VEGA

ABLE Instruments & Controls

Interface measurement

Guided Microwave

# VEGAFLEX 67

## Product Information

VEGA


**Reading Office**
Cutbush Park, Danehill, Lower Earley,
Reading, Berkshire. RG6 4UT. UK.
Tel: +44 (0)118 9311188
Email: info@able.co.uk

**Aberdeen Office**
Unit 6 Airside Business Park, Kirkhill Industrial Estate,
Dyce, Aberdeen. AB21 0GT. UK.
Tel: +44 (0)1224 725999
Email: ab@able.co.uk

Internet: www.able.co.uk
e-procurement: www.247able.com
Registered in England No: 01851002
VAT No: GB 417 2481 61

# Content

# 1 Description of the measuring principle

### Measuring principle

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

A microprocessor identifies these level echoes, which are subsequently measured by the ECHOFOX software, evaluated and converted into level information.

Thanks to the simple measuring principle, time-consuming adjustment with medium is no longer necessary. The instruments are pre-set to the ordered probe length. Because their rods or cables can be shortened, the sensors can be adapted individually to the local requirements.

### Wide application range

With measuring ranges up to 60 m (197 ft), the sensors are well suited for tall vessels. Temperatures of -110 °C (-166 °F) to 400 °C (752 °F) and pressures from vacuum (-14.5 psig) up to 160 bar (2321 psig) ensure a wide application range.

### Interface measurement

VEGAFLEX 67 is particularly suitable for interface measurement of liquids. The mechanical configuration as well as the electronics were optimised for this application.

Due to its guide tube, the coax version is not influenced by vessel installations and reliably measures products with low DK value. Therefore this instrument version is preferred.

Several different probes are available

- Cable probes - for applications in high vessels up to 60 m (197 ft)
- Rod probes for applications in vessels up to 6 m (20 ft)
- Coax probes for application in low viscosity liquids, with vessel installations, in vessels up to 6 m (20 ft)

### Prerequisites for interface measurement

### Upper medium (L2)

- The upper medium must not be conductive
- The dielectric value of the upper medium must be known (input necessary). Min. dielectric values: Rod version 1.7, coax version 1.4. You can find a list of the dielectric values on our homepage: www.vega.com
- The composition of the upper medium must be stable, no varying products or mixtures
- The upper medium must be homogeneous, no stratifications within the medium
- The layer can be only measured from a thickness of 100 mm (4 in)
- Clear separation from the lower medium, no emulsion phase, no mull layer
- If possible, no foam on the surface

### Lower medium (L1)

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

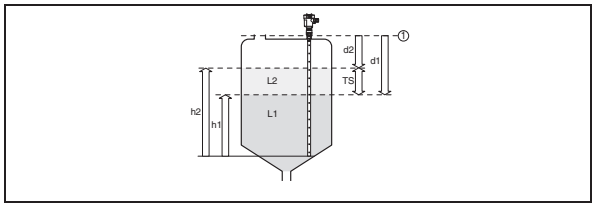


*Fig. 1: Interface measurement*

*1 Reference plane*
*d1 Distance to the interface (HART value 1 or Primary Value)*
*d2 Distance to the level (HART value 3 or Third Value)*
*TS Thickness of the upper medium (d1 - d2)*
*h1 Height - Interface*
*h2 Height - Level*
*L1 Lower medium*
*L2 Upper medium*

### Output signal

The interface is processed directly by the sensor.

The analogue output (4 … 20 mA) transmits the height of the interface (h1) in percent. This is also the value that is adjusted.

The instrument is supplied with the sensor length and upper dead band (0 %/100 %) already adjusted.

The display of PLICSCOM and PACTware™ outputs the distance to the interface (d1) in m(d) and to the level (d2) in m(d) (m - distance).

The HART protocol can transmit the distance to the interface - HART value 1 (d1) and the distance to the level (d2) - HART value 3.

The values can be evaluated with a VEGAMET 625 or any HART communication-based processing system such as e.g. interface modules. VEGAMET 625 can also generate the difference of the two values. This difference corresponds to the layer thickness of the upper medium.

## 2 Type overview

| | VEGAFLEX 67 with cable probe ø 4 mm (0.157 in) | VEGAFLEX 67 with rod probe ø 6 mm (0.236 in) |
|---|---|---|
| |  |  |
| Application: | Liquids | Liquids |
| Measuring range: | 0.15 … 32 m (0.492 … 104.99 ft) | 0.15 … 4 m (0.492 … 13.12 ft) |
| Process fitting: | Thread, flange | Thread, flange |
| Material: | 316L and PCTFE, 316 (1.4401) | 316L and PCTFE, Hastelloy C22 (2.4602) |
| Process temperature: | -40 … +150 °C (-40 … +302 °F) | -40 … +150 °C (-40 … +302 °F) |
| Process pressure: | -1 … 40 bar/-100 … 4000 kPa (-14.5 … 580 psig) | -1 … 40 bar/-100 … 4000 kPa (-14.5 … 580 psig) |
| Signal output: | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology |

| | VEGAFLEX 67 with cable probe ø 6 mm (0.236 in) | VEGAFLEX 67 with rod probe ø 16 mm (0.63 in) |
|---|---|---|
| |  |  |
| Application: | Liquids | Liquids |
| Measuring range: | 0.15 … 60 m (0.492 … 196.9 ft) | 0.15 … 4 m (0.492 … 13.12 ft) |
| Process fitting: | Thread, flange | Thread, flange |
| Material: | 316L and PCTFE, 316 | 316L and PCTFE, Hastelloy C22 (2.4602) |
| Process temperature: | -40 … +150 °C (-40 … +302 °F) | -40 … +150 °C (-40 … +302 °F) |
| Process pressure: | -1 … 40 bar/-100 … 4000 kPa (-14.5 … 580 psig) | -1 … 40 bar/-100 … 4000 kPa (-14.5 … 580 psig) |
| Signal output: | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology |

| | VEGAFLEX 67 with fully insulated cable probe ø 4 mm (0.157 in) | VEGAFLEX 67 with fully insulated rod probe ø 10 mm (0.394 in) | VEGAFLEX 67 with coax probe ø 21.3 mm (0.839 in) |
|---|---|---|---|
| |  |  |  |
| Application: | Liquids | Liquids | Liquids |
| Measuring range: | 1 … 32 m (0.984 … 104.99 ft) | 0.5 … 4 m (1.64 … 13.12 ft) | 0.05 … 6 m (0.164 … 19.69 ft) |
| Process fitting: | Flange, Tri-Clamp, bolting | Flange, Tri-Clamp, bolting | Thread, flange |
| Material: | PTFE (TFM 1600) | PTFE (TFM 1600) | 316L and PTFE (TFM 4105), Hastelloy C22 (2.4602) and PTFE (TFM 4105) |
| Process temperature: | -40 … +150 °C (-40 … +302 °F) | -40 … +150 °C (-40 … +302 °F) | -40 … +150 °C (-40 … +302 °F) |
| Process pressure: | -1 … 16 bar/-100 … 1600 kPa (-14.5 … 232 psig) | -1 … 16 bar/-100 … 1600 kPa (-14.5 … 232 psig) | -1 … 40 bar/-100 … 4000 kPa (-14.5 … 580 psig) |
| Signal output: | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology |

| -20 … +250 °C (-4 … +482 °F) | VEGAFLEX 67 with cable probe ø 4 mm (0.157 in) | VEGAFLEX 67 with rod probe ø 6 mm (0.236 in) | VEGAFLEX 67 with coax probe ø 21.3 mm (0.839 in) |
|---|---|---|---|
| |  |  |  |
| Application: | Liquids | Liquids | Liquids |
| Measuring range: | 1 … 32 m (3.28 … 104.99 ft) | 0.5 … 4 m (1.64 … 13.12 ft) | 0.3 … 6 m (0.984 … 19.69 ft) |
| Process fitting: | Thread, flange | Thread, flange | Thread, flange |
| Material: | 316L and PEEK GF30, 316 | 316L and PEEK GF30, Hastelloy C22 | 316L and PEEK GF30, Hastelloy C22 and PTFE (TFM 4105) |
| Process temperature: | -20 … +250 °C (-4 … +482 °F) | -20 … +250 °C (-4 … +482 °F) | -20 … +250 °C (-4 … +482 °F) |
| Process pressure: | -1 … 100 bar/-100 … 10000 kPa (-14.5 … 1450 psig) | -1 … 100 bar/-100 … 10000 kPa (-14.5 … 1450 psig) | -1 … 100 bar/-100 … 10000 kPa (-14.5 … 1450 psig) |
| Signal output: | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology |

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| -110 … +400 °C (-166 … +752 °F) | VEGAFLEX 67 with cable probe ø 4 mm (0.157 in) | VEGAFLEX 67 with rod probe ø 6 mm (0.236 in) | VEGAFLEX 67 with coax probe ø 21.3 mm (0.839 in) |
|---|---|---|---|
| |  |  |  |
| Application: | Liquids | Liquids | Liquids |
| Measuring range: | 1 … 32 m (3.28 … 104.99 ft) | 0.5 … 6 m (1.64 … 19.69 ft) | 0.3 … 6 m (0.984 … 19.69 ft) |
| Process fitting: | Thread, flange | Thread, flange | Thread, flange |
| Material: | 316L and Aluminium oxide-ceramic 99.7 % ($Al_2O_3$) | 316L and Aluminium oxide-ceramic 99.7 % ($Al_2O_3$), Hastelloy C22 and Aluminium oxide-ceramic 99.7 % ($Al_2O_3$) | 316L and Aluminium oxide-ceramic 99.7 % ($Al_2O_3$), Hastelloy C22 and Aluminium oxide-ceramic 99.7 % ($Al_2O_3$) |
| Process temperature: | -110 … +400 °C (-166 … +752 °F) | -110 … +400 °C (-166 … +752 °F) | -110 … +400 °C (-166 … +752 °F) |
| Process pressure: | -1 … 160 bar/-100 … 16000 kPa (-14.5 … 2321 psig) | -1 … 160 bar/-100 … 16000 kPa (-14.5 … 2321 psig) | -1 … 160 bar/-100 … 16000 kPa (-14.5 … 2321 psig) |
| Signal output: | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology | 4 … 20 mA/HART in two-wire, four-wire, Profibus PA, Foundation Fieldbus technology |

