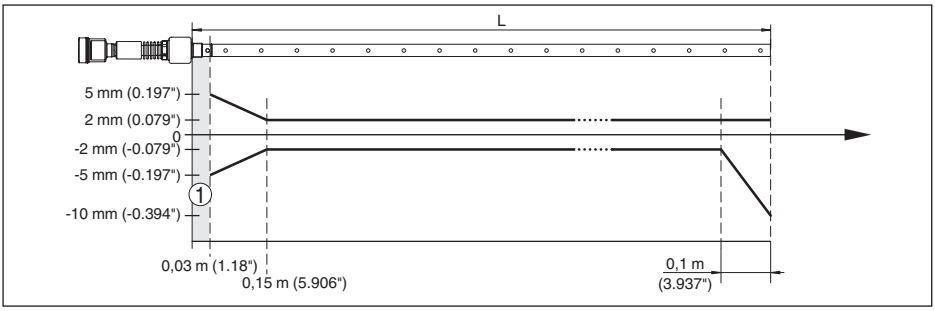


Fig. 31: Deviation SITRANS LG270 in coax version in water (measurement length up to 1.5 m/4.92 ft)

1 Dead band (no measurement possible in this area)
L Probe length

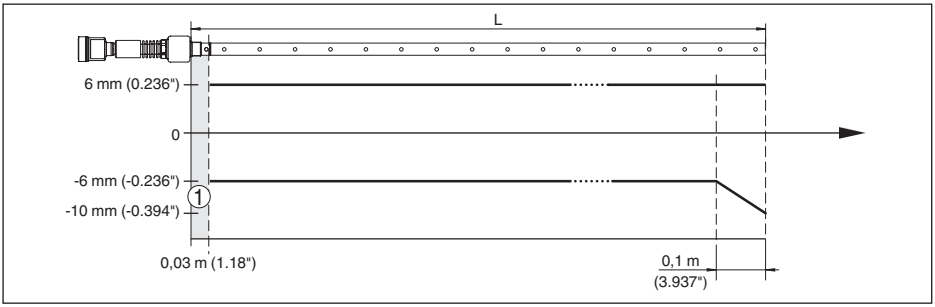


Fig. 32: Deviation SITRANS LG270 in coax version in water (measurement length up to 6 m/19.69 ft)

1 Dead band (no measurement possible in this area)
L Probe length

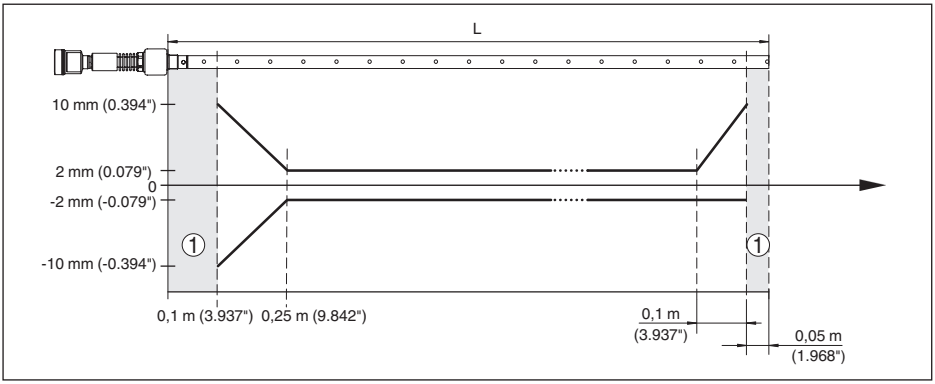


Fig. 33: Deviation SITRANS LG270 in coax version in oil (measurement length up to 1.5 m/4.92 ft)

1 Dead band (no measurement possible in this area)
L Probe length

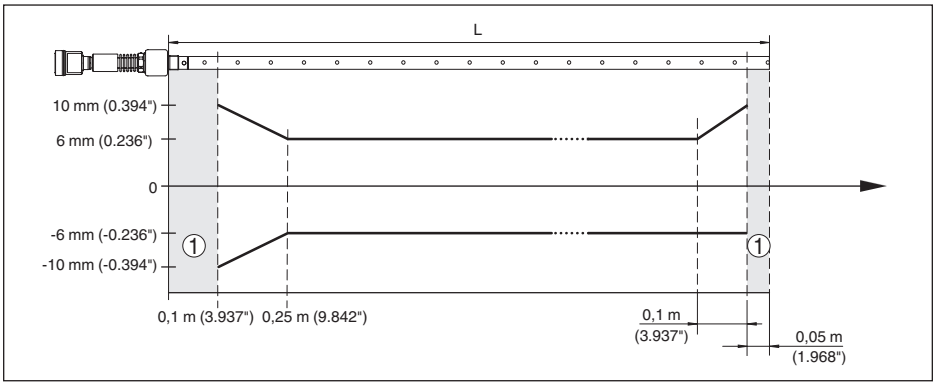


Fig. 34: Deviation SITRANS LG270 in coax version in oil (measurement length up to 6 m/19.69 ft)

1 Dead band (no measurement possible in this area)
L Probe length

Max. deviation and max. deviating upper blocking distance - version with reference distance

Length - Reference distance (7)	Length - Blocking distance (4)	Probe length min. (2)	Deviation max.
260 mm (10.24 in)	450 mm (17.72 in)	> 1000 mm (39.37 in)	± 10 %
500 mm (19.69 in)	690 mm (27.17 in)	> 1250 mm (49.21 in)	± 5 %
750 mm (29.53 in)	940 mm (37.01 in)	> 1500 mm (59.06 in)	± 3 %

Repeatability ≤ ±1 mm

Variables influencing measurement accuracy

Temperature drift - Digital output ±3 mm/10 K relating to the max. measuring range or max. 10 mm (0.394 in)

Additional deviation through electromagnetic interference acc. to EN 61326 < ±10 mm (< ±0.394 in)

Influence of the superimposed gas and pressure on measurement accuracy

The propagation speed of the radar impulses in gas or vapour above the medium is reduced by high pressure. This effect depends on the superimposed gas or vapours.

