Operating Instructions

VEGAPULS WL 61

4 … 20 mA/HART two-wire

Document ID:
38061

Radar

Contents

38061-EN-101005

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.

1 About this document

1.1 Function

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

1.2 Target group

This operating instructions manual is directed to trained 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.

1 **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 plant operator.

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

2.2 Appropriate use

VEGAPULS WL 61 is a sensor for continuous level measurement.

You can find detailed information on the application range in chapter "*Product description*".

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

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

This is a state-of-the-art instrument complying with all prevailing regulations and guidelines. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument.

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

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

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

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

Depending on the instrument version, the emitting frequencies are in the C or K band range. The low emitting frequencies are far below the internationally approved limit values. When used correctly, there is no danger to health.

2.5 CE conformity

The device fulfills the legal requirements of the applicable EC guidelines. By attaching the CE mark, VEGA provides a confirmation of successful testing. You can find the CE conformity declaration in the download area of www.vega.com.

2.6 Fulfillment of NAMUR recommendations

The device fulfills the requirements of the applicable NAMUR recommendations.

2.7 Radio approval for Europe

The instrument is approved according to EN 302372-1/2 (2006-04) for use in closed vessels as well as according to EN 302729 for use in the open air.

2.8 Environmental instructions

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

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

- Chapter "*Packaging, transport and storage*"
- Chapter "*Disposal*"

3 Product description

3.1 Structure

Type label

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

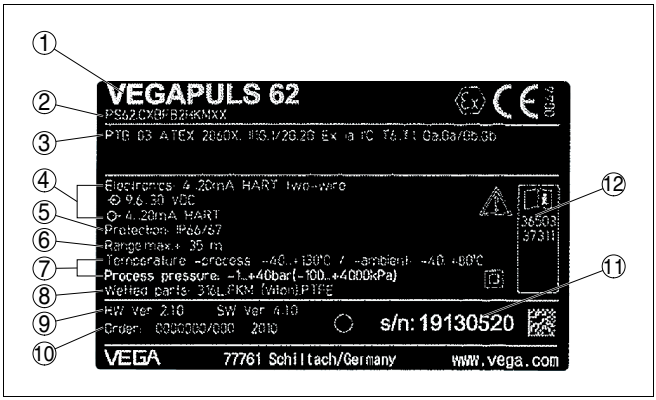


Fig. 1: Structure of the type label (example)

1 *Instrument type*
2 *Product code*
3 *Approvals*
4 *Electronics*
5 *Protection rating*
6 *Measuring range*
7 *Process and ambient temperature, process pressure*
8 *Material, wetted parts*
9 *Hardware and software version*
10 *Order number*
11 *Serial number of the instrument*
12 *ID numbers, instrument documentation*

Serial number

The serial number on the type label of the instrument allows you to call up the order data, operating instructions manuals, sensor data for the service DTM as well as the test certificate (depending on the instrument). To do this, open under www.vega.com, "*VEGA Tools*" and "*serial number search*".

Scope of the operating instructions manual

This operating instructions manual applies to the following instrument versions:

- Hardware from 1.0.0
- Software from 4.4.0

Scope of delivery

The scope of delivery encompasses:

- Radar sensor
- Documentation
  - this operating instructions manual
  - Ex-specific "*Safety instructions*" (with Ex versions)

– if necessary, further certificates

3.2 Principle of operation

Application area

The radar sensor VEGAPULS WL 61 is particularly suitable for use in pump stations and rain overflow basins, for flow measurement in open flumes as well as for gauge measurement. The high housing protection rating of the instrument allows outdoor mounting.

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.

3.3 Packaging, transport and storage

Packaging

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

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

Transport

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

Transport inspection

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

Storage

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

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

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

Storage and transport temperature

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

3.4 Accessories and replacement parts

Interface adapter

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

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

External indicating and adjustment unit with HART protocol

VEGADIS 62 is suitable for measured value indication and adjustment of sensors with HART protocol. It is looped into the 4 … 20 mA/HART signal cable.

You can find further information in the operating instructions "*VEGADIS 62*" (Document-ID 36469).

4 Mounting

4.1 General instructions

Suitability for the process conditions

Make sure that all parts of the instrument exposed to the process, in particular the antenna, seal and process fitting, are suitable for the existing process conditions. These include above all the process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" or on the type label.

4.2 Mounting versions

Straining clamp

The most simple way to mount the instrument is via a straining clamp. For this purpose, the connection cable is provided with a strain relief rope of Kevlar. This rope must be anchored separately.

In order to avoid faulty measured values, make sure that the sensor does not oscillate.

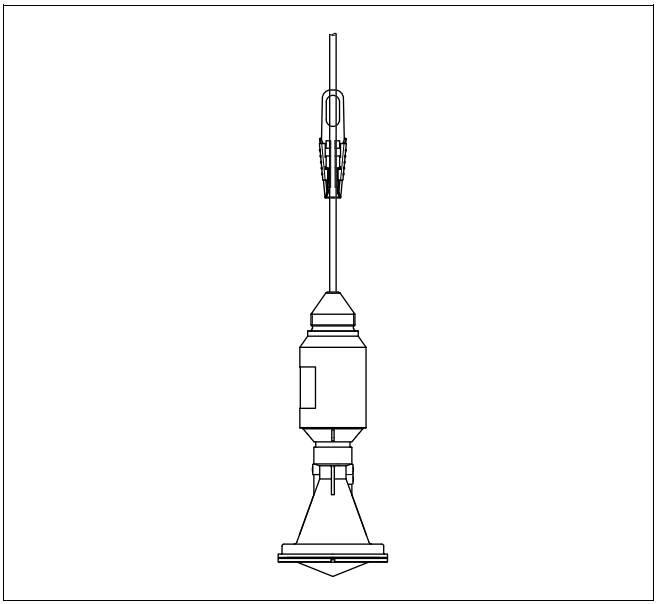


Fig. 2: Mounting via the connection cable, for example, via a straining clamp

Mounting bracket

For a rigid mounting, a mounting bracket with opening for thread G1½A, e.g. from the VEGA product range, is recommended. The mounting the sensor in the bracket is carried out via a G1½A counter nut of plastic. Take note of chapter 4.4 "*Mounting instructions*" for the distance to the wall.

