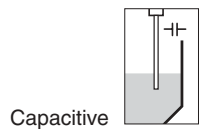


## Operating Instructions

### VEGACAL 67

### 4 ... 20 mA/HART



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## Supplementary operating instructions manuals



### Information:

VEGACAL 67 is available in different versions. Depending on the selected version, supplementary operating instructions manuals may also come with the shipment. The supplementary operating instructions manuals are listed in section "*Product description*."

## Operating instructions manuals for accessories and replacement parts



### Tip:

To ensure reliable setup and operation of your VEGACAL 67, we offer accessories and replacement parts. The associated documents are:

- Operating instructions manual "*External indicating and adjustment unit VEGADIS 61*"
- Operating instructions manual "*Oscillator VEGACAL series 60*"
- Supplementary instructions manual "*Flanges according to DIN-EN-ASME-JIS*"

# 1 About this document

## 1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup. In addition, you will find important notes on maintenance and trouble shooting. Please read this information before putting the instrument into operation.

Keep this manual as a product component safe and accessible in the immediate proximity 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.



### 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 operator.

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

### 2.2 Appropriate use

VEGACAL 67 is a sensor for continuous level measurement.

You can find detailed information on the application range of VEGACAL 67 in chapter "*Product description*".

### 2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overflow 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 (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

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

The user is further compelled to determine the compliance of the necessary occupational safety measures with the current version of the valid regulations and note new regulations during complete duration of use.

### 2.5 CE conformity

VEGACAL 67 is in CE conformity with EMC (89/336/EEG) and LVD (73/23/EEG).

CE conformity has been judged according to the following standards:

- EMC:
  - Emission EN 61326: 2004 (class B)
  - Susceptibility EN 61326: 2004 including supplement A
- LVD: EN 61010-1: 2001

## 2.6 Fulfilling NAMUR recommendations

With regard to interference resistance and interference emission, VEGACAL 67 fulfils NAMUR recommendation NE 21.

VEGACAL 67 and its indicating and adjustment components fulfill NAMUR recommendation NE 53 in respect to compatibility. VEGA instruments are generally upward and downward compatible:

- Sensor software to DTM VEGACAL 67 HART, PA or FF
- DTM VEGACAL 67 for adjustment software PACTware™
- Indicating and adjustment module 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.

The software version of VEGACAL 67 can be determined as follows:

- via PACTware™
- on the type label of the electronics
- via the indicating and adjustment module

You can view all software histories on our website [www.vega.com](http://www.vega.com). Make use of this advantage and get registered for update information via e-mail.

## 2.7 Manufacturer declaration

In conformity with DIN EN 60079-14/2004, para. 5.2.3, point c1, the capacitive probe VEGACAL 67 is suitable for use in zone 2.

The operator must use the instrument as it was intended to be used and follow the specifications of the following documents:

- this operating instructions manual
- this manufacturer declaration (24641)
- the applicable installation regulations

Max. increase of the surface temperature during operation:  
25 K (individual components in the instrument)

With an ambient temperature of 70 °C (158 °F) on the housing and a process temperature of 70 °C (158 °F), the max. ambient temperature during operation is 95 °C (203 °F).

Measures to maintain explosion protection during operation:

- Operate the instrument in the range of the specified electrical limit values. Permissible supply voltage: see "*Technical data*"
- Mount and operate the instrument in such a way that no danger of ignition by electrostatic charges is to be expected. Process fitting, plastic-coated probe part or housing (as the case may be depending on instrument version) are made of electrically non-conductive plastic.
- Make sure that the seal is mounted correctly between lower part of the housing and cover. Screw the cover on tightly.
- Make sure there is no explosive atmosphere present if you intend to operate the instrument with opened cover
- Make sure that the cable gland is tight and strain-relieved. The outer diameter of the connection cable must be adapted to the cable gland. Tighten the pressure screw of the cable gland carefully.
- Cover unused openings for cable glands tightly
- Mount the instrument in such a way that the sensor cannot touch the vessel wall or vessel installations. Keep in mind the influence of product movement in the vessel.
- The surface temperature of the housing must not exceed the ignition temperature of the surrounding explosive atmosphere

This instrument was assessed by a person who fulfils the DIN EN 60079-14 requirements.

## 2.8 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter "*Packaging, transport and storage*"
- Chapter "*Disposal*"

## 3 Product description

### 3.1 Configuration

#### Scope of delivery

The scope of delivery encompasses:

- VEGACAL 67 level sensor
- Documentation
  - this operating instructions manual
  - Operating instructions manual "*Indicating and adjustment module PLICSCOM*" (optional)
  - Supplementary instructions manual "*Heating for indicating and adjustment module PLICSCOM*" (optional)
  - Supplementary instructions manual "*Plug connector for continuously measuring sensors*" (optional)
  - Ex-specific "*Safety instructions*" (with Ex-versions)
  - if necessary, further certificates

#### Components

VEGACAL 67 consists of the following components:

- Process fitting with probe
- Housing with electronics
- Housing cover, optionally available with indicating and adjustment module PLICSCOM



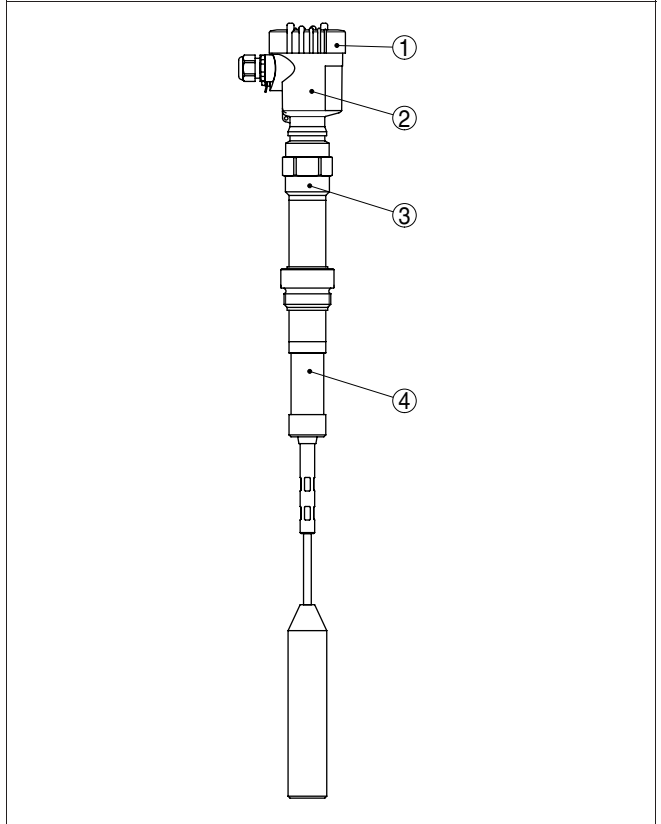


Fig. 1: VEGACAL 67 - with plastic housing

- 1 Housing cover
- 2 Housing with electronics
- 3 Process fitting
- 4 Ceramic insulator

### 3.2 Principle of operation

#### Area of application

VEGACAL 67 is a level sensor with partly insulated electrode for continuous level measurement under high process temperatures.

The electronics functions according to the admittance principle (phase-selective admittance processing).

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

Probes such as VEGACAL 67 are used in solids applications.

The range of the process temperature is -50 ... 300°C (-58 ... 572°F). With remote housing -50 ... 400°C (-58 ... 752°F).

### Functional principle

Probe, measured product and vessel wall form an electrical capacitor. The capacitance is influenced by three main factors.

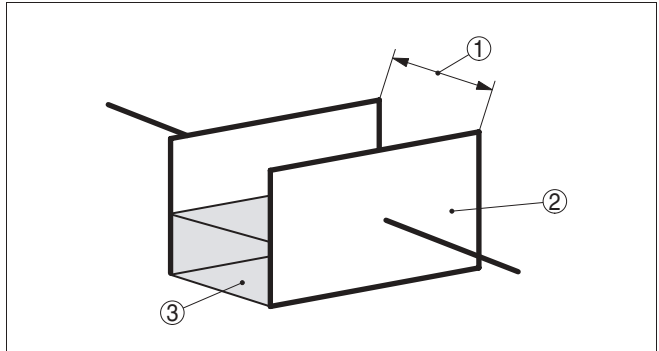


Fig. 2: Functional principle - Plate capacitor

- 1 Distance between the electrode surfaces
- 2 Size of the electrode surfaces
- 3 Type of dielectric between the electrodes

The probe and the vessel wall are the capacitor plates. The measured product is the dielectric. Due to the higher dielectric constant (DK value) of the product compared to air, the capacitance increases as the probe is gradually covered.

