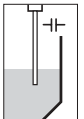


Operating Instructions

VEGACAP 66

with relay output



Contents

1	About this document	
1.1	Function	4
1.2	Target group	4
1.3	Symbolism used	4
2	For your safety	
2.1	Authorised personnel	5
2.2	Appropriate use	5
2.3	Warning about misuse	5
2.4	General safety instructions	5
2.5	CE conformity	5
2.6	Safety information for Ex areas	6
2.7	Environmental instructions	6
3	Product description	
3.1	Configuration	7
3.2	Principle of operation	8
3.3	Adjustment	9
3.4	Storage and transport	9
4	Mounting	
4.1	General instructions	10
4.2	Mounting information	11
5	Connecting to power supply	
5.1	Preparing the connection	14
5.2	Connection procedure	14
5.3	Wiring plans, single chamber housing	15
6	Set up	
6.1	General	18
6.2	Adjustment elements	18
6.3	Function chart	20
7	Maintenance and fault rectification	
7.1	Maintenance	22
7.2	Fault rectification	22
7.3	Exchanging the electronics	23
7.4	Instrument repair	25
8	Dismounting	
8.1	Dismounting procedure	26
8.2	Disposal	26

9 Supplement

9.1	Technical data	27
9.2	Dimensions	31
9.3	Certificates	33
9.4	Industrial property rights.	34

1 About this document

1.1 Function

This operating instructions manual has all the information you need for quick setup and safe operation of VEGACAP 66. Please read this manual before you start setup.

1.2 Target group

This operating instructions manual is directed to trained 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, warning, danger

This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.



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, specialised personnel authorised by the operator. For safety and warranty reasons, any internal work on the instruments must be carried out only by personnel authorised by the manufacturer.

2.2 Appropriate use

VEGACAP 66 is a sensor for level detection.

Detailed information on the application range of VEGACAP 66 is available 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 overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

VEGACAP 66 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.

2.5 CE conformity

VEGACAP 66 is in CE conformity with EMC (89/336/EWG) and NSR (73/23/EWG).

Conformity has been judged acc. to the following standards:

- EMC:
 - Emission EN 61326: 2004 (class B)
 - Susceptibility EN 61326: 2004/Supplement A
- NSR: EN 61010-1: 2001

2.6 Safety information 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.

2.7 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 acc. to DIN EN ISO 14001.

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

- Chapter "*Storage and transport*"
- Chapter "*Disposal*"

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGACAP 66 level sensor
- Documentation
 - this operating instructions manual
 - Ex-specific safety instructions (with Ex versions) and, if necessary, further certificates

Components

VEGACAP 66 consists of the following components:

- Housing cover
- Housing with electronics
- Process fitting with electrode

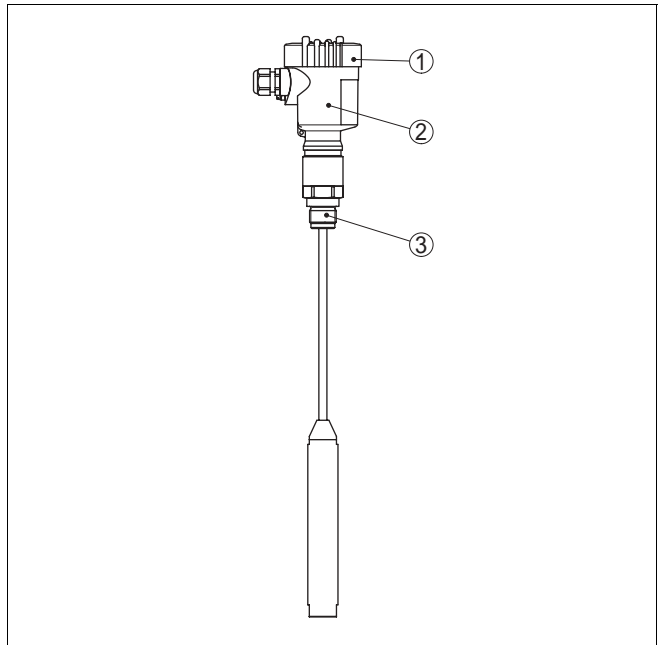


Fig. 1: VEGACAP 66 - with plastic housing

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

3.2 Principle of operation

Area of application

VEGACAP 66 is a level sensor with fully insulated capacitive electrode for level detection.

VEGACAP 66 is very rugged and maintenance-free and can be used in all areas of industrial process technology.

