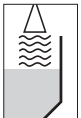


Operating Instructions

VEGAPULS 65

4 ... 20 mA/HART



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Supplementary operating instructions manuals



Information:

VEGAPULS 65 is available in many versions and is thus supplied according to customer order. Depending on the selected version, supplementary operating instructions manuals also come with the delivery. You will find the supplementary operating instructions manuals in chapter "*Product description*".

Operating instructions manuals for accessories and replacement parts



Tip:

To ensure reliable setup and operation of your VEGAPULS 65, we offer accessories and replacement parts. The associated documents are:

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

1 About this document

1.1 Function

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

1.2 Target group

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

1.3 Symbolism used



Information, tip, note

This symbol indicates helpful additional information.



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

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

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



Ex applications

This symbol indicates special instructions for Ex applications.



List

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



Action

This arrow indicates a single action.



Sequence

Numbers set in front indicate successive steps in a procedure.

2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the operator. For safety and warranty reasons, any internal work on the instruments must be carried out only by personnel authorised by the manufacturer.

2.2 Appropriate use

VEGAPULS 65 is a sensor for continuous level measurement.

Detailed information on the application range of VEGAPULS 65 is available in chapter "*Product description*".

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

VEGAPULS 65 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The emitting frequencies of all radar sensors are in the C or K-band range (depending on the instrument version). The low transmitting power is far below the internationally permitted limit values, and when the instrument is used correctly, no health-endangering effects are to be expected. There are no restrictions on using the instrument on the outside of metallic, closed vessels. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

2.5 CE conformity

VEGAPULS 65 is in CE conformity with EMVG (89/336/EWG), R & TTE directive (1999/5/EC) and LVD (73/23/EWG).

Conformity has been judged according to the following standards:

- EMC: EN 61326: 2004

- Emission: Class B
- Susceptibility: Industrial areas
- R & TTE directive: I-ETS 300-440 Expert opinion No. 0043052-01/SEE, Notified Body No. 0499
- LVD: EN 61010-1: 2002

2.6 Fulfilling NAMUR recommendations

With regard to interference resistance and interference emission, VEGAPULS 65 fulfils NAMUR recommendation NE 21.

VEGAPULS 65 and its indicating and adjustment components fulfill NAMUR recommendation NE 53 in respect to compatibility. VEGA instruments are generally upward and downward compatible:

- Sensor software to DTM VEGAPULS 65 HART, PA or FF
- DTM VEGAPULS 65 for adjustment software PACTware™
- Indicating and adjustment module for sensor software

The parameter adjustment of the basic sensor functions is independent of the software version. The range of available functions depends on the respective software version of the individual components.

The software version of VEGAPULS 65 can be determined as follows:

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

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

2.7 SIL conformity

VEGAPULS 65 fulfills the requirements for functional safety according to IEC 61508/IEC 61511. You can find further information in the Safety Manual "*VEGAPULS series 60 - 4 ... 20 mA/HART*".

2.8 FCC and IC conformity (only for USA/Canada)

VEGAPULS 65 is FCC and IC approved:

- FCC ID: O6QPULS6566

- IC: 3892A-PS6566

Modifications not expressly approved by VEGA will lead to expiry of the operating licence according to FCC.

VEGAPULS 65 is in conformity with part 15 of the FCC regulations. Take note of the respective operating regulations:

- The instrument must not cause any interfering emissions
- The instrument must be insensitive to interfering emissions, also to such that may cause unwanted operating conditions.

VEGAPULS 65 was tested and meets the limit values for a digital instrument of class B, according to part 15 of the FCC regulations. The limit values are for protection against interfering emissions during operation in industrial environment.

The instrument can generate, use and emit high frequency energy and can generate interfering emissions if not used as described in the operator's manual. Because interfering emissions have to be reckoned with when the instrument is used in residential areas, the user must make sure necessary countermeasures are implemented.

2.9 Safety instructions for Ex areas

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

2.10 Manufacturer declaration

In conformity with DIN EN 60079-14/2004, para. 5.2.3, point c1, VEGAPULS 65 is suitable for use in zone 2.

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

- this operating instructions manual
- this manufacturer declaration (24626)
- the applicable installation regulations

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

With an ambient temperature of 70 °C (158 °F) on the housing and a process temperature of 70 °C (158 °F), the max. ambient temperature during operation is 97 °C (207 °F).

Measures to maintain explosion protection during operation:

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

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

2.11 Functional range of approved instruments

Instruments with national approvals such as according to FM or CSA are partly supplied with a previous hardware or software version. For approval-technical reasons, some functions for these instruments will be only available at a later date.

You will find corresponding instructions in the description of the individual functions in this operating instructions manual.

2.12 Environmental instructions

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

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

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

3 Product description

3.1 Configuration

Versions

The VEGAPULS 65 radar sensor is available in two electronics versions:

- Standard electronics type PS60K
- Electronics with increased sensitivity type PS60S

The respective version can be determined by means of the type label on the electronics.

The electronics version influences the SIL conformity, the factory setting for the medium selection and vessel form, the accuracy of VEGAPULS 65. The differences are listed in the respective sections of this operating instructions manual.

Scope of delivery

The scope of delivery encompasses:

- VEGAPULS 65 radar sensor
- Documentation
 - this operating instructions manual
 - Supplementary instructions manual "*Safety Manual according to IEC 61508/IEC 61511 (SIL)*"
 - Operating instructions manual "*Indicating and adjustment module*" (optional)
 - Supplementary instructions manual "*Heating for indicating and adjustment module*" (optional)
 - Supplementary instructions manual "*Plug connector for continuously measuring sensors*" (optional)
 - Ex-specific "*Safety instructions*" (with Ex-versions)
 - if necessary, further certificates

Components

VEGAPULS 65 consists of the following components:

- Process fitting with antenna system
- Housing with electronics, optionally available with plug connector, optionally available with connection cable
- Housing cover, optionally available with indicating and adjustment module PLICSCOM

The components are available in different versions.

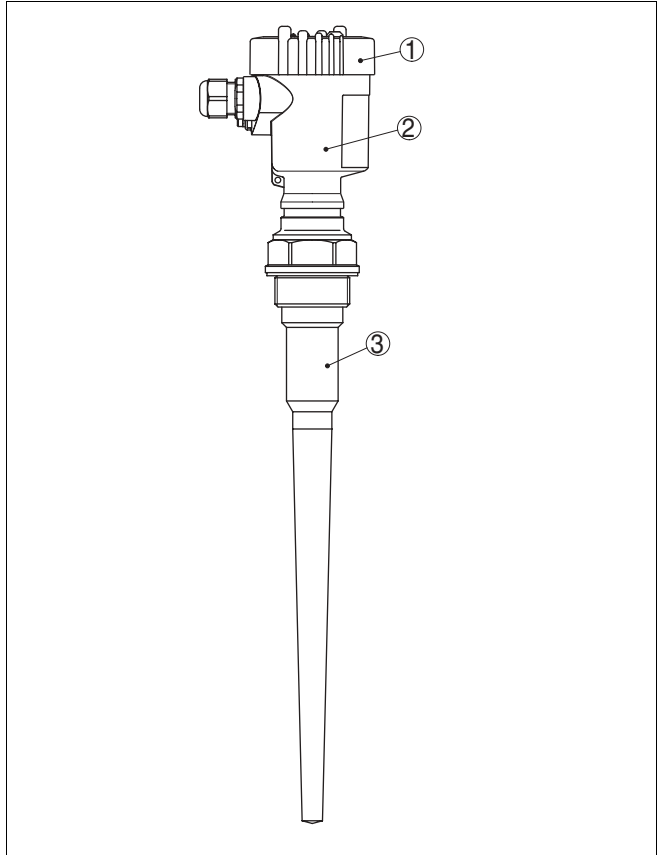


Fig. 1: VEGAPULS 65 in threaded version with plastic housing

- 1 Housing cover with integrated PLICSCOM (optional)
- 2 Housing with electronics
- 3 Process fitting with antenna system

3.2 Principle of operation

Area of application

VEGAPULS 65 is a radar sensor in C-band technology (emitting frequency approx. 6 GHz) for continuous level measurement. It is particularly suitable for vessels with small process fitting that contain corrosive liquids under simple to difficult process conditions.

Functional principle

The antenna of the radar sensor emits short radar pulses with a duration of approx. 1 ns. These pulses are reflected by the product and received by the antenna as echoes. The running time of the radar pulses from emission to reception is

proportional to the distance and hence to the level. The determined level is converted into an appropriate output signal and outputted as measured value.

Supply

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

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

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

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

For instruments with national approvals such as e.g. according to FM and CSA, this function only available at a later date.

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

This function is generally not available for approved instruments.

3.3 Operation

VEGAPULS 65 can be adjusted with different adjustment media:

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

The entered parameters are generally saved in VEGAPULS 65, optionally also in the indicating and adjustment module or in PACTware™.

3.4 Storage and transport

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

Packaging

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

Storage and transport temperature

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

4 Mounting

4.1 General instructions

Installation position

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

Screwing in



Warning:

The housing of the threaded versions must not be used to screw the instrument in! Applying tightening force on the housing can damage its rotational mechanical parts.