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| | | | | |
|---|---|---|---|---|
| **Indicating and adjustment module** |  PLICSCOM | | | |
| **Housing** |  Plastic |  Stainless steel |  Aluminium |  Aluminium (double chamber) |
| **Electronics** |  4 … 20 mA/HART two-wire |  4 … 20 mA/HART four-wire |  Profibus PA |  Foundation Field-bus |
| **Process fitting** |  Thread |  Flange | | |
| **Sensors** |  Rod probe |  Cable probe |  Coax probe | |
| **Approvals** |  Gas-explosion pro-tection | | | |

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# 3 Mounting instructions

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

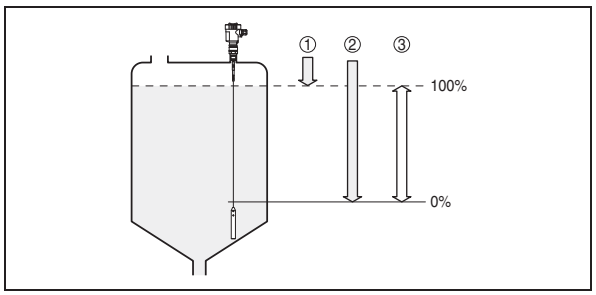



*Fig. 2: Measuring range (operating range) and max. measuring distance*

*1 full*
*2 empty (max. measuring distance)*
*3 Measuring range*

Keep in mind that a min. distance must be maintained below the reference plane and possibly also at the end of the probe - measurement in these areas is not possible (dead band). Keep in mind that the cable length cannot be used all the way to the end because measurement in the area of the gravity weight is not possible. A possible overfilling however, is also detected reliably within the dead band.

These min. distances (dead zones) are specified in chapter "*Technical data*".

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

**Installation position**
Mount VEGAFLEX so that the probe does not touch any installations or the vessel wall during operation. If necessary, fasten the probe end.

If such an installation location cannot be avoided, use a coax meas. probe - this type is not affected by such installation conditions.

When mounting the cable and rod versions of VEGAFLEX keep at least a distance of 300 mm (11.81 in) to vessel installations or the vessel wall.

The rod probe should end approx. 30 mm (1.2 in) above the vessel bottom to ensure that the probe does not touch the vessel wall.

VEGAFLEX can be also mounted in standpipes or bypass tubes. Make sure that the probe does not touch the tube during operation. The tube should have an inner diameter between 25 and 300 mm (1 und 11.81 in).

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible down to the lowest point of the bottom. When using the cable version, keep in mind that measurement down to the end of the probe is not possible. The exact value of the min. distance (lower dead band) is stated in chapter "*Technical data*".

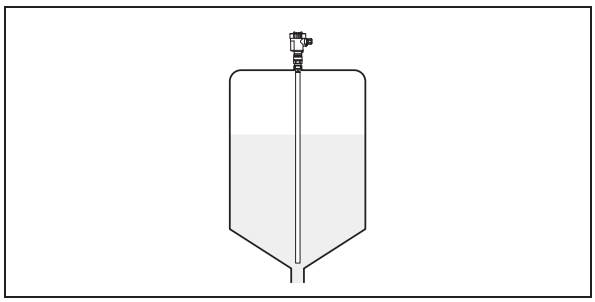


*Fig. 3: Vessel with conical bottom*

**Standpipes or bypass tubes**
Standpipes or bypass tubes are normally metal tubes with a diameter of 30 … 200 mm (1.18 … 7.87 in). In measurement technology such a tube corresponds to a coax probe. It does not matter if the standpipe is perforated or slotted for better mixing. Lateral inlets with bypass tubes also do not influence the measurement.

Measuring probes can be mounted in bypass tubes up to DN 200.

If VEGAFLEX is used in standpipes or bypass tubes, contact with the tube wall should be avoided. We offer spacers as accessories for fastening the probe in the middle of the tube.

Depending on the tube diameter or tube length, one or several spacers can be mounted. With cable probes, the cable can also be strained to avoid contact with the tube.

The max. temperature for the spacers is 250°C (482°F).

Keep in mind that buildup can form on the spacers. Strong buildup can influence the measurement.

For process technical reasons, plastic standpipes can always be used. However, they offer no advantages for the measurement. If durability is no problem, then we recommend the use of metal standpipes.

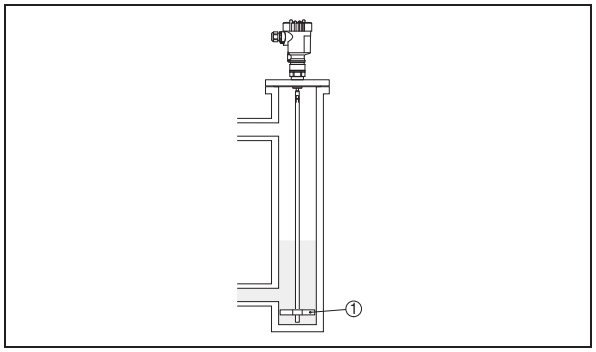



*Fig. 4: Position of the spacer*

*1 Spacer*

**Note:**
Measurement in a standpipe is not recommended for very adhesive products.

**Socket**
Generally the sockets do not influence the measurement. In limit ranges, e.g. in liquids with small dielectric figures (< 2) and applications with high wide sockets, e.g. > DN 100, h > 200 mm (7.9 in) the upper dead band extends by the socket height. If both conditions apply, it is recommended to use a small socket.

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

If a socket is absolutely necessary, then the use of a coax probe is recommended. Due to the coax guide tube, sockets do not influence measurement accuracy.

**Inflowing medium**
Make sure that the probe is not subjected to strong lateral forces. Mount VEGAFLEX at a position in the vessel where no disturbances, e.g. from filling openings, agitators, etc., can occur.

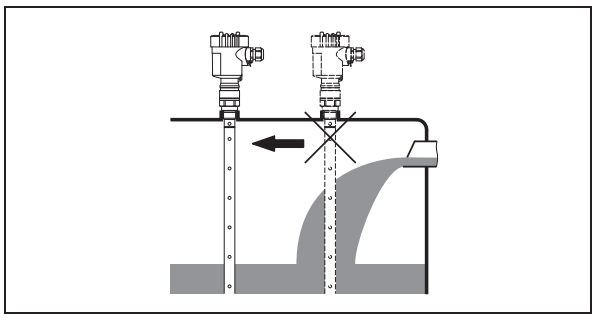


*Fig. 5: Lateral load*

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

In the gravity weight there is a thread (M12), e.g. for a ring bolt (article no. 2.27424).

Make sure that the probe cable is not extremely taut. Avoid tensile loads on the cable. Use a slightly pre-stressed tension spring to fasten the cable.

Avoid undefined cable-vessel connections, i.e. the connection must be either grounded reliably or isolated reliably. Any uncontrolled deviation from this requirement can lead to measurement errors.

# 4 Electrical connection

## 4.1 General prerequisites

The supply voltage range can differ depending on the instrument version. You can find exact specifications in chapter "*Technical data*".

The national installation standards as well as the valid safety regulations and accident prevention rules must be observed.

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

## 4.2 Voltage supply

**4 … 20 mA/HART two-wire**
Supply voltage and current signal are carried on the same two-wire cable. The requirements on the power supply are specified in chapter "*Technical data*".

The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as the VEGAMET signal conditioning instruments are suitable for power supply. When one of these instruments is used, a reliable separation of the supply circuit from the mains circuits according to DIN VDE 0106 part 101 and protection class II is ensured.

**4 … 20 mA/HART four-wire**
Power supply and current output are carried on two separate connection cables.

The standard version can be operated with an earth-connected current output, the Exd version must be operated with a floating output.

The instrument is designed in protection class I. To maintain this protection class, it is absolutely necessary that the ground conductor be connected to the internal ground conductor terminal.

**Profibus PA**
Power is supplied by a Profibus DP/PA segment coupler or a VEGALOG 571 EP input card.

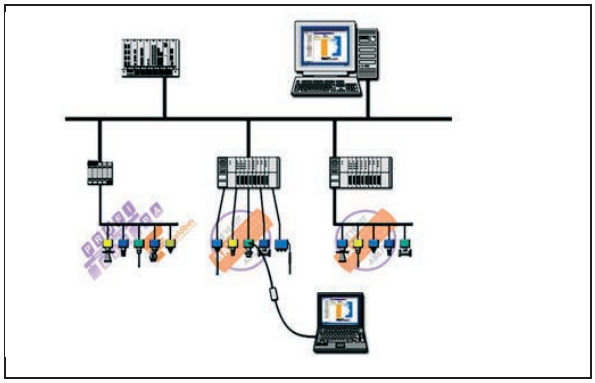


*Fig. 6: Integration of instruments in a Profibus PA system via segment coupler DP/PA or data recording systems with Profibus PA input card*

**Foundation Fieldbus**
Power supply via the H1 Fieldbus cable.

## 4.3 Connection cable

**Generally**
The sensors are connected with standard cable without screen. An outer cable diameter of 5 … 9 mm ensures the seal effect of the cable entry.

