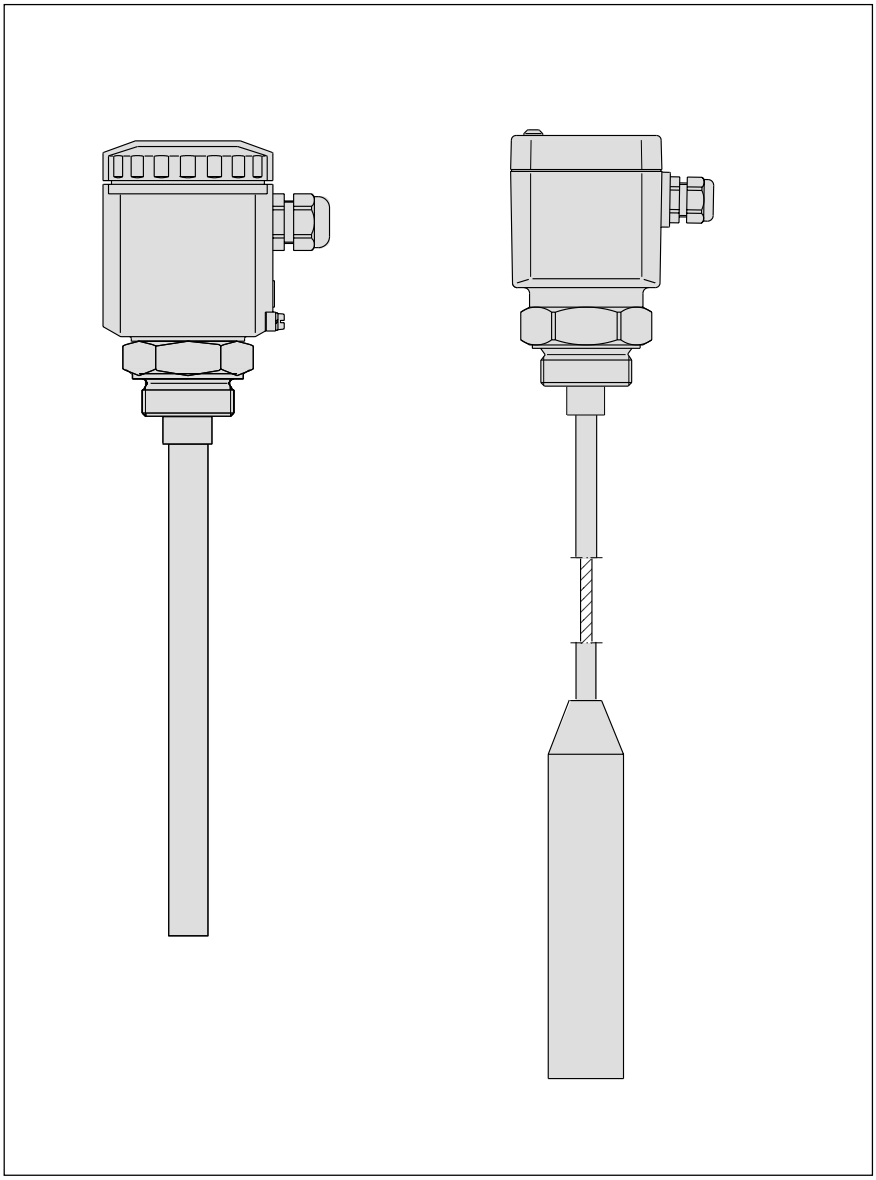
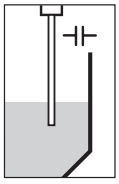
Level and Pressure

Product Information

Capacitive





Contents

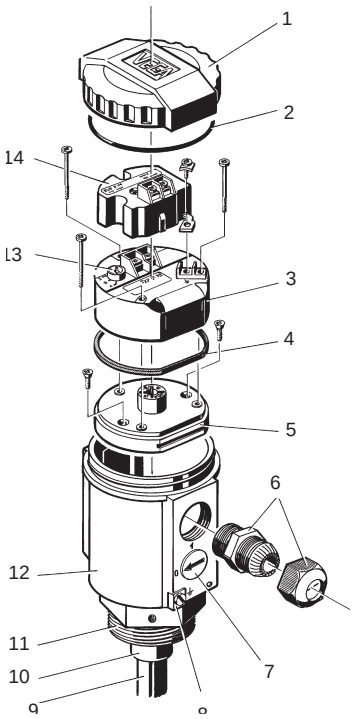
1 Product description

Capacitive electrodes type EK, EL and VEGACAP are used for reliable continuous level measurement or level detection of solids and liquids based on the capacitive principle.

1.1 Capacitive electrode type EL

Capacitive electrodes for continuous level measurement and/or level detection

- floating oscillators
- overvoltage arrester integrated in housing (option)
- special version for the measurement of very adhesive and conductive products (phase selective admittance processing)
- level measurement of solids with humidity changes up to 15 % (phase selective admittance processing)
- compensation of intrinsic capacitance
- adjustable measuring range for optimal adaptation to the application
- plug-in oscillators
- test circuit for switching point simulation (option)
- operating temperature from -50°C to 200°C (high temperature version up to 400°C)
- operating pressure up to 63 bar
- protection IP 66 (option IP 67)
- high-resistance electrode insulation PP, PE, PTFE, PFA, PE/PA 12, FEP, ceramic
- double rod electrodes for very corrosive products
- with either plastic or stainless steel housing
- Ex, StEx, CENELEC, WHG, ship approvals for rod and cable electrodes



1 Housing cover
2 Seal ring
3 Oscillator
4 Cellular rubber seal
5 Socket plate
6 Cable entry
7 Test switch (option)
8 Earth terminals
9 Electrode
10 Insulation
11 Process connection
12 Housing
13 Range selector
14 Overvoltage protection module (option)

Fig. 1.1 Capacitive electrode type EL

1.2 Capacitive electrodes type EK

Capacitive electrodes for continuous level measurement and/or level detection

- thread $^3/_4$" or 1"
- floating oscillators
- overvoltage protection integrated in the housing
- special version for the measurement of very adhesive, conductive products
- compensation of intrinsic capacitance
- plug-in oscillators
- operating temperature from -50°C to 200°C
- operating pressure up to 63 bar
- protection IP 66 (option IP 67)
- high resistance electrode insulation of PE, PTFE, FEP
- with either plastic or Aluminium housing
- Ex, CENELEC, GL-approvals for rod and cable electrodes

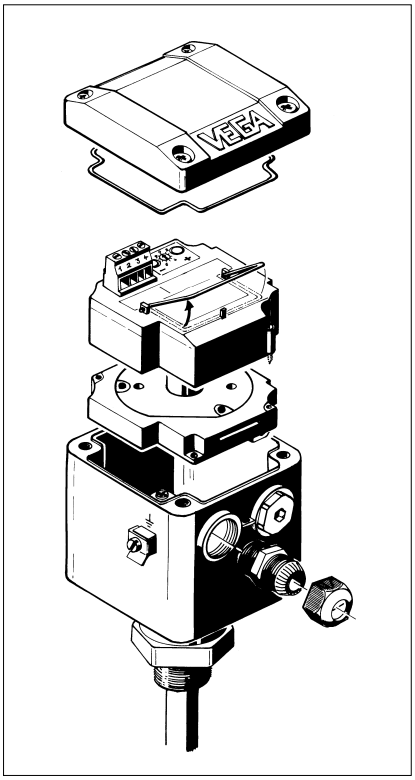
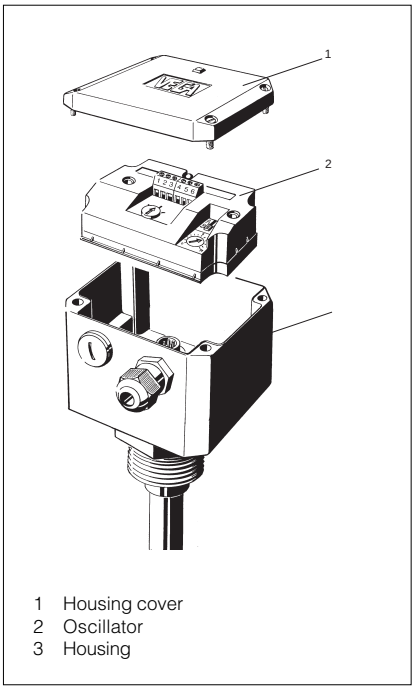


Fig. 1.2 Capacitive electrode type EK

1.3 VEGACAP compact instrument

Compact instruments for level detection

- special versions for very adhesive products
- floating oscillators
- high switching reliability through compensation of intrinsic capacitance
- universal supply voltages
- adjustable measuring range for optimal adaptation to the application
- plug-in oscillators
- test circuit for switching point simulation (option)
- transistor version (T-electronic) overload resistant and permanently short circuit proof
- non-contact version (C-electronic) also for operation of miniature contactors
- relay version
- modular construction for adaptation to virtually any application
- operating temperature from -40°C to 200°C (high temperature version up to 300°C)
- operating pressure up to 63 bar
- protection IP 66 (standard)
- high-resistance electrode insulation PP, PE, PTFE, PFA, PE/PA 12, ceramic
- StEx-approvals for rod, cable and plate electrodes
- setup without vessel filling (VEGACAP 27 and 98 with CAP E31R)



1 Housing cover
2 Oscillator
3 Housing

Fig. 1.3 VEGACAP compact level switch

2 Function and application

2.1 Principle of operation

Capacitive electrodes of series EL and VEGACAP detect levels of virtually every product, regardless whether liquid, powder, granule or paste. This applies also the adhesive products.

Measuring principle

Electrode, product and vessel wall form an electrical capacitor.

The capacitance is particularly influenced by three factors:
- distance of the electrode plates (a)
- size of the electrode plates (b)
- dielectric value of material between the electrodes (c)

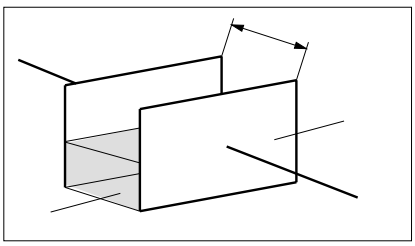


Fig. 2.1 Plate capacitor (schematic demonstration)

The electrode and the vessel wall are the capacitor plates. The product is the dielectric. Due to the higher dielectric constant (DK-value) of the product against air, the capacitance value increases with the depth of immersion.

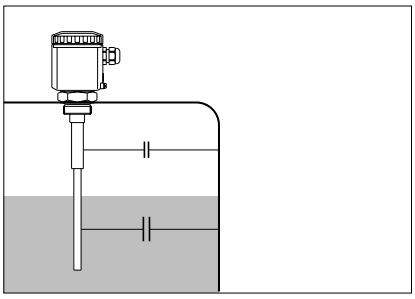


Fig. 2.2 Capacitance change through immersion

The capacitance change is converted by the oscillator into a level-proportional, floating current in the range of 4 … 20 mA or into a switching command.

2.2 Continuous level measurement

With continuous level measurement, the product level is continuously monitored and converted into a level-proportional signal which is either indicated directly or further processed. The signal can be processed in two different ways:
either via a signal conditioning instrument or via a compact sensor that outputs the signal directly as a 4 … 20 mA signal.

Signal conditioning instrument

Via a signal conditioning instrument you require a capacitive electrode (series EL or EK with oscillator) and a VEGAMET signal conditioning instrument that converts the proportional current of the oscillator into standardised current and voltage signals.

The continuous measurement requires a constant dielectric value ε_r, i.e. the product should have relatively constant properties.

The floating measuring signal of the sensor is in the range of 4 … 20 mA and can thus be inputted into other processing systems such as e.g. VEGALOG without the need for an additional potential barrier.

In addition to the continuous measurement, limits can also be detected (VEGAMET or VEGASEL).

Compact instrument

If the sensor should directly provide a 4 … 20 mA-signal, you require a capacitive electrode with oscillator CAP E32 Ex or CAP E32H Ex.

The capacitance change is processed by the oscillator and converted into a level-proportional measured value. The measured value is outputted as a standardized, analogue current (4 … 20 mA), optionally also as HART® communication protocol.

The sensor can be adjusted directly with the integrated electronics, or optionally with a HART® handheld or a PC running the VVO adjustment software.

Adhesive and hygroscopic products

The oscillator E18 with its patented signal processing system (phase selective admittance processing) extends the application range of capacitive level measurement technology. In conjunction with the fully insulated rod electrode EL/EK 24, the oscillator E18 even compensates very adhesive buildup (see fig. 2.3).

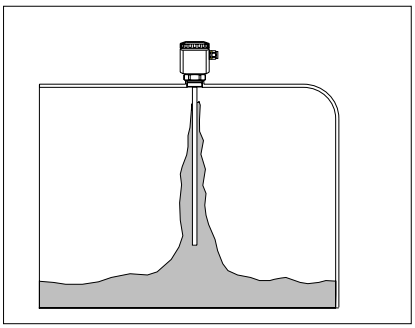


Fig. 2.3 Buildup on the capacitive electrode

Mounted on any rod or cable electrode of type EL/EK, the E18 also enables the precise measurement in solids with varying humidity content. The oscillator E18 evaluates the currents according to their phase position. Measuring currents with a defined phase shift, caused by buildup or humidity changes, are filtered out.

Buildup

A circuit diagram equivalent to the effects of conductive buildup can be drawn with resistors connected in series and capacitors connected in parallel (see fig. 2.4).

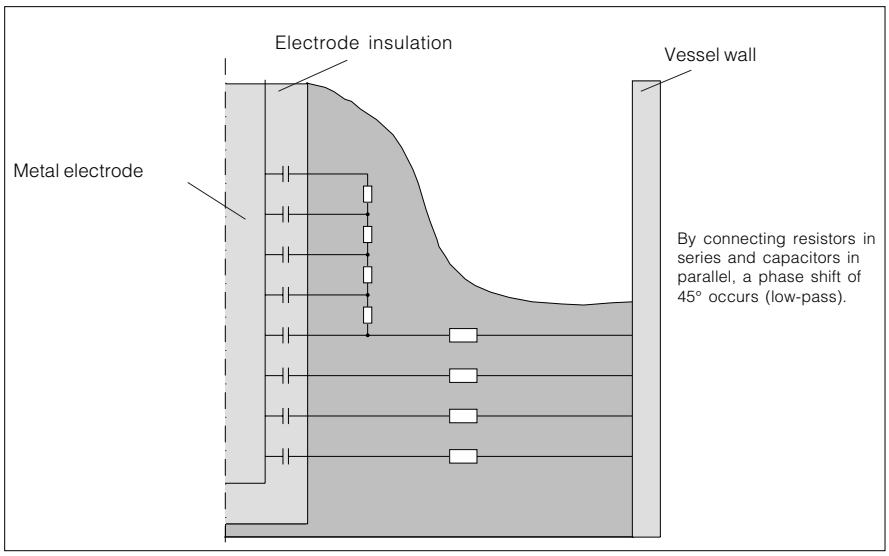


Fig. 2.4 Equivalent circuit diagram for adhesive products

In the field of AC engineering, this circuit diagram is called low-pass chain and indicates a current phase shift of 45°.

Standard capacitive electrodes also measure these phase-shifted currents and, as a result, cause considerable measurement errors.

When the vessel is being emptied, standard capacitive electrodes do not react to the change in level and the measured value remains the same.

The oscillator E18 ignores these phase-shifted currents of the buildup and compensates for the errors.

Change of moisture content

A change of dampness in solids causes a change of the dielectric constant (ε_r). At the same time, the ohmic resistance of the product changes. Due to the change, a phase shift of the measuring currents also takes place.

Even a slight change of moisture content, for example 2 %, causes errors of 50 to 100 % in a capacitive measurement. Typical measured products are e.g. sand, aggregate in the cement industry, hops or plastic granules (after the drying machine).

When using the oscillator E18, changes taking place up to a total moisture content of 15 % do not influence the accuracy of the measurement. Even layering of products with varying moisture content does not affect the accuracy.

As the moisture content goes above 15 %, fully and partly insulated electrodes react differently (see fig. 2.5).

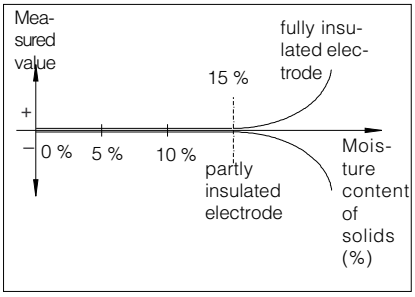


Fig. 2.5 Change of measured value with moisture content > 15 %

Given a constant product level, the measured value of a fully insulated electrode increases, whereas that of a partly insulated electrode decreases.

2.3 Level detection

Level switches output a signal when a certain level is reached, e.g. maximum or minimum levels. These levels are detected at fixed position and are converted into a switching command.

The capacitive electrodes type EL/EK with the appropriate VEGATOR signal conditioning instruments and the VEGACAP compact level switches are available for level detection. A switching command can be triggered when the electrode is covered or uncovered (adjustable mode).

Adjustment-free and suitable for adhesive products

VEGACAP 27, 35 and 98 combine the positive characteristics of capacitive measurement with the advantage that an adjustment to a specific product is no longer necessary.

This is ensured by the CAP E31 R oscillator and the patented mechanical configuration of the electrode.

The CAP E31 R oscillator is equipped with a floating double relay (DPDT), switching two independent alarm systems such as e.g. a magnet valve and a signal lamp.

Adjustment-free

The setup is very simple, as the switching point on VEGACAP 27, 35 and 98 must no longer be adjusted.

Adjustment-free also means that alternating products having different dielectric constants (ε_r), e.g. water and oil or conductive and non-conductive products, do not influence the adjustments on VEGACAP and its switching condition.

If the electrodes are installed vertically, the switching point is determined by the length of the electrode.

If the electrodes are installed horizontally, the installation position represents the position of the switching point.

For very adhesive products

The special mechanical construction compensates conductive buildup. Fault currents caused by buildup are drained off via the screen segment.

Even heavy condensation or buildup do not influence the switching condition of VEGACAP (see fig. 2.6).

The compensation of buildup is supported by the patented processing system (phase selective admittance processing) in the CAP E31R oscillator.

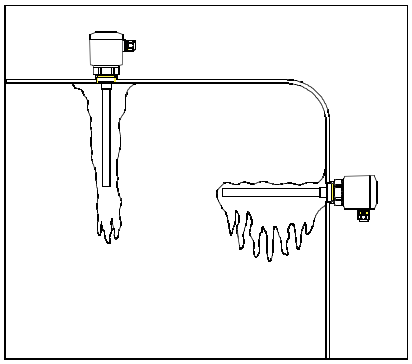


Fig. 2.6 Buildup on VEGACAP level switches

Applications

In general, VEGACAP 27, 35 and 98 are equally suitable for liquid and solid applications.

Liquids

In the food processing industry for example, adhesive products (milk, yoghurt, ketchup etc.) and the cleaning liquid usually have very different features.

In milk vessels, e.g. the VEGACAP deliver exact switching points despite alternating, inconstant product compositions.

Solids

All VEGACAP switches can be used in cereal silos, gravel, sand, flour, filler etc.

VEGACAP 35, however, is particularly suitable for use in solids, since the flexible cable electrode can more easily follow product movements.

Also varying products and humidity changes do not influence the switching condition.

2.4 Measuring system

Continuous level measurement

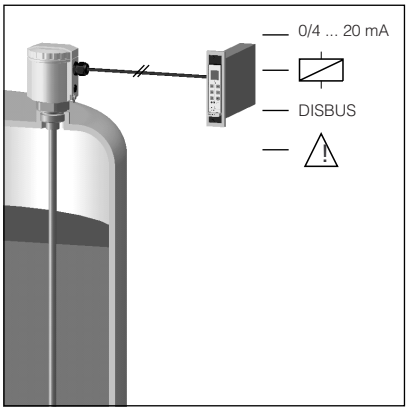


Fig. 2.7 Electrode with signal conditioning instrument

A measuring system consists of:
- a capacitive electrode type EL or EK
- an oscillator integrated in the electrode housing
- a VEGAMET signal conditioning instrument or the VEGALOG processing system
- connected instruments (e.g. indicating instrument, VEGASEL auxiliary level switch)

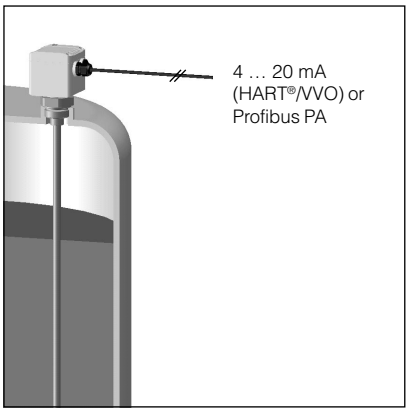


Fig. 2.8 Electrode as compact instrument

A measuring system consists of:
- a capacitive electrode type EL or EK
- a 4 … 20 mA-oscillator E32HEx integrated in the electrode housing, with or without HART®, VVO-communication
- a capacitive electrode EL or EK with integral electronics for connection to Profibus PA
- connected instruments (e.g. indicating instrument)

Level detection

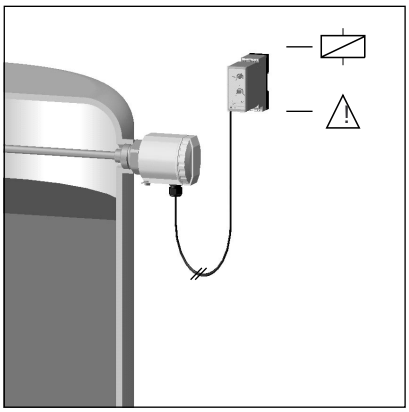


Fig. 2.9 Electrode with level switch

A measuring system consists of:
- a capacitive electrode type EL or EK
- an oscillator integrated in the electrode housing
- a VEGATOR signal conditioning instrument or the VEGALOG processing system
- connected instruments which react to the measuring system

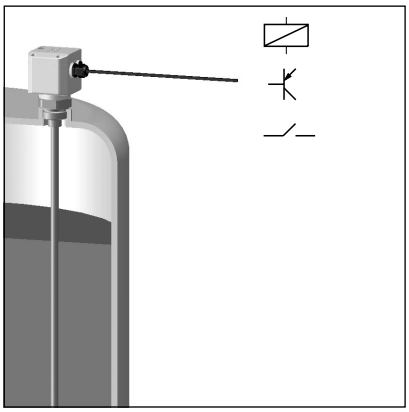


Fig. 2.10 VEGACAP compact level switch

A measuring system consists of:
- a capacitive VEGACAP compact level switch
- an oscillator integrated in the housing
- connected instruments which are operated with the output signal of VEGACAP

3 Types and versions

3.1 Capacitive measurement

For capacitive measurement, VEGA offers a number of different versions such as rod, double rod, cable, plate, annular and pipe clamp electrodes, all either partly or fully insulated.

Partly insulated
The electrode is insulated over a defined length. The measurement is carried out in the uninsulated area.

Fully insulated
The electrode is insulated along its entire length. The accompanying gravity weight can also be fully insulated if a cable electrode is used.

