Product information
Capacitive

Level measurement in liquid
VEGACAL 62
VEGACAL 63
VEGACAL 64
VEGACAL 66
VEGACAL 69
Take note of safety instructions for Ex applications

Please note the Ex specific safety information that you can find at www.vega.com and that comes with each instrument. In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.
1 Description of the measuring principle

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

![Fig. 1: Functional principle - Plate capacitor](image)

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 of the product compared to air, the capacitance increases as the probe is gradually covered.

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

The more constant the conductivity, concentration and temperature of a product, the better the conditions for admittance measurement. Changes in the measuring conditions are generally less critical when detecting materials with high DK values.

The sensors are maintenance free and rugged and can be implemented in all areas of industrial measurement engineering.

Admittance probes have no minimum distances or dead band in which measurement is not possible.

Whereas partly insulated versions are predominantly used for solids, fully insulated versions are preferred for liquids.

Corrosive and adhesive products
Implementation in very adhesive or corrosive products is no problem. Since the admittance measuring principle places no special requirements on mounting, a host of different applications can be equipped with VEGACAL series 60 probes.

Wide application range
With measuring ranges up to 32 m (105 ft), the sensors are well suited for tall vessels. Temperatures up to 200 °C (392 °F) and pressures from vacuum to 64 bar (928 psig) cover a wide range of applications.

1.2 Application examples

Liquid vessels up to 6 m high

![Fig. 2: Small liquid tank](image)

1. Fully insulated rod probe VEGACAL 63

Admittance probes can be used in liquid vessels where products are stored or further processed. To avoid incorrect measuring results in applications with non-conductive products, the measured medium must always remain the same. A change of the medium (different dielectric value) necessitates a fresh calibration. When the conductivity is approx. 100 µS/cm or above, different products or even mixtures can be measured without renewed calibration.

The dielectric value determines whether a partly or fully insulated probe must be used. If the value is in the range up to 5, a partly insulated probe will be sufficient, from 5 on, a fully insulated probe should be used.

Because admittance measuring probes have no dead band and impose no restrictions on mounting, they are well suited for small vessels. The measuring probes are not affected by high sockets and wall distances upwards of approx. 100 mm.

Advantages:
- No dead bands
- Low min. distance
- Unaffected by sockets and vessel installations
- High chemical resistance
Description of the measuring principle

Liquid vessels higher than 6 m and vessels in roofed-over spaces

Cable measuring probes are preferred for tall vessels (higher than 6 m) and vessels situated in roofed-over spaces. Meas. lengths up to 32 m enable installation in very tall vessels. Flexible cable probes allow easy installation even in tight quarters.

Since the distance to the vessel wall should be stable, securing the gravity weight to the bottom of the vessel is recommended.

Advantages:
- Long meas. lengths
- No dead band
- Low min. distance
- Unaffected by sockets and vessel installations
- High chemical resistance

Vessel with adhesive, conductive liquids

Whereas electrically non-conductive products are no problem for admittance measurement, adhesive, conductive products cause measurement errors. Due to the mechanical construction of VEGACAL 64 and the admittance processing, this effect is neutralised. Even strong conductive buildup is compensated and thus does not rule out good measuring results.

Advantages:
- Immune even to heavy buildup
- No dead bands
- Low min. distance
- Unaffected by sockets and vessel installations
## 2 Type overview

### VEGACAL 62
- **Preferred applications**: Liquids, non-conductive
- **Version**: Rod - partly insulated
- **Insulation**: PTFE
- **Length**: 0.2 … 6 m (0.656 … 19.69 ft)
- **Process fitting**: Thread from G3/4, flanges
- **Process temperature**: -50 … +200 °C (-58 … +392 °F)
- **Process pressure**: -1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)

### VEGACAL 63
- **Preferred applications**: Liquids, conductive
- **Version**: Rod - fully insulated
- **Insulation**: PE, PTFE
- **Length**: 0.2 … 6 m (0.656 … 19.69 ft)
- **Process fitting**: Thread from G3/4, flanges
- **Process temperature**: -50 … +200 °C (-58 … +392 °F)
- **Process pressure**: -1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)

### VEGACAL 64
- **Preferred applications**: Liquids, conductive
- **Version**: Rod - fully insulated
- **Insulation**: FEP
- **Length**: 0.2 … 4 m (0.656 … 13.12 ft)
- **Process fitting**: Thread from G1, flanges
- **Process temperature**: -50 … +200 °C (-58 … +392 °F)
- **Process pressure**: -1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)

### VEGACAL 66
- **Preferred applications**: Solids, liquids
- **Version**: Cable - insulated
- **Insulation**: PTFE
- **Length**: 0.4 … 32 m (1.312 … 105 ft)
- **Process fitting**: Thread from G3/4, flanges
- **Process temperature**: -50 … +200 °C (-58 … +392 °F)
- **Process pressure**: -1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)