Fully insulated probes such as VEGACAP 66 are used in solids as well as in liquids.

Typical applications are overflow and dry run protection.

The capacitive measuring principle places no special requirements on installation. Hence, many different applications can be equipped with VEGACAP 66.

Problem-free use in adhesive or corrosive products.

Physical principle

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

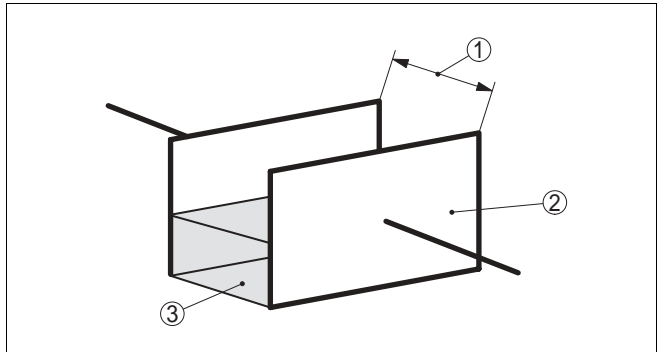


Fig. 2: Functional principle - Plate capacitor

- 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 material gradually covers the probe.

The capacitance change is converted by the oscillator into a switching command.

Power supply

VEGACAP 66 is a compact instrument, i.e. it can be operated without external evaluation system. The integrated electronics evaluates the level signal and outputs a switching signal. With this switching signal, a connected device can be operated directly (e.g. a warning system, a PLC, a pump etc.).

The exact range of the power supply is stated in the Technical data in the Supplement.

3.3 Adjustment

The probe can be adapted to the dielectric constant of the product directly on the electronics module.

A switching command can be triggered when the probe is covered or laid bare.

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

- signal lamp for indication of the switching condition (green/red)
- Potentiometer for switching point adaptation
- DIL switch for measuring range selection
- DIL switch for mode adjustment

3.4 Storage and transport**Packaging**

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test acc. to DIN 55439.

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.

Storage and transport temperature

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

4 Mounting

4.1 General instructions

Switching point

In general, VEGACAP 66 can be mounted in any position. The instrument must be mounted in such a way that the probe is at the height of the requested switching point.

Handling

With screwed versions, the housing must not be used for screwing in! Tightening can cause damages on the locking piston of the housing.

To screw in, use the hexagon above the thread.

Moisture

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

You can give your VEGACAP 66 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.

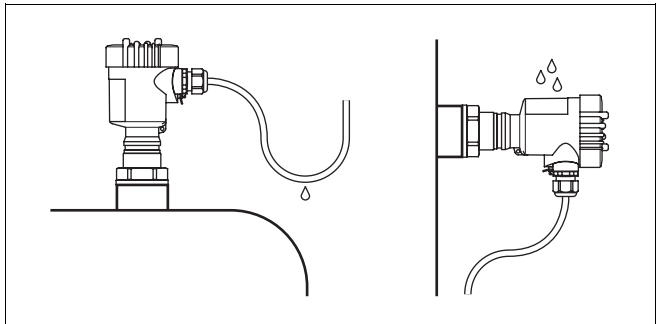


Fig. 3: Measures against moisture penetration

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.

4.2 Mounting information

Agitators and fluidization

Due to agitators, vibrations or similar, the level switch can be subjected to strong lateral forces. For this reason, do not use an overly long probe for VEGACAP 66, but check if you can mount a short level switch on the side of the vessel in horizontal position.

Inflowing material

If VEGACAP 66 is mounted in the filling stream, unwanted faulty measurements may be generated. Mount VEGACAP 66 at a location in the vessel where no disturbing influence from e. g. filling openings, agitators, etc. can occur.

This applies to all instrument types with long probe.

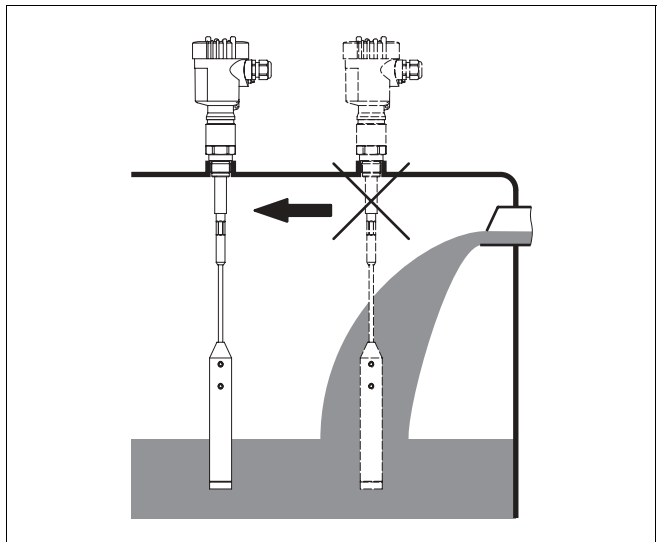


Fig. 4: Inflowing material

Socket

The probe should protrude into the vessel to avoid buildup. For that reason, avoid using mounting bosses for flanges and screwed fittings. This applies particularly to use with adhesive products.

