Operating Instructions

Capacitive rod electrode for continuous level measurement

VEGACAL 63

4 … 20 mA/HART - two-wire

Document ID: 30027

Contents

30027-EN-170503

Supplementary documentation

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

Instructions manuals for accessories and replacement parts

Tip:
To ensure reliable setup and operation of your VEGACAL 63, we offer accessories and replacement parts. The corresponding documentations are:

- 27720 - VEGADIS 61
- 30531 - Electronics module VEGACAL series 60
- 34296 - Protective cover
- 31088 - Flanges according to DIN-EN-ASME-JIS

Editing status: 2017-04-06

30027-EN-170503

1 About this document

1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup of the instrument. Furthermore there are important instructions for maintenance, fault rectification, the exchange of parts and the safety of the user. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained specialist personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbols used

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

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

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

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

Ex applications
This symbol indicates special instructions for Ex applications.

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

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

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

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

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

30027-EN-170503

2 For your safety

2.1 Authorised personnel

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

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

2.2 Appropriate use

VEGACAL 63 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

2.3 Warning about incorrect use

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

2.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media where a malfunction of the instrument can cause a danger, the operator has to convince himself on the correct function of the instrument by taking suitable measures.

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

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety

reasons, only the accessory specified by the manufacturer must be used.

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

2.5 Safety label on the instrument

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

2.6 EU conformity

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

You can find the EU conformity declaration on our website under www.vega.com/downloads.

2.7 Fulfillment of NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components

For further information see www.namur.de.

2.8 Installation and operation in the USA and Canada

This information is only valid for USA and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70).

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

2.9 Safety instructions for Ex areas

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

2.10 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:

- Level sensor VEGACAL 63
- Documentation
  - This operating instructions manual
  - Safety Manual "*Functional safety (SIL)*" (optional)
  - Supplementary instructions manual "*Heating for display and adjustment module*" (optional)
  - Supplementary instructions manual "*Plug connector for continuously measuring sensors*" (optional)
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - If necessary, further certificates

Constituent parts

The VEGACAL 63 consists of the components:

- Process fitting with probe
- Housing with electronics
- Housing lid

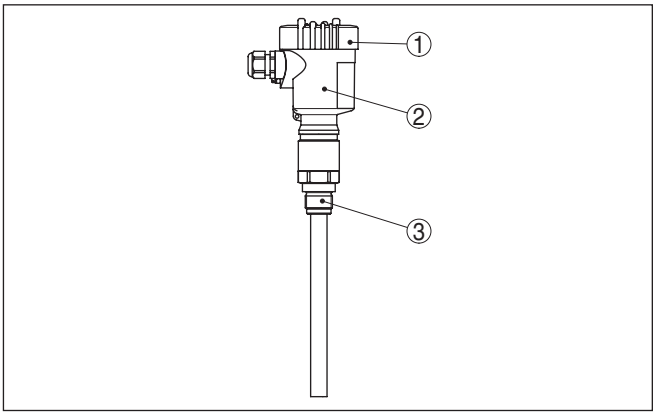


Fig. 1: VEGACAL 63, rod version with plastic housing

1 Housing lid
2 Housing with electronics
3 Process fitting

Type label

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

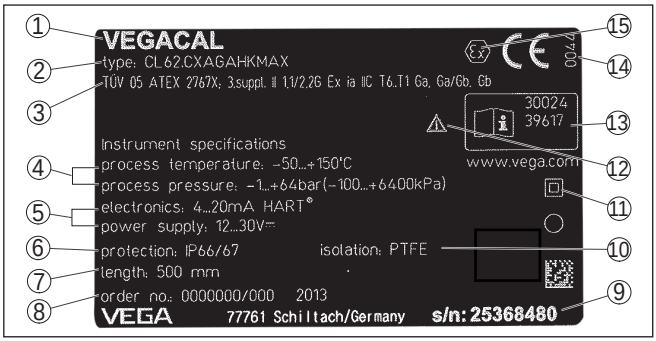


Fig. 2: Layout of the type label (example)

1 *Instrument type*
2 *Product code*
3 *Approvals*
4 *Process and ambient temperature, process pressure*
5 *Power supply and signal output, electronics*
6 *Protection rating*
7 *Probe length*
8 *Order number*
9 *Serial number of the instrument*
10 *Material, wetted parts*
11 *Symbol of the device protection class*
12 *Reminder to observe the instrument documentation*
13 *ID numbers, instrument documentation*
14 *Notified authority for CE marking*
15 *Approval directives*

With the serial number, you can access the delivery data of the instrument via "www.vega.com", "*VEGA Tools*" and "*Instrument search*". You can find the serial number on the inside of the instrument as well as on the type label on the outside.

3.2 Principle of operation

Application area

The VEGACAL 63 sensor can be used universally for level measurement in conductive and non-conductive liquids.

The rod probe is fully insulated and the proven mechanical construction offers high functional safety.

Functional principle

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

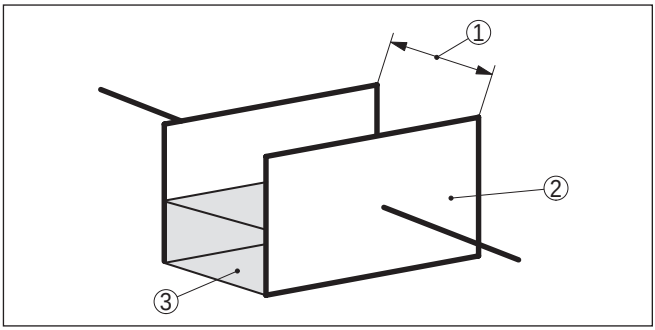


Fig. 3: Functional principle - Plate capacitor

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 and the insulation are the dielectric. Due to the higher dielectric constant of the insulation and the conductive 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.

Voltage supply

4 … 20 mA/HART two-wire electronics for voltage supply and measured value transmission on the same cable.

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

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

The backlight of the display 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*".

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

This function is generally not available for approved instruments.

3.3 Adjustment

The instrument can be adjusted with the following adjustment media:

- With the display 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

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 based on ISO 4180.

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

Transport

Transport must be carried out in due consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

Lifting and carrying

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

3.5 Accessories and replacement parts

PLICSCOM

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

The integrated Bluetooth module (optional) enables wireless adjustment via standard adjustment devices:[1)]

- Smartphone/tablet (iOS or Android operating system)
- PC/notebook with Bluetooth USB adapter (Windows operating system)

You can find further information in the operating instructions "*Display and adjustment module PLICSCOM*" (Document-ID 27835).

[1)] Bluetooth function with VEGADIS 82 can only be used at a later date.

VEGACONNECT

The interface adapter VEGACONNECT enables the connection of communication-capable instruments to the USB interface of a PC. For parameter adjustment of these instruments, the adjustment software PACTware with VEGA-DTM is required.

You can find further information in the operating instructions "*Interface adapter VEGACONNECT*" (Document-ID 32628).

VEGADIS 82

VEGADIS 82 is suitable for measured value indication and adjustment of sensors with HART protocol. It is looped into the 4 … 20 mA/HART signal cable.

You can find further information in the operating instructions "*VEGADIS 82 4 … 20 mA/HART*" (Document-ID 45300).

Protective cover

The protective cover protects the sensor housing against soiling and intense heat from solar radiation.

You will find additional information in the supplementary instructions manual "*Protective cover*" (Document-ID 34296).

Flanges

Screwed flanges are available in different versions according to the following standards: DIN 2501, EN 1092-1, BS 10, ASME B 16.5, JIS B 2210-1984, GOST 12821-80.

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

Screening tube adapter

There are different reasons for the use of a screening tube adapter.

Condensation
In case of strong condensation, the draining of condensed water can change the measurement accuracy. The suitable version is the **Screening against condensation**. The condensation can drain off outside on the screening tube adapter.

Typical applications of the screening tube adapters are e.g. for condensation or sockets. Apart from the standard version, there is a second version for vacuum with a sepcial seal. When the screening tube adapter is submerged in liquid, we recommend the use of a vacuum-tight version.

Mounting socket
In case of long sockets, the screening tube can increase the sensitivity of the probe by compensating the influences of the socket. The suitable version is **Capacitive screening, vacuum-tight**.

When the probe is mounted laterally, buildup can accumulate in the socket. A screening tube makes the covered part of the probe inactive and hence insensitive to influence from buildup and socket. Hence, the screening tube adapter excludes changing influences caused by the medium and ensures stable measurement conditions. The suitable version is **Capacitive screening, vacuum-tight**.

4 Mounting

4.1 General instructions

Suitability for the process conditions

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

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

Suitability for the ambient conditions

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

Installation position

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of a display and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the display and adjustment module in four different positions (each displaced by 90°).

Welding work

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

Ground the probe before welding directly on the rod or cable.

Handling

With threaded versions, the housing must not be used to screw in the instrument! Applying tightening forces on the housing can damage its internal parts.

Use the hexagon for screwing in.

Moisture

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

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

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

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

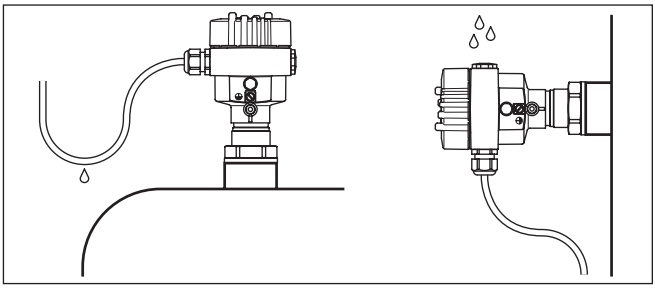


Fig. 4: Measures against moisture ingress

Pressure/Vacuum

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

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

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 those made of 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 vessels
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.

