Vibrating Switches

SITRANS LVL200H

Two-wire 8/16 mA

Operating Instructions • 07/2017

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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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.

Editing status: 2017-07-14

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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 of the instrument. Furthermore there are 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 specialist personnel. The contents of this manual should be made available to these personnel and put into practice by them.

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.

SIL applications
This symbol indicates instructions for functional safety which must be taken into account particularly for safety-relevant 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

The SITRANS LVL200H is a sensor for point level detection.

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.

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.

2.3 Warning about incorrect use

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment. Thus damage to property, to persons or environmental contamination can be caused. Also the protective characteristics of the instrument can be influenced.

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

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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.

2.5 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

2.6 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm successful testing of the product.

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

2.8 Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- SITRANS LVL200H point level switch
- Documentation
  - This operating instructions manual
  - Supplementary instructions manual "*Plug connector for level sensors*" (optional)
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - If necessary, further certificates

Constituent parts

The SITRANS LVL200H consists of the components:

- Housing lid
- Housing with electronics
- Process fitting with tuning fork

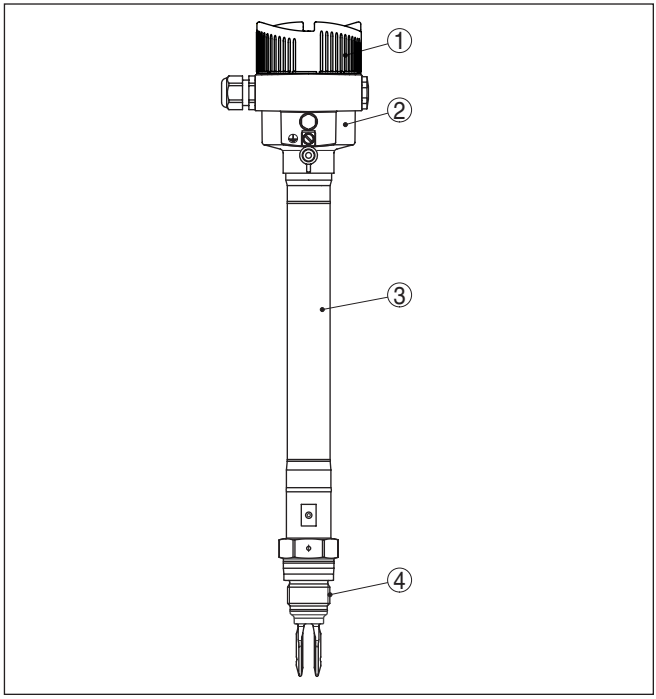

Fig. 1: SITRANS LVL200H - compact version

1 Housing lid
2 Housing with electronics
3 Temperature adapter
4 Process fitting

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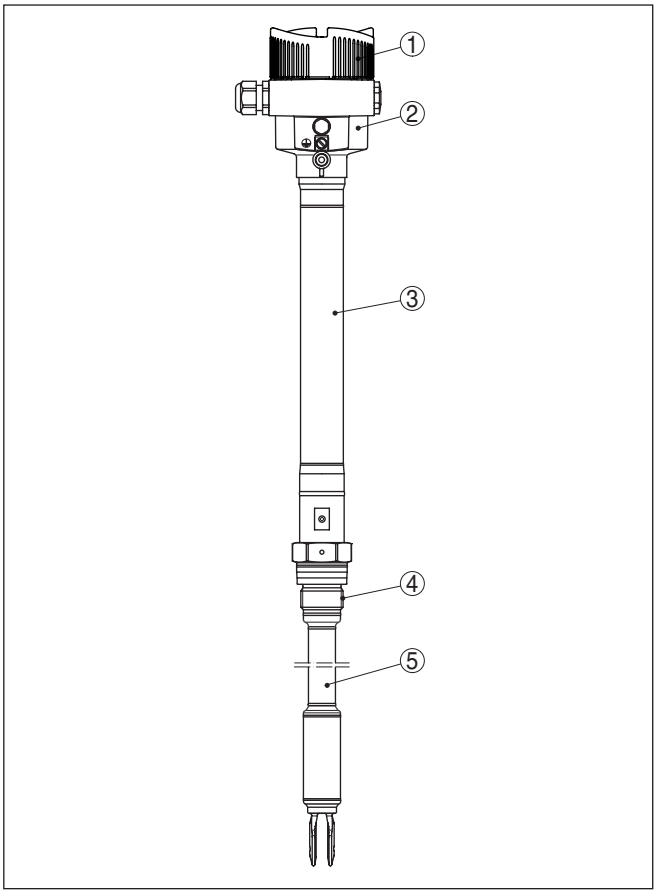

Fig. 2: SITRANS LVL200H with tube extension

1 Housing lid
2 Housing with electronics
3 Temperature adapter
4 Process fitting
5 Tube extension

Type label

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

- Article number
- Serial number
- Technical data
- Article numbers, documentation
- SIL identification (with SIL rating ex works)

3.2 Principle of operation

Application area

SITRANS LVL200H is a point level sensor with tuning fork for point level detection.

It is designed for industrial use in all areas of process technology and can be used in liquids. It is particularly suitable for applications with high temperatures up to 450 °C (842 °F) and high process pressure up to 160 bar (2320 psig).

Typical applications are overfill and dry run protection. The small tuning fork allows use in all kinds of tanks and vessels. Thanks to its simple and rugged measuring system, SITRANS LVL200H is virtually unaffected by the chemical and physical properties of the liquid.

It functions even under difficult conditions such as turbulence, foam generation, buildup, external vibration or changing products.

The SITRANS LVL200H is not suitable for use in pipelines.

Function monitoring

The electronics module of SITRANS LVL200H continuously monitors the following criteria via frequency evaluation:

- Strong corrosion or damage on the tuning fork
- Loss of vibration
- Break in the vibration drive circuit

If one of these faults is detected, the electronics signals it via a defined current to the signal conditioning instrument. The connection cable to the sensor is also monitored for line break and short-circuit.

Functional principle

The tuning fork vibrates at its mechanical resonance frequency of approx. 1400 Hz. When the tuning fork is submerged in the product, the frequency changes. This change is detected by the integrated electronics module, passed on to the processing system as a current value and converted there into a switching command.

Voltage supply

Depending on your requirements, SITRANS LVL200H with two-wire electronics can be connected to different signal conditioning instruments. Compatible signal conditioning instruments are listed in chapter "*Technical data*".

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

3.3 Adjustment

With the factory setting, products with a density ≥ 0.7 g/cm^3 (0.025 lbs/in^3) can be detected. The instrument can be adapted to products with lower density.

On the electronics module you will find the following display and adjustment elements:

- Signal lamp for indication of the operating status (green)
- Control lamp for indication of the switching status (yellow)
- Control lamp for fault indication (red)
- DIL switch for sensitivity adjustment
- Mode switch for selecting the switching behaviour (min./max.)
- Test key

3.4 Storage and transport

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 carton material. The sensing element is additionally protected with a cardboard cover. For special versions, PE foam or PE foil is also used. Please dispose of the packaging material through 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.

3.5 Accessories

Flanges

Screwed flanges are available in different versions according to the following standards: DIN 2501, EN 1092-1, BS 10, 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*".

Electronics module

The electronics module SW E60 is a replacement part for level switches SITRANS LVL200H.

You can find information in the operating instructions manual of the electronics module.

Plug connector

For connecting the sensors with a separator to voltage supply or signal processing, the sensors are also available with plug connectors.

The following plug connectors are available:

- M12 x 1
- ISO 4400
- Harting HAN 7D
- Harting HAN 8D
- Amphenol-Tuchel

4 Mounting

4.1 General instructions

Suitability for the process conditions

Make sure that all parts of the instrument coming in direct contact with the process, especially the sensor element, process seal and process fitting, are suitable for the existing process conditions, such as process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" and on the nameplate.