Material cone

Material cones can form in solids silos which can change the switching point. Please keep this in mind when installing the sensor in the vessel. We recommend selecting an installation location where the probe detects an average value of the material cone.

The measuring probe must be mounted in a way that takes the arrangement of the filling and emptying apertures into consideration.

To compensate measurement errors in cylindrical vessels caused by the material cone, the sensor must be mounted at a distance of $d/6$ from the vessel wall.

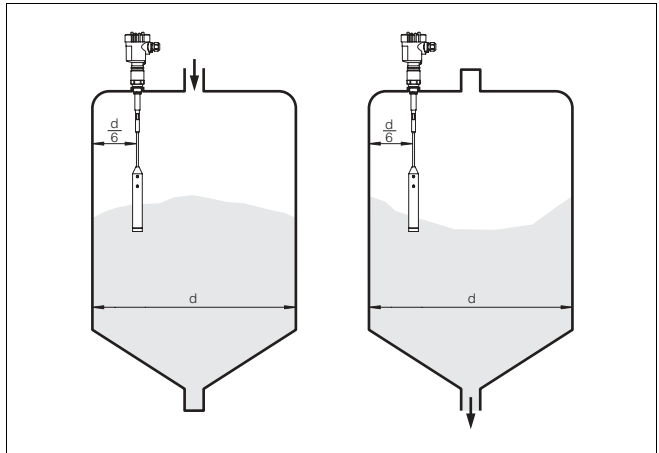


Fig. 5: Filling and emptying centered

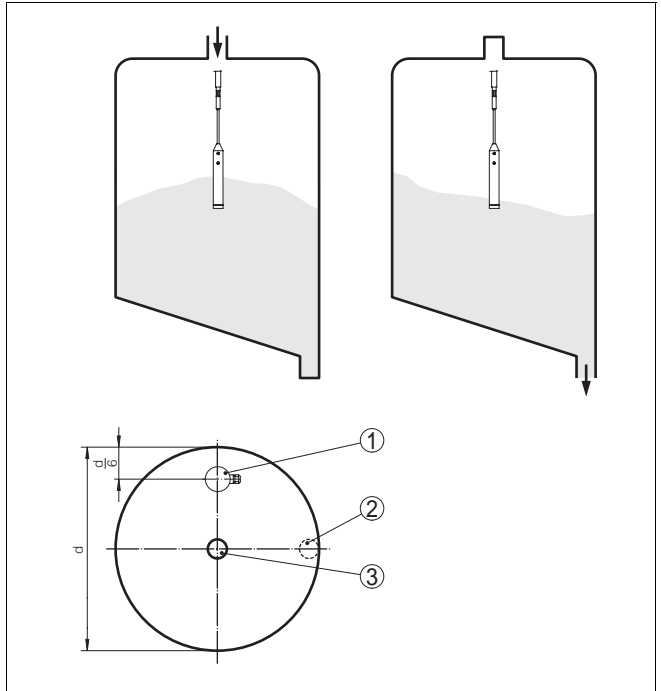


Fig. 6: Filling in the center, emptying laterally

- 1 VEGACAP 66
- 2 Emptying opening
- 3 Filling opening

Tensile load

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

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always observe the following safety instructions:

- Connect only in the complete absence of line voltage

Select power supply

Connect the power supply acc. to the following diagrams. Oscillator CP60R is designed in protection class 1. To maintain this protection class, it is absolutely necessary that the ground conductor is connected to the internal ground terminal. Take note of the general installation regulations. As a rule, connect VEGACAP 66 to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges.

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

Selecting the connection cable

VEGACAP 66 is connected with standard cable with round wire cross section. An outer cable diameter of 5 ... 9 mm (0.2 ... 0.35 in) ensures the seal effect of the cable entry.

If cable with a different diameter or wire cross section is used, exchange the seal or use an appropriate cable connection.