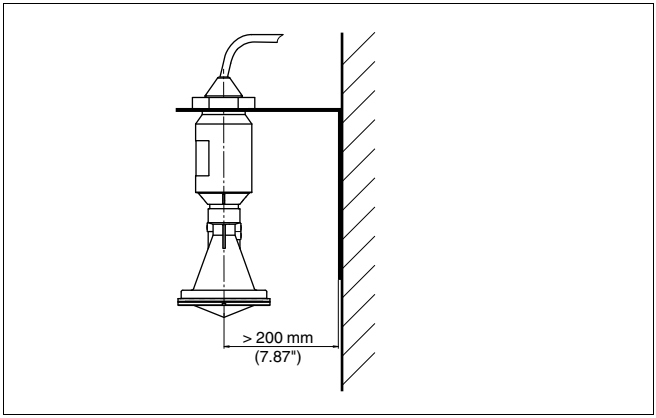


Fig. 3: Mounting via a mounting bracket

Mounting strap

The optional mounting strap allows sensor mounting on a bracket or a ceiling. Vertical mounting is the standard method. This allows rotating the sensor for optimal alignment.

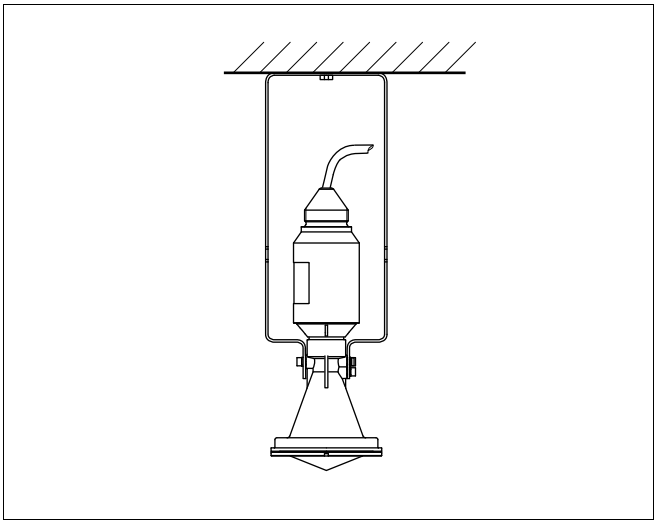


Fig. 4: Mounting via a mounting strap - vertically

In some cases, e.g. in closed rain overflow basins with narrow space between ceiling and water surface, horizontal mounting is recommended. For this purpose, there is a mounting strap with 170 mm length available in the VEGA product line. The radar impulses are deflected via a 45° reflector, e.g. a stainless steel sheet, to the water surface.

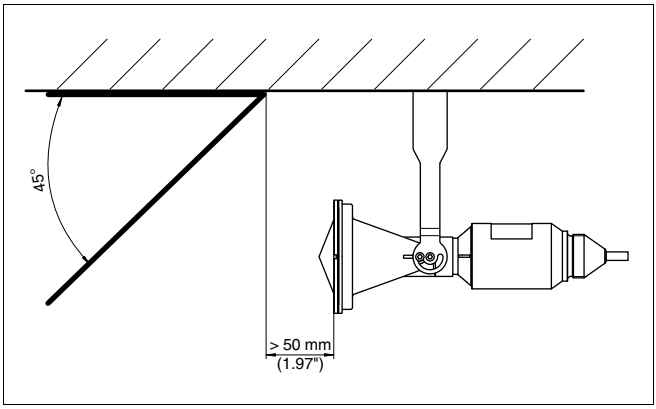


Fig. 5: Mounting via a mounting strap - horizontally

Flange

For mounting the instrument on a socket or a manhole cover, an unassembled combination compression flange is optionally available for DN 80 (ASME 3" or JIS 80), also as a retrofitting part. As an alternative, the instrument can be already supplied with a tight, fix-mounted adapter flange from DN 100 (ASME 4" or JIS 100).

You can find drawings of these mounting options in chapter "*Dimensions*".

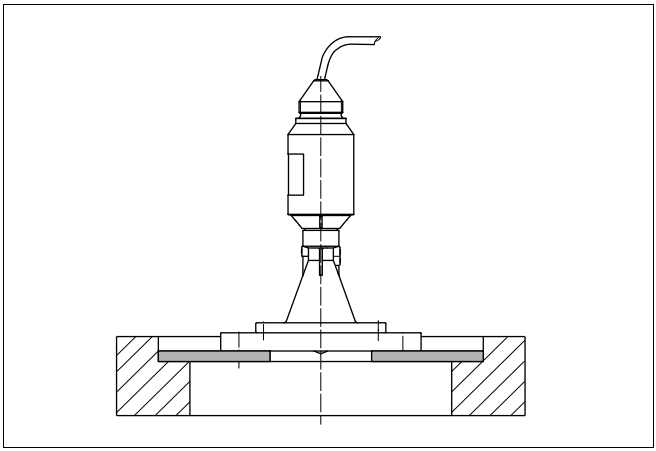


Fig. 6: Mounting by means of an adapter flange, for example, on a manhole top.

4.3 Mounting preparations, mounting strap

The optional strap is supplied unassembled and must be screwed to the sensor before setup with three hexagon socket screws M5x10 and spring washers. Max. torque, see chapter "*Technical data*". Required tools: Allen wrench size 4.

There are two different versions for screwing the strap to the sensor. Depending on the selected version, the sensor can be rotated infinitely variably in the strap by 180° or in three steps 0°, 90° and 180°.

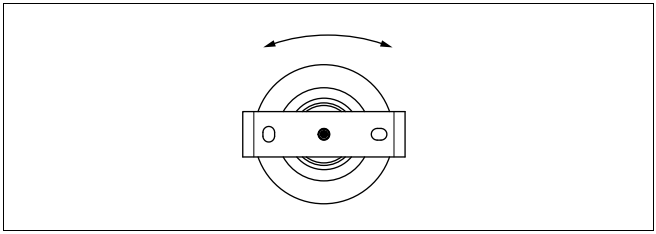


Fig. 7: Turning by fastening in the centre

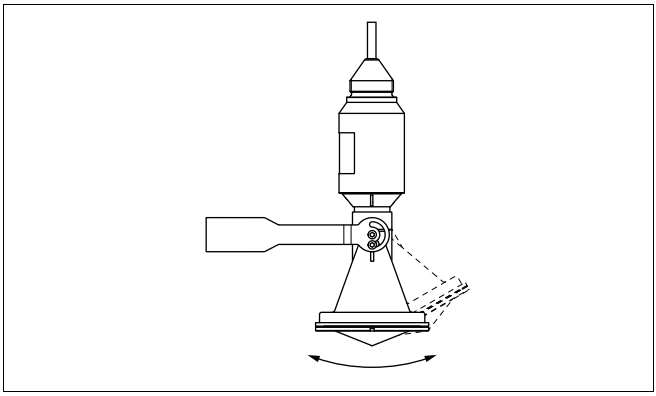


Fig. 8: Adjustment of the angle of inclination

4.4 Mounting instructions

Polarisation plane

The emitted radar impulses of the radar sensor are electromagnetic waves. The polarisation plane is the direction of the electrical wave component. By turning the instrument in the connection flange or mounting strap, the polarisation can be used to reduce the effects of false echoes.