The capacitance as well as the resistance change are converted by the electronics module into a level-proportional signal.

### Supply

Two-wire electronics 4 ... 20 mA/HART for power supply and measured value transmission over the same cable.

The supply voltage range can differ depending on the instrument version.

The data for power supply are stated in chapter "Technical data" in the "Supplement".

The backlight of the indicating and adjustment module is powered by the sensor. The prerequisite for this is a supply voltage at a certain level. The exact voltage specifications are stated in chapter "Technical data" in the "Supplement".

This function is available for instruments with national approvals such as e.g. according to FM or CSA only at a later date.

The optional heating requires its own power supply. You can find further details in the supplementary instructions manual "*Heating for indicating and adjustment module*".

This function is generally not available for approved instruments.

### 3.3 Operation

VEGACAL 67 can be adjusted with different adjustment media:

- with indicating and adjustment module
- with the suitable VEGA DTM in conjunction with an adjustment software according to the FDT/DTM standard, e.g. PACTware™ and PC
- with manufacturer-specific adjustment programs AMS™ or PDM
- with a HART handheld

The entered parameters are generally saved in VEGACAL 67, optionally also in the indicating and adjustment module or in PACTware™.

### 3.4 Packaging, transport and storage

#### Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test according to DIN EN 24180.

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

#### Transport

Transport must be carried out 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 packaging must be closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packaging 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 "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 ... 85 %

## 4 Mounting

### 4.1 General instructions

<b>Installation position</b>	Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of an indicating and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the indicating and adjustment module in four different positions (each displaced by 90°).
<b>Welding work</b>	Before beginning with the welding work, remove the oscillator out of the sensor. By doing this, you avoid damages on the electrode due to inductive couplings.
<b>Handling</b>	<p>The housing of threaded versions must not be used to screw the instrument in! Applying tightening force on the housing can damage its rotational mechanical parts.</p> <p>Use the hexagon for screwing in.</p>
<b>Moisture</b>	<p>Use the recommended cables (see chapter "<i>Connecting to power supply</i>") and tighten the cable gland.</p> <p>You can give your VEGACAL 67 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 mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.</p>

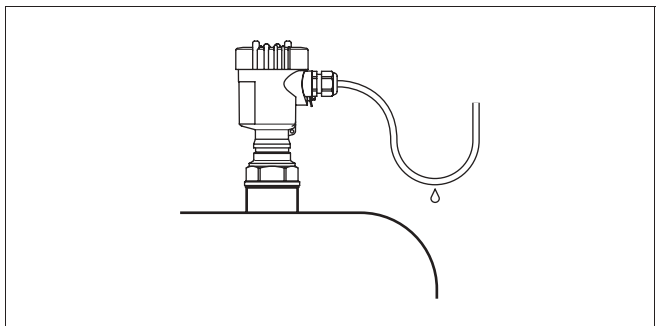


Fig. 3: Measures against moisture penetration

**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 stated in chapter "*Technical data*" in the "*Supplement*" or on the type label of the sensor.

Insulating measures, such as e.g. covering the thread with teflon tape, can interrupt the necessary electrical connection with metal vessels. For this reason, ground the probe on the vessel or use a conductive seal material.

**Vessel material****Metal vessel**

Make sure that the mechanical connection of the probe to the vessel is electrically conductive to ensure sufficient grounding.

Use conductive seals such as e.g. copper or lead etc. Insulating measures, such as covering the thread with Teflon tape, can interrupt the necessary electrical connection with metal vessels. For this reason, ground the probe on the vessel or use a conductive seal material.

**Non-conductive vessel**

In non-conductive vessels, e.g. plastic tanks, the second pole of the capacitor must be provided separately, e.g. in the form of a concentric tube.

**Vessel forms**

If possible, the capacitive probe should be mounted vertically or parallel to the counter electrode. This applies particularly to applications in non-conductive products.

In cylindrical tanks, spherical tanks or other asymmetrical tank forms, nonlinear level values are generated due to the varying distance to the vessel wall.

Use a concentric tube in non-conductive products or linearize the meas. signal.

**4.2 Mounting instructions****Inflowing medium**

If VEGACAL 67 is mounted in the filling stream, unwanted mismeasurements may result. Mount VEGACAL 67 at a location in the vessel where no disturbing influence from e.g. filling openings, agitators, etc. can occur.

This applies particularly to instrument versions with a longer probe.

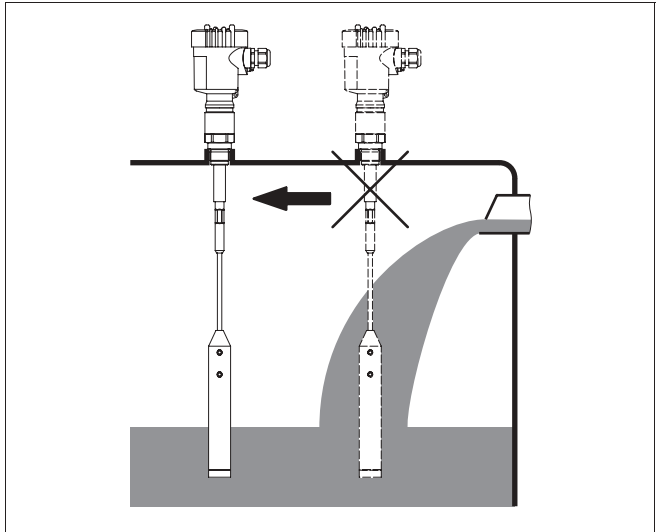


Fig. 4: Inflowing medium

#### Tensile load

Make sure that the max. permissible tensile load of the suspension cable is not exceeded. The danger of this happening exists particularly with very heavy solids and large meas. lengths. The max. permissible load is stated in chapter "Technical data" in the "Supplement".

## 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
- If overvoltage surges are expected, overvoltage arresters should be installed



#### Tip:

We recommend using VEGA overvoltage arresters ÜS-F-LB-I and ÜSB 62-36G.X.

#### Select power supply

Power supply and current signal are carried on the same two-wire cable. The voltage supply range can differ depending on the instrument version.

The data for power supply are stated in chapter "*Technical data*" in the "*Supplement*".

Provide a reliable separation between the supply circuit and the mains circuits according to DIN VDE 0106 part 101. The VEGA power supply units VEGATRENN 149A Ex, VEGAS-TAB 690, VEGADIS 371 as well as all VEGAMETs meet this requirement.

Bear in mind the following factors regarding supply voltage:

- Output voltage of the power supply unit can be lower under nominal load (with a sensor current of 20.5 mA or 22 mA in case of fault message)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*").

#### Selecting connection cable

VEGACAL 67 is connected with standard two-wire cable without screen. An outer cable diameter of 5 ... 9 mm ensures the seal effect of the cable gland. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used. For HART multidrop operation we recommend as standard practice the use of screened cable.

#### Cable gland ½ NPT

On VEGACAL 67 with cable gland ½ NPT and plastic housing, a metal ½" threaded insert is moulded in the plastic housing.



**Caution:**

No grease should be used when screwing the NPT cable gland or steel tube into the threaded insert. Standard grease can contain additives that corrode the connection between threaded insert and housing. This would influence the stability of the connection and the tightness of the housing.

**Cable screening and grounding**

If screened cable is necessary, connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal on the outside of the housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the connection on the processing side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

**5.2 Connection steps - Instrument housing**

Proceed as follows:

- 1 Unscrew the housing cover
- 2 If an indicating and adjustment module is installed, remove it by turning it slightly to the left.
- 3 Loosen compression nut of the cable entry
- 4 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires
- 5 Insert the cable into the sensor through the cable entry
- 6 Lift the opening levers of the terminals with a screwdriver (see following illustration)
- 7 Insert the wire ends into the open terminals according to the wiring plan

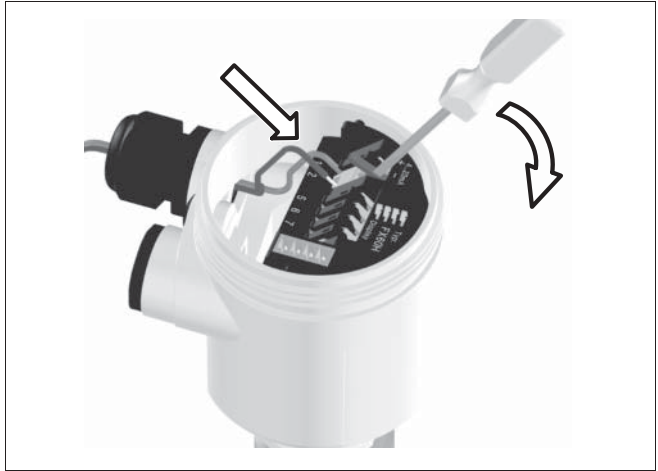


Fig. 5: Connection steps 6 and 7

- 8 Press down the opening levers of the terminals, you will hear the terminal spring closing
  - 9 Check the hold of the wires in the terminals by lightly pulling on them
  - 10 Connect the screen to the internal ground terminal and the external ground terminal to potential equalisation
  - 11 Tighten the compression nut of the cable entry. The seal ring must completely encircle the cable
  - 12 Screw the housing cover back on
- The electrical connection is finished.