Capacitive measurement is rugged, maintenance-free, reasonably priced and virtually unaffected by pressure and temperature.

There are limits to continuous capacitive measurement, however, if the dielectric constant changes considerably. This can be the case if the measured product is switched, or changes in density or temperature occur. For level detection, such changes have little effect.

Generally speaking, products with a dielectric constant (DK-value) of 1.5 and up can be measured capacitively without problem.

Most selection criteria depend on the measured product, the kind of vessel and the process technology or facility.

Interface detection
A capacitive measuring system for oil/water detection can be used for interface detection of light liquids on water (e.g. oil on water) (see fig. 3.1).

3.2 Instrument choice

Use the following table to analyze your specific application. You will find appropriate information on the individual topic indicated by numbers on the following pages.

A. Measurement method/Electrode

- Continuous 14, 17, 19, 20, 21
- Level detection 4, 6, 10, 11, 14, 19, 20
- Electrode types
  Rod electrode 1, 2, 4, 7, 8, 10, 11, 14, 15, 17
  Cable electrode 1, 2, 3, 4, 7, 8, 14, 16, 17
  Plate electrode 4, 6

B. Measured product

- Liquid 22, 26
- Solid 6, 10, 11, 16, 22, 26, 27
- DK-value 20, 24
- Conductivity 19, 20
- Abrasive 25, 11
- Aggressive 14, 25
- Buildup 10, 15, 17, 18, 26
- Moisture content fluctuations 26
- Temperature, density fluctuations 20

C. Vessel

- Vessel form 21, 27
- Vessel material
  Metal 12, 13
  Plastic 6, 14, 25
  Concrete 14, 23
- Process connection
  Thread 9, 12, 13, 15
  Flange 9, 15

D. Process technology /System

- Roof or struts above the vessel 17
- High temperatures 20, 22
- Strong vibrations or shocks 5
- Stirrer 2, 3, 4, 6
- Filling 2, 8, 11, 27
- High extraction forces 8
- Pressure 9
- Accuracy 10, 11, 21, 24, 27
- Approvals 28

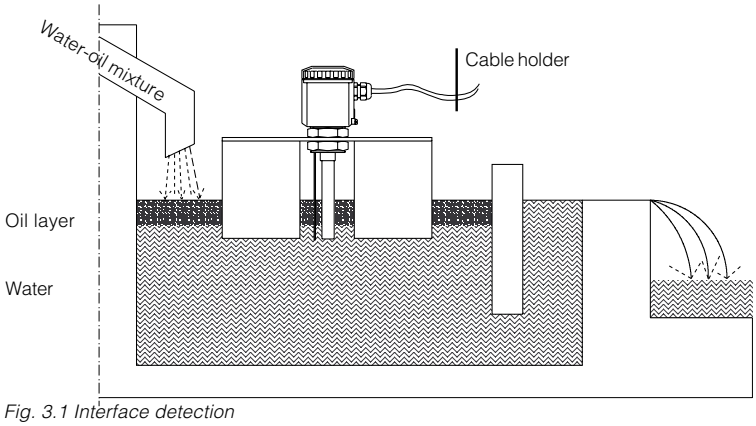


Fig. 3.1 Interface detection

1 Length of the electrode

When ordering electrodes please note already that the measurement probe must be sufficiently covered (according to the electrical properties, esp. DK-value of the product).

An electrode for level detection in oil (ε_r ~2) requires a considerably higher covering than in water (ε_r ~81).

2 Lateral load

Ensure that the electrode is not subjected to strong lateral forces. Mount the electrode at a position in the vessel where no interference from stirrers, filling openings etc. can occur. This is particularly the case for long rod and cable electrodes (fig. 3.2).

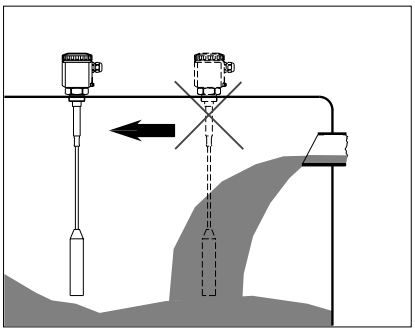


Fig. 3.2 Lateral load

3 Product movement

If strong turbulence occurs caused by stirrers etc. in the vessel or if the electrode cable is too close to the vessel wall, use a fixing weight on the cable electrode. Avoid strong forces on the cable when fixing the cable electrode. A fixing spring that prevents overload of the cable is available as an accessory (see price list).

For the use in Ex-areas zone 0, the electrode must be mounted in such a way that contact with the vessel wall or bending of the concentric or screening tube is absolutely impossible.

4 Level detection

Due to stirrers or similar devices the electrode can be subjected to strong lateral forces. For this reason do not use an overly long electrode, but rather find out if a short, horizontal rod electrode could be mounted instead.

5 Vibrations

Strong vibrations and shocks can damage the electronics. This can be avoided with type EL by separating the electronic module from the electrode and mounting it in a separate housing.

6 Plate electrode

Plate electrodes detect product levels, preferably in solids. They are used when rod or cable electrodes interfere in the vessel. This can be the case if stirrers, discharge scrolls or heavy solids are present.

In non-conductive vessels (e.g. plastic) it is possible to measure through the vessel wall with type EL 82.

Mount the plate electrode such that the electrode surface is flush with the vessel wall.

With thick vessel walls, chamfer the inner edges of the holes so that no buildup is possible on the edge.

7 Shortening of the electrode

Fully insulated electrodes have fixed dimensions which must not be changed. Any change will destroy the instrument. Partly insulated cable or rod electrodes can be shortened later. Please note that due to the change of the intrinsic capacitance the switching point can differ.

The measuring instrument is compensated to the actual electrode length. For this reason, you should explicitly state in your order that you want to shorten the electrode.

8 Extraction forces

If strong extraction forces occur, e.g. during filling or the sliding in of solids, high tensile loads can result.

Under such circumstances - if the measuring distance is short - use a rod electrode, as a rod is generally more stable. If due to the distance or the installation position a cable electrode is necessary, the electrode should not be fixed but only equipped with a gravity weight (which allows the cable to more easily follow product movements). Make sure that the electrode cable cannot touch the vessel wall (see "2.1 Functional principle").

9 Seal

The thread connection on the mounting boss must be sealed. Please use the supplied seal ring. Check if the seal ring is resistant against the measured product. This applies mainly to pressurised vessels. Isolating measures, e.g. the covering of the thread with Teflon tape, can interrupt the required electrical connection to the vessel. In this case, electrical contact must be provided by an external cable connection (see "13 Metal vessel").

10 Horizontal installation

To achieve a precise switching point in level detection, the measuring probe can be installed horizontally. W e recommend installing the electrode at approx. 20° (inclined to vessel floor), so that no buildup can occur (fig. 3.3).

11 Filling opening

Install the electrode in a way that it does not protrude directly into the filling stream. If such a position is necessary, mount a suitable protective sheet above or in front of the electrode, e.g. L 80 x 8 DIN 1028, etc. (see "Horizontal installation" and "Lateral load", fig. 3.3). In case of very abrasive products, the protective sheet should be mounted according to fig. 3.3 "b".

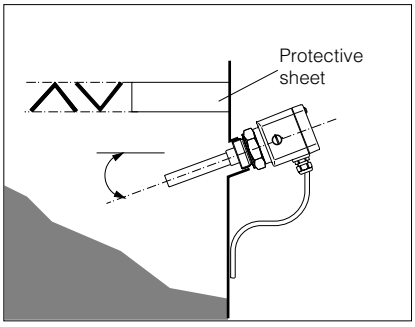


Fig. 3.3 Horizontal installation, protective sheet mounting

12 Aluminium vessel

In aluminium vessels use an electrode with a steel thread. The combination aluminium to aluminium should be avoided because the thread "seizes" when screwing and, after some time, cannot be removed without damage.

13 Metal vessel

To provide sufficient grounding, make sure that the mechanical connection of the probe to the vessel is electrically conductive.

Use conductive seals such as e.g. copper, lead etc. Isolating measures, such as the covering of the thread with Teflon tape, can interrupt the necessary electrical connection. In this case, use a ground terminal on the housing to connect the electrode to the vessel wall.

14 Non-conductive vessels

In non-conductive vessels, e.g. plastic tanks, the second pole of the capacitor must be provided separately, either in form of a concentric tube or by the use of a double rod electrode.

When using a standard electrode, a suitable grounding surface must be provided. This can be done by attaching a wide grounding surface to the vessel wall, e.g. by laminating a wire braid into the wall or by gluing a metal foil to the outside (fig. 3.4 to 3.7). Connect the grounding surface to the ground terminal on the housing.

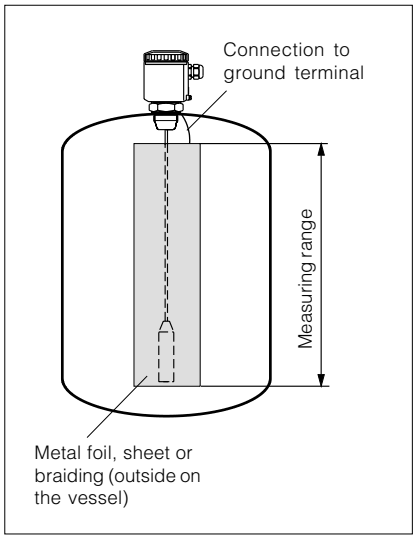


Fig. 3.4 Non-conductive vessel (continuous)

In non-conductive vessels and products that corrode metal, the double rod electrode EL 29 is particularly suitable, since the electrode rods are fully insulated and no grounding surface must be used (fig. 3.5).

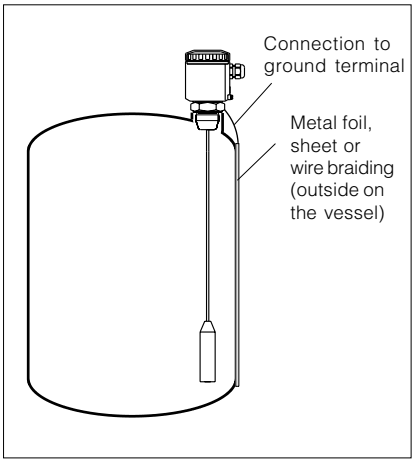


Fig. 3.5 Non-conductive vessel (continuous)

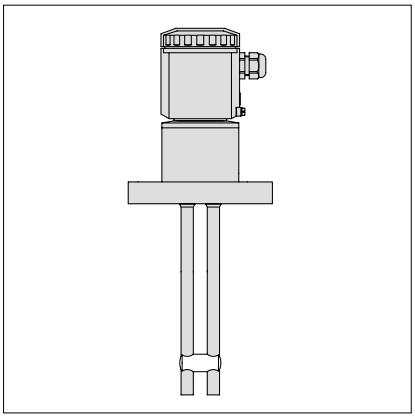


Fig. 3.6 Double rod electrode EL 29

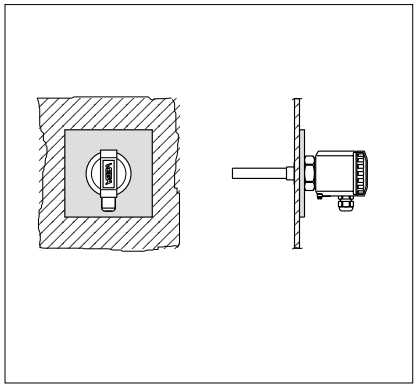


Fig. 3.7 Non-conductive vessel (level detection)

15 Rod electrodes

Install the rod electrodes such that the electrode protrudes into the vessel. When mounted in a pipe or a socket, buildup, which can interfere with the measurement, can occur. This applies particularly to viscous or adhesive products (fig. 3.8).

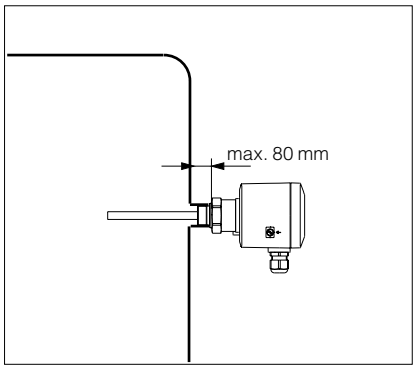


Fig. 3.8 Rod electrodes

16 Cable electrodes in solids

Depending on the kind of solid or the positioning and method of filling, the cable electrode can "float" despite the gravity weight. The electrode (cable) is pushed by the product to the vessel wall and false measured values result. This must be avoided when applying continuous level measurement.

If this happens, use a fixing weight on the cable electrode.

When fixing the cable electrode, avoid high cable tension. In our price list, you will find a fixing spring (as an accessory) that prevents overload of the cable (fig. 3.9).

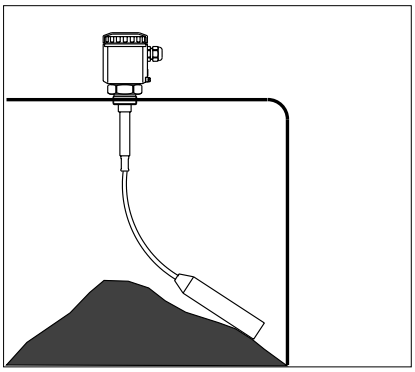


Fig. 3.9 Cable electrodes in solids

17 Continuous electrodes

Electrodes providing continuous measured values must always be mounted vertically. If the installation from above is not possible, the electrode can also be mounted laterally.

If there are struts or roofs at the installation spot, find out if a rod electrode of the required length can be mounted. Use a cable electrode if mounting a rod electrode is not possible.

In our price list (under accessory), you will find a screening tube and a closing cone or an L-shaped rod electrode that allow the instrument to be mounted laterally. Select the length (L) of the screening tube such that no product bridges can form between cable and vessel wall, and the electrode cable can never touch the wall due to product movement. Use a fixing weight (fig. 3.10).

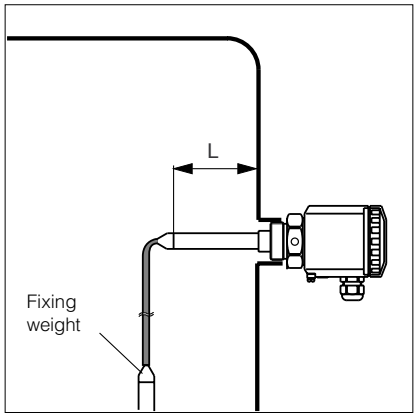


Fig. 3.10 Continuous electrodes

18 Buildup

Up to now, the use of capacitive measurement in applications with fluctuating moisture content or heavy, conductive buildup was practically impossible.

The oscillator E18 with its patented processing technology (phase selective admittance processing) enables the use of capacitive measuring probes even in such applications.

In conjunction with the fully insulated rod electrode EL 24, the oscillator E18 compensates even heavy, conductive buildup (fig. 3.11).

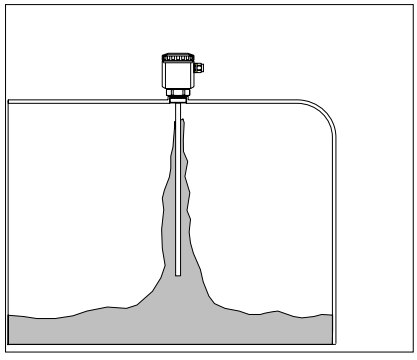


Fig. 3.11 Buildup on the capacitive electrode

19 Conductivity of the product

Continuous measurement

For continuous measurement in electrically conductive products, use fully insulated electrodes.

For products which are electrically non-conductive, such as hydrocarbons, an insulation is not necessary, but it does not interfere with the measurement.

Level detection

In certain cases, partly insulated electrodes EL can be used in conductive products for level detection. Oscillators E14 or E15 must be used for electrodes type EL.

20 Influencing factors

In practice, the dielectric constant is subject to certain fluctuations. The following factors can effect the capacitive measuring method:
- bulk density
- concentration (mixture ratio of the product)
- temperature
- conductivity.

The more constant the above mentioned factors, the better the conditions for capacitive measurement. Changes in the conditions are generally less critical for products with high DK-values.

21 Vessel form

In non-conductive or slightly conductive products a uniform flux pattern is a requirement for an optimum capacitive measurement. In a vertical cylindrical tank with a flat bottom, the conditions are excellent, the flux pattern is linear.

In a horizontal cylindrical tank or in other asymmetrical tank forms, the flux pattern is nonlinear. Due to varying distances to the vessel wall, nonlinear level values are generated.

In such a case, use a concentric tube as reference electrode or a double rod electrode or carry out a linearization with an appropriate signal conditioning instrument (fig. 3.12 up to 3.14).

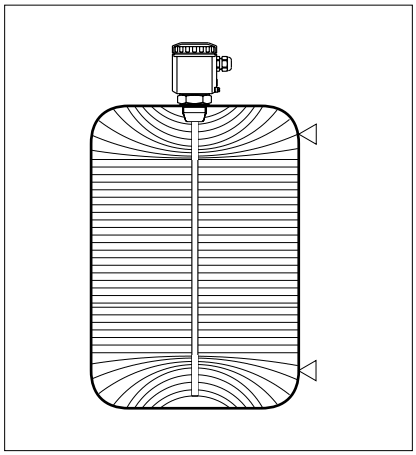


Fig. 3.12 Flux pattern in a cylindrical tank (vertical)

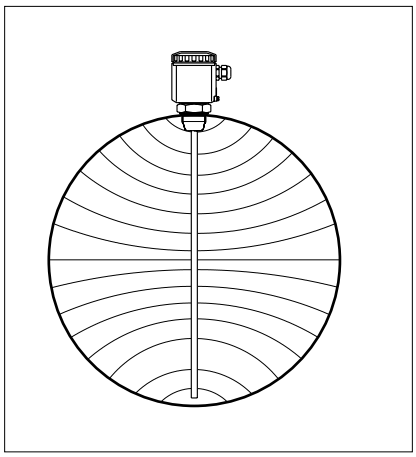


Fig. 3.13 Flux pattern in a cylindrical tank (horizontal)

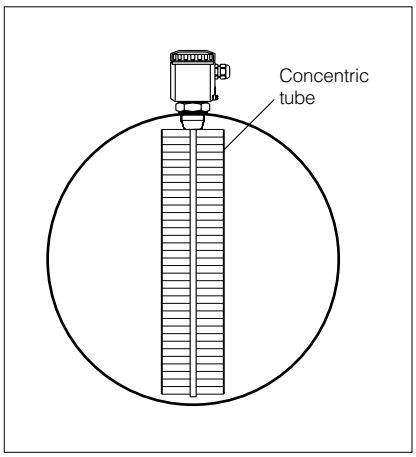


Fig. 3.14 Flux pattern in a concentric tube

22 Operating temperatures

Capacitive electrodes can be used in product temperatures of up to 400°C. For product temperatures of +100°C up to +200°C, a temperature adapter must be used.

The temperature range of the capacitive electrode depends on the materials of the insulation and mechanical connection. Electrodes with PTFE insulation and stainless steel connection can be e.g. used from -50°C up to 200°C (see "3.6 Product temperature").

The temperature resistance of the individual insulation is documented in the list under Technical data: "Insulation material".

If ambient temperatures of more than 80°C occur on the housing, a temperature adapter must be used, or the electronics must be separated from the electrode and located in a separate housing (type EL) at a cooler place (see "3.6 Product temperature").

For temperatures up to 400°C, a high-temperature electrode (EL 60, EL 61) can be used. This is particularly suitable for the use with solids.

Make sure that the high temperature electrode is not covered by a vessel insulation that may be present.

23 Concrete vessels

The ground terminal of the measuring probe should be connected to the steel reinforcement of the concrete vessel to ensure a sufficient grounding (see "14 Non-conductive vessels").

24 Dielectric constant (DK-value)

For products with low DK-value and small level fluctuations, you should try to increase the capacitance change. Use electrodes with a larger surface (larger electrode diameter) or a concentric tube.

With a DK-value of < 1.5 special arrangements are necessary to make sure the level can be reliably detected. For level detection, this means e.g. using L-shaped electrodes, providing of additional surfaces, etc.

Typical DK-values

Air	1
Vacuum	1
Styrofoam granules	1.05 - 1.5
Washing powder	1.1 - 1.3
Liquid gas, general	1.2 - 1.7
Plastic granules	1.5 - 2
Broken glass	1.2 - 2.2
Milk powder	1.8 - 2.2
Gasoline	1.9
Cyclohexane	2
Diesel oil	2.1
Coal dust, dry	2.2
Gypsum	1.8 - 2.5
Oils, general	2 - 4
Cereals	2.5 - 4.5
Sand, dry	3 - 4
Tar	4 - 5
Cement	4 - 6
Methylether	5
Brown coal, dry	6
Isocyanate	7.5
Butanol	11
Sand, moist	15 - 20
Ammonia (NH_3)	21
Latex	24
Ethanol	25
Caustic soda	22 - 26
Soot	25 - 30
Ore	25 - 30
Acetone	20 - 30
Methanol	30
Glycerine	37
Water (20°C)	81

Electrically conductive products act like products with very high DK-value.

25 Aggressive, abrasive products

For very aggressive or abrasive products, several insulation materials are available. The features and resistances of the individual insulators are shown in the list "3.7 Insulating materials".

When metal is not chemically resistant against the measured product, use an adapter of PTFE or PP or an electrode with a plated flange.
For non-metallic vessels and products that corrode metal, the double rod electrode EL 29 is suitable, since both electrode rods are fully insulated and no ground connection is required. EL 29 is insensitive to buildup and crystallization caused by, for example, acids.

26 Condensation

When condensate is generated on the vessel ceiling, measuring errors can be caused by the liquid flowing down, especially onto partly insulated electrodes (bridging).
For that reason, use a screening tube from our line of accessories. The length of the screening tube depends on the quantity of the condensate and the drainage properties of the product.

27 Material cone

When choosing a mounting position on the vessel for the electrodes, remember that solids can form material cones that modify the switching point. We recommend selecting a location where the electrode detects an average value of the material cone.

The location of the filling and emptying apertures determine where the measuring probe has to be installed. The electrode should be installed at a distance $^{d}/_{6}$ from the vessel wall to compensate errors caused by the material cone (fig. 3.15 and 3.16).

28 Approval

If the capacitive electrode is used in conjunction with appropriate signal conditioning instruments for measurement in hazardous areas of zone 0, zone 1 or zone 10, the conformity certificates (or type approvals) of the capacitive measuring probes and the signal conditioning instruments have to be observed.

If a capacitive measuring probe is used as part of an overfill protection system acc. to WHG, the particulars of the construction permits and type approvals are valid. Observe the installation and operating regulations supplied with the respective instrument.