The position of the polarisation level is marked by marking bars on the instrument.

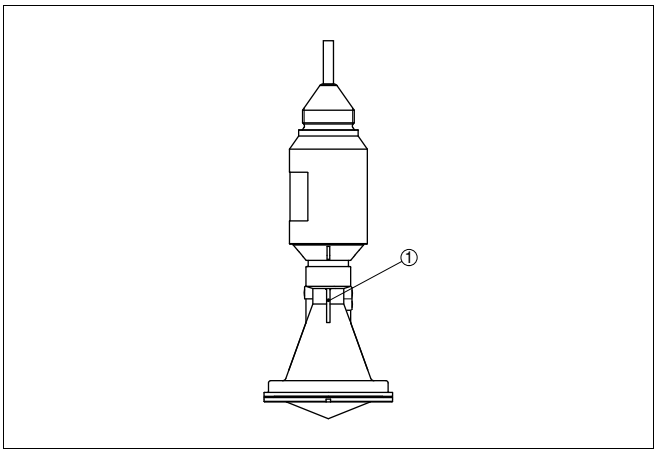


Fig. 9: Position of the polarisation plane of VEGAPULS WL 61

1 Marking bar

Mounting position

When mounting the sensor, keep a distance of at least 200 mm (7.874 in) to the vessel wall. If the sensor is installed in the center of dished or round vessel tops, multiple echoes can arise. These can, however, be suppressed by an appropriate adjustment (see chapter "*Setup*").

If you cannot keep this distance you should carry out a false echo storage before setup. This applies mainly if buildup on the vessel wall is expected. In this case, we recommend repeating a false echo storage later with existing buildup.

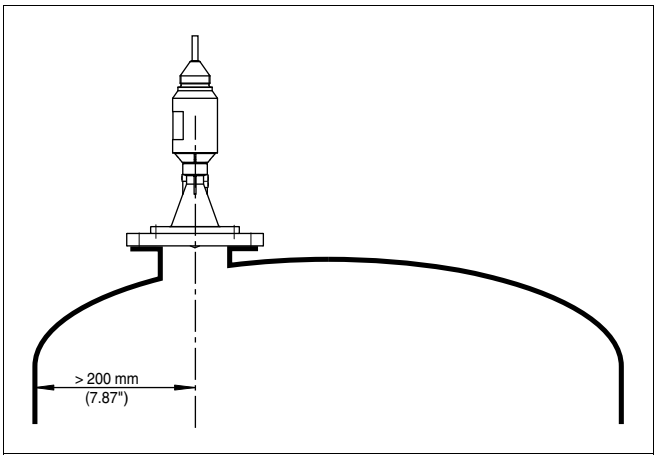


Fig. 10: Mounting of the radar sensor on round vessel tops

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.

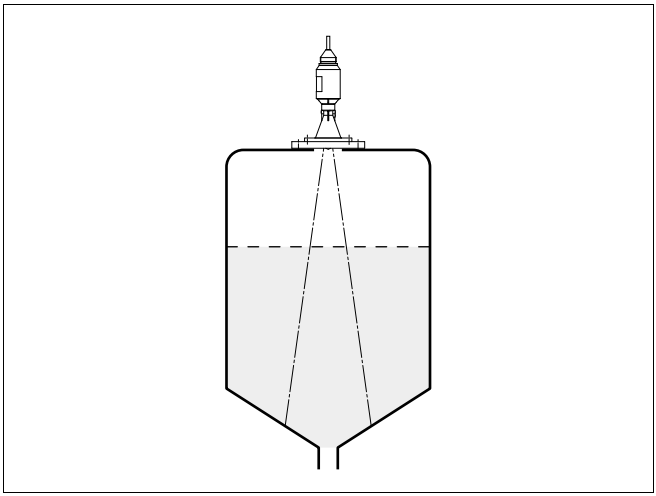


Fig. 11: Mounting of the radar sensor on vessels with conical bottom

Inflowing medium

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

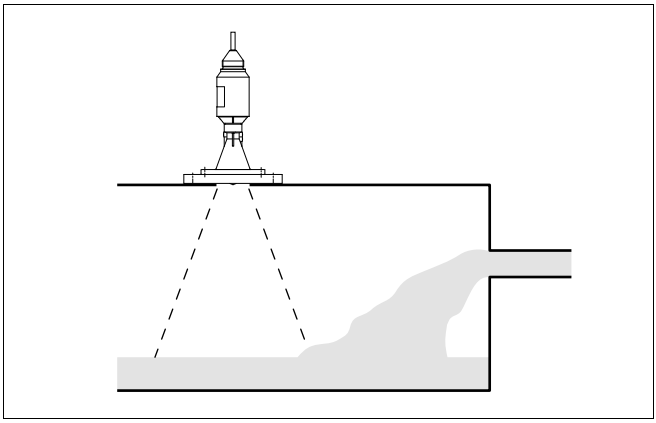
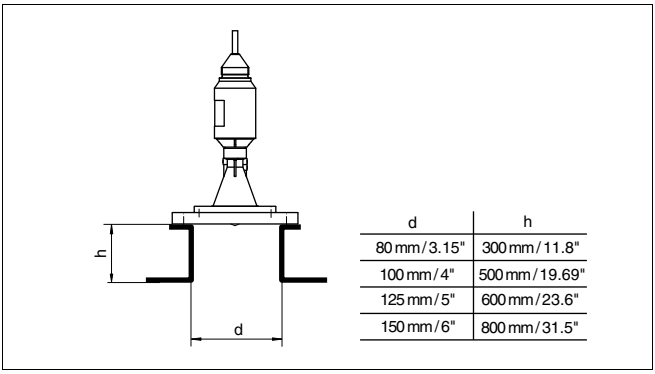


Fig. 12: Mounting of the radar sensor with inflowing medium

Socket

Approximate values of the socket heights are shown in the following illustration. The socket end should be smooth and burr-free, if possible also rounded. Aftr mounting, you have to carry out a false signal memory during the parameter adjustment.



d	h
80 mm / 3.15"	300 mm / 11.8"
100 mm / 4"	500 mm / 19.69"
125 mm / 5"	600 mm / 23.6"
150 mm / 6"	800 mm / 31.5"

Fig. 13: Deviating socket dimensions

Sensor orientation

Direct the sensor as perpendicular as possible to the product surface to achieve optimum measurement results.