### 5.3 Wiring plan, single chamber housing

#### Housing overview

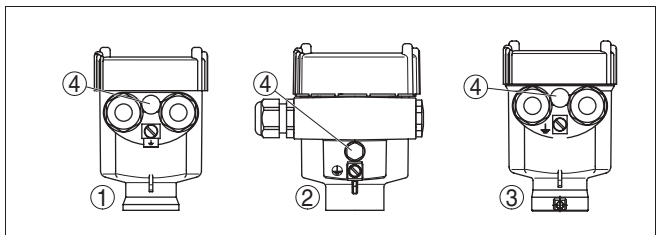
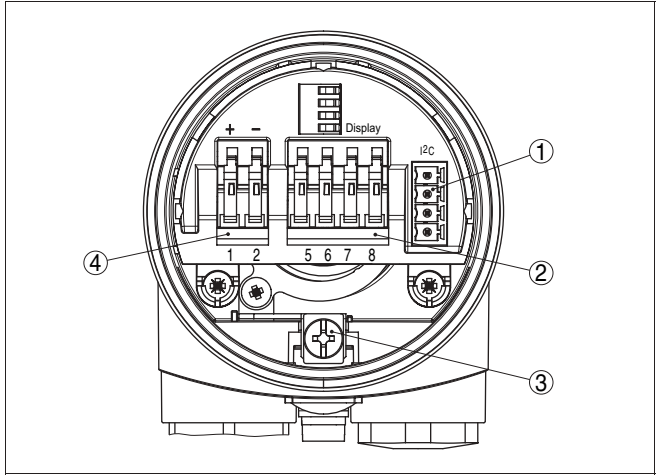


Fig. 6: Material versions, single chamber housing

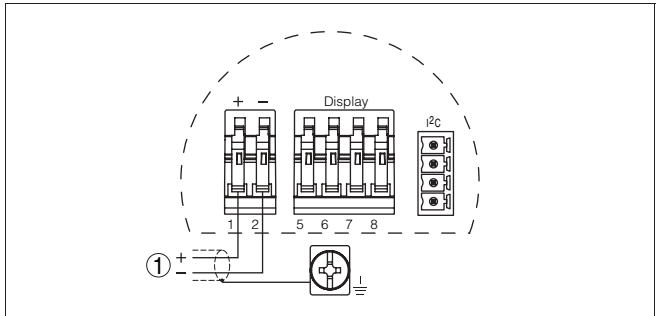
- 1 Plastic
- 2 Aluminium
- 3 Stainless steel
- 4 Filter element for air pressure compensation of all material versions. Blind stopper with version IP 66/IP 68, 1 bar for Aluminium and stainless steel

**Electronics and connection compartment**



*Fig. 7: Electronics and connection compartment, single chamber housing*  
 1 Plug connector for VEGACONNECT (I<sup>2</sup>C interface)  
 2 Spring-loaded terminals for connection of the external indication VEGADIS 61  
 3 Ground terminal for connection of the cable screen  
 4 Spring-loaded terminals for voltage supply

**Wiring plan**



*Fig. 8: Wiring plan, single chamber housing*  
 1 Voltage supply/Signal output

## 5.4 Wiring plan, double chamber housing

### Housing overview

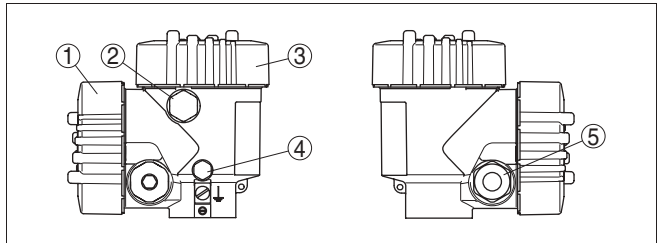


Fig. 9: Double chamber housing

- 1 Housing cover, connection compartment
- 2 Blind stopper or plug M12x1 for VEGADIS 61 (option)
- 3 Housing cover, electronics compartment
- 4 Filter element for pressure compensation or blind stopper with version IP 66/ IP 68, 1 bar<sup>1)</sup>
- 5 Cable entry or plug

### Electronics compartment

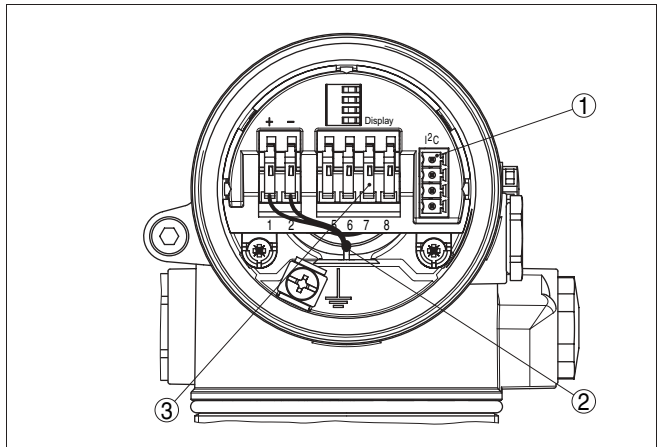


Fig. 10: Electronics compartment, double chamber housing

- 1 Plug connector for VEGACONNECT (I<sup>2</sup>C interface)
- 2 Internal connection cable to the connection compartment
- 3 Terminals for VEGADIS 61

<sup>1)</sup> Version IP 66/IP 68, 1 bar not with four-wire instruments

Connection compartment

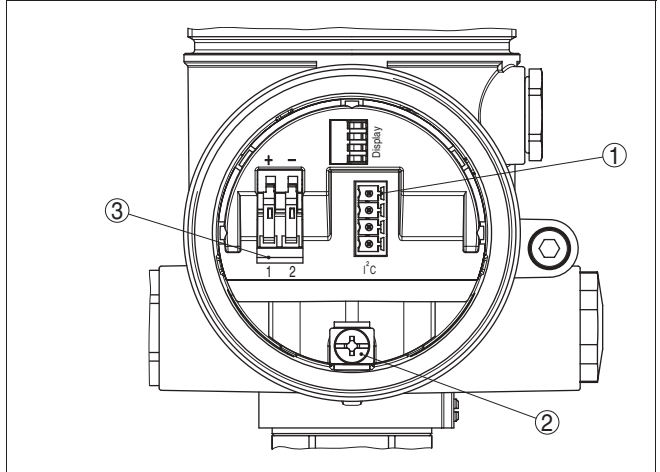


Fig. 11: Connection compartment, double chamber housing

- 1 Plug connector for VEGACONNECT (I<sup>2</sup>C interface)
- 2 Ground terminal for connection of the cable screen
- 3 Spring-loaded terminals for voltage supply

Wiring plan

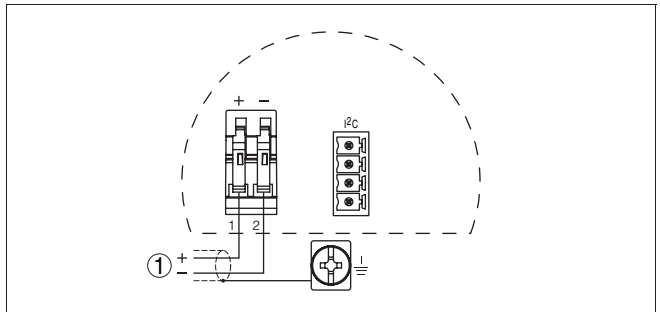


Fig. 12: Wiring plan, double chamber housing

- 1 Voltage supply/Signal output

## 5.5 Wiring plan, version IP 66/IP 68, 1 bar

### Wire assignment, connection cable

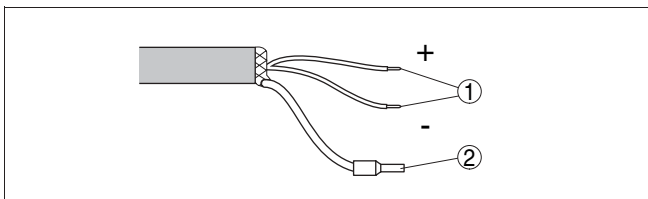


Fig. 13: Wire assignment, connection cable

- 1 brown (+) and blue (-) to power supply or to the processing system
- 2 Screen