Moisture

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

You can give your VEGAPULS 65 additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

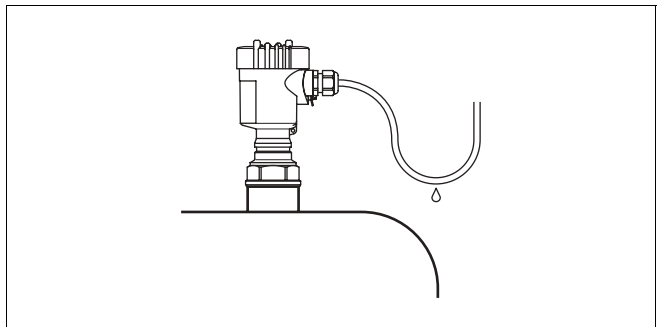


Fig. 2: Measures against moisture penetration

Measuring range

The reference plane for the measuring range of the sensors is the lower edge of the flange or the seal surface of the thread.

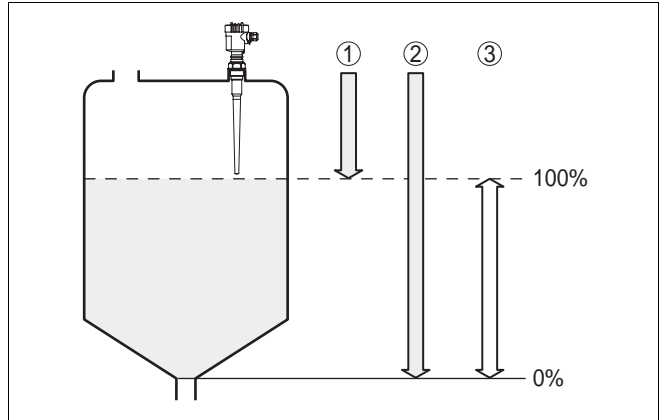


Fig. 3: Measuring range (operating range) and max. measuring distance
 1 full
 2 empty (max. measuring distance)
 3 Measuring range



Information:

If the medium reaches the antenna, buildup can form on it and cause faulty measurements later on.

Materials, wetted parts

Make sure that the wetted parts of VEGAPULS 65, especially the seal and process fitting, are suitable for the existing process conditions such as pressure, temperature etc. as well as the chemical properties of the medium.

You will find specification in chapter "*Technical data*" in the "*Supplement*".

4.2 Mounting instructions

Torque of the flange screws

The flange screws of VEGAPULS 65 must be always screwed with the torque stated in the technical data so that the PTFE washer of the encapsulated antenna system seals.

Installation position

Mount VEGAPULS 65 at least 500 mm (19.7 in) from the vessel wall. If the sensor is installed in the center of vessels with dished or round tops, multiple echoes can arise. These can, however, be suppressed by an appropriate adjustment (see "*Setup*").

If this distance cannot be maintained, a false echo storage should be carried out during setup. This applies particularly if buildup on the vessel wall is expected. In such case, we recommend repeating the false echo storage later on with existing buildup.

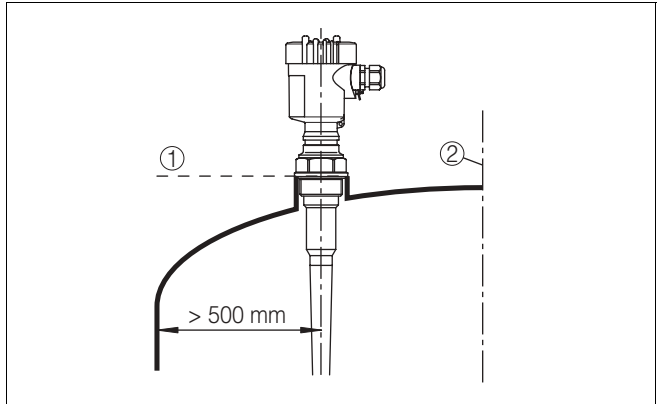


Fig. 4: Mounting on round vessel tops

- 1 Reference plane
- 2 Vessel center or symmetry axis

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

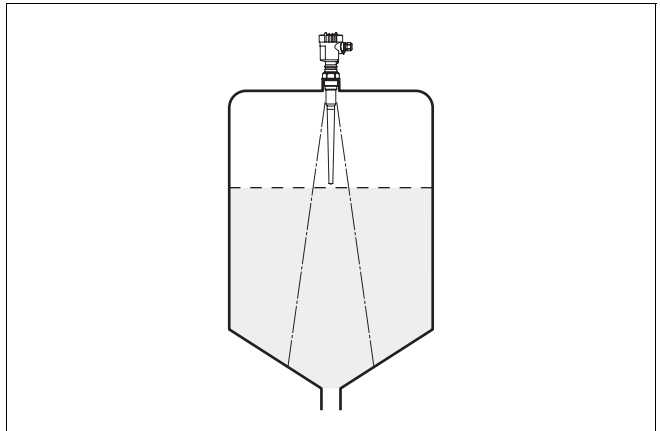


Fig. 5: Vessel with conical bottom

Inflowing medium

Do not mount the instruments in or above the filling stream. Make sure that you detect the product surface and not the inflowing product.

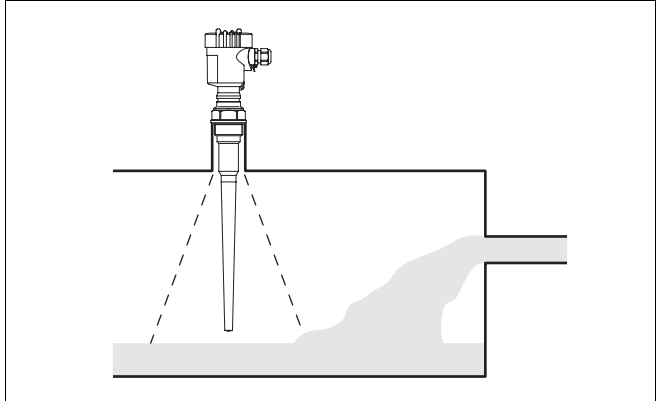


Fig. 6: Inflowing liquid

Socket

The active part of the antenna, i.e. the conical antenna part should protrude completely out of the socket.

To meet the different socket dimensions, sensors for socket lengths up to 50, 100 and 250 mm (2, 4, 10 in) are available.

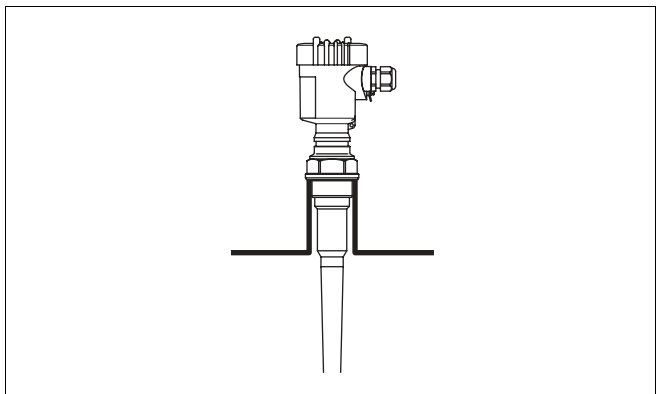


Fig. 7: Recommended socket mounting

In case of very big socket diameters, the active antenna part can be slightly recessed in the socket. The following rule applies to the standard version of VEGAPULS 65: Socket diameter corresponds to max. socket height.

Sensor orientation

In liquids, direct the sensor as perpendicular as possible to the product surface to achieve an optimum measurement.

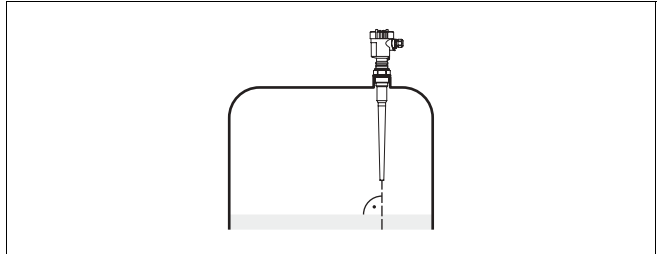


Fig. 8: Orientation in liquids

Vessel installations

The mounting location of the radar sensor should be a place where no other equipment or fixtures cross the path of the microwave signals.

Vessel installations such as, for example, ladders, limit switches, heating spirals, struts, etc. can cause false echoes that get superimposed on the useful echo. Make sure when planning your measuring site that the radar sensor has a "clear view" to the measured product.

If there are existing vessel installations, a false echo storage should be carried out during setup.

If large vessel installations such as struts or supports cause false echoes, these can be attenuated through supplementary measures. Small, inclined sheet metal baffles above the installations scatter the radar signals and prevent direct interfering reflections.

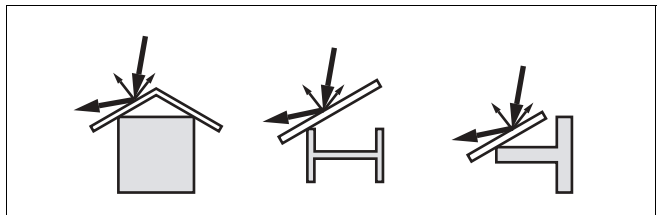


Fig. 9: Cover smooth profiles with deflectors

Agitators

If there are agitators in the vessel, a false echo storage should be carried out with the agitators in motion. This ensures that the interfering reflections from the agitators are saved with the blades in different positions.

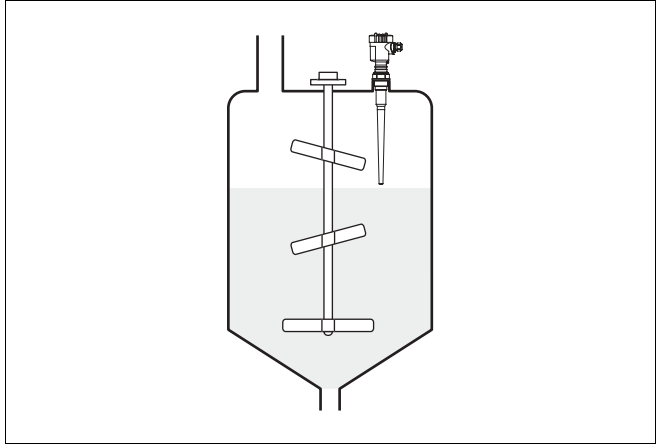


Fig. 10: Agitators

Foam generation

Through the action of filling, stirring and other processes in the vessel, dense foams which considerably damp the emitted signals may form on the product surface.