5.2 Connection procedure



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

Proceed as follows:

- 1 Unscrew the housing cover
- 2 Loosen compression nut of the cable entry
- 3 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires
- 4 Insert the cable into the sensor through the cable entry
- 5 Lift the opening levers of the terminals with a screwdriver (see following illustration)
- 6 Insert the wire ends into the open terminals according to the wiring plan

- 7 Press down the opening levers of the terminals, you will hear the terminal spring closing
 - 8 Check the hold of the wires in the terminals by lightly pulling on them
 - 9 Tighten the compression nut of the cable entry, the seal ring must completely encircle the cable
 - 10 Screw the housing cover back on
- The electrical connection is finished.



Fig. 7: Connection steps 5 and 6

5.3 Wiring plans, single chamber housing

Housing overview

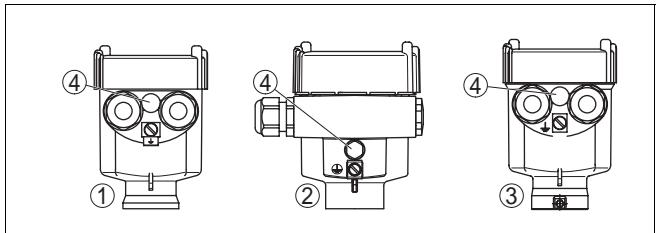


Fig. 8: Material versions, single chamber housing

- 1 Plastic (not with dust-Ex)
- 2 Aluminium
- 3 Stainless steel
- 4 Filter element for pressure compensation

Electronics and connection compartment

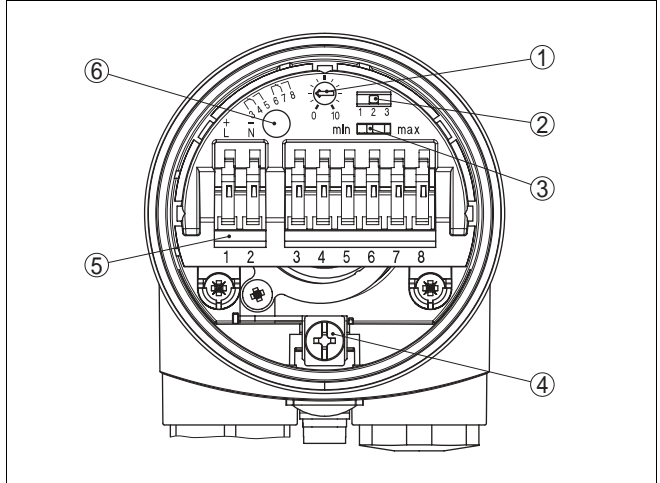


Fig. 9: Electronics and connection compartment
 1 Potentiometer for switching point adaptation
 2 DIL switch for measuring range selection
 3 DIL switch for mode adjustment
 4 Ground terminal
 5 Terminals
 6 Control lamp

Wiring plan

We recommend connecting VEGACAP 66 in such a way that the switching circuit is open when there is a level signal, line break or failure (safe condition).

The relays are always shown in non-operative condition.

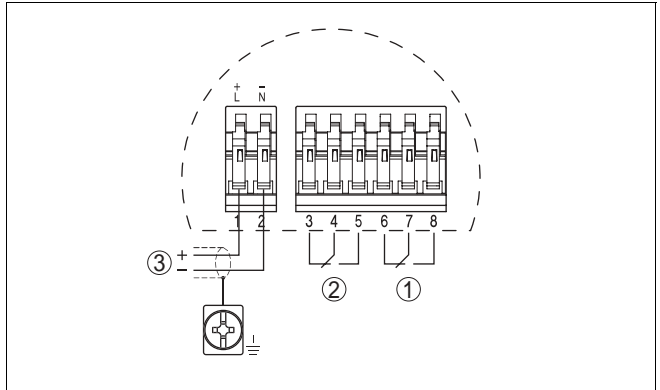


Fig. 10: Wiring plan

- 1 Relay output
- 2 Relay output
- 3 Supply voltage

6 Set up

6.1 General

The numbers in brackets refer to the following illustrations.

Function/Configuration

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

- Potentiometer for switching point adaptation
- DIL switch for measuring range selection
- DIL switch for mode adjustment - min/max
- Control lamp



Note:

As a rule, always set the mode with the mode switch (3) before starting to set up VEGACAP 66. The switching output will change if you set the mode switch (3) afterwards. This could possibly trigger other connected instruments or devices.