## 6 Set up with the indicating and adjustment module PLICSCOM

### 6.1 Short description

#### Function/Configuration

The indicating and adjustment module is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All sensors of the plics<sup>®</sup> instrument family, in the single as well as in the double chamber housing (optionally in the electronics or connection compartment)
- External indicating and adjustment unit VEGADIS 61

From a hardware revision ...- 01 or higher of PLICSCOM as well as a hardware revision ...- 01, 03 or higher of the corresponding sensor, an integrated backlight can be switched via the adjustment menu. The hardware revision is stated on the type label of the PLICSCOM or the sensor electronics.



#### Information:

This function is for instruments with StEx, WHG or ship approval as well as country-specific approvals such as those according to FM or CSA, available at a later date.



#### Note:

You will find detailed information on the adjustment in the operating instructions manual of the "*Indicating and adjustment module*".

#### Mount/dismount indicating and adjustment module

### 6.2 Insert indicating and adjustment module

The indicating and adjustment module can be inserted into the sensor and removed again at any time. It is not necessary to interrupt the power supply.

Proceed as follows:

- 1 Unscrew the housing cover
- 2 Place the indicating and adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
- 3 Press the indicating and adjustment module onto the electronics and turn it to the right until it snaps in.

- 4 Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

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



Fig. 14: Installation of the indicating and adjustment module



**Note:**

If you intend to retrofit VEGACAL 67 with an indicating and adjustment module for continuous measured value indication, a higher cover with an inspection glass is required.



### 6.3 Adjustment system

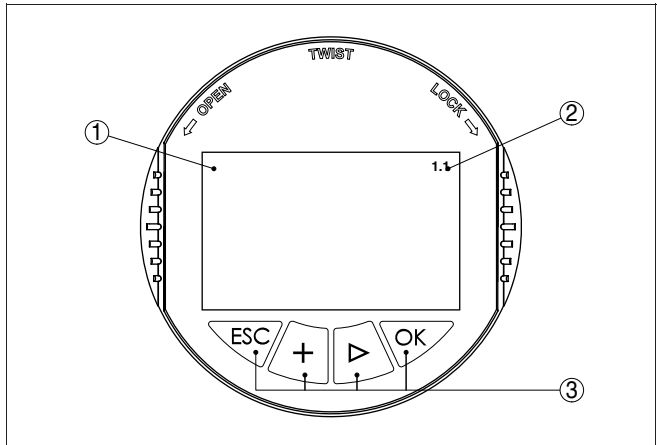


Fig. 15: Indicating and adjustment elements

- 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 a parameter
- **[ESC]** key:
  - interrupt input
  - jump to the next higher menu

#### Adjustment system

The sensor is adjusted via the four keys of the indicating and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with **[OK]** will not be saved.

## 6.4 Setup procedure

### Switch-on phase

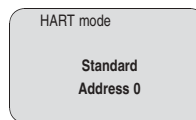
After connecting VEGACAL 67 to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

- Internal check of the electronics
- Indication of the instrument type, the firmware as well as the sensor TAGs (sensor designation)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the corresponding current is outputted to the cable (the value corresponds to the actual level as well as the settings already carried out, e.g. factory setting).

### Address setting HART-Multidrop

In HART-Multidrop mode (several sensors on one input) the address must be set before continuing with the parameter adjustment. You will find a detailed description in the operating instructions manual "*Indicating and adjustment module*" or in the online help of PACTware™ or DTM.



### Parameter adjustment

VEGACAL 67 measures the capacitance of the respective product. To display the actual level of the product, an allocation of the measured capacitance to the percentage height must be carried out. For this adjustment, the capacitance is entered with emptied and filled vessel.

If the vessel cannot be emptied or filled completely, you can carry out the adjustment also with two known levels - for example with 10 % and 90 %. The difference between the empty and full adjustment values should be as large as possible.

The actual level can then be calculated on the basis of these settings.

VEGACAL 67 must be installed. A change of level is necessary for this adjustment.

In the main menu item "*Basic adjustment*", the individual submenu items should be selected one after the other and provided with the correct parameter values.

**Tip:**

If the indicating and adjustment module PLICSCOM remains on the probe as a display, we recommend saving the sensor data in PLICSCOM.

Use the function "Copy sensor data".

Start your parameter adjustment with the following menu items of the basic adjustment:

**Carrying out min. adjustment**

To be on the safe side, note the adjustment values for full and empty. If an adjustment procedure fails, it is not necessary to again carry out a level change.

These values can be helpful if the electronics has to be exchanged.

	%	Value
Empty adjustment		
Full adjustment		

Tab. 2: Adjustment protocol

**Tip:**

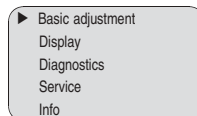
For min. adjustment the vessel should be as empty as possible, and for max. adjustment, as full as possible. If the vessel is already full, start with max. adjustment.

**Note:**

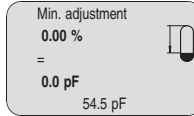
If possible, the vessel should be as empty as possible for min. adjustment.

Proceed as follows:

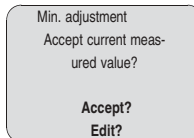
- 1 Move from the measured value display to the main menu by pushing **[OK]**.



- 2 Select the menu item "*Basic adjustment*" with **[->]** and confirm with **[OK]**. Now the menu item "*Min. adjustment*" is displayed.



- 3 Prepare the adjustment value for editing with **[OK]**. Move to the selection window with **[OK]**.



- 4 Accept the current measured value or move to the editing window with "Edit". To edit, set the cursor to the requested position with **[->]**. Set the requested % value with **[+]** and save with **[OK]**. The cursor jumps to the capacitance value.
- 5 Enter the current capacitance value in pF (displayed below) for the empty vessel corresponding to the percentage value.
- 6 Save the settings with **[OK]** and move to "Max. adjustment" with **[->]**.

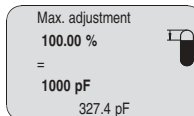
**Carrying out max. adjustment** Fill the vessel to the highest possible level.



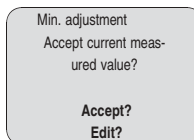
**Note:**

For max. adjustment, the vessel should be as full as possible. This will make the calibration more accurate.

Proceed as follows:



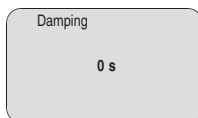
- 1 Prepare the adjustment value for editing with **[OK]**. Move to the selection window with **[OK]**.



- 2 Accept the current measured value or move to the editing window with "Edit". To edit, set the cursor to the requested position with **[<->]**. Set the requested % value with **[+]** and save with **[OK]**. The cursor jumps to the capacitance value.
- 3 Enter the current capacitance value in pF (displayed below) for the full vessel corresponding to the percentage value.
- 4 Save the settings with **[OK]**.

## Damping

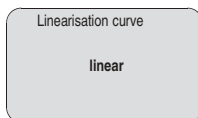
To suppress fluctuations in the measured value display, e.g. caused by an agitated product surface, an integration time can be set. This time can be between 0 and 999 seconds. Keep in mind that the reaction time of the entire measurement will then be longer and the sensor will react to measured value changes with a delay. In general, a period of a few seconds is sufficient to smooth the measured value display.



Enter the requested parameter via the appropriate keys, save your settings and jump to the next menu item with the **[<->]** key.

## Linearisation curve

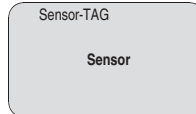
A linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. with a cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearization curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "Display".



Enter the requested parameter via the appropriate keys, save your settings and jump to the next menu item with the **[<->]** key.

**Sensor-TAG**

In this menu item you can enter an unambiguous designation for the sensor, e.g. the measurement loop name or the tank or product designation. In digital systems and in the documentation of larger plants, a singular designation should be entered for exact identification of individual measuring sites.