### VEGACAL 69
- **Preferred applications**: Liquids
- **Version**: Double rod - fully insulated
- **Insulation**: FEP
- **Length**: 0.2 … 4 m (0.656 … 13.12 ft)
- **Process fitting**: Flange (PP or PTFE)
- **Process temperature**: -40 … +100 °C (-40 … +212 °F)
- **Process pressure**: -1 ... 2 bar/-100 ... 200 kPa (-14.5 ... 29 psig)
### 3 Housing overview

<table>
<thead>
<tr>
<th>Plastic PBT</th>
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<td>IP 66/IP 67</td>
<td>IP 66/IP 67</td>
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<tr>
<td>Version</td>
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<td>Double chamber</td>
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<tr>
<td>Application area</td>
<td>Industrial environment</td>
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<td>IP 66/IP 67, IP 66/IP 68 (1 bar)</td>
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<tr>
<td>Version</td>
<td>Single chamber</td>
<td>Double chamber</td>
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<tr>
<td>Application area</td>
<td>Industrial environment with increased mechanical stress</td>
<td>Industrial environment with increased mechanical stress</td>
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<tr>
<th>Stainless steel 316L</th>
<th>![Image]</th>
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<td>IP 66/IP 67, IP 66/IP 68 (1 bar)</td>
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<td>Version</td>
<td>Single chamber, electropolished</td>
<td>Single chamber, precision casting</td>
<td>Double chamber, precision casting</td>
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<tr>
<td>Application area</td>
<td>Aggressive environment, food processing, pharmaceutical</td>
<td>Aggressive environment, extreme mechanical stress</td>
<td>Aggressive environment, extreme mechanical stress</td>
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</tbody>
</table>
4 Mounting instructions

Pressure/Vacuum
The process fitting must be sealed if there is gauge or low pressure in the vessel. Check if the seal material is resistant against the measured product and the process temperature.

Insulating measures in metal vessels such as e.g. covering the thread with teflon tape can interrupt the necessary electrical connection to the vessel. Ground the probe on the vessel.

Mounting socket
In adhesive products, the probe should protrude into the vessel (horizontal mounting), to avoid buildup. In such cases, avoid sockets for flanges and threaded fittings.

Measuring range
Please note that with fully insulated cable probes, measurement in the area of the gravity weight is not possible (L - length of the gravity weight). With fully insulated rod probes, measurement is not possible within the 20 mm of the probe tip (L - 20 mm).

If necessary, use a correspondingly longer meas. probe.

Agitators
Excessive system vibration or shocks, e.g. caused by agitators or turbulence in the vessel (e.g. from fluidisation) can cause the probe of VEGACAL to vibrate in resonance. This can lead to increased material stress. Should a longer rod probe be necessary, you can provide a suitable support or guy directly above the end of the probe to stabilise it.

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

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. Use a double rod electrode or mount a concentric tube.

Operating temperatures
If the housing is subject to high ambient temperatures, you have to either use a temperature adapter or disconnect the electronics from the probe and install it in a separate housing at a cooler place.

Make sure that the probe is not covered by an existing vessel insulation.

The temperature ranges of the probes are listed in chapter "Technical data".

Corrosive, abrasive products
Various isolating materials are available for very corrosive or abrasive products. If metal is not chemically resistant to the medium, use a plated flange.

Fasten

Rod versions
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).

Cable versions
Long cable versions are particularly susceptible to product movement, i.e. they may touch the vessel wall if the forces are strong enough. For that reason, the measuring probe should be firmly secured.

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

Make sure that the probe cable is not completely taut. Avoid tensile loads on the cable. In our line of accessories you will find a straining spring that can be applied to avoid cable overload.
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.

Measurement is not possible over the length of the gravity weight of the fully insulated probe. The measuring range of the probe ends at the upper edge of the gravity weight.

**Protective cover**

To protect the sensor against pollution and strong heat due to the sun, you can snap a weather protective cover onto the sensor housing.
5 Electrical connection

5.1 General requirements
The supply voltage range can differ depending on the instrument version. You can find exact specifications in chapter "Technical data". The national installation standards as well as the valid safety regulations and accident prevention rules must be observed.

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

5.2 Voltage supply

General information
Supply voltage and current signal are carried on the same two-wire cable. The requirements on the power supply are specified in chapter "Technical data".

Two-wire 4 … 20 mA/HART, > 4 … < 20 mA
The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as VEGAMET signal conditioning instruments are suitable for power supply. When one of these instruments is used, a reliable separation of the supply circuits from the mains circuits according to DIN VDE 0106 part 101 is ensured for the sensor.