**4 … 20 mA/HART two-wire and four-wire**
If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used. In HART multidrop mode the use of screened cable is generally recommended.

**Profibus PA, Foundation Fieldbus**
The installation must be carried out according to the appropriate bus specification. The sensor is connected respectively with screened cable according to the bus specification. Make sure that the bus is terminated via appropriate terminating resistors.

For power supply, an approved installation cable with PE conductor is also required.

In Ex applications, the corresponding installation regulations must be noted for the connection cable.

## 4.4 Connection of the cable screen and grounding

If screened cable is necessary, the cable screen must be connected on both ends to ground potential. If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V).

**Profibus PA, Foundation Fieldbus**
In systems with potential separation, the cable screen is connected directly to ground potential on the power supply unit, in the connection box and directly on the sensor.

In systems without potential equalisation, connect the cable screen directly to ground potential only at the power supply unit and at the sensor - do not connect to ground potential in the connection box or T-distributor.

## 4.5 Wiring plan

### Single chamber housing

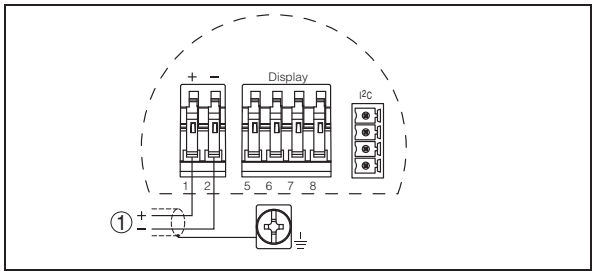



*Fig. 7: Connection HART two-wire, Profibus PA, Foundation Fieldbus*

*1 Voltage supply and signal output*

### Double chamber housing - two-wire

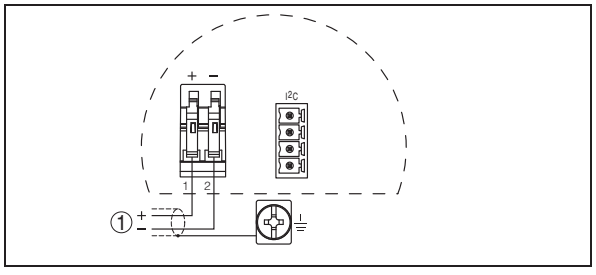



*Fig. 8: Connection HART two-wire, Profibus PA, Foundation Fieldbus*

*1 Voltage supply and signal output*

### Double chamber housing - 4 … 20 mA/HART four-wire

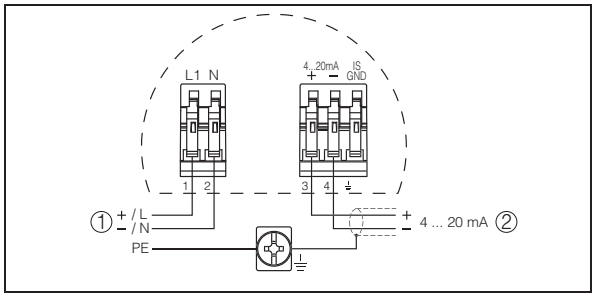



*Fig. 9: Connection 4 … 20 mA/HART four-wire*

*1 Voltage supply*
*2 Signal output*

# 5 Operation

## 5.1 Overview

The sensors can be adjusted with the following adjustment media:

- with indicating and adjustment module
- an adjustment software according to FDT/DTM standard, e.g. PACTware™ and PC

and, depending on the signal output, also with:

- a HART handheld (4 … 20 mA/HART)
- The adjustment program AMS (4 … 20 mA/HART and Foundation Fieldbus)
- The adjustment program PDM (Profibus PA)
- a configuration tool (Foundation Fieldbus)

The entered parameters are generally saved in the sensor, optionally also in the indicating and adjustment module or in the adjustment program.

## 5.2 Compatibility according to NAMUR NE 53

VEGAFLEX meet NAMUR recommendation NE 53. VEGA instruments are generally upward and downward compatible:

- Sensor software to DTM VEGAFLEX HART, PA or FF
- DTM VEGAFLEX for adjustment software PACTware™
- Indicating and adjustment module PLICSCOM for sensor software

The parameter adjustment of the basic sensor functions is independent of the software version. The range of available functions depends on the respective software version of the individual components.

## 5.3 Adjustment with the indicating and adjustment module PLICSCOM

**Setup and indication**

PLICSCOM is a pluggable indication and adjustment module for plics® sensors. It can be placed in four different positions on the instrument (each displaced by 90°). Indication and adjustment are carried out via four keys and a clear, graphic-capable dot matrix display. The adjustment menu with language selection is clearly structured and enables easy setup. After setup, PLICSCOM serves as indicating instrument: through the screwed cover with glass insert, measured values can be read directly in the requested unit and presentation style.

The integrated background lighting of the display can be switched on via the adjustment menu.[1)]

**PLICSCOM adjustment**

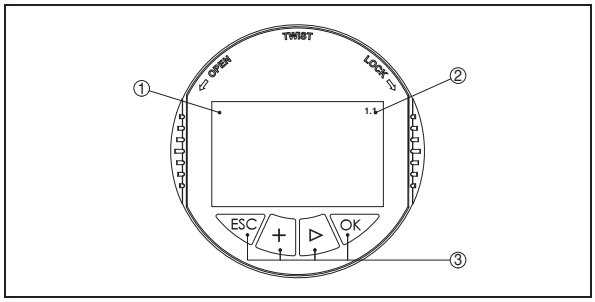



*Fig. 10: Indicating and adjustment elements*

*1 LC display*
*2 Indication of the menu item number*
*3 Adjustment keys*

**Key functions**

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- ***[->]*** key to select:
  - menu change
  - list entry
  - Select editing position
- ***[+]*** key:
  - Change value of the parameter
- ***[ESC]*** key:
  - interrupt input
  - jump to the next higher menu

## 5.4 Adjustment with PACTware™

**PACTware™/DTM**

Independent of the respective signal output 4 … 20 mA/HART, Profibus PA or Foundation Fieldbus, the sensors can be operated directly on the instrument via PACTware™. The sensors with signal output 4 … 20 mA/HART can be also operated via the HART signal on the signal cable.

An VEGACONNECT interface adapter as well as an instrument driver for the respective sensor is necessary for the adjustment with PACTware™. All currently available VEGA DTMs are included as DTM Collection with the current PACTware™ version on a CD. They are available for a protective fee from our respective VEGA agency. In addition, this DTM Collection incl. the basic

1) For instruments with national approvals such as e.g. according to FM or CSA only available at a later date.

version of PACTware™ can be downloaded free-of-charge from the Internet.

To use the entire range of functions of a DTM, incl. project documentation, a DTM licence is required for that particular instrument family. This licence can be bought from the VEGA agency serving you.

### Connect the PC via VEGACONNECT 3

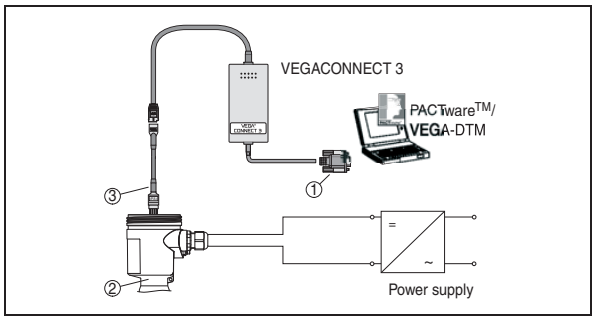



*Fig. 11: Connection of the PC directly to the sensor via I²C interface*

*1 RS232 connection*
*2 VEGAFLEX*
*3 I²C adapter cable for VEGACONNECT 3*

To adjust with PACTware™, a VEGACONNECT 3 with I²C adapter cable (art. no. 2.27323) as well as a power supply unit is necessary in addition to the PC and the suitable VEGA-DTM.

### Connect the PC via VEGACONNECT 4

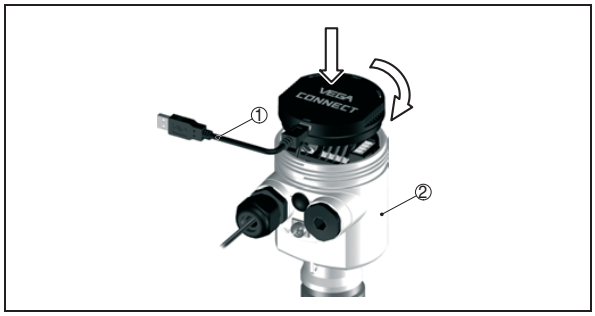



*Fig. 12: Internal connection of the PC directly to the sensor via I²C interface*

*1 USB cable*
*2 Sensor*

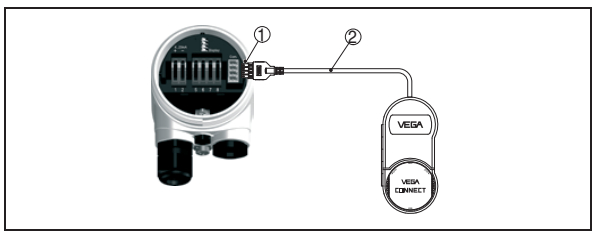



*Fig. 13: External connection of the PC directly to the sensor via I²C interface*

*1 I²C bus (Com.) interface*
*2 I²C connection cable of VEGACONNECT 4*

# 6 Technical data

## General data

Material 316L corresponds to 1.4404 or 1.4435

**VEGAFLEX 67 - cable: ø 4 mm (0.157 in), rod: ø 6 mm (0.236 in)**

Materials, wetted parts

| | |
|---|---|
| – Process fitting | 316L and PCTFE, Hastelloy C22 (2.4602) and PCTFE |
| – Process seal on the instrument side (cable/rod leadthrough) | FKM (e.g. Viton), Kalrez 6375, EPDM, FKM (e.g. Viton) FEP-coated |
| – Process seal | On site (instruments with thread: Klingersil C-4400 is attached) |
| – inner conductor (up to the separation cable/rod) | 1.4462 |
| – Rod: ø 6 mm (0.236 in) | 316L/Hastelloy C22 |
| – Cable: ø 4 mm (0.157 in) with gravity weight (optional) | 316 |