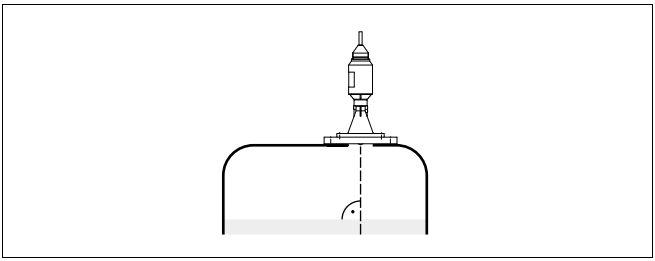


Fig. 14: Orientation of the sensor

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 e.g. ladders, limit switches, heating spirals, struts, etc., can cause false echoes and impair the useful echo. Make sure when planning your measuring site that the radar sensor has a "clear view" to the measured product.

In case of 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.

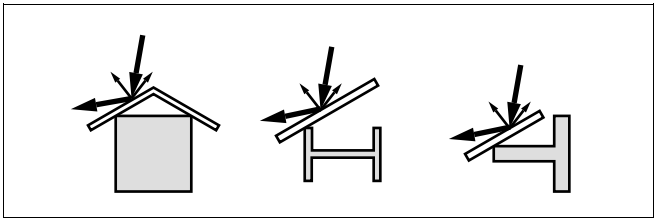


Fig. 15: Cover smooth profiles with deflectors

Foam generation

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

If foams are causing measurement errors, the biggest possible radar antennas, the electronics with increased sensitivity or low frequency radar sensors (C band) should be used.

As an alternative, sensors with guided microwave can be used. These are unaffected by foam generation and are best suited for such applications.

Flow measurement with rectangular flume

The short examples give you introductory information on the flow measurement. Detailed planning information is available from flume manufacturers and in special literature.

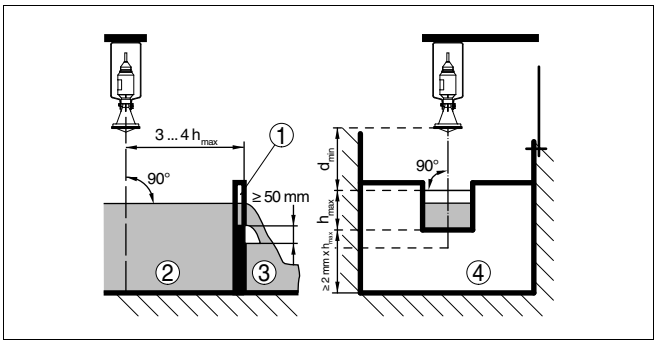


Fig. 16: Flow measurement with rectangular flume: $d_{min.}$ = min. distance of the sensor (see chapter "Technical data"); $h_{max.}$ = max. filling of the rectangular flume

1 Overflow orifice (side view)
2 Headwater
3 Tail water
4 Overfall orifice (view from bottom water)

In general, the following points must be observed:

- Install the sensor on the headwater side

- Installation in the centre of the flume and vertical to the liquid surface
- Distance to the overfall orifice
- Distance of orifice opening above ground
- Min. distance of the orifice opening to bottom water
- Min. distance of the sensor to max. storage level

Flow measurement with Khafagi Venturi flume

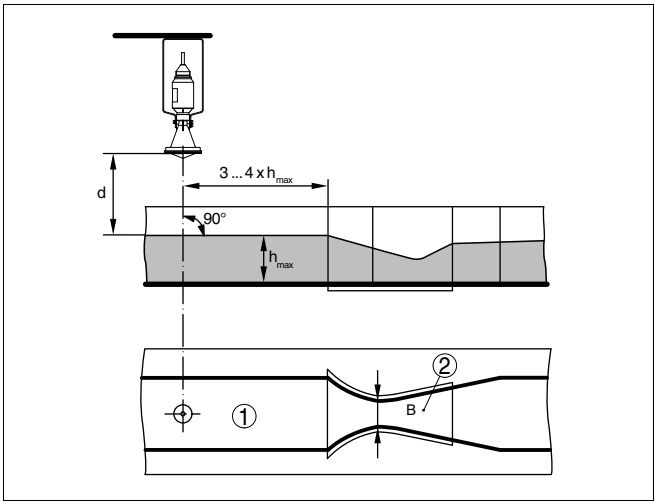


Fig. 17: Flow measurement with Khafagi-Venturi flume: d = Min. distance to sensor; $h_{max.}$ = max. filling of the flume; B = tightest constriction in the flume

1 Position sensor
2 Venturi flume

In general, the following points must be observed:

- Installation of the sensor at the inlet side
- Installation in the centre of the flume and vertical to the liquid surface
- Distance to the Venturi flume
- Min. distance of the sensor to max. storage level

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltages are expected, install overvoltage arresters

Voltage 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 specified in chapter "*Technical data*".

Provide a reliable separation between the supply circuit and the mains circuits according to DIN VDE 0106 part 101.

Keep in mind the following additional influences on the operating 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*")

Connection to signal conditioning instruments

The signal conditioning instruments VEGAMET and VEGASCAN have digital sensor recognition. When connecting VEGAPULS WL 61, an up-to-date software version of the signal conditioning instrument is required for the signal conditioning instrument. For a software update go to "Software" under "*www.vega.com/downloads*".

Connection cable

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

For instruments with housing and cable gland, use cable with round cross-section. A cable outer diameter of 5 … 9 mm (0.2 … 0.35 in) ensures the seal effect of the cable gland. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

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

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

Wire assignment connection cable

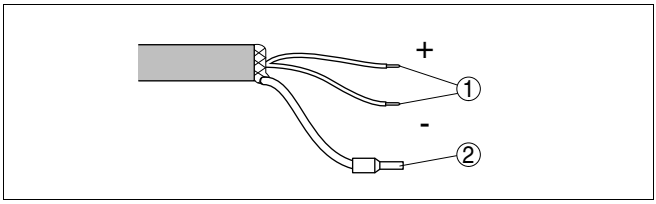


Fig. 18: Wire assignment fix-connected connection cable

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

5.3 Switch on phase

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

- Internal check of the electronics
- Indication of the instrument type, hardware and software version, measurement loop name on the display or PC
- Indication of the status message "*F 105 Determine measured value*" on the display or PC
- The output signal jumps to the set error current

As soon as a plausible measured value is found, the corresponding current is outputted to the signal cable. The value corresponds to the actual level as well as the settings already carried out, e.g. factory setting.