6.2 Adjustment elements

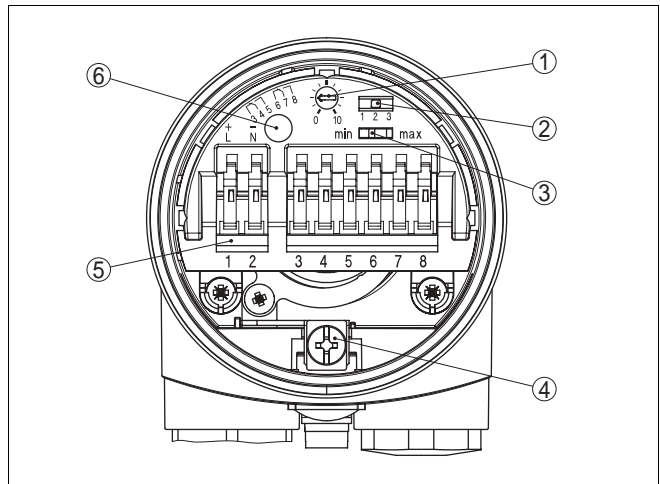


Fig. 11: Oscillator - Relay output

- 1 Potentiometer for switching point adaptation
- 2 DIL switch for measuring range selection
- 3 DIL switch for mode adjustment
- 4 Ground terminal
- 5 Terminals
- 6 Control lamp

The switching status of the electronics can be checked with closed housing (only plastic housing), see "Function chart".



Note:

Screw the housing cover tightly to the point where the inspection glass is above the control lamp (LED).

To adjust VEGACAP 66, first of all remove the housing cover.

Switching point adaptation (1)

You can adapt the switching point to the solid with the potentiometer.

As a default setting, the potentiometer of VEGACAP 66 is set to mid position. To make the instrument less sensitive, turn the potentiometer clockwise. VEGACAP 66 can then detect products with high dielectric value (e.g. water) more reliably.

To make the instrument more sensitive, turn the potentiometer anticlockwise. VEGACAP 66 can then detect products with low dielectric value (e.g. oil) more reliably.

Measuring range selection switch (2)

With the potentiometer (1) and the meas. range selection switch (2) you can change the switching point of the probe or adapt the sensitivity of the probe to the electrical properties of the product and the conditions in the vessel. This is necessary so that the level switch can also reliably detect products, e.g. with very low or very high dielectric value.

Range 1 – 0 ... 20 pF

Range 2 – 0 ... 85 pF

Range 3 – 0 ... 450 pF

Mode adjustment (3)

With the mode switch (3) you can change the switching condition of the relay. You can set the required mode. max. – max. detection or overflow protection, min. – min. detection or dry run protection.

We recommend connecting acc. to the quiescent current principle (relay contact deenergizes when reaching the switching point), because the relay takes on the same (safe) condition if a failure is detected.

Signal lamp (6)

Signal lamp for indication of the switching condition.

- green = relay energized
- red = relay deenergized
- red (flashing) = failure

Switching point adjustment

The adjustment of the switching point is only possible in installed condition

The numbers in brackets refer to the following illustrations.

Vertically mounted probes**Mode max. (max. detection)**

- 1 Set mode switch (3) to mode max.
- 2 Set meas. range selection switch (2) to range 1.
- 3 Fill the vessel up to the requested level.
- 4 Turn the potentiometer (1) to 10; the control lamp (6) lights green.
- 5 Turn the potentiometer (1) very slowly anticlockwise until the control lamp (6) lights red. If the control lamp does not light red, then you have to set the meas. range selection switch (2) to the next higher stage and repeat the setting with the potentiometer (1) until the control lamp lights red.

The measuring system is now ready for operation.




Mode min. (min. detection)














- 1 Set mode switch (3) to mode min.
- 2 Set meas. range selection switch (2) to position 1.
- 3 Lower the level to the requested min. level.
- 4 Turn the potentiometer (1) to 0; the control lamp (6) lights green.
- 5 Turn the potentiometer (1) very slowly clockwise until the control lamp (6) lights red. If the control lamp does not light red, set the meas. range selection switch (2) the the next higher stage and repeat the setting with the potentiometer (1) until the control lamp lights red.

The measuring system is now ready for operation.