The following table shows the resulting deviation for some typical gases and vapours. The specified values refer to the distance. Positive values mean that the measured distance is too large, negative values that the measured distance is too small.

Gas phase	Temperature	Pressure				
		10 bar (145 psig)	50 bar (725 psig)	100 bar (1450 psig)	200 bar (2900 psig)	400 bar (5800 psig)
Air	20 °C/68 °F	0.22 %	1.2 %	2.4 %	4.9 %	9.5 %
	200 °C/392 °F	0.13 %	0.74 %	1.5 %	3 %	6 %
	400 °C/752 °F	0.08 %	0.52 %	1.1 %	2.1 %	4.2 %
Hydrogen	20 °C/68 °F	0.10 %	0.61 %	1.2 %	2.5 %	4.9 %
	200 °C/392 °F	0.05 %	0.37 %	0.76 %	1.6 %	3.1 %
	400 °C/752 °F	0.03 %	0.25 %	0.53 %	1.1 %	2.2 %
Steam (saturated steam)	100 °C/212 °F	-	-	-	-	-
	180 °C/356 °F	2.1 %	-	-	-	-
	264 °C/507 °F	1.44 %	9.2 %	-	-	-
	366 °C/691 °F	1.01 %	5.7 %	13.2 %	76 %	-

Characteristics and performance data

Measuring cycle time	< 500 ms
Step response time[4)]	≤ 3 s
Max. filling/emptying speed	1 m/min Products with high dielectric constant (>10) up to 5 m/min.

Ambient conditions

Ambient, storage and transport temperature	-40 … +80 °C (-40 … +176 °F)

Process conditions

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

The measurement error through the process conditions in the specified pressure and temperature range is < 1 %.

Process pressure	-1 … +400 bar/-100 … +40000 kPa (-14.5 … +5800 psig), depending on the process fitting
Vessel pressure relating to the flange nominal pressure stage	see supplementary instructions manual "*Flanges according to DIN-EN-ASME-JIS*"
Process temperature	-196 … +280 °C (-321 … +536 °F)

4) Time span after a sudden measuring distance change by max. 0.5 m in liquid applications, max 2 m with bulk solids applications, until the output signal has taken for the first time 90 % of the final value (IEC 61298-2).

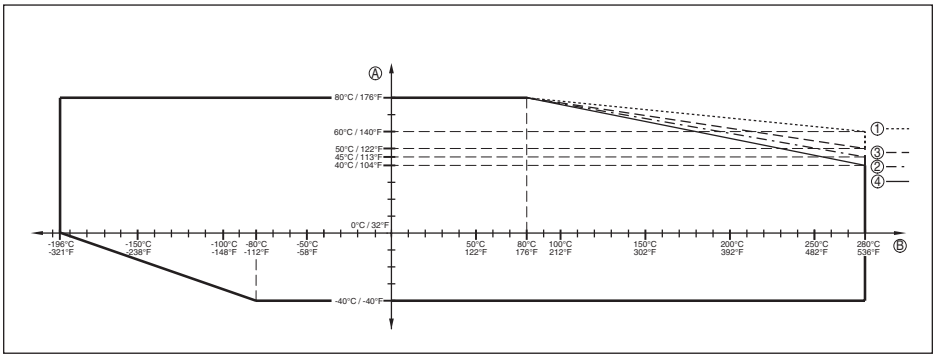


Fig. 35: Ambient temperature - process temperature, standard version

A Ambient temperature
B Process temperature (depending on the seal material)
1 Aluminium housing
2 Plastic housing
3 Stainless steel housing, precision casting
4 Stainless steel housing, electropolished

Process temperature

-196 … +450 °C (-321 … +842 °F)

The measurement error from the process conditions is in the specified pressure and temperature range of below 1 %.

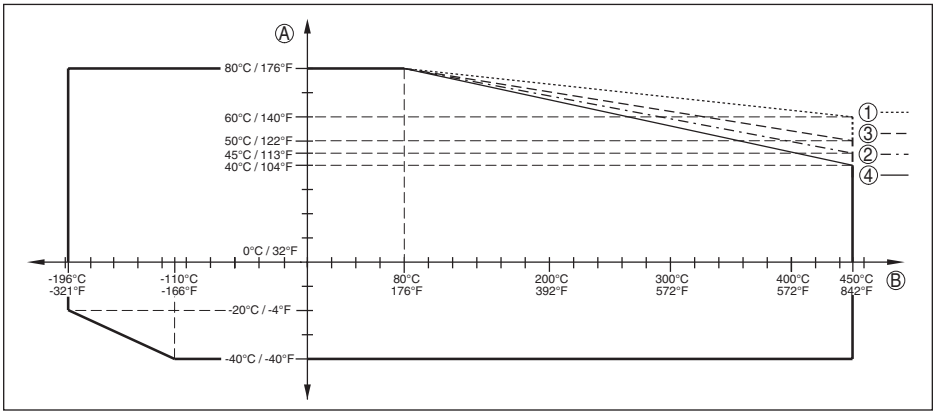


Fig. 36: Ambient temperature - process temperature, standard version

A Ambient temperature
B Process temperature (depending on the seal material)
1 Aluminium housing
2 Plastic housing
3 Stainless steel housing, precision casting
4 Stainless steel housing, electropolished

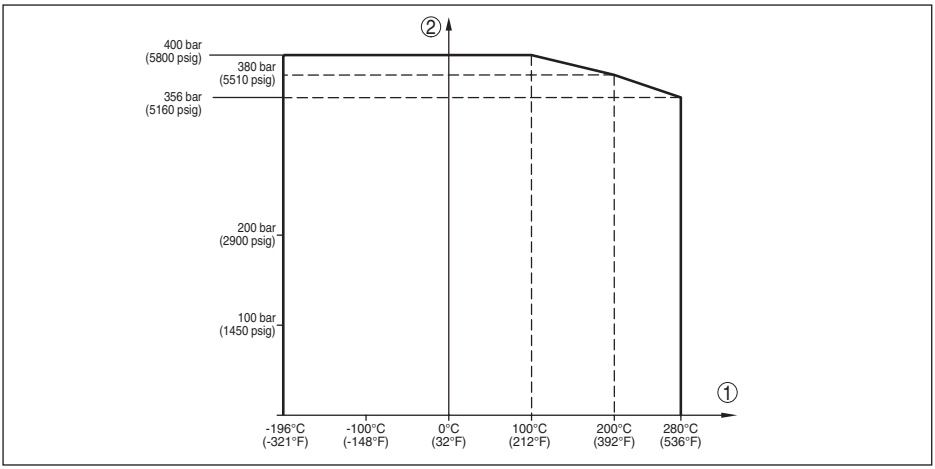


Fig. 37: Process pressure - process temperature (version -196 … +280 °C/-321 … +536 °F)