If foams are causing measurement errors, the biggest possible radar antenna should be used.

VEGAFLEX sensors with guided microwaves are not influenced by foam generation and are particularly suitable for such applications.

5 Connecting to voltage supply

5.1 Preparing the connection

Note safety instructions

Generally note the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltage surges are expected, overvoltage arresters should be installed



Tip:

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

Take note of safety instructions for Ex applications



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

Select power supply

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

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

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

Bear in mind the following factors regarding supply voltage:

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

Selecting connection cable

VEGAPULS 65 is connected with standard two-wire cable without screen. An outer cable diameter of 5 ... 9 mm ensures the seal effect of the cable gland. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used. For HART multidrop operation we recommend as standard practice the use of screened cable.

Cable gland ½ NPT

On VEGAPULS 65 with cable gland ½ NPT and plastic housing, a metal ½" threaded insert is moulded in the plastic housing.

**Caution:**

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

Cable screening and grounding

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

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

Select connection cable for Ex applications

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

5.2 Connection steps Instrument housing

Proceed as follows:

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

- 7 Insert the wire ends into the open terminals according to the wiring plan



Fig. 11: Connection steps 6 and 7

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

5.3 Wiring plan, single chamber housing



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

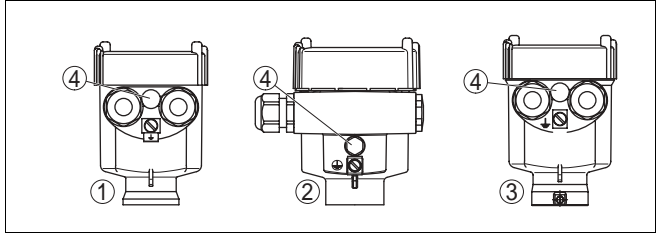
Housing overview

Fig. 12: Material versions, single chamber housing

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

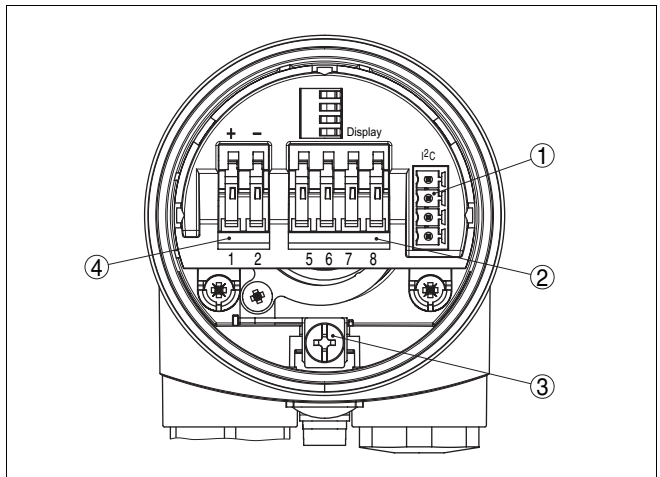
Electronics and connection compartment

Fig. 13: Electronics and connection compartment, single chamber housing

- 1 Plug connector for VEGACONNECT (I^2C interface)
- 2 Spring-loaded terminals for connection of the external indication VEGADIS 61
- 3 Ground terminal for connection of the cable screen
- 4 Spring-loaded terminals for voltage supply

Wiring plan

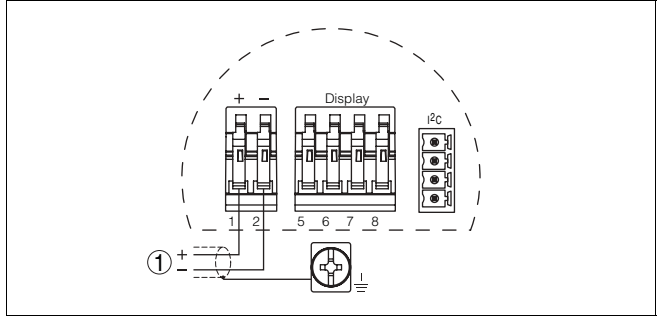


Fig. 14: Wiring plan, single chamber housing
 1 Power supply/Signal output

5.4 Wiring plan, double chamber housing



The following illustration apply to non-Ex as well as Ex ia versions. The Exd version is described in the next subchapter.

Housing overview

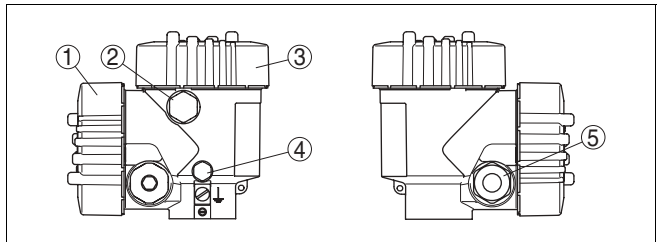


Fig. 15: Double chamber housing
 1 Housing cover, connection compartment
 2 Blind stopper or plug M12x1 for VEGADIS 61 (option)
 3 Housing cover, electronics compartment
 4 Filter element for pressure compensation or blind stopper with version IP 66/
 IP 68, 1 bar¹⁾
 5 Cable entry or plug

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

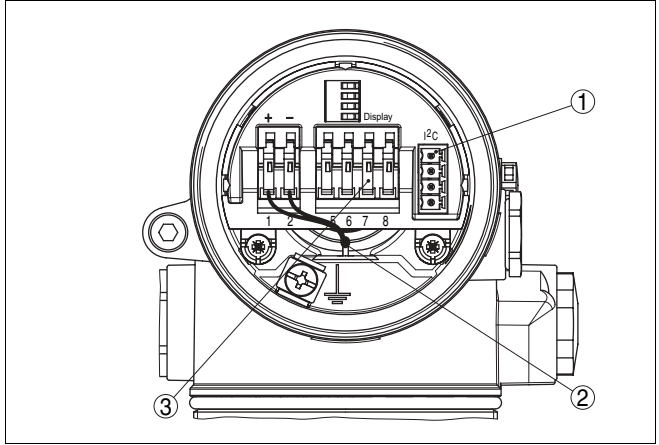
Electronics compartment

Fig. 16: Electronics compartment, double chamber housing

- 1 Plug connector for VEGACONNECT (I²C interface)
- 2 Internal connection cable to the connection compartment
- 3 Terminals for VEGADIS 61

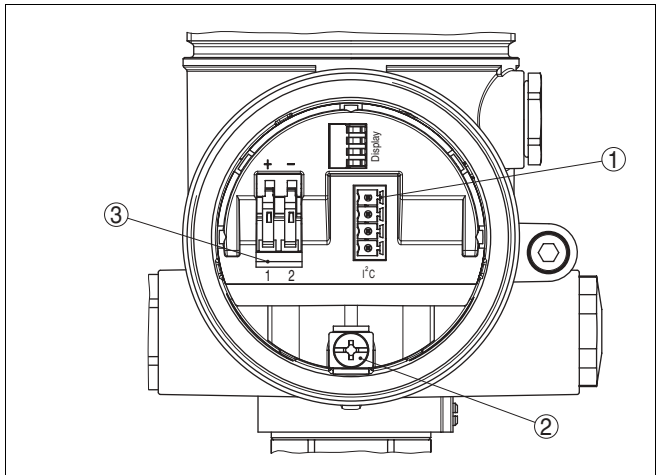
Connection compartment

Fig. 17: Connection compartment, double chamber housing

- 1 Plug connector for VEGACONNECT (I²C interface)
- 2 Ground terminal for connection of the cable screen
- 3 Spring-loaded terminals for voltage supply

Wiring plan

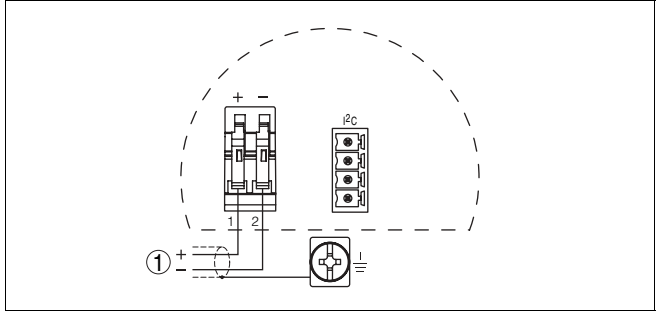


Fig. 18: Wiring plan, double chamber housing
 1 Power supply/Signal output

5.5 Wiring plan, double chamber housing Exd

Housing overview

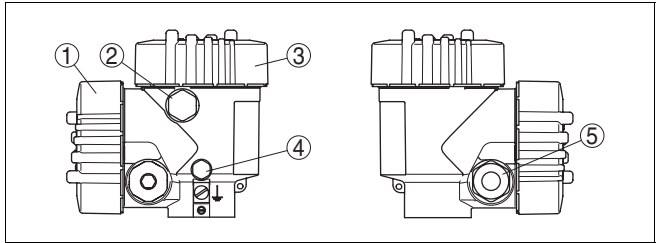


Fig. 19: Double chamber housing
 1 Housing cover, connection compartment
 2 Blind stopper or plug M12x1 for VEGADIS 61 (option)
 3 Housing cover, electronics compartment
 4 Filter element for pressure compensation or blind stopper with version IP 66/
 IP 68, 1 bar²⁾
 5 Cable entry or plug