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.

Switching point

In general, SITRANS LVL200H can be installed in any position. The instrument only has to be mounted in such a way that the tuning fork is at the height of the desired switching point.

The tuning fork has lateral markings (notches) that indicate the switching point with vertical mounting. The switching point applies to water in conjunction with the basic setting of the density switch ≥ 0.7 g/cm³ (0.025 lbs/in³). When mounting SITRANS LVL200H, make sure that this marking is at the height of the requested switching point. Keep in mind that the switching point of the instrument will shift if the medium has a density other than water - water is 1 g/cm³ (0.036 lbs/in³). For products ≤ 0.7 g/cm³ (0.025 lbs/in³) and ≥ 0.47 g/cm³ (0.017 lbs/in³) the density switch must be set to ≥ 0.47 g/cm³.

Keep in mind that foams with a density ≥ 0.45 g/cm³ (0.016 lbs/in³) are detected by the sensor. This can lead to erroneous switchings, particulary when the sensor is used for dry run protection.

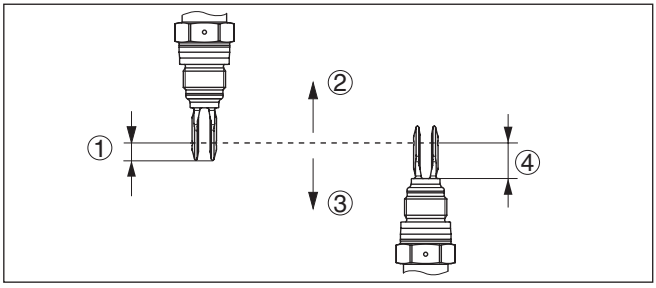

Fig. 3: Vertical mounting

1 Switching point approx. 13 mm (0.51 in)
2 Switching point with lower density
3 Switching point with higher density
4 Switching point approx. 33 mm (1.3 in)

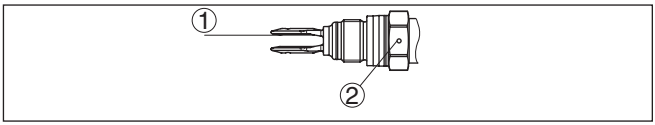

Fig. 4: Horizontal mounting

1 Switching point
2 Marking on top with threaded versions, marking aligned to flange holes with flange versions

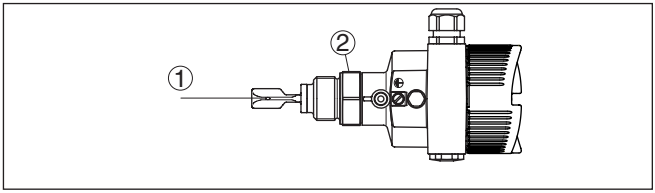

Fig. 5: Horizontal installation (recommended mounting position, particularly for adhesive products)

1 Switching point
2 Marking with screwed version, facing up

In the case of flange versions, the fork is aligned as follows.

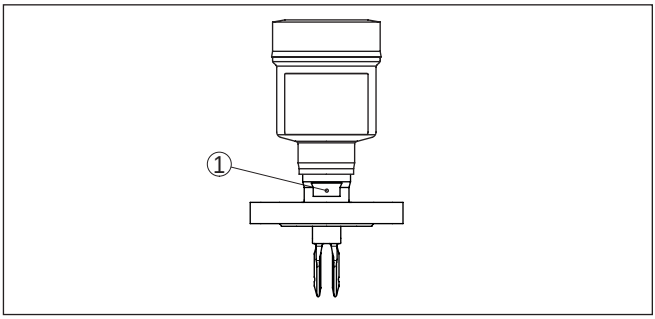

Fig. 6: Fork position with flange versions

1 Marking with flange version, facing up

Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or 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.

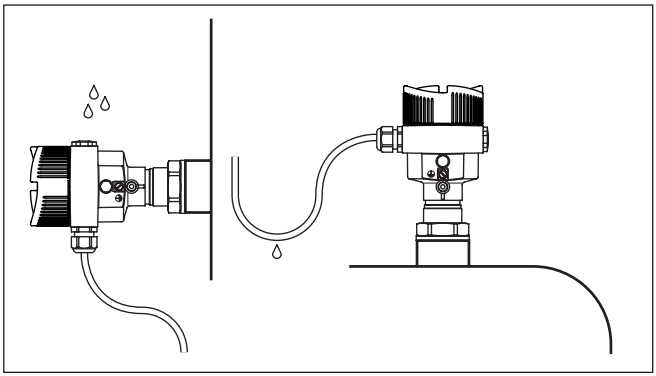

Fig. 7: Measures against moisture ingress

Transport

Caution:
Do not hold SITRANS LVL200H on the tuning fork. Particularly with flange or tube versions, the tuning fork can be damaged just by the weight of the instrument. Transport coated instruments very carefully and avoid touching the tuning fork.

Remove the packaging or the protective cover just before installation.

Handling

The vibrating level switch is a measuring instrument and must be treated accordingly. Bending the vibrating element will destroy the instrument.

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

Use the hexagon above the thread for screwing in.

Cable entries - NPT thread
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.

4.2 Mounting instructions

Welded socket

The thread and the seal on the threaded version of SITRANS LVL200H correspond to DIN 3852 part 2, screwed plug Form A.

Use screw-in openings or screw-in sleeves according to DIN 3852 part 2.

Make sure that with instruments with 1" NPT thread, the screw-in opening on the vessel has an inside diameter of at least 29.5 mm (1.16 in).

To mount the sensor, proceed as follows:

1. Screw the SITRANS LVL200H into the mounting boss up to the stop. You can determine the later position already before welding.
2. Mark the position of the SITRANS LVL200H on the mounting boss.
3. Mark the respective position of the mounting boss on the vessel.

   In case of lateral mounting, make sure the mark on the spanner flat of SITRANS LVL200H points upwards.
4. Remove the SITRANS LVL200H from the mounting boss before welding.
5. Weld the mounting boss according to your marking.

Adhesive products

In case of horizontal mounting in adhesive and viscous products, the surfaces of the tuning fork should be vertical in order to reduce buildup on the tuning fork. On the screwed version you will find a marking on the hexagon. With this, you can check the position of the tuning fork when screwing it in.

In the case of flange versions, the fork is aligned with the flange holes.

When used in adhesive and viscous products, the tuning fork should protrude into the vessel to avoid buildup. For that reason, sockets for flanges and mounting bosses should be avoided when mounting horizontally.

Pressure/Vacuum

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.

Note:
Seal for instruments with process fitting thread

The thread and the seal form on the mounting boss correspond to DIN 3852, part 2, screwed plug Form A.

We recommend using a temperature and medium-resistant seal for dismounting the instrument for maintenance and revision purposes.

Mounting in the vessel insulation

Instruments for high temperatures have a temperature adapter between process fitting and electronics housing. This is used for thermal decoupling of the electronics from high process temperatures.

Information:
The temperature adapter may be embedded in the vessel insulation only up to max. 50 mm (1.97 in). Only then is a reliable temperature decoupling guaranteed.

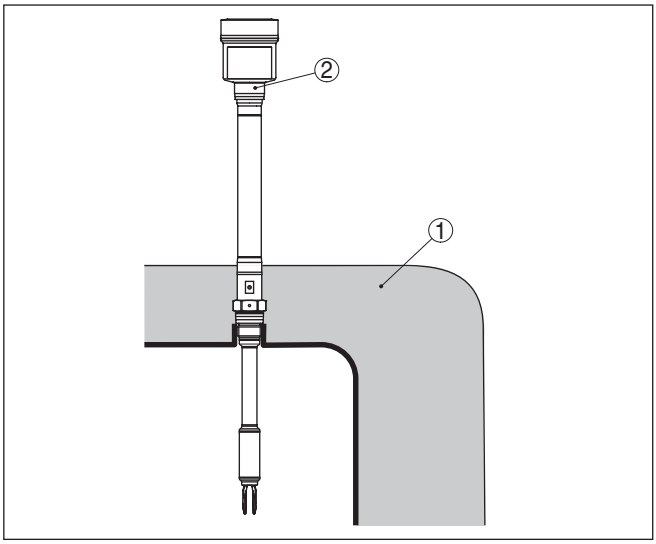

Fig. 8: Mounting the instrument on insulated vessels.