1 Process temperature (depending on the seal material)
2 Process pressure

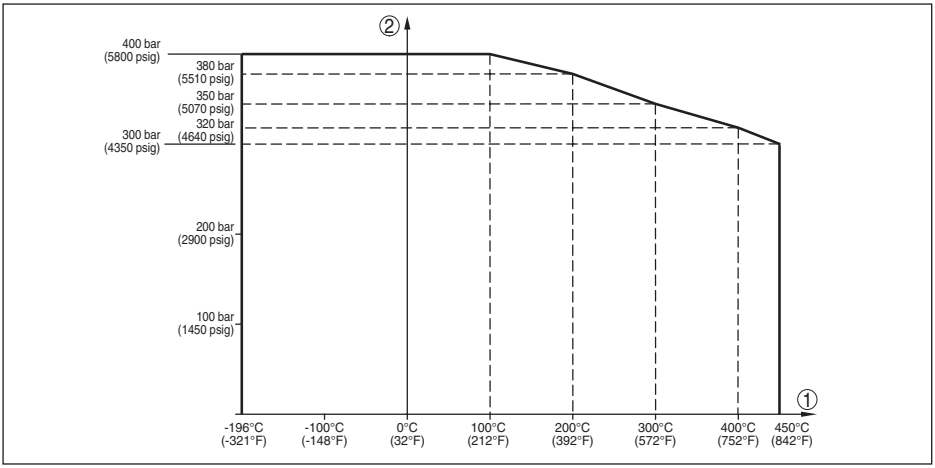


Fig. 38: Process pressure - process temperature (version -196 … +450 °C/-321 … +842 °F)

1 Process temperature (depending on the seal material)
2 Process pressure

	Flanges of 904L (1.4539): see ASME B16.5-2013, Table 2-3.11, permissible temperature range: -60 … +400 °C (-76 … 752 °F)
Viscosity - dynamic	0.1 … 500 mPa s (requirement: with density 1)
Vibration resistance	
– Coax probe	1 g with 5 … 200 Hz according EN 60068-2-6 (vibration at resonance) with tube length 50 cm (19.69 in)

Shock resistance

– Coax probe	25 g, 6 ms according to EN 60068-2-27 (mechanical shock) with tube length 50 cm (19.69 in)

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar

Options of the cable entry

– Cable entry	M20 x 1.5; ½ NPT
– Cable gland	M20 x 1.5; ½ NPT (cable ø see below table)
– Blind plug	M20 x 1.5; ½ NPT
– Closing cap	½ NPT

Material cable gland	Material seal insert	Cable diameter				
		4.5 … 8.5 mm	5 … 9 mm	6 … 12 mm	7 … 12 mm	10 … 14 mm
PA	NBR	–	●	●	–	●
Brass, nickel-plated	NBR	●	●	●	–	–
Stainless steel	NBR	–	●	●	–	●

Wire cross-section (spring-loaded terminals)

– Massive wire, stranded wire	0.2 … 2.5 mm^2 (AWG 24 … 14)
– Stranded wire with end sleeve	0.2 … 1.5 mm^2 (AWG 24 … 16)

Electromechanical data - version IP 66/IP 68 (1 bar)

Options of the cable entry

– Cable gland with integrated connection cable	M20 x 1.5 (cable: ø 5 … 9 mm)
– Cable entry	½ NPT
– Blind plug	M20 x 1.5; ½ NPT

Connection cable

– Wire cross-section	0.5 mm^2 (AWG 20)
– Wire resistance	< 0.036 Ω/m
– Tensile strength	< 1200 N (270 lbf)
– Standard length	5 m (16.4 ft)
– Max. length	180 m (590.6 ft)
– Min. bending radius	25 mm (0.984 in) with 25 °C (77 °F)
– Diameter	approx. 8 mm (0.315 in)
– Colour - Non-Ex version	Black
– Colour - Ex-version	Blue

Display and adjustment module

Display element	Display with backlight

Measured value indication	
– Number of digits	5
– Size of digits	W x H = 7 x 13 mm
Adjustment elements	
– 4 keys	***[OK]***, ***[->]***, ***[+]***, ***[ESC]***
– Switch	Bluetooth On/Off
Protection rating	
– unassembled	IP 20
– mounted in the housing without lid	IP 40
Materials	
– Housing	ABS
– Inspection window	Polyester foil
Functional safety	SIL non-reactive

Integrated clock

Date format	Day.Month.Year
Time format	12 h/24 h
Time zone, factory setting	CET
Max. rate deviation	10.5 min/year

Additional output parameter - Electronics temperature

Output of the values	
– Indication	Via the display and adjustment module
– Analogue	Via the current output
– Digital	Via the digital output signal (depending on the electronics version)
Range	-40 … +85 °C (-40 … +185 °F)
Resolution	< 0.1 K
Accuracy	±3 K

Voltage supply

Operating voltage	
– Non-Ex instrument	9 … 32 V DC
– Ex-ia instrument - Power supply FISCO model	9 … 17.5 V DC
– Ex-ia instrument - Power supply ENTITY model	9 … 24 V DC
– Ex-d-ia instrument	16 … 32 V DC
Operating voltage U_B - illuminated display and adjustment module	
– Non-Ex instrument	13.5 … 32 V DC
– Ex-ia instrument - Power supply FISCO model	13.5 … 17.5 V DC

