OPERATING INSTRUCTIONS

# LFV 330
## - NAMUR


GB

SICK
Sensor Intelligence.

# Contents



35917-EN-100908

**Supplementary documentation**

**Information:**
Supplementary documents appropriate to the ordered version come with the delivery. You can find them listed in chapter "*Product description*".

**Instructions manuals for accessories and replacement parts**

**Tip:**
To ensure reliable setup and operation of your LFV 330, we offer accessories and replacement parts. The corresponding documentations are:

- 36051 - Electronics module LFV series 300
- 36053 - Lock fitting for LFV 330, unpressurized operation
- 36054 - Lock fitting for LFV 330, pressure range -1 … 16 bar
- 36055 - Lock fitting for LFV 330, pressure range -1 … 64 bar

# 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 and fault rectification. 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 qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

## 1.3 Symbolism 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**
Numbers set in front indicate successive steps in a procedure.

# 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 LFV 330 is a sensor for level detection.

You can find detailed information on the application range 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 misuse

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.

## 2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

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.

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## 2.5 Safety label on the instrument

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

## 2.6 CE conformity

This device fulfills the legal requirements of the applicable EC guidelines. By attaching the CE mark, we provide confirmation of successful testing.

## 2.7 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.

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# 3 Product description

## 3.1 Structure

**Scope of delivery**

The scope of delivery encompasses:

- Point level sensor LFV 330
- Documentation
  - this operating instructions manual
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - if necessary, further certificates

**Constituent parts**

The LFV 330 consists of the following components:

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

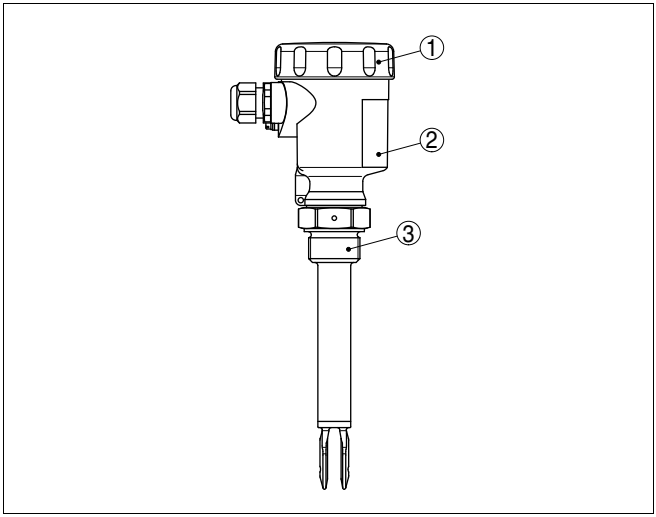


*Fig. 1: LFV 330 with plastic housing*

*1 Housing cover*
*2 Housing with electronics*
*3 Process fitting*

**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

In addition to the type label outside on the instrument, you find the serial number also inside the instrument.

## 3.2 Principle of operation

**Application area**

LFV 330 is a point level sensor with tuning fork for level detection.

It is designed for industrial use in all areas of process technology and can be used in liquids.

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, LFV 330 is virtually unaffected by the chemical and physical properties of the liquid.

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

**Fault monitoring**
The electronics module of LFV 330 continuously monitors via frequency evaluation the following criteria:

- Strong corrosion or damage on the tuning fork
- Loss of vibration
- Line break to the piezo drive

If one of these faults is detected or if the power supply fails, the electronics takes on a defined output status (safe condition).

**Functional principle**

The tuning fork is piezoelectrically energised and vibrates at its mechanical resonance frequency of approx. 1200 Hz. The piezos are fixed mechanically and are hence not subject to temperature shock limitations. The frequency changes when the tuning fork is covered by the medium. This change is detected by the integrated electronics module and converted into a switching command.

**Voltage supply**

LFV 330 is a compact instrument, i.e. it can be operated without external evaluation system. The integrated electronics evaluates the level signal and outputs a switching signal. With this switching signal, a connected device can be operated directly (e.g. a warning system, a PLC, a pump etc.).

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

## 3.3 Operation

The switching condition of LFV 330 with plastic housing can be checked when the housing is closed (signal lamp). With the basic setting, products with a density > 0.7 g/cm$^3$ (0.025 lbs/in$^3$) can be detected. The instrument can be adapted if products with lower density are to be measured.

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

- Control lamp for indication of the switching status
- DIL switch for sensitivity adjustment

- Mode switch to select the switching condition (reverse characteristics)
- Simulation 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 according to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. In addition, the sensor can be provided with a protective cover of ABS. 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 under 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 %

# 4 Mounting

## 4.1 General instructions

**Suitability for the process conditions**

Make sure that all parts of the instrument exposed to the process, in particular the sensor element, process seal and process fitting, are suitable for the existing process conditions. These include above all the process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" or on the type label.

**Switching point**

In general, LFV 330 can be installed in any position. The instrument simply 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 refers to water with the basic setting of the sensitivity switch ≥ 0.7 g/cm$^3$ (0.025 lbs/in$^3$). When mounting LFV 330, make sure that this marking is at the height of the requested switching point. Keep in mind that the switching point of the instrument is shifted if the medium has a density other than water - water 1 g/cm$^3$ (0.036 lbs/in$^3$). For products < 0.7 g/cm$^3$ (0.025 lbs/in$^3$) and > 0.5 g/cm$^3$ (0.018 lbs/in$^3$) the density switch must be set to ≥ 0.5 g/cm$^3$.

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 cause faulty switchings particulary when used as dry run protection system.