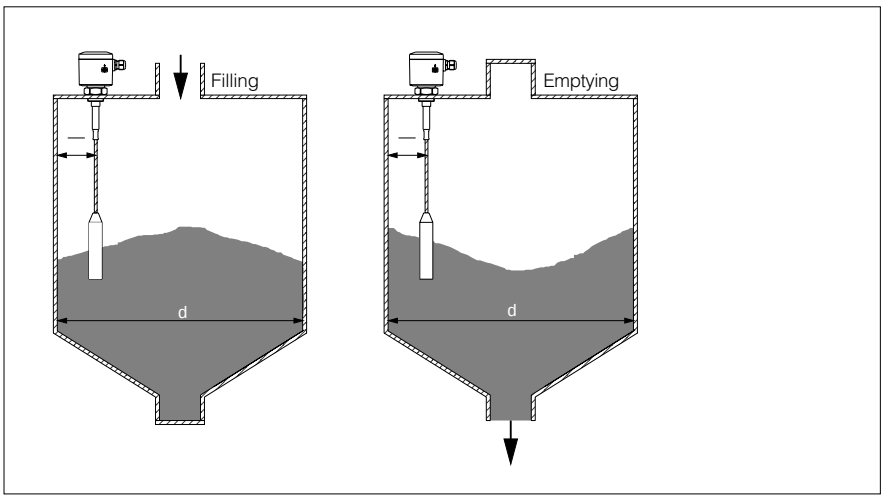


Fig. 3.15 Material cone, filling and emptying centered

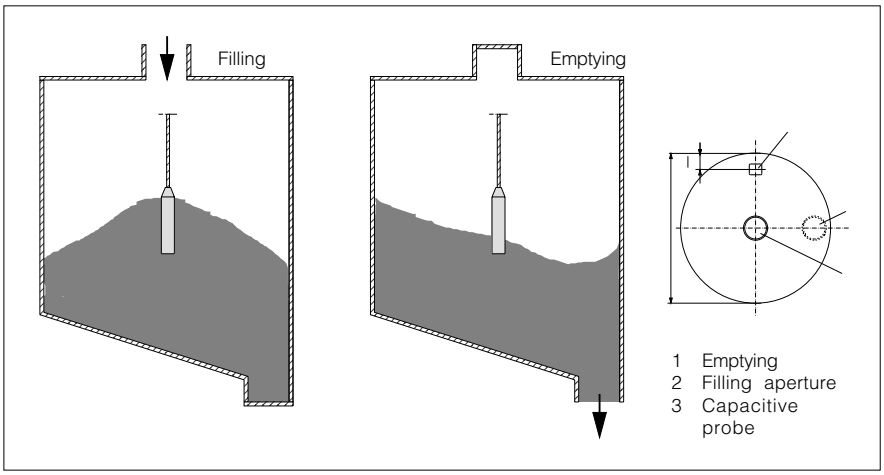


Fig. 3.16 Material cone, filling centered, emptying laterally

29 Change of moisture content

A change of moisture content in solids will cause a change of the dielectric constant (εr). In addition, the ohmic resistance of the product changes.

Due to this change there will be also a phase shift in the measuring currents.

With standard capacitive measurement, even slight moisture changes of e.g. 2 % cause measuring errors of 50 to 100 %. Typical products are e.g. sand, aggregate in the cement industry, hops or plastic granules (after drying).

When using the oscillator E18 changes in moisture content of up to 15 % do not influence the accuracy of the measurement. Even layering of products with varying moisture content does not affect the accuracy.

When the moisture content is more than 15 %, fully and partly insulated electrodes react differently.

Given a steady product level, the measurement value of a fully insulated electrode increases, whereas that of a partly insulated electrode decreases.

3.3 Capacitive electrodes type EL/EK

Technical data for capacitive electrodes type EL/EK

Table

Type	EL/ EK	EL/ EK	EL/ EK	EL/ EK	EL	EL	EL/ EK	EL	EL	EL	EL	EL	EL	EL	EL
Version	**11**	**21**	**24**	**26**	**28**	**29**	**31**	**33**	**34**	**42**	**52**	**53**	**60** [1]	**61** [1]	**70**
Continuous	•	•	•		•	•	•	•		•	•	•	•	•	•
Level detection[7]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Partly insulated	•						•	•	•				•	•	•
Fully insulated		•	•	•	•	•				•	•	•			
Two-wire 4 … 20 mA/VVO/HART®	•	•	•		•	•	•	•		•	•	•			
Separately with signal conditioning instr.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Two-wire Profibus PA	•	•	•		•	•	•	•		•	•	•			
Approvals															
CENELEC EEx ia IIC T6	•	•	•	•	•	•	•[10]	•	•	•	•	•	•	•	
PTB-Zone 0 EEx ia IIC T6	•	•	•	•			•			•					
StEx	•[10]						•[10]						•	•	•
Overfill protection acc. to WHG [3]	•	•	•	•		•	•			•					
Ship approvals	•	•	•	•			•	•	•	•	•	•			
Process connection															
G $^1/_2$ A					•										
G $^3/_4$ A [9]	•	•	•	•			•								
$^3/_4$" NPT [9]	•	•	•	•			•								
1" NPT [9]	•	•	•	•			•								
G 1 A [9]	•	•	•	•			•								
1$^1/_2$" NPT [10]	•	•		•			•	•	•	•	•	•	•	•	
G 1$^1/_2$ A [10]	•	•	•	•			•	•	•	•	•	•	•	•	
Tri-Clamp 1$^1/_2$" [10]	•	•		•											
Tri-Clamp 2" [10]	•	•	•	•				•			•				
Bolting DN 50 [10] •	•	•	•												
Flange [10]	•	•		•		•	•	•	•	•	•	•			•
Flange plated [10]		•		•											
Adapter [11]															
PP		•	•	•						•	•				
PTFE		•	•	•						•	•				
Electrode material															
Steel	•[10]	•		•		•	•[10]	•	•	•	•	•	•	•	•
Stainless steel (stst)	•	•[10]	•	•[10]	•		•	•		•	•		•	•	•
Insulating material															
PTFE	•	•		•	•		•	•		•	•				
PP	•						•[10]								
PE/PA 12									•						
PFA		•[10]		•[10]											
FEP			•			•									
PE	•	•					•[9]					•			•
Ceramic													•	•	
Concentric tube [8]															
Steel	•	•													
Stainless steel (stst)	•	•													
Screening tube (option)															
Steel [10]	•	•					•	•	•	•	•	•			
Stainless steel (stst)	•	•					•[10]	•	•	•	•	•			

Type	EL/ EK	EL/ EK	EL/ EK	EL/ EK	EL	EL	EL/ EK	EL	EL	EL	EL	EL	EL	EL	EL
Version	**11**	**21**	**24**	**26**	**28**	**29**	**31**	**33**	**34**	**42**	**52**	**53**	**60** [1]	**61** [1]	**70**
Temperature adapter (option)															
Steel [10]	•	•		•			•	•			•				
Stainless steel (stst)	•	•		•			•	•			•				
PA [10]	•	•	•				•	•		•	•				
Housing material															
Plastic (IP 66)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
StSt 1.4301 (IP 67) [10]	•	•	•	•			•	•	•	•	•	•	•	•	
GG grey cast															•
Aluminium	•	•	•	•			•								
Miscellaneous															
Separate housing [10]	•	•	•	•	•		•	•		•	•		•	•	
Adapter [10]	•	•					•			•	•				
Overvoltage protection	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Test switch [10]	•	•	•	•		•	•	•	•	•	•	•	•	•	
Overvoltage arrester [4][10]	•	•	•	•			•	•	•	•	•	•	•	•	
L-shaped electrode [5]	•	•[6][10]													

[1] only for solid applications
[2] special temperature adapter (standard feature)
[3] for combustible liquids in pressurised vessels, e.g. liquid gas, ammonia
[4] for high electrostatic discharges, e.g. in plastic granules
[5] bending max. 90°
[6] EL/EK 21 only for PTFE with 3.2 mm insulation thickness
[7] level detection with signal conditioning instrument possible
[8] for thin, non-conductive products
[9] only type EK
[10] only type EL
[11] adapter of PP or PTFE only up to 3 bar

General information, electrodes type EL/EK

Housing

Housing material	plastic PBT (Polyester), aluminium or stainless steel (1.4301), EL 70 of grey cast
Protection	
- plastic housing	IP 66
- aluminium housing	IP 66
- stainless steel housing	IP 66 and 67 (meet both protections)
Cable entry	1 x M20 x 1.5
Terminals	for max. 1.5 mm^2 conductor cross-section

Process connection

Material	steel (St 37), 1.4571, Aluminium
Thread	
- EL	G $1^1/_2$ A or $1^1/_2$" NPT
- EK	G $^3/_4$ A or $^3/_4$" NPT G 1 A or 1" NPT
Flange	see "Flange versions"

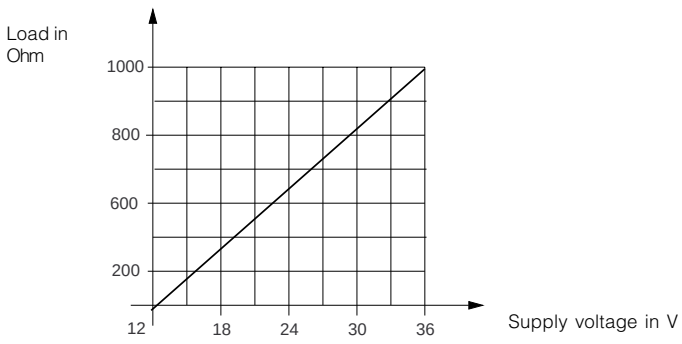
Electrode

Material	
- EL	steel (St 37), stst (1.4571)
- EK11	1.4435 (316L)
- EK 21	steel (St37), 1.4435 (316L)
- EK 31	1.4401 (316L)
- EK 24	1.4571 (316L)
Length	
- rod	
EL	max. 4 m
EK	max. 3 m
- cable	
EL	max. 25 m
EK	max. 20 m
Insulation	see "Insulating materials"
Max. tensile load (cable versions)	
- EL 31	20 KN
- EL 33, 34, 52, 53	15 KN
- EK 31	3 KN

Ambient conditions

Ambient temperature on the housing	-40°C ... +80°C
Product temperature	see "3.5 Product temperature and operating pressure"
Storage and transport temperature	-40°C ... +80°C
Operating pressure	see "3.5 Product temperature and operating pressure"

For Ex-applications, the permissible electrical connection values stated in the certificate have to be noted:



Oscillators

Protection class	II
Overvoltage category	III
Frequency	see table on the following page
Capacitance ranges	see table on the following page
Voltage	12 … 36 V DC (supply via signal conditioning instrument)
Potential separation	min. 500 V DC (except E14)

Accessories

Straining spring (1.4571) (EL 42, EL 52, EL 53)	
- length	185 mm (strained)
- tensile force	approx. 300 Nm
Angle bracket of steel or 1.4571	with thread G1 1/2 A or G 1/2 A
Abrasion protection	of steel (EL 31 and EL 34 [up to max. 6 m])
Plug connection	in Pg (IP 65)
Gravity weight	of 1.4571 (EL 31, EL 33, EL 34: length 100, 150, 200 mm)

Weight

Basic weight	
- EL 24	approx. 1.4 kg
- EK 24	approx. 0.8 kg
Rod weight	
- EL	approx. 1.4 kg/m
- EK	→ 6 mm - 0.23 kg/m → 10 mm - 0.62 kg/m

Approvals (deviating technical data)

Supply and signal circuit in classification intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit with the following max. values:

U_O = 29 V	U_O = 24 V
I_K = 116 mA	I_K = 131 mA
P = 841 mW	P = 786 mW

Oscillators in two-wire technology for capacitive electrodes EL

Type	Application	Measuring range	Frequency	Signal condit. instr.
E14	Level detection general	I: 0 … 25 pF II: 0 … 100 pF III: 0 … 400 pF	400 kHz	VEGATOR VEGALOG
E15	Level detection general with potential separation	I: 0 … 25 pF II: 0 … 100 pF III: 0 … 400 pF	400 kHz	VEGATOR VEGALOG
E15 Ex	as E15, however for use in hazardous areas acc. to CENELEC, PTB zone 0 as well as zone 0 and StEx zone 10 as well as part of an overfill protection acc. to WHG	I: 0 … 25 pF II: 0 … 100 pF III: 0 … 400 pF	400 kHz	VEGATOR Ex VEGALOG [1]
E17	continuous level measurement general or level detection with potential separation	I: 0 … 120 pF II: 0 … 600 pF III: 0 … 3000 pF	40 kHz	VEGAMET VEGALOG (VEGATOR)
E17 Ex	as E17, however for use in hazardous areas acc. to CENELEC, PTB zone 0 or zone 0 and StEx zone 10 as well as part of an overfill protection acc. to WHG	I: 0 … 120 pF II: 0 … 600 pF III: 0 … 3000 pF	40 kHz	VEGAMET Ex VEGALOG [1] (VEGATOR)
E18	continuous level measurement or level detection with potential separation acc. to the principle of the phase selective admittance processing especially for adhesive products and for the use in solids with varying moisture content	I: 0 … 120 pF II: 0 … 600 pF III: 0 … 3000 pF	470 kHz	VEGAMET VEGALOG (VEGATOR)
E18 Ex	as E18, however for use in hazardous areas acc. to CENELEC, PTB zone 0 as well as zone 0 and StEx zone 10 as well as part of an overfill protection acc. to WHG	I: 0 … 120 pF II: 0 … 600 pF III: 0 … 3000 pF	470 kHz	VEGAMET Ex VEGALOG [1] (VEGATOR)
CAP E32 Ex	compact electronic 4 … 20 mA for continuous level measurement, acc. to the principle of the phase selective admittance processing. Parameter adjustment via keys on the oscillator	0 … 3000 pF	300 kHz	not necessary
CAP E32 H Ex	compact electronic 4 … 20 mA for continuous level measurement, acc. to the principle of the phase selective admittance processing. Parameter adjustment via keys on the oscillator, VVO from V. 2.30 or HART®-handheld	0 … 3000 pF	300 kHz	not necessary
CAP E34 PA EX	continuous level measurement acc. to the principle of the phase selective admittance processing with potential separation. For connection to digital communication of Profibus PA, approved for use in hazardous areas of zone 0	0 … 3000 pF	300 kHz	Segment coupler

[1] in conjunction with safety barrier type 145

Thread for capacitive electrodes

Screwed connections	Capacitive electrode type EL													
	11	21	24	26	28	29	31	33	34	42	52	53	60	61
Thread G 1/2 A of 1.4571					•									
Thread G 1 A of 1.4571	•	•		•			•	•			•			
Thread G 1 1/2 A of aluminium	•	•		•			•	•	•		•	•		
Thread G 1 1/2 A of steel	•	•	•	•			•	•	•	•	•	•	•	•
Thread G 1 1/2 A of 1.4571	•	•	•	•			•	•	•	•	•	•	•	•
Thread G 1 1/2 A of steel/PP [1]		•		•						•	•			
Thread G 1 1/2 A of steel/PTFE [1]		•	•	•						•	•			
Thread G 1 1/2 A of StSt/PP [1]		•		•							•			
Thread G 1 1/2 A of StSt/PTFE [1]		•	•	•							•			
Thread 1 1/2" NPT of steel	•	•		•			•	•	•		•	•	•	•
Thread 1 1/2" NPT of 1.4571	•	•		•			•	•	•		•	•	•	•
TRI-Clamp of 1.4571 (1 1/2", 2")	•	•		•							•			
Bolting of 1.4571 (DN 50)	•	•		•										

[1] Adapter of PP or PTFE screwed on thread

Screwed connections	Capacitive electrode type EK				
	11	21	24	26	31
Thread G 3/4 A of 1.4435	•	•	•	•	•
Thread 3/4" NPT of 1.4435	•	•	•	•	•
Thread G 1 A of 1.4435	•	•	•	•	•
Thread 1" NPT of 1.4435	•	•	•	•	•

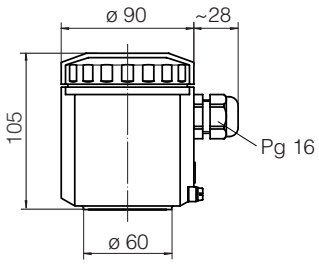
DIN and ANSI flanges welded to capacitive electrode

All stated DIN and ANSI flanges are suitable for CENELEC and PTB zone 0-versions.

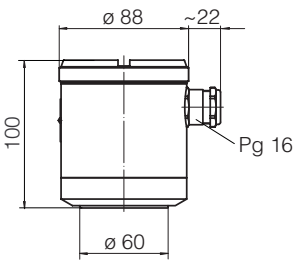
Flange acc. to DIN (C-form)	Suitable for electrode type									
	EL 11	EL 21	EK 21	EL 26	EL 31	EL 33	EL 34	EL 42	EL 52	EL 53
DN 25 PN 40 of steel, PTFE-plated		•	•	•						
DN 25 PN 40 of StSt, PTFE-plated		•		•						
DN 40 PN 40 of steel	•	•		•	•	•	•	•	•	•
DN 40 PN 40 of 1.4571	•	•		•	•	•	•	•	•	•
DN 40 PN 40 of steel, PTFE-plated		•		•						
DN 40 PN 40 of 1.4571, PTFE-plated		•		•						
DN 50 PN 40 of steel	•	•		•	•	•	•	•	•	•
DN 50 PN 40 of 1.4571	•	•		•	•	•	•	•	•	•
DN 50 PN 40 of steel, PTFE-plated		•		•						
DN 50 PN 40 of 1.4571, PTFE-plated		•		•						
DN 80 PN 40 of steel	•	•		•	•	•	•	•	•	•
DN 80 PN 40 of 1.4571	•	•		•	•	•	•	•	•	•
DN 80 PN 40 of steel, PTFE-plated		•		•						
DN 80 PN 40 of 1.4571, PTFE-plated		•		•						
DN 100 PN 16 of steel	•	•		•	•	•	•	•	•	•
DN 100 PN 16 of 1.4571	•	•		•	•	•	•	•	•	•
DN 100 PN 40 of steel	•	•		•	•	•	•	•	•	•
DN 100 PN 40 of 1.4571	•	•		•	•	•	•	•	•	•
DN 100 PN 40 of steel, PTFE-plated		•		•						
DN 100 PN 40 of 1.4571, PTFE-plated		•		•						

Dimensions of the capacitive electrodes type EL

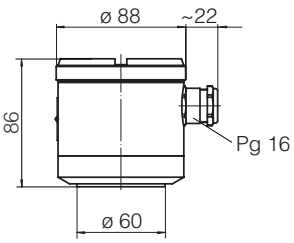
Plastic housing [1]



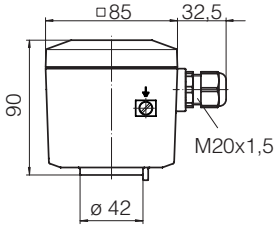
Stainless steel housing [1]

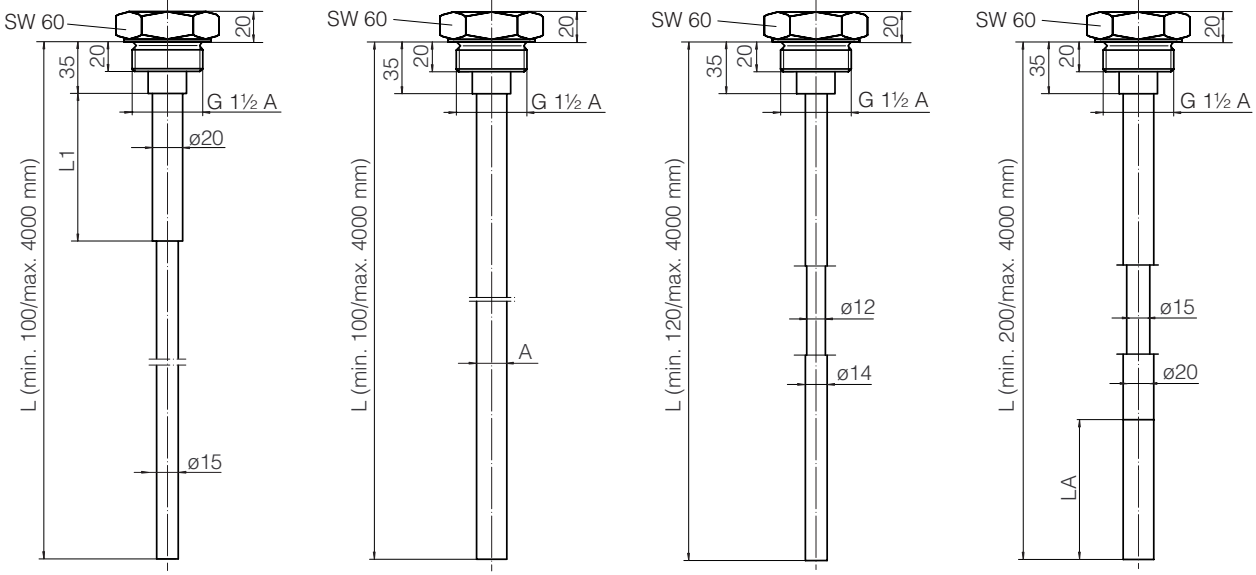


Stainless steel housing [2]



Aluminium or plastic housing [3]





Type EL 11 (partly insulated)

Insulation length L1:
PP: 100 mm
PTFE: 50 mm
StEx: max. 100 mm

Type EL 21 (fully insulated)

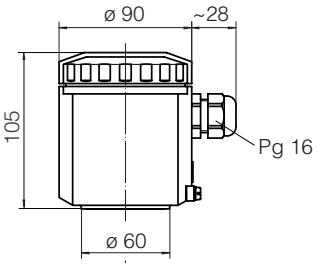
Insulation		A outer-ø
PE	2.0 mm	20 mm
PTFE	2.0 mm	20 mm
PTFE	3.2 mm	16 mm
PFA	2.0 mm	20 mm

Type EL 24 (fully insulated, for adhesive products)

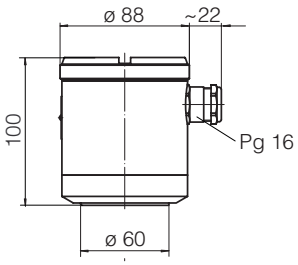
Type EL 26 (fully insulated, for adhesive products)

[1] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) also with overvoltage protection
[2] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) without overvoltage protection
[3] Suitable for oscillator CAP E32H (Ex), CAP E34 PA (Ex)

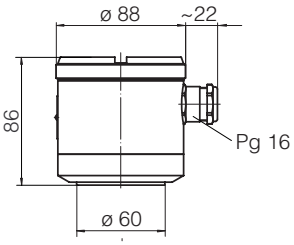
Plastic housing [1]



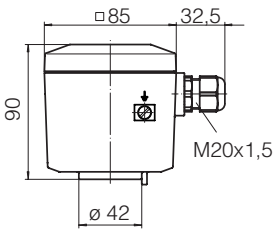
Stainless steel housing [1]

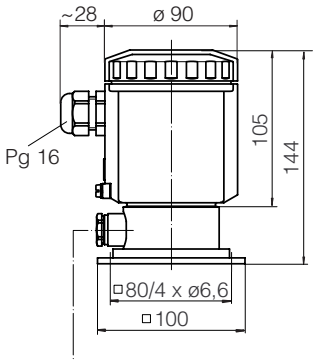


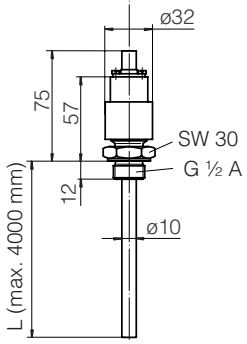
Stainless steel housing [2]