– Ex-ia instrument - Power supply ENTITY model	13.5 … 24 V DC
– Ex-d-ia instrument	No lighting possible (integrated ia barrier)
Power supply by/max. number of sensors	
– Fieldbus	max. 32 (max. 10 with Ex)

Potential connections and electrical separating measures in the instrument

Electronics	Not non-floating
Ground terminal	Galvanically connected with the metal process fitting
Galvanic separation between electronics and metal housing parts	
– Reference voltage	500 V AC

Electrical protective measures

Protection rating

Housing material	Version	Protection acc. to IEC 60529	Protection acc. to NEMA
Plastic	Single chamber	IP 66/IP 67	Type 4X
	Double chamber	IP 66/IP 67	Type 4X
Aluminium	Single chamber	IP 66/IP 68 (0.2 bar)	Type 6P
	Double chamber	IP 66/IP 67 IP 66/IP 68 (0.2 bar)	Type 4X Type 6P
Stainless steel, electro-polished	Single chamber	IP 66/IP 68 (0.2 bar)	Type 6P
Stainless steel, precision casting	Single chamber	IP 66/IP 68 (0.2 bar)	Type 6P
	Double chamber	IP 66/IP 67 IP 66/IP 68 (0.2 bar)	Type 4X Type 6P

Connection of the feeding power supply unit	Networks of overvoltage category III
Altitude above sea level	
– by default	up to 2000 m (6562 ft)
– with connected overvoltage protection	up to 5000 m (16404 ft)
Pollution degree[5)]	4
Protection class	III[6)]

Approvals

Instruments with approvals can have deviating technical data (depending on the version). For such instruments, the corresponding approval documents must be noted.

11.2 Supplementary information Foundation Fieldbus

The following table gives you an overview of the instrument versions and the corresponding device

[5)] When used with fulfilled housing protection
[6)] IEC 61010-1

descriptions, the electrical characteristics of the bus system as well as the applied function blocks.

Revisions Data	DD-Revision	Rev_01
	CFF-File	030101.cff
	Device Revision	3
	Cff-Revision	xx xx 01
	Device software revision	> 1.3.0
	ITK (Interoperability Test Kit) Number	6.2.0
Electricial Characteristics	Physicial Layer Type	Low-power signaling, bus-powered, FISCO I.S.
	Input Impedance	> 3000 Ohms between 7.8 KHz - 39 KHz
	Unbalanced Capacitance	< 250 pF to ground from either input terminal
	Output Amplitude	0.8 V P-P
	Electrical Connection	2 Wire
	Polarity Insensitive	Yes
	Max. Current Load	10 mA
	Device minimum operating voltage	9 V
Transmitter Function Blocks	Resource Block (RB)	1
	Transducer Block (TB)	1
	Standard Block (AI)	3
	Execution Time	30 mS
Advanced Function Blocks	Discret Input (DI)	Yes
	PID Control	Yes
	Output Splitter (OS)	Yes
	Signal Characterizer (SC)	Yes
	Integrator	Yes
	Input Selector (IS)	Yes
	Arithmetic (AR)	Yes
Diagnostics	Standard	Yes
	Advanced	Yes
	Performance	No
	Function Blocks Instantiable	No
General Information	LAS (Link Active Scheduler)	Yes
	Master Capable	Yes
	Number of VCRs (Virtual Communication Relationships)	24

Function blocks

Transducer Block (TB)

The Transducer Block "*Analog Input (AI)*" takes the original measured value (Secondary Value 2), carries out the min./max. adjustment (Secondary Value 1), carries out a linearization (Primary Value) and makes the values on its output available for further function blocks.

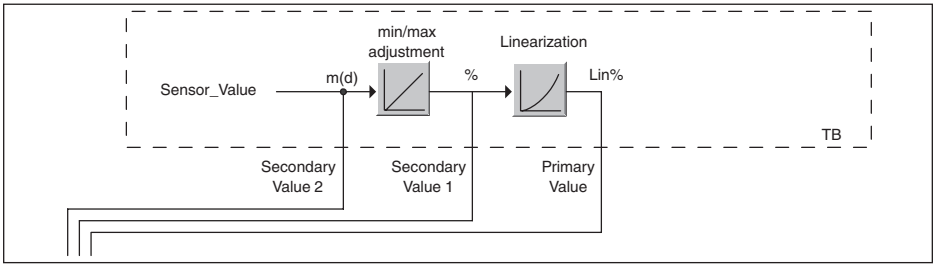


Fig. 39: Schematic presentation Transducer Block (TB)

Function block Analog Input (AI)

The function block "*Analog Input (AI)*" takes the original measured value selected by a Channel Number and makes it available to additional function blocks on its output.

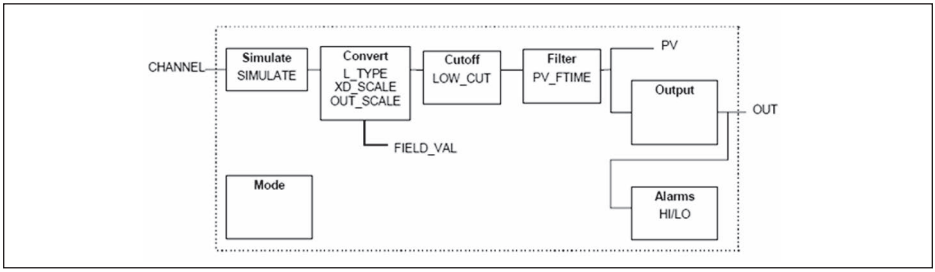


Fig. 40: Schematic presentation function block Analog Input (AI)

Function block Discret Input (DI)

The function block "*Discret Input (DI)*" takes the original measured value selected by a Channel Number and makes it available to additional function blocks on its output.