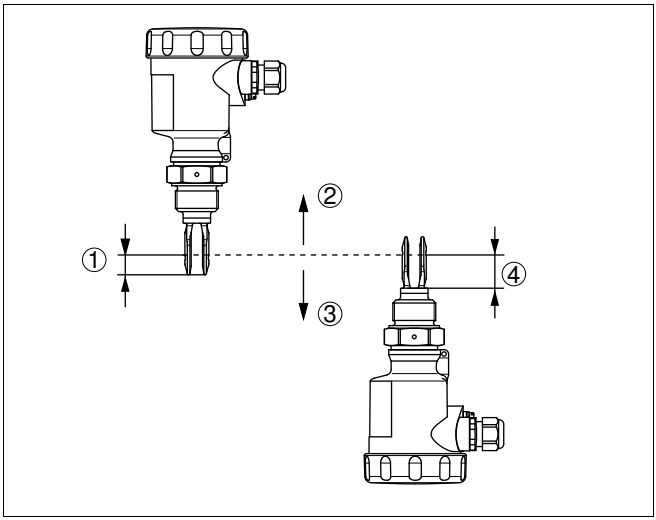


*Fig. 2: Vertical mounting*

*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. 27 mm (1.06 in)*

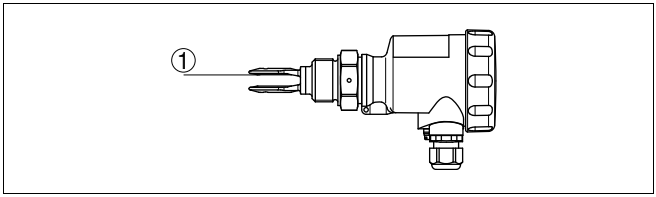


*Fig. 3: Horizontal mounting*

*1 Switching point*

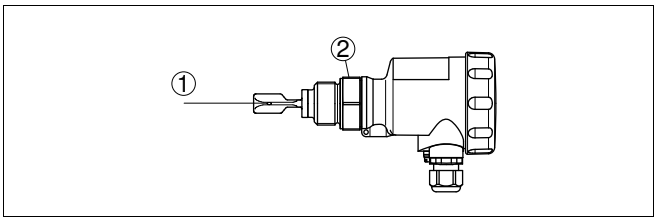


*Fig. 4: Horizontal installation (recommended installation position, especially for adhesive products)*

*1 Switching point*
*2 Marking with screwed version on top, with flange versions directed to the flange holes*

With flange versions, the fork is directed as follows to the flange holes.

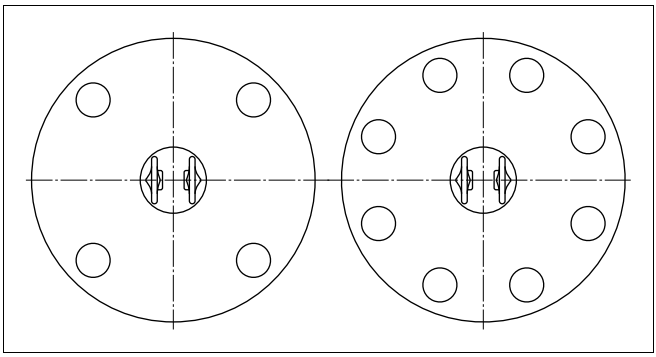

*Fig. 5: Fork position with flange versions*

**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.

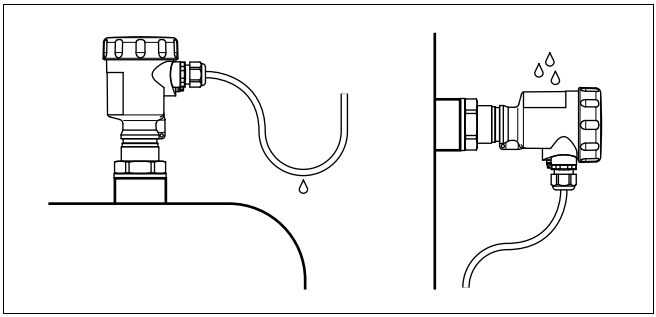

*Fig. 6: Measures against moisture penetration*

**Transport**

**Caution:**
Do not hold LFV 330 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.

**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.

**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.

## 4.2 Mounting instructions

**Welded socket**

LFV 330 has a defined thread starting point. This means that every LFV 330 is in the same fork position after being screwed in. Remove therefore the supplied seal from the thread of LFV 330. This seal is not required when using a welded socket with O-ring in front.

Keep in mind that this welded socket is not suitable for coated instrument versions.

Screw LFV 330 completely into the welded socket. The later position can be determined already before welding. Mark the appropriate position of the welded socket. Before welding, unscrew LFV 330 and remove the rubber ring from the welded socket. The welded socket has a marking (notch). Weld the socket with the notch facing upward, or in case of pipelines (DN 32 up to DN 50), aligned with the direction of flow.

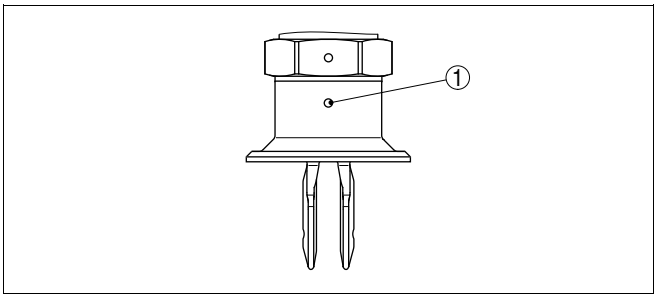


*Fig. 7: Marking on the welded socket*

*1 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. When the hexagon touches the seal, the thread can still be turned by approx. half a turn. This is sufficient to reach the recommended installation position.