²⁾ Version IP 66/IP 68, 1 bar not with four-wire instruments

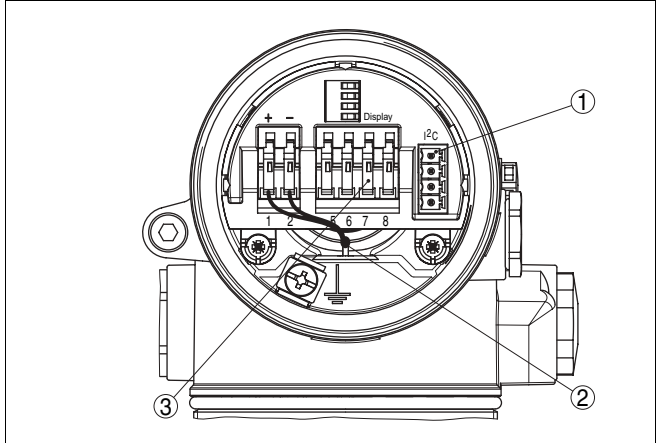
Electronics compartment

Fig. 20: Electronics compartment, double chamber housing

- 1 Plug connector for VEGACONNECT (I²C interface)
- 2 Internal connection cable to the connection compartment
- 3 Terminals for VEGADIS 61

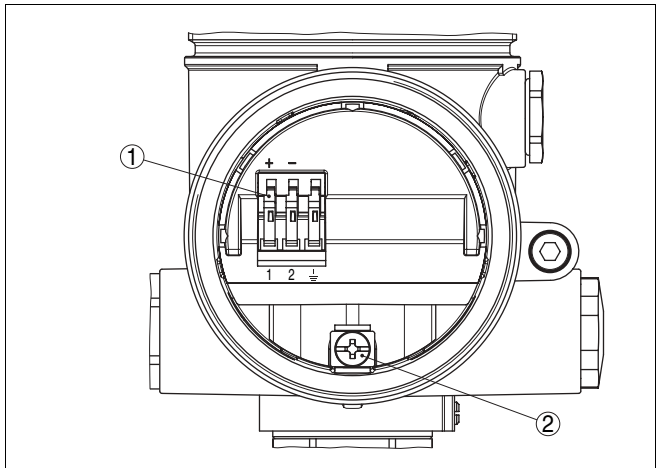
Connection compartment

Fig. 21: Connection compartment, double chamber housing Exd

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

Wiring plan

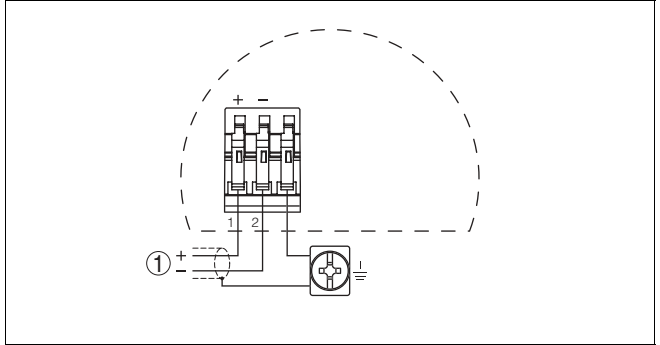


Fig. 22: Wiring plan, double chamber housing Exd
 1 Power supply/Signal output

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

Wire assignment, connection cable

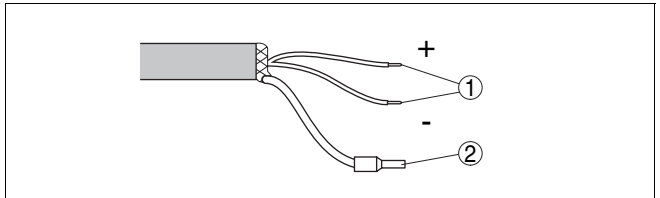


Fig. 23: Wire assignment, connection cable
 1 brown (+) and blue (-) to power supply or to the processing system
 2 Screen

5.7 Switch-on phase

Switch-on phase

After connecting VEGAPULS 65 to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

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

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

6 Setup with the indicating and adjustment module PLICSCOM

6.1 Short description

Function/Configuration

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

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

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



Information:

For instruments with national approvals such as e.g. according to FM and CSA, this function only available at a later date.



Note:

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

6.2 Insert the indicating and adjustment module

Mounting/dismounting the indicating and adjustment module

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

Proceed as follows:

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

Removal is carried out in reverse order.

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



Fig. 24: Installation of the indicating and adjustment module



Note:

If you intend to retrofit VEGAPULS 65 with an indicating and adjustment module for continuous measured value indication, a higher cover with an inspection glass is required.

6.3 Adjustment system

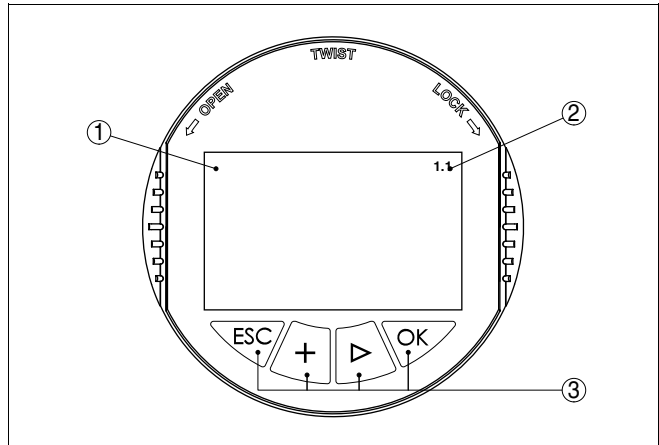


Fig. 25: Indicating and adjustment elements

- 1 LC display
- 2 Indication of the menu item number
- 3 Adjustment keys

Key functions

- **[OK]** key:
 - move to the menu overview
 - confirm selected menu
 - edit parameter
 - save value
- **[→]** key to select:
 - menu change
 - list entry
 - Select editing position
- **[+]** key:
 - Change value of a parameter
- **[ESC]** key:
 - interrupt input
 - jump to the next higher menu

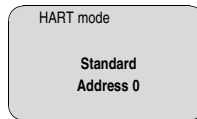
Adjustment system

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

6.4 Setup procedure

Address setting HART-Multi-drop

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



Parameter adjustment

As VEGAPULS 65 is a distance measuring instrument, the distance from the sensor to the product surface is measured. To have the real product level displayed, an allocation of the measured distance to the percentage height must be made. To carry out this adjustment, the distance is entered with full and empty vessel. If these values are not known, an adjustment with the distance values, e.g. 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange. With these settings, the real level is calculated. Furthermore the operating range of the sensor is limited from maximum to the required range.

The real product level during this adjustment is not important, because the min./max. adjustment is always carried out without changing the product level. These settings can be made ahead of time without the instrument having to be installed.



Caution:

If there is a separation of liquids with different dielectric values in the vessel, e.g. by condensation, VEGAPULS 65 can detect under certain circumstances only the medium with the higher dielectric value.

Keep in mind that interfaces can cause faulty measurements.

If you want to measure the total height of both liquids reliably, please contact our service department or use an instrument specially designed for interface measurement.

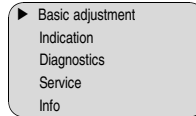
In the main menu item "*Basic adjustment*", the individual submenu items should be selected one after the other and provided with the correct parameter values.

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

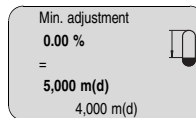
Carrying out min. adjustment

Proceed as follows:

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



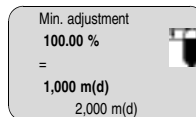
- 2 Select the menu item "**Basic adjustment**" with **[->]** and confirm with **[OK]**. Now the menu item "**Min. adjustment**" is displayed.



- 3 Prepare the % value for editing with **[OK]** and set the cursor to the requested position with **[->]**. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the distance value.
- 4 Enter the appropriate distance value in m (corresponding to the percentage value) for the empty vessel (e.g. distance from the sensor to the vessel bottom).
- 5 Save the settings with **[OK]** and move to "Max. adjustment" with **[->]**.

Carrying out max. adjustment

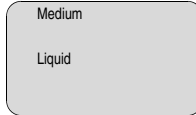
Proceed as follows:



- 1 Prepare the % value for editing with **[OK]** and set the cursor to the requested position with **[->]**. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the distance value.
- 2 Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. Keep in mind that the max. level must lie below the dead band.
- 3 Save the settings with **[OK]** and move to "Medium selection" with **[->]**.

Medium selection

Each product has different reflective properties. In addition, there are various interfering factors which have to be taken into account: agitated product surfaces and foam generation (with liquids); dust generation, material cones and echoes from the vessel wall (with solids). To adapt the sensor to these different conditions, you should first select "*Liquid*" or "*Solid*".



According to the conductivity and the dielectric value of liquids, the reflection properties can differ considerably. Therefore additional options such as "*Solvent*", "*Chem. mixture*" and "*Water based*" are offered below the menu item Liquid.

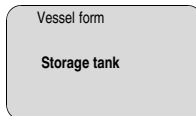
With solids, you can also choose between "*Powder/Dust*", "*Granular/Pellets*" or "*Ballast/Pebbels*".

Through this additional selection, the sensor is adapted perfectly to the product and measurement reliability, particularly in products with bad reflective properties, is considerably increased.