Cable entries - NPT thread
Cable glands

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

You have to remove these plugs before electrical connection.

NPT thread

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

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

4.2 Mounting instructions

Installation position

During operation, the probe must not touch any installations or the vessel wall. The measured value can also change if the distance to the vessel wall changes considerably. If necessary, secure the end of the probe (insulated).

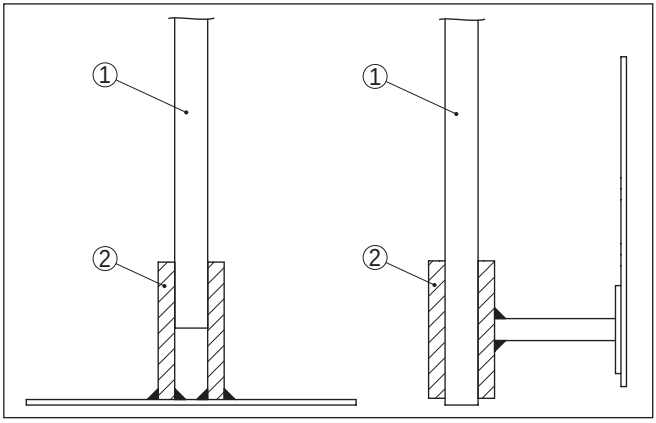


Fig. 5: Fasten the probe

1 Measuring probe
2 Plastic socket

In vessels with conical bottom it can be advantageous to mount the sensor in the centre of the vessel, as measurement is then possible down to the bottom.

Inflowing medium

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

This applies particularly to instrument versions with a longer probe.

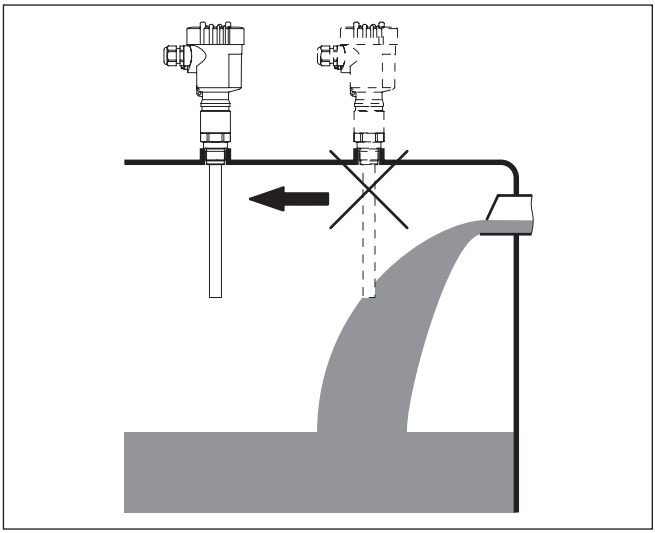


Fig. 6: Inflowing medium

Torque with PTFE plated flanges

To compensate the material-specific preload loss due to sealing materials, you have to additionally use disc springs for fastening flange screws on PTFE coated flanges. Tighten the screws moderately with the torque stated in the technical data. Depending on the process and ambient conditions, this value can vary. In individual cases you should occasionally check the tightness on site.

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

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

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

Voltage supply

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

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

Provide a reliable separation between the supply circuit and the mains circuits according to DIN EN 61140 VDE 0140-1.

Power the instrument via an energy-limited circuit acc. to DIN/EN/IEC/ANSI/ISA/UL/CSA 61010-1, e.g. via Class 2 power supply unit acc. to UL 1310 or an SELV power supply unit with suitable external current limitation.[2)]

Keep in mind the following additional factors that influence the operating voltage:

- Lower output voltage of the power supply unit under nominal load (e.g. with a sensor current of 20.5 mA or 22 mA in case of fault)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*")

Connection cable

The instrument is connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326-1 for industrial areas, screened cable should be used.

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

Use cable with round cross section for instruments with housing and cable gland. To ensure the seal effect of the cable gland (IP protection rating), find out which cable outer diameter the cable gland is suitable for.

Use a cable gland fitting the cable diameter.

We generally recommend the use of screened cable for HART multidrop mode.

[2)] Class 2 power supply unit: limited voltage and power level, special insulation against circuits with higher voltage. SELV (Safety Extra Low Voltage) power supply unit: limited voltage level, special insulation against circuits with higher voltage

Cable glands

Metric threads

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

You have to remove these plugs before electrical connection.

NPT thread

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

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

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

Cable screening and grounding

If screened cable is required, we recommend connecting 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 ground potential (low impedance).

In Ex systems, the grounding is carried out according to the installation regulations.

In electroplating plants as well as plants that apply cathodic corrosion protection, it must be taken into account that significant potential differences exist. This can lead to unacceptably high currents in the cable screen if it is grounded at both ends.

Information:
The metallic parts of the instrument (process fitting, housing, etc.) are conductively connected to the ground terminal.

Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

5.2 Connection procedure

Proceed as follows:

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

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

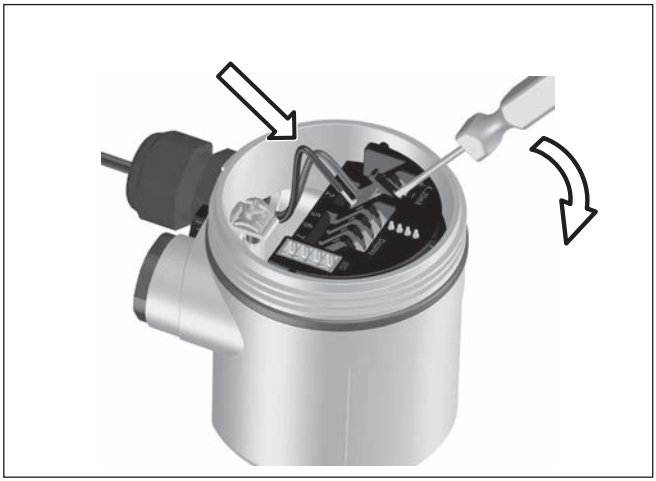


Fig. 7: Connection steps 6 and 7

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, connect the external ground terminal to potential equalisation
11. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
12. Screw the housing lid back on

The electrical connection is finished.

5.3 Wiring plan, single chamber housing

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

Housing overview

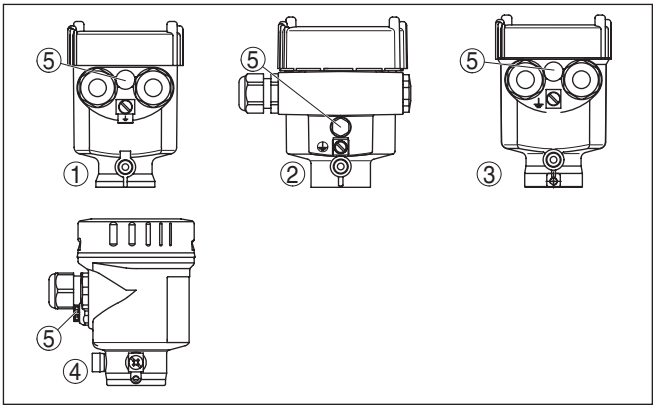


Fig. 8: Material versions, single chamber housing

1 *Plastic*
2 *Aluminium*
3 *Stainless steel (precision casting)*
4 *Stainless steel (electro-polished)*
5 *Filter element for air pressure compensation of all material versions. Blind plug with version IP 66/IP 68, 1 bar for Aluminium and stainless steel*

Electronics and terminal compartment

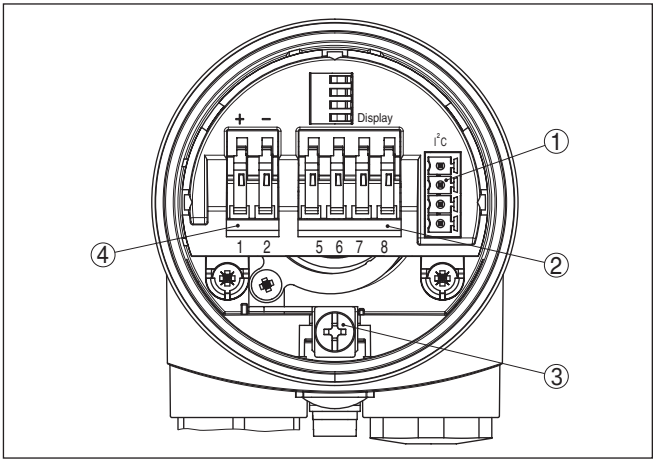


Fig. 9: Electronics and terminal compartment - single chamber housing

1 *Plug connector for VEGACONNECT (I^2C 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

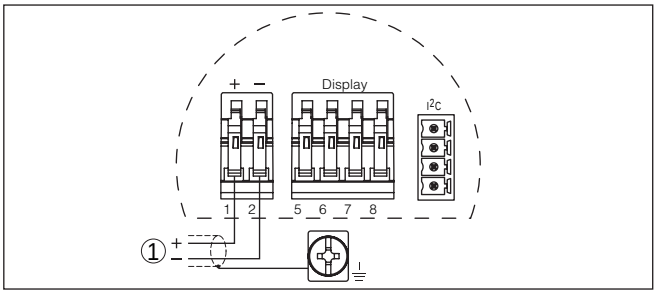


Fig. 10: Wiring plan - single chamber housing

1 Voltage supply, signal output

5.4 Wiring plan, double chamber housing

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

Housing overview

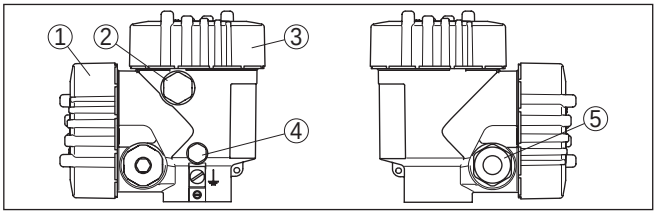


Fig. 11: Double chamber housing

1 Housing cover - connection compartment
2 Blind plug or plug M12 x 1 for VEGADIS 61 (optional)
3 Housing cover - electronics compartment
4 Filter element for air pressure compensation
5 Cable gland