With flange versions, the fork is directed to 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.

**Inflowing medium**

If LFV 330 is mounted in the filling stream, unwanted false measurement signals can be generated. For this reason, mount LFV 330 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.

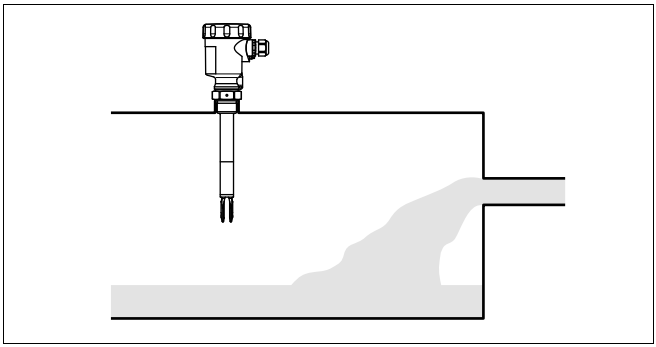

*Fig. 8: Inflowing medium*

**Flows**

To minimise flow resistance caused by the tuning fork, LFV 330 should be mounted in such a way that the surfaces of the blades 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 for LFV 330, but check if you can mount a level switch LFV 310 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 the extension tube of LFV 330 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 category 1G or WHG. Make sure that the tube is not subject to bending stress due to this measure.

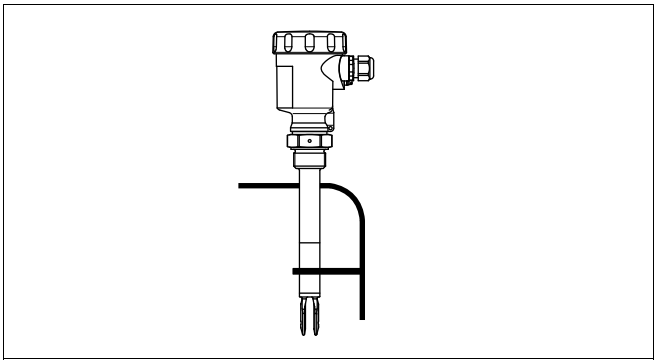

*Fig. 9: Lateral straining of LFV 330*

# 5 Connecting to power supply

## 5.1 Preparing the connection

**Note safety instructions**

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage

**Take note of safety instructions for Ex applications**

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

**Voltage supply**

Connect the operating voltage according to the following diagrams. Take note of the general installation regulations. As a rule, connect LFV 330 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.

Use cable with round cross-section. A cable outer diameter of 5 … 9 mm (0.2 … 0.35 in) ensures the seal effect of the cable gland. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

In hazardous areas, only use approved cable connections for LFV 330.

**Connection cable for Ex applications**

Take note of the corresponding installation regulations for Ex applications.

## 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 cover
2 Loosen compression nut of the cable entry
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. The seal ring must completely encircle the cable

10 Screw the housing cover 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 EEx-d version.

**Housing overview**

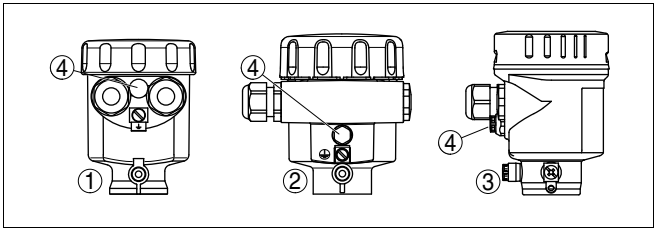


*Fig. 10: Material versions, single chamber housing*

*1 Plastic (not with EEx d)*
*2 Aluminium*
*3 Stainless steel, electro-polished*
*4 Filter element for air pressure compensation*

**Electronics and connection compartment**

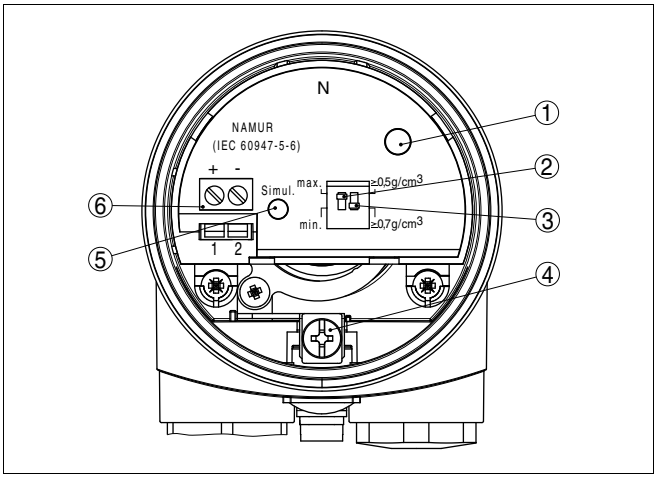


*Fig. 11: Electronics and connection compartment, single chamber housing*

*1 Control lamp*
*2 DIL switch for characteristics reversal*
*3 DIL switch for sensitivity adjustment*
*4 Ground terminal*
*5 Simulation key*
*6 Connection terminals*

**Wiring plan**

For connection of the amplifier according to NAMUR (IEC 60947-5-6, EN 50227). You can find further information in the "*Technical data*".