6 Set up with VEGADIS 62

6.1 Connection

The VEGADIS 62 is an indicating and adjustment unit without external energy for looping into 4 … 20 mA/HART circuits.

VEGADIS 62 also allows the measuring range and unit of the connected HART sensor to be modified. To do this, no additional devices or tools are necessary. Further changes to the configuration of the sensor cannot be carried out.

The parameter adjustment of the sensor is carried out via HART communication. During the parameter adjustment, the VEGADIS 62 works as a Secondary Master against the sensor.

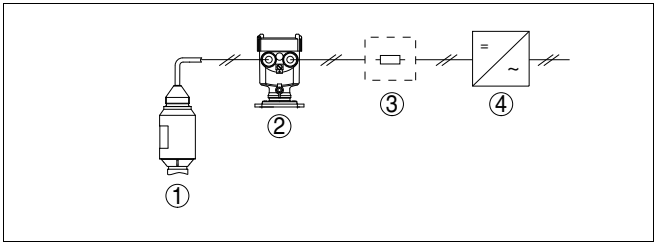


Fig. 19: Connection of VEGADIS 62 to the sensor

1 Sensor
2 VEGADIS 62
3 HART resistor > 150 Ω (with low impedance power supply necessary)
4 Voltage supply/Processing

7 Setup with PACTware

7.1 Connecting the PC

Via interface adapter to the signal cable

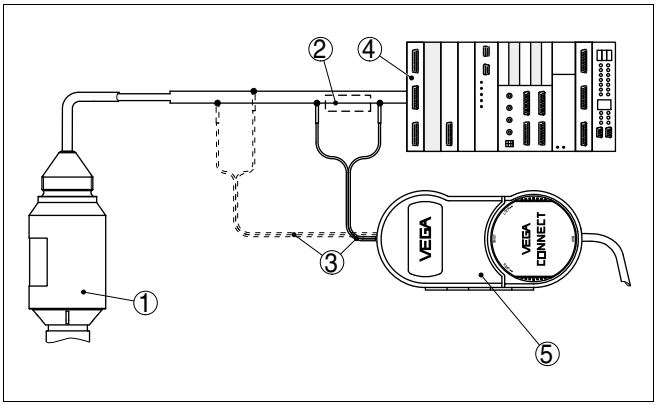


Fig. 20: Connecting the PC to the signal cable

1 Sensor
2 HART resistance 250 Ω (optional depending on processing)
3 Connection cable with 2 mm pins and terminals
4 Processing system/PLC/Voltage supply
5 Interface adapter, for example VEGACONNECT 4

Note:

With power supply units with integrated HART resistance (internal resistance approx. 250 Ω), an additional external resistance is not necessary. This applies, e.g. to the VEGA instruments VEGATRENN 149A, VEGAMET 381, VEGAMET 391. Common Ex separators are also usually equipped with a sufficient current limitation resistance. In such cases, the interface converter can be connected parallel to the 4 … 20 mA cable (dashed line in the previous illustration).

Via interface adapter to the VEGAMET signal conditioning instrument

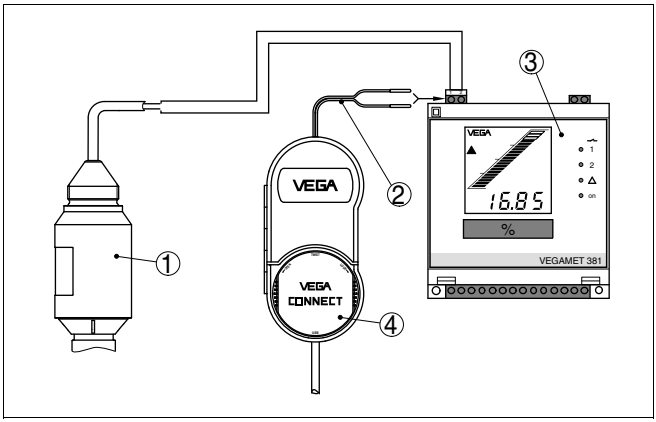


Fig. 21: Connection of the PC to the VEGAMET signal conditioning instrument

1 Sensor
2 Connection cable with 2 mm pins
3 Signal conditioning instrument, e.g. VEGAMET 381
4 Interface adapter, for example VEGACONNECT 4

7.2 Parameter adjustment with PACTware

Prerequisites

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

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

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

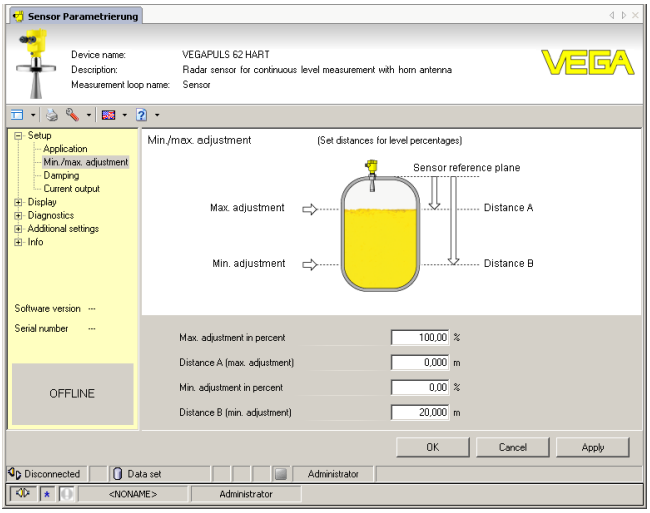


Fig. 22: Example of a DTM view

Standard/Full version

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

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

The standard version is available as a free-of-charge download under http://www.vega.com. The full version is available on CD from the agency serving you.

7.3 Saving the parameter adjustment data

We recommend documenting or saving the parameter adjustment data via PACTware. That way they are available for multiple use or service purposes.

8 Setting up with other systems

8.1 DD adjustment programs

Device descriptions as Enhanced Device Description (EDD) are available for DD adjustment programs, such as e.g. AMS™ and PDM.