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

Vessel form

Apart from the medium, the vessel shape can also influence the measurement. To adapt the sensor to these measuring conditions, this menu item offers different options depending on whether liquid or solid is selected. With "*Liquid*" these are "*Storage tank*", "*Stilling tube*", "*Open vessel*" or "*Stirred vessel*", with "*Solid*", "*Silo*" or "*Bunker*".

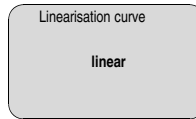


Enter the requested parameter via the appropriate keys, save your settings and jump to the next menu item with the **[->]** key.

Linearisation curve

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

By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "Display".



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



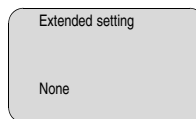
Caution:

Note the following, if VEGAPULS 65 is used as part of an overflow protection system according to WHG:

If a linearisation curve is selected, the measuring signal is no longer compulsorily linear proportional to the level. This must be taken into consideration by the user, particularly when adjusting the switching point on the level switch.

Extended setting/Quick level change

The menu item "Extended setting" offers the possibility to optimise VEGAPULS 65 for applications in which the level changes very quickly. For this reason, select the function "Quick level change >1m/min.".



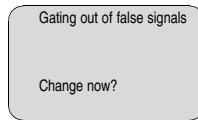
Note:

Because the average value generation of the signal processing is clearly reduced with the function "Quick level change >1m/min.", false reflections caused by agitators or vessel installations can cause measured value fluctuations. A false echo storage is recommended.

Gating out of false signals

High sockets or vessel installations, such as e.g. struts or agitators as well as buildup and weld joints on the vessel walls cause interfering reflections which can impair the measurement. A false echo storage detects and marks these false echoes, so that they are no longer taken into account for the

level measurement. A false echo memory should be created with empty vessel so that all potential interfering reflections will be detected.



Proceed as follows:

- 1 Move from the measured value display to the main menu by pushing **[OK]**.
- 2 Select the menu item "Service" with **[->]** and confirm with **[OK]**. Now the menu item "False signal suppression" is displayed.
- 3 Confirm "False signal suppression - Change now" with **[OK]** and select in the below menu "Create new". Enter the actual distance from the sensor to the product surface. All false signals in this area are detected by the sensor and saved after confirming with **[OK]**.



Note:

Check the distance to the product surface, because if an incorrect (too large) value is entered, the existing level will be saved as false signal. The filling level would then no longer be detectable in this area.

Copy sensor data

This function enables reading out parameter adjustment data as well as writing parameter adjustment data into the sensor via the indicating and adjustment module. A description of the function is available in the operating instructions manual "*Indicating and adjustment module*".

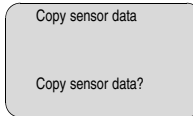
The following data are read out or written with this function:

- Measured value presentation
- Adjustment
- Medium
- Inner diameter of the standpipe (with standpipe versions)
- Vessel form
- Damping
- Linearisation curve
- Sensor-TAG
- Displayed value
- Display unit
- Scaling
- Current output

- Unit of measurement
- Language

The following safety-relevant data are **not** read out or written:

- HART mode
- PIN
- SIL



Reset

Basic adjustment

If the "Reset" is carried out, the sensor resets the values of the following functions to the reset values (see chart):³⁾

Function	Reset value
Min. adjustment	0 m(d)
Min. adjustment	30 m(d) (VEGAPULS 61, 63, 65) 35 m(d) (VEGAPULS 62, 66) 70 m(d) (VEGAPULS 68)
Medium	Liquid
Vessel form	not known
Damping	0 s
Linearization	linear
Sensor-TAG	Sensor
Displayed value	Distance
Extended settings	Keine
Current output - characteristics	4 ... 20 mA
Current output - max. current	20 mA
Current output - min. current	4 mA
Current output - failure	<3.6 mA
Unit of measurement	m(d)

The values of the following functions are *not* reset to the reset values (see chart) with "Reset":

Function	Reset value
Lighting	no reset

³⁾ Sensor-specific basic adjustment.

Language	no reset
SIL	no reset
HART mode	no reset

Factory setting

Like basic setting, in addition special parameters are reset to default values.⁴⁾

Pointer

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

Optional settings

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

⁴⁾ Special parameters are parameters which are set customer-specifically on the service level with the adjustment software PACTware™.

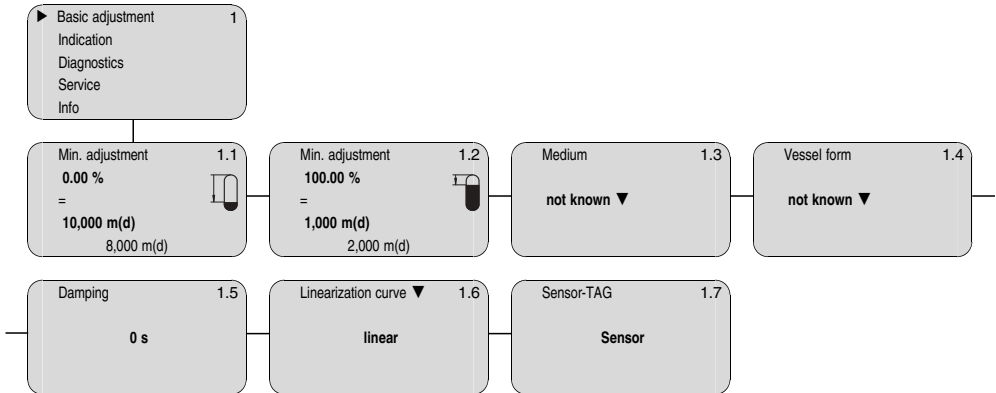
6.5 Menu schematic



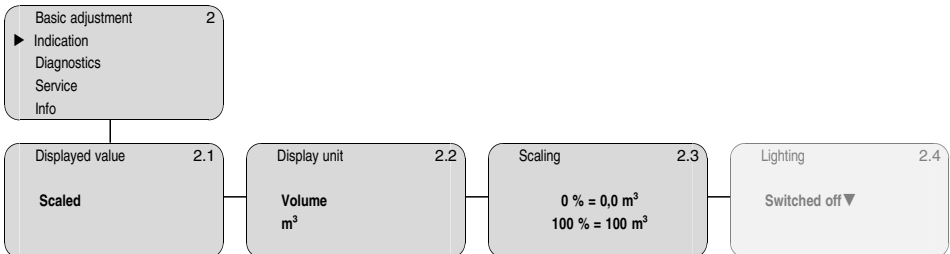
Information:

Depending on the version and application, the light-coloured menu windows are not always available or offer no selection possibility.

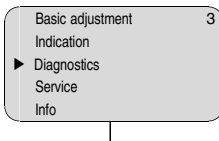
Basic adjustment

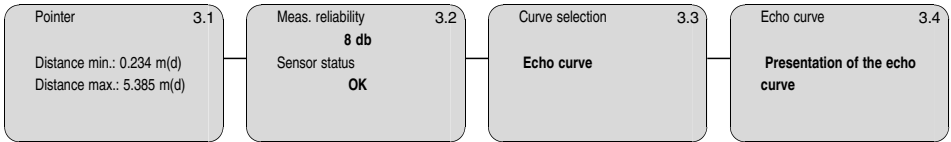


Indication

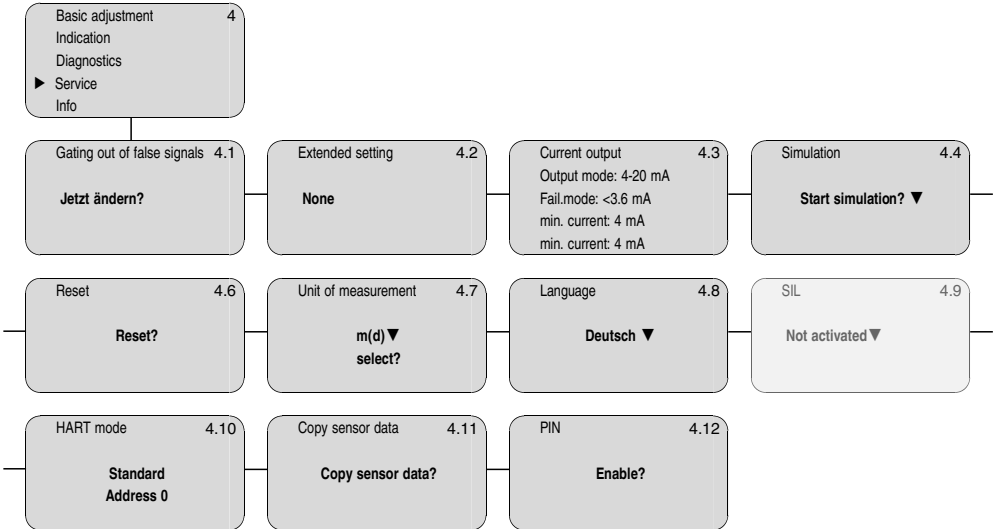


Diagnostics

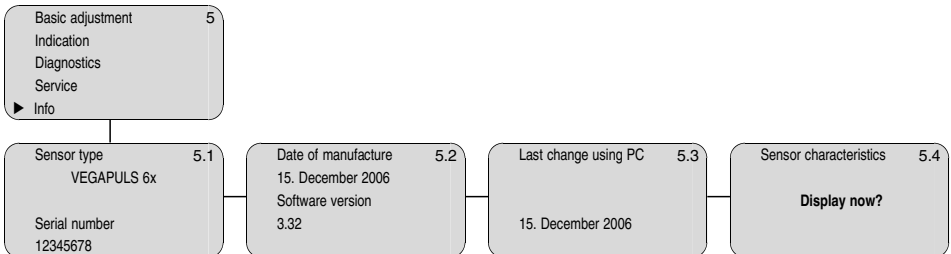




Service



Info



6.6 Saving the parameter adjustment data

It is recommended noting the adjusted data, e.g. in this operating instructions manual and archive them afterwards. They are hence available for multiple use or service purposes.