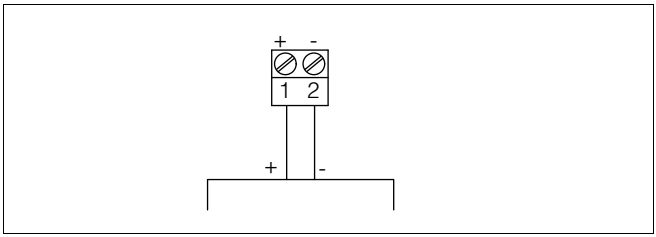


*Fig. 12: Wiring plan, single chamber housing*

# 6 Set up

## 6.1 In general

The figures in brackets refer to the following illustrations.

**Function/Configuration**

With plastic housings, the switching condition of the electronics can be checked when the housing cover is closed (control lamp). With 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, the switch must be set to > 0.5 g/cm$^3$ (0.018 lbs/in$^3$).

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

- Signal lamp (1)
- DIL switch for characteristics reversal - min./max. (2)
- DIL switch for sensitivity adjustment (3)
- Simulation key (4)

**Note:**
For test purposes, immerse the tuning fork of LFV 330 always in liquids. Do not test the function of LFV 330 with the hand. This can damage the sensor.

## 6.2 Adjustment elements

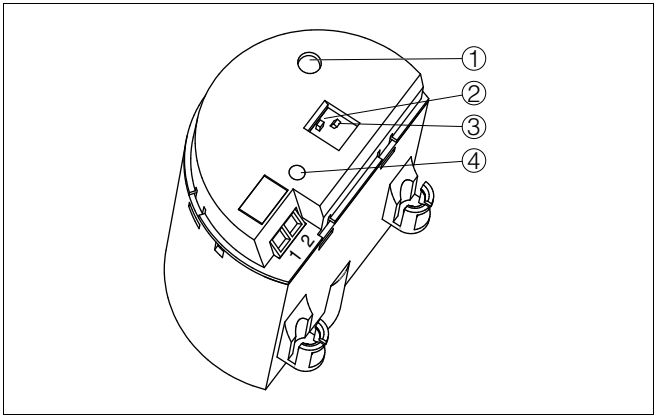


*Fig. 13: Oscillator SWE60N - NAMUR output*

*1 Signal lamp (LED)*
*2 DIL switch for characteristics reversal*
*3 DIL switch for sensitivity adjustment*
*4 Simulation key*

**Signal lamp (1)**

Single-coloured control lamp for indication of the switching condition.

- red = High current ≥ 2.6 mA
- dark = Low current ≤ 0.6 mA
- red (flashing) = Failure ≤ 0.6 mA

**Characteristics reversal (2)**

The characteristics reversal can be carried out with the DIL switch. You can choose between falling characteristic curve (switch position max.) and rising characteristic curve (switch position min.). This allows you to output the desired current.

Modes

- min. - rising characteristic curve (High current when immersed)
- max. - falling characteristics (Low current when immersed)

The NAMUR output can be switched over to falling or rising characteristics (see also "*Function chart*").

For applications according to WHG, the DIL switch must be set to position max.

**Sensitivity adjustment (3)**

With this DIL switch (3) you can set the switching point to liquids having a density between 0.5 and 0.7 g/cm$^3$ (0.018 and 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 > 0.5 g/cm$^3$ (0.018 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.

**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 cause faulty switchings particulary when used as dry run protection system.

**Simulation key (4)**

The simulation key is located in a recess on the upper side of the electronics module. Push the simulation key with a suitable object (screwdriver, pen, etc.).

When the key is pushed, a line break between sensor and processing unit is simulated. The signal lamp on the sensor extinguishes. The measuring system must signal a fault and take on a safe condition when the key is pushed.

Keep in mind that downstream connected instruments will be activated during operation. This allows you to check the correct function of the measuring system.

## 6.3 Functional chart

The following chart provides an overview of the switching conditions depending on the adjusted mode and level.

**Note:**
The mode setting on the NAMUR amplifier must be selected in such a way that the switching output takes on safe condition in case of failure (I ≤ 0.6 mA).

| | Level | Signal current - Sensor | Control lamp |
|---|---|---|---|
| Falling characteristics max. |  | ≥ 2.6 mA | ☼ Red |
| Falling characteristics max. |  | ≤ 0.6 mA | ○ off |
| Rising characteristics min. |  | ≥ 2.6 mA | ☼ Red |
| Rising characteristics min. |  | ≤ 0.6 mA | ○ off |
| Failure | any | ≤ 0.6 mA | ✳ flashes red |

# 7 Maintenance and fault rectification

## 7.1 Maintenance

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

## 7.2 Rectify faults

**Reaction when malfunctions occur**

The operator of the system is responsible for taking suitable measures to remove interferences.

**Failure reasons**

LFV 330 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 be taken is to check the output signal. In many cases, the causes can be determined this way and the faults rectified.

**Checking the switching signal**

| Error | Cause | Removal |
|---|---|---|
| LFV 330 signals "covered" when the vibrating element is not submerged (overfill protection)<br>LFV 330 signals "uncovered" when the vibrating element is submerged (dry run protection) | Operating voltage too low | Check operating voltage |
| | Electronics defective | Press the characteristic reversal switch. 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. |
| | | Push the characteristic reversal switch. If the instrument then does not change the mode, the electronics module may be 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 if there is buildup and remove it. |

| Error | Cause | Removal |
|---|---|---|
| | Wrong characteristic selected | Set the correct characteristics on the characteristics reversal switch (overflow protection, dry run protection). Wiring should be carried out according to the quiescent current principle. |
| Signal lamp flashes red | Error on the vibrating element | Check if the vibrating element is damage 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 failure reason and measures taken, the steps described in chapter "*Set up*" must be carried out again, if necessary.