A free-of-charge download of these files is available via Internet. Move via www.vega.com and "*Downloads*" to "*Software*".

8.2 Communicator 375, 475

Device descriptions for the instrument are available as DD or EDD for parameter adjustment with the Field Communicator 375 or 475.

A free-of-charge download of these files is available via Internet. Move via www.vega.com and "*Downloads*" to "*Software*".

9 Diagnosis and service

9.1 Maintenance

When the device is used correctly, no maintenance is required in normal operation.

9.2 Measured value and event memory

Measured value memory

The instrument has an integrated measured value memory with time stamp. Up to 100,000 measured values can be saved in the sensor in a ringing memory. Each entry contains date/time as well as the respective measured value.

Stored values are for exmaple sensor value, level, current value, reliability and electronics temperature. The data remain even in case of voltage interruption.

Via a PC with PACTware/DTM or the control system with EDD, the requested values and recording conditions are stipulated. Data are also read our or reset.

Event memory

The instrument also has an integrated event memory with time stamp. Up to 500 events are automatically stored in the sensor and are delete protected. Each entry contains date/time, event time, event description and value.

Event types are, for example, parameter modifications, status and error messages as well as switch on and switch off times. The data remain also in case of voltage interruption.

The data are read out via a PC with PACTware/DTM or the control system with EDD.

Echo curve memory

The instrument also has an integrated echo curve memory in which echo curves can be stored for diagnostic purposes. The echo curves are stored with date and time as well as the corresponding echo data. The data remain even in case of voltage interruption. The memory is divided into two sections:

Echo curve of the setup: here you can store the echo curve as a reference during setup. This echo curve can be used, for example, to detect changes in the installation conditions or buildup on the antenna.

Echo curve memory: up to 10 echo curves can be stored in a ring buffer in this memory section.

The requested values and recording conditions are stipulated via a PC with PACTware/DTM or the control system with EDD. Data are also read out or reset. Depending on the instrument, the echo curve created during setup can be stored alternatively also via the indicating and adjustment module.

9.3 Status messages

The instrument has a self-monitoring and diagnosis according to NE 107 and VDI/VDE 2650. The following status messages can be outputted:

Failure: Due to a malfunction in the instrument, a failure message is outpuuted. This status message is activated in the delivery status and cannot be deactivated by the user.

Function check: The instrument is in operation, the measured value is temporarily invalid (for example during simulation). This status message is activatedin the delivery status and cannot be deactivated by the user.

Out of specification: The measured value is unstable because the instrument specification was exceeded (for example electronics temperature). This status messae is deactivated in the delivery status and must be activated via PACTware/DTM and PC.

Maintenance: Due to external influences, the instrument function is limited. The measurement is affected, but the measured value is still valid. Plan in maintenance for the instrument because a failure is expected in the near future (e.g. due to buildup). This status message is deactivated in the delivery status and must be activated via PACTware/DTM and PC.

Depending on the instrument, error codes and text messages are dispayed via the indicating and adjustment module, PACTware/DTM as well as EDD in the control system. Additional information on error statstics is displayed in the menu Diagnosis under *Device status*" in the indicating and adjustment module as well as in PACTware/DTM.

Failure

The following table shows the error codes and text messages in the status message "*Failure*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Removal
F013 no measured value available	• Sensor does not detect an echo during operation • Antenna system contaminated or defective	• Check or correct installation and/or parameter adjustment • Clean or exchange process component or antenna
F017 Adjustment span too small	• Adjustment not within specification	• Change adjustment according to the limit values (difference between min. and max. ≥ 10 mm)

Code Text message	Cause	Removal
F025 Error in the linearization table	• Index markers are not continuously rising, for examle unlogical value pairs	• Check linearization table • Delete table/Create new
F036 No operable software	• Failed or interrupted software update	• Repeat software update • Check electronics version • Exchange of the electronics • Send instrument for repair
F040 Error in the electronics	• Hardware defect	• Exchange of the electronics • Send instrument for repair
F080	• General software error	• Separate operating voltage briefly
F105 Determine measured value	• The instrument is still in the start phase, the measured value could not yet be determined	• Wait for the warm-up phase • Duration depending on the version and parameter adjustment up to approximately 3 min.
F125 Unpermissible electronics temperature	• Temperature of the electronics in the non-specified section	• Check ambient temperature • Isolate electronics • Use instrument with higher temperature range
F260 Error in the calibration	• Error in the calibration carried out in the factory • Error in the EEPROM	• Exchange of the electronics • Send instrument for repair
F261 Error in the configuration	• Error during setup • False signal suppression faulty • Error when carrying out a reset	• Repeat setup • Repeat reset
F264 Installation/Setup error	• Adjustment not within the vessel height/measuring range • Max. measuring range of the instrument not sufficient	• Check or correct installation and/or parameter adjustment • Use an instrument with bigger measuring range
F265 Measurement function disturbed	• Sensor does no longer carry out a measurement • Operating voltage too low	• Check operating voltage • Carry out a reset • Separate operating voltage briefly

Function check

The following table shows the error codes and text messages in the status message "*Function check*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Removal
C700 Simulation	• Simulation active	• Finish simulation • Wait for the automatic end after 60 mins.

Out of specification

The following table shows the error codes and text messages in the status message "*Out of specification*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Removal
S600 Unpermissible electronics temperature	• Temperature of the electronics in the non-specified section	• Check ambient temperature • Isolate electronics • Use instrument with higher temperature range

Maintenance

The following table shows the error codes and text messages in the status message "*Maintenance*" and provides information on causes as well as corrective measures.

Code Text message	Cause	Removal
M500 Error with the reset delivery status	• With the reset to delivery status, the data could not be restored	• Repeat reset • Load XML file with sensor data into the sensor
M501 Error in the non-active linearization table	• Hardware error EEPROM	• Exchange of the electronics • Send instrument for repair
M502 Error in the diagnosis memory	• Hardware error EEPROM	• Exchange of the electronics • Send instrument for repair

Code Text message	Cause	Removal
M503 Reliability too low	• The echot/noise ratio is the small for a reliable measurement	• Check installation and process conditions • Clean the antenna • Change polarisation direction • Use instrument with higher sensitivity
M504 Error on an device interface	• Hardware defect	• Check connections • Exchange of the electronics • Send instrument for repair

9.4 Rectify faults

Reaction when malfunctions occur

The operator of the system is responsible for taking suitable measures to remove interferences.

Fault rectification

The first measures to be taken are to check the output signal as well as to evaluate the error messages via the indicating and adjustment module. 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 this way and faults rectified.