**VEGAFLEX 67 - cable: ø 6 mm (0.236 in), rod: ø 16 mm (0.63 in)**

Materials, wetted parts

| | |
|---|---|
| – Process fitting - cable version | 316L and PTFE |
| – Process fitting - rod version | 316L and PCTFE, Hastelloy C22 (2.4602) and PTFE |
| – Process seal on the instrument side (cable/rod leadthrough) | FKM (e.g. Viton), Kalrez 6375, EPDM, FKM (e.g. Viton) FEP-coated |
| – Process seal | On site (instruments with thread: Klingersil C-4400 is attached) |
| – Rod: ø 16 mm (0.63 in) | 316L, Hastelloy C22 |
| – Cable: ø 6 mm (0.236 in) | 316 |

**VEGAFLEX 67 - fully insulated - cable: ø 4 mm (0.157 in), rod: ø 10 mm (0.394 in)**

Materials, wetted parts

| | |
|---|---|
| – Process fitting | PFA and PTFE (TFM 1600) |
| – Rod: ø 10 mm (0.394 in), cannot be shortened | PFA and PTFE (TFM 1600) |
| – Cable: ø 4 mm (0.157 in), cannot be shortened, with gravity weight (optionally available) | PFA and PTFE (TFM 1600) |
| – Process seal | On site (instruments with thread: Klingersil C-4400 is attached) |

**VEGAFLEX 67 - coax version: ø 21.3 mm (0.839 in)**

Materials, wetted parts

| | |
|---|---|
| – Process fitting | 316L and PTFE (TFM) +25 % GF; Hastelloy C22 (2.4602) and PCTFE (TFM) +25 % GF |
| – Process seal on the instrument side (tube leadthrough) | FKM (e.g. Viton), Kalrez 6375, EPDM, FKM (e.g. Viton) FEP-coated |
| – Process seal | On site (instruments with thread: Klingersil C-4400 is attached) |
| – Tube: ø 21.3 mm (0.839 in) | 316L, Hastelloy C22 (2.4602) |

**VEGAFLEX 67 - high temperature version**

Materials, wetted parts - version -20 … +250 °C (-4 … +482 °F)

| | |
|---|---|
| – Process fitting - coax version | 316L, Hastelloy C22 (2.4602) and PEEK GF30 |
| – Process fitting - rod version | 316L, Hastelloy C22 (2.4602) and PEEK GF30 |
| – Process fitting - cable version | 316L and PEEK GF30 |
| – Tube: ø 21.3 mm (0.839 in) | 316L, Hastelloy C22 |
| – Rod: ø 6 mm (0.236 in) | 316L, Hastelloy C22 |
| – Cable: ø 4 mm (0.157 in) | 316 |
| – Process seal - instrument side | Kalrez 6375 |
| – Process seal | On site (instruments with thread: Klingersil C-4400 is attached) |

Materials, wetted parts - version -110 … +400 °C (-166 … +752 °F)

| | |
|---|---|
| – Process fitting - coax version | 316L, Hastelloy C22 (2.4602) and Aluminium oxide ceramic 99.7 % ($Al_2O_3$) |
| – Process fitting - rod version | 316L, Hastelloy C22 (2.4602) and Aluminium oxide ceramic 99.7 % ($Al_2O_3$) |
| – Process fitting - cable version | 316L, Hastelloy C22 (2.4602) and Aluminium oxide ceramic 99.7 % ($Al_2O_3$) |
| – Tube: ø 21.3 mm (0.839 in) | 316L, Hastelloy C22 |
| – Rod: ø 6 mm (0.236 in) | 316L, Hastelloy C22 |
| – Cable: ø 4 mm (0.157 in) | 316 |
| – Process seal - instrument side | graphite |
| – Process seal | On site (instruments with thread: Klingersil C-4400 is attached) |

**Materials, non-wetted parts**

Materials, non-wetted parts

| | |
|---|---|
| – Housing | Plastic PBT (polyester), Alu die-casting powder-coated, 316L |
| – Seal between housing and housing cover | NBR (stainless steel housing), silicone (Alu/plastic housing) |
| – Inspection window in housing cover for PLICSCOM (optional) | Polycarbonate |
| – Ground terminal | 316L |

**Weights approx.**
Depending on process fitting

| | |
|---|---|
| Instrument weight VEGAFLEX 67 | approx. 0.8 … 8 kg (0.176 … 17.64 lbs) |
| Weights | |
| – Cable: ø 4 mm (0.157 in) | 80 g/m (0.86 oz/ft) |
| – Cable: ø 6 mm (0.236 in) | 170 g/m (1.8 oz/ft) |
| – Rod: ø 6 mm (0.236 in) | 220 g/m (2.365 oz/ft) |
| – Rod: ø 10 mm (0.394 in) | 620 g/m (6.7 oz/ft) |
| – Rod: ø 16 mm (0.63 in) | 1600 g/m (17.2 oz/ft) |
| – Tube: ø 21.3 mm (0.839 in) | 920 g/m (9.9 oz/ft) |
| – Gravity weight - cable ø 4 mm (0.157 in) (optional) | 325 g (11.5 oz) |
| – Gravity weight - cable ø 6 mm (0.236 in) (optional) | 730 g (25.8 oz) |

**Lengths**

| | |
|---|---|
| Lengths (L) | |
| – Cable: ø 4 mm (0.157 in) | 1 … 32 m (3.28 … 104.99 ft) |
| – Cable: ø 6 mm (0.236 in) | 1 … 60 m (3.28 … 196.9 ft) |
| – Trimming accuracy - cable | ±0.05 % |
| – Rod: ø 6 mm (0.236 in) | 0.3 … 4 m (0.984 … 13.12 ft) |
| – Rod: ø 10 mm (0.394 in) | 0.3 … 4 m (0.984 … 13.12 ft) |
| – Rod: ø 16 mm (0.63 in) | 0.3 … 6 m (0.984 … 19.69 ft) |
| – Trimming accuracy - rod | < 1 mm (0.039 in) |
| – Tube: ø 21.3 mm (0.839 in) | 0.3 … 6 m (0.984 … 19.69 ft) |

**Lateral load**

| | |
|---|---|
| Lateral load | |
| – Rod: ø 6 mm (0.236 in) | 4 Nm (3 lbf ft) |
| – Rod: ø 10 mm (0.394 in) | 4 Nm (3 lbf ft) |
| – Rod: ø 16 mm (0.63 in) | 30 Nm (22 lbf ft) |
| – Tube: ø 21.3 mm (0.839 in) | 60 Nm (44 lbf ft) |

**Max. tensile load**

| | |
|---|---|
| Max. tensile load | |
| – VEGAFLEX 67 - cable: ø 4 mm (0.157 in) | 5 KN (1124 lbf) |
| – VEGAFLEX 67 - cable: ø 6 mm (0.236 in) | 30 KN (6745 lbf) |
| – VEGAFLEX 67 - fully insulated, cable: ø 4 mm (0.157 in) | 2 KN (450 lbf) |
| – VEGAFLEX 67 - high temperature version, cable: ø 4 mm (0.157 in) | 2.5 KN (562 lbf) |

## Output variable

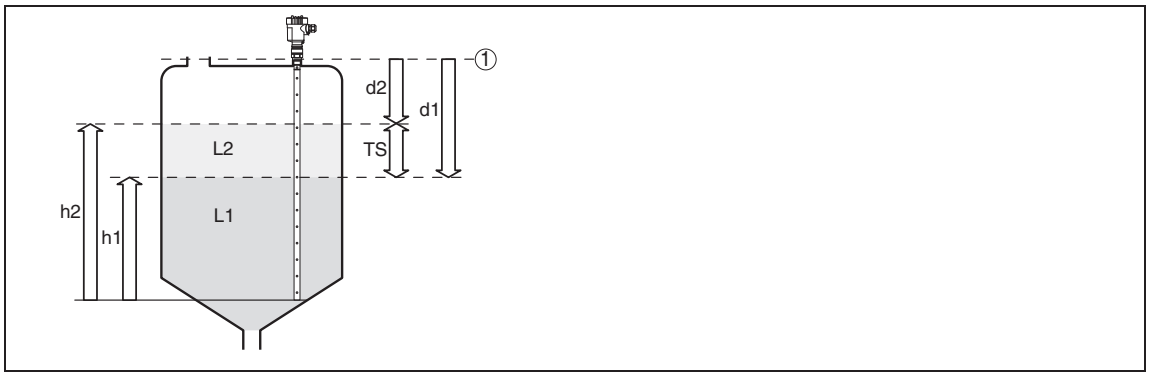



*Fig. 14: Interface measurement*

*1 Reference plane*
*d1 Distance to the interface (HART value 1 or Primary Value)*
*d2 Distance to the level (HART value 3 or Third Value)*
*TS Thickness of the upper medium (d1 - d2)*
*h1 Height - Interface*
*h2 Height - Level*
*L1 Lower medium*
*L2 Upper medium*

**4 … 20 mA/HART**

| | |
|---|---|
| Output signal | 4 … 20 mA/HART |
| HART specification | |
| – d1 | Distance to the interface (HART value 1 or Primary Value) |
| – d2 | Distance to the level (HART value 3 or Third Value) |
| Resolution | 1.6 µA |
| Fault message | Current output unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable) |
| Current limitation | 22 mA |
| Load | |
| – four-wire sensor | max. 500 Ohm[2)] |
| – two-wire sensor | see load diagram under Power supply |
| Integration time | 0 … 999 s, adjustable |
| Fulfilled NAMUR recommendations | NE 43 |