## 7.3 Exchange of the electronics

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

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

You find all information to the electronics exchange in the operating instructions of the new electronics module.

In general, all electronics modules of series SW60 can be interchanged. If you want to use an electronics module with a different signal output, you carry out the complete setup. You find the necessary, suitable operating instruction on our homepage.

## 7.4 Instrument repair

If it is necessary to repair the instrument, please contact the responsible Sick agency.

# 8 Dismounting

## 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 to persons and 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

**General data**

Material 316L corresponds to 1.4404 or 1.4435

| | |
|---|---|
| Materials, wetted parts | |
| – Process fitting - thread | 316L |
| – Process fitting - flange | 316L |
| – Process seal | Klingersil C-4400 |
| – Tuning fork | 316L |
| – Extension tube: ø 21.3 mm (0.839 in) | 316L |
| Materials, non-wetted parts | |
| – Plastic housing | plastic PBT (Polyester) |
| – Aluminium die-casting housing | Aluminium die-casting AlSi10Mg, powder-coated - basis: Polyester |
| – Stainless steel housing, electropolished | 316L |
| – Seal between housing and housing cover | NBR (stainless steel housing), silicone (Alu/plastic housing) |
| – Light guide in housing cover (plastic) | PMMA (Makrolon) |
| – Ground terminal | 316L |
| – Temperature adapter (optional) | 316L |
| – Gas-tight leadthrough (optional) | 316L/glass |
| Sensor length (L) | 80 … 6000 mm (3.15 … 236.22 in) |
| Weight | |
| – Instrument weight (depending on process fitting) | approx. 0.8 … 4 kg (0.18 … 8.82 lbs) |
| – Tube extension | approx. 920 g/m (9.9 oz/ft) |
| Surface quality | |
| – Standard | $R_a$ approx. 3 µm ($1.18^{-4}$ in) |
| – Hygienic version (3A) | $R_a$ < 0.8 µm ($3.15^{-5}$ in) |
| – Hygienic version (3A) | $R_a$ < 0.3 µm ($1.18^{-5}$ in) |
| Process fittings | |
| – Pipe thread, cylindrical (DIN 3852-A) | G¾ A, G1 A |
| – American pipe thread, conical (ASME B1.20.1) | ¾ NPT or 1 NPT |
| – Flanges | DIN from DN 25, ANSI from 1" |
| – hygienic fittings | Bolting DN 40 PN 40, Tri-Clamp 1", Tri-Clamp 1½" PN 10, conus DN 25 PN 40, Tuchenhagen Varivent DN 50 PN 10 |
| Max. torque - process fitting | |
| – Thread G¾ A, ¾ NPT | 75 Nm (55 lbf ft) |

| | |
|---|---|
| – Thread G1 A, 1 NPT | 100 Nm (73 lbf ft) |
| Gas-tight leadthrough (optional) | |
| – Leakage rate | < $10^{-6}$ mbar l/s |
| – Pressure resistance | PN 64 |

**Output variable**

| | |
|---|---|
| Output | Two-wire NAMUR output |
| Current consumption | |
| – Falling characteristics | ≥ 2.6 mA uncovered/≤ 0.6 mA covered |
| – rising characteristics | ≤ 0.6 mA uncovered/≥ 2.6 mA covered |
| – Failure message | ≤ 0.6 mA |
| Necessary processing system | NAMUR processing system according to IEC 60947-5-6 (EN 50227/DIN 19234) |
| Modes (NAMUR output adjustable to falling or rising characteristics) | |
| – Min. | rising characteristic curve (High current when immersed) |
| – Max. | falling characteristics (Low current when immersed) |

**Accuracy (similar 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/cm$^3$ (0.036 lbs/in$^3$) (water) |
| – Product viscosity | 1 mPa s |
| – Superimposed pressure | 0 kPa |
| – Sensor installation | vertically from top |
| – Density selection switch | > 0.7 g/cm$^3$ |

**Measuring accuracy**

| | |
|---|---|
| Deviation | ± 1 mm (0.04 in) |

### Influence of the process temperature on the switching point

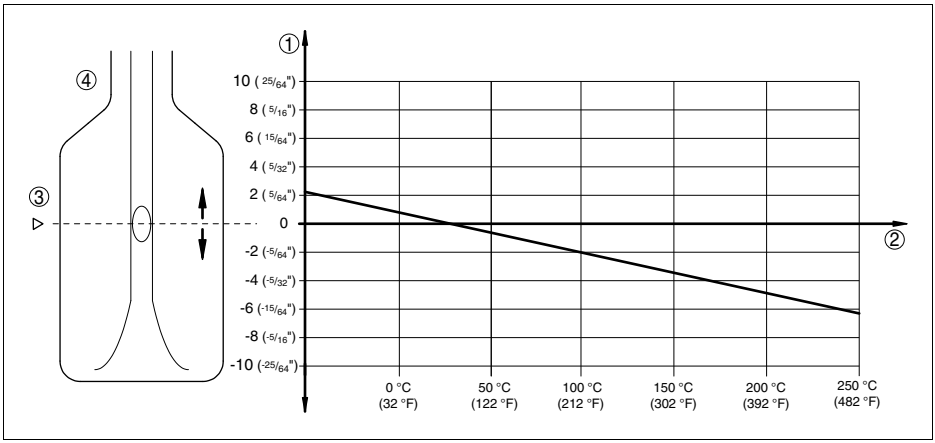


*Fig. 23: Influence of the process temperature on the switching point*

*1 Shifting of the switching point in mm (in)*
*2 Process temperature in °C (°F)*
*3 Switching point at reference conditions (notch)*
*4 Tuning fork*