1 Temperature isolation - max. 50 mm (1.97 in)
2 Ambient temperature on the housing

Inflowing medium

If SITRANS LVL200H is mounted in the filling stream, unwanted false measurement signals can be generated. For this reason, mount SITRANS LVL200H at a position in the vessel where no disturbances, e.g. from filling openings, agitators, etc., can occur.

This applies particularly to instrument types with long extension tube.

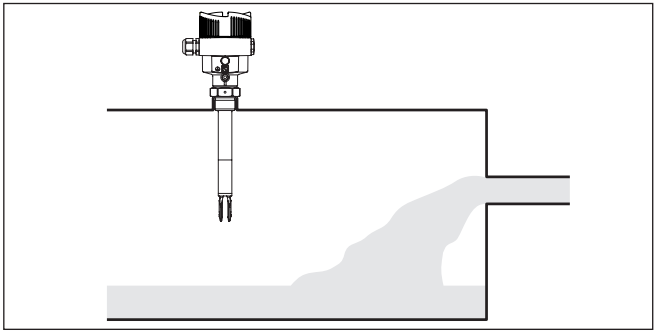

Fig. 9: Inflowing medium

Product flow

To make sure the tuning fork of SITRANS LVL200H generates as little resistance as possible to product flow, mount the sensor so that the surfaces are parallel to the product movement.

Agitators

Due to the effects of agitators, equipment vibration or similar, the level switch can be subjected to strong lateral forces. For this reason,

do not use an overly long extension tube (optional) for SITRANS LVL200H, instead check if it is possible to mount a short level switch SITRANS LVL200H on the side of the vessel in horizontal position.

Extreme vibration caused by the process or the equipment, e.g. agitators or turbulence in the vessel, can cause a long extension tube of SITRANS LVL200H to vibrate in resonance. This leads to increased stress on the upper weld joint. Should a longer tube version be necessary, you can provide a suitable support directly above the tuning fork to secure the extension tube.

This measure applies mainly to applications in Ex areas of category 1G or WHG as well as to ship classifications. Make sure that the tube is not subject to bending stress due to this measure.

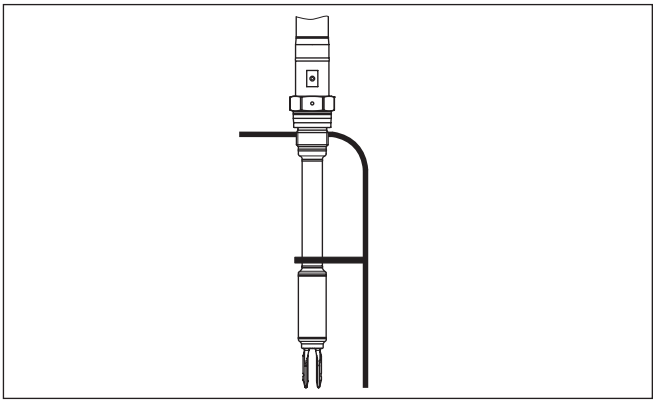

Fig. 10: Lateral suppot of SITRANS LVL200H

Gas-tight leadthrough

The second seal of the gas-tight leadthrough (option) prevents an uncontrolled leakage of the medium. The service life of the gas-tight leadthrough depends on the chemical resistance of the materials. See "*Technical data*".

Caution:
If it is determined (e.g. via an error message from SITRANS LVL200H) that medium has already penetrated into the vibrating element, the instrument must be exchanged immediately.

5 Connecting to power supply

5.1 Preparing the connection

Note 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.
- Always switch off power supply, before connecting or disconnecting the instrument.

Take note of safety instructions for Ex applications

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

Voltage supply

Connect the voltage supply according to the following diagrams. Take note of the general installation regulations. As a rule, connect SITRANS LVL200H to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the instrument housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

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

Connection cable

The instrument is connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

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

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.

- 5 … 9 mm (0.20 … 0.35 in)
- 6 … 12 mm (0.24 … 0.47 in)
- 10 … 14 mm (0.40 … 0.55 in)

Use a cable gland fitting the cable diameter.

In hazardous areas, use only approved cable connections for SITRANS LVL200H.

Connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

Cover all housing openings conforming to standard according to EN 60079-1.

5.2 Connection procedure

With Ex instruments, the housing cover may only be opened if there is no explosive atmosphere present.

Proceed as follows:

1. Unscrew the housing lid
2. Loosen compression nut of the cable gland and remove blind plug
3. 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
4. Insert the cable into the sensor through the cable entry
5. Open the terminals with a screwdriver
6. Insert the wire ends into the open terminals according to the wiring plan
7. Tighten the terminals with a screwdriver
8. Check the hold of the wires in the terminals by lightly pulling on them
9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
10. Screw the housing lid back on

The electrical connection is finished.

5.3 Wiring plan, single chamber housing

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

Housing overview

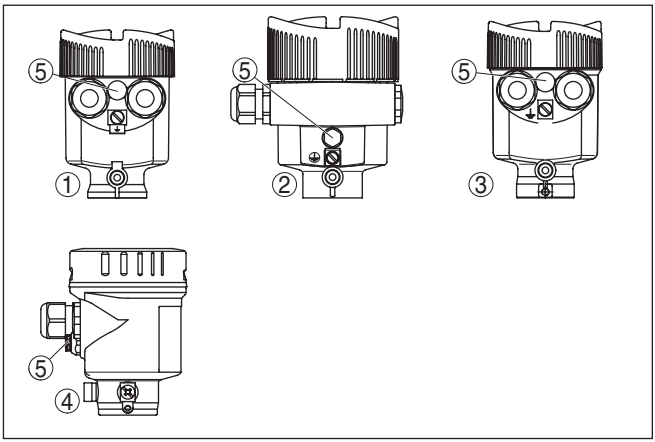

Fig. 11: Material versions, single chamber housing

1 Plastic (not with Ex d)
2 Aluminium
3 Stainless steel, precision casting
4 Stainless steel, electropolished (not with Ex d)
5 Filter element for pressure compensation (not with Ex d)

Electronics and terminal compartment

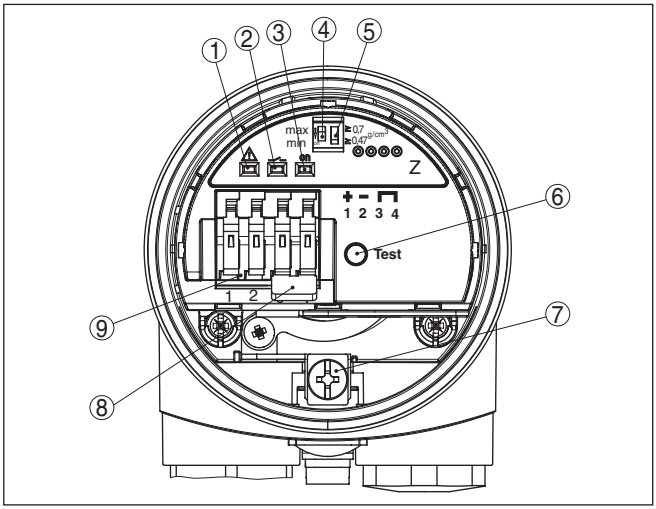

Fig. 12: Electronics and terminal compartment, single chamber housing

1 Control lamp - fault indication (red)
2 Control lamp - Switching status (yellow)
3 Control lamp - Operating status (green)
4 Mode switch for selecting the switching behaviour (min./max.)
5 DIL switch for sensitivity adjustment
6 Test key
7 Ground terminal
8 Connector block
9 Connection terminals

Wiring plan

We recommend connecting SITRANS LVL200H according to the closed-circuit principle, i.e. the switching circuit is open when there is a level signal, line break or fault (safe state).