**Profibus PA**

| | |
|---|---|
| Output signal | digital output signal, format according to IEEE-754 |
| – Sensor address | 126 (default setting) |
| HART specification | |
| – d1 | Distance to the interface (HART value 1 or Primary Value) |
| – d2 | Distance to the level (HART value 3 or Third Value) |
| Current value | constantly 10 mA, ±0.5 mA |
| Integration time | 0 … 999 s, adjustable |

**Foundation Fieldbus**

| | |
|---|---|
| Output | |
| – Signal | digital output signal, Foundation Fieldbus protocol |
| – Physical layer | according to IEC 61158-2 |
| HART specification | |
| – d1 | Distance to the interface (HART value 1 or Primary Value) |
| – d2 | Distance to the level (HART value 3 or Third Value) |

2) With inductive load ohmic share min. 25 Ω/mH.

| | |
|---|---|
| Channel Numbers | |
| – Channel 1 | Primary Value |
| – Channel 2 | Secondary Value 1 |
| – Channel 3 | Secondary Value 2 |
| – Channel 4 | Temperature Value[3] |
| Current value | 10 mA, ±0.5 mA |

## Input variable

| | |
|---|---|
| Parameter | Interface measurement of liquids |
| Min. dielectric figure (lower medium) | by 10 higher than Er of the upper medium |
| Min. measured layer thickness (upper medium) | > 100 mm (3.937 in) |
| Min. dielectric figure (upper medium) - coax version | εr > 1.4 |
| Dead band - coax version | |
| – top | 30 mm (1.181 in) |
| – bottom | 0 mm |

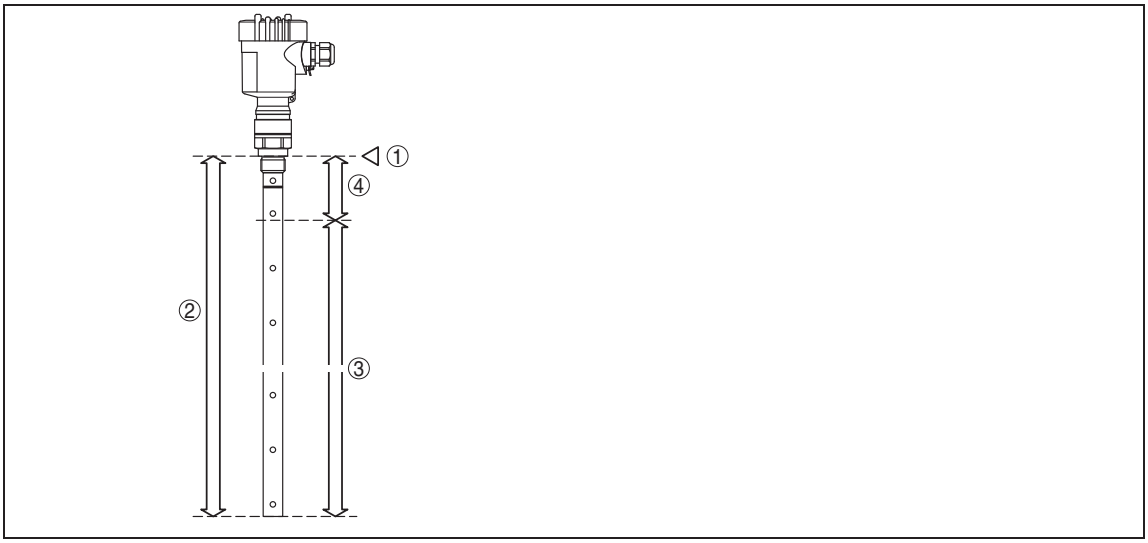



*Fig. 15: Measuring ranges of VEGAFLEX - coax version*

*1 Reference plane*
*2 Probe length*
*3 Measuring range*
*4 Upper dead band*

| | |
|---|---|
| Min. dielectric figure (upper medium) with rod, cable version | εr > 1.6 |
| Dead band with rod version | |
| – top | 80 mm (3.15 in) |
| – bottom | 0 mm |
| Dead band with cable version | |
| – top | 80 mm (3.15 in) |
| – bottom | 250 mm (9.843 in), gravity weight + 100 mm (3.937 in) |

[3] Only with sensors with integrated temperature measurement.

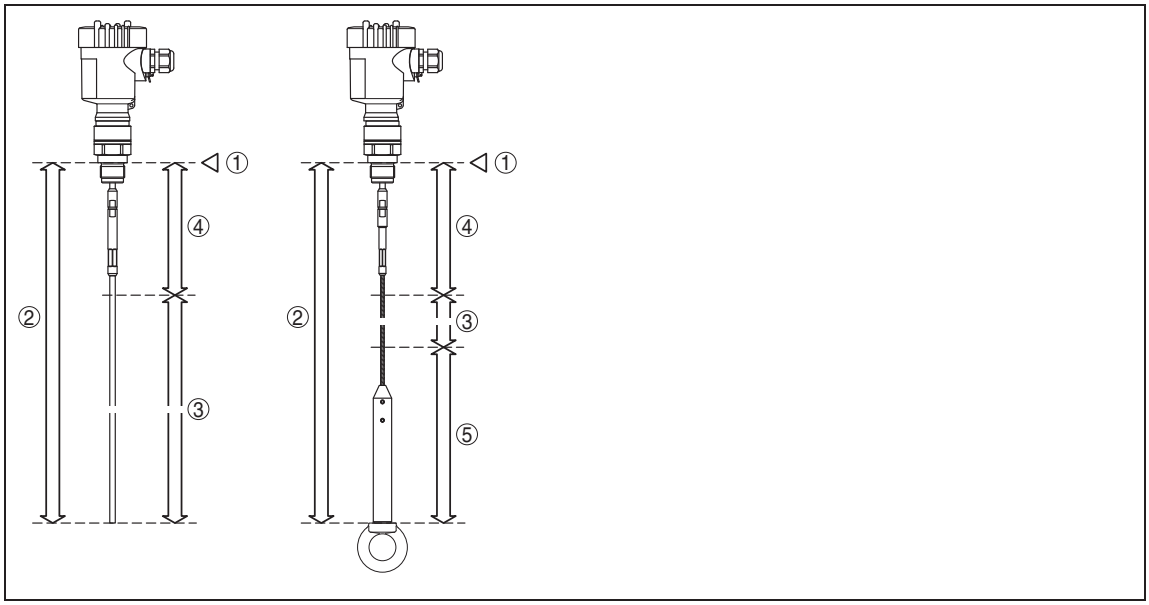



*Fig. 16: Measuring ranges of the VEGAFLEX - rod and cable version*

1 *Reference plane*
2 *Probe length*
3 *Measuring range*
4 *Upper dead band*
5 *Lower dead band (only with cable version)*

## Accuracy (similar to DIN EN 60770-1)

| | |
|---|---|
| Reference conditions according to DIN EN 61298-1 | |
| – Temperature | +18 … +30 °C (+64 … +86 °F) |
| – Relative humidity | 45 … 75 % |
| – Air pressure | 860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psig) |

## Deviation in characteristics and characteristics

| | |
|---|---|
| Reference installation conditions | |
| – Flange | DN 100 |
| – min. distance to installations | 500 mm (19.69 in) |
| Reference reflector | Metal plate: ø 1 m (39.37 in) |
| Temperature drift (current output) | 0.06 %/10 K relating to the max. measuring range |
| Accuracy | |
| – Cable version | ±10 mm (0.394 in) |
| – Rod version | ±10 mm (0.394 in) |
| – Coax version | ±10 mm (0.394 in) |

## Ambient conditions

| | |
|---|---|
| Ambient, storage and transport temperature | |
| – Standard version | -40 … +80 °C (-40 … +176 °F) |
| – Version IP 66/IP 68, 1 bar with connection cable PE | -20 … +60 °C (-4 … +140 °F) |

## Process conditions

**VEGAFLEX 67**

| | |
|---|---|
| Process pressure | -1 … 40 bar/-100 … 4000 kPa (-14.5 … 580 psig), depending on the process fitting |

Process temperature (thread or flange temperature)

| | |
|---|---|
| – FKM (e.g. Viton) | -40 … +150 °C (-40 … +302 °F) |
| – FKM (e.g. Viton), FEP-coated | -40 … +150 °C (-40 … +302 °F) |
| – EPDM | -40 … +150 °C (-40 … +302 °F) |
| – Kalrez 6375 | -20 … +150 °C (-4 … +302 °F) |

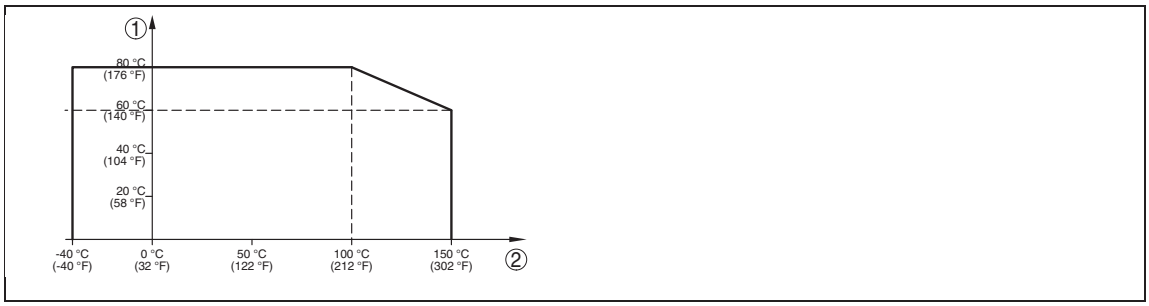



*Fig. 17: VEGAFLEX 67 - ambient temperature - product temperature*

*1 Ambient temperature*
*2 Product temperature (depending on the seal material)*

**VEGAFLEX 67 - fully insulated**

Process pressure

| | |
|---|---|
| – Flange version ≤ 2"/DN 50 | -0.5 … 16 bar/-50 … 1600 kPa (-7.3 … 232 psig), depending on the process fitting |
| – Flange version > 2"/DN 50 | -0.2 … 16 bar/-20 … 1600 kPa (-2.9 … 232 psig), depending on the process fitting |
| Process temperature (flange temperature) | -40 … +150 °C (-40 … +302 °F) |