### Influence of the product density on the switching point

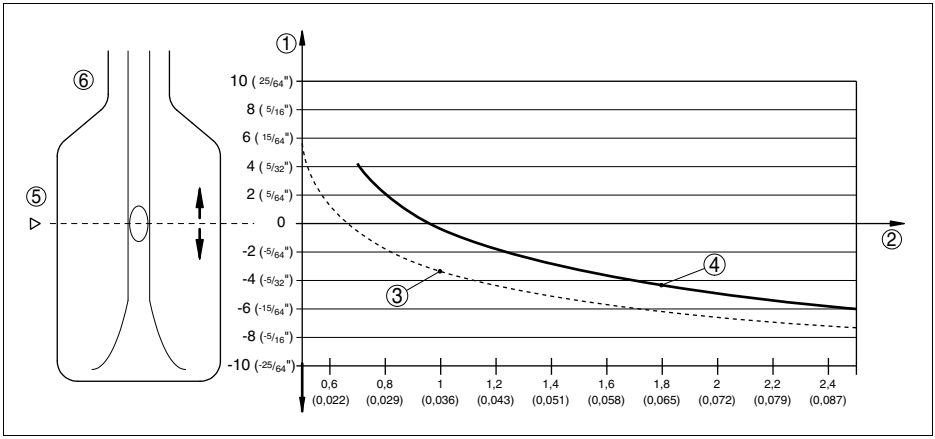


*Fig. 24: Influence of the product density on the switching point*

*1 Shifting of the switching point in mm (in)*
*2 Product density in g/cm³ (lb/in³)*
*3 Switch position 0.5 g/cm³ (0.018 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**

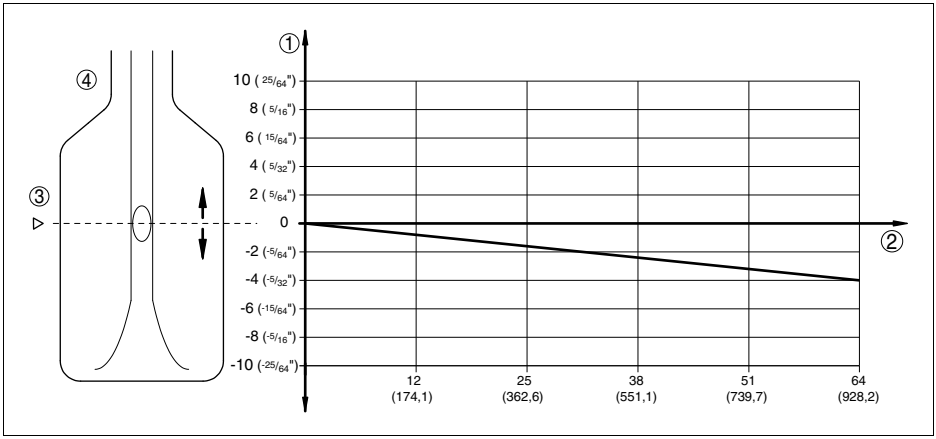


*Fig. 25: Influence of the process pressure to the switching point*

*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 | approx. 500 ms (on/off) |
| Frequency | approx. 1200 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 | -1 … 64 bar/-100 … 6400 kPa (-14.5 … 928 psig) depending on the process fitting, e.g. flange (see following diagrams) |

Process temperature (thread or flange temperature)

| | |
|---|---|
| – LFV 330 of 316L | -50 … +150 °C (-58 … +302 °F) |
| – LFV 330 with temperature adapter (option) | -50 … +250 °C (-58 … +482 °F) |

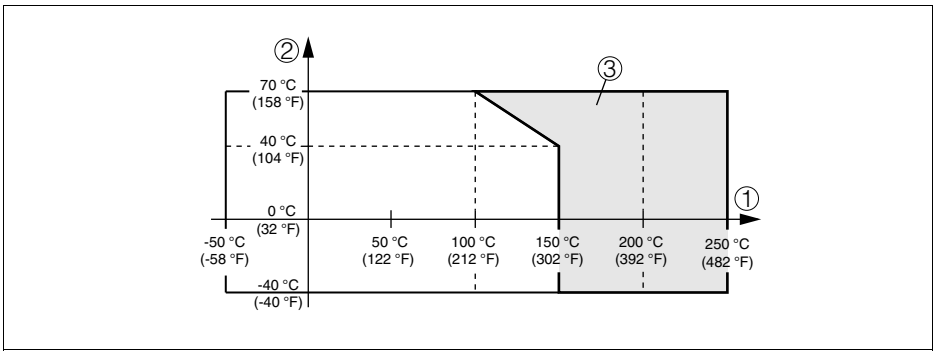


*Fig. 26: Ambient temperature - Process temperature*

*1 Process temperature in °C (°F)*
*2 Ambient temperature in °C (°F)*
*3 Temperature range with temperature adapter*