Electronics compartment

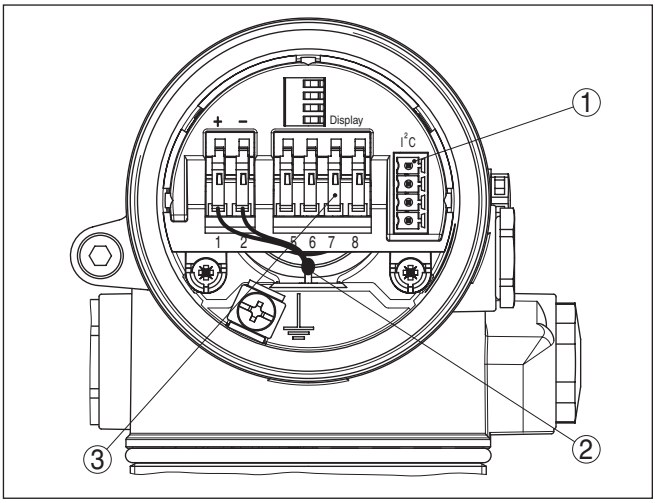


Fig. 12: Electronics compartment - double chamber housing

1 Plug connector for VEGACONNECT (I^2C interface)
2 Internal connection cable to the connection compartment
3 Terminals for VEGADIS 81

Terminal compartment

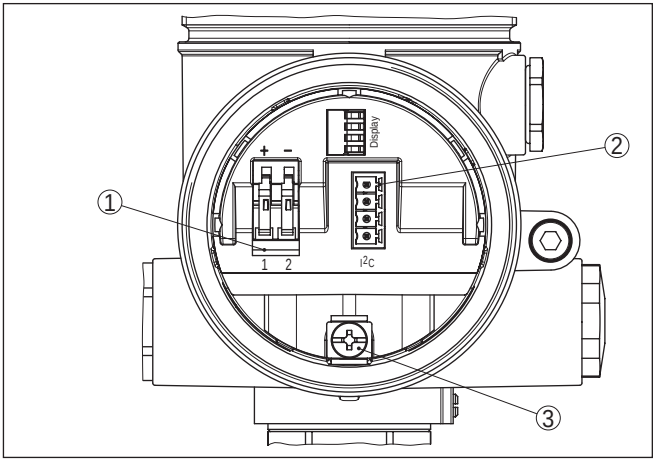


Fig. 13: Terminal compartment - double chamber housing

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

Wiring plan

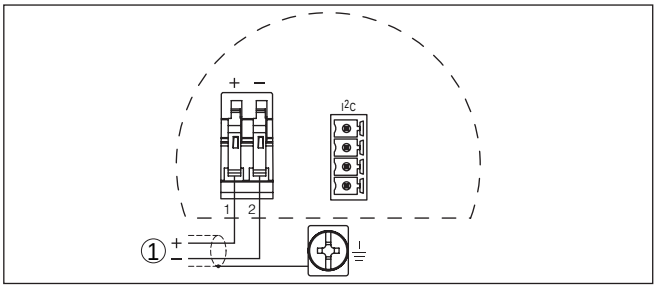


Fig. 14: Wiring plan - double chamber housing

1 Voltage supply, signal output

5.5 Wiring plan, Ex-d double chamber housing

Housing overview

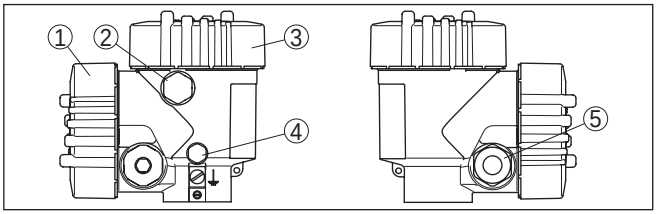


Fig. 15: Double chamber housing

1 Housing cover - connection compartment
2 Blind plug or plug M12 x 1 for VEGADIS 61 (optional)
3 Housing cover - electronics compartment
4 Filter element for air pressure compensation
5 Cable gland

Electronics compartment

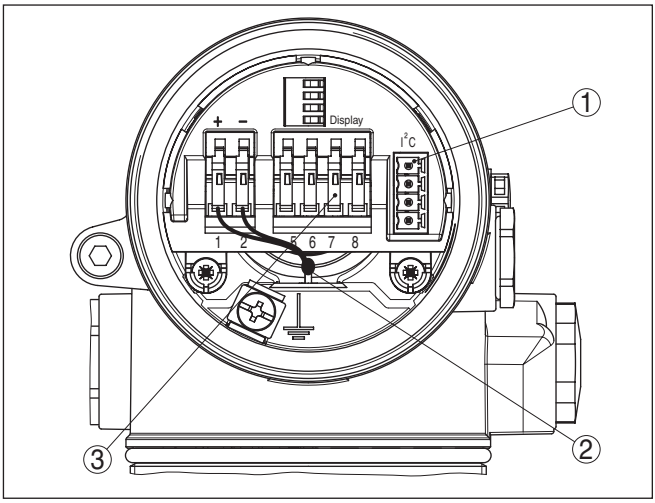


Fig. 16: Electronics compartment - double chamber housing

1 Plug connector for VEGACONNECT (I^2C interface)
2 Internal connection cable to the connection compartment
3 Terminals for VEGADIS 81

Terminal compartment

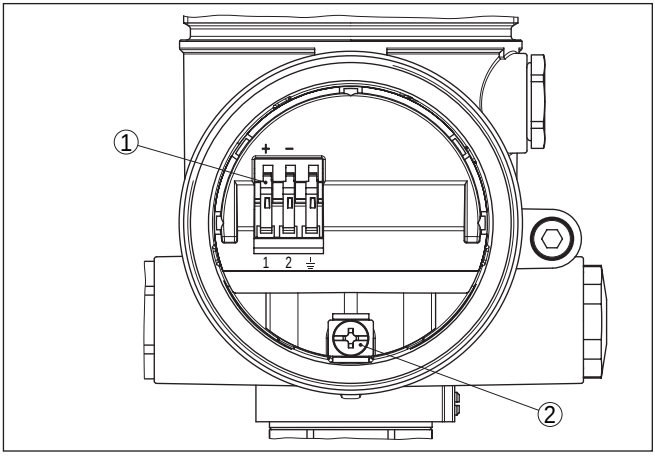


Fig. 17: Connection compartment, Ex-d-ia double chamber housing

1 Spring-loaded terminals for power supply and cable screen
2 Ground terminal for connection of the cable screen

Wiring plan

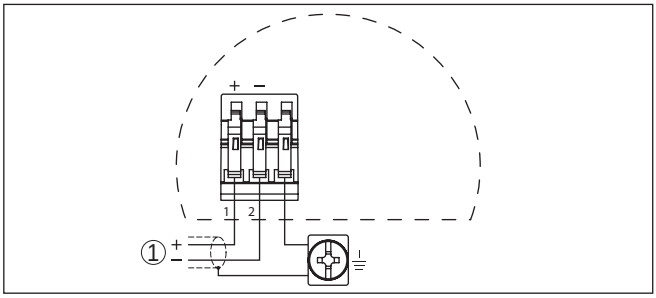


Fig. 18: Wiring plan, Ex-d-ia double chamber housing

1 Voltage supply, signal output

5.6 Wiring plan - version IP 66/IP 68, 1 bar

Wire assignment, connection cable

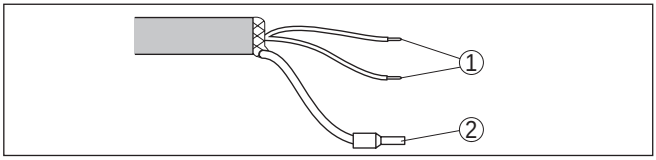


Fig. 19: Wire assignment, connection cable

1 Brown (+) and blue (-) to power supply or to the processing system
2 Shielding

6 Set up with the display and adjustment module PLICSCOM

6.1 Short description

Function/Configuration

The display 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® instrument family, in the single as well as in the double chamber housing (optionally in the electronics or connection compartment)
- External display and adjustment unit VEGADIS 61

6.2 Insert display and adjustment module

Mount/dismount display and adjustment module

The display 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 lid
2. Place the display 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 display and adjustment module onto the electronics and turn it to the right until it snaps in
4. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

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

Fig. 20: Insert display and adjustment module

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

6.3 Adjustment system

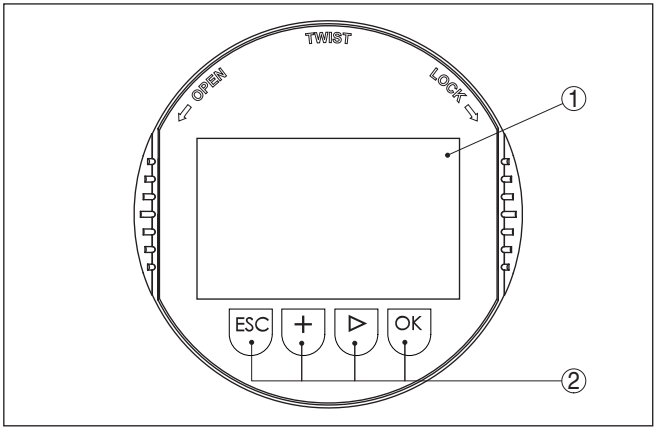


Fig. 21: Display and adjustment elements

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
  - Select list entry
  - Select editing position

- ***[+]*** key:
  - Change value of the parameter

- ***[ESC]*** key:
  - Interrupt input
  - Jump to next higher menu

Adjustment system

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

Time functions

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

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

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

6.4 Setup steps

Switch-on phase

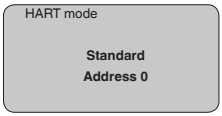
After connecting VEGACAL 63 to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

- 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 "*Display and adjustment module*" or in the online help of PACTware or DTM.