For connection to a suitable signal conditioning instrument. The sensor is powered by the connected signal conditioning instrument. Further information is available in chapter "*Technical data*", "*Ex-technical data*" are available in the supplied "*Safety information manual*".

The wiring example is applicable for all suitable signal conditioning instruments.

The yellow control lamp on the SITRANS LVL200H lights depending on the adjusted mode.

Take note of the operating instructions manual of the signal conditioning instrument. Suitable signal conditioning instruments are listed in chapter "*Technical data*".

If SITRANS LVL200H is used in Ex areas, take note of the regulations in the safety instructions and conformity certificates. If the instrument is to be operated directly on the analogue input of a PLC, a suitable safety barrier should be connected.

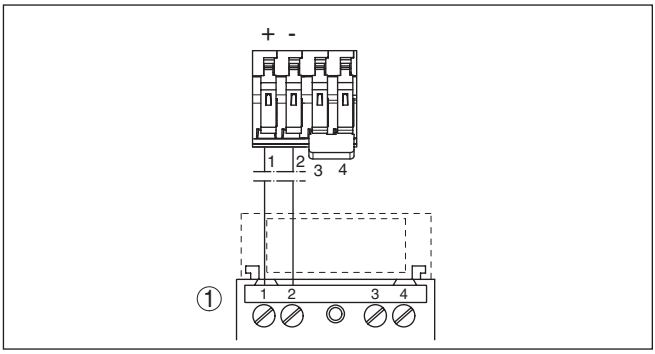

Fig. 13: Wiring plan, single chamber housing

1 Signal conditioning instrument

6 Setup

6.1 General information

The figures in brackets refer to the following illustrations.

Function/Configuration

In the basic setting, products with a density ≥ 0.7 g/cm^3 (0.025 lbs/in^3) can be detected. For products with lower density, you have to set the switch to ≥ 0.47 g/cm^3 (0.017 lbs/in^3).

Optionally the instrument can be supplied instead of ≥ 0.47 g/cm also with a min. density range of ≥ 0.42 g/cm^3 (0.015 lbs/in^3).

On the electronics module you will find the following display and adjustment elements:

- Signal lamps (1, 2, 3)
- DIL switch for mode setting - min./max. (4)
- DIL switch for adjustment of the density range (5)
- Test key (6)

Mode adjustment (min./max.)
With a suitable processing system or a PLC.

The switching condition can be changed with the min./max. switch. You can set the required mode according to the "Function table" (max. - max. detection or overfill protection, min. - min. detection or dry run protection). Adjust the requested mode (max. detection or overfill protection, min. detection or dry run protection) on the processing system acc. to the function table.

If you want to carry out the mode adjustment via the signal conditioning instruments, you have to set the mode switch on the electronics module of SITRANS LVL200H to "*max.*".

Note:
Always immerse the tuning fork of SITRANS LVL200H in a liquid to test its function. Do not test the function of SITRANS LVL200H with your hand. This can damage the sensor.

6.2 Adjustment elements

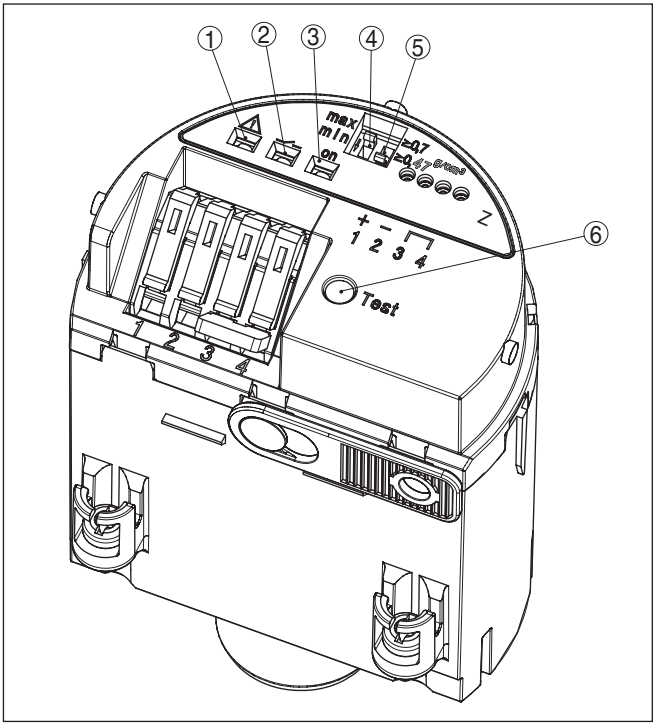

Fig. 14: Electronics module - Two-wire output

1 Signal lamp - red (LED)
2 Signal lamp - yellow (LED)
3 Signal lamp - green (LED)
4 DIL switch for mode adjustment
5 DIL switch for adjustment of the density range
6 Test key

Control lamp (1) - fault indication (red)

The instrument monitors the vibrating frequency, electronics temperature and internal instrument functions.

- Red LED lights = fault
- Reaktion on the output

Signal lamp (2) - Switching condition (yellow)

Control lamp for indication of the switching status.

With the mode setting (4), the switching condition and hence the function of the signal lamp can be changed.

- Yellow LED lights = 8 mA
- Yellow LED off = 16 mA

Signal lamp (3) - Operating condition (green)

- Green LED lights = operating voltage on

Mode setting (4)

With the mode adjustment (min./max.) you can determine the output current.

Note:
When using a signal conditioning instrument, always set the mode switch (4) to max. mode.

In this case, you select the requested mode according to the "*Function table*" (max. - max. detection or overfill protection, min. - min. detection or dry run detection) on the signal conditioning instrument.

When used on a control system, the following values apply:

- Mode min./max.
  - Vibrating element uncovered - 8 mA ±1.5 mA
  - Vibrating element covered - 16 mA ±1.5 mA

Adjustment of the density range (5)

With this DIL switch (5) you can set the switching point to liquids having a density between 0.47 and 0.7 g/cm^3 (0.017 - 0.025 lbs/in^3). With the basic setting, liquids with a density of ≥ 0.7 g/cm^3 (0.025 lbs/in^3) can be detected. In liquids with lower density, you must set the switch to ≥ 0.47 g/cm^3 (0.017 lbs/in^3). The specifications for the position of the switching point relate to water - density value 1 g/cm^3 (0.036 lbs/in^3). In products with a different density, the switching point will shift in the direction of the housing or tuning fork end depending on the density and type of installation.

Optionally the instrument can be also supplied with a min. density range of ≥ 0.42 g/cm^3 (0.015 lbs/in^3). In this case, the max. permissible process pressure is limited to 25 bar (363 psig).

Note:
Keep in mind that foams with a density ≥ 0.45 g/cm^3 (0.016 lbs/in^3) are detected by the sensor. This can lead to erroneous switchings, particulary when the sensor is used for dry run protection.

Note:
In case of intense boiling or bubbling processes as well as extreme outgassing, the density of the gas/product mixture at the product surface can be so low that it can't be detected by the sensor. This can cause erroneous switchings.

Test key (6)

With key (6) you can activate the test process. You interrupt the voltage supply as long as you are pressing the key. The test process will be carried out after releasing the key.

6.3 Function table

The following table provides an overview of the switching conditions depending on the set mode and the level.