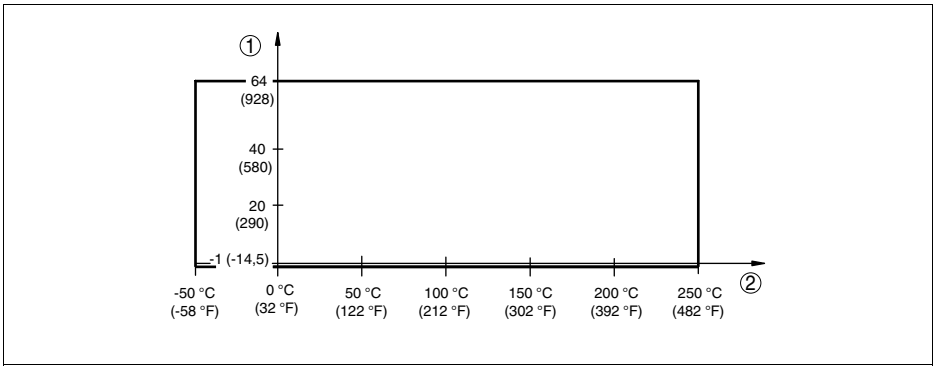


*Fig. 27: Process temperature - Process pressure with switch position 0.7 g/cm³ (mode switch)*

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

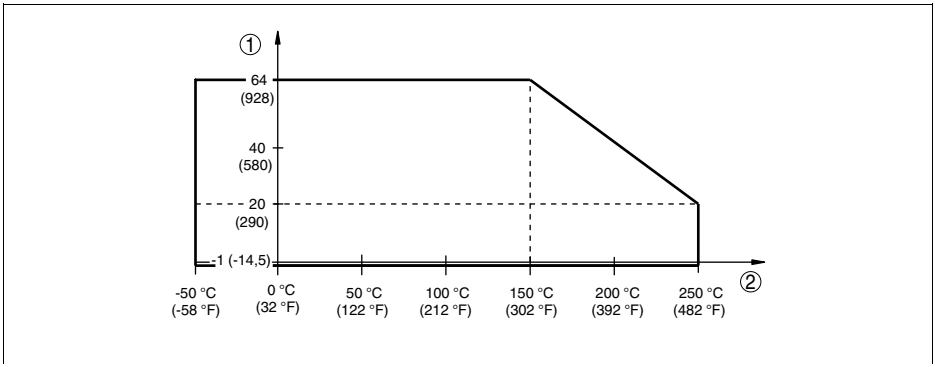

*Fig. 28: Process temperature - Process pressure with switch position 0.5 g/cm³ (mode switch)*

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

| | |
|---|---|
| Viscosity - dynamic | 0.1 … 10,000 mPa s (requirement: with density 1) |
| Density | 0.7 … 2.5 g/cm³ (0.025 … 0.09 lbs/in³); 0.5 … 2.5 g/cm³ (0.018 … 0.09 lbs/in³) by switching over |

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

| | |
|---|---|
| Cable entry/plug[1] | |
| – Single chamber housing | • 1 x cable gland M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind stopper M20 x 1.5<br>or:<br>• 1 x closing cap ½ NPT, 1 x blind plug ½ NPT<br>or:<br>• 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5 |
| Screw terminals | for wire cross-section up to 1.5 mm² (AWG 16) |

**Adjustment elements**

| | |
|---|---|
| Mode switch | |
| – Min. | rising characteristic curve (High current when immersed) |
| – Max. | falling characteristics (Low current when immersed) |
| Sensitivity switch | |
| – 0.5 | 0.5 … 2.5 g/cm³ (0.018 … 0.9 oz/in³) |
| – 0.7 | 0.7 … 2.5 g/cm³ (0.025 … 0.9 oz/in³) |
| Test key | simulation of a line break between sensor and processing unit |

**Voltage supply**

| | |
|---|---|
| Operating voltage (characteristics according to standard) | for connection to an amplifier according to NAMUR IEC 60947-5-6, approx. 8.2 V |
| Off-load voltage | $U_0$ approx. 8.2 V |
| Shortcircuit current | $I_U$ approx. 8.2 mA |

**Electrical protective measures**

| | |
|---|---|
| Protection rating | |
| – Plastic housing | IP 66/IP 67 |
| – Aluminium housing | IP 66/IP 68 (0.2 bar)[2] |

[1] Depending on the version M12 x 1, according to ISO 4400, Harting, 7/8" FF.
[2] A suitable cable is the prerequisite for maintaining the protection rating.

| | |
|---|---|
| Overvoltage category | III |
| 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

### LFV 330

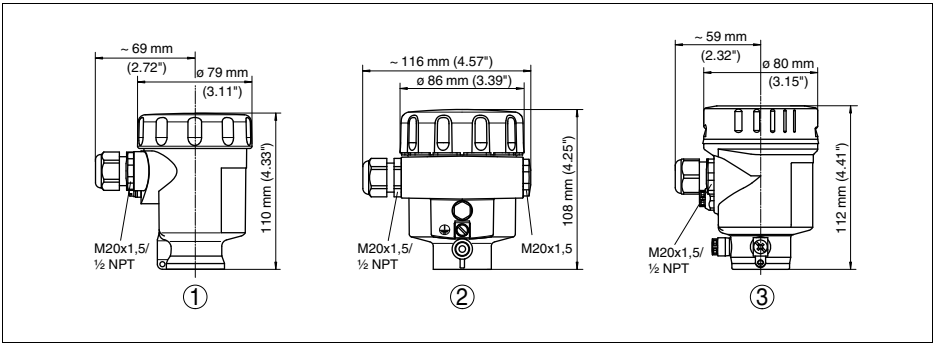


*Fig. 29: Housing versions*

*1 Plastic housing*
*2 Aluminium housing*
*3 Stainless steel housing, electropolished*