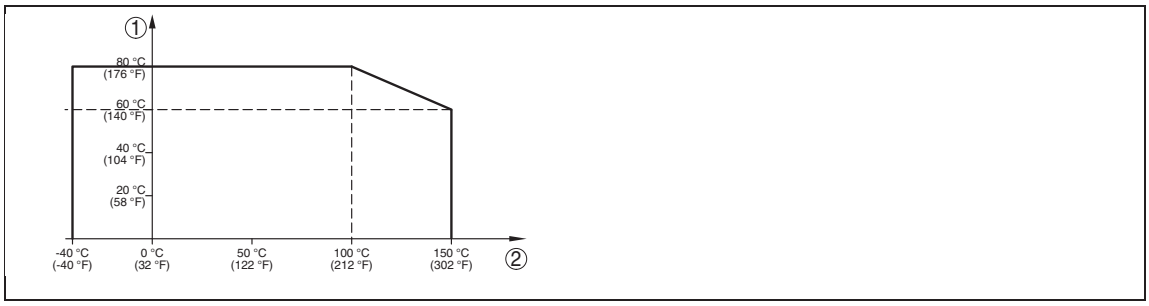



*Fig. 18: VEGAFLEX 67 fully insulated, ambient temperature - product temperature*

*1 Ambient temperature*
*2 Product temperature (depending on the seal material)*

**VEGAFLEX 67 (-20 … +250 °C/-4 … +482 °F)**

| | |
|---|---|
| Process pressure | -1 … 100 bar/-100 … 10000 kPa (-14.5 … 1450 psig), depending on the process fitting |
| Process temperature | -20 … +250 °C (-4 … +482 °F) |

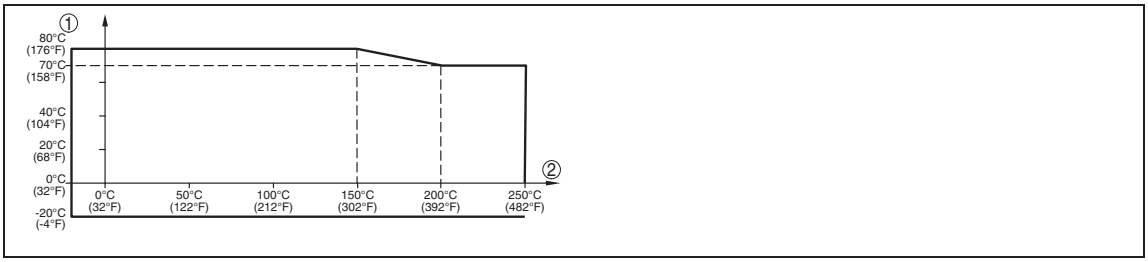



*Fig. 19: Ambient temperature - product temperature (version -20 … +250 °C/-4 … +482 °F)*

*1 Ambient temperature*
*2 Product temperature (depending on the seal material)*

**VEGAFLEX 67 (-110 … +400 °C/-328 … +752 °F)**
Not for steam pressure applications

| | |
|---|---|
| Process pressure | -1 … 160 bar/-100 … 16000 kPa (-14.5 … 2321 psig), depending on the process fitting |
| Process temperature (graphite seal) | -110 … +400 °C (-166 … +752 °F) |

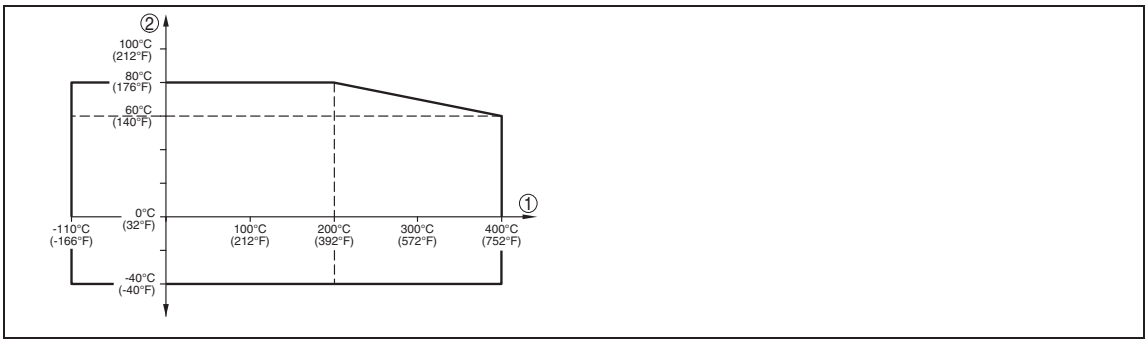



*Fig. 20: Ambient temperature - product temperature (version -110 … +400 °C/-166 … +752 °F)*

*1 Product temperature*
*2 Ambient temperature*

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

Cable entry/plug[4)]

– Single chamber housing
- 1 x cable entry M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind stopper M20 x 1.5

or:
- 1 x closing cap M20 x 1.5; 1 x blind stopper 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

– Double chamber housing
- 1 x cable entry M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind stopper M20 x 1.5; 1 x blind stopper M16 x 1.5 or optionally available with 1 x plug M12 x 1 for VEGADIS 61

or:
- 1 x closing cap ½ NPT, 1 x blind stopper ½ NPT, 1 x blind stopper M16 x 1.5 or optionally available with 1 x plug M12 x 1 for VEGADIS 61

or:
- 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5; 1 x blind stopper M16 x 1.5 or optionally available with 1 x plug M12 x 1 for VEGADIS 61

4) Depending on the version M12x1, according to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF.

| | |
|---|---|
| Connection terminals | Spring-loaded terminals for wire cross-section up to 2.5 mm² (AWG 14) |

## Indicating and adjustment module

| | |
|---|---|
| Power supply and data transmission | through the sensor |
| Indication | LC display in Dot matrix |
| Adjustment elements | 4 keys |
| Protection | |
| – unassembled | IP 20 |
| – mounted into the sensor without cover | IP 40 |
| Materials | |
| – Housing | ABS |
| – Inspection window | Polyester foil |

## Power supply VEGAFLEX - two-wire instrument

### 4 … 20 mA/HART

| | |
|---|---|
| Supply voltage | |
| – Non-Ex instrument | 14 … 36 V DC |
| – EEx-ia instrument | 14 … 30 V DC |
| – EEx-d-ia instrument | 20 … 36 V DC |
| Permissible residual ripple | |
| – < 100 Hz | $U_{ss}$ < 1 V |
| – 100 Hz … 10 kHz | $U_{ss}$ < 10 mV |
| Load | see diagram |

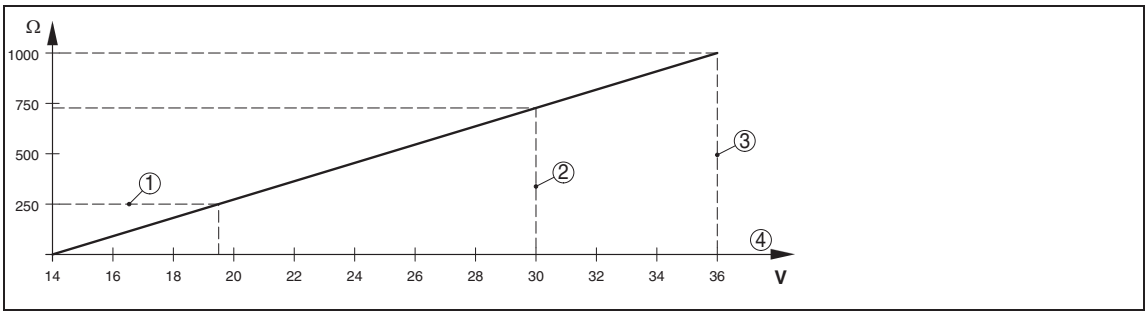



*Fig. 21: Voltage diagram*

*1 HART load*
*2 Voltage limit EEx-ia instrument*
*3 Voltage limit non-Ex/Exd instrument*
*4 Supply voltage*

### Profibus PA

| | |
|---|---|
| Supply voltage | |
| – Non-Ex instrument | 9 … 32 V DC |
| – EEx-ia instrument | 9 … 24 V DC |
| Power supply by/max. number of sensors | |
| – DP/PA segment coupler | max. 32 (max. 10 with Ex) |
| – VEGALOG 571 EP card | max. 15 (max. 10 with Ex) |

### Foundation Fieldbus

| | |
|---|---|
| Supply voltage | |
| – Non-Ex instrument | 9 … 32 V DC |
| – EEx-ia instrument | 9 … 24 V DC |
| Power supply by/max. number of sensors | |
| – H1 Fieldbus cable/Voltage supply | max. 32 (max. 10 with Ex) |

## Power supply VEGAFLEX - four-wire instrument

**4 … 20 mA**

| | |
|---|---|
| Supply voltage | |
| – Non-Ex and EEx-d instrument | 20 … 72 V DC, 20 … 253 V AC, 50/60 Hz |
| Max. power consumption | 4 VA; 2.1 W |