Checking the 4 … 20 mA signal

Connect a handmultimeter in the suitable measuring range according to the wiring plan. The following table describes possible errors in the current signal and helps to remove them:

Error	Cause	Removal
4 … 20 mA signal not stable	Level fluctuations	Set damping according to the instrument via the indicating and adjustment module or PACTware/DTM
4 … 20 mA signal missing	Electrical connection faulty	Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"
	Voltage supply missing	Check cables for breaks; repair if necessary
	Operating voltage too low or load resistance too high	Check, adapt if necessary

Error	Cause	Removal
Current signal greater than 22 mA or less than 3.6 mA	Oscillator in the sensor defective	Exchange the instrument or send it in for repair

Reaction after fault rectification

Depending on the failure reason and measures taken, the steps described in chapter "*Set up*" must be carried out again, if necessary.

24 hour service hotline

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

The hotline is 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.

9.5 Software update

The following components are required to update the sensor software:

- Sensor
- Voltage supply
- Interface adapter VEGACONNECT 4
- PC with PACTware
- Current sensor software as file

Caution:
Keep in mind that a software update can lead to expiry of the approvals. You can find detailed information on our homepage www.vega.com.

Load sensor software to PC

At "www.vega.com/downloads" go to "*Software*". Select under "*plics sensors and instruments*" the respective instrument series and software version. Load the zip file via the right mouse key with "*Save target as*" e.g. on the desktop of your PC. Extract all files available in the zip file, e.g. to the desktop.

Prepare update

Connect the sensor to power supply and provide connection from the PC to the instrument via the interface adapter. Start PACTware and move via the menu "*Project*" to the *VEGA project assistant*. Select "*USB*" and "*Set instruments online*". Provide connection to the sensor via "*Start*" until the message "*Search complete*" is displayed.

Load software into sensor

Move in the PACTware menu bar to "*Instrument data*", "*Additional functions*" and "*Software update*". PACTware now checks the actual hardware and software version of the sensor and displays the data. This process takes approx. 60 s.

Push the button "*Update software*" and select the previously extracted XML file. Then the software update can be started. The additional files are installed automatically. Depending on the sensor, this procedure lasts up to 15 min.

9.6 How to proceed in case of repair

If a repair is necessary, please proceed as follows:

You can download a return form (23 KB) from our Internet 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 back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging
- Please ask the agency serving you for the address of your return shipment. You can find the competent agency on our website www.vega.com.

10 Dismounting

10.1 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.

10.2 Disposal

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

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

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

Materials: see chapter "*Technical data*"

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

11 Supplement

11.1 Technical data

General data

Materials, wetted parts	
– Adapter flange	PP
– Seal, adapter flange	FKM (Viton), EPDM
– Antenna	PBT-GF 30
– Focussing lense	PP
Materials, non-wetted parts	
– Compression flange	PP
– Mounting strap	316L
– Fixing screws, mounting strap	316L
– Fixing screws, adapter flange	304
– Housing	plastic PBT (Polyester)
– type label support on cable	PE hard
Process fitting, mounting thread on the housing	
– Flange	DIN from DN 80, ANSI from 3", JIS from DN 100 10K
– Pipe thread, cylindrical (ISO 228 T1)	G1½ A
Instrument weight, depending on process fitting	0.7 … 3.4 kg (1.543 … 7.496 lbs)
Weight suspension cable	0.1 kg/m (0.07 lbs/ft)
Max. torque, mounting screws - strap on the sensor housing	4 Nm

Input variable

Measured variable	The measured variable is the distance between the process fitting of the sensor and the product surface. The reference plane is the lower side of the flange.

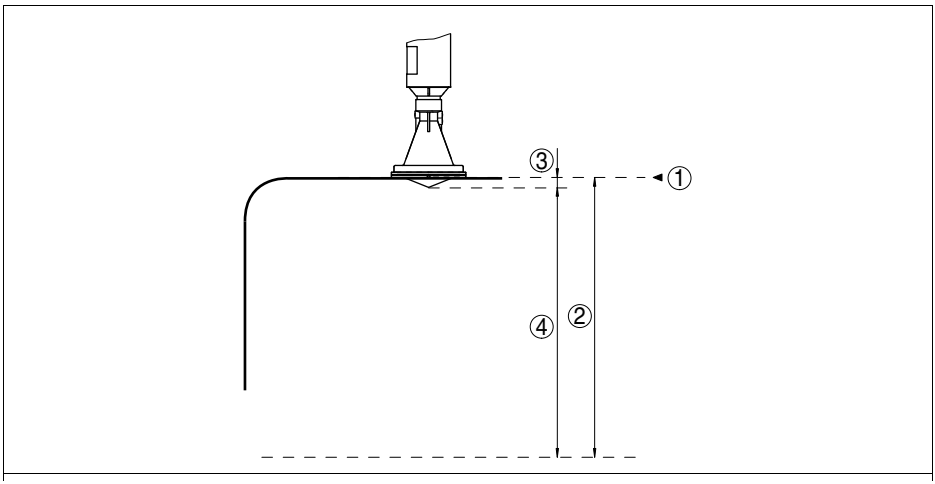


Fig. 23: Data of the input variable

1 Reference plane
2 Measured variable, max. measuring range
3 Antenna length
4 Useful measuring range

Max. measuring range	15 m (49.21 ft)

Output variable	
Output signal	4 … 20 mA/HART
Signal resolution	0.3 µA
Residual ripple	±0.4 µA
Failure signal current output (adjustable)	mA-value unchanged 20.5 mA, 22 mA, < 3.6 mA
Max. output current	22 mA
Starting current	≤ 3.6 mA; ≤ 10 mA for 5 ms after switching on
Load	see load diagram under Power supply
Damping (63 % of the input variable), adjustable	0 … 999 s
HART output values according to HART 7.0[1)]	
– PV (Primary Value)	Distance to the level
– SV (Secondary Value)	Level as percentage value
– TV (Third Value)	Linearised percentage value
– QV (Fourth Value)	Scaled measured value
Resolution, digital	< 1 mm (0.039 in)

1) Default values, can be assigned individually

Accuracy (similar to DIN EN 60770-1)

Process reference conditions according to DIN EN 61298-1

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

Installation reference conditions

– Min. distance to installations	> 200 mm (7.874 in)
– Reflector	Corner reflector
– False reflections	Largest false echo 20 dB smaller than the useful echo
Deviation with liquids	See following diagrams