Note:
Keep in mind that the mode switch of SITRANS LVL200H must be always set to "max.".

		Sensor				Signal conditioning instrument
Mode on the signal conditioning instrument	**Level**	**Signal current - Sensor**	**Signal lamp - green** **Voltage supply**	**Signal lamp - yellow** **Switching status**	**Signal lamp - red** **Fault message**	**Analogue - input control**
Mode max. Overflow protection		approx. 8 mA	☼	☼	○	> 3.8 mA < 11.5 mA
Mode max. Overflow protection		approx. 16 mA	☼	○	○	> 12.5 mA < 21 mA
Mode min. Dry run protection		approx. 8 mA	☼	☼	○	> 3.8 mA < 11.5 mA
Mode min. Dry run protection		approx. 16 mA	☼	○	○	> 12.5 mA < 21 mA
Failure of the supply voltage Mode (max./ min.)	any	-	○	○	○	-
Fault message Mode (max./ min.)	any	approx. 3.6 mA	☼	○	☼	≤ 3.6 mA ≥ 21 mA

6.4 Proof test

SIL To find out possible undetected, dangerous failures, a proof test must be carried out in adequate time intervals to check the safety function. It is the user's responsibility to choose the type of testing.

You will find further instructions in the Safety Manual.

Implementation - Function test

There are the following possibilities to carry out the recurring function test:

1 Filling the vessel up to the switching point
If this does not cause any problems, you can fill the vessel up to the switching point and monitor the correct sensor reaction.

2 Dismounting of the sensor and immersion in the original medium

You can dismount the sensor for test purposes and check its proper functioning by immersing it in the original product.

3 Short interruption of the supply line to the sensor

The recurring proof test according to IEC 61508 can be carried out through a short interruption (> 2 seconds) of the supply line to the sensor. This starts a test sequence.

The correctness of the subsequent switching conditions on the indications of the SPLC must be monitored. The sensor must neither be dismounted nor triggered by filling the vessel.

You can carry out the function test with the outputted current values also directly via a safety PLC or a process control system.

1 Filling the vessel up to the switching point

If this does not cause any problems, you can fill the vessel up to the switching point and monitor the correct sensor reaction.

Procedure

1. Carry out the function test according to the above description (1 Short interruption of the supply line to the sensor.

   Separate the instrument briefly (> 2 s) from voltage supply or push the test key.

   Check the results of the test.

   Make sure the connected downstream devices are activated during the function test.

2. Set the mode switch (min./max.)

   Check if the switching status changes (signal lamp - switching status). By doing so, you can check the function of the measuring system.

   If this is not the case, then there is a fault in the measuring system.

   Make sure the connected downstream devices are activated during the function test.

3. Fill the vessel up to the switching point.

   Check if the switching status changes (signal lamp - switching status). By doing so, you can check the function of the measuring system.

   If this is not the case, then there is a fault in the measuring system.

   Make sure the connected downstream devices are activated during the function test.

You can find the coverage of the test in the Safety Manual.

2 Dismounting of the sensor and immersion in the original medium

You can dismount the sensor for test purposes and check its function by immersing the vibrating element in the original medium.

Procedure

1. Carry out the function test according to the above description (1 Short interruption of the supply line to the sensor.

   Separate the instrument briefly (> 2 s) from voltage supply or push the test key.

   Check the results of the test.

   Make sure the connected downstream devices are activated during the function test.

2. Set the mode switch (min./max.)

   Check if the switching status changes (signal lamp - switching status). By doing so, you can check the function of the measuring system.

   If this is not the case, then there is a fault in the measuring system.

   Make sure the connected downstream devices are activated during the function test.

3. Dismount the instrument and immerse the vibrating element up to the switching point in the original medium.

   Check if the switching status changes (signal lamp - switching status). By doing so, you can check the function of the measuring system.

   If this is not the case, then there is a fault in the measuring system.

   Make sure the connected downstream devices are activated during the function test.

You can find the coverage of the test in the Safety Manual.

3 Short interruption of the supply line to the sensor

This test is valid if you cannot change the vessel filling or cannot dismount the sensor.

This function test can be carried out with measurement setups in conjunction with the two-wire electronics module.

The recurring proof test according to IEC 61508 can be carried out through a short interruption (> 2 seconds) of the supply line to the sensor.

By doing so, a test procedure is started. The correctness of the subsequent switching conditions on the indications of the SPLC must be monitored.

a. Short interruption of the supply line to the sensor

You can carry out the function test with the outputted current values also directly via a safety PLC or a process control system.

1. Separate the instrument briefly (> 2 s) from voltage supply.

   Check if all three switching conditions change in the correct sequence and the specified duration. By doing so, you can check the function of the measuring system.

   You can find the test procedure under "*Implementation - Function test*".

Make sure the connected downstream devices are activated during the function test.

2. Set the mode switch (min./max.)

   Check if the switching status changes (signal lamp - switching status). By doing so, you can check the function of the measuring system.

   If this is not the case, then there is a fault in the measuring system.

   Make sure the connected downstream devices are activated during the function test.

b. Pushing the test key

An integrated test key is lowered in the front plate of the signal conditioning instrument or in the electronics module of the SITRANS LVL200H. Push the test key for > 2 seconds with a suitable object.

1. Push the test key.

   Check if all three switching conditions change in the correct sequence and the specified duration. By doing so, you can check the function of the measuring system.

   You can find the test procedure under "*Implementation - Function test*".

   Make sure the connected downstream devices are activated during the function test.

2. Set the mode switch (min./max.)

   Check if the switching status changes (signal lamp - switching status). By doing so, you can check the function of the measuring system.

   If this is not the case, then there is a fault in the measuring system.

   Make sure the connected downstream devices are activated during the function test.

You can find the coverage of the test in the Safety Manual.

Implementation - Function test

When the SITRANS LVL200H is connected to a processing system or an SPLC, you have to interrupt the connection cable to the sensor for > 2 seconds. The switching delay must be set to 0.5 s.

After a short interruption of the connection cable to the sensor, the complete measuring system can be checked on correct function. The following operating conditions are simulated during the test:

- Fault message
- Empty signal
- Full signal

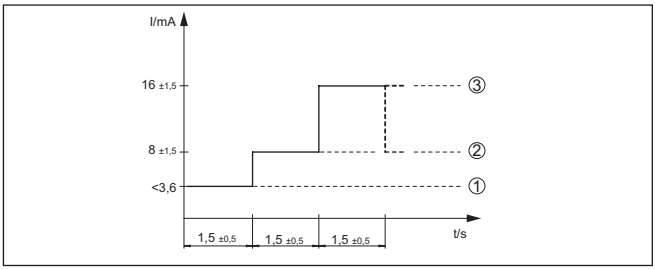

Fig. 37: Flow chart of the function test (mode "max.")

1 Fault message
2 Empty signal
3 Full signal

Check if all three switching conditions occur in the correct sequence and the stated time period. If this is not the case, there is a fault in the measuring system (see also the operating instructions manual of the signal conditioning instrument). Keep in mind that connected instruments are activated during the function test. By doing this, you can check the correct function of the measuring system.

Note:
Keep in mind that the starting time t_A of the voltage supply can extend the time up to the first switching.

Test procedure
After releasing the button or after a brief line break.