With this menu item, the Basic adjustment is finished and you can now jump to the main menu with the **[ESC]** key.

**Optional settings**

Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual "*Indicating and adjustment module*".

**Reset****Basic adjustment**

If the function "Reset" is carried out, the sensor resets all settings to default.

The following values will be reset:

Function	Reset value
Max. adjustment	3000 pF
Min. adjustment	0 pF
Integration time $t_i$	0 s
Linearization	linear
Sensor-TAG	Sensor
Display	%
Current output - characteristics	4 ... 20 mA
Current output - max. current	20.5 mA
Current output - min. current	3.8 mA
Current output - failure	<3.6 mA

**Special parameters**

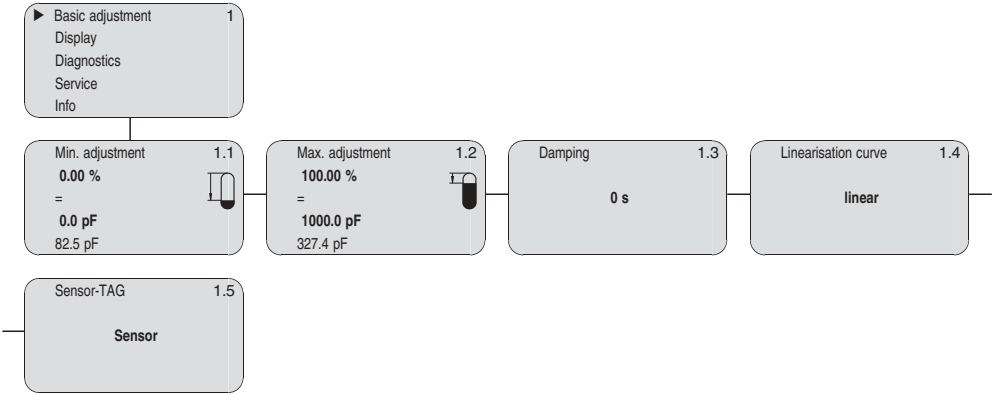
All special parameters are reset to delivery status.

**Pointer**

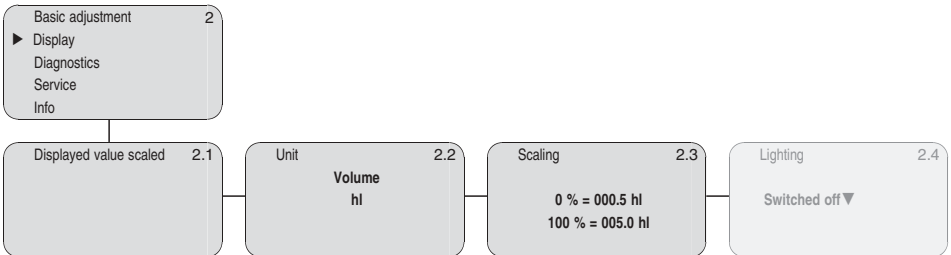
The min. and max. values are reset to the actual value.

## 6.5 Menu schematic

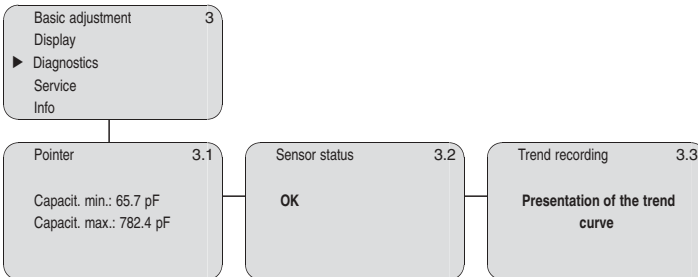
### Basic adjustment



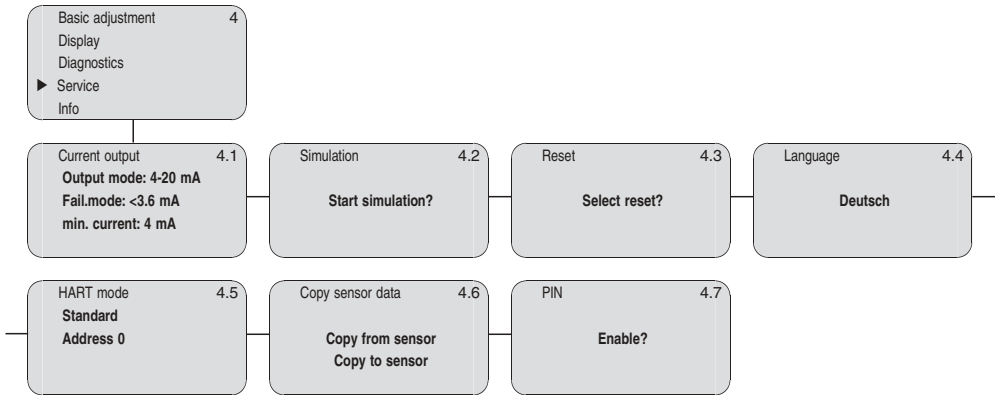
### Display



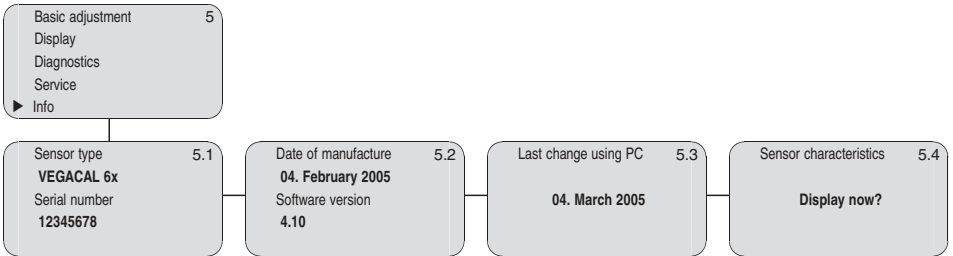
### Diagnostics



### Service



### Info





## 7 Setup with PACTware™ and other adjustment programs

### 7.1 Connecting the PC

#### Connection via I<sup>2</sup>-C interface

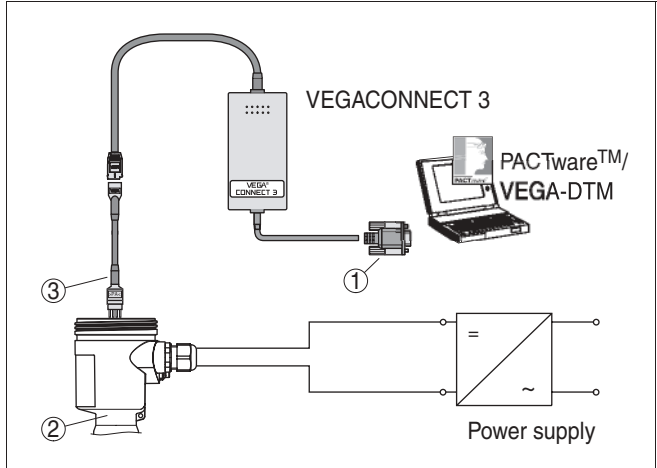


Fig. 16: Connection of the PC via I<sub>2</sub>-C interface directly on the sensor

- 1 RS232 connection
- 2 VEGACAL 67
- 3 I<sup>2</sup>C adapter cable for VEGACONNECT 3

#### Necessary components:

- VEGACAL 67
- PC with PACTware™ and suitable VEGA DTM
- VEGACONNECT 3 with I<sup>2</sup>C adapter cable (article no. 2.27323)
- Power supply unit

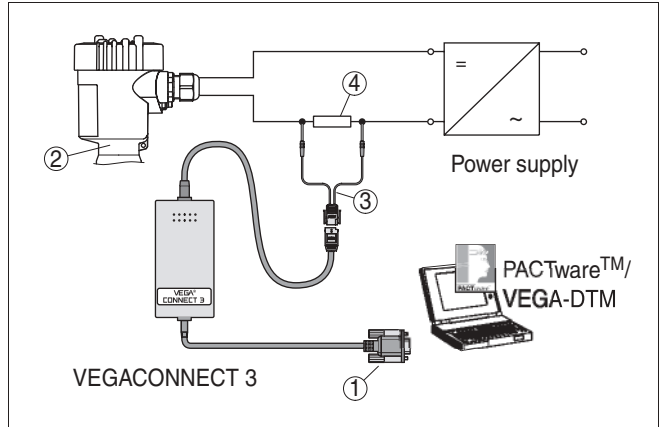
**Connection via HART**

Fig. 17: Connecting the PC via HART to the signal cable

- 1 RS232 connection
- 2 VEGACAL 67
- 3 HART adapter cable for VEGACONNECT 3
- 4 HART resistance 250 Ohm

**Necessary components:**

- VEGACAL 67
- PC with PACTware™ and suitable VEGA DTM
- VEGACONNECT 3 with HART adapter cable (art. no. 2.25397)
- HART resistance approx. 250 Ohm
- Power supply unit

**Note:**

With power supply units with integrated HART resistance (internal resistance approx. 250 Ohm), an additional external resistance is not necessary. This applies, e.g. to the VEGA instruments VEGATRENN 149A, VEGADIS 371, VEGAMET 381). Also usual Ex separators are most of the time equipped with a sufficient current limitation resistor. In such cases, VEGACONNECT 3 can be connected parallel to the 4 ... 20 mA cable.