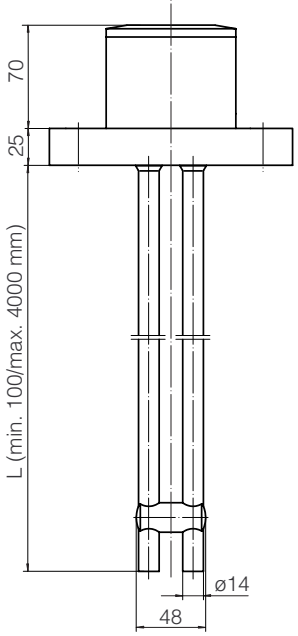
Aluminium or plastic housing [3]



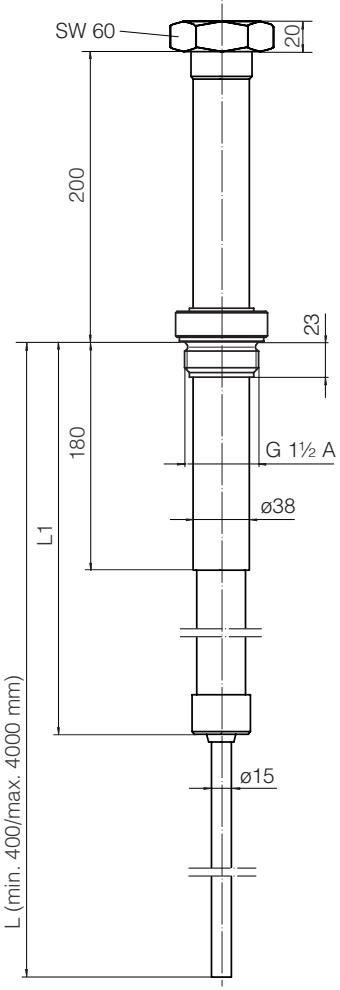




Type EL 28



Type EL 29 (fully insulated)

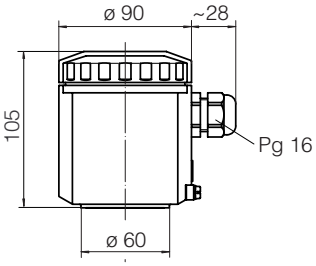


Type EL 60 (partly insulated, high temperature electrode)

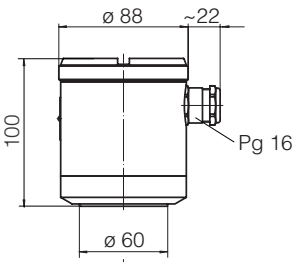
Supporting tube L1:
Standard: 300 mm
min. 200 mm
max. 1700 mm

[1] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) also with overvoltage protection
[2] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) without overvoltage protection
[3] Suitable for oscillator CAP E32H (Ex), CAP E34 PA (Ex)

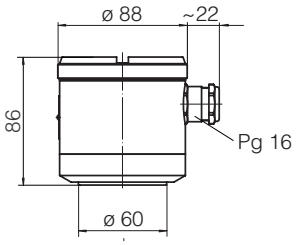
Plastic housing [1]



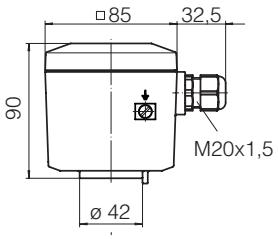
Stainless steel housing [1]

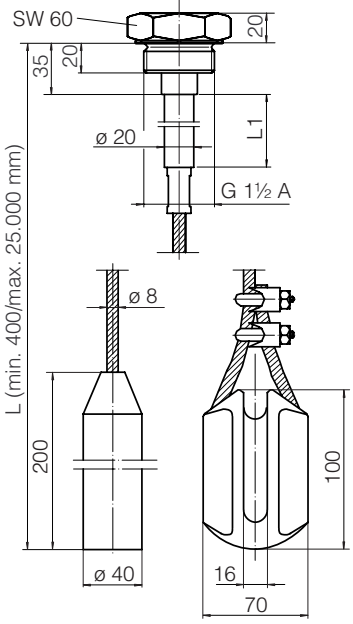


Stainless steel housing [2]



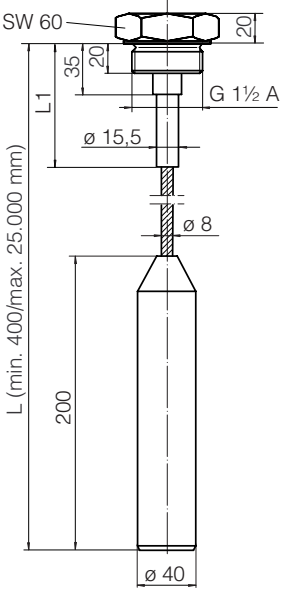
Aluminium or plastic housing [3]



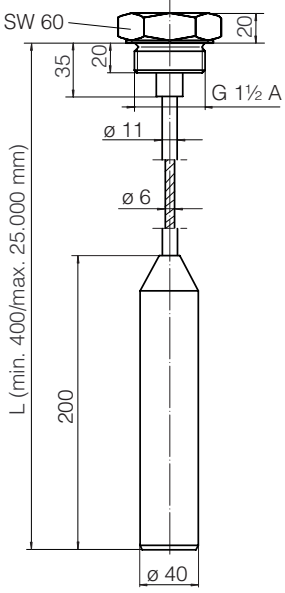


Type EL 31
(partly insulated)

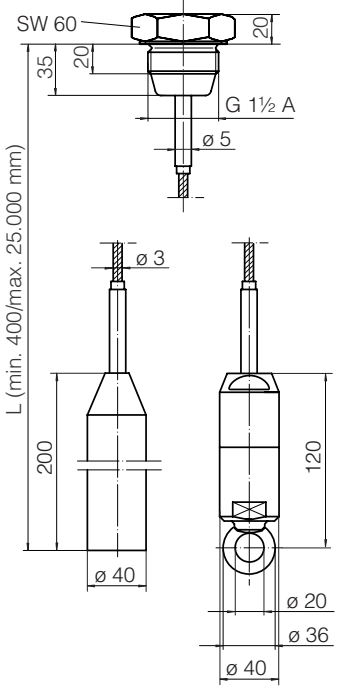
Insulation length L1:
PP: 100 mm
PTFE: 50 mm
StEx: max. 100 mm



Type EL 33
(partly insulated)



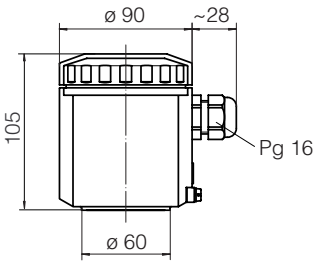
Type EL 34
(partly insulated)



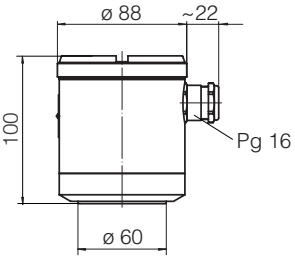
Type EL 42
(fully insulated)

[1] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) also with overvoltage protection
[2] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) without overvoltage protection
[3] Suitable for oscillator CAP E32H (Ex), CAP E34 PA (Ex)

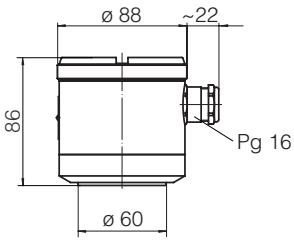
Plastic housing [1]



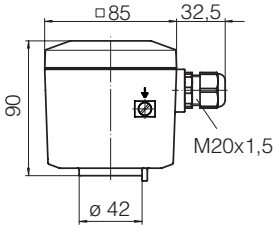
Stainless steel housing [1]

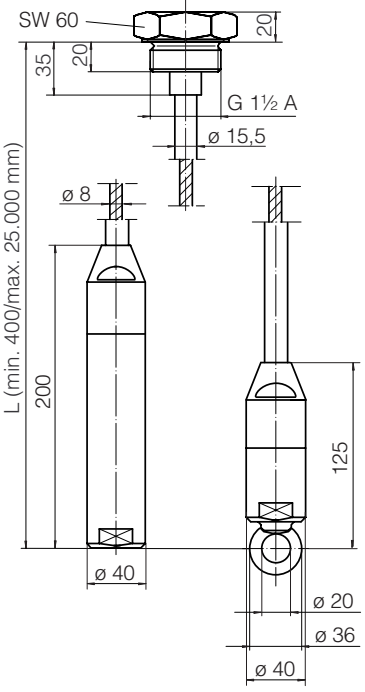


Stainless steel housing [2]

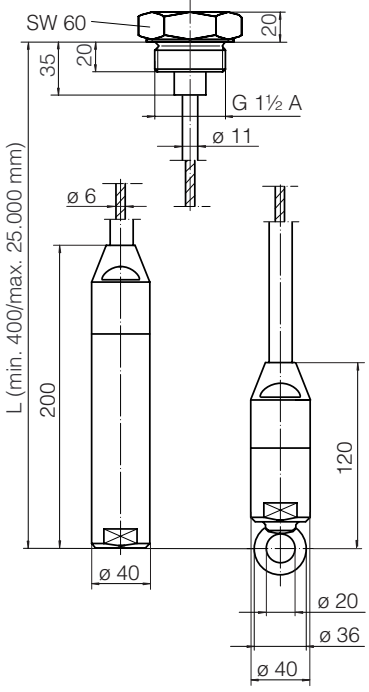


Aluminium or plastic housing [3]

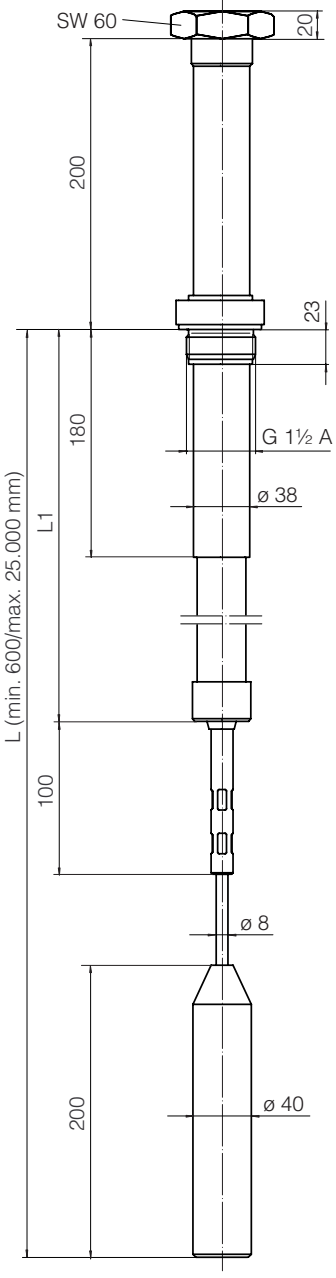




Type EL 52 (fully insulated)



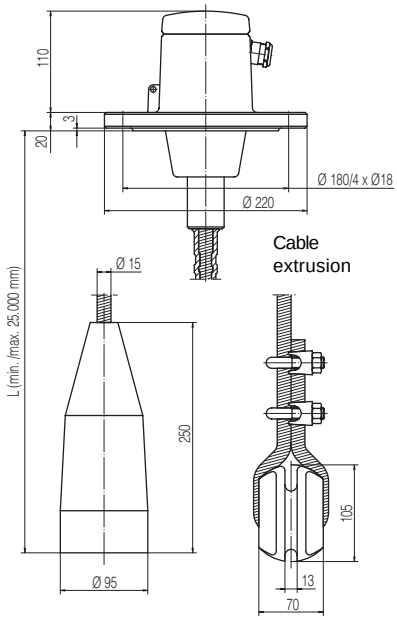
Type EL 53 (fully insulated)



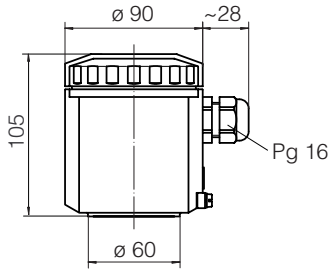
Type EL 61 (partly insulated, high temperature electrode)

[1] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) also with overvoltage protection
[2] Suitable for oscillators E14, E15 (Ex), E17 (Ex), E18 (Ex) without overvoltage protection
[3] Suitable for oscillator CAP E32H (Ex), CAP E34 PA (Ex)

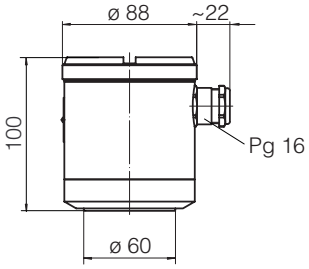
Type EL 70
(partly insulated heavy cable electrode)



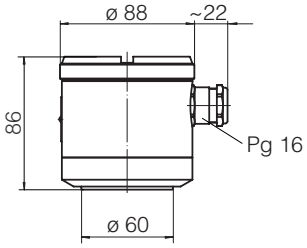
Housing



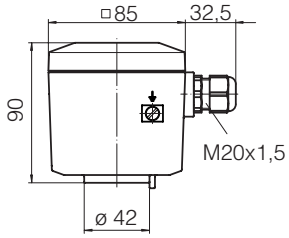
Housing (K or T) of plastic, IP 66



Housing (V) of 1.4301, IP 66/IP 67 for integral overvoltage protection

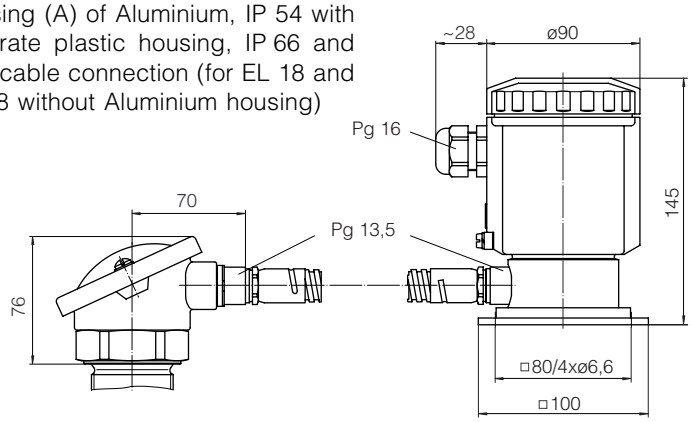


Housing (V) of 1.4301, IP 66/IP 67 without overvoltage protection

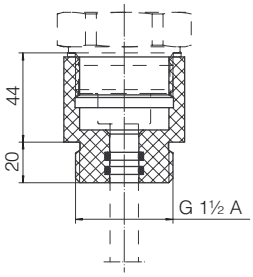


Housing of Aluminium or plastic IP 66/IP 67

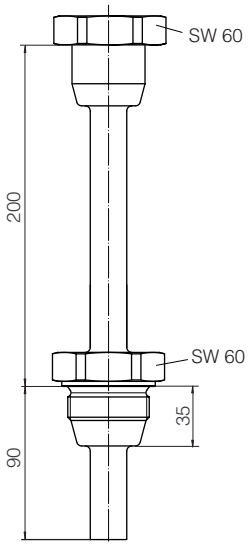
Housing (A) of Aluminium, IP 54 with separate plastic housing, IP 66 and triax cable connection (for EL 18 and EL 28 without Aluminium housing)



Adapter of PP or PTFE (GBT and GBP)

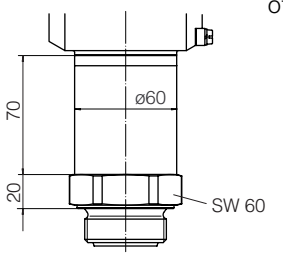


Temperature adapters

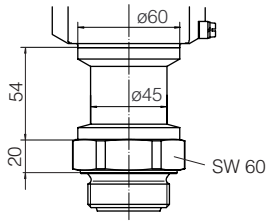


of galvanized steel (1)
or 1.4571 (2)

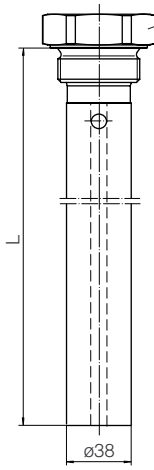
of PA (3)



Adapter for combustible liquids in pressurised vessels (4)

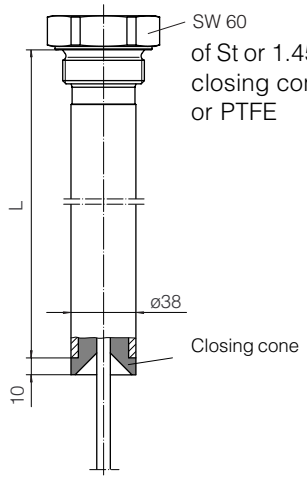


Concentric tube



of St or 1.4571

Screening tube



of St or 1.4571 with closing cone of PP or PTFE

3.4 VEGACAP compact level switch

Technical data for VEGACAP compact level switch

Types

VEGACAP	11 [1]	21	26	27	31 [1]	33	34	35	60 [2]	61 [2]	82 [1]	92	98
Series													
Rod electrode	•	•	•	•					•				•
Cable electrode					•	•	•	•		•			
Plate electrode											•	•	
Version													
Partly insulated	•				•	•	•	•	•	•	•		
Fully insulated		•	•	•								•	•
Thread													
1 1/2" NPT	•	•	•	•	•	•	•	•					
G 1 1/2 A	•	•	•	•	•	•	•	•	•	•			•
Electrode material													
Steel	•	•	•	•	•	•	•	•	•	•		•	
StSt	•				•	•			•	•	•		
Insulation material													
PTFE	•	•	•	•	•	•					•	•	
PP	•				•								•
PE/PA 12							•	•					
PFA		•	•	•									
PE		•											
Ceramic									•	•			
Screening tube													
Steel	•	•			•	•	•						
StSt	•	•			•	•	•						
Temperature adapter													
Steel	•	•	•	•	•	•			[2]	[2]			
StSt	•	•	•	•	•	•			[2]	[2]			
PA	•	•			•	•			[2]	[2]	•	•	
Miscellaneous													
Test switch	•	•	•	•	•	•	•	•	•	•	•	•	

[1] VEGACAP 11 R ExS, 31 R ExS and 82 R ExS with integral oscillator E30 R ExS are approved for dust-Ex applications
[2] special temperature adapter (standard feature)

General information, VEGACAP

Housing

Housing material	plastic PBT (Polyester)
Protection	IP 66 (StEx: IP 65)
Cable entry	1 x Pg 13.5 (with oscillator "R" = 2 x Pg 13.5)
Terminals	for max. 1.5 mm^2 conductor cross-section

Thread

Material	
- VEGACAP all except VEGACAP 98	steel (St 37), 1.4571, Aluminium
- VEGACAP 98	PP
Thread	G $1^1/_2$ A or $1^1/_2$" NPT
Flange	see "Flange versions"

Rod electrode (VEGACAP 11, 21, 26, 98)

Rod material	
- VEGACAP 11, 21 and 26	steel (St 37) or 1.4571 (stst)
- VEGACAP 98	PP
Length	max. 4 m (VEGACAP 98: max. 1.5 m)

Cable electrode (VEGACAP 31, 33, 34)

Cable material	
- VEGACAP 31, 33	steel (St 37) or 1.4571 (stst)
- VEGACAP 34	steel (St 37)
Length	max. 25 m

Weight

Basic weight	
- VEGACAP 11, 21, 26	approx. 1.2 kg
- VEGACAP 31, 33, 34	approx. 3.3 kg
- VEGACAP 82, 92	approx. 2.1 kg
- VEGACAP 98	approx. 0.6 kg
Rod weight	approx. 1.4 kg/m
Cable weight	approx. 0.3 kg/m

Ambient conditions

Ambient temperature on the housing	-40°C ... +70°C
- StEx-version	-20°C ... +60°C
Product temperature	see "3.6 Product temperature and operating pressure"
Storage and transport temperature	-40°C ... +80°C
Operating pressure	see "3.6 Product temperature and operating pressure"

Function

Modes	A/B-mode A - overfill protection or max. detection B - dry run protection or min. detection
Integration time	approx. 0.5 sec
Signal lamp	LED for indication of the switching condition

Oscillators, VEGACAP

General

Frequency	400 kHz
Capacitance ranges	
- range 1	0 … 20 pF
- range 2	0 … 85 pF
- range 3	0 … 450 pF
Switching hysteresis	approx. 2 % relating to the adjusted capacitance value

C - Non-contact switch (E30 C)

Supply voltage	20 … 250 V AC, 50/60 Hz 20 … 250 V DC
Output	non-contact switch
Current consumption	< 5 mA (via the load circuit) for reliable switching of contactors, with very low hold current, the own current is shortly lowered below 1 mA.
Load current	min. 10 mA, max. 400 mA at a load current of more than 300 mA, the max. permissible ambient temperature is 60°C.
Protection class	I
Overvoltage category	III

R - Relay output (E30 R)
R - Relay output, adjustment without vessel filling for VEGACAP 27, 35, 98 (E31 R)

Supply voltage	20 … 250 V AC, 50/60 Hz 20 … 72 V DC
Power consumption	1 … 9 StSt, max. 1,5 W
Output	relay output
Relay data	
- contact	floating spdt
- contact material	AgCdO and Au plated
- turn-on voltage	min. 10 mV max. 250 V AC, 250 V DC
- switching current	min. 10 µA max. 3 A AC, 1 A DC
- breaking capacitance	max. 750 StSt, 54 W
Protection class	I
Overvoltage category	III

T - Transistor output (E30 T)

Supply voltage	10 … 55 V DC
Power consumption	max. 0.5 W
Output	floating transistor output NPN/PNP, selectable by different connection
Load current	max. 400 mA (the output is overload resistant and permanently shortcircuit proof)
Blocking current	max. 10 µA
Voltage loss	max. 1 V (with conductive output)
Protection class	II
Overvoltage category	III

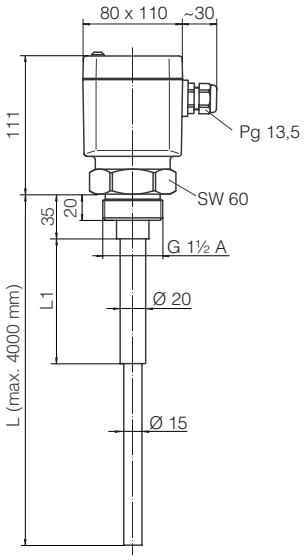
Note:
The oscillator is independent of the electrode and can be exchanged locally.