	Sensor current - Sensor	**Level relay A - overfill protection**	**Signal lamp A - Overfill protection**	**Level relay B - dry run protection**	**Signal lamp B - Dry run protection**	**Fail safe relay**	**Control lamp - Fault signal**
1. Fault signal approx. 1.5 s (±0.5 s) + t_A [1)]	< 3.6 mA (±1.5 mA)	currentless	○	currentless	○	currentless	☼
2. Empty signal 1.5 s (±0.5 s)	8 mA (±1.5 mA)	energized	☼	currentless	○	energized	○
3. Full signal 1.5 s (±0.5 s)	16 mA (±1.5 mA)	currentless	○	energized	☼	energized	○
4. Return to current operating condition	-	-	-	-	-	-	-

[1)] Starting time of the voltage supply

Test assessment (SPLC)

Test passed

Status	Current value	Time
False signal	< 3.6 mA	1.5 s (±0.5 s)
Uncovered	8 mA (±1.5 mA)	1.5 s (±0.5 s)
Covered	16 mA (±1.5 mA)	1.5 s (±0.5 s)

7 Maintenance and fault rectification

7.1 Maintenance

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

7.2 Rectify faults

Reaction when malfunction occurs

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

Causes of malfunction

SITRANS LVL200H offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measure to take is to check the output signal. In many cases, the causes can be determined this way and the faults quickly rectified.

Checking the switching signal

Error	Reason	Rectification
SITRANS LVL200H signals "covered" without being submerged (overflow protection) SITRANS LVL200H signals "uncovered" when being submerged (dry run protection)	Operating voltage too low	Check operating voltage
	Electronics defective	Press the mode switch on the signal conditioning instrument. If the instrument then changes the mode, the vibrating element may be covered with buildup or mechanically damaged. Should the switching function in the correct mode still be faulty, return the instrument for repair.
		Press the mode switch on the signal conditioning instrument. If the instrument then does not change the mode, the electronics module is defective. Exchange the electronics module.
	Unfavourable installation location	Mount the instrument at a location in the vessel where no dead zones or air bubbles can form.
	Buildup on the vibrating element	Check the vibrating element and the sensor for buildup and remove the buildup if there is any.
	Wrong mode selected	Set the correct mode on the signal conditioning instrument (overflow protection, dry run protection). Wiring should be carried out according to the idle current principle.
Red control lamp lights up	Error on the vibrating element	Check if the vibrating element is damaged or extremely corroded.
	Interference on the electronics module	Exchanging the electronics module
	instrument defective	Exchange the instrument or send it in for repair

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "*Set up*" may have to be carried out again.

7.3 Exchanging the electronics

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

In Ex applications only an electronics module with respective Ex approval may be used.

You can find all the information you need to carry out an electronics exchange in the handbook of the new electronics module.

In general, all electronics modules of the respective type series can be interchanged. The type name is stated on the electronics module.

If you want to use an electronics module with a different signal output, you have to carry out the complete setup. You can find the required operating instructions manual on our homepage.

7.4 How to proceed if a repair is necessary

If it is necessary to repair the instrument, please contact Siemens. You find the locations on our homepage "www.siemens.com/processautomation".

8 Dismount

8.1 Dismounting steps

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, 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.

With Ex instruments, the housing cover may only be opened if there is no explosive atmosphere present.

8.2 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.

WEEE directive 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG 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.

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.

9 Supplement

9.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

General data

Material 316L corresponds to 1.4404 or 1.4435	
Materials, wetted parts	
– Process fitting - thread (up to 100 bar)	Inconel 718
– Process fitting - thread (up to 160 bar)	Inconel 718
– Process fitting - flange	316L
– Process seal	On site
– Tuning fork	Inconel 718
– Extension tube: ø 21.3 mm (0.839 in) up to 100 bar (optional)	316L
– Extension tube: ø 21.3 mm (0.839 in) up to 160 bar (optional)	Alloy C22 (2.4602)
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
– Seal between housing and housing lid	Silicone SI 850 R, NBR silicone-free
– Ground terminal	316L
– Temperature adapter (ø 33,7 mm)	316L
Second Line of Defense (optional)[2)]	
– 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
– Material	Ceramic Al_2O_3 (99.5 %)
– Contacts	Kovar (gold-plated)
– Helium leak rate	< 10^{-8} mbar l/s
– Pressure resistance	PN 160

[2)] Or gas-tight leadthrough.

Sensor length - Compact version	
– Alloy C22 (2.4602)	74 mm (2.91 in)
– Inconel 718	74 mm (2.91 in)
Sensor length (L) - Tube version	
– 316L, Alloy C22 (2.4602)	260 … 3000 mm (10.24 … 118.1 in)
– Inconel 718	260 … 3000 mm (10.24 … 118.1 in)
Weight	
– Instrument weight (depending on process fitting)	approx. 0.8 … 4 kg (0.18 … 8.82 lbs)
– Tube extension	approx. 1100 g/m (11.8 oz/ft)
Surface quality	R_a approx. 3 µm (1.18^{-4} in)
Process fittings	
– Pipe thread, cylindrical (DIN 3852-A)	G1
– Pipe thread, conical (ASME B1.20.1)	1 NPT
– Flanges	DIN EN from DN 50, ASME from 1½"
Max. torque - process fitting	
– Thread G1, 1 NPT	max. 285 Nm (210 lbf ft)[3)]

Output variable

Output	Two-wire output
Output signal	
– Mode min.	Vibrating element uncovered: 16 mA ±1.5 mA, vibrating element covered: 8 mA ±1.5 mA
– Mode max.	Vibrating element uncovered: 8 mA ±1.5 mA, vibrating element covered: 16 mA ±1.5 mA
– Fault message	< 3.6 mA
Modes (switchable)	Min./Max.

Accuracy (according to DIN EN 60770-1)

Reference conditions and actuating variables according to DIN EN 61298-1	
– Ambient temperature	+18 … +30 °C (+64 … +86 °F)
– Relative humidity	45 … 75 %
– Air pressure	860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psig)
– Product temperature	+18 … +30 °C (+64 … +86 °F)
– Product density	1 g/cm³ (0.036 lbs/in³) (water)
– Product viscosity	1 mPa s
– Superimposed pressure	0 kPa
– Sensor installation	Vertically from top
– Density selection switch	≥ 0.7 g/cm³

[3)] Depending on the mounting boss of the vessel.

Measuring accuracy

Deviation	± 1 mm (0.04 in)

Influence of the product density on the switching point

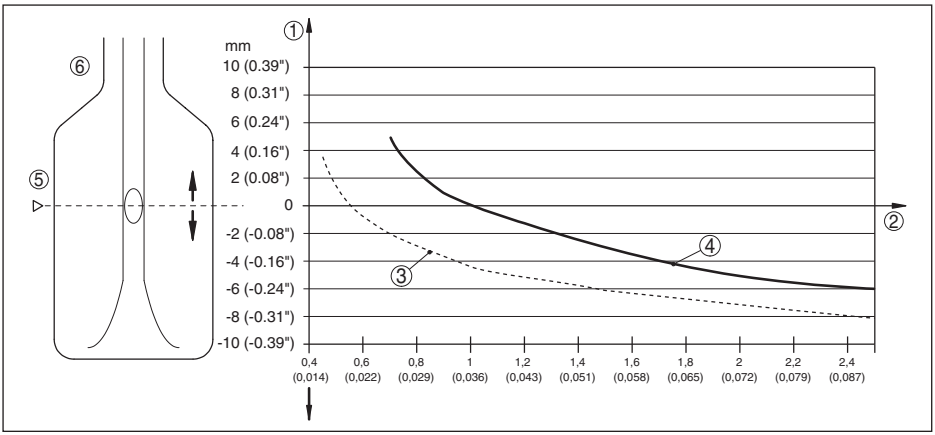

Fig. 47: Influence of the product density on the switching point

1 *Shifting of the switching point in mm (in)*
2 *Product density in g/cm³ (lb/in³)*
3 *Switch position ≥ 0.47 g/cm³ (0.017 lb/in³)*
4 *Switch position ≥ 0.7 g/cm³ (0.025 lb/in³)*
5 *Switching point at reference conditions (notch)*
6 *Tuning fork*