6.3 Function chart

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

	Level	Switching status	Control lamp
max. mode Overfill protection		 Relay energized	 Green

	Level	Switching status	Control lamp
max. mode Overfill protection		 Relay deenergized	 Red
min. mode Dry run protection		 Relay energized	 Green
min. mode Dry run protection		 Relay deenergized	 Red
Failure of the supply voltage (min./max. mode)	any	 Relay deenergized	
Failure	any	 Relay deenergized	 flashes red

7 Maintenance and fault rectification

7.1 Maintenance

When used as directed in normal operation, VEGACAP 66 is completely maintenance-free.

7.2 Fault rectification

Causes of malfunction

VEGACAP 66 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Power supply
- Signal processing.

Fault rectification

The first measure is checking the output signal. In many cases the reasons can be determined and faults rectified.

24 hour service hotline

Should the following measures not be successful, please call in urgent cases the VEGA service hotline under the phone number **+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 switching signal

? VEGACAP 66 signals "covered" when the vibrating element is not submerged (overflow protection)

? VEGACAP 66 signals "uncovered" when the vibrating element is submerged (dry run protection)

- Supply voltage too low

→ Check the power supply

- Electronics defective

→ Push the mode switch (min./max.). If the instrument then changes the mode, the instrument may be mechanically damaged. Should the switching function in the correct mode still be faulty, return the instrument for repair.

- Push the mode switch. If the instrument then does not change the mode, the oscillator may be defective. Exchange the oscillator.
 - Check if there is buildup on the probe, and if so, remove it.
 - Unfavourable installation location
 - Mount the instrument at a location where no dead zones or mounds can form in the vessel.
 - Check if the probe is covered by buildup on the socket.
 - Wrong mode selected
 - Set the correct mode on the mode switch (max: overflow protection; min: dry run protection). Wiring should be carried out acc. to the quiescent current principle.
- ? Signal lamp flashes red
- Electronics has detected a failure
 - Exchange instrument or return it for repair

7.3 Exchanging the electronics

In general, all oscillators of series CP60 can be interchanged. If you want to use an oscillator with a different signal output, you can download the corresponding operating instructions manual from our homepage under Downloads.

Proceed as follows:

- 1 Switch off power supply
- 2 Unscrew the housing cover
- 3 Lift the opening levers of the terminals with a screwdriver
- 4 Pull the connection cables out of the terminals
- 5 Loosen the two screws with a Phillips screwdriver (size 1)

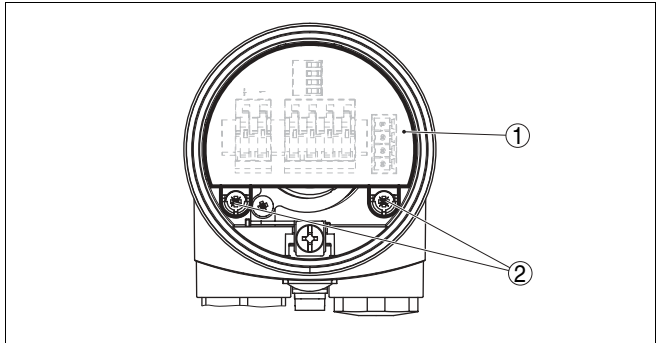


Fig. 12: Loosen the screws

- 1 Electronics module
- 2 Screws (2 pcs.)

- 6 Remove the old oscillator
- 7 Compare the new oscillator with the old one. The type label of the oscillator must correspond to that of the old oscillator. This applies particularly to instruments used in hazardous areas.
- 8 Compare the settings of the two oscillators. Set the adjustment elements of the new oscillator to the settings of the old oscillator.



Information:

Make sure that the housing is not rotated during the electronics exchange. Otherwise the plug may be in a different position later.

- 9 Insert the oscillator carefully. Make sure that the plug is in the correct position.
- 10 Screw in and tighten the two screws with a Phillips screwdriver.
- 11 Insert the wire ends into the open terminals according to the wiring plan
- 12 Close the opening levers of the terminals, you will hear the terminal spring closing
- 13 Check the hold of the wires in the terminals by lightly pulling on them
- 14 Check the tightness of the cable entry. The seal ring must completely encircle the cable.
- 15 Screw the housing cover back on

The electronics exchange is finished.

7.4 Instrument repair

If it is necessary to repair VEGACAP 66 please proceed as follows:

You can download a return form (23 KB) from our homepage www.vega.com under: "*Services – Downloads – Forms and Certificates – Repair form*".

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

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and possibly also a safety data sheet to the instrument.
- Send the instrument to the respective address of your agency. In Germany to the VEGA headquarters in Schiltach.