If VEGAPULS 65 is equipped with an indicating and adjustment module, the most important data can be read out of the sensor into indicating and adjustment module. The procedure is described in the operating instructions manual "*Indicating and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

If it is necessary to exchange VEGAPULS 65, the indicating and adjustment module is inserted into the replacement instrument and the data are written into the sensor under the menu item "*Copy sensor data*".

7 Setup with PACTware™ and other adjustment programs

7.1 Connecting the PC

Connecting the PC directly to the sensor

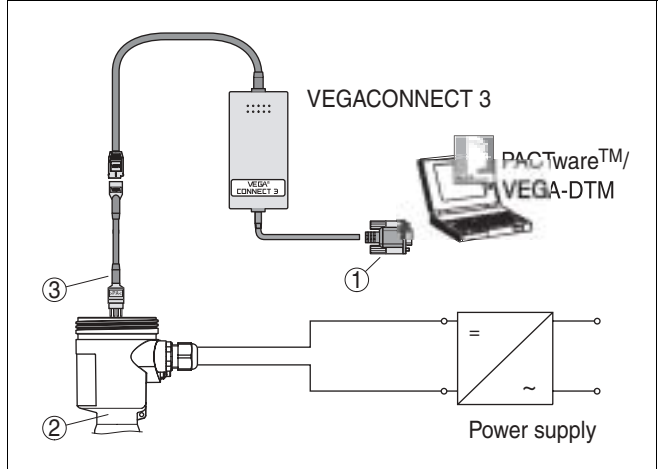


Fig. 26: Connection directly to the sensor

- 1 RS232 connection
- 2 VEGAPULS 65
- 3 I²C adapter cable for VEGACONNECT 3

Necessary components:

- VEGAPULS 65
- PC with PACTware™ and suitable VEGA DTM
- VEGACONNECT 3 with I²C adapter cable (article no. 2.27323)
- Power supply unit

Connecting the PC to the signal cable

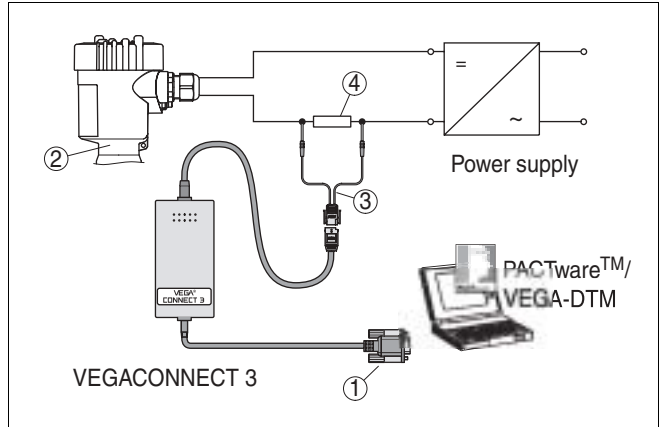


Fig. 27: Connecting the PC to the signal cable

- 1 RS232 connection
- 2 VEGAPULS 65
- 3 HART adapter cable for VEGACONNECT 3
- 4 HART resistance 250 Ohm

Necessary components:

- VEGAPULS 65
- PC with PACTware™ and suitable VEGA DTM
- VEGACONNECT 3 with HART adapter cable (art. no. 2.25397)
- HART resistance approx. 250 Ohm
- Power supply unit



Note:

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

7.2 Parameter adjustment with PACTware™

Further setup steps are described in the operating instructions manual "DTM Collection/PACTware™" attached to each CD and which can also be downloaded from our homepage. A

detailed description is available in the online help of PACTware™ and the VEGA DTMs.

**Note:**

Keep in mind that for setup of VEGAPULS 65, DTM-Collection 06/2003 or a newer version must be used.

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

Go via www.vega.com and "*Downloads*" to the item "*Software*".

7.3 Parameter adjustment with AMS™ and PDM

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

Go via www.vega.com and "*Downloads*" to the item "*Software*".

7.4 Saving the parameter adjustment data

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

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

8 Maintenance and fault rectification

8.1 Maintenance

When used as directed in normal operation, VEGAPULS 65 is completely maintenance free.

8.2 Remove interferences

Causes of malfunction

VEGAPULS 65 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Supply
- Signal processing

Fault rectification

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

24 hour service hotline

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

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

Checking the 4 ... 20 mA signal

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

? 4 ... 20 mA signal not stable

- Level fluctuations
- Set integration time via the indicating/adjustment module

- ? 4 ... 20 mA signal missing
 - Wrong connection
 - Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"
 - No supply voltage
 - Check cables for line breaks; repair if necessary
 - supply voltage too low or load resistance too high
 - Check, adapt if necessary

- ? Current signal greater than 22 mA or less than 3.6 mA
 - Electronics defective
 - Exchange instrument or return instrument for repair



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

Fault messages via the indicating/adjustment module

- ? E013
 - no measured value available
 - sensor in boot phase
 - sensor does not find an echo, e.g. because of faulty installation or incorrect parameter adjustment

- ? E017
 - Adjustment span too small
 - Carry out a fresh adjustment and increase the distance between min. and max. adjustment

- ? E036
 - no operable sensor software
 - Carry out a software update or send the instrument for repair

- ? E041, E042, E043
 - Hardware error, electronics defective
 - Exchange instrument or return instrument for repair

8.3 Exchange of the electronics module

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



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

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

Sensor serial number

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

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

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



Information:

When loading on site, the order data must be downloaded from the Internet (see Operating Instructions manual "*Oscillator*").

Assignment

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

4 ... 20 mA/HART

Oscillator PS-E.60CH. is suitable for **C** band VEGAPULS 65 and 66 - 4 ... 20 mA/HART:

- PS-E.60CH**X** (X = without approvals)
- PS-E.60CH**A** (A = approvals CA, DA, EA according to VEGA product list)
- PS-E.60CH**D** (D = approvals XM, CM, CK, CI, DM, DK, DI, EX, GX, UX, UF according to VEGA product list)
- PS-E.60CH**E** (E = approvals CX, DX according to VEGA product list)

8.4 Instrument repair

If a repair is necessary, please proceed as follows:

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

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

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the filled in form and if necessary, a safety data sheet to the instrument
- Please ask the agency serving you for the address of your return shipment. You find the respective agency on our website www.vega.com under: "*Company - VEGA world-wide*"

9 Dismounting

9.1 Dismounting steps

**Warning:**

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

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

9.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronic modules to be easily separable.

WEEE directive 2002/96/EG

This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws (in Germany, e.g. ElektroG). Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects to persons and environment and ensures recycling of useful raw materials.

Materials: see "*Technical data*"

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

10 Supplement

10.1 Technical data

General data

316L corresponds to 1.4404 or 1.4435

Materials, wetted parts

- | | |
|--|---------------------|
| – Process fitting - thread | PVDF, 316L |
| – Seal - thread PVDF | FKM (Viton) |
| – Seal - thread 316L | Klingersil |
| – Process fittings Tri-Clamp and bolt-
ing | 316L |
| – Process fitting - flange | Flange plating PTFE |
| – Antenna for sockets 50 mm
(1.969 in) | PVDF and PTFE |
| – Antenna for sockets 100 mm
(3.937 in) and 250 mm (9.843 in) | PTFE |

Materials, non-wetted parts

- | | |
|--|--|
| – Housing | Plastic PBT (Polyester), Alu die-casting powder-coated, 316L |
| – Seal ring between housing and
housing cover | NBR (Alu/stainless steel housing), silicone
(plastic housing) |
| – Inspection window in housing cover
for PLICSCOM | Polycarbonate (UL-746-C listed) |
| – Ground terminal | 316Ti/316L |

Weight

- | | |
|----------------------------|--|
| – Process fitting - thread | 2 ... 2.8 kg (4.4 ... 6.2 lbs), depending on
thread size and housing material |
| – Process fitting - flange | 4.2 ... 15.4 kg (9.3 ... 34 lbs), depending on
flange size and housing material |
-

Output variable

- | | |
|--------------------|--|
| Output signal | 4 ... 20 mA/HART |
| Resolution | 1.6 μ A |
| Failure message | Current output unchanged 20.5 mA, 22 mA,
<3.6 mA (adjustable) |
| Current limitation | 22 mA |
| Load | see load diagram under Power supply |

Integration time (63 % of the input variable)	0 ... 999 s, adjustable
Fulfilled NAMUR recommendations	NE 43

Input variable

Parameter	distance between process fitting and product surface
Min. distance from antenna tip	50 mm (1.969 in)
Measuring range	up to 30 m (98.425 ft)

Reference conditions to measuring accuracy (similar to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1

– Temperature	+18 ... +30 °C (+64 ... +86 °F)
– Relative humidity	45 ... 75 %
– Air pressure	860 ... 1060 mbar/86 ... 106 kPa (12.5 ... 15.4 psi)

Other reference conditions

– Reflector	idealer Reflektor, z. B. Metallplatte 2x2m
– False reflections	größtes Störecho 20 dB kleiner als Nutzecho

Characteristics and performance data

Frequency	C-band (6 GHz technology)
Beam angle 3 dB	24°
Step response or adjustment time ⁵⁾	>1 s (dependent on the parameter adjustment)
Max. level change	adjustable up to 1 m/min. (dependent on the parameter adjustment)
Received average emitted power reaching an object directly in front of the antenna	
– Distance 1 m (3.28 ft)	108 nW per cm ² (108 ⁻⁹ W/cm ²) or 108 nW per 0.155 in ² (108x10 ⁻⁹ W/0.155 in ²)
– Distance 5 m (16.404 ft)	4.3 nW per cm ² (4.3 ⁻⁹ W/cm ²) or 4.3 nW per 0.155 in ² (4.3x10 ⁻⁹ W/0.155 in ²)

Measuring accuracy

Resolution, general	max. 1 mm (max. 0.039 in)
Deviation ⁶⁾	see diagrams

⁵⁾ Time to output the correct level (with max. 10 % deviation) after a sudden level change.