Overview

VEGACAP	11	21	26	27	31	33	34	35	60	61	82	92	98	11 StEx	31 StEx	82 StEx
Non-contact switch E30 C	•	•	•	•	•	•	•	•	•	•	•	•				•
Floating relay output E30 R, E30 R ExS	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Floating relay output E31 R (adjustment free)			•					•					•			
Floating transistor output E30 T	•	•	•	•	•	•	•	•	•	•	•	•				•

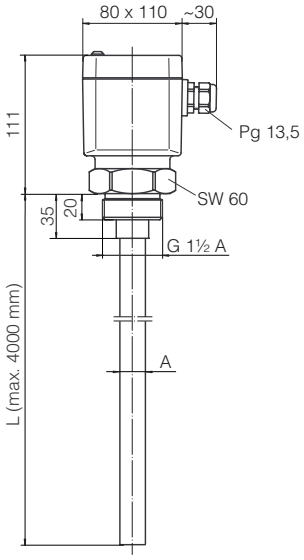
Dimensions VEGACAP compact level switch

VEGACAP 11 (partly insulated)



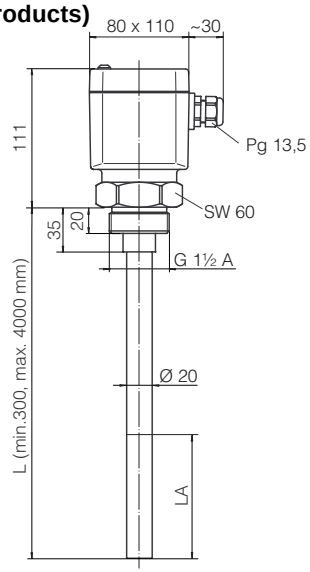
Insulation length L1:
PP: 100 mm
PTFE: 50 mm
StEx: max. 100 mm

VEGACAP 21 (fully insulated)



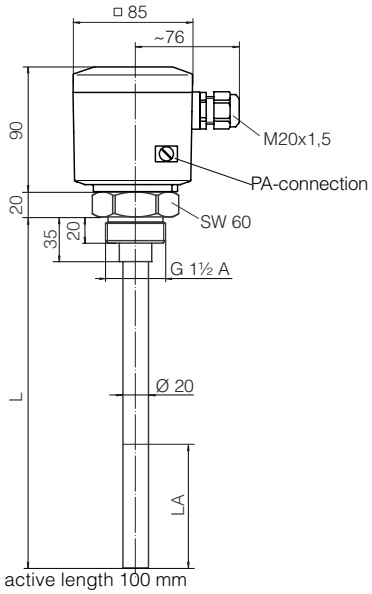
Insulation		A outer-ø
PE	2.0 mm	20 mm
PTFE	2.0 mm	20 mm
PTFE	3.2 mm	16 mm
PFA	2.0 mm	20 mm

VEGACAP 26 (fully insulated, for adhesive products)



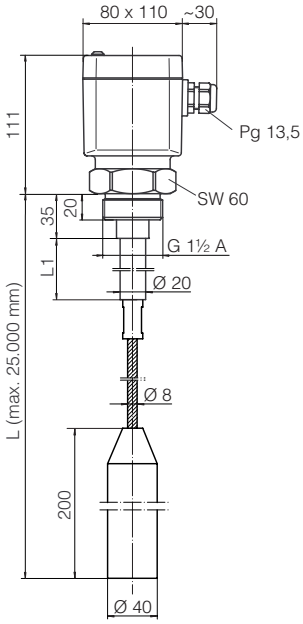
LA = active length (standard 100 mm)

VEGACAP 27 (for adhesive products and adjustment free)



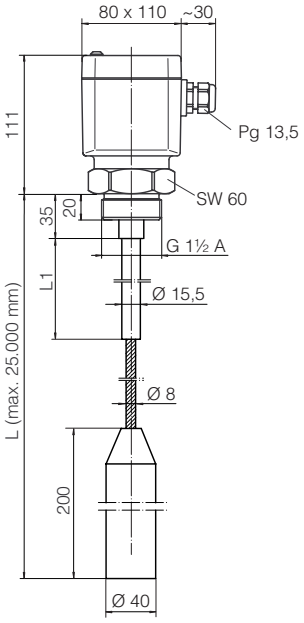
La = active length 100 mm

VEGACAP 31 (partly insulated)

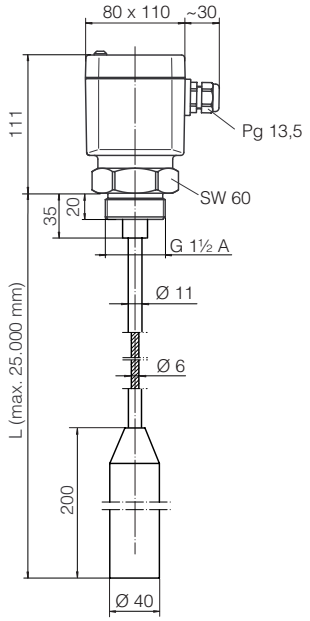


Insulation length L1:
PP: 100 mm
PTFE: 50 mm
StEx: max. 100 mm

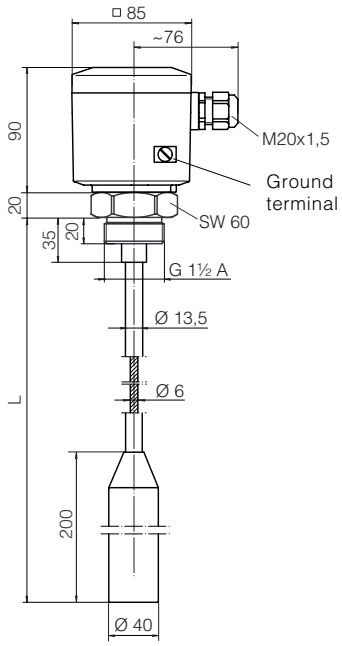
VEGACAP 33 (partly insulated)



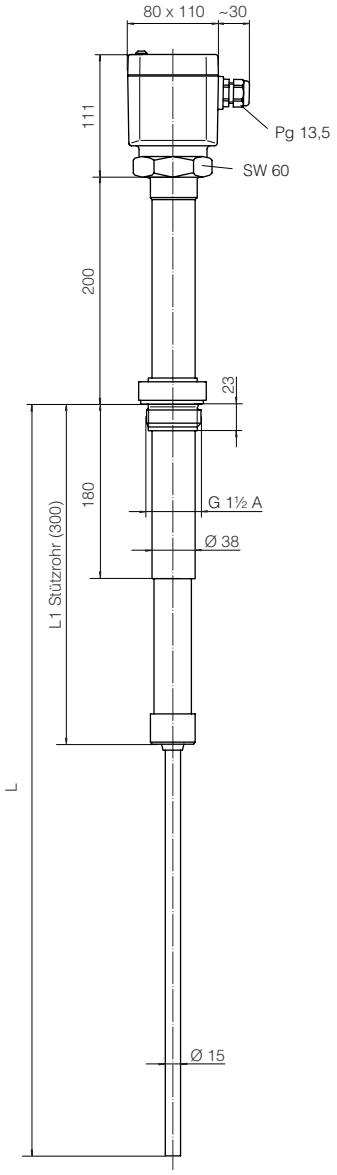
VEGACAP 34 (partly insulated)



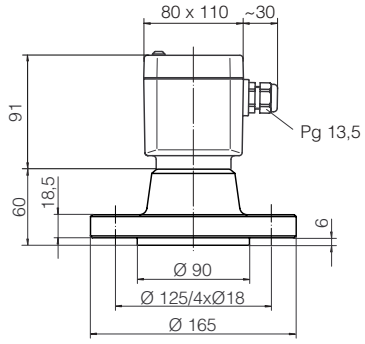
VEGACAP 35 (partly insulated)



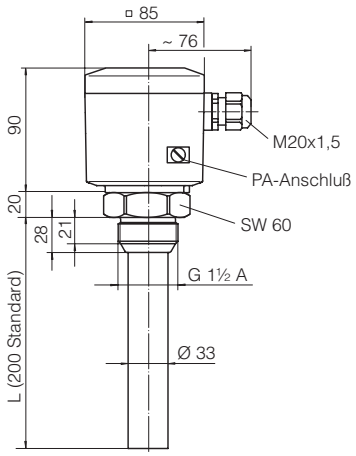
VEGACAP 60



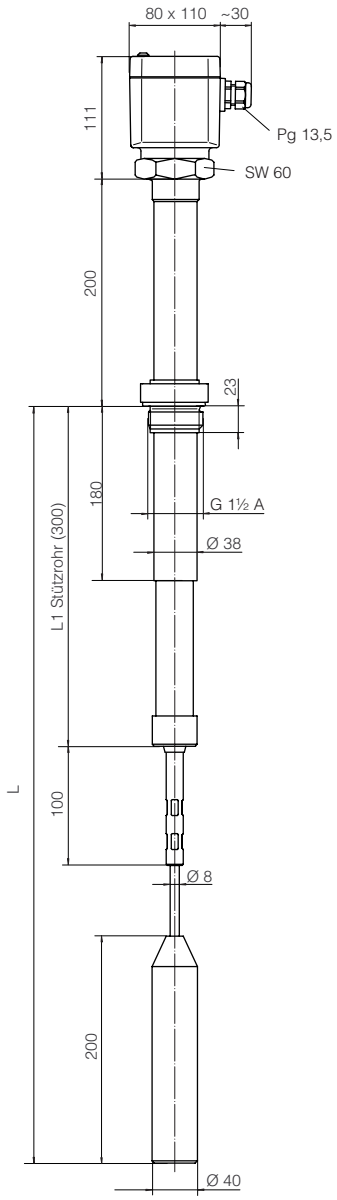
VEGACAP 82/VEGACAP 92 (partly/fully insulated)



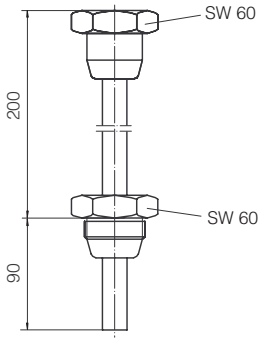
VEGACAP 98 (fully insulated)



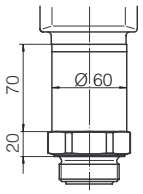
VEGACAP 61



Temperature adapter St/StSt

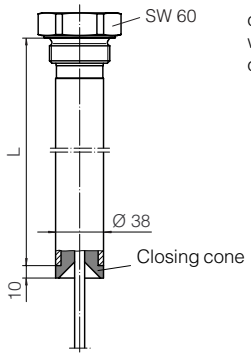


Temperature adapter PA



for temperatures up to 150°C, from 100°C only unpressurised

Screening tube



of St or 1.4571 with closing cone of PP or PTFE

3.5 Product temperature and operating pressure

The figures of the tables relate to the figures on this page. The pressure stated is valid for screw connections G $1^1/_2$ A, $1^1/_2$" NPT and R $1^1/_2$. Boltings DN 50 acc. to DIN 11 851 only up to max. 25 bar. The nominal pressure must be noted for flange versions.
All electrodes are also suitable for vacuum (-1 bar).
For electrodes certified for Ex-zone 0, only PTFE and FEP are approved as insulating material.

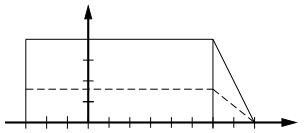
For Ex-applications the permissible temperatures and pressures stated in the certificate have to be observed. In addition note the tables on the following pages:

Process connection, 1.4571 (stst)

Electrode type \ Insulation	PE	PP	PTFE	PE/PA 12	PFA	FEP
EL 11/VEGACAP 11	-	1	3	-	-	-
EK 11	1	-	3	-	-	-
EK 18	-	-	2	-	-	-
EL 21/EK 21/VEGACAP 21	1	-	3	-	3	-
EL 21/EK 21/ VEGACAP 21 with flange [2]	-	-	2	-	-	-
EL 24/EK 24	-	-	-	-	-	2
EL 26/VEGACAP 26	-	-	3	-	3	-
EL 26/VEGACAP 26 with flange [2]	-	-	2	-	-	-
EL 28	-	-	2	-	-	-
EL 31/VEGACAP 31	-	1	3	-	-	-
EK 31	1	-	3	-	-	-
EL 33/VEGACAP 33	-	-	3	-	-	-
EL 34/VEGACAP 34 unpressurised	-	-	-	1	-	-
EL 42	-	-	2	-	-	-
EL 52	-	-	3	-	-	-
EL 53	-	-	-	1	-	-

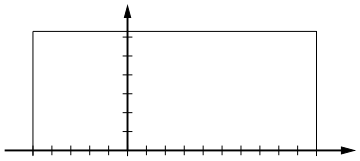
[1] Temperature adapter of PA up to 150°C, from 100°C unpressurised
[2] Flange plated

1



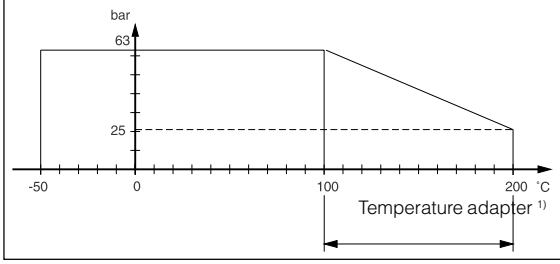
EL 21, 53,
VEGACAP 21, 53:
PE and PE/PA 12
up to 16 bar
EL 34, VEGACAP 34:
unpressurised

2

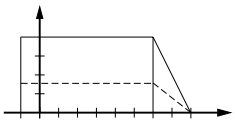


EL 42,
VEGACAP 42:
up to 16 bar
EL 24:
up to 40 bar

3

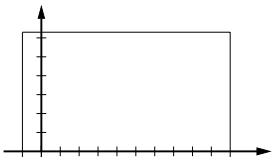


4



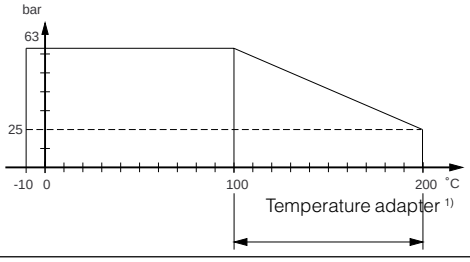
EL 21, 53,
VEGACAP 21, 53:
PE and PE/PA 12
up to 16 bar
EL 34, VEGACAP 34:
unpressurised

5



EL 42,
VEGACAP 42:
up to 16 bar
EL 24:
up to 40 bar [1]

6



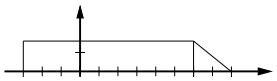
Process connection, steel (St 37)

Electrode type \ Insulation	PE	PP	PTFE	PE/PA 12	PFA	FEP
EL 11/VEGACAP 11	-	4	6	-	-	-
EL 21/VEGACAP 21	4	-	6	-	6	-
EL 21/VEGACAP 21 with flange [2]	-	-	5	-	-	-
EL 24	-	-	-	-	-	5
EL 26/VEGACAP 26	-	-	6	-	6	-
EL 26/VEGACAP 26 with flange [2]	-	-	5	-	-	-
EL 31/VEGACAP 31	-	4	6	-	-	-
EL 33/VEGACAP 33	-	-	6	-	-	-
EL 34/VEGACAP 34 unpressurised	-	-	-	4	-	-
EL 42	-	-	5	-	-	-
EL 52	-	-	6	-	-	-
EL 53	-	-	-	4	-	-

Process connection, Aluminium

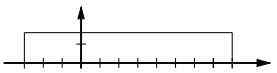
Electrode type \ Insulation	PE	PP	PTFE	PE/PA 12	PFA
EL 11/VEGACAP 11	-	7	8	-	-
EL 21/VEGACAP 21	7	-	8	-	8
EL 26/VEGACAP 26	-	-	8	-	8
EL 31/VEGACAP 31	-	7	8	-	-
EL 33/VEGACAP 33	-	-	8	-	-
EL 34/VEGACAP 34 unpressurised	-	-	-	7	-
EL 42	-	-	8	-	-
EL 52	-	-	8	-	-
EL 53	-	-	-	7	-
EL 82/VEGACAP 82 unpressurised	-	-	9	-	-
EL 92/VEGACAP 92	-	-	9	-	-
VEGACAP 98	80°C, unpressurised				

7

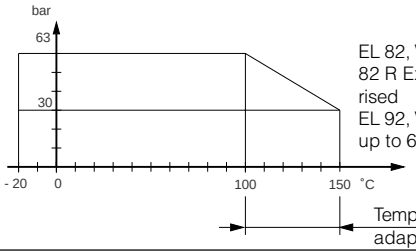


EL 34, VEGACAP 34: only unpressurised

8

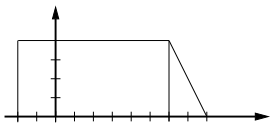


9

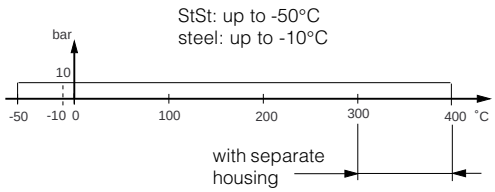


EL 82, VEGACAP 82, 82 R ExS: unpressurised
EL 92, VEGACAP 92: up to 6 bar

10



11



Instruments with dust-Ex-approval

Process connection, steel (St 37) or 1.4571 (stst)

Electrode type \ Insulation	PP	PTFE
VEGACAP 11 R Ex S	10	9
VEGACAP 31 R Ex S	10	9
VEGACAP 82 R Ex S unpressurised	-	9

High temperature electrodes

Electrode type \ Insulation	Ceramic
EL 60	11
EL 61	11

Oscillator temperature (electrode type EL)

It is difficult to determine the temperature of the oscillator, whereas the product and ambient temperatures are known most of the time.

The following product and ambient temperatures must be held so that the limit temperature of the electronics will not be exceeded.

The stated values are obligatory for applications in hazardous areas. For these applications, check the appropriate official documents (test report, test certificates, type approvals and conformity certificates).

Temperature class T6

Product temperature	-40°C … +60°C
Ambient temperature	-40°C … +60°C

Temperature class T5

Product temperature	-40°C … +75°C
Ambient temperature	-40°C … +75°C

Temperature classes T4 ... T1

Without temperature adapter

Product temperature	-40°C … +100°C
Ambient temperature	-40°C … +80°C

With temperature adapter

		Plastic housing		Metal housing		
Product temperature	-40°C …	180°C	200°C	150°C	175°C	200°C
Ambient temperature[1)]	-40°C …	80°C	75°C	80°C	69°C	58°C

1) Ambient temperature on the oscillator

3.6 Insulating material

Insulating material	resistant to	not resistant to	Features	Characteristics
PE (Polyethylene)	lyes and weak acids alcohol, oil, saline solutions hydrous solutions	CKW, aromatic compounds chocolate concentrated acids	suitable for foodstuffs, low abrasion resistance, good insulating reaction	cheap
PE/PA (Polyamide)	aliphatics aromatic hydrocarbons fuel, oil, grease, alcohols esther, ketone, ether organic and anorg. base up to mean concentration chlorized hydrocarbons such as e.g. tetrachloride, freon, Freon 12 colours and lacquers	strong lyes solutions of oxidants, formic acid, phenole, kresole, glycole chloroform, methylchloride, concentrated acids	PE: good electrical insulation also in liquids PA: high abrasion resistance	basic layer of PE with PA-coating
PTFE (Polytetrafluor-ethylene)	acids, fuel, oils, aromatic compunds etc. very good chemical resistance	hydrofluoric acid, fluoric product,Toluol, hot steam can diffuse	very smooth surface, low adhesion tendency, suitable for foodstuffs, gas permeable, tendency to cold flow	
PP (Polypropylene)	lyes and weak acids alcohol, oils, saline solutions hydrous solutions	CKW, aromatic compounds chocolate concentrated acids	suitable for foodstuffs low abrasion resistance good insulating reaction	cheap only as partial insulation
PFA (Polyfluoralkyvinyl-ether)	dilluted acids, oils, aromatic compounds etc.	fluoric acid, hot steam, fluoric products, Toluol	very smooth surface low adhesion tendency, suitable for foodstuffs tendency to cold flow	more tight than PTFE more expensive than PTFE
FEP (Perfluorethylene-propylene)	dilluted acids, oils, aromatic compounds etc.	fluoric acid, hot steam, fluoric products, Toluol	very smooth surface low adhesion tendency, suitable for foodstuffs tendency to cold flow	more tight than PTFE more expensive than PTFE
Ceramic	all known materials		very hard, very abrasion resistant, temperature resistant	only as partial insulation

3.7 Approvals

The capacitive electrodes type EL are available with the following approvals:
- explosion protection (CENELEC, zone 0)
- overfill protection acc. to WHG - applied
- dust-explosion protection (zone 10) - applied
- ship approvals (GL, LRS, ABS, BV, RINA)

VEGACAP compact level switches are available with the following approvals:
- dust-explosion protection (zone 10)

For these applications please note the appropriate official documents (test reports, test certificates, type approvals and conformity certificates). These are supplied with the appropriate instrument.

CE approval CE

The capacitive electrodes type EL meet the protective regulations of EMC (89/336/EWG) and NSR (72/23/EWG). The conformity has been judged acc. to the following standards:

EMC	Emission	EN 50 081-1: 1992
	Susceptibility	EN 50 082-2: 1995
NSR		EN 61 010-1: 1993

CE approval CE

VEGACAP compact level switches meet the protective regulations of EMC (89/336/EWG) and NSR (72/23/EWG). The conformity has been judged acc. to the following standards:

EMC	Emission	EN 50 081-1: 1992
	Susceptibility	EN 50 082-1: 1992
NSR		EN 61 010-1

PTB-Zone 0 (EEx ia IIC)

Continuous level measurement

Electrodes	Certificate	Oscillator	Certificate	Signal conditioning	Certificate	Aux. level switch
Capacitive electrodes EL [1]	PTB-no. Ex-96.D.2021	E17 EX	PTB-no. Ex-95.D.2041U	VEGAMET 513 EX, 514... EX	PTB-no. Ex-95.D.2145X	VEGASEL 543 ... 547
		E18 EX	PTB-no. Ex-95.D.2042 U	515 EX	PTB-no. Ex-95.D.2161X	
				602 EX	PTB-no. Ex-96.D.2095	VEGASEL 643
				614 EX	TÜV 98 ATEX 1269X PTB-no. Ex-98.E.2088	
				VEGATRENN 544 EX	PTB-no. Ex-95.D.2145X	
Capacitive electrodes EK [2]	applied	E17 EX	PTB-no. Ex-95.D.2041U	VEGAMET 513 EX, 514... EX	PTB-no. Ex-95.D.2145X	VEGASEL 543 ... 547
		E18 EX	PTB-no. Ex-95.D.2042 U	515 EX	PTB-no. Ex-95.D.2161X	
				602 EX	PTB-no. Ex-96.D.2095	VEGASEL 643
				614 EX	TÜV 98 ATEX 1269X PTB-no. Ex-98.E.2088	
				VEGATRENN 544 EX	PTB-no. Ex-95.D.2145X	
Capacitive electrodes EL [1] EK [2]	PTB-no. Ex-98.E.2085 TÜV 98 ATEX 2086	CAP E32 EX CAP E32 HEX	PTB-no. Ex-98.E.2085 TÜV 98 ATEX 2086	compact instrum. 4 ... 20 mA supply ia		

All electrodes with appropriate oscillator type E17 Ex, E18 Ex can be connected in conjunction with safety barrier type 145 to non-Ex VEGAMET signal conditioning instruments as well as to the appropriate VEGALOG 571, the conformity certificate PTB-no. Ex-85.B.2038 has to be noted.