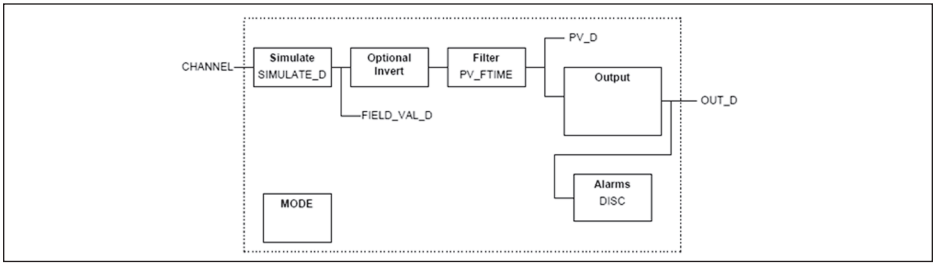


Fig. 41: Schematic presentation function block Discret Input (DI)

Function block PID Control

The function block "*PID Control* " is a key component for various tasks in the process automation

and is used universally. PID blocks can be cascaded if this is necessary or requested due to different time constants with the primary and secondary process measurement.

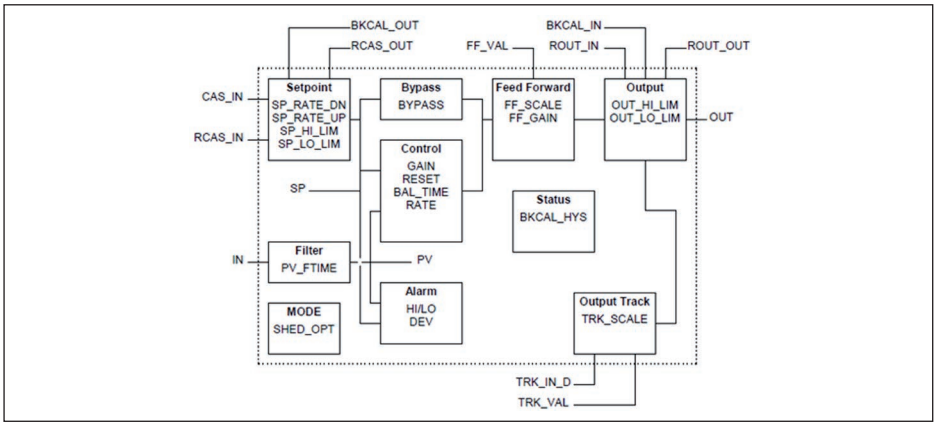


Fig. 42: Schematic presentation function block PID Control

Function block Output Splitter

The function block "*Output Splitter*" generates two control outputs out of one input. Each output is a linear image of a part of the input. A retrograde calculation function is realised by using the linear imaging function inversely. A cascading of several Output Splitters is supported by an integrated decision table for the combinability of inputs and outputs.

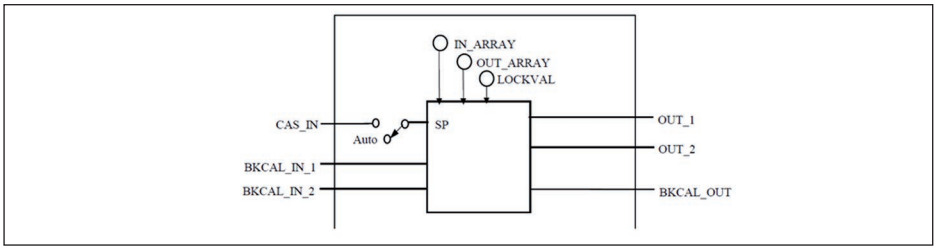


Fig. 43: Schematic presentation function block Output Splitter

Function block Signal Characterizer

The function block "*Signal Characterizer*" has two channels the outputs of which are not in linear relation with the respective input. The non-linear relation is defined by a look-up table with individually selectable x/y-pairs. The respective input signal is imaged on the corresponding output, hence this function block can be used in a control loop or signal path. Optionally the function axis can be exchanged in channel 2 so that the block can be also used in a reverse control loop.

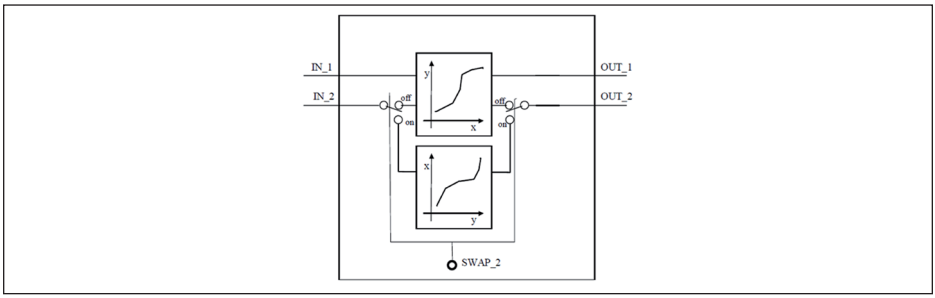


Fig. 44: Schematic presentation function block Signal Characterizer

Function block Integrator

The function block "*Integrator*" integrates a continuous input signal over the time and sums the results of an impulse input block. It is used as a totalizer up to a reset or as a subtotalizer up to a reference point at which the integrated and accumulated value is compared with the default values. When these default values are reached, digital output signals will be outputted. The integration function is carried out upwardly starting with zero and downwards with a default value. Two flow values are also available so that the net flow volume can be calculated and integrated. This can be used for calculation of volume and mass changes in the vessel or for optimisation of flow controls.