8 Dismounting

8.1 Dismounting procedure

**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.

8.2 Disposal

VEGACAP 66 consists of materials which can be recycled by specialised recycling companies. We have purposely designed the electronic modules to be easily separable. Mark the instrument as scrap and dispose of it according to national government regulations (e.g. in Germany acc. to the EU Directive on Waste Electrical and Electronic Equipment, WEEE).

Materials: see "*Technical data*"

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

9 Supplement

9.1 Technical data

General data

Material 316L corresponds to 1.4404 or 1.4435

Materials, wetted parts

– Process fitting – Thread	316L
– Process fitting - Flange	316L
– Process seal	Klingersil C-4400
– insulation (fully insulated)	PTFE
– Probe (cable PTFE fully insulated ø 8 mm/ø 0.32 in)	316L

Materials, non-wetted parts

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

Weights

– with plastic housing	1150 g (40 oz)
– with Aluminium housing	1600 g (56 oz)
– with stainless steel housing	1950 g (69 oz)
– Gravity weight	900 g (32 oz)
– Cable weight ø 8 mm (ø 0.32 in)	200 g/m (2.1 oz/ft)

Sensor length (L)	0.2 ... 32 m (0.7 ... 105 ft)
Max. tensile load (cable)	10 KN (2248 lbs)
Max. torque (process fitting thread)	100 Nm (73 lbf ft)

Output variable

Output	relay output (DPDT), 2 floating spdts
Turn-on voltage	
– min.	10 mV
– max.	253 V AC, 253 V DC
Switching current	
– min.	10 µA
– max.	3 A AC, 1 A DC

Breaking capacity

- min. 50 mW
- max.

750 VA AC, 54 W DC

If inductive loads and higher currents are applied, the gold plating on the relay contact surface can be permanently damaged. The contact is then no longer suitable for switching of low-level signal circuits.

Contact material (relay contacts)

Modes (adjustable)

AgNi or AgSnO and Au plated
min./max.**Integration time**

- when immersed approx. 0.5 s
- when laid bare approx. 0.5 s
- in case of failure approx. 1 s

Ambient conditions

Ambient temperature on the housing

-40 ... +80°C (-40 ... +176°F)

Storage and transport temperature

-40 ... +80°C (-40 ... +176°F)

Process conditions

Process pressure

-1 ... 64 bar (-100 ... 6400 kPa/-14.5 ... 928 psi)

Process temperature VEGACAP 66 of 316L

-50 ... +150°C (-58 ... +302°F)

Process temperature (thread or flange temperature) with temperature adapter (option)

-50 ... +200°C (-58 ... +392°F)

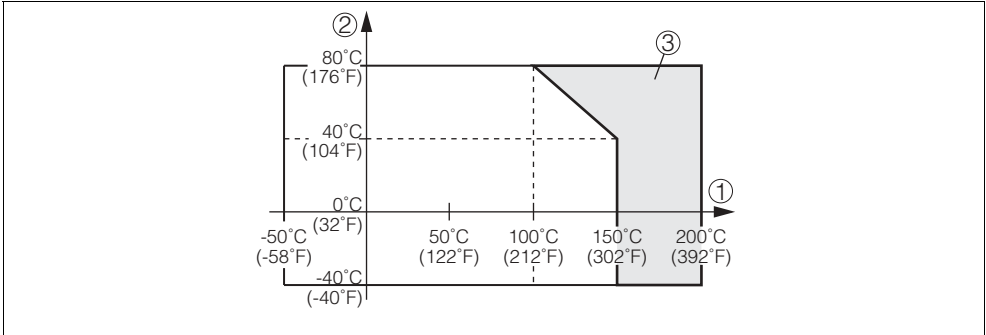


Fig. 13: Ambient temperature – Product temperature
 1 Product temperature
 2 Ambient temperature
 3 Temperature range with temperature adapter

Dielectric figure >1.5

Electromechanical data

Cable entry/plug (dependent on the version)

- Single chamber housing
 - 1x cable entry M20x1.5 (cable- \varnothing 5 ... 9 mm), 1x blind stopper M20x1.5, attached 1x cable entry M20x1.5
 - or:
 - 1x cable entry 1/2 NPT, 1x blind stopper 1/2 NPT, 1x cable entry 1/2 NPT
 - or:
 - 1x plug M12x1, 1x blind stopper M20x1.5 for wire cross section up to 1.5 mm² (0.0023 in²)

Adjustment elements

Mode switch

- min. min. detection or dry run protection
- max. max. detection or overflow protection

DIL switch for measuring range selection

- range 1 0 ... 20 pF
- range 2 0 ... 85 pF
- range 3 0 ... 450 pF

Trim potentiometer

Switching point adaptation

Supply voltage

Supply voltage	20 ... 253 V AC, 50/60 Hz, 20 ... 72 V DC (at U >60 V DC the ambient temperature must be max. 50°C/122°F)
Power consumption	1 ... 8 VA (AC); approx. 1 W (DC)

Electrical protective measures

Protection	IP 66/IP 67
Overvoltage category	III
Protection class	I

Approvals¹⁾

Overfill protection acc. to WHG

Ship approvals

¹⁾ Deviating data with Ex applications: see separate safety instructions.