Parameter adjustment

VEGACAL 63 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 63 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 display and adjustment module remains on the probe as a display, we recommend saving the sensor data in the display and adjustment module.

Use the function "Copy sensor data".

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

Carry 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		

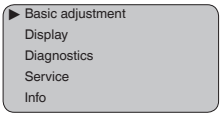
Tab. 1: Adjustment protocol

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.

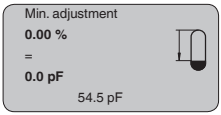
Note:
If possible, the vessel should be as empty as possible for min. adjustment.

Proceed as follows:

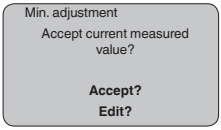
1. Move from the measured value display to the main menu by pushing ***[OK]***.



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]***.



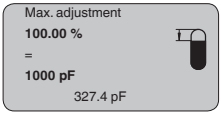
4. Accept the current measured value or move to the editing window with "Edit". To edit, set the cursor to the requested position with ***[->]***. Set the requested % value with ***[+]*** and save with ***[OK]***. The cursor jumps to the capacitance value.
5. Enter the current capacitance value in pF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

Carry out max. adjustment

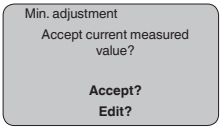
Fill the vessel to the highest possible level.

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]***.

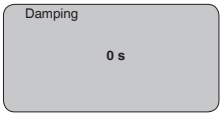


2. Accept the current measured value or move to the editing window with "Edit". To edit, set the cursor to the requested position with ***[->]***. Set the requested % value with ***[+]*** and save with ***[OK]***. The cursor jumps to the capacitance value.

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]***.

Basic adjustment - Damping

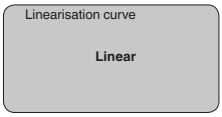
To suppress fluctuations in the measured value display, e. g. caused by an agitated product surface, a damping can be set. This time can be between 0 and 999 seconds. Keep in mind that the reaction time of the entire measurement will then be longer and the sensor will react to measured value changes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



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

Basic adjustment - Linearization curve

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



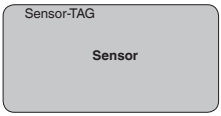
Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the ***[->]*** key.

Caution:
Note the following if the VEGACAL 63 with corresponding approval is used as part of an overfill protection system according to WHG (Water Resources Act):

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

Basic adjustment - 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 points.



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

Display - Indicated value

In the menu item "*Display*" you can define how the measured value should be presented on the display.

The following indication values are available:

- Height
- Distance
- Current
- Scaled
- Percent
- Lin. percent

The selection "*scaled*" opens the menu items "*Display unit*" and "*Scaling*". In "*Display unit*" there are the following options:

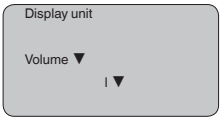
- Height
- Ground
- Flow
- Volume
- Without unit

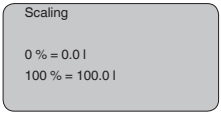
Depending on selection, the different units are in turn available.

In the menu item "*Scaling*", the requested numerical value with decimal point is entered for 0 % and 100 % of the measured value.

There is the following relationship between the indication value in the menu "*Display*" and the adjustment unit in the menu "*Device settings*":

- Indication value "*Distance*": Presentation of the measured value in the selected adjustment unit, e.g. m(d).





Display - Backlight

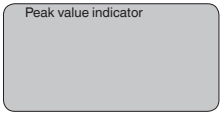
A background lighting integrated by default can be adjusted via the adjustment menu. The function depends on the height of the supply voltage. See "*Technical data/Voltage supply*".

In the default setting, the lightning is switched off.

Diagnosis - Peak value

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

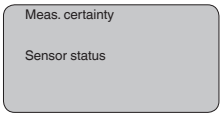
- Min. and max. distance in m(d)
- Min. and max. temperature



Diagnostics - Device status

The instrument status is displayed in this menu item. If no failure is detected by the sensor, "*OK*" will be displayed. If a failure is detected, there will be a sensor-specific flashing fault signal, for example "*E013*". The failure is also displayed in clear text, for example "*No measured value available*".

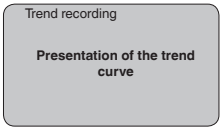
Information:
The fault message as well as the clear text indication are also carried out in the measured value display.



Trend recording

Up to 3000 measured values are recorded (depending on the sensor) when starting a "**Trend curve**". Then the values can be displayed on a time axis. The oldest measured values are always deleted.

The measured values displayed are in the unit pF.



Information:
The trend recording is not activated when being shipped. It must be started by the user via the menu item "*Start trend curve*".

Service - Current output

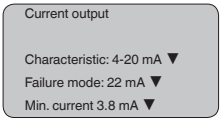
In the menu item "*Current output*" you determine the behaviour of the current output during operation and in case of failure. The following options are available:

Current output

Characteristics	**4 … 20 mA** 20 … 4 mA
Failure mode[3]	Hold value 20.5 mA 22 mA **< 3.6 mA**
Min. current[4]	**3.8 mA** 4 mA
Max. current[5]	**20 mA** 20.5 mA

The values in bold font represent the data of the factory setting.

In HART multidrop mode, the current is constantly 4 mA. This value does not change even in case of failure.



Service - Simulation

In this menu item you simulate a user-defined level or pressure value via the current output. This allows you to test the signal path, e.g. through connected indicating instruments or the input card of the control system.

The following simulation variables are available:

- Percent
- Current
- Pressure (with pressure transmitters)
- Distance (with radar and guided microwave)

With Profibus PA sensors, the selection of the simulated value is made via the "Channel" in the menu "*Basic adjustments*".

How to start the simulation:

1. Push ***[OK]***
2. Select the requested simulation variable with ***[->]*** and confirm with ***[OK]***.
3. Set the requested numerical value with ***[+]*** and ***[->]***.
4. Push ***[OK]***

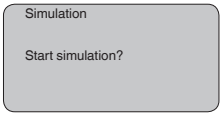
The simulation is now running, with 4 … 20 mA/HART a current is outputted and with Profibus PA or Foundation Fieldbus a digital value.

How to interrupt the simulation:

→ Push ***[ESC]***

[3] Value of the current output in case of failure, e.g. if no valid measured value is delivered.
[4] This value is not underrun during operation.
[5] This value is not exceeded during operation.

Information:
The simulation is automatically terminated 10 minutes after the last pressing of a key.



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
Damping ti	0 s
Linearisation	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

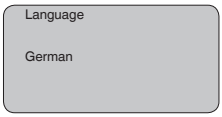
Special parameters
All special parameters are reset to delivery status.

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

Service - Language

The sensor is already set to the ordered national language. In this menu item you can change the language. The following languages are available, e.g. in software version 3.50:

- Deutsch
- English
- Français
- Espanõl
- Pycckuu
- Italiano
- Netherlands
- Japanese
- Chinese



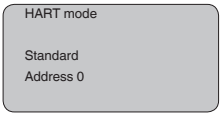
Service - HART mode

HART offers standard and multidrop mode.

The mode "standard" with the fixed address 0 means outputting the measured value as a 4 … 20 mA signal.

In Multidrop mode, up to 15 sensors can be operated on one two-wire cable. An address between 1 and 15 must be assigned to each sensor.[6)]

In this menu item you determine the HART mode and enter the address for multidrop.



The default setting is standard with address 0.

Copy sensor data

With this function

- Load parameter adjustment data from the sensor into the display and adjustment module
- Write parameter adjustment data from the display and adjustment module into the sensor

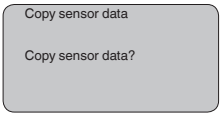
The data are permanently saved in an EEPROM memory in the display and adjustment module and remain there even in case of power failure. From there, they can be written into one or several sensors or kept as backup for a possible sensor exchange.

The type and the volume of the copied data depend on the respective sensor.

Information:
Before data are written into the sensor, a check is carried out to determine whether the data fit the sensor. If the data do not fit, a fault signal is triggered or the function is blocked. When writing data into the sensor, you will see which instrument type the data originate from and which TAG-no. this sensor had.

The following items are checked:

- Software version
- WHG approval
- SIL activated
- Measuring principle
- Signal output

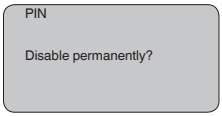


Service - PIN

In this menu item, the PIN is activated/deactivated permanently. Entering a 4-digit PIN protects the sensor data against unauthorized

[6)] The 4 … 20 mA signal of the sensor is switched off. The sensor uses a constant current of 4 mA. The measuring signal is transmitted exclusively as a digital HART signal.

access and unintentional modifications. If the PIN is activated permanently, it can be deactivated temporarily (i.e. for approx. 60 min.) in any menu item. The instrument is delivered with the PIN set to 0000.