## Electrical protective measures

| | |
|---|---|
| Protection | |
| – Plastic housing | IP 66/IP 67 |
| – Double chamber Alu-housing, four-wire instruments | IP 66/IP 67 |
| – Alu and stainless steel housing, two-wire instruments | IP 66/IP 68 (0.2 bar)[5] |
| – Alu and stainless steel housing optional, two-wire instruments | IP 66/IP 68 (1 bar) |
| Overvoltage category | III |
| Protection class | |
| – two-wire, Profibus PA, Foundation Fieldbus | II |
| – four-wire | I |

## Approvals[6]

| | |
|---|---|
| ATEX | ATEX II 1G, 1/2G, 2G EEx ia IIC T6<br>ATEX II 1/2G, 2G EExd ia IIC T6 |
| FM | FM Cl.I, Div 2 (NI)+Cl.II, III, Div 1 (DIP)<br>FM Cl.I-III, Div 1 (IS)<br>FM Cl.I-III, Div 1 (IS) + Cl.I-III, Div 1 Gr.C-G(XP) |
| CSA | CSA Cl.I, Div 2 (NI)+Cl.II, III, Div 1 (DIP)<br>CSA Cl.I-III, Div 1 (IS)<br>CSA Cl.I-III, Div 1 (IS) + Cl.I-III, Div 1 Gr.C-G(XP) |
| Ship approvals | |

**VEGAFLEX 67**

| | |
|---|---|
| ATEX | ATEX II 1G, 1/2G, 2G EEx ia IIC T6<br>ATEX II 1/2G, 2G EEx d ia IIC T6, ATEX II 1/2D IP66 T, WHG |
| FM | FM Cl.I, Div 2 (NI)+Cl.II, III, Div 1 (DIP)<br>FM Cl.I-III, Div 1 (IS)<br>FM Cl.I-III, Div 1 (IS) + Cl.I-III, Div 1 Gr.C-G(XP) |
| CSA | CSA Cl.I, Div 2 (NI)+Cl.II, III, Div 1 (DIP)<br>CSA Cl.I-III, Div 1 (IS)<br>CSA Cl.I-III, Div 1 (IS) + Cl.I-III, Div 1 Gr.C-G(XP) |
| Ship approvals | |

**VEGAFLEX 67 - high temperature version**

| | |
|---|---|
| ATEX | ATEX II 1G, 1/2G, 2G EEx ia IIC T6<br>ATEX II 1/2G, 2G EExd ia IIC T6 |
| FM | FM Cl.I, Div 2 (NI)+Cl.II, III, Div 1 (DIP)<br>FM Cl.I-III, Div 1 (IS)<br>FM Cl.I-III, Div 1 (IS) + Cl.I-III, Div 1 Gr.C-G(XP) |
| Ship approvals | |

## CE conformity

EMVG (89/336/EWG), Emission: EN 61326: 1997 (class B),
Susceptibility: EN 61326: 1997/A1: 1998
LVD (73/23/EWG), EN 61010-1: 2001
NAMUR recommendation NE 21

## Environmental instructions

| | |
|---|---|
| VEGA environment management system | certified according to DIN EN ISO 14001 |
| You can find detailed information under www.vega.com. | |

5) A suitable cable is the prerequisite for maintaining the protection class.
6) Deviating data in Ex applications: see separate safety instructions.

# 7 Dimensions

### Housing in protection IP 66/IP 67 and IP 66/IP 68; 0.2 bar

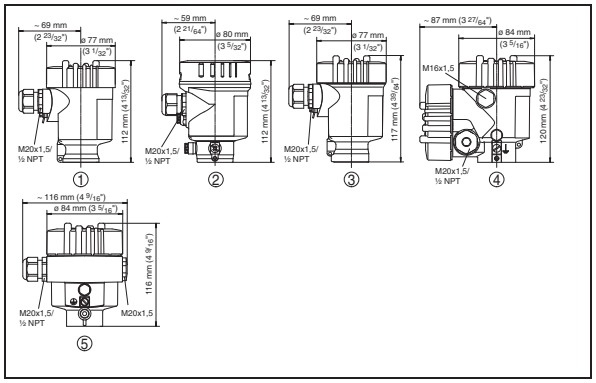



*Fig. 22: Housing versions in protection IP 66/IP 67 and IP 66/IP 68, 0.2 bar (with integrated indicating and adjustment module the housing height increases by 9 mm/ 0.35 in)*

*1 Plastic housing*
*2 Stainless steel housing*
*3 Stainless steel housing - precision casting*
*4 Aluminium double chamber housing*
*5 Aluminium housing*

### Housing in protection IP 66/IP 68, 1 bar

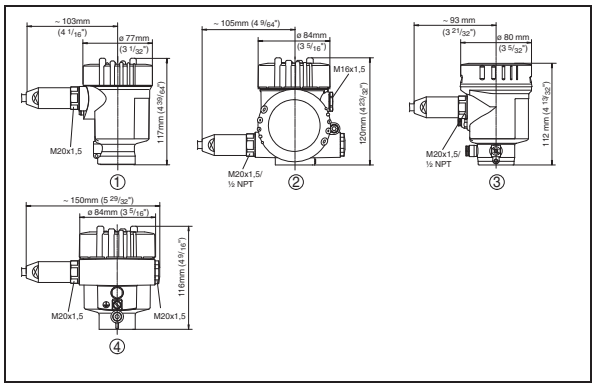



*Fig. 23: Housing versions in protection IP 66/IP 68, 1 bar (with integrated indicating and adjustment module the housing is 9 mm/0.35 in higher)*

*1 Stainless steel housing - precision casting*
*2 Aluminium double chamber housing*
*3 Stainless steel housing*
*4 Aluminium housing*

### VEGAFLEX 67 - cable version: ø 4 mm (0.157 in), rod version: ø 6 mm (0.236 in)

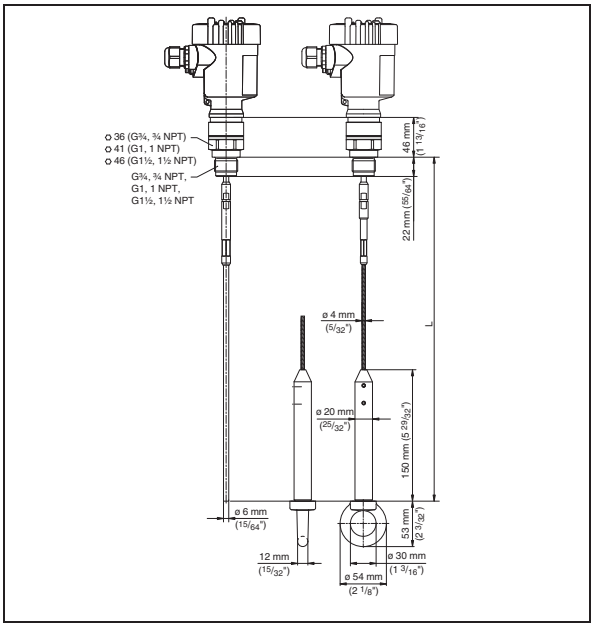



*Fig. 24: VEGAFLEX 67 - cable, rod version with thread*

*L Sensor length, see chapter "Technical data"*

### VEGAFLEX 67 - cable version: ø 6 mm (0.236 in), rod version: ø 16 mm (0.63 in)

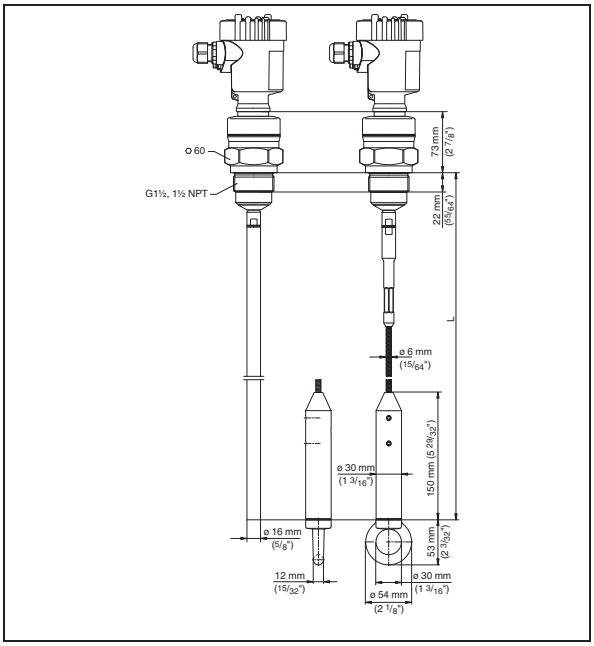



*Fig. 25: VEGAFLEX 67 - cable, rod version with thread*

*L Sensor length, see chapter "Technical data"*

### VEGAFLEX 67 - fully insulated, cable version: ø 4 mm (0.157 in), rod version: ø 10 mm (0.394 in)

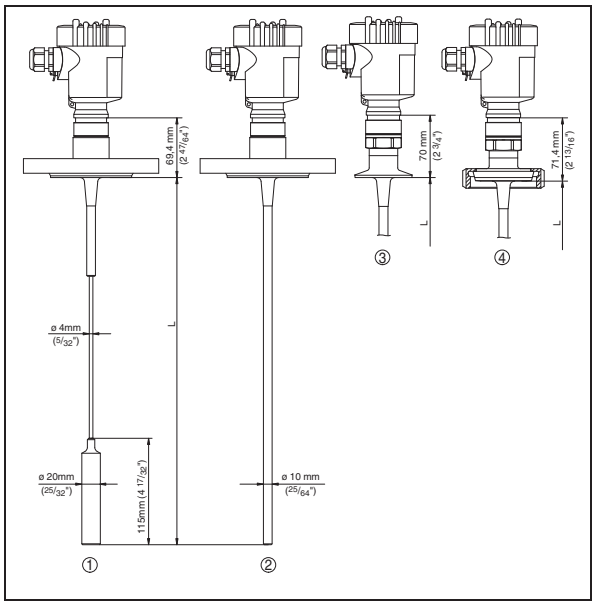



*Fig. 26: VEGAFLEX 67 - flange version*

*L Sensor length, see chapter "Technical data"*
*1 Cable version with flange connection*
*2 Rod version with flange connection*
*3 Tri-Clamp*
*4 Bolting*