Influence of the process pressure to the switching point

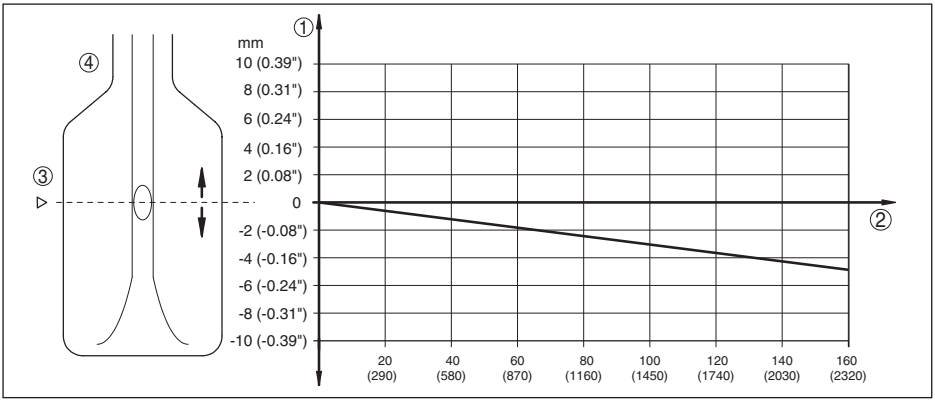

Fig. 48: Influence of the process pressure to the switching point

1 *Shifting of the switching point in mm (in)*
2 *Process pressure in bar (psig)*
3 *Switching point at reference conditions (notch)*
4 *Tuning fork*

Repeatability	0.1 mm (0.004 in)
Hysteresis	approx. 2 mm (0.08 in) with vertical installation
Switching delay	
– Standard	approx. 1 s (on/off)
– Optional - can be ordered factory-made	1 … 60 s (on/off)
Measuring frequency	approx. 1400 Hz

Ambient conditions

Ambient temperature on the housing	-40 … +70 °C (-40 … +158 °F)
Storage and transport temperature	-40 … +80 °C (-40 … +176 °F)

Process conditions

Measured variable	Limit level of liquids
Process pressure	
– Instrument version up to 100 bar (1450 psig)	-1 … 100 bar/-100 … 10000 kPa (-14.5 … 1450 psig) The process pressure is dependent on the process fitting, e.g. flange (see the following diagrams)
– Instrument version up to 160 bar (2320 psig)	-1 … 160 bar/-100 … 16000 kPa (-14.5 … 2320 psig) The process pressure is dependent on the process fitting, e.g. flange (see the following diagrams)

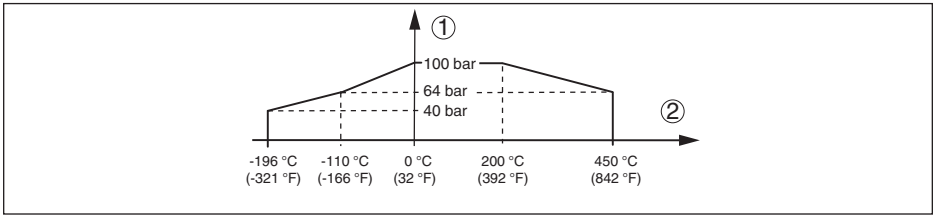

Fig. 49: Process temperature - Process pressure - Version up to 100 bar (1450 psig)

1 Process pressure in bar (psig)
2 Process temperature in °C (°F)

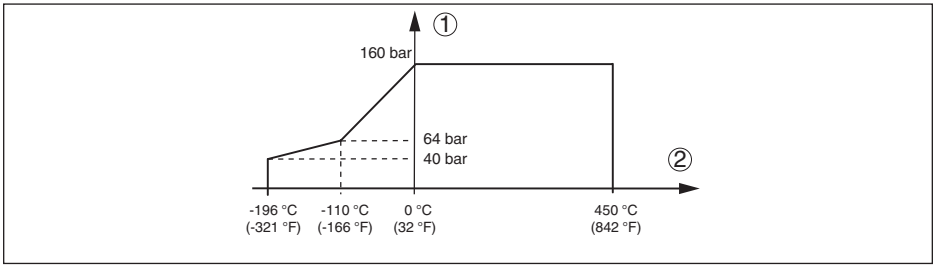

Fig. 50: Process temperature - Process pressure - Version up to 160 bar (2321 psig)

1 Process pressure in bar (psig)
2 Process temperature in °C (°F)

Process temperature (thread or flange temperature)

– SITRANS LVL200H of 316L/Alloy C22 (2.4602)/Inconel 718 (2.4668) -196 … +450 °C (-321 … +842 °F)

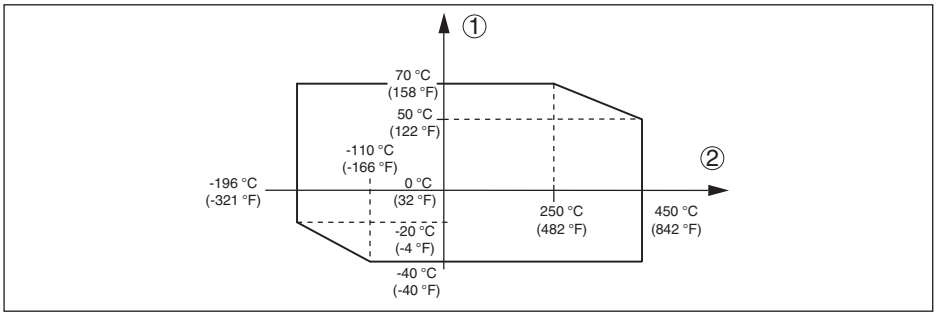

Fig. 51: Ambient temperature - Process temperature

1 Ambient temperature in °C (°F)
2 Process temperature in °C (°F)

Viscosity - dynamic	0.1 … 1000 mPa s (requirement: with density 1)
Flow velocity	max. 6 m/s (with a viscosity of 1000 mPa s)
Density	
– Standard sensitivity	0.7 … 2.5 g/cm^3 (0.025 … 0.09 lbs/in^3)
– High sensitivity	0.47 … 2.5 g/cm^3 (0.017 … 0.09 lbs/in^3)
	Optionally also ≥ 0.42 g/cm^3 (0.015 lbs/in^3)[4]
Vibration resistance	
– Instrument housing	1 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance)
– Sensor	1 g with 5 … 200 Hz according EN 60068-2-6 (vibration at resonance) with sensor length up to 50 cm (19.69 in)
	With a sensor length > 50 cm (19.69 in) you have to fix the extension tube with a suitable support. See mounting instructions.

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

Cable entry/plug[5]	
– Single chamber housing	– 1 x cable entry M20 x 1.5 (use seal according to the cable diameter), 1 x blind plug M20 x 1.5 or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT or: – 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5

[4] Max. permissible process pressure: 25 bar (363 psig)
[5] Depending on the version M12 x 1, according to ISO 4400, Harting, 7/8" FF.

Spring-loaded terminals	for wire cross-section up to 1.5 mm² (AWG 16)

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

Cable entry	
– Single chamber housing	– 1 x IP 68 cable gland M20 x 1.5; 1 x blind plug M20 x 1.5 or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT
Connection cable	
– Wire cross-section	> 0.5 mm² (AWG 20)
– Wire resistance	< 0.036 Ω/m (0.011 Ω/ft)
– Tensile strength	< 1200 N (270 lbf)
– Standard length	5 m (16.4 ft)
– Max. length	1000 m (3280 ft)
– Min. bending radius	25 mm (0.984 in) with 25 °C (77 °F)
– Diameter approx.	8 mm (0.315 in)
– Colour - standard PE	Black
– Colour - standard PUR	Blue
– Colour - Ex-version	Blue

Adjustment elements

Mode switch	
– Max.	Max. detection or overflow/overfill protection
– Min.	Min. detection or dry run protection
Sensitivity switch	
– ≥ 0.47 g/cm³	0.47 … 2.5 g/cm³ (0.017 … 0.09 lbs/in³)
– ≥ 0.7 g/cm³	0.7 … 2.5 g/cm³ (0.025 … 0.09 lbs/in³)
Test key	To activate the test process

Voltage supply

Operating voltage (via the signal conditioning instrument)	
– Non-Ex instrument	9.6 … 35 V DC
– Ex-d instrument (ATEX, FM, CSA)	9.6 … 35 V DC
– Ex-ia instrument (ATEX, FM, CSA)	9.6 … 30 V DC

Electrical protective measures

Protection rating	
– Plastic housing	IP 66/IP 67 (NEMA Type 4X)
– Aluminium and stainless steel (standard)	IP 66/IP 68 (0.2 bar), NEMA Type 6P[6)]
– Aluminium and stainless housing (optionally available)	IP 66/IP 68 (1 bar), NEMA Type 6P

[6)] A suitable cable is required for maintaining the protection rating.