[1] EL 11 EX0, EL 21 EX0, EL 24 EX0, EL 31 EX0, EL 42 EX0
[2] EK 11 EX0, EK 21 EXO, EK 24 EX0, EK 31 EX0

Level detection with fault monitoring

Electrodes	Certificate	Oscillator	Certificate	VEGATOR level switch	Certificate PTB-no.
Capacitive electrodes [1]	PTB-no. Ex-95.D.2097	E15 EX	PTB-no. Ex-95.D.2040 U	521 EX, 522 EX	Ex-95.D.2065 X
				523 EX, 527 EX	Ex-95.D.2073 X
				621 EX, 622 EX	Ex-96.D.2068
Capacitive electrode EL 26 EX	PTB-no. Ex-95.D.2097	E18 EX	PTB-no. Ex-95.D.2042 U	521 EX, 522 EX	Ex-95.D.2065 X
				523 EX, 527 EX	Ex-95.D.2073 X
				621 EX, 622 EX	Ex-96.D.2068

All above mentioned electrodes in conjunction with safety barrier type 145 can be connected to suitable non-Ex- VEGATOR two-wire instruments as well as to VEGALOG 571, the conformity certificate PTB-no. Ex-85.B.2038 has to be noted.

[1] EL 11 EX, EL 18 EX, EL 21 EX, EL 24 EX, EL 28 EX, EL 29 EX, EL 31 EX, EL 33 EX, EL 34 EX, EL 42 EX, EL 52 EX, EL 53 EX, EL 60 EX, EL 61 EX
[2] EL 1 EX, EL 2 EX, EL 3 EX, EL 5 EX, EL 9 EX

CENELEC (EEx ia IIC)

Continuous level measurement

Electrodes	Certificate	Oscillator	Certificate	Signal conditioning	Certificate	Aux. level switch
Capacitive electrodes [1]	PTB-no. Ex-95.D.2097	E17 EX	PTB-no. Ex-95.D.2041 U	VEGAMET 513 EX, 514... EX	PTB-no. Ex-95.D.2145X	VEGASEL 543 ... 547
				515 EX	PTB-no. Ex-95.D.2161X	
				602 EX	PTB-no. Ex-96.D.2095	VEGASEL 643
				614 EX	TÜV 98 ATEX 1269X PTB-no. Ex-98.E.2028	
				VEGATRENN 544 EX	PTB-no. Ex-95.D.2145X	
Capacitive electrodes [1]	PTB-no. Ex-95.D.2097	E18 EX	PTB-no. Ex-95.D.2042 U	VEGAMET 513 EX, 514... EX	PTB-no. Ex-95.D.2145X	VEGASEL 543 ... 547
				515 EX	PTB-no. Ex-95.D.2161X	
				602 EX	PTB-no. Ex-96.D.2095	VEGASEL 643
				614 Ex	TÜV 98 ATEX 1269X PTB-no. Ex-98.E.2028	
				VEGATRENN 544 EX	PTB-no. Ex-95.D.2145X	

All above mentioned electrodes except the compact instruments in conjunction with safety barrier type 145 can be connected to suitable non-Ex VEGAMET two-wire instruments as well as to VEGALOG 571, the conformity certificate PTB-no. Ex-85.B.2038 has to be noted.

[1] EL 11 EX, EL 18 EX, EL 21 EX, EL 24 EX, EL 28 EX, EL 29 EX, EL 31 EX, EL 33 EX, EL 34 EX, EL 42 EX, EL 52 EX, EL 53 EX, EL 60 EX, EL 61 EX
[2] Supply via intrinsically safe circuit (ia)

Level detection with fault monitoring

Electrodes	Certificate	Oscillator	Certificate	VEGATOR level switch	Certificate PTB-no.
Capacitive electrodes [1]	PTB-no. Ex-95.D.2097	E15 EX	PTB-no. Ex-95.D.2040 U	521 EX, 522 EX	Ex-95.D.2065 X
				523 EX, 527 EX	Ex-95.D.2073 X
				621 EX, 622 EX	Ex-96.D.2068
Capacitive electrode EL 26 EX	PTB-no. Ex-95.D.2097	E18 EX	PTB-no. Ex-95.D.2042 U	521 EX, 522 EX	Ex-95.D.2065 X
				523 EX, 527 EX	Ex-95.D.2073 X
				621 EX, 622 EX	Ex-96.D.2068

All above mentioned electrodes in conjunction with safety barrier type 145 can be connected to suitable non-Ex VEGATOR two-wire instruments as well as to VEGALOG 571, the conformity certificate PTB-no. Ex-85.B.2038 has to be noted.

[1] EL 11 EX, EL 18 EX, EL 21 EX, EL 24 EX, EL 28 EX, EL 29 EX, EL 31 EX, EL 33 EX, EL 34 EX, EL 42 EX, EL 52 EX, EL 53 EX, EL 60 EX, EL 61 EX
[2] EL 1 EX, EL 2 EX, EL 3 EX, EL 5 EX, EL 9 EX

Dust-Ex (Zone 10)

Electrodes	Oscillator	VEGATOR level switch	Certificate
Capacitive electrodes [1]	E15 EX	521 EX, 522 EX, 523 EX 527 EX, 621 EX, 622 EX 425 ExF, 825 Ex	BVS-no. 96.Y.8006
Capacitive VEGACAP 11 EXS 31 EXS 82 EXS	CAP E30 R EX S	compact instrument	BVS-no. 95.Y.8001

Zone 2

According to DIN VDE 0165 instruments can be used in hazardous areas of zone 2 without approval; however they have to meet the requirements of paragraph 6.3 of this VDE. The compliance of the instruments with these requirements is confirmed in a manufacturer declaration.

Ship approvals

Type approval certificates of several ship classification authorities (GL, LRS, ABS) are available for the use on ships.

WHG

Continuous level measurement with auxiliary level switch

Electrodes	Oscillator	VEGAMET level switch	Test report-no.	VEGASEL auxiliary level switch
Capacitive electrodes EL [1]	E17 EX E18 EX	602 EX, 513 Ex 514 EX, 515 EX	Z-65.13-123	643 543 ... 547
		614 EX	applied	
	CAP E32 EX CAP E32 HEX	compact instrument 4 ... 20 mA [3]	applied	
Capacitive electrodes EK [2]	E17 EX E18 EX	602 EX, 513 Ex 514 EX, 515 EX 614 EX	applied	643 543 ... 547
	CAP E32 EX CAP E32 HEX	compact instrument 4 ... 20 mA [3]	applied	

[1] EL 11 EX0, EL 21 EX0, EL 24 EX0, EL 29 EX, EL 31 EX0, EL 42 EX0
[2] EK 11 EX0, EK 21 EX0, EK 24 EX0, EK 31 EX0
[3] When used in Ex-areas, supply via intrinsically safe circuit (ia)

Level detection with fault monitoring

Electrodes	Oscillator	VEGATOR level switch	Test report-no.
Capacitive electrodes EL [1]	E15 EX E17 EX E18 EX	621 EX, 622 EX 521 EX, 522 EX 523 EX, 527 EX	Z-65.13-105
Capacitive electrodes EK [2]	E15 EX E17 EX E18 EX	621 EX, 622 EX 521 EX, 522 EX 523 EX, 527 EX	applied
Capacitive VEGACAP [3]	CAP E30 C CAP E30 R CAP E30 T	compact instrument	Z-65.13-160
Capacitive VEGACAP 21, 35, 98	CAP E31 R	compact instrument	applied

[1] EL 11 EX0, EL 21 EX0, EL 24 EX0, EL 26 EX0, EL 29 EX, EL 31 EX0, EL 42 EX0
[2] EK 11 EX0, EK 21 EX0, EK 24 Ex0, EK 26 EX0, EK 31 EX0
[3] VEGACAP 11, 21, 26, 31, 33, 34

4 Mounting and installation instructions

4.1 General

Different product and measurement requirements demand different types of installations. The following instructions should be observed.

Lateral load

Make sure that the electrode is not subjected to strong lateral forces. Mount the electrode at a location in the vessel where no interfering influences due to e.g. stirrers, filling apertures, etc. occur. This is mainly applicable for very long rod and cable electrodes (fig. 4.1).

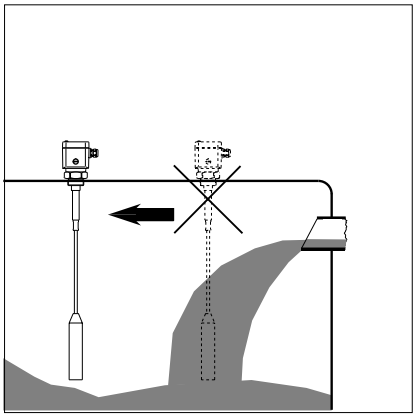


Fig. 4.1 Lateral load

Plate electrode

Install the plate electrode such that the electrode surface is flush with the vessel wall. The wall thickness of the vessel should not exceed 20 mm. Chamfer the inner edge of the hole so that buildup can be avoided.

Pressure

If there is gauge or low pressure in the vessel, the mounting boss must be sealed on the thread. Please use the supplied seal ring. Check if the seal ring is resistant to the measured product.

Insulating measures such as wrapping the thread with teflon tape can interrupt the necessary electrical connection in metal vessels. For this reason, connect the electrode to ground. See "Grounding".

Horizontal installation

The electrode can be installed horizontally to achieve an exact switching point. However if the switching point has a tolerance of several centimeters, we recommend installing the electrode approx. 20° inclined to the bottom so that buildup is avoided (fig. 4.2).

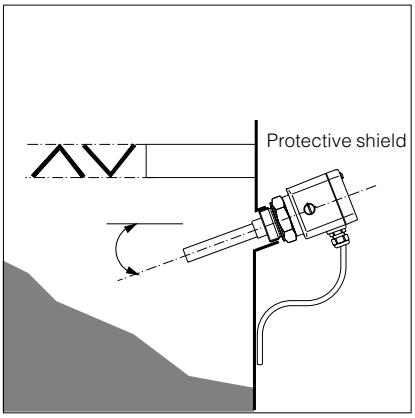


Fig. 4.2 Horizontal installation

Filling opening

Mount the electrode such that it does not protrude directly into the filling stream. If such a location should be necessary, mount a suitable protective shield above or in front of the electrode e.g. L80 x 8 DIN 1028 etc. (see Horizontal installation, fig. 4.2). For very abrasive products, the protective shield should be mounted acc. to fig. 4.2 "a".

Moisture

After installation turn the cable entries of the instrument downward to avoid moisture ingress. The instrument housing can be rotated by approx. 330°. With vertically installed electrodes loop the connecting cable downward from the instrument housing, so that rain and condensation water can drain off.

This is mainly applicable when mounting outdoors, in humid areas (e.g. during cleaning processes) or on cooled or heated vessels (fig. 4.3).

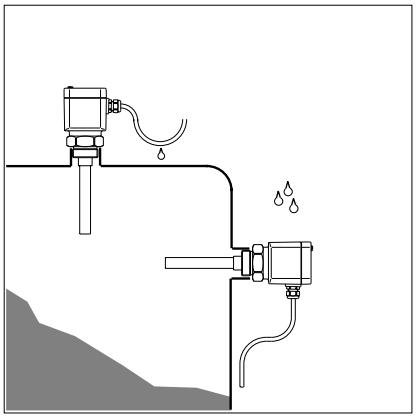


Fig. 4.3 Moisture

Grounding

Make sure that the mechanical connection of the electrode is electrically conductive to the vessel, to ensure sufficient grounding. Use conductive seals such as copper, lead etc. Insulating measures such as wrapping the thread with teflon tape interrupt the necessary electrical connection. Therefore ground the electrode. A ground terminal is provided on the side of the housing.

Rod electrodes

Mount the rod electrodes so that the electrode protrudes into the vessel (fig. 4.4).

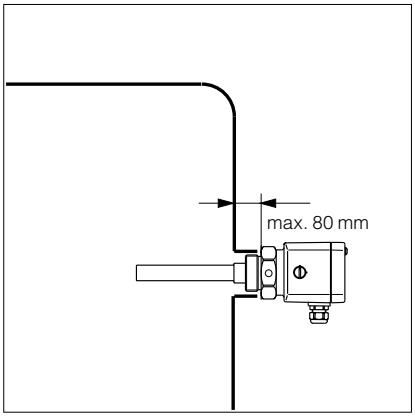


Fig. 4.4 Rod electrodes

Cable electrodes in solids

Depending upon the kind of solid and location or kind of filling, the cable electrode can "float" despite the gravity weight. The electrode (cable) is pushed by the product to the vessel wall and inaccurate measured values result. This must be avoided for continuous level measurement. Use a fixing weight to fix the cable electrode.
Avoid high cable tension when fixing the electrode. In our price list, you will find a fixing spring (as an accessory) that prevents overload of the cable.

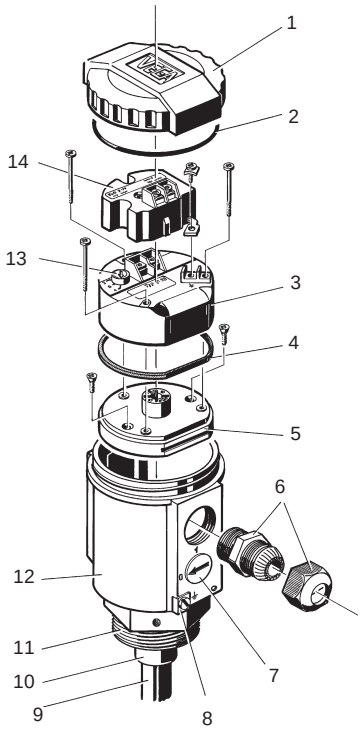
5 Electrical connection

5.1 Wiring instructions type EL/EK

Note

Switch off the power supply before starting the wiring.

The electrical connection must conform to the oscillator used. The installed electronics type is stated on the type plate of the oscillator.



1 Housing cover
2 Seal ring
3 Oscillator
4 Cellular rubber seal
5 Socket plate
6 Cable entry
7 Test switch (option)
8 Ground terminal
9 Electrode
10 Insulation
11 Process connection
12 Housing (T)
13 Range selector
14 Overvoltage protection module (option)

Fig. 5.1 Capacitive electrode EL

Note

If strong electromagnetic interference is to be expected, we recommend using a shielded cable. The shield of the cable must be grounded at the sensor end. Carry out the grounding on the sensor side (electrode).

Generally connect the electrode to vessel ground (PA). A terminal is provided on the side of the housing. This connection is also used for the ground reference potential and for electrostatic discharge.

5.2 Wiring plan type EL/EK

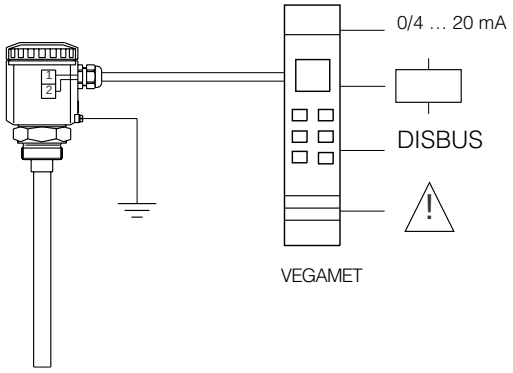
Note

The oscillator is independent of the electrode and can be exchanged on site.

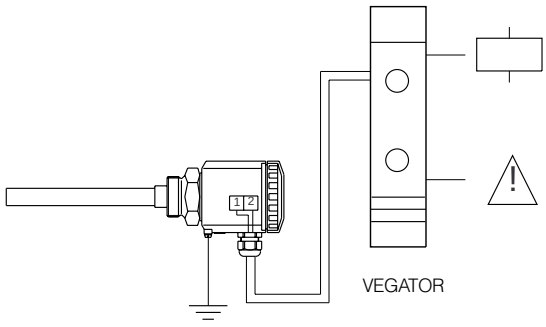
As the oscillators have different characteristics, it can be necessary to readjust the signal conditioning instrument after an exchange of electronics.

Connection examples

Continuous level measurement

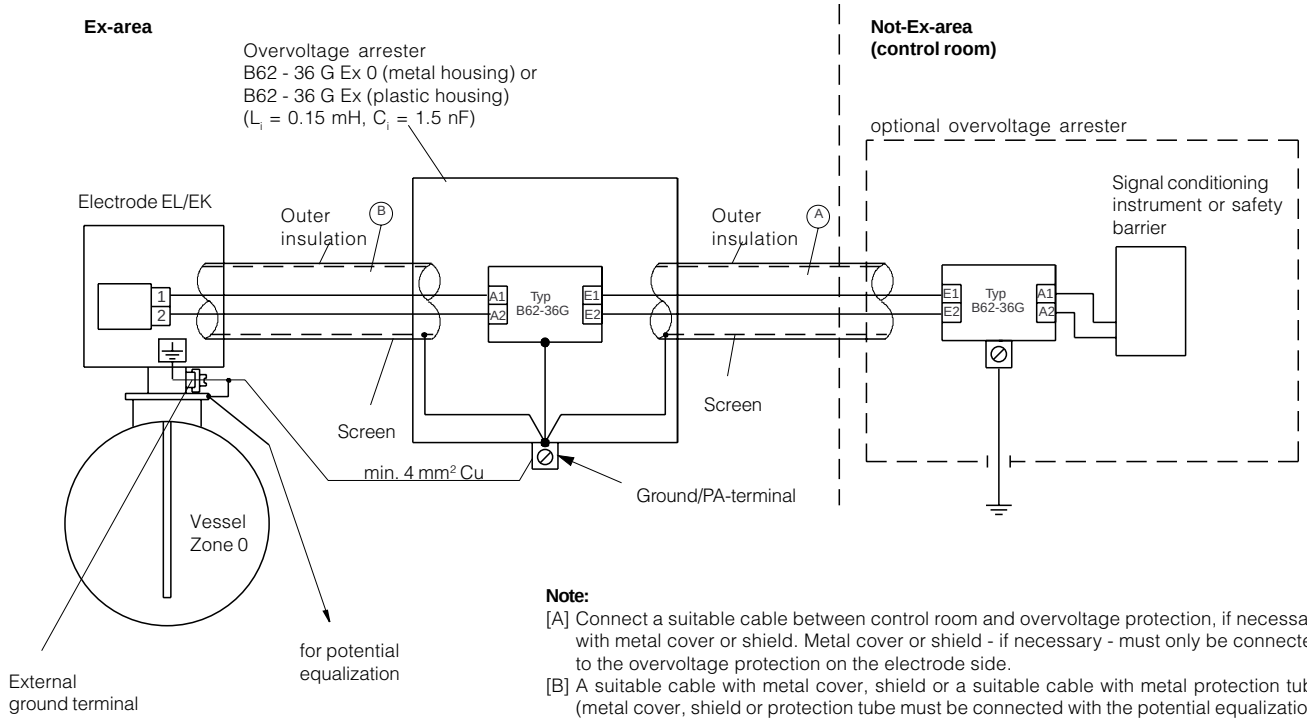


Level detection



Capacitive electrode with external overvoltage protection unit

Vessel without cathodic corrosion protection



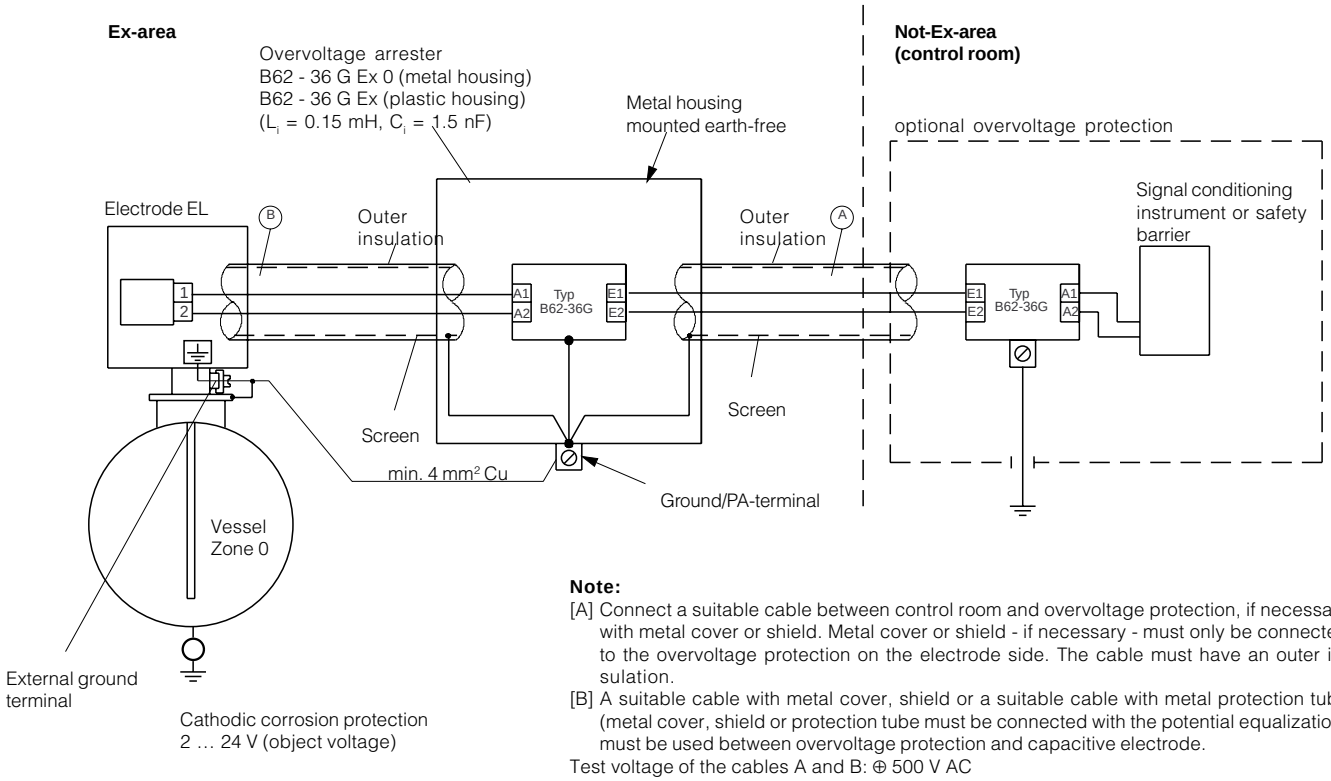
Note:

[A] Connect a suitable cable between control room and overvoltage protection, if necessary with metal cover or shield. Metal cover or shield - if necessary - must only be connected to the overvoltage protection on the electrode side.

[B] A suitable cable with metal cover, shield or a suitable cable with metal protection tube (metal cover, shield or protection tube must be connected with the potential equalization) must be used between overvoltage protection and capacitive electrode.