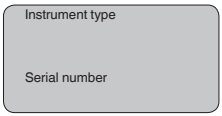
Only the following functions are permitted with activated PIN:

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

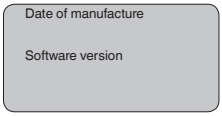
Info

In this menu item the most important sensor information can be displayed:

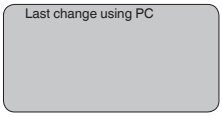
- Instrument type
- Serial number: 8-digit number, e.g. 12345678



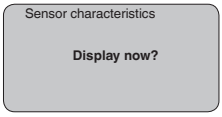
- Date of manufacture: Date of the factory calibration
- Software version: Edition of the sensor software



- Date of last change using PC: Date of the last change of sensor parameters via PC

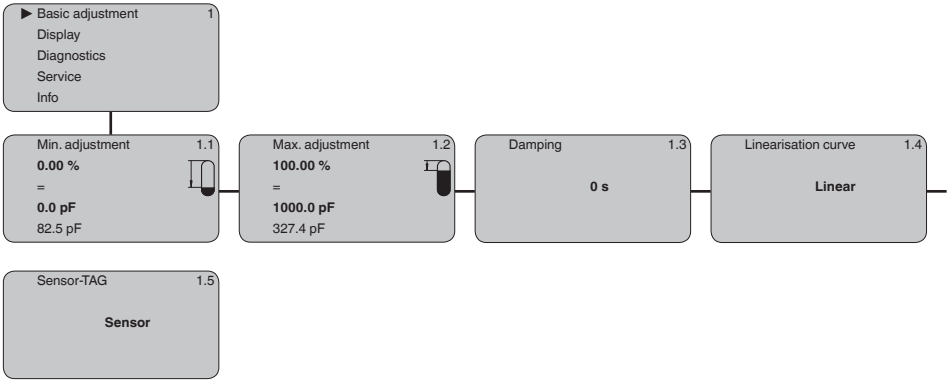


- Sensor details, e.g. approval, process fitting, seal, measuring cell, measuring range, electronics, housing, cable entry, plug, cable length etc.

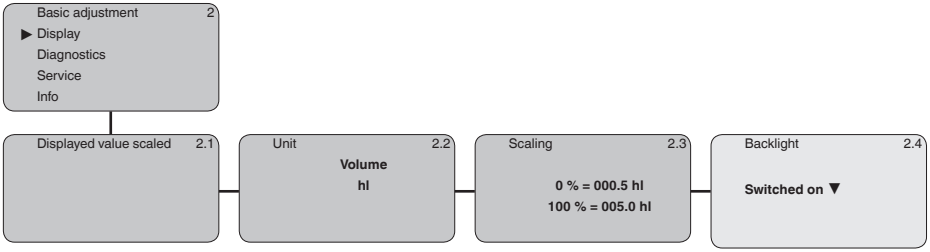


6.5 Menu schematic

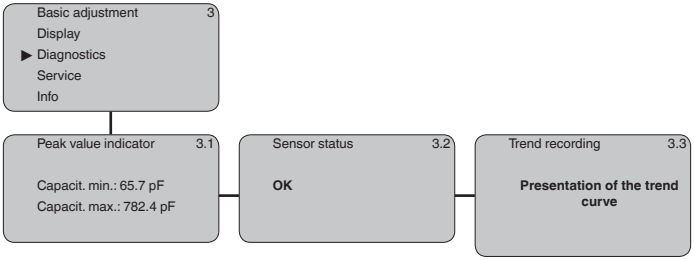
Basic adjustment



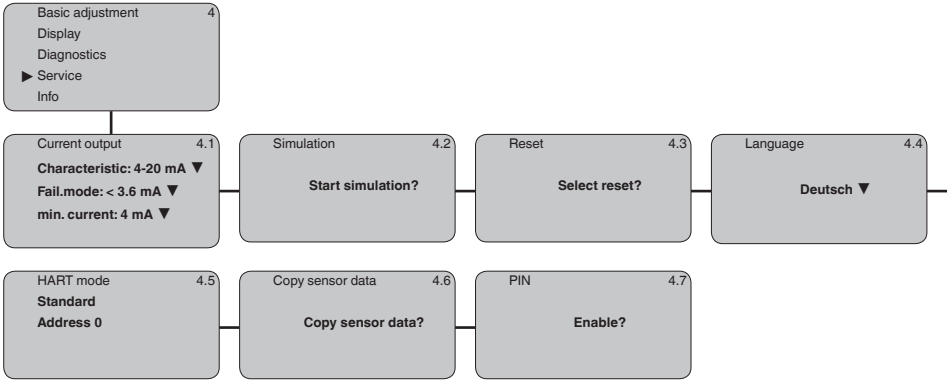
Display



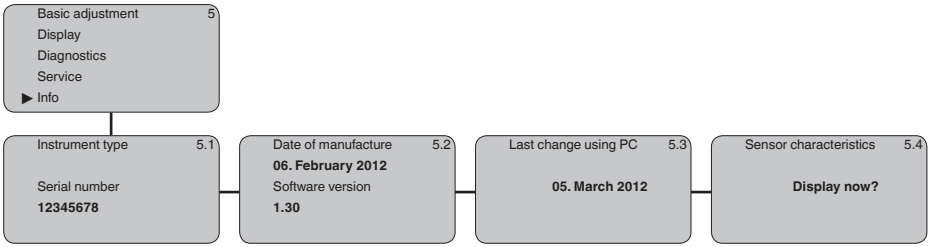
Diagnostics



Service



Info



6.10 Saving the parameterisation data

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

If VEGACAL 63 is equipped with a display and adjustment module, the most important data can be read out of the sensor into the display and adjustment module. The procedure is described in the operating instructions manual "*Display and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

If it is necessary to exchange the sensor, the display and adjustment module is inserted into the replacement instrument and the data are written into the sensor under the menu item "*Copy sensor data*".

7 Set up with PACTware and other adjustment programs

7.1 Connect the PC

VEGACONNECT directly on the sensor

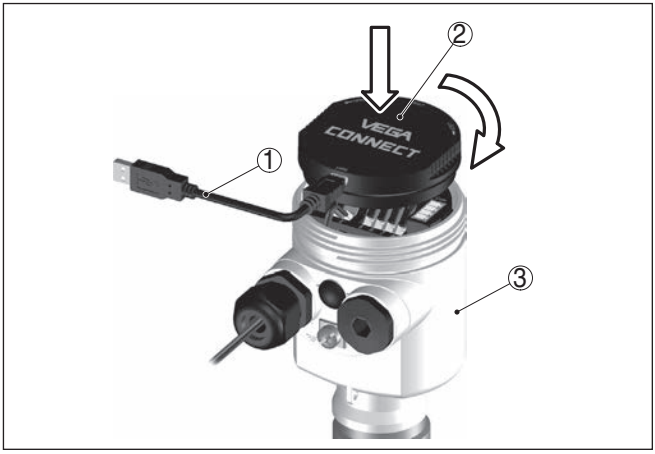


Fig. 22: Connection of the PC via VEGACONNECT directly to the sensor

1 USB cable to the PC
2 VEGACONNECT
3 Sensor

VEGACONNECT externally

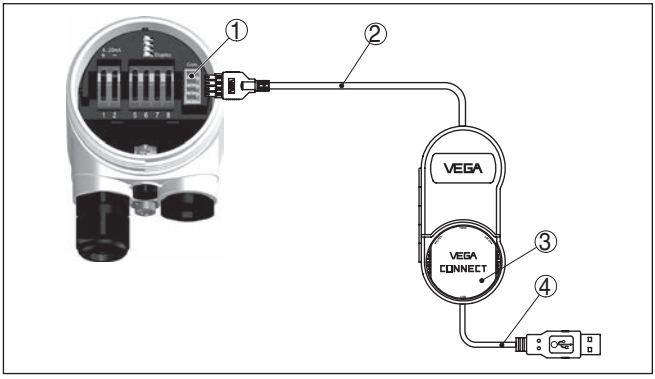


Fig. 23: Connection via VEGACONNECT externally

1 I^2C bus (com.) interface on the sensor
2 I^2C connection cable of VEGACONNECT
3 VEGACONNECT
4 USB cable to the PC

Necessary components:

- VEGACAL 63
- PC with PACTware and suitable VEGA DTM

- VEGACONNECT
- Power supply unit or processing system

VEGACONNECT via HART

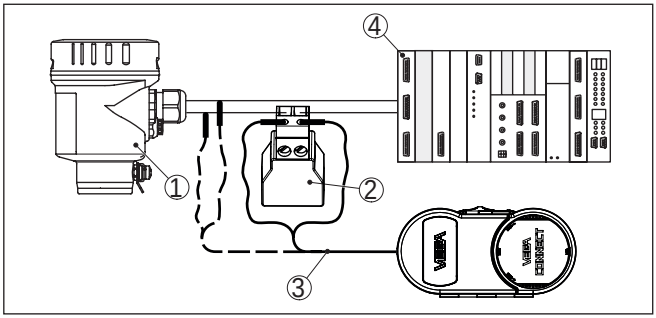


Fig. 24: Connecting the PC via HART to the signal cable

1 VEGACAL 63
2 HART resistance 250 Ω (optional depending on evaluation)
3 Connection cable with 2 mm pins and terminals
4 Processing system/PLC/Voltage supply

Necessary components:

- VEGACAL 63
- PC with PACTware and suitable VEGA DTM
- VEGACONNECT
- HART resistance approx. 250 Ω
- Power supply unit or processing system

Note:
With power supply units with integrated HART resistance (internal resistance approx. 250 Ω), an additional external resistance is not necessary. This applies, e. g. to the VEGA instruments VEGATRENN 149A, VEGADIS 371, VEGAMET 381. Common Ex separators are also usually equipped with a sufficient current limitation resistance. In such cases, VEGACONNECT 4 can be connected parallel to the 4 … 20 mA cable.