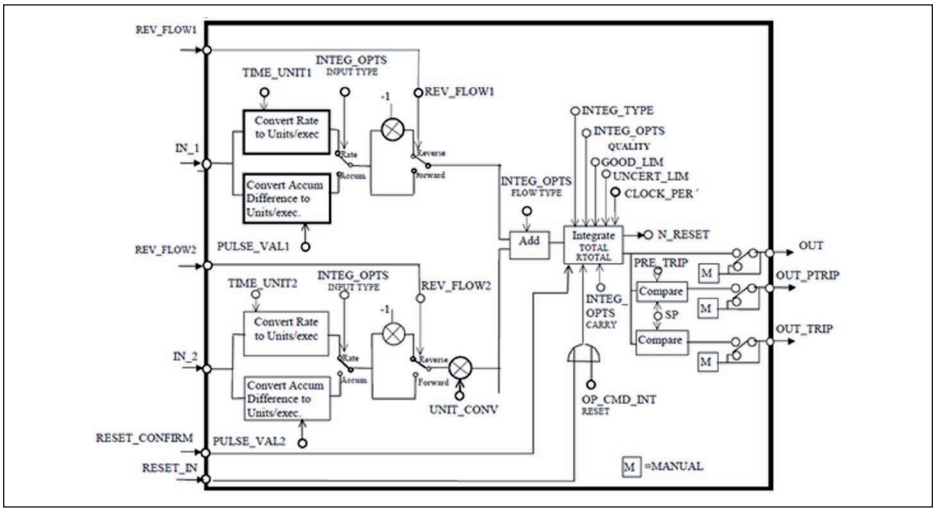


Fig. 45: Schematic presentation function block Integrator

Function block Input Selector

The function block "*Input Selector*" offers selection possibilities for up to four inputs and generates an output signal according to the selection criteria. Typical input signals are AI blocks. Selection possibilities are maximum, minimum, mean value, average value and first useful signal. Through parameter combination, the block can be used as rotary switch or as preselection switch for the first useful value. Switch information can be received by other input blocks or the user. Mean value selection is also supported.

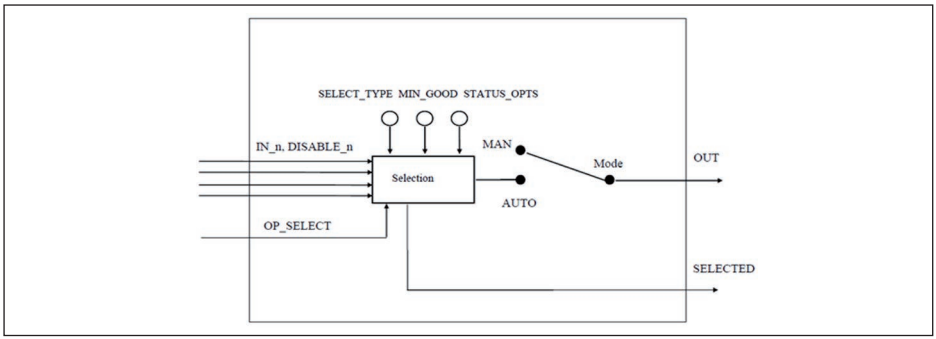


Fig. 46: Schematic presentation function block Input Selector

Function block Arithmetic

The function block "*Arithmetic*" allows the simple integration of usual metrological calculation functions. The user can select the requested measurement algortihm according to the name without known the formula.

The following algorithms are available:

- Flow compensation, linear
- Flow compensation, square root
- Flow compensation, approximate
- BTU flow
- Traditional Multiply Divide
- Average
- Traditional Summer
- Fourth order polynomial
- Simple HTG compensated level
- Fourth order Polynomial Based on PV

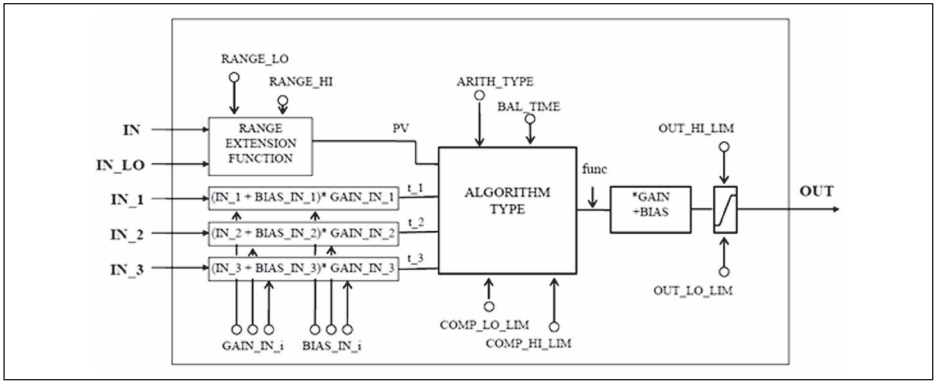


Fig. 47: Schematic presentation function block Arithmetic

Parameter list

The following table gives you an overview of the parameters used.

FF desciptor	Description	Unit
PRIMARY_VALUE	PRIMARY_VALUE (Linearized value). This is the process value after min/max adjustment and Linearization with the status of the transducer block. The unit is defined in "*PRIMARY_VALUE_UNIT*"	
PRIMARY_VALUE_UNIT	Selected unit code for "*PRIMARY_VALUE*"	
SECONDARY_VALUE_1	This is the measured value after min/max adjustment with the status of the transducer block. The unit is defined in "*SECONDARY_VALUE_1_UNIT*"	
SECONDARY_VALUE_1_ UNIT	Selected unit code for "*SECONDARY_VALUE_1*"	
SECONDARY_VALUE_2	This is the distance value ("*sensor_value*") with the status of the transducer block. The unit is defined in "*SECONDARY_VALUE_2_UNIT*"	
FILL_HEIGHT_VALUE	Filling height. The unit is defined in "*FILL_HEIGHT_VALUE_ UNIT*"	
FILL_HEIGHT_VALUE_UNIT	Filling height unit	
CONST_VALUE	Constant value	
SECONDARY_VALUE_1_ TYPE	Secondary value 1 type	
SECONDARY_VALUE_2_ TYPE	Secondary value 2 type	
FILL_HEIGHT_VALUE_Type	Filling height value type	
DIAGNOSIS	AITB Diagnosis	
DIAG_MASK_1		
DIAG_OUT_1		
DIAG_MASK_2		
DIAG_OUT_2		
DEVICE_IDENTIFICATION	Manufacturer ID, device type, bus type ID, measurement principle, serial number, DTM ID, device revision	
DEVICE_NAME	Device name	
IS-SPARE_ELECTRONICS	Device name	
DEVICE_VERSION_INFO	Hard- and software version for system, function and error	
CALIBRATION_DATE	Day, month and year	
FIRMWARE_VERSION_ASCII	Software version	
HW_VERSION_ASCII	Hardware version	
ADJUSTMENT_DATA	Min./max.-adjustment physical, percent and offset	
FIRMWARE_VERSION_MAIN	Firmware versions major, minor, revision and build	
PHYSICAL_VALUES	Distance, distance unit, distance status, level and status	
DEVICE_UNITS	Distance and temperature units of the instrument	
APPLICATION_CONFIG	Medium type, media, application type, vessel bottom, vessel height	
LINEARIZATION_TYPE_SEL	Type of linearization	