Test voltage of the cables A and B: ⊕ 500 V AC

Vessel with cathodic corrosion protection



Note:

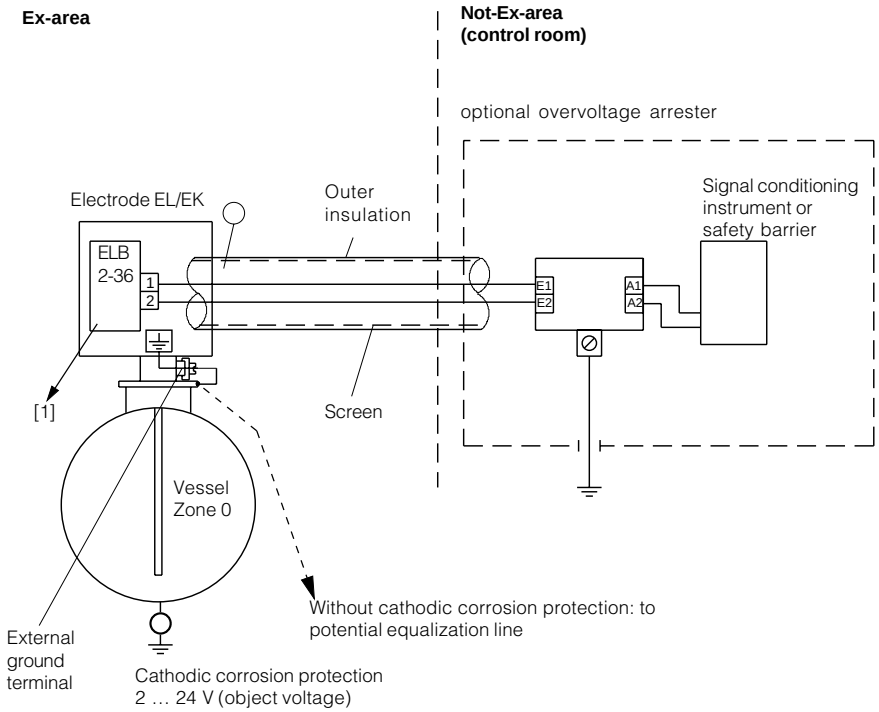
[A] Connect a suitable cable between control room and overvoltage protection, if necessary with metal cover or shield. Metal cover or shield - if necessary - must only be connected to the overvoltage protection on the electrode side. The cable must have an outer insulation.

[B] A suitable cable with metal cover, shield or a suitable cable with metal protection tube (metal cover, shield or protection tube must be connected with the potential equalization) must be used between overvoltage protection and capacitive electrode.

Test voltage of the cables A and B: ⊕ 500 V AC

Capacitive electrode with integral overvoltage protection module

Vessel with/without cathodic corrosion protection



[1] Overvoltage protection module ELB 2-36 mounted to oscillator (L_i = 0.15 mH, C_i = 1.5 nF)

Note:

[A] Connect a suitable cable between control room and overvoltage protection, if necessary with metal cover or shield. Metal cover or shield - if necessary - must only be connected to the overvoltage protection on the electrode side. The cable must have an outer insulation for cathodic corrosion protection.

5.3 Connection instructions VEGACAP

Danger

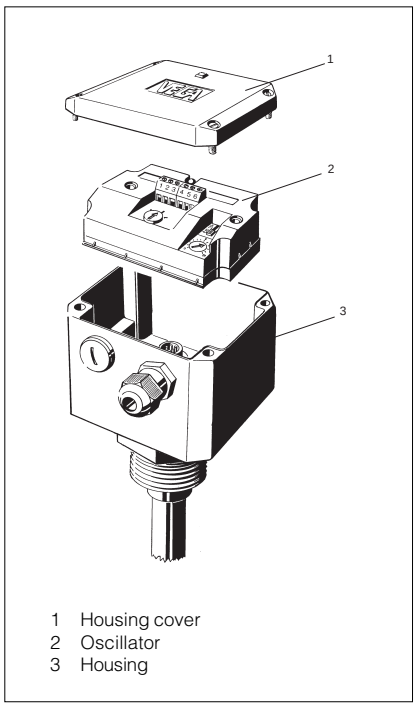
Switch off the power supply before starting the wiring.

The electrical connection must conform to the oscillator used. Connect mains according to the following diagrams.

Note

If strong electromagnetic interference is to be expected, we recommend using a shielded cable. The shielding of the cable must be grounded at one end. Provide the grounding on the sensor side (electrode).

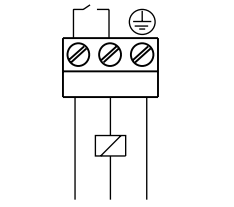
Generally connect VEGACAP to vessel ground (PA). A thread (screw M4 x 5) is provided on the side of the hexagon of the mounting boss. This connection is also used for ground reference potential as well as for electrostatic discharge.



1 Housing cover
2 Oscillator
3 Housing

Fig. 5.2 VEGACAP

5.4 Connection diagram VEGACAP



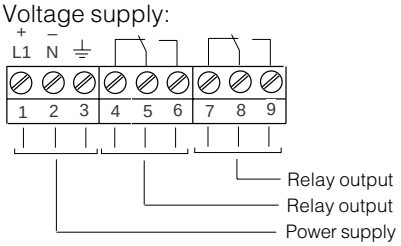
Non-contact switch (E30 C)

Voltage supply:
20 … 250 V AC, 50/60 Hz
20 … 250 V DC
(for further information see technical data)

For direct control of relays, contactors, valves, warning lights, horns etc. the instrument must not be operated without connected load (switched in series), as the oscillator can be destroyed when connected directly to mains. Not suitable for connection to low voltage PLC-inputs. The domestic current is temporarily lowered below 1 mA after switching off the load so that contactors (whose holding current is lower than the permanently flowing domestic current of the electronics) are reliably switched off.

Floating relay output (E30 R, E31 R)

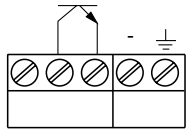
Voltage supply:



20 … 250 V AC, 50/60 Hz
20 … 72 V DC
(for further information see technical data)

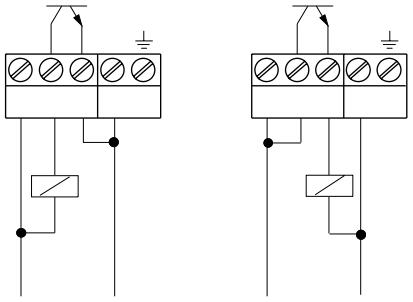
For switching of external voltage sources to relays, contactors, valves, warning lights, horns etc.

Floating transistor output (E30 T)



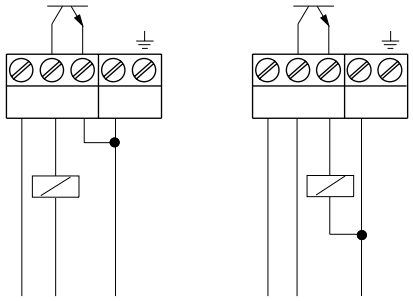
Voltage supply:
10 … 55 V DC
(for further information see the following connection examples as well as the technical data)

Connection examples



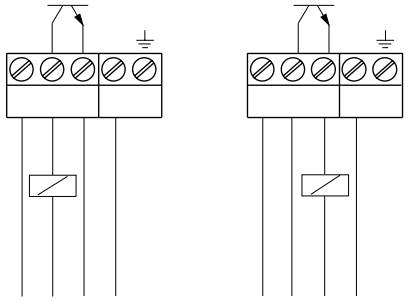
NPN action PNP action

The transistor switches the supply voltage of the oscillator to the binary input of a PLC or to an electrical load. PNP or NPN action can be achieved by changing the connection of the load circuit.



NPN action PNP action

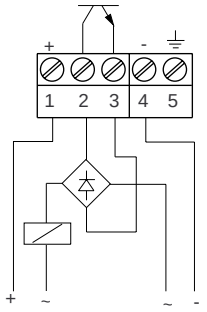
The transistor switches a second voltage source with the same reference potential to the binary input of a PLC or to an electrical load. PNP or NPN action can be achieved by changing the connection of the load circuit.



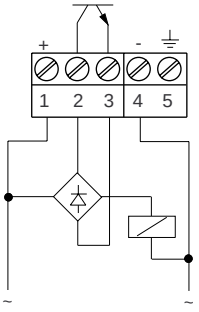
NPN action PNP action

The transistor switches a second, galvanically isolated voltage source to the binary input of a DCS or to an electrical load. PNP or NPN action can be achieved by changing the connection of the load circuit.

Control of alternating current loads



The transistor switches a galvanically isolated alternating voltage 10 … 42 V AC to a load.



The transistor switches an alternating voltage 10 … 42 V AC, which is also supply voltage, to a load.

Note

The transistor outputs of multiple VEGACAPs can be switched in series or in parallel, to connect their signal logically. The connection must be made such that terminal 2 always has a higher voltage than terminal 3.

6 Order code

6.1 Capacitive electrodes type EL

Capacitive rod electrode EL 11

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- EXS.X StEx Zone 10 [•]
- .M Ship approval [x]

Process connection
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x] [o] [•]
- GBV Thread G 1 1/2 A of 1.4571 [x] [o] [•]
- FCS Flange DN 50 PN 40 of steel (welded with electrode) [x] [o] [•]
- FCV Flange DN 50 PN 40 of 1.4571 (welded with electrode) [x] [o] [•]
- [ ] Others

Material rod
- S steel [x] [o] [•]
- V 1.4571 [x] [o] [•]

Insulation
- B PP (L1 = 100 mm; other lengths on request) [x] [•]
- T PTFE (L1 = 50 mm; other lengths on request) [x] [o] [•]

Concentric tube, screening tubes
(not in conjunction with process connection of Aluminium)
- X without [x] [o] [•]
- A Concentric tube of steel [x] [o]
- B Concentric tube of 1.4571 [x] [o]
- D Screening tube of steel with closing cone of PP [x] [•]
- E Screening tube of steel with closing cone of PTFE [x] [o] [•]
- F Screening tube of 1.4571 with closing cone of PP [x] [•]
- G Screening tube of 1.4571 with closing cone of PTFE [x] [o] [•]

Adapters (from 100°C with temperature adapter)
(not in conjunction with PP-insulation)
- X without [x] [o] [•]
- 1 Temperature adapter up to 200°C of galvanized steel [x] [o] [•]
- 2 Temperature adapter up to 200°C of 1.4571 [x] [o] [•]
- 3 Temperature adapter up to 150°C of PA [x] [o]
- 4 Adapter for combustible liquids in pressurized vessels, e.g. liquid gas [x] [o]

Housing
- K Plastic PBT (Valox) IP 66 [x] [o] [•]
- T Plastic PBT (Valox) IP 66 with test switch [x] [o] [•]
- V 1.4301 IP 66/IP 67 [x] [o] [•]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [o] [•]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however appr. for Ex, WHG [x] [o] [•]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however appr. for Ex, WHG [x] [o] [•]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however appr. for Ex [x] [o] [•]

Overvoltage arrester integrated in housing
- X without [x] [o] [•]
- B with overvoltage arrester ELB 2-36 [x] [o] [•]
- C Overvoltage arrester for electrost. discharge [x]

EL11 Order number

Capacitive rod electrode EL 21

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval [x]

Process connection
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x] [o]
- GBV Thread G 1 1/2 A of 1.4571 [x] [o]
- FCS Flange DN 50 PN 40 of steel (welded with electrode) [x] [o]
- FCV Flange DN 50 PN 40 of 1.4571 (welded with electrode) [x] [o]
- PAS Flange DN 25 PN 40 of steel, PTFE-plated [x] [o]
- PAV Flange DN 25 PN 40 of 1.4571, PTFE-plated [x] [o]
- [ ] Others [x] [o]

Material rod
- S steel [x] [o]
- V 1.4571 [x] [o]

Insulation
- E PE [x]
- D PTFE 2.0 mm insulation thickness [x] [o]
- T PTFE 3.2 mm insulation thickness [x] [o]
- F PFA [x] [o]

Concentric tube, screening tubes
(not in conjunction with process connection of Aluminium)
- X without [x] [o]
- A Concentric tube of steel [x] [o]
- B Concentric tube of 1.4571 [x] [o]
- D Screening tube of steel with closing cone of PP [x]
- E Screening tube of steel with closing cone of PTFE [x] [o]
- F Screening tube of 1.4571 with closing cone of PP [x]
- G Screening tube of 1.4571 with closing cone of PTFE [x] [o]

Adapters (from 100°C with temperature adapter)
(not in conjunction with PP-insulation)
- X without [x] [o]
- 1 Temperature adapter up to 200°C of galvanized steel [x] [o]
- 2 Temperature adapter up to 200°C of 1.4571 [x] [o]
- 3 Temperature adapter up to 150°C of PA [x] [o]
- 4 Adapter for combustible liquids in pressurized vessels, e.g. liquid gas [x] [o]

Housing
- K Plastic PBT (Valox) IP 66 [x] [o]
- T Plastic PBT (Valox) IP 66 with test switch [x] [o]
- V 1.4301 IP 66/IP 67 [x] [o]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [o]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however appr. for Ex, WHG [x] [o]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however appr. for Ex, WHG [x] [o]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however appr. for Ex [x] [o]

Overvoltage arrester integrated in housing
- X without [x] [o]
- B with overvoltage arrester ELB 2-36 [x] [o]
- C Overvoltage arrester for electrost. discharge [x]

EL21 Order number

Capacitive rod electrode EL 24 for adhesive products

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval [x]

Process connection
- GBS Thread G 1 1/2 A of steel [x] [o]
- GBV Thread G 1 1/2 A of 1.4571 [x] [o]
- YYY Others [x] [o]

Adapters (from 100°C with temperature adapter)
- X without [x] [o]
- 3 Temperature adapter up to 150°C of PA

Housing
- K Plastic PBT (Valox) IP 66 [x] [o]
- T Plastic PBT (Valox) IP 66 with test switch [x] [o]
- V 1.4301 IP 66/IP 67 [x] [o]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [o]

Oscillators mounted into electrode
- X without
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however approved for Ex [x] [o]
- Y Others e.g. 4…20mA, HART®, Profibus PA

Overvoltage arrester
- X without [x] [o]
- B with overvoltage arrester ELB 2-36 [x] [o]
- C Overvoltage arrester for electrostat. discharge [x]

EL24 VAX — Order number

Fully insulated capacitive rod electrode EL 28

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]

Process connection
- GTV Thread G 1/2 A of 1.4571 [x]

Material rod
- V 1.4571 [x]

Insulation
- T PTFE [x]

Concentric tube, screening tubes
- X without [x]

Adapters
- X without [x]

Housing
- X without
- K Plastic PBT (Valox) IP 66 with 2 m triax cable and BNC-plug [x]

Oscillators mounted into electrode
- X without
- B E15 for level detection with potential separation
- C E15 Ex as E15, however appr. for Ex, WHG [x]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however appr. for Ex, WHG [x]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however appr. for Ex [x]
- Y Others e.g. 4…20mA, HART®, Profibus PA

Overvoltage arrester integrated in housing
- X without [x] [o]
- B with overvoltage arrester ELB 2-36 [x]

EL28 GTV V T X X — Order number

Capacitive rod electrode EL 26 for adhesive products (only level detection)

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval [x]

Process connection
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x] [o]
- GBV Thread G 1 1/2 A of 1.4571 [x] [o]
- FCS Flange DN 50 PN 40 of steel (welded with electrode) [x] [o]
- FCV Flange DN 50 PN 40 of 1.4571 (welded with electrode) [x] [o]
- PAS Flange DN 25 PN 40 of steel, PTFE-plated [x] [o]
- PAV Flange DN 25 PN 40 of 1.4571, PTFE-plated [x] [o]
- [ ] Others [x] [o]

Material rod
- S steel [x] [o]
- V 1.4571 [x] [o]

Insulation
- T PTFE [x] [o]
- F PFA [x] [o]

Concentric tube, screening tubes
- X without [x] [o]

Adapters (from 100°C with temperature adapter)
- X without [x] [o]
- 1 Temperature adapter up to 200°C of galvanized steel [x] [o]
- 2 Temperature adapter up to 200°C of 1.4571 [x] [o]

Housing
- K Plastic PBT (Valox) IP 66 [x] [o]
- T Plastic PBT (Valox) IP 66 with test switch [x] [o]
- V 1.4301 IP 66/IP 67 [x] [o]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [o]

Oscillators mounted into electrode
- X without
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however appr. for Ex [x] [o]

Overvoltage arrester integrated in housing
- X without [x] [o]
- B with overvoltage arrester ELB 2-36 [x] [o]
- C Overvoltage arrester of electrostat. discharge [x]

EL26 X — Order number

Capacitive double rod electrode EL 29

Approval
- .X without
- EX.A CENELEC EEx ia IIC, WHG [x]

Process connection
- FCB Flange DN 50 of PP [x]
- FCC Flange DN 50 of PVC [x]
- FCT Flange DN 50 of PTFE [x]
- FDB Flange DN 80 of PP [x]
- FDC Flange DN 80 of PVC [x]
- FDT Flange DN 80 of PTFE [x]
- FFB Flange DN 100 of PP [x]
- FFC Flange DN 100 of PVC [x]
- FFT Flange DN 100 of PTFE [x]
- AIT Flange ANSI 2" 150 psi of PTFE [x]
- AKT Flange ANSI 2" 300 psi of PTFE [x]
- YYY Others [x]

Housing
- K Plastic PBT (Valox) IP 66 [x]
- T Plastic PBT (Valox) IP 66 with test switch [x]
- Y Others

Oscillators mounted into electrode
- X without
- B E15 for level detection with potential separation
- C E15 Ex as E15, however approved for Ex, WHG [x]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however approved for Ex, WHG [x]
- Y Others e.g. 4…20mA, HART®, Profibus PA

Overvoltage arrester integrated in housing
- X without [x] [o]
- B with overvoltage arrester ELB 2-36 [x]

EL29 — Order number

Capacitive cable electrode EL 31

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- EXS.X StEx Zone 10 [•]
- .M Ship approval [x]

Process connection
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x] [o] [•]
- GBV Thread G 1 1/2 A of 1.4571 [x] [o] [•]
- FCS Flange DN 50 PN 40 of steel (welded with electrode) [x] [o] [•]
- FCV Flange DN 50 PN 40 of 1.4571 (welded with electrode) [x] [o] [•]
- ☐ Others

Material cable
- S steel [x] [o] [•]
- V 1.4571 [x] [o] [•]

Insulation
- B PP (L1 = 100 mm; other lengths on request) [x] [•]
- T PTFE (L1 = 50 mm; other lengths on request) [x] [o] [•]

Concentric tube, screening tubes
(not in conjunction with process connection of Aluminium)
- X without [x] [o] [•]
- D Screening tube of steel with closing cone of PP [x] [•]
- E Screening tube of steel with closing cone of PTFE [x] [o] [•]
- F Screening tube of 1.4571 with closing cone of PP [x] [•]
- G Screening tube of 1.4571 with closing cone of PTFE [x] [o] [•]

Adapters (from 100°C with temperature adapter)
(not in conjunction with PP-Insulation)
- X without [x] [o] [•]
- 1 Temperature adapter up to 200°C of galvanized steel [x] [o] [•]
- 2 Temperature adapter up to 200°C of 1.4571 [x] [o] [•]
- 3 Temperature adapter up to 150°C of PA [x] [o]
- 4 Adapter for combustible liquids in pressurized vessels, e.g. liquid gas [x] [o]

Gravity weight, fixing insulator
- S Gravity weight of steel [x] [o] [•]
- V Gravity weight of 1.4571 [x] [o] [•]
- T Fixing insulator of ceramic and steel [x] [o] [•]
- E Fixing insulator of ceramic and 1.4571 [x] [o] [•]
- Y Others [x] [o] [•]

Housing
- K Plastic PBT (Valox) IP 66 [x] [o] [•]
- T Plastic PBT (Valox) IP 66 with test switch [x] [o] [•]
- V 1.4301 IP 66/IP 67 [x] [o] [•]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [o] [•]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however appr. for Ex, WHG [x] [o] [•]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however appr. for Ex, WHG [x] [o] [•]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however appr. for Ex [x] [o] [•]

Overvoltage arrester integrated in housing
- X without [x] [o] [•]
- B with overvoltage arrester ELB 2-36 [x] [o] [•]
- C Overvoltage arrester for electrostat. discharge [x]

EL31 Order number

Capacitive cable electrode EL 33

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- .M Ship approval [x]

Process connection
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x]
- GBV Thread G 1 1/2 A of 1.4571 [x]
- FCS Flange DN 50 PN 40 of steel (welded with electrode) [x]
- FCV Flange DN 50 PN 40 of 1.4571 (welded with electrode) [x]
- ☐ Others [x]

Material cable
- S steel [x]
- V 1.4571 [x]

Insulation
- T PTFE [x]

Screening tubes
(not in conjunction with process connection of Aluminium)
- X without [x]
- E Screening tube of steel with closing cone of PTFE [x]
- G Screening tube of 1.4571 with closing cone of PTFE [x]

Adapters (from 100°C with temperature adapter)
- X without [x]
- 1 Temperature adapter up to 200°C of galvanized steel [x]
- 2 Temperature adapter up to 200°C of 1.4571 [x]
- 3 Temperature adapter up to 150°C of PA [x]

Gravity weight
- S of steel [x]
- V of 1.4571 [x]
- Y Others

Housing
- K Plastic PBT (Valox) IP 66 [x]
- T Plastic PBT (Valox) IP 66 with test switch [x]
- V 1.4301 IP 66/IP 67 [x]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however approved for Ex, WHG [x]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however approved for Ex, WHG [x]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however approved for Ex, WHG [x]
- Y Others e.g. 4…20mA, HART®, Profibus PA

Overvoltage arrester
- X without [x] [o]
- B with overvoltage arrester ELB 2-36 [x]
- C Overvoltage arrester for electrostat discharge [x]

EL33 Order number

Capacitive cable electrode EL 34

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- .M Ship approval [x]

Process connection
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x]
- GBV Thread G 1 1/2 A of 1.4571 [x]
- ☐ Others

Screening tubes
(not in conjunction with process connection of Aluminium)
- X without [x]
- D Screening tube of steel with closing cone of PP [x]
- G Screening tube of 1.4571 with closing cone of PTFE [x]

Gravity weight
- S of steel [x]
- V of 1.4571 [x]
- Y Others

Housing
- K Plastic PBT (Valox) IP 66 [x]
- T Plastic PBT (Valox) IP 66 with test switch [x]
- V 1.4301 IP 66/IP 67 [x]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however approved for Ex [x]

Overvoltage arrester
- X without [x]
- B with overvoltage arrester ELB 2-36 [x]
- C Overvoltage arrester for electrostat. discharge [x]

EL34 SE X Order number

Capacitive cable electrode EL 42

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval [x]

Process connection
- GBS Thread G 1 1/2 A of steel [x] [o]
- GBV Thread G 1 1/2 A of 1.4571 [x] [o]
- GBB Thread G 1 1/2 A of steel/PP [x]
- GBT Thread G 1 1/2 A of steel/PTFE [x]
- [ ] Others

Material cable
- S steel [x] [o]
- V 1.4571 [x] [o]

Insulation
- T PTFE [x]

Screening tubes
- X without [x] [o]
- E Screening tube of steel with closing cone of PTFE [x] [o]
- G Screening tube of 1.4571 with closing cone of PTFE [x] [o]