7.2 Parameter adjustment with PACTware

Prerequisites

For parameter adjustment of the instrument via a Windows PC, the configuration software PACTware and a suitable instrument driver (DTM) according to FDT standard are required. The latest PACTware version as well as all available DTMs are compiled in a DTM Collection. The DTMs can also be integrated into other frame applications according to FDT standard.

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

Further setup steps are described in the operating instructions manual "*DTM Collection/PACTware*" attached to each DTM Collection and which can also be downloaded from the Internet. Detailed descriptions are available in the online help of PACTware and the DTMs.

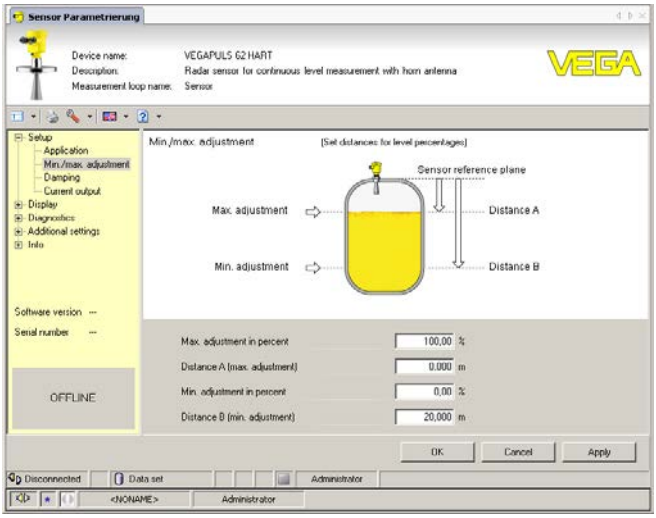


Fig. 25: Example of a DTM view

Standard/Full version

All device DTMs are available as a free-of-charge standard version and as a full version that must be purchased. In the standard version, all functions for complete setup are already included. An assistant for simple project configuration simplifies the adjustment considerably. Saving/printing the project as well as import/export functions are also part of the standard version.

In the full version there is also an extended print function for complete project documentation as well as a save function for measured value and echo curves. In addition, there is a tank calculation program as well as a multiviewer for display and analysis of the saved measured value and echo curves.

The standard version is available as a download under www.vega.com/downloads. The full version is available on CD from the agency serving you.

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. Move to www.vega.com.

7.4 Saving the parameterisation data

It is recommended to document or save the parameter adjustment data. That way they are 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

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

8.2 Rectify faults

Reaction when malfunction occurs

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

Causes of malfunction

VEGACAL 63 offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the display 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 and the faults rectified this way.

24 hour service hotline

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

The hotline is manned 7 days a week round-the-clock. Since we offer this service worldwide, the support is only available in the English language. The service is free, only standard call charges are incurred.

Check the 4 … 20 mA signal

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

Error	Reason	Rectification
4 … 20 mA signal not stable	Level fluctuations	Set damping via the display and adjustment module
4 … 20 mA signal missing	Wrong connection	Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"
	No power supply	Check cables for breaks; repair if necessary
	Operating voltage too low or load resistance too high	Check, adapt if necessary
Current signal greater than 22 mA or less than 3.6 mA	Shortcircuit in the probe, e.g. because of moisture in the housing	Remove the electronics module. Check the resistance between the marked plug connections. See the following instructions.
	Electronics module defective	Exchange the instrument or send it in for repair

Check the resistance in the probe

Remove the electronics module. Check the resistance between the two plug connections.

There must no longer be a connection (high impedance). If there is still a connection, exchange the instrument or return it for repair

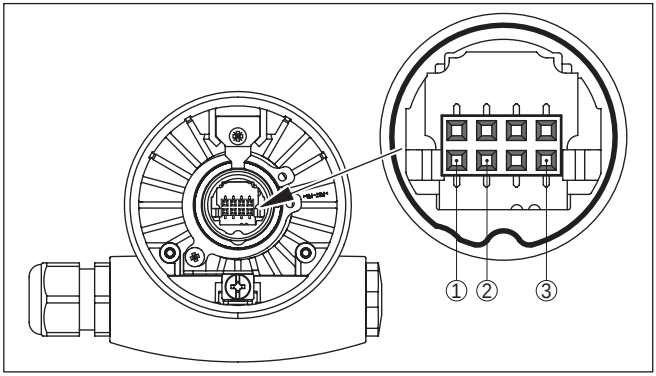


Fig. 26: Check the resistance in the probe

1 Shielding
2 Measuring probe
3 Ground potential

In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

Error messages via the display and adjustment module

Error	Reason	Rectification
E013	no measured value available	● Probe insulation damaged, short-circuit due to permeating, conductive medium ● Exchange the instrument or send it in for repair
	Shortcircuit in the probe, e.g. because of moisture in the housing	● Remove the electronics module out of the probe and check the resistor between the two marked plug connections according to the figure in paragraph "*Check the resistance in the probe*". ● There should be no contact between any of the connections (high resistance) ● If there is still a connection, exchange the 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 instrument for repair

Reaction after fault rectification

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

8.3 Exchanging the electronics module

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

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

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

Sensor serial number

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

- At the factory by VEGA
- Or on site by the user

In both cases, the sensor serial number is needed. 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 first be downloaded from the Internet (see operating instructions manual "*Electronics module*").

Assignment

The electronics modules are adapted to the respective sensor and differ in their signal output or in their power supply. You can find a suitable electronics module in the following overview.

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

The following types are available:

- CL-E60**H** (4 … 20 mA/HART)
- CL-E60**P** (Profibus PA)
- CL-E60**F** (Foundation Fieldbus)

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

8.4 How to proceed if a repair is necessary

You can find an instrument return form as well as detailed information about the procedure in the download area of our homepage: www.vega.com.

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

If a repair is necessary, please proceed as follows:

- 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 contact the agency serving you to get the address for the return shipment. You can find the agency on our home page www.vega.com.

9 Dismount

9.1 Dismounting steps

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

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

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. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

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

Materials: see chapter "*Technical data*"

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

10 Supplement

10.1 Technical data

General data

Material 316L corresponds to 1.4404 or 1.4435	
Materials, wetted parts	
– Process fitting - thread	316L, St C22.8 (1.0460), Alloy C22 (2.4602)
– Process fitting - flange	316L, Alloy C22 (2.4602), PTFE-plattiert
– Process seal	Klingersil C-4400
– insulation (fully insulated)	PTFE, PE
– Probe (rod fully insulated: ø 12 mm/0.472 in)	316L
– Probe (rod fully insulated: ø 16 mm/0.63 in)	316L
Materials, non-wetted parts	
– Plastic housing	plastic PBT (Polyester)
– Aluminium die-cast housing	Aluminium die-casting AlSi10Mg, powder-coated - basis: Polyester
– Stainless steel housing (precision casting)	316L
– Stainless steel housing (electropolished)	316L
– Seal between housing and housing lid	Silicone
– Ground terminal	316L
– Cable gland	PA, stainless steel, brass
– Sealing, cable gland	NBR
– Blind plug, cable gland	PA
Process fittings	
– Pipe thread, cylindrical (DIN 3852-A)	G½, G¾, G1, G1½
– Pipe thread, conical (ASME B1.20.1)	½ NPT, ¾ NPT, 1 NPT, 1½ NPT
– Flanges	DIN from DN 20, ASME from 1"
Weight	
– Instrument weight (depending on process fitting)	0.8 … 4 kg (0.18 … 8.82 lbs)
– Rod weight: ø 10 mm (0.394 in)	400 g/m (4 oz/ft)
– Rod weight: ø 16 mm (0.63 in)	1100 g/m (12 oz/ft)
Sensor length (L)	
– Process fitting: thread and flanges	0.1 … 6 m (0.328 … 19.69 ft)
– Process fitting: Flanges - PTFE plated	0.15 … 6 m (0.492 … 19.69 ft)
Max. lateral lod - rod: ø 10 mm (0.394 in)	10 Nm (7.4 lbf ft)
Max. lateral load - rod: ø 16 mm (0.63 in)	10 Nm (7.4 lbf ft)
Torque of the flange screws (min.)	60 Nm (44.25 lbf ft)

Max. torque (process fitting - thread) - rod: ø 10 mm (0.394 in)	100 Nm (73 lbf ft)
Max. torque (process fitting - thread) - rod: ø 16 mm (0.63 in)	100 Nm (73 lbf ft)
Torque for NPT cable glands and Conduit tubes	
– Plastic housing	max. 10 Nm (7.376 lbf ft)
– Aluminium/Stainless steel housing	max. 50 Nm (36.88 lbf ft)