⁶⁾ Incl. non-linearity, hysteresis and non-repeatability.

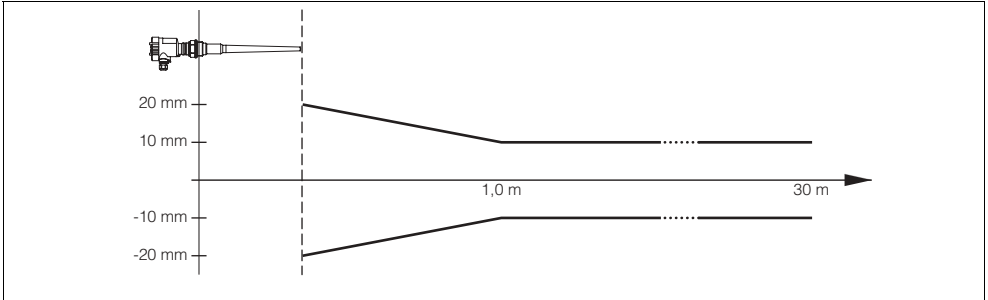


Fig. 28: Accuracy VEGAPULS 65 in mm, measuring range in m

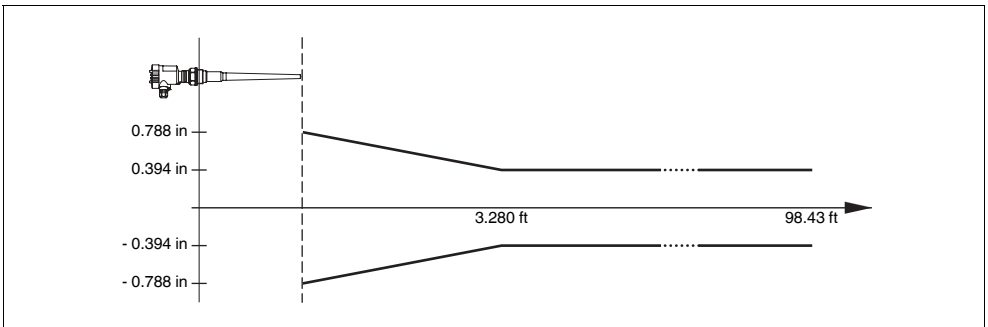


Fig. 29: Accuracy VEGAPULS 65 in Inch, measuring range in ft

Influence of the ambient temperature to the sensor electronics⁷⁾

Average temperature coefficient of the zero signal (temperature error) 0.03 %/10 K

Influence of superimposed gas and pressure to the accuracy

The spreading speed of radar impulses in gas or vapour above the measured product is reduced by high pressures. This effect depends on the superimposed gas or vapour and is very high in case of low temperatures. The following chart shows the resulting deviation for some typical gases or vapours. The stated values relate to the distance. Positive values mean that the measured distance is too high, negative values that the measured distance is too small.

Gas phase	Temperature	1 bar/14.5 psi	10 bar/145 psi	50 bar/725 psi
Air/Nitrogen	20 °C/68 °F	0.00 %	0.22 %	1.2 %
Air/Nitrogen	200 °C/392 °F	0.00 %	0.13 %	0.74 %

⁷⁾ Relating to the nominal measuring range.

Gas phase	Temperature	1 bar/14.5 psi	10 bar/145 psi	50 bar/725 psi
Hydrogen	20 °C/68 °F	-0.01 %	0.10 %	0.61 %
Hydrogen	200 °C/392 °F	-0.02 %	0.05 %	0.37 %
Water (saturated steam)	100 °C/212 °F	0.20 %	-	-
Water (saturated steam)	180 °C/356 °F	-	2.1 %	-

Ambient conditions

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

Process conditions

For the vessel pressure, you also have to note the specifications on the type label. Always the lowest value is applicable.

Vessel pressure

- Threaded part PVDF -100 ... 300 kPa/-1 ... 3 bar (-14.5 ... 43.5 psi)
- Screwed part and flange 316L -100 ... 1600 kPa/-1 ... 16 bar (-14.5 ... 232 psi)

Process temperature (measured on the process fitting)

- Process fitting, thread PVDF -40 ... +130 °C (-40 ... +266 °F)
- Other process fittings -40 ... +150 °C (-40 ... +302 °F)

Vibration resistance

mechanical vibrations with 4 g and 5 ... 100 Hz⁸⁾

⁸⁾ Tested according to the regulations of German Lloyd, GL directive 2

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar

Cable entry/plug⁹⁾

- Single chamber housing
 - 1x cable entry M20x1.5 (cable- \varnothing 5 ... 9 mm), 1x blind stopper M20x1.5
 - or:
 - 1x closing cap M20x1.5, 1x blind stopper M20x1.5
 - or:
 - 1x closing cap ½ NPT, 1x blind plug ½ NPT
 - or:
 - 1x plug (depending on the version), 1x blind plug M20x1.5

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

Spring-loaded terminals

for wire cross-section up to 2.5 mm²

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

Cable entry

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

Connection cable

- Wire cross-section 0.5 mm²
- wire resistance <0.036 Ohm/m (0.011 Ohm/ft)
- Tensile strength >1200 N (270 lbf)
- Standard length 5 m (16.4 ft)

⁹⁾ Depending on the version M12x1, according to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF.

– Max. length	1000 m (3280 ft)
– Min. bending radius	25 mm (1 in) at 25 °C (77 °F)
– Diameter	approx. 8 mm
– Colour - standard PE	Black
– Colour - standard PUR	Blue
– Colour - Ex-version	Blue

Indicating and adjustment module

Power supply and data transmission	through sensor via gold-plated sliding contacts (I ² C bus)
Indication	LC display in Dot matrix
Adjustment elements	4 keys
Protection	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Materials	
– Housing	ABS
– Inspection window	Polyester foil

Voltage supply

Supply voltage	
– Non-Ex instrument	14 ... 36 V DC
– EEx ia instrument	14 ... 30 V DC
– EExd ia instrument	20 ... 36 V DC
Supply voltage with lighted indicating and adjustment module	
– Non-Ex instrument	20 ... 36 V DC
– EEx ia instrument	20 ... 30 V DC
– EExd ia instrument	20 ... 36 V DC
Permissible residual ripple	
– <100 Hz	$U_{ss} < 1 \text{ V}$
– 100 Hz ... 10 kHz	$U_{ss} < 10 \text{ mV}$
Load	see diagram

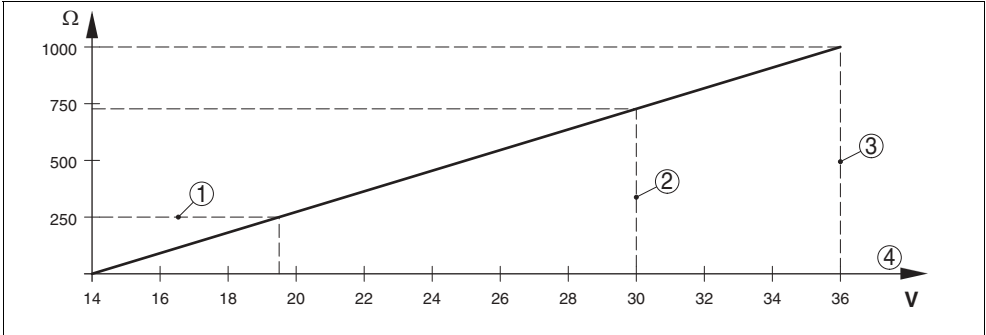


Fig. 30: Voltage diagram

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

Electrical protective measures

Protection

- Plastic housing IP 66/IP 67
- Alu and stainless steel standard IP 66/IP 68 (0.2 bar)¹⁰⁾
- Alu and stainless housing (optionally available) IP 66/IP 68 (1 bar)

Overvoltage category III

Protection class II

Functional safety (SIL)

Functional safety according to IEC 61508 or IEC 61511

- Single channel architecture (1oo1D) up to SIL2
- Multiple channel architecture see "Safety Manual"

Approvals¹¹⁾¹²⁾

ATEX ia	ATEX II 1G, 1/2G, 2G EEx ia IIC T6
ATEX d	ATEX II 1/2G, 2G EExd ia IIC T6
IEC ia	IEC Ex ia IIC T6
IECEX	Ex tD A20/21 IP66 T, A21

¹⁰⁾ Prerequisite for maintaining the protection is a suitable cable.

¹¹⁾ Deviating data in Ex applications: see separate safety instructions.

¹²⁾ Depending on order specification.