Adapters (from 100°C with temperature adapter)
- X without [x] [o]
- 3 Temperature adapter of PA [x] [o]
- 4 Adapter for combustible liquids in pressurised vessels, e.g. liquid gas [x] [o]

Gravity weight, fixing weight
- G Gravity weight of steel [x] [o]
- N Gravity weight of 1.4571 [x] [o]
- B Gravity weight of steel, PP-fully insulated [x]
- T Gravity weight of steel, PTFE-fully insulated [x]
- I Fixing weight of steel [x] [o]
- P Fixing weight of 1.4571 [x] [o]
- E Fixing weight of steel, PP-fully insulated [x]
- Y Others

Housing
- K Plastic PBT (Valox) IP 66 [x] [o]
- T Plastic PBT (Valox) IP 66 with test switch [x] [o]
- V 1.4301 IP 66/IP 67 [x] [o]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [o]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however appr. for Ex, WHG [x] [o]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however appr. for Ex, WHG [x] [o]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however appr. for Ex, WHG [x] [o]
- Y Others e.g. 4…20mA, HART®, Profibus PA

Overvoltage arrester
- X without [x] [o]
- B with overvoltage arrester ELB 2-36 [x] [o]
- C Overvoltage arrester for electrostat. disch. [x] [o]

EL42 Order number

Capacitive cable electrode EL 52

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- .M Ship approval [x]

Process connection
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x]
- GBV Thread G 1 1/2 A of 1.4571 [x]
- GBP Thread G 1 1/2 A of steel, PP-isoliert [x]
- GBT Thread G 1 1/2 A of steel, PTFE-isoliert [x]
- FCS Flange DN 50 PN 40 of steel (welded with electrode) [x]
- FCV Flange DN 50 PN 40 of 1.4571 (welded with electrode) [x]
- [ ] Others

Material cable
- S steel [x]
- V 1.4571 [x]

Insulation
- T PTFE [x]

Screening tubes
(not in conjunction with process connection of Aluminium)
- X without [x]
- E Screening tube of steel with closing cone of PTFE [x]
- G Screening tube of 1.4571 with closing cone of PTFE [x]

Adapters (from 100°C with temperature adapter)
- X without [x]
- 1 Temperature adapter up to 200°C of galvanized steel [x]
- 2 Temperature adapter up to 200°C of 1.4571 [x]
- 3 Temperature adapter up to 150°C of PA [x]
- 4 Adapter for combustible liquids in pressurized vessels, liquid gas, ammonia [x]

Gravity weight, fixing weight
- G Gravity weight of steel [x]
- N Gravity weight of 1.4571 [x]
- B Gravity weight of steel, PP-fully insulated
- T Gravity weight of steel, PTFE-fully insulated
- I Fixing weight of steel [x]
- P Fixing weight of 1.4571 [x]
- E Fixing weight of steel, PP-fully insulated
- Y Others

Housing
- K Plastic PBT (Valox) IP 66 [x]
- T Plastic PBT (Valox) IP 66 with test switch [x]
- V 1.4301 IP 66/IP 67 [x]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however approved for Ex [x]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however approved for Ex [x]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however approved for Ex [x]
- Y Others e.g. 4…20mA, HART®, Profibus PA

Overvoltage arrester
- X without [x]
- B with overvoltage arrester ELB 2-36 [x]
- C Overvoltage arrester for electrostat. discharge [x]

EL52 Order number

Capacitive cable electrode EL 53

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- .M Ship approval [x]

Prozeßanschluß
- GBA Thread G 1 1/2 A of Aluminium [x]
- GBS Thread G 1 1/2 A of steel [x]
- GBV Thread G 1 1/2 A of 1.4571 [x]
- [ ] Others

Screening tubes (not in conjunction with process connection of Alu)
- X without [x]
- D Screening tube of steel with closing cone of PP [x]
- F Screening tube of 1.4571 with closing cone of PP [x]

Gravity weight, fixing weight
- G Gravity weight of steel [x]
- N Gravity weight of 1.4571 [x]
- I Fixing weight of steel [x]
- P Fixing weight of 1.4571 [x]
- Y Others

Housing
- K Plastic PBT (Valox) IP 66 [x]
- T Plastic PBT (Valox) IP 66 with test switch [x]
- V 1.4301 IP 66/IP 67 [x]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however approved for Ex [x]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however approved for Ex [x]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however approved for Ex [x]
- Y Others e.g. 4…20mA, HART®, Profibus PA

Overvoltage arrester
- X without [x]
- B with overvoltage arrester ELB 2-36 [x]
- C Overvoltage arrester for electrostat. discharge [x]

EL53 SE X — Order number

Capacitive high-temperature cable electrode EL 61

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EXS.X StEx Zone 10 [•]

Process connection
- GBS Thread G 1 1/2 A of steel [x] [•]
- GBV Thread G 1 1/2 A of 1.4571 [x] [•]
- [ ] Others

Werkstoff Seil and Stützrohr
- S steel [x] [•]
- V 1.4571 [x] [•]

Gravity weight
- S of steel [x] [•]
- V of 1.4571 [x] [•]
- Y Others

Housing
- K Plastic PBT (Valox) IP 66 [x] [•]
- T Plastic PBT (Valox) IP 66 with test switch [x] [•]
- V 1.4301 IP 66/IP 67 [x] [•]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [•]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however approved for Ex [x] [•]

Overvoltage arrester
- X without [x]
- B with overvoltage arrester ELB 2-36 [x]
- C Overvoltage arrester for electrostat. discharge [x]

EL61 XXX — Order number

Capacitive high-temperature rod electrode EL 60

Approval
- .X without
- EX.X CENELEC EEx ia IIC [x]
- EXS.X StEx Zone 10 [•]

Process connection
- GBS Thread G 1 1/2 A of steel [x] [•]
- GBV Thread G 1 1/2 A of 1.4571 [x] [•]
- [ ] Others

Material rod and supporting tube
- S steel [x] [•]
- V 1.4571 [x] [•]

Housing
- K Plastic PBT (Valox) IP 66 [x] [•]
- T Plastic PBT (Valox) IP 66 with test switch [x] [•]
- V 1.4301 IP 66/IP 67 [x] [•]
- A Aluminium IP 54 with separate plastic housing IP 66 and 2 m triax cable [x] [•]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however approved for Ex [x] [•]

Overvoltage arrester
- X without [x] [•]
- B with overvoltage arrester ELB 2-36 [x] [•]
- C Overvoltage arrester for electrostat. discharge [x]

EL60 XXX — Order number

Partly insulated, heavy capacitive cable electrode EL 70

Approval
- .X without
- EXS.X StEx Zone 10 [•]

Process connection
- FEG Flange DIN DN 100 PN 10 of GG [•]

Material cable
- S steel [•]
- V 1.4571 [•]
- A steel with abrasion protection of steel [•]
- B 1.4571 with abrasion protection of 1.4571 [•]

Insulation
- E PE [•]

Gravity weight, fixing weight, fixing insulator
- I Fixing insulator of ceramic [•]
- S Gravity weight of GG ø 95 mm [•]

Housing
- G of GG, IP 66 [•]

Oscillators mounted into electrode
- X without
- A E14 for level detection
- B E15 for level detection with potential separation
- C E15 Ex as E15, however appr. for Ex [•]
- D E17 for continuous level measurement floating
- E E17 Ex as E17, however appr. for Ex [•]
- F E18 as E17, however increased frequency
- G E18 Ex as E18, however appr. for Ex [•]

EL42 — Order number

6.2 Capacitive electrodes type EK

Capacitive rod electrode EK 11

Approval
- .X without
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval

Process connection
- TAB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TEB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TBB Thread G 1 A of 1.4435 (316 L) [o]
- TFB Thread 1" NPT of 1.4435 (316 L) [o]

Material rod, rod-ø
- A 1.4435, ø 6 mm [o]
- B 1.4435, ø 10 mm [o]

Insulation
- P PE (with rod-ø 10 mm) [o]
- T PTFE [o]

Concentric tube, screening tube with rod-ø 6 mm
- X without [o]
- H Concentric tube of 1.4435 [o]
- A Screening tube of 1.4435 with closing cone of PTFE [o]

Adapter
- X without [o]
- T Temperature adapter up to 200°C of 1.4435 [o]

Housing
- P Plastic PBT (Valox) IP 66 [o]
- B Plastic PBT (Valox) IP 66 with integral display [o]
- M Aluminium, plastic coated IP 66/IP 67 [o]

Electronics for connection to signal conditioning instr.
- X without
- A E14
- B E15
- C E15 Ex [o]
- D E17
- E E17 Ex [o]
- F E18
- G E18 Ex [o]

Electronics compact
- I 4 … 20 mA standard [o]
- H 4 … 20 mA with HART®/VVO communication [o]
- P Profibus PA [o]
- M Profibus PA with pluggable adjustm. module MINICOM [o]

Overvoltage arrester
- X without [o]
- B with (compact electronics 4 … 20 mA [o]

EK11 — Order number

Capacitive rod electrode EK 21

Approval
- .X without
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval

Process connection
- TAB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TEB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TBB Thread G 1 A of 1.4435 (316 L) [o]
- TFB Thread 1" NPT of 1.4435 (316 L) [o]
- ACF Flange of steel, PTFE-plated DN 25 PN 40 [o]

Material rod, rod-ø
- C 1.steel, ø 10 mm [o]
- D 1.steel, ø 14 mm [o]

Insulation
- P PE (with rod-ø 14 mm)
- T PTFE, 2 mm [o]

Concentric tube, screening tube with rod-ø 6 mm
- X without [o]
- H Concentric tube of 1.4435 [o]
- A Screening tube of 1.4435 with closing cone of PTFE [o]

Adapter
- X without [o]
- T Temperature adapter up to 200°C of 1.4435 [o]

Housing
- P Plastic PBT (Valox) IP 66 [o]
- B Plastic PBT (Valox) IP 66 with integral display [o]
- M Aluminium, plastic coated IP 66/IP 67 [o]

Electronics for connection to signal conditioning instr.
- X without
- A E14
- B E15
- C E15 Ex [o]
- D E17
- E E17 Ex [o]
- F E18
- G E18 Ex [o]

Electronics compact
- I 4 … 20 mA standard [o]
- H 4 … 20 mA with HART®/VVO communication [o]
- P Profibus PA [o]
- M Profibus PA w.pluggable adjustm.module MINICOM [o]

Overvoltage arrester
- X without [o]
- B with (compact electronics 4 … 20 mA [o]

EK21 — Order number

Capacitive rod electrode EK 24

Approval
- .X without
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval

Process connection
- TAB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TEB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TBB Thread G 1 A of 1.4435 (316 L) [o]
- TFB Thread 1" NPT of 1.4435 (316 L) [o]

Material rod
- V 1.4571 [o]

Insulation
- F FEP [o]

Concentric tube, screening tube
- X without [o]

Adapter
- X without [o]

Housing
- P Plastic PBT (Valox) IP 66 [o]
- B Plastic PBT (Valox) IP 66 with integral display [o]
- M Aluminium, plastic coated IP 66/IP 67 [o]

Electronics for connection to signal conditioning instr.
- X without
- F E18
- G E18 Ex [o]

Electronics compact
- I 4 … 20 mA standard [o]
- H 4 … 20 mA with HART®/VVO communication [o]
- P Profibus PA [o]
- M Profibus PA w.pluggable adjustm.module MINICOM [o]

Overvoltage arrester
- X without [o]
- B with (compact electronics 4 … 20 mA [o]

EK24 V F X X — Order number

Capacitive rod electrode EK 26

Approval
- .X without
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval

Process connection
- TAB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TEB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TBB Thread G 1 A of 1.4435 (316 L) [o]
- TFB Thread 1" NPT of 1.4435 (316 L) [o]

Material rod
- S steel [o]

Insulation
- T PTFE [o]

Concentric tube, screening tube
- X without [o]

Adapter
- X without [o]
- T Temperature adapter up to 200°C of 1.4435 [o]

Housing
- P Plastic PBT (Valox) IP 66 [o]
- M Aluminium, plastic coated IP 66/IP 67 [o]

Electronics for connection to signal conditioning instr.
- X without
- F E18
- G E18 Ex [o]

Overvoltage arrester
- X without [o]

EK26 S T X — Order number

Capacitive cable electrode EK 31

Approval
- .X without
- EX0.A Ex Zone 0 acc. to PTB and ATEX II 1/2G EEx ia IIC, WHG [o]
- .M Ship approval

Process connection
- TAB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TEB Thread G $^3/_4$ A of 1.4435 (316 L) [o]
- TBB Thread G 1 A of 1.4435 (316 L) [o]
- TFB Thread 1" NPT of 1.4435 (316 L) [o]

Material cable
- V 1.4401 [o]

Insulation
- P PE
- T PTFE [o]

Screening tube
- X without [o]

Adapter
- X without [o]
- T Temperature adapter up to 200°C of 1.4435 [o]

Gravity weight, fixing insulator
- S Gravity weight of 1.4435 [o]
- A Fixing insulator of ceramic [o]

Housing
- P Plastic PBT (Valox) IP 66 [o]
- B Plastic PBT (Valox) IP 66 with integral display [o]
- M Aluminium, plastic coated IP 66/IP 67 [o]

Electronics for connect. to signal conditioning instr.
- X without
- A E14
- B E15
- C E15 Ex [o]
- D E17
- E E17 Ex [o]
- F E18
- G E18 Ex [o]

Electronics compact
- I 4 … 20 mA standard [o]
- H 4 … 20 mA with HART®/VVO communication [o]
- P Profibus PA [o]
- M Profibus PA w. pluggable adj. module MINICOM [o]

Overvoltage arrester
- X without [o]
- B with (compact electronics 4 … 20 mA [o]

EK11	V	X		Order number

6.3 VEGACAP compact level switch

VEGACAP 11

Approval
- .X without
- .A WHG
- EXS.X StEx Zone 10

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- ☐ Others

Material rod
- S steel
- V 1.4571
- Y Others

Insulation
- B PP (L1 = 100 mm)
- T PTFE (L1 = 50 mm)
- Y Others

Screening tubes against condensation
(not in conjunction with process connection of Aluminium)
- X without
- D Screening tube of steel with closing cone of PP
- E Screening tube of steel with closing cone of PTFE
- F Screening tube of 1.4571 with closing cone of PP
- G Screening tube of 1.4571 with closing cone of PTFE

Adapters
(temperature adapter in conjunction with PTFE-insulation)
- X without
- 1 Temperature adapter up to 200°C of galvanized steel
- 2 Temperature adapter up to 200°C of 1.4571
- 3 Temperature adapter up to 150°C of PA

Housing
- K Plastic PBT (Valox) IP 66
- T Plastic PBT (Valox) IP 66 with test switch

Electronics
- C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
- R Relay output (UB 20…72 V DC, 20…250 V AC)
- T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP11 Order number

VEGACAP 21

Approval
- .X without
- .A WHG

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- ☐ Others

Material rod
- S steel
- Y Others

Insulation
- E PE 2.0 mm insulation thickness
- D PTFE 2.0 mm insulation thickness
- T PTFE 3.2 mm insulation thickness
- F PFA 2.0 mm insulation thickness
- Y Others

Screening tubes against condensation
(not in conjunction with process connection of Aluminium)
- X without
- D Screening tube of steel with closing cone of PP
- E Screening tube of steel with closing cone of PTFE
- F Screening tube of 1.4571 with closing cone of PP
- G Screening tube of 1.4571 with closing cone of PTFE

Adapters
(temperature adapter in conjunction with PTFE-insulation)
- X without
- 1 Temperature adapter up to 200°C of galvanized steel
- 2 Temperature adapter up to 200°C of 1.4571
- 3 Temperature adapter up to 150°C of PA

Housing
- K Plastic PBT (Valox) IP 66
- T Plastic PBT (Valox) IP 66 with test switch

Electronics
- C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
- R Relay output (UB 20…72 V DC, 20…250 V AC)
- T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP21 Order number

VEGACAP 26

Approval
- .X without
- .A WHG

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- ☐ Others

Material rod
- S steel
- Y Others

Insulation
- T PTFE
- F PFA
- Y Others

Screening tubes against condensation
- X without

Adapters
- X without
- 1 Temperature adapter up to 200°C of galvanized steel
- 2 Temperature adapter up to 200°C of 1.4571

Housing
- K Plastic PBT (Valox) IP 66
- T Plastic PBT (Valox) IP 66 with test switch

Electronics
- C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
- R Relay output (UB 20…72 V DC, 20…250 V AC)
- T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP26 X Order number

VEGACAP 27

Approval
- .X without
- .A WHG

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- ☐ Others

Material rod
- S steel
- Y Others

Insulation
- T PTFE
- F PFA
- Y Others

Screening tubes against condensation
- X without

Adapters
- X without
- 1 Temperature adapter up to 200°C of galvanized steel
- 2 Temperature adapter up to 200°C of 1.4571

Housing
- P Plastic PBT (Valox) IP 66
- M Aluminium plastic coated IP 66/IP 67

Electronics
- D adjustment free with floating double relay (DPDT, max. 5 A), (UB 20…72 V DC, 20…250 V AC)

CAP27 X Order number

VEGACAP 31

Approval
- .X without
- .A WHG
- EXS.X StEx Zone 10

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- [ ] Others

Material cable
- S steel
- V 1.4571

Insulation
- B PP (L1 = 100 mm)
- T PTFE (L1 = 50 mm)

Screening tubes against condensation
(not in conjunction with process connection of Aluminium)
- X without
- D Screening tube of steel with closing cone of PP
- E Screening tube of steel with closing cone of PTFE
- F Screening tube of 1.4571 with closing cone of PP
- G Screening tube of 1.4571 with closing cone of PTFE

Adapters
(Temperature adapter in conjunction with PTFE-insulation)
- X without
- 1 Temperature adapter up to 200°C of galvanized steel
- 2 Temperature adapter up to 200°C of 1.4571
- 3 Temperature adapter up to 150°C of PA

Gravity weight
- S of steel
- V of 1.4571

Housing
- K Plastic PBT (Valox) IP 66
- T Plastic PBT (Valox) IP 66 with test switch

Electronics
- C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
- R Relay output (UB 20…72 V DC, 20…250 V AC)
- T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP31 — Order number

VEGACAP 33

Approval
- .X without
- .A WHG

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- [ ] Others

Material cable
- S steel
- V 1.4571

Insulation
- T PTFE

Screening tubes against condensation
(not in conjunction with process connection of Aluminium)
- X without
- E Screening tube of steel with closing cone of PTFE
- G Screening tube of 1.4571 with closing cone of PTFE

Adapters
(temperature adapter in conjunction with PTFE-insulation)
- X without
- 1 Temperature adapter up to 200°C of galvanized steel
- 2 Temperature adapter up to 200°C of 1.4571
- 3 Temperature adapter up to 150°C of PA

Gravity weight
- S of steel
- V of 1.4571

Housing
- K Plastic PBT (Valox) IP 66
- T Plastic PBT (Valox) IP 66 with test switch

Electronics
- C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
- R Relay output (UB 20…72 V DC, 20…250 V AC)
- T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP33 — Order number

VEGACAP 34

Approval
- .X without
- .A WHG

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- [ ] Others

Material cable
- S steel

Insulation
- E PE/PA 12

Screening tubes against condensation
(not in conjunction with process connection of Aluminium)
- X without
- D Screening tube of steel with closing cone of PP
- F Screening tube of 1.4571 with closing cone of PP

Adapters
- X without

Gravity weight
- S of steel
- A of Aluminium
- V of 1.4571

Housing
- K Plastic PBT (Valox) IP 66
- T Plastic PBT (Valox) IP 66 with test switch

Electronics
- C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
- R Relay output (UB 20…72 V DC, 20…250 V AC)
- T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP34 S E X — Order number

VEGACAP 35

Approval
- .X without
- .A WHG

Process connection
- GBA Thread G 1 1/2 A of Aluminium
- GBS Thread G 1 1/2 A of steel
- GBV Thread G 1 1/2 A of 1.4571
- NBS Thread NPT 1 1/2" of steel
- NBV Thread NPT 1 1/2" of 1.4571
- [ ] Others

Material cable
- S steel

Insulation
- E PE/PA 12

Screening tubes against condensation
- X without

Adapters
- X without

Gravity weight
- S of steel
- V of 1.4571

Housing
- P Plastic PBT (Valox) IP 66
- M Aluminium plastic coated IP 66/IP 67

Electronics
- D adjustment free with floating double relay (DPDT, max. 5 A), (UB 20…72 V DC, 20…250 V AC)

CAP35 S E X X — Order number

VEGACAP 60

Process connection
GBS Thread G 1 1/2 A of steel
GBV Thread G 1 1/2 A of 1.4571
[ ] Others
Material rod and supporting tube
S steel
V 1.4571
Insulation
X without
Concentric tubes, screening tubes
X without
Adapters
X without
Housing
K Plastic PBT (Valox) IP 66
T Plastic PBT (Valox) IP 66 with test switch
Electronics
C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
R Relay output (UB 20…72 V DC, 20…250 V AC)
T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP60.X X X X Order number

VEGACAP 61

Process connection
GBS Thread G 1 1/2 A of steel
GBV Thread G 1 1/2 A of 1.4571
[ ] Others
Material cable
S steel
V 1.4571
Insulation
X without
Concentric tubes, screening tubes
X without
Adapters
X without
Gravity weight
S of steel
V of 1.4571
Y Others
Housing
K Plastic PBT (Valox) IP 66
T Plastic PBT (Valox) IP 66 with test switch
Electronics
C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
R Relay output (UB 20…72 V DC, 20…250 V AC)
T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP61.X Order number

VEGACAP 82 and 92

Instrument type
82 PTFE-partly insulated
92 PTFE-fully insulated
Approval
.X without
.A WHG
EXS.X StEx Zone 10
Adapters
X without
3 Temperature adapter up to 150°C of PA
Housing
K Plastic PBT (Valox) IP 66
T Plastic PBT (Valox) IP 66 with test switch
Electronics
C Non-contact (UB 20…250 V AC/DC; max. 400 mA)
R Relay output (UB 20…72 V DC, 20…250 V AC)
T Transistor output (NPN/PNP; UB 10…55 V DC, max. 400 mA)

CAP Order number

VEGACAP 98

Approval
.X without
.A WHG
Housing
P Plastic PBT (Valox) IP 66
M Aluminium plastic coated IP 66/IP 67
Length
X Standard (200 mm)
Y Others (max. 1.5 m)
Electronics
D adjustment free with floating double relay (DPDT, max. 5 A), (UB 20…72 V DC, 20…250 V AC)

CAP98 Order number

HiTECH
Technologies, Inc.

A TECHNOLOGY FOR
EVERY LEVEL APPLICATION

HiTECH Technologies, Inc.

301 Oxford Valley Road - Building 505
Yardley, PA 19067-7706
Tel: 215. 321. 6012; Fax: 215. 321. 6067
Tech Support (Toll Free) 866-DrLevel or 888-NIVELCO
Email: info@DrLevel.com or info@hitechtech.com
Web Site: www.DrLevel.com or www.hitechtech.com

Ex CE