Output variable	
Output signal	4 … 20 mA/HART
HART output values	
– HART value (Primary Value)	Capacitance
– HART value (Secondary Value)	Capacitance - scaled
Resolution	1.6 µA
Fault signal, current output (adjustable)	mA value unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable)
Current limitation	22 mA
Load	see load diagram under Power supply
Damping (63 % of the input variable)	0 … 999 s, adjustable
Rise time	500 ms (ti: 0 s, 0 … 100 %)
Met NAMUR recommendation	NE 43

Input variable	
Measured variable	Level of liquids
Measuring principle	phase-selective admittance processing (PSA)
Measuring range	0 … 3000 pF
Measuring frequency	270 kHz

Accuracy (according 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)
Temperature error	
– < 120 pF	< 1 pF
– > 120 pF	1 % of the current measured value
Linearity error	< 0.25 % of the complete measuring range

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

Process conditions

Process pressure	
– Threaded versions	-1 … 64 bar/-100 … 6400 kPa (-14.5 … 928 psig), depending on the process fitting
– Flange version	-1 … 64 bar/-100 … 6400 kPa (-14.5 … 928 psig), depending on the process fitting
– Flange version ≥ 3"/DN 80, plated	-0.4 … 64 bar/-40 … 6400 kPa (-5.8 … 928 psig), depending on the process fitting
Process temperature VEGACAL 63 of 316L	
– Insulation PE	-40 … +80 °C (-40 … +176 °F)
– Insulation PTFE	-50 … +150 °C (-58 … +302 °F)
Process temperature (thread or flange temperature) with temperature adapter (option with PTFE)	-50 … +200 °C (-58 … +392 °F)
Process temperature VEGACAL 63 of St C22.8	
– Insulation PE	-20 … +80 °C (-4 … +176 °F)
– Insulation PTFE	-20 … +150 °C (-4 … +302 °F)

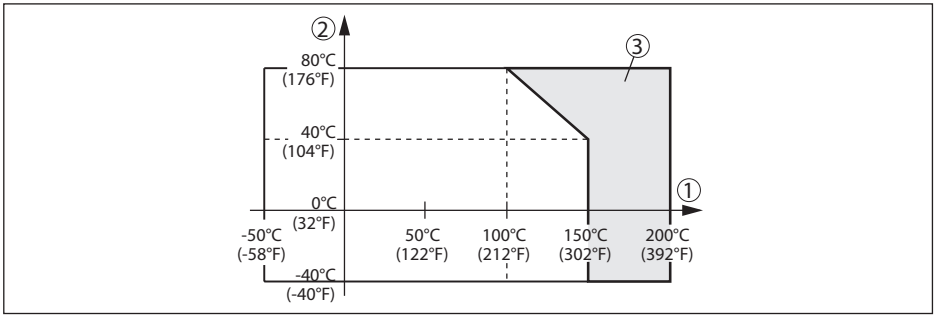


Fig. 27: Ambient temperature - Process temperature

1 Process temperature
2 Ambient temperature
3 Temperature range with temperature adapter

Dielectric constant	≥ 1.5

Electromechanical data - version IP 54

Cable entry	
– Sensor housing (BNC plug)	– 1 x BNC plug
– External housing	– 1 x cable entry M16 x 1.5 (cable ø 3.5 … X mm)

Electromechanical data - version IP 67

Cable entry	
– Sensor housing (hexagon housing)	– 1 x cable entry M16 x 1.5 (cable ø 3.5 … X mm)
– External housing	– 1 x cable entry M16 x 1.5 (cable ø 3.5 … X mm)
Screw terminals	for wire cross-section up to 2.5 mm² (AWG 14)

Electromechanical data - version IP 68	
Cable entry	
– Sensor housing (lateral cable outlet)	– 1 x cable entry M16 x 1.5 (cable ø 3.5 … X mm)
– External housing	– 1 x cable entry M16 x 1.5 (cable ø 3.5 … X mm)
Screw terminals	for wire cross-section up to 2.5 mm² (AWG 14)

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar	
Cable entry/plug[7]	
– Single chamber housing	– 1 x cable gland M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind plug M20 x 1.5 or: – 1 x closing cap M20 x 1.5; 1 x blind plug M20 x 1.5 or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT 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 plug M20 x 1.5; 1 x blind plug M16 x 1.5 or optionally available with 1 x plug M12 x 1 for external display and adjustment unit or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT, 1 x blind plug M16 x 1.5 or optionally 1 x plug M12 x 1 for external display and adjustment unit or: – 1 x plug (depending on the version), 1 x blind plug M20 x 1.5; 1 x blind plug M16 x 1.5 or optionally available with 1 x plug M12 x 1 for external display and adjustment unit
Spring-loaded terminals for wire cross-section	< 2.5 mm² (AWG 14)

Electromechanical data - version IP 66/IP 68 (1 bar)	
Cable entry	
– Single chamber housing	1 x IP 68 cable gland M20 x 1.5; 1 x blind plug M20 x 1.5
– Double chamber housing	1 x IP 68 cable gland M20 x 1.5; 1 x blind stopper M20 x 1.5; 1 x blind stopper M16 x 1.5
Connection cable	
– Wire cross-section	0.5 mm² (AWG 20)
– Wire resistance	< 0.036 Ω/m (0.011 Ω/ft)
– Tensile strength	< 1200 N (270 lbf)
– Standard length	5 m (16.4 ft)
– Max. length	1000 m (3280 ft)

[7] Depending on the version M12 x 1, according to DIN 43650, Harting, 7/8" FF.

– Min. bending radius	25 mm (0.984 in) with 25 °C (77 °F)
– Diameter approx.	8 mm (0.315 in)
– Colour - standard PE	Black
– Colour - standard PUR	Blue
– Colour - Ex-version	Blue

Display and adjustment module

Voltage supply and data transmission	through the sensor
Indication	LC display in dot matrix
Adjustment elements	4 keys
Protection rating	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Ambient temperature - Display and adjustment module	-20 … +70 °C (-4 … +158 °F)
Material	
– Housing	ABS
– Inspection window	Polyester foil

Voltage supply

Operating voltage U_B	
– Non-Ex instrument	12 … 36 V DC
– Ex ia instrument	12 … 30 V DC
– Ex-d-ia instrument	18 … 36 V DC
Operating voltage U_B - illuminated display and adjustment module	
– Non-Ex instrument	20 … 36 V DC
– Ex ia instrument	20 … 36 V DC
– Ex-d-ia instrument	Lighting not possible
Reverse voltage protection	Integrated

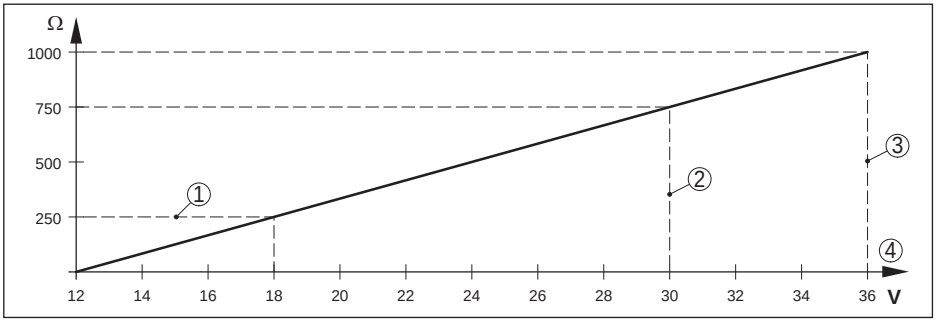


Fig. 28: Voltage diagram

1 HART load
2 Voltage limit Ex-ia instrument
3 Voltage limit non-Ex-/Ex-d-ia instrument
4 Operating voltage

Permissible residual ripple

– < 100 Hz	U_{ss} < 1 V
– 100 Hz … 10 kHz	U_{ss} < 10 mV
Load	see diagram

Potential connections and electrical separating measures in the instrument

Electronics	Not non-floating
Ground terminal	Galvanically connected with the metal process fitting

Galvanic separation between electronics and metal housing parts

– Reference voltage	500 V AC

Electrical protective measures

Protection rating

Housing material	Version	IP-protection class	NEMA protection
Plastic	Single chamber	IP 66/IP 67	Type 4X
	Double chamber	IP 66/IP 67	Type 4X
Aluminium	Single chamber	IP 66/IP 68 (0.2 bar) IP 68 (1 bar)	Type 6P Type 6P
	Double chamber	IP 66/IP 67 IP 66/IP 68 (0.2 bar) IP 68 (1 bar)	Type 4X Type 6P Type 6P
Stainless steel (electro-polished)	Single chamber	IP 66/IP 68 (0.2 bar)	Type 6P
Stainless steel (precision casting)	Single chamber	IP 66/IP 68 (0.2 bar) IP 68 (1 bar)	Type 6P Type 6P
	Double chamber	IP 66/IP 67 IP 66/IP 68 (0.2 bar) IP 68 (1 bar)	Type 4X Type 6P Type 6P

Connection of the feeding power supply unit	Networks of overvoltage category III
Altitude above sea level	
– by default	bis 2000 m (6562 ft)
– with connected overvoltage protection	up to 5000 m (16404 ft)
Pollution degree[8)]	4
Protection class	II (IEC 61010-1)

Functional safety (SIL)

Functional safety is already activated on instruments with SIL qualification ex factory. On instruments without SIL qualification ex factory, the functional safety must be activated by the user via the display and adjustment module or via PACTware for applications according to SIL.

Functional safety according to IEC 61508-4

– Single channel architecture (1oo1D)	up to SIL2
– double channel diversitary redundant architecture (1oo2D)	up to SIL3

You can find detailed information in the supplied Safety Manual of the instrument series or under "www.vega.com", "*Downloads*", "*Approvals*".