**7.2 Parameter adjustment with PACTware™**

Further setup steps are described in the operating instructions manual "DTM Collection/PACTware™" attached to each CD and which can also be downloaded from our homepage. A detailed description is available in the online help of PACTware™ and the VEGA DTMs.

**Note:**

Keep in mind that for setup of VEGACAL 67, DTM-Collection 04/2005 or a newer version must be used.

All currently available VEGA DTMs are provided in the DTM Collection on CD and can be obtained from the responsible VEGA agency for a token fee. This CD includes also the up-to-date PACTware™ version. The basic version of this DTM Collection incl. PACTware™ is also available as a free-of-charge download from the Internet.

Go via [www.vega.com](http://www.vega.com) and "*Downloads*" to the item "*Software*".

**7.3 Parameter adjustment with AMS™ and PDM**

For VEGA sensors, instrument descriptions for the adjustment programs AMS™ and PDM are available as DD or EDD. The instrument descriptions are already implemented in the current versions of AMS™ and PDM. For older versions of AMS™ and PDM, a free-of-charge download is available via Internet.

Go via [www.vega.com](http://www.vega.com) and "*Downloads*" to the item "*Software*".

**7.4 Saving the parameter adjustment data**

It is recommended to document or save the parameter adjustment data. They are hence available for multiple use or service purposes.

The VEGA DTM Collection and PACTware™ in the licensed, professional version provide suitable tools for systematic project documentation and storage.

## 8 Maintenance and fault rectification

### 8.1 Maintenance

When used as directed in normal operation, VEGACAL 67 is completely maintenance free.

### 8.2 Remove interferences

#### Causes of malfunction

VEGACAL 67 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Supply
- Signal processing

#### Fault clearance

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the indicating and adjustment module. The procedure is described below. Further comprehensive diagnostics can be carried out on a PC with the software PACTware™ and the suitable DTM. In many cases, the causes can be determined in this way and faults can be rectified.

#### 24 hour service hotline

However, should these measures not be successful, call the VEGA service hotline in urgent cases under the phone no. **+49 1805 858550**.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

#### Checking the 4 ... 20 mA signal

Connect a handheld multimeter in the suitable measuring range according to the wiring plan.

#### ? 4 ... 20 mA signal not stable

- Level fluctuations
- Set the integration time via the indicating and adjustment module or PACTware™

- ? 4 ... 20 mA signal missing
- Wrong connection
  - Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"
  - No voltage supply
  - Check cables for breaks; repair if necessary
  - load resistance too high
  - Check, adapt if necessary
- ? Current signal greater than 22 mA or less than 3.6 mA
- Electronics module defective
  - Exchange instrument or return instrument for repair
  - Shortcircuit in the probe, e.g. because of moisture in the housing
  - Remove the oscillator and check the resistance between the marked plug connections according to the following illustration.

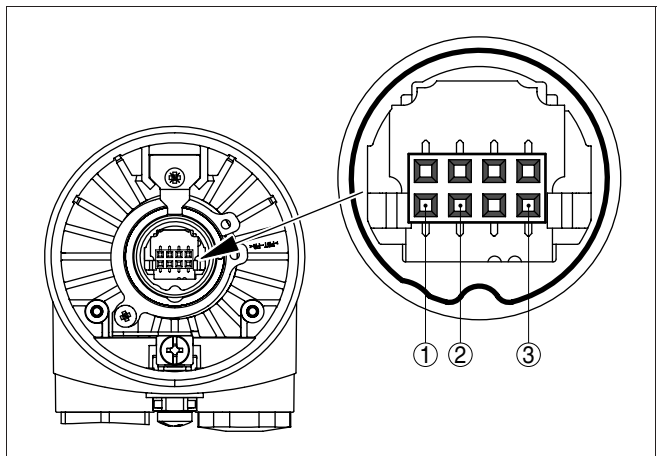


Fig. 18: Check the resistance in the probe

- 1 Screening
- 2 Probe
- 3 Ground potential

→ There should be no contact between any of the connections (high resistance).

→ However, if there is somehow contact, exchange instrument or return it for repair.

### Fault messages via the indicating/adjustment module

#### ? E013

- no measured value available
- Short-circuit due to bridging by conductive buildup between process fitting and electrode
- Remove buildup - if necessary, mount a protective tube
- Shortcircuit in the probe, e.g. because of moisture in the housing
- Remove the oscillator and check the resistance between the marked plug connections according to the following illustration.

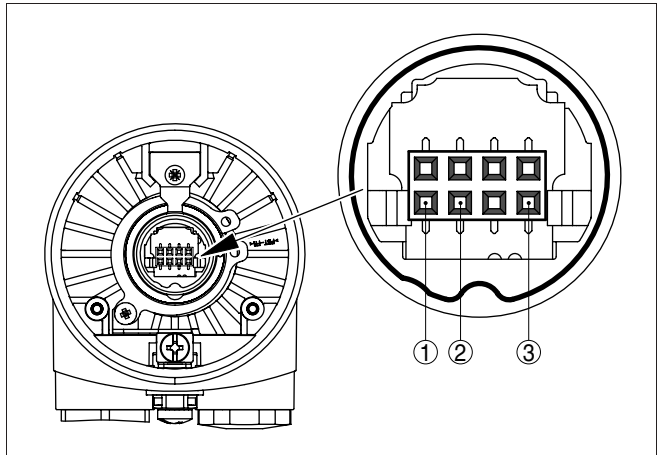


Fig. 19: Check the resistance in the probe

- 1 Screening
- 2 Probe
- 3 Ground potential

- There should be no contact between any of the connections (high resistance)
- However, if there is somehow contact, exchange instrument or return it for repair.

#### ? E017

- Adjustment span too small
- Carry out a fresh adjustment and increase the distance between min. and max. adjustment

**? E036**

- no operable sensor software
- Carry out a software update or send the instrument for repair

**8.3 Exchange of the electronics module**

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



In Ex applications, only an instrument and an electronics module with appropriate Ex approval may be used.

If there is no electronics module available on site, one can be ordered from the VEGA agency serving you.

**Sensor serial number**

The order data of the sensor must be downloaded into the new electronics module. This can be done:

- at the factory by VEGA
- or on site by the user

In both cases, the sensor serial number is necessary. The serial numbers are stated on the type label of the instrument or on the delivery note.

**Information:**

When loading on site, the order data must be downloaded from the Internet (see operating instructions manual of the oscillator).

**Assignment**

The oscillators are adapted to the respective sensor and differ in their signal output or in their power supply. You can find a suitable oscillator in the below overview.

The oscillators differ only in their signal output and are suitable for all series 60 sensors.

The following types are available:

- CL-E60H (4 ... 20 mA/HART)
- CL-E60P (Profibus PA)
- CL-E60F (Foundation Fieldbus)

**8.4 Shorten the probe****Shorten the probe**

The probe (cable) can be shortened by any length.

- 1 Loosen the two pins on the gravity weight (hexagon) and remove the pins.
- 2 Pull the cable out of the gravity weight.
- 3 To avoid splicing of the steel cable, tin the cable before shortening with a soldering iron and tighten the wire.
- 4 Shorten the cable with a cut-off wheel or metal saw at the lower end. Make sure the length is correct before shortening.