FF desciptor	Description	Unit
SIMULATION_PHYSCAL		
INTEGRATION_DATA	Physical offset and integration time	
DEVICE_CONFIG_PULS_ RADAR	Electronics variant, probe type, max. measuring range, antenna extension length, adjustment propagation antenna extension lprapproval configuration	
ADJUSTMENT_LIMITS_MIN	Min. range min.-/max.- values physical, percent, offset	
ADJUSTMENT_LIMITS_MAX	Max. range min.-/max.- values physical, percent, offset	%
FALSE_SIGNAL_COMMAND		%
FALSE_SIGNAL_CMD_CRE-ATE_EXTEND		
FALSE_SIGNAL_CMD_DE-LET_REGION		
FALSE_SIGNAL_CMD_STATE	Busy, last command, errorcode	
FALSE_SIGNAL_CMD_CON-FIGURATION1	Amplitude safety of the 0 % curve, safety of the false signal suppression, position of the 0 % and 100 % curve in near and far range	
FALSE_SIGNAL_CMD_CON-FIGURATION2	Gradient of the manual sectors, safety at the end of false echo memory and depending on the import range gating out the false signals	
ECP_CURVE_AVARAGING_ CONFIG	Averaging factor on increasing and decreasing amplitude	
LEVEL_ECHO_MEASURE-MENT	Function measured value filter	
ECHO_CURVE_STATUS		
PACKET_COUNT		
GU_ID_END		
ECHO_CURVE_READ	Echo curve data	
ECHO_EVALUATOR	Echo parameters, first large echo, amplitude threshold first large echo	
ECHO_DECIDER	Echo selection criteria, fault signal on loss of echo, delay on fault signal on loss of echo	
DISPLAY_SETTINGS	Indication value, menu language, lightning	
SIL_MODE		
EDENVELOPE_CURVE_FIL-TER	Parameters of envelope curve filter, activation of smooth raw value curve	
EDDETECTION_CURVE_FIL-TER	Parameters of the detection filter, offset threshold value curve	
EDECHO_COMBINATION	Parameters for echo combination, function combine echoes, amplitude difference of combined echoes, position difference of combined echoes	
LIN_TABLE_A … LIN_ TABLE_Q	32 couples of percentage and lin. percentage values	
ELECTRONICS_INFORMA-TION	Electronics version	

FF desciptor	Description	Unit
APPLICATION_CONFIG_ SERVICE	Limitation measuring range begin, safety of measuring range end	
LEVEL_ECHO_INFO	Level echo ID, amplitude, measurement safety	
DEVICE_STATUS	Device status	
FALSE_SIGNAL_LIMITS	False signal distance min./max.	
USER_PEAK_ELEC_TEMP	Min.-/max.- values of electronics temperature, date	
USER_MIN_MAX_PHYSI-CAL_VALUE	Min.-/max.- distance values, date	
RESET_PEAK_PHYSICAL_ VALUE		
RESET_LINEARIZATION_ CURVE		
DEVICE_STATUS_ASCII	Device status	
ECHO_CURVE_PLICSCOM_ REQUEST	Parameters as curve selection and resolution	
ECHO_CURVE_PLICSCOM_ LIMITS	Parameters as start and end	
APPROVAL_WHG	Sensor acc. to WHG	
DEVICE_STATE_CONFIG	Function check, maintenance required, out of specification	
ELECTRONIC_TEMPERA-TURE	Electronics temperature	
RESET_PEAK_ELECTRON-IC_TEMP		
FOCUS_RANGE_CONFIG	Width focusing range, time for opening the focusing range, min. measurement reliability in and outside the focusing range	
NOISE_DETECTION_INFO	Increase of the system noise	
NOISE_DETECTION_CON-FIG	System noise treatment	
ECHO_MEM_SAVE_CURVE_ TYPE		
ECHO_MEM_STATE	Busy, curve type, error code	

11.3 Dimensions

Plastic housing

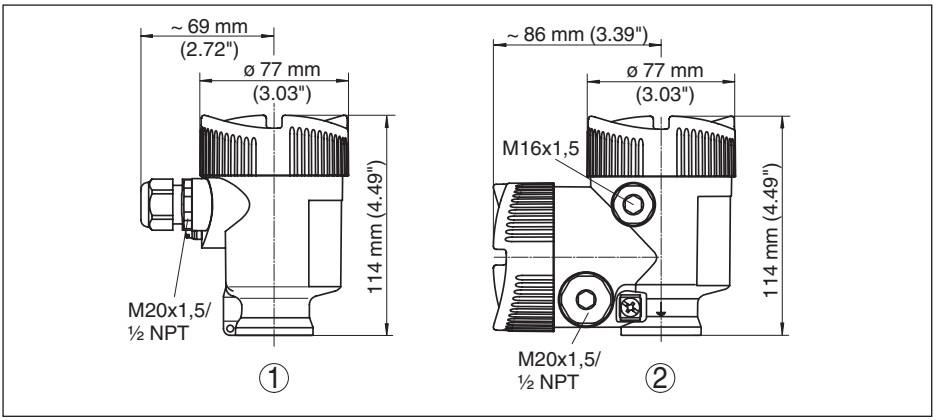


Fig. 48: Housing versions with protection rating IP 66/IP 67 - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Plastic single chamber
2 Plastic double chamber