FM	FM Cl.I, Div2 (NI)+Cl.II, III, Div1 (DIP); FM Cl.I-III, Div 1 (IS); FM Cl.I-III, Div 1 (IS)+Cl.I-III, Div 1 Gr.C-G(XP)
CSA	CSA Cl.I, Div2 (NI)+Cl.II, III, Div1 (DIP); CSA Cl.I-III, Div 1 (IS); CSA Cl.I-III, Div 1 (IS)+Cl.I-III, Div 1 Gr.C-G(XP)
Ship approvals	GL, LRS, ABS, CCS, RINA
Others	WHG

10.2 Dimensions

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

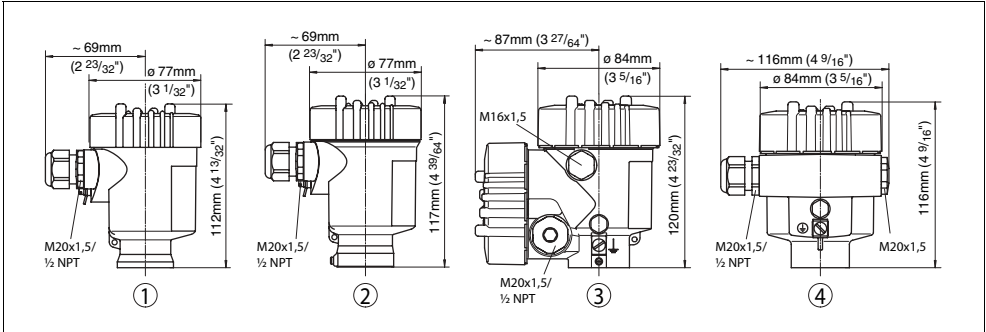


Fig. 31: Housing versions in protection IP 66/IP 67 and IP 66/IP 68; 0.2 bar, with integrated indicating and adjustment module the housing height increases by 9 mm ($1/64''$)

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

Housing in protection IP 66/IP 68, 1 bar

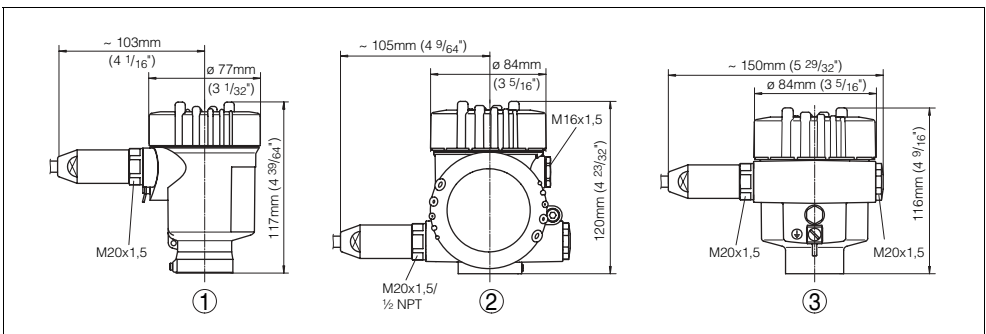


Fig. 32: Housing versions in protection IP 66/IP 68, 1 bar (with integrated indicating and adjustment module the housing is 9 mm/0.4 in higher)

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

VEGAPULS 65, threaded version

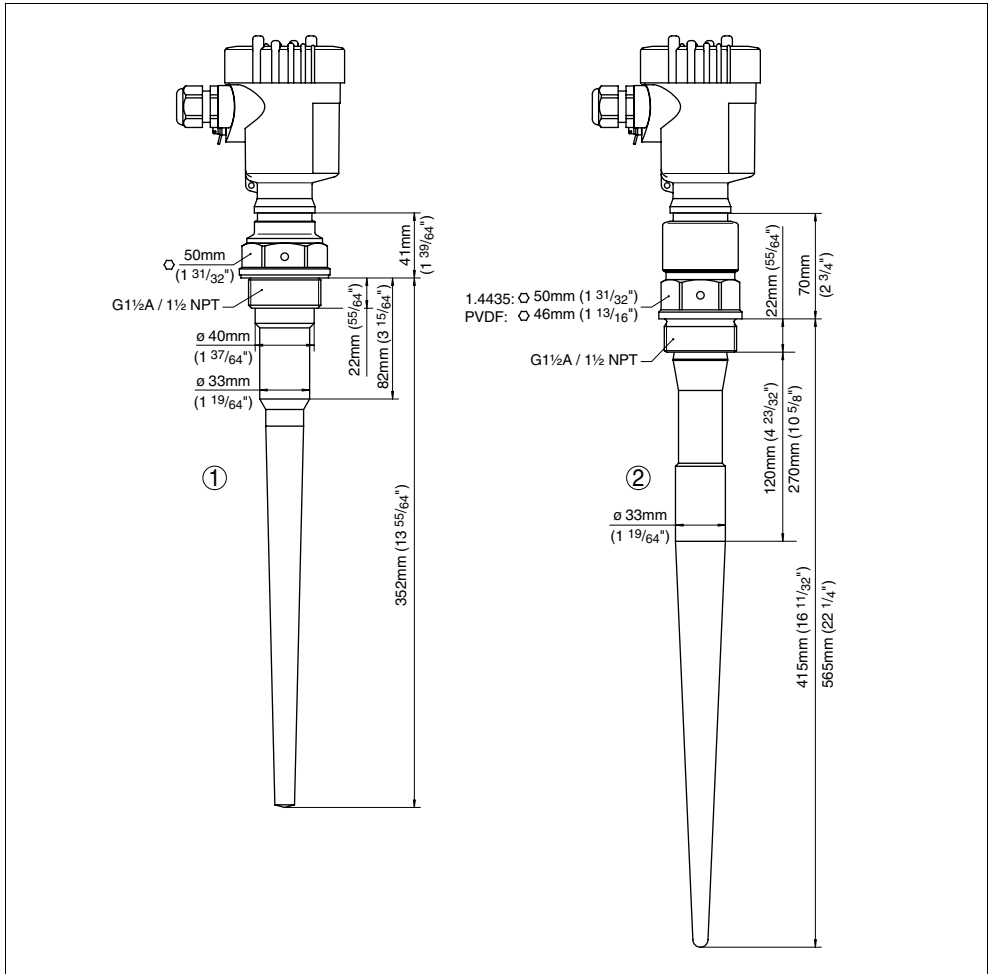


Fig. 33: VEGAPULS 65, threaded version

- 1 Thread and hexagon of PVDF for sockets with 50 mm height (inactive length 82 mm, 55/64")
- 2 Thread and hexagon of PVDF or 316L for sockets with 100 mm height (inactive length 120 mm, 4 23/32") or 250 mm height (inactive length 270 mm, 10 5/8")

VEGAPULS 65, flange version

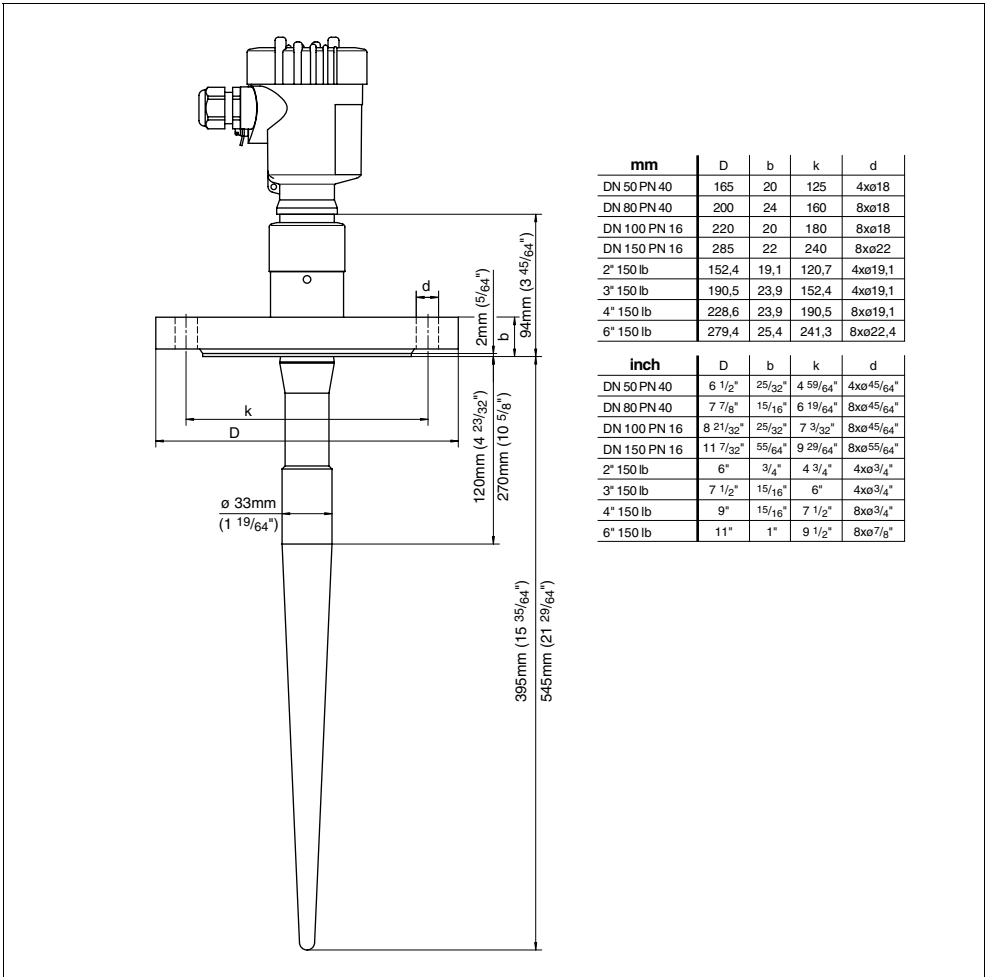


Fig. 34: VEGAPULS 65, flange version for sockets with 100 mm height (inactive length 120 mm, 4 23/32") or 250 mm height (inactive length 270 mm, 10 5/8")

10.3 Industrial property rights

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