Protection class	II

Approvals

Depending on the version, instruments with approvals can have different technical data. For these instruments, please note the corresponding approval documents. They are included in the scope of delivery.

9.2 Dimensions

SITRANS LVL200H, housing

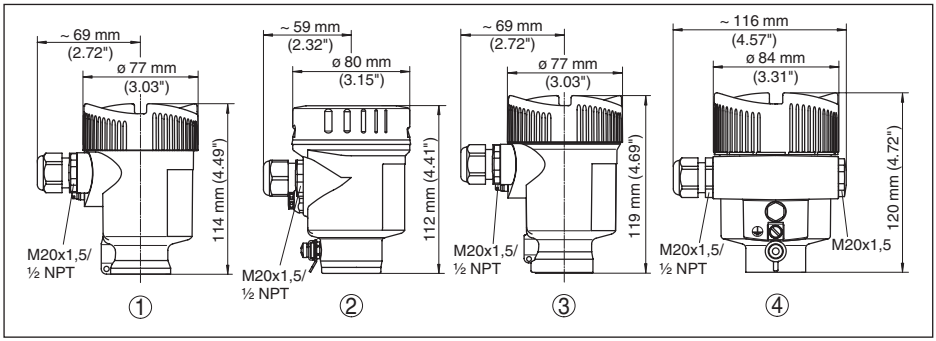

Fig. 52: Housing versions

1 Plastic single chamber
2 Stainless steel single chamber (electropolished)
3 Stainless steel single chamber (precision casting)
4 Aluminium - single chamber

SITRANS LVL200H, compact version

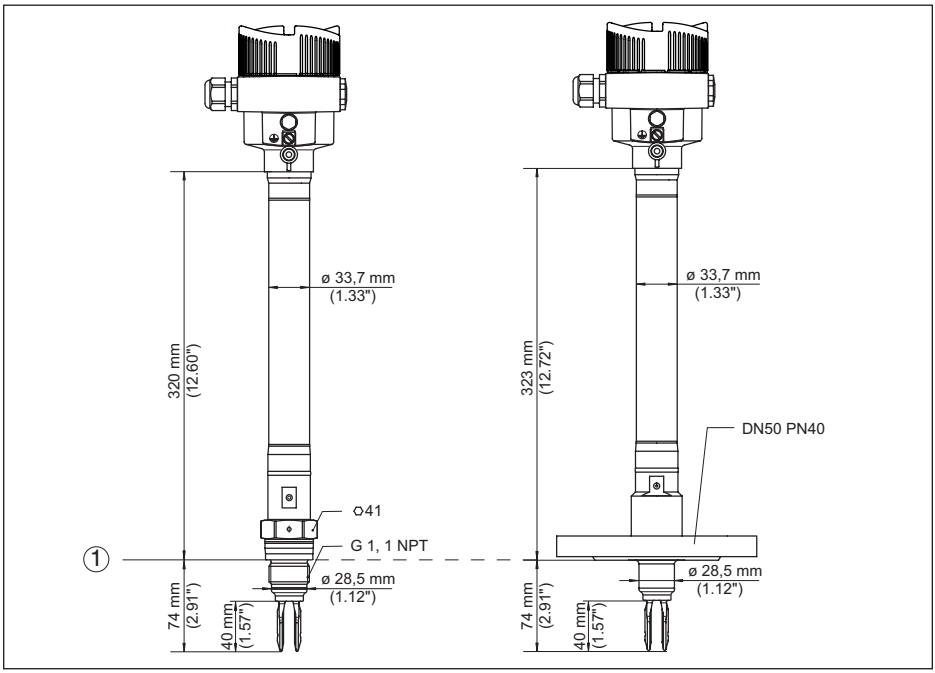

Fig. 53: SITRANS LVL200H, compact version

1 Sealing surface

SITRANS LVL200H, tube version

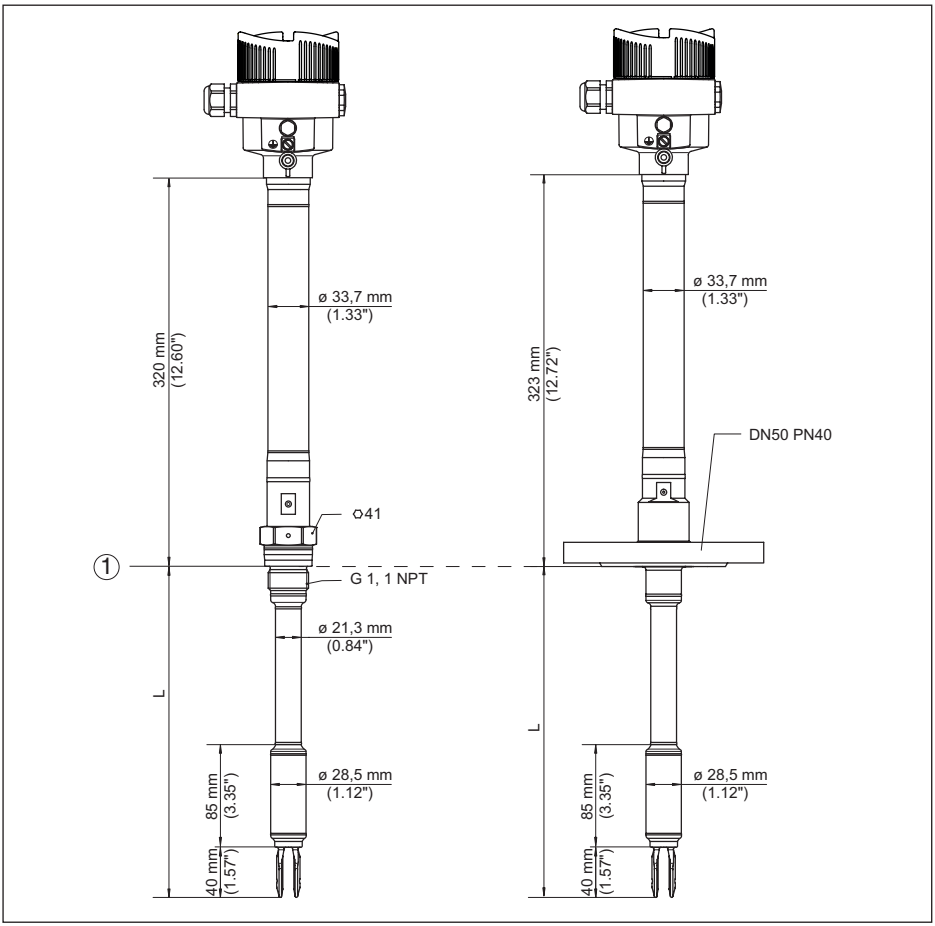

Fig. 54: SITRANS LVL200H, tube version

L Sensor length - see Technical data - General data
1 Sealing surface

9.3 Trademark

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

Notes

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For more information

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