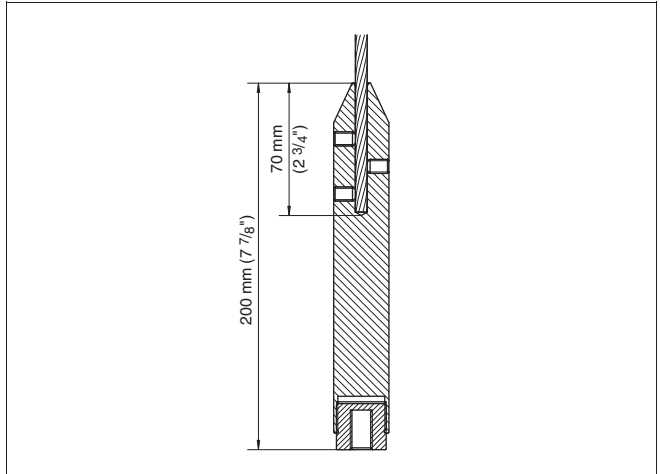


Fig. 20: Take the gravity weight into account and shorten the cable respectively

- 5 Shift the gravity weight again flush to the cable and fix it with the two pins.
- 6 Carry out an adjustment. See "Setup procedure, carry out min. adjustment - carry out max. adjustment".

## 8.5 Instrument repair

If a repair is necessary, please proceed as follows:

You can download a return form (23 KB) from the Internet on our homepage [www.vega.com](http://www.vega.com) under: "Downloads - Forms and certificates - Repair form".

By doing this you help us carry out the repair quickly and without having to call for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging



- Please ask the agency serving you for the address of your return shipment. You can find the respective agency on our website [www.vega.com](http://www.vega.com) under: "*Company - VEGA worldwide*"

## 9 Dismounting

### 9.1 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.

### 9.2 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 (in Germany, e.g. ElektroG). 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 cannot dispose of the instrument properly, please contact us about disposal methods or return.

## 10 Supplement

### 10.1 Technical data

#### General data

Material 316L corresponds to 1.4404 or 1.4435

Process fitting	G1½ A, 1½ NPT
Materials, wetted parts	
– Process fitting - thread	316L
– Process fitting - flange	316L
– Process seal	Klingsil C-4400
– insulation (partly insulated)	Ceramic (KER 221 according to DIN 40685)
– Probe - rod, ceramic partly insulated (ø 15 mm/0.6 in)	316L
– Probe - cable, ceramic partly insulated (ø 8 mm/0.32 in) <sup>2)</sup>	316L

#### Materials, non-wetted parts

– Housing	Plastic PBT (Polyester), Alu die-casting powder-coated, 316L
– Seal ring between housing and housing cover	NBR (stainless steel housing), silicone (Alu/plastic housing)
– Ground terminal	316L

#### Weights

– with plastic housing	3000 g (106 oz)
– with Aluminium housing	3400 g (120 oz)
– with stainless steel housing	3800 g (134 oz)
– Gravity weight	1800 g (64 oz)
– Rod weight ø 15 mm (0.6 in)	1400 g/m (15 oz/ft)
– Cable weight ø 8 mm (0.32 in)	400 g/m (4.4 oz/ft)

#### Sensor length (L)

– Rod (ø 15 mm/0.6 in)	0.28 ... 6 m (0.9 ... 20 ft)
– Cable (ø 8 mm/0.32 in)	0.5 ... 40 m (1.6 ... 131 ft)

Supporting tube length L1 0.2 ... 1.7 m (0.7 ... 5.6 ft)

Max. lateral load 10 Nm (7.4 lbf ft)

#### Max. tensile load (cable)

– Ceramic partly insulated ø 8 mm (0.32 in)	10 KN (2248 lbf)
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<sup>2)</sup> Cable connected electrically conductive with the gravity weight.

Max. torque (process fitting - thread)	80 Nm (58 lbf ft)
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**Output variable**


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Output signal	4 ... 20 mA/HART
Resolution	1.6 $\mu$ A
Failure message	Current output unchanged 20.5 mA, 22 mA, <3.6 mA (adjustable)
Current limitation	22 mA
Load	see load diagram under Power supply
Integration time (63 % of the input variable)	0 ... 999 s, adjustable
Rise time	500 ms (ti: 0 s, 0 ... 100 %)
Fulfilled NAMUR recommendations	NE 43

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**Input variable**


---

Parameter	level of non-conductive liquids and solids
Measuring principle	phase-selective admittance processing (PSA)
Measuring range	0 ... 3000 pF
Frequency	270 kHz

---

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


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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 psi)

Temperature error

- <120 pF	<1 pF
- >120 pF	1 % of the current measured value

Linearity error

&lt;0.25 % of the complete measuring range

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**Ambient conditions**


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

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**Process conditions**


---

Process pressure	-1 ... 16 bar/-100 ... 1600 kPa (-14.5 ... 232 psi)
------------------	---

Process temperature (thread or flange temperature)

- Standard -50 ... +300 °C (-58 ... +572 °F)
- with remote housing -50 ... +400 °C (-58 ... +752 °F)

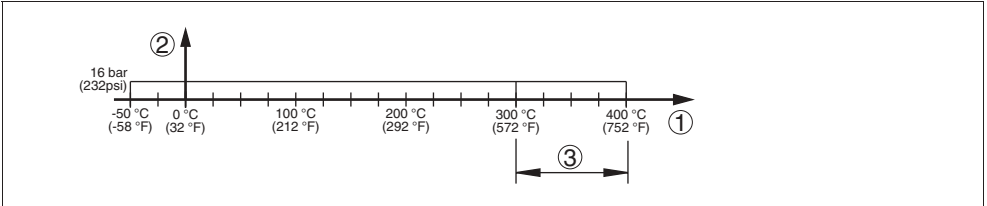


Fig. 21: Process temperature - Process pressure

- 1 Process temperature
- 2 Process pressure
- 3 Temperature range with remote housing

Dielectric figure ≥1.5

**Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar**Cable entry/plug<sup>3)</sup>

- Single chamber housing
  - 1x cable entry M20x1.5 (cable- $\varnothing$  5 ... 9 mm), 1x blind stopper M20x1.5
  - or:
  - 1x closing cap M20x1.5, 1x blind stopper M20x1.5
  - or:
  - 1x closing cap ½ NPT, 1x blind plug ½ NPT
  - or:
  - 1x plug (depending on the version), 1x blind plug M20x1.5
- Double chamber housing
  - 1x cable entry M20x1.5 (cable- $\varnothing$  5 ... 9 mm), 1x blind stopper M20x1.5; 1x blind stopper M16x1.5 or optionally 1x plug M12x1 for VEGADIS 61
  - or:
  - 1x closing cap ½ NPT, 1x blind stopper ½ NPT, 1x blind stopper M16x1.5 or optionally 1x plug M12x1 for VEGADIS 61
  - or:
  - 1x plug (depending on the version); 1x blind stopper M20x1.5; 1x blind stopper M16x1.5 or optionally 1x plug M12x1 for VEGADIS 61

Spring-loaded terminals for wire cross-sections up to 2.5 mm<sup>2</sup>

**Electromechanical data - version IP 66/IP 68, 1 bar**

## Cable entry

- Single chamber housing 1x IP 68 cable entry M20x1.5; 1x blind stopper M20x1.5
- Double chamber housing 1x IP 68 cable gland M20x1.5; 1x blind stopper M20x1.5; 1x blind stopper M16x1.5

## Connection cable

- Wire cross-section 0.5 mm<sup>2</sup>
- wire resistance <0.036 Ohm/m
- Tensile strength >1200 N (270 lbf)
- Standard length 5 m (16.404 ft)

<sup>3)</sup> Depending on the version M12x1, according to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF.