Aluminium housing

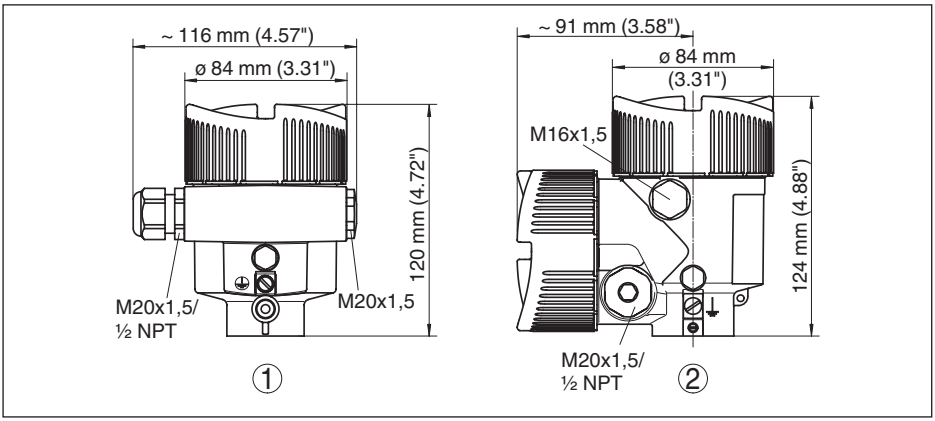


Fig. 49: Housing versions with protection rating IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Aluminium - single chamber
2 Aluminium - double chamber

Stainless steel housing

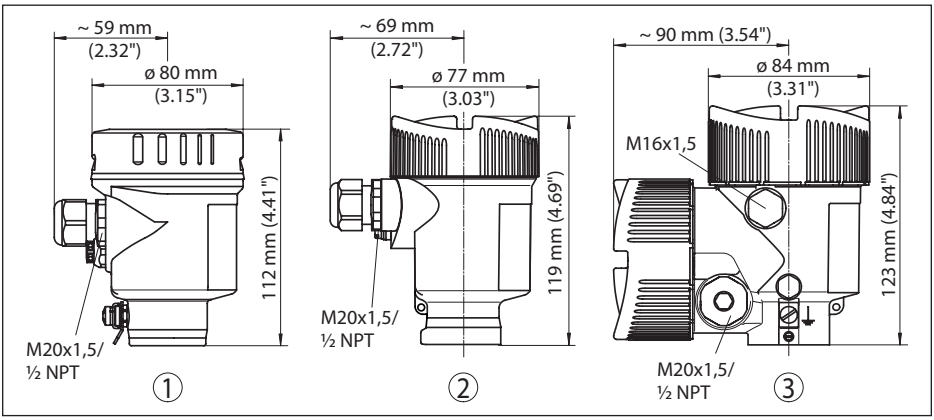


Fig. 50: Housing versions with protection rating IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Stainless steel single chamber (electropolished)
2 Stainless steel single chamber (precision casting)
3 Stainless steel double chamber housing (precision casting)

SITRANS LG270, coax version

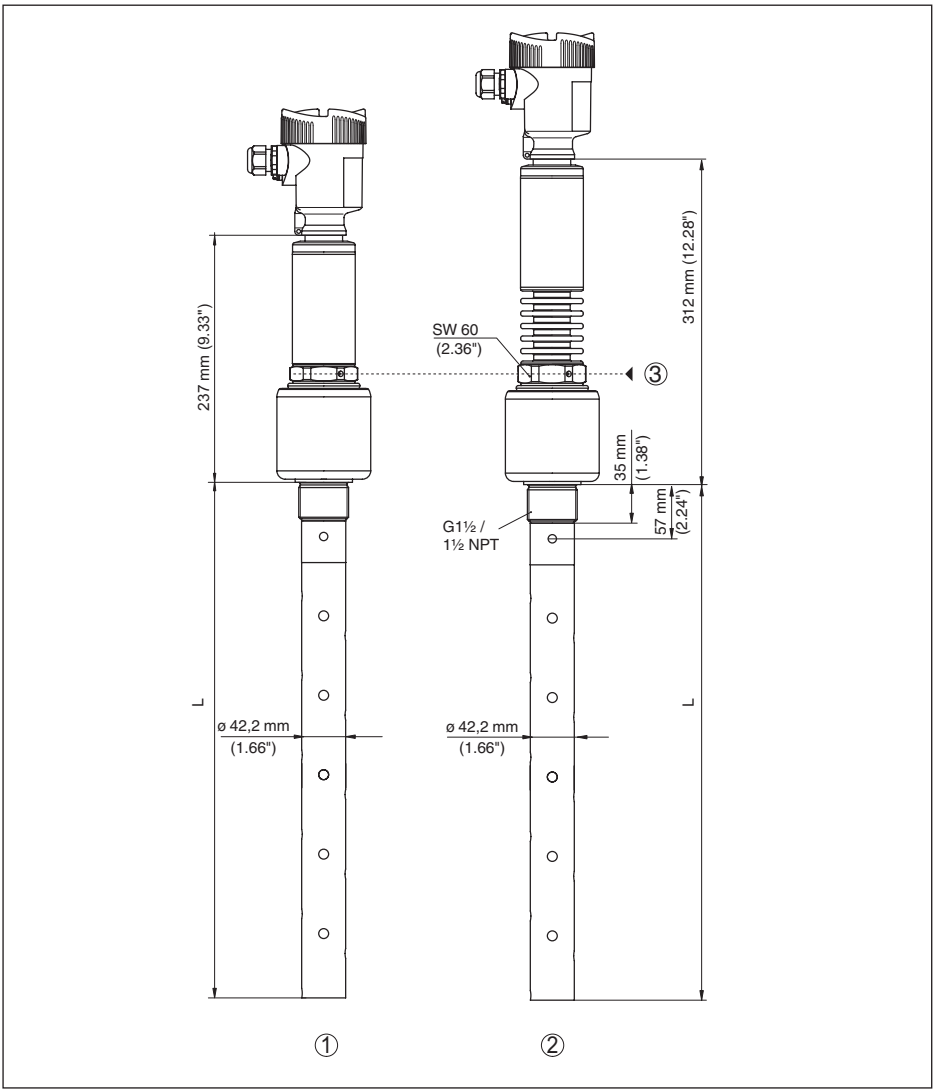


Fig. 51: SITRANS LG270, threaded version

L Sensor length, see chapter "Technical data"
1 Temperature version -196 … +280 °C (-321 … 536 °F)
2 Temperature version -196 … +450 °C (-321 … 842 °F)
3 Max. height of the vessel insulation

11.4 Trademark

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

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