### VEGAFLEX 67 - coax version: ø 21.3 mm (0.839 in)

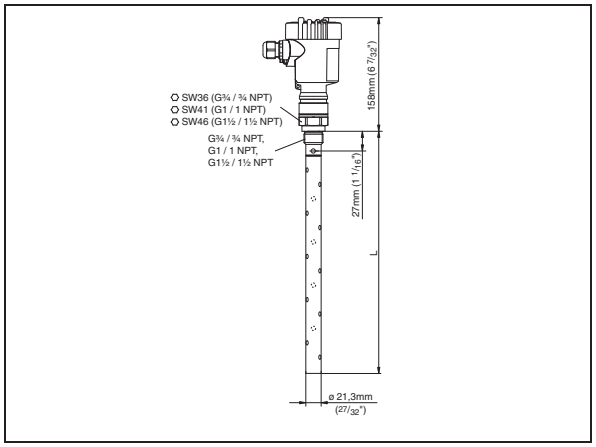



*Fig. 27: VEGAFLEX 67 - coax version with thread*

*L Sensor length, see chapter "Technical data"*

### VEGAFLEX 67 - cable, rod version (-20 … +250 °C/-4 … +482 °F)

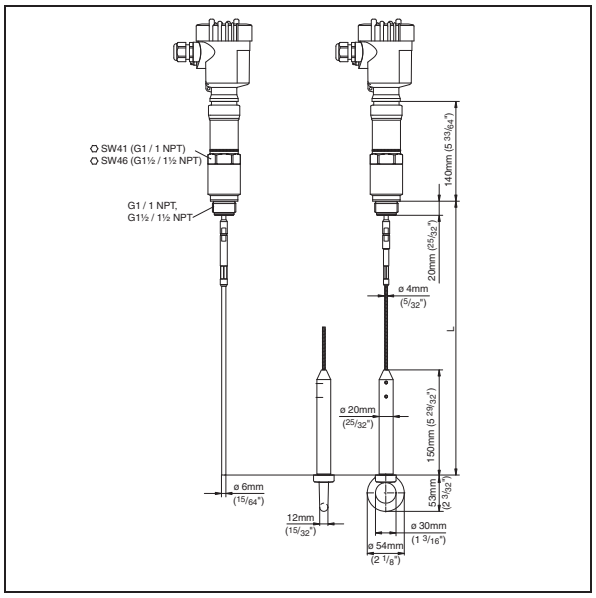



*Fig. 28: VEGAFLEX 67 - cable, rod version with thread (-20 … +250 °C/-4 … +482 °F)*

*L Sensor length, see chapter "Technical data"*

### VEGAFLEX 67 - coax version (-20 … +250 °C/-4 … +482 °F)

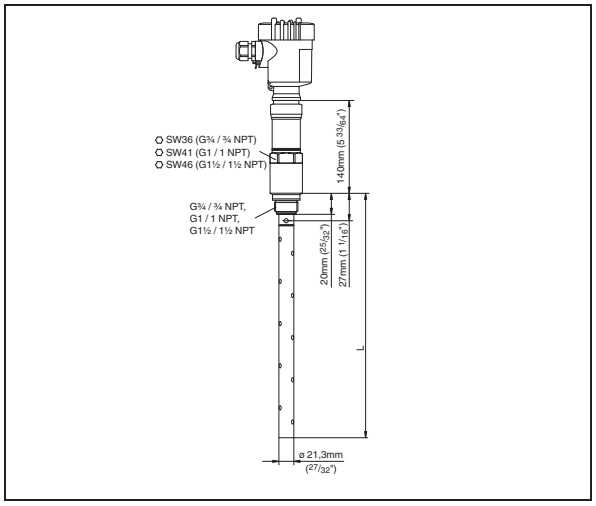



*Fig. 29: VEGAFLEX 67 - coax version with thread (-20 … +250 °C/-4 … +482 °F)*

*L Sensor length, see chapter "Technical data"*

### VEGAFLEX 67 - cable, rod version (-110 … +400 °C/-166 … +752 °F)

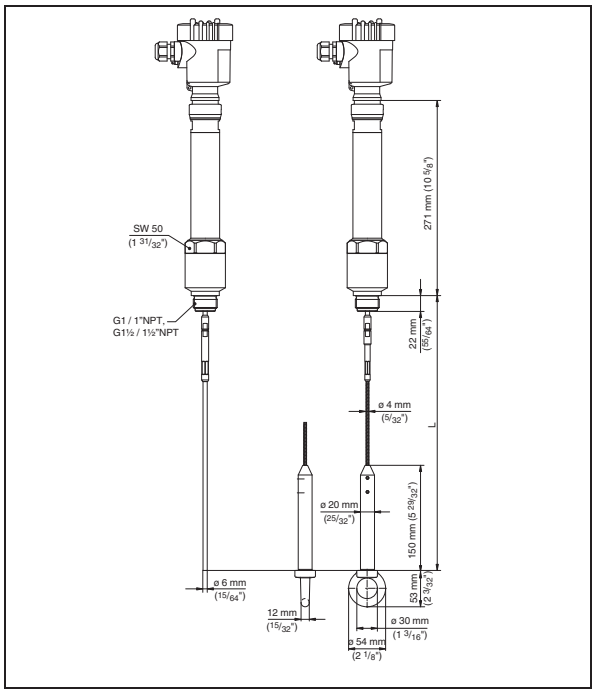



*Fig. 30: VEGAFLEX 67 - cable, rod version with thread (-110 … +400 °C/-166 … +752 °F)*

*L Sensor length, see chapter "Technical data"*

### VEGAFLEX67-coaxversion(-110…+400°C/-166…+752°F)

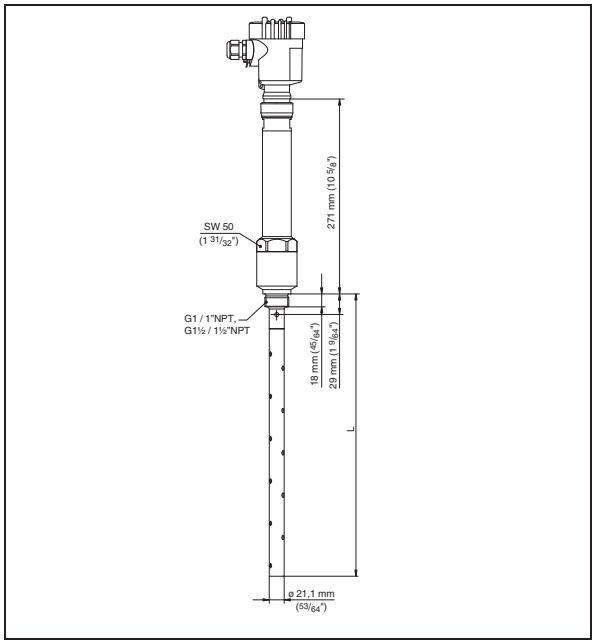
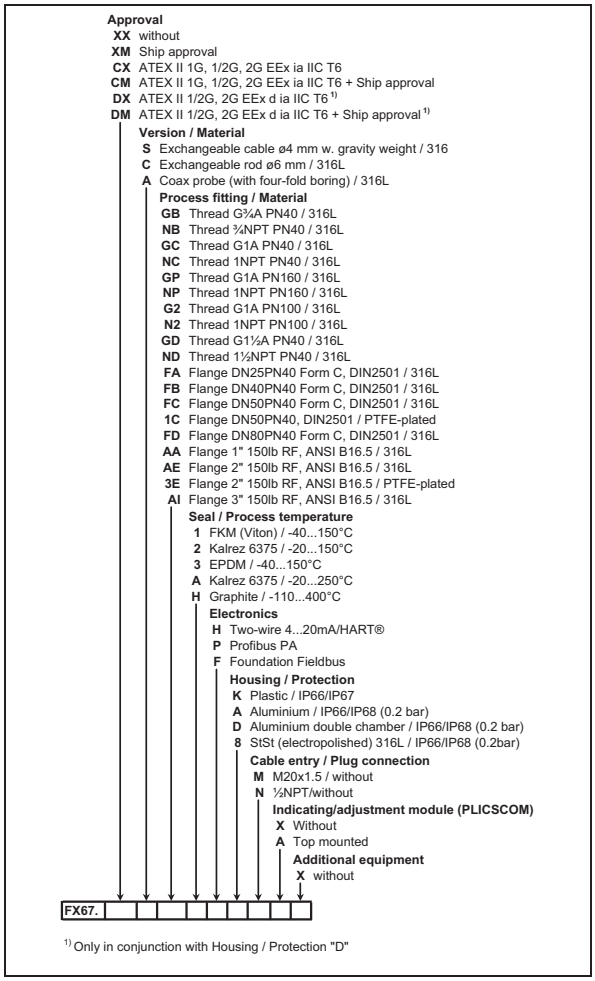



*Fig. 31: VEGAFLEX67 - coax version with thread (-110 … +400 °C/-166 … +752 °F)*

*L Sensor length, see chapter "Technical data"*

# 8 Product code

## VEGAFLEX 67




1) Only in conjunction with Housing / Protection "D"