Approvals

Instruments with approvals can have different technical specifications depending on the version.

For that reason the associated approval documents of these instruments have to be carefully noted. They are part of the delivery or can be downloaded under www.vega.com "*Instrument search (serial number)*" as well as in the general download area.

8) When used with fulfilled housing protection

10.2 Dimensions

Housing in protection IP 66/IP 68 (0.2 bar)

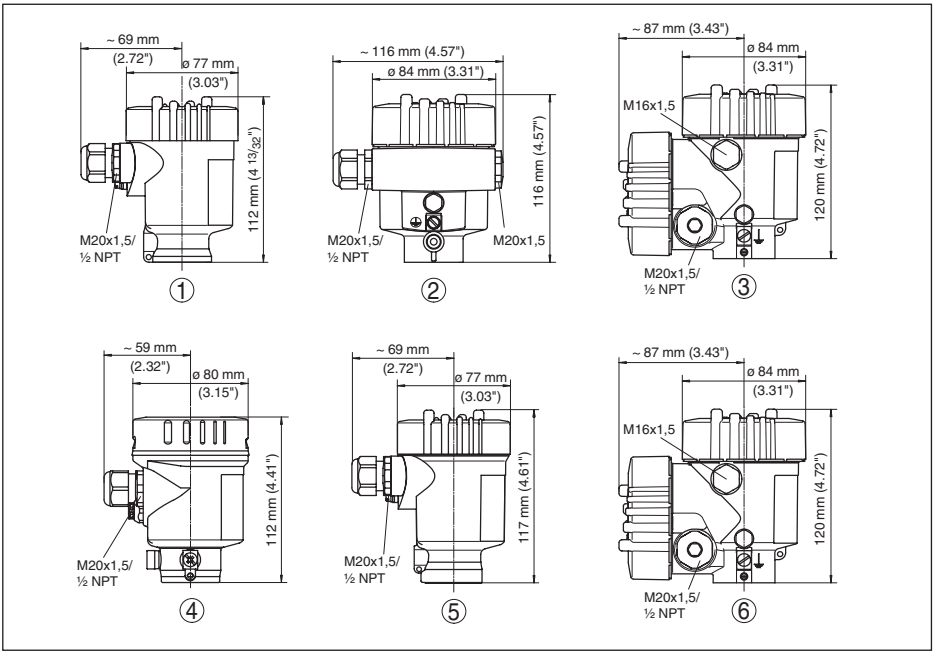


Fig. 29: Housing versions with protection rating IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 *Plastic single chamber (IP 66/IP 67)*
2 *Aluminium - single chamber*
3 *Aluminium - double chamber*
4 *Stainless steel single chamber (electropolished)*
5 *Stainless steel single chamber (precision casting)*
6 *Stainless steel double chamber housing (precision casting)*

Housing in protection IP 66/IP 68 (1 bar)

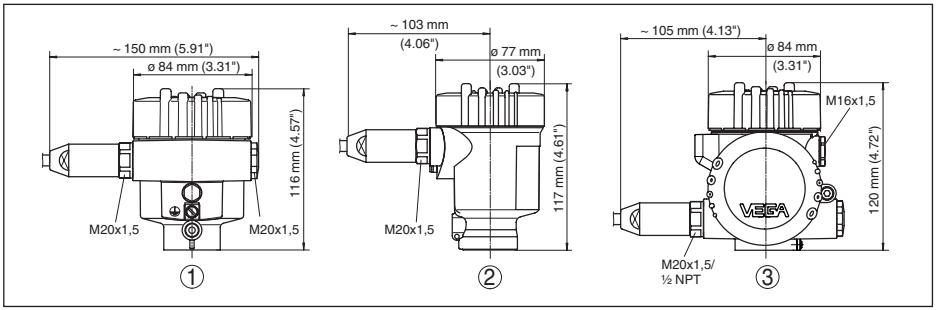


Fig. 30: Housing version with protection rating IP 66/IP 68 (1 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Aluminium - single chamber
2 Stainless steel single chamber (precision casting)
2 Stainless steel double chamber housing (precision casting)

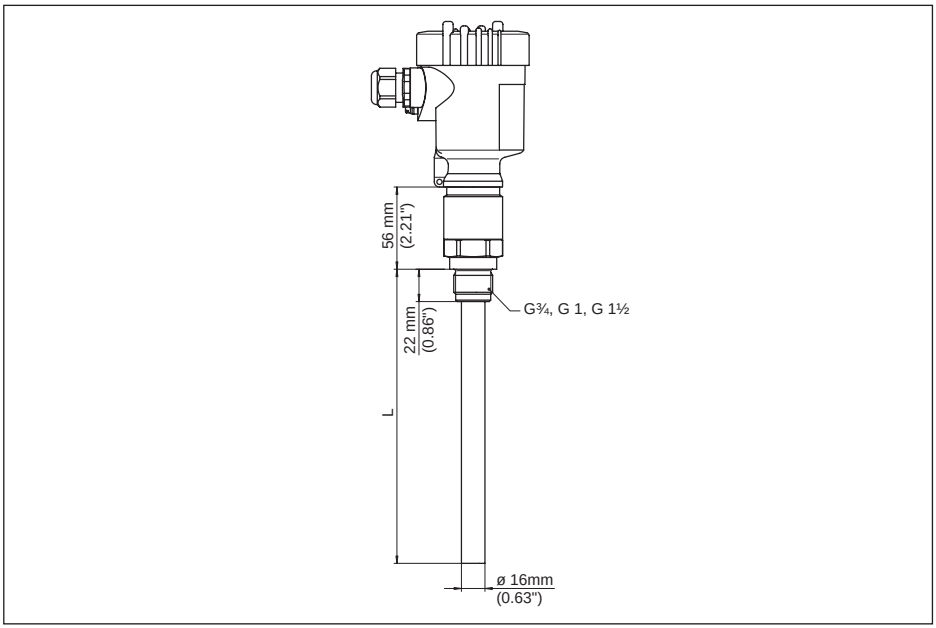


Fig. 31: VEGACAL 63, threaded version G1 (ISO 228 T1)

L Sensor length, see chapter "Technical data"

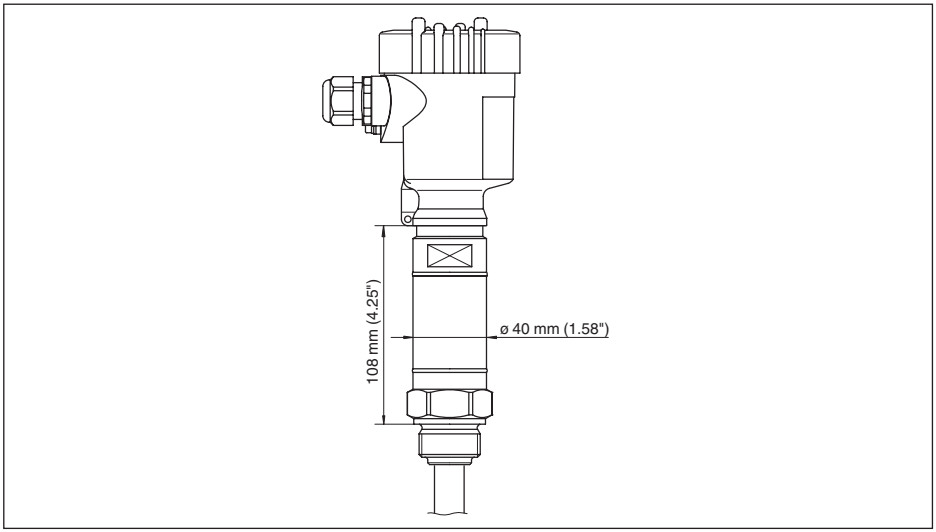


Fig. 32: Temperature adapter

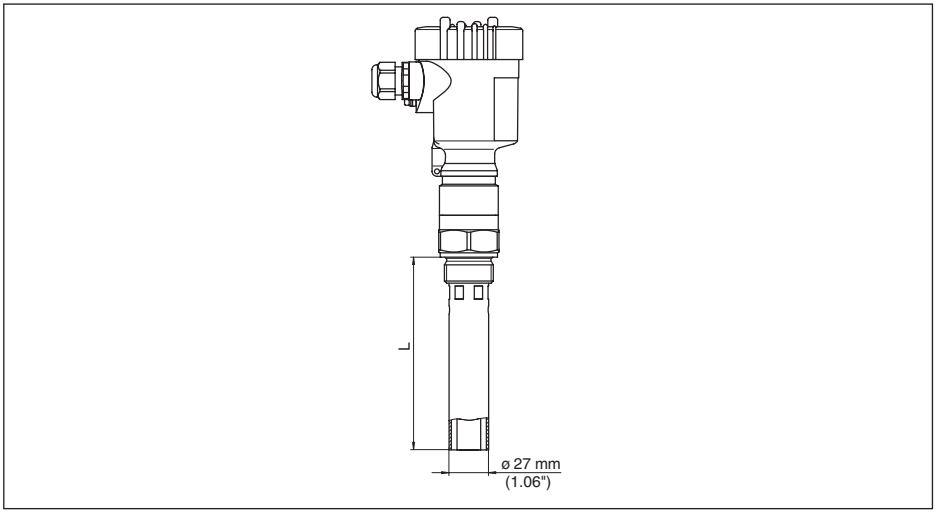


Fig. 33: VEGACAL 63, concentric tube, for example with small dielectric constant or for linearization

L Concentric tube length, see chapter "Technical data"

10.3 Industrial property rights

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Printing date:

30027-EN-170503

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