Profibus PA
Power is supplied by a Profibus DP/PA segment coupler or a VEGALOG S71 EP input card.

Foundation Fieldbus
Power supply via the H1 Fieldbus cable.

5.3 Connection cable

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

Two-wire 4 … 20 mA/HART, > 4 … < 20 mA
If electromagnetic interference is expected, screened cable should be used for the signal lines.

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

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

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

5.4 Connection of the cable screen and grounding

Two-wire 4 … 20 mA/HART, > 4 … < 20 mA
The cable screen must be connected on both ends to ground potential. If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V).

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

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

5.5 Wiring plan

Single chamber housing

Fig. 21: Integration of instruments in a Profibus PA system via segment coupler DP/PA or data recording systems with Profibus PA input card

Foundation Fieldbus
Power supply via the H1 Fieldbus cable.

Double chamber housing - two-wire

Fig. 22: Connection HART two-wire, Profibus PA, Foundation Fieldbus
1 Voltage supply and signal output

Two-wire output > 4 … < 20 mA

Fig. 23: Connection > 4 … < 20 mA (not standardised) for connection to a signal conditioning instrument
1 Voltage supply/Signal output

Double chamber housing - two-wire

Fig. 24: Connection HART two-wire, Profibus PA, Foundation Fieldbus
1 Voltage supply and signal output
6 Adjustment

6.1 Adjustment on the measurement loop

Via the display and adjustment module through keys
The plug-in display and adjustment module is used for measured value indication, adjustment and diagnosis. It is equipped with an illuminated full dot matrix as well as four keys for adjustment.

PACTware is an adjustment software for configuration, parameter adjustment, documentation and diagnosis of field devices. The corresponding device drivers are called DTMs.

6.2 Operation in the measurement loop environment - wireless via Bluetooth

Via a smartphone/tablet
The display and adjustment module with integrated Bluetooth functionality allows wireless connection to smartphones/tablets with iOS or Android operating system. The adjustment is carried out via the VEGA Tools app from the Apple App Store or Google Play Store.

Via a PC with PACTware/DTM
The wireless connection from the PC to the sensor is carried out via the Bluetooth USB adapter and a display and adjustment module with integrated Bluetooth function. The adjustment is carried out via the PC with PACTware/DTM.

6.3 Adjustment carried out at position remote from the measuring point - wired

Via external display and adjustment units
For this, the external display and adjustment units VEGADIS 81 and 82 are available. The adjustment is carried out via the keys of the built-in display and adjustment module.

The VEGADIS 81 is mounted at a distance of 50 m from the sensor and directly to the sensor electronics. VEGADIS 82 is looped directly into the signal cable at any point.
6.5 Alternative adjustment programs

**DD adjustment programs**

Device descriptions as Enhanced Device Description (EDD) are available for DD adjustment programs such as, for example, AMS™ and PDM. The files can be downloaded at [www.vega.com/downloads](http://www.vega.com/downloads) under "Software".

**Field Communicator 375, 475**

Device descriptions for the instrument are available as EDD for parameter adjustment with the Field Communicator 375 or 475. For the integration of the EDD in the Field Communicator 375 or 475, the software "Easy Upgrade Utility" is required which is available from the manufacturer. This software is updated via the Internet and new EDDs are automatically taken over into the device catalogue of this software after they are released by the manufacturer. They can then be transferred to a Field Communicator.

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**6.4 Adjustment carried out at position remote from the measuring point - wireless through mobile network**

As an option, the radio module PLICSMOBILE can be mounted into a plics® sensor with double chamber housing. It is used for transmission of measured values and for remote parameter adjustment of the sensor.
7 Dimensions

Housing

Fig. 34: Housing versions
1 Plastic housing
2 Stainless steel housing
3 Stainless steel housing - precision casting
4 Aluminium double chamber housing
5 Aluminium housing

VEGACAL 62

Fig. 35: VEGACAL 62 - threaded version
L Sensor length, see chapter "Technical data"

VEGACAL 63

Fig. 36: VEGACAL 63 - threaded version
L Sensor length, see chapter "Technical data"

VEGACAL 64

Fig. 37: VEGACAL 64 - threaded version
L Sensor length, see chapter "Technical data"

1) Not with electronics version two-wire output > 4 … < 20 mA.
VEGACAL 66

![Diagram of VEGACAL 66]

Fig. 38: VEGACAL 66 - threaded version
L Sensor length, see chapter "Technical data"

VEGACAL 69

![Diagram of VEGACAL 69]

Fig. 39: VEGACAL 69
L Sensor length, see chapter "Technical data"
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. Subject to change without prior notice

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