**LFV 330**

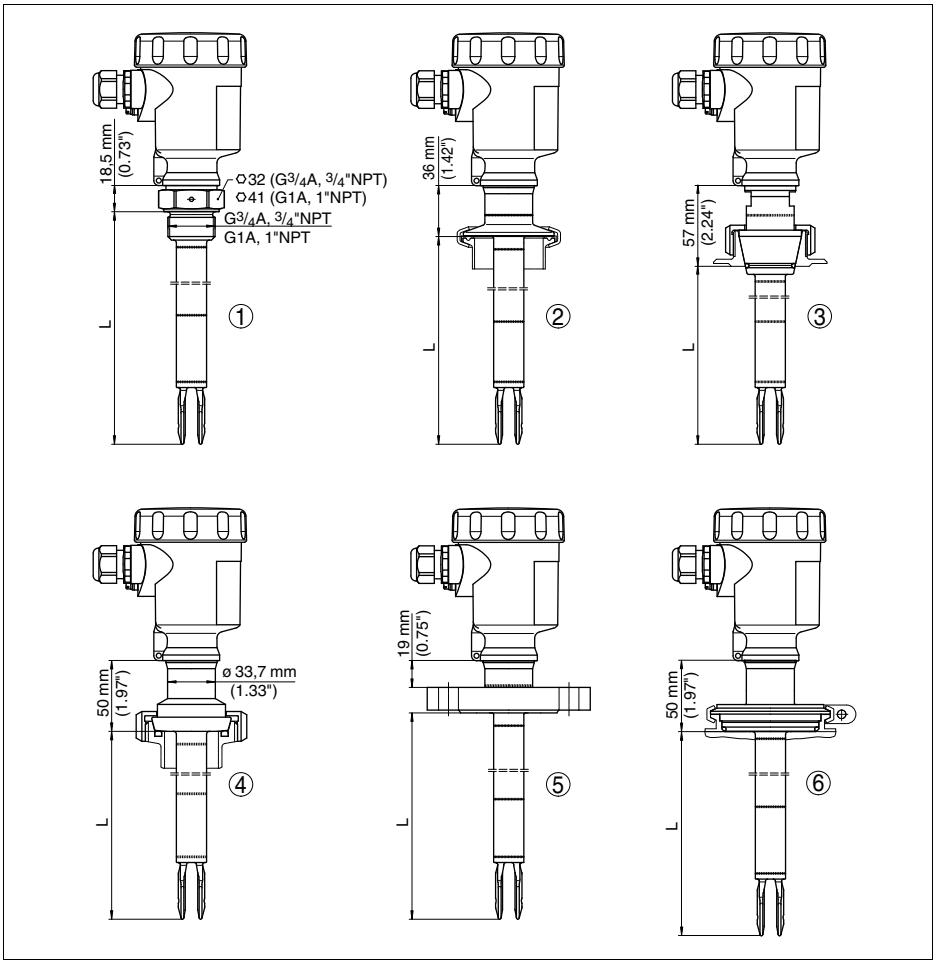


*Fig. 30: LFV 330*

*1 Thread*
*2 Tri-Clamp*
*3 Cone DN 25*
*4 Bolting DN 40*
*5 Flange*
*6 Gas-tight leadthrough*
*7 Temperature adapter*
*L = Sensor length, see chapter "Technical data"*

**LFV 330 - options**

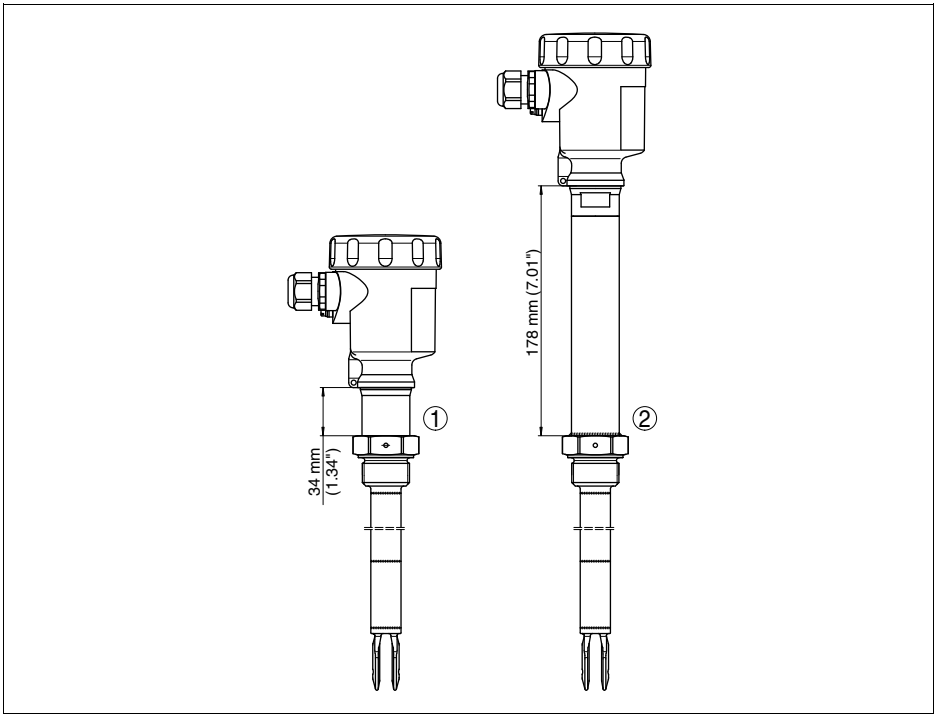


*Fig. 31: Options*

*1 Gas-tight leadthrough*
*2 Temperature adapter*

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