– Max. length	1000 m (3280 ft)
– Min. bending radius	25 mm (0.984 in) at 25 °C (77 °F)
– Diameter	approx. 8 mm (0.315 in)
– Colour - standard PE	Black
– Colour - standard PUR	Blue
– Colour - Ex-version	Blue

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### Indicating and adjustment module

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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

---

### Voltage supply

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Supply voltage	
– Non-Ex instrument	12 ... 36 V DC
– EEx ia instrument	12 ... 30 V DC
– EExd ia instrument	18 ... 36 V DC

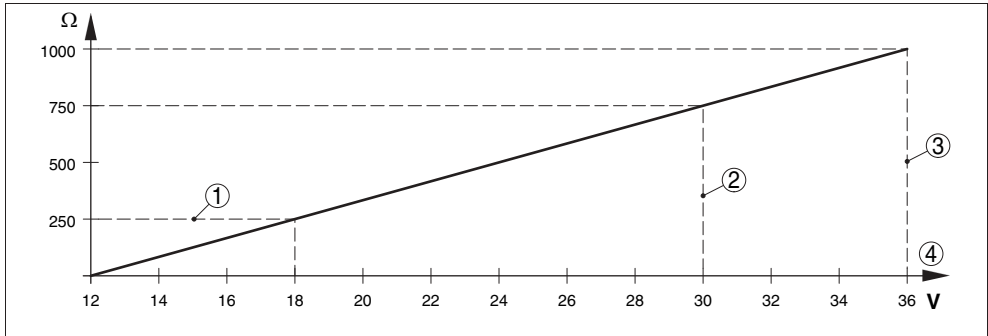


Fig. 22: Voltage diagram

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

### Supply voltage with lighted indicating and adjustment module

- Non-Ex instrument 20 ... 36 V DC
- EEx ia instrument 20 ... 30 V DC
- EExd ia instrument 20 ... 36 V DC

### Permissible residual ripple

- <100 Hz  $U_{ss} < 1 \text{ V}$
- 100 Hz ... 10 kHz  $U_{ss} < 10 \text{ mV}$

Load see diagram

## Electrical protective measures

### Protection

- Plastic housing IP 66/IP 67
- Alu and stainless steel standard IP 66/IP 68 (0.2 bar)<sup>4)</sup>
- Alu and stainless housing (optionally available) IP 66/IP 68 (1 bar)

Overvoltage category III

Protection class II

<sup>4)</sup> Prerequisite for maintaining the protection is a suitable cable.



## 10.2 Dimensions

### Housing in protection IP 66/IP67 and IP 66/IP 68; 0.2 bar

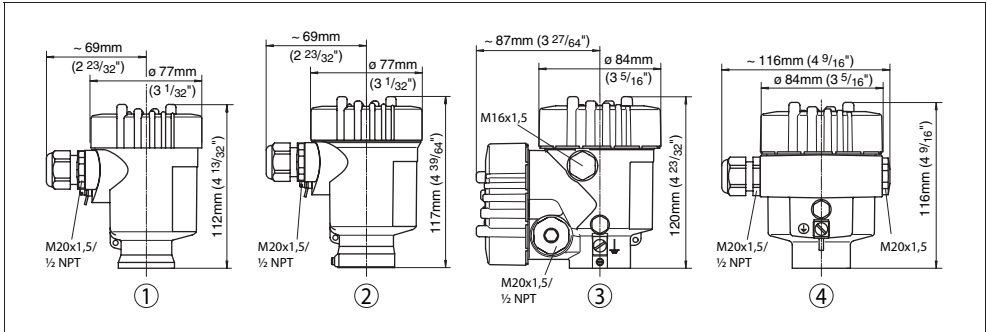


Fig. 23: Housing versions in protection IP 66/IP 67 and IP 66/IP 68; 0.2 bar, with integrated indicating and adjustment module the housing is 9 mm ( $1/64''$ ) higher

- 1 Plastic housing
- 2 Stainless steel housing
- 3 Aluminium double chamber housing
- 4 Aluminium housing

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

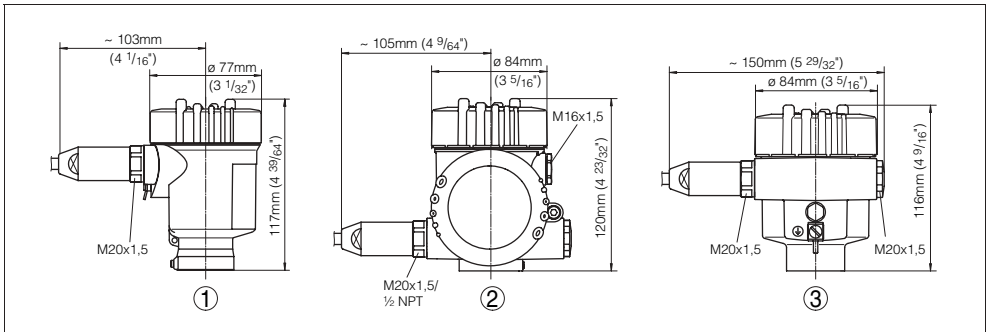


Fig. 24: Housing versions in protection IP 66/IP 68, 1 bar (with integrated indicating and adjustment module the housing is 9 mm/0.4 in higher)

- 1 Stainless steel housing
- 2 Aluminium double chamber housing
- 3 Aluminium housing

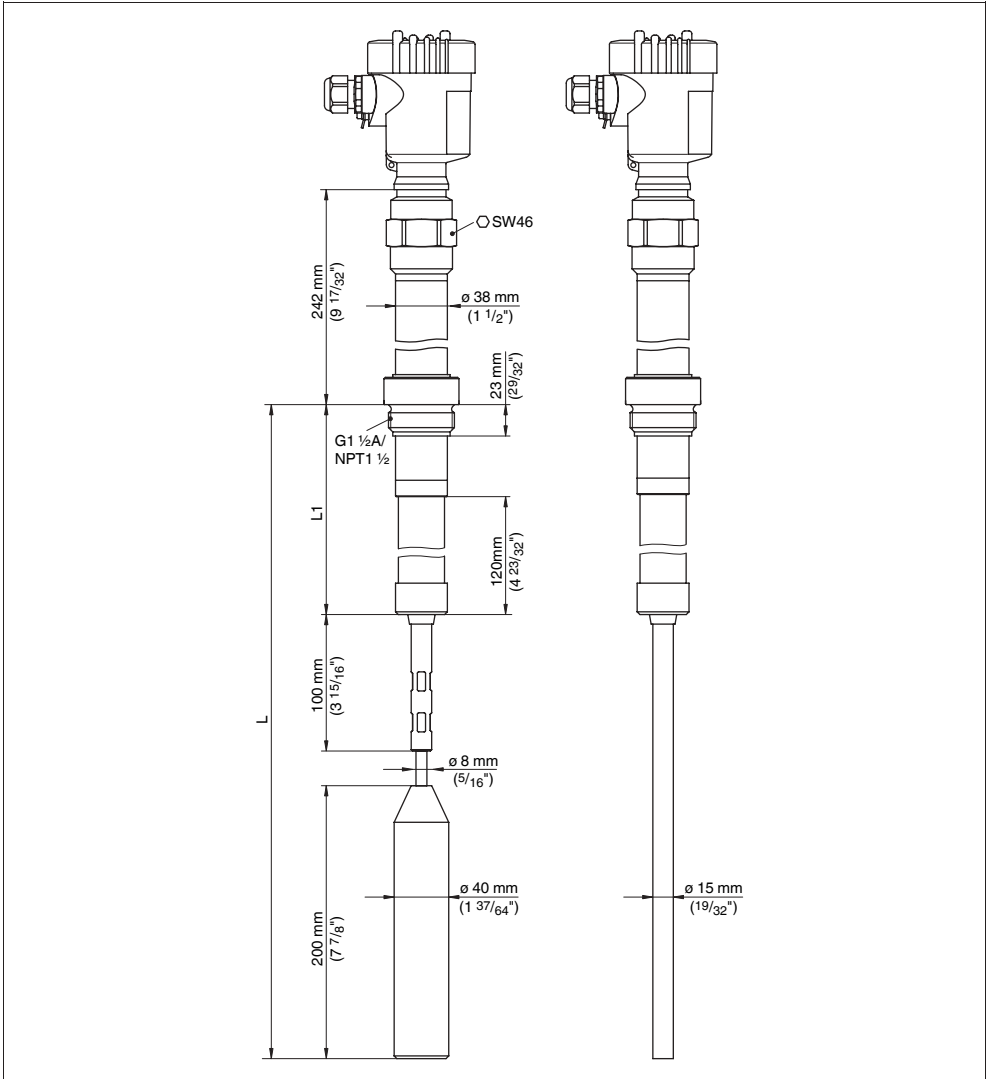


Fig. 25: VEGACAL 67, threaded version G1½ A and 1½ NPT, -50 ... +300 °C (-58 ... +572 °F)  
Version -50 ... +400 °C (-58 ... +752 °F) only with remote housing.

See supplementary instructions manual "Remote housing - VEGACAP, VEGACAL"

L = Sensor length, see "Technical data"

L1 = Supporting tube length, see "Technical data"

### 10.3 Industrial property rights

VEGA product lines are global protected by industrial property rights.

Further information see <http://www.vega.com>.

Only in U.S.A.: Further information see patent label at the sensor housing.

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All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

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