9.2 Dimensions

VEGACAP 66 ²⁾

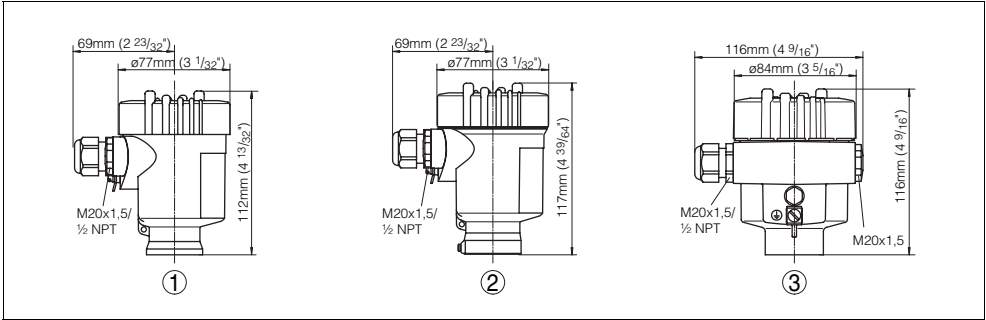


Fig. 14: Housing versions

- 1 Plastic housing
- 2 Stainless steel housing
- 3 Aluminium housing

²⁾ All dimensions in mm (inch)

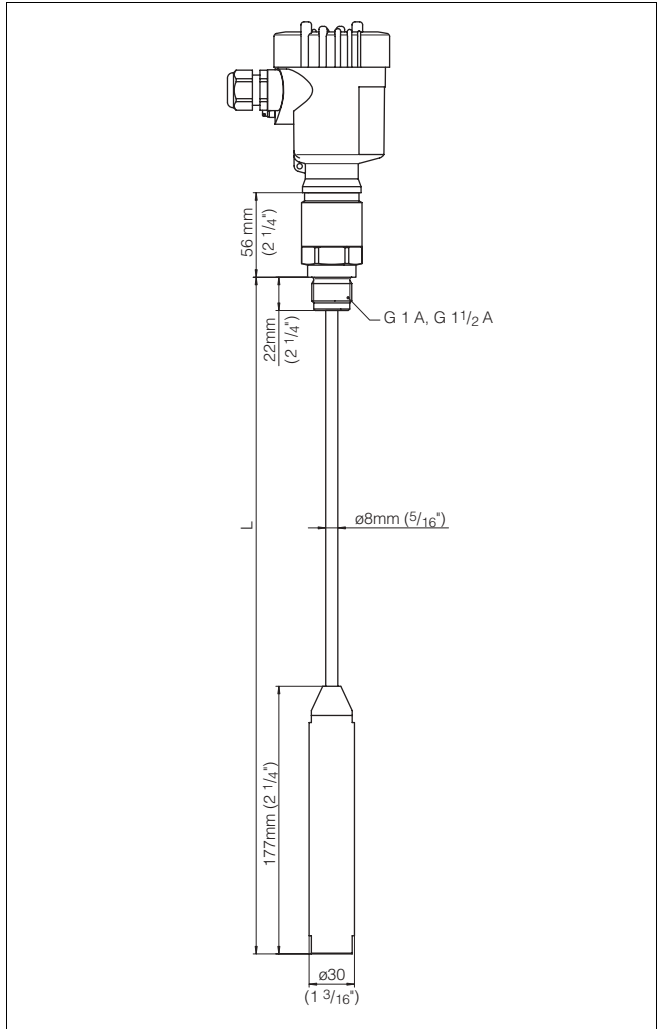


Fig. 15: VEGACAP 66 - Threaded version G1A

L = Sensor length, see Technical data

9.3 Certificates

CE declaration of conformity



Fig. 16: CE declaration of conformity

9.4 Industrial property rights

VEGA product lines are global protected by intellectual 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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