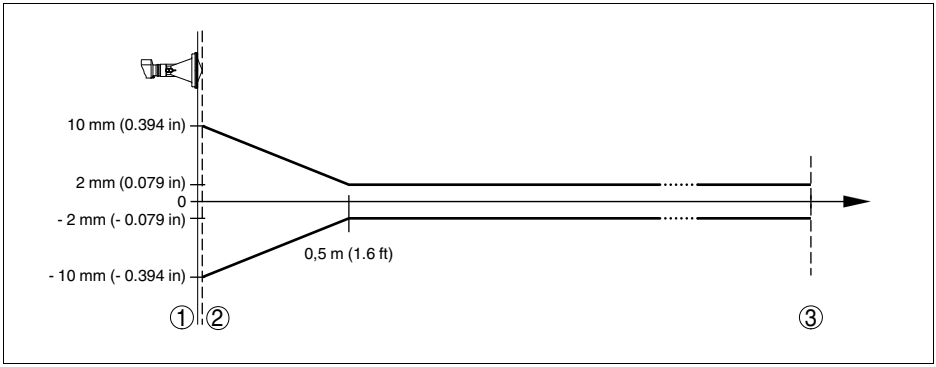


Fig. 24: Deviation under reference conditions

1 Reference plane
2 Antenna edge
3 Recommended measuring range

Reproducibility	≤ ±1 mm
Deviation under EMC influence	≤ ±30 mm

Variables influencing measurement accuracy

Specifications apply to the HART signal and the current output

Temperature drift - Digital output	±3 mm/10 K relating to the max. measuring range or max. 10 mm
Additional deviation through strong, high frequency electromagnetic fields acc. to EN 61326	<±50 mm

Specifications apply also to the current output

Temperature drift - Current output	±0.03 %/10 K relating to the 16 mA span max. ±0.3 %

Deviation on the current output by analogue/ digital conversion	<±15 µA
Deviation on the current output by strong, high frequency electromagnetic fields within EN 61326	<±100 µA

Characteristics and performance data

Frequency	K-band (26 GHz technology)
Measuring cycle time approx.	450 ms
Step response time[2)]	≤ 3 s
Tracking speed of the measuring window max.	1 m/min
Beam angle[3)]	10°
Emitted HF power of the antenna system	
– Pulse peak power	< 10 mW
– Pulse duration	< 1 ns
– Average power	< 25 µW
– Average power with 1 m distance	< 1 µW/cm²

Ambient conditions

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

Process conditions

For the process conditions, please also note the specifications on the type label. The lower value always applies.

Vessel pressure	-1 … 2 bar (-100 … 200 kPa/-14.5 … 29.0 psig)
Process temperature (measured on the process fitting)	-40 … +80 °C (-40 … +176 °F)
Vibration resistance[4)]	
– With adapter flange	mechanical vibrations up to 2 g in the frequency range 5 … 200 Hz
– with mounting strap	mechanical vibrations up to 1 g in the frequency range 5 … 200 Hz

Electromechanical data - version IP 66/IP 68 (2 bar)

Cable entry	IP 68 cable gland
Connection cable	
– Structure	two wires, one Kevlar cable, braiding, cover

2) Time span after a sudden distance change of max. 0.5 m until the output signal reaches for the first time 90% of the final value (IEC 61298-2).
3) Outside the specified beam angle, the energy of the radar signal has a level of -3 dB (50 %)
4) Tested according to the guidelines of German Lloyd, GL directive 2.

– Wire cross-section	0.5 mm^2 (AWG 20)
– Standard length	6 m (19.69 ft)
– Max. length	1000 m (3280 ft)
– Min. bending radius	25 mm (0.984 in) with 25 °C (77 °F)
– Diameter approx.	8 mm (0.315 in)
– Wire isolating and cable cover	PUR
– Colour - standard	Black
– Colour - Ex-version	Blue
– Fire protection classification	UL94-V0

Integrated clock

Date format	Day.Month.Year
Time format	12 h/24 h
Time zone Ex factory	CET

Electronics temperature measurement

Resolution	1 °C (1.8 °F)
Accuracy	±1 °C (1.8 °F)

Voltage supply

Operating voltage	
– Non-Ex instrument	9.6 … 36 V DC
– Ex-ia instrument	9.6 … 30 V DC
Interpolation protection	Available
Permissible residual ripple - Non-Ex, Ex-ia instrument	
– for 9.6 $V_{< U_N}$ < 14 V	≤ 0.7 V_{eff} (16 … 400 Hz)
– for 18 $V_{< U_N}$ < 36 V	≤ 1.0 V_{eff} (16 … 400 Hz)
Load	see diagram

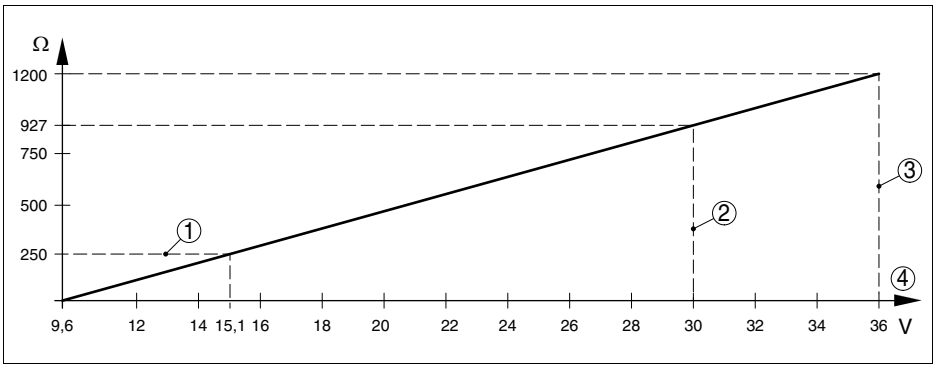


Fig. 25: Voltage diagram

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

Electrical protective measures	
Protection rating	IP 66/IP 68 (2 bar)
Overvoltage category	III
Protection class	II

Approvals

Depending on the version, instruments with approvals can have different technical data.

For these instruments, the corresponding approval documents have to be taken into account. These are part of the delivery or can be downloaded under www.vega.com via "*VEGA Tools*" and "*serial number search*" as well as via "*Downloads*" and "*Approvals*".

11.2 Dimensions

The following dimensional drawings represent only an extract of the possible versions. Detailed dimensional drawings can be downloaded on www.vega.com under "*Downloads*" and "*Drawings*".

VEGAPULS WL 61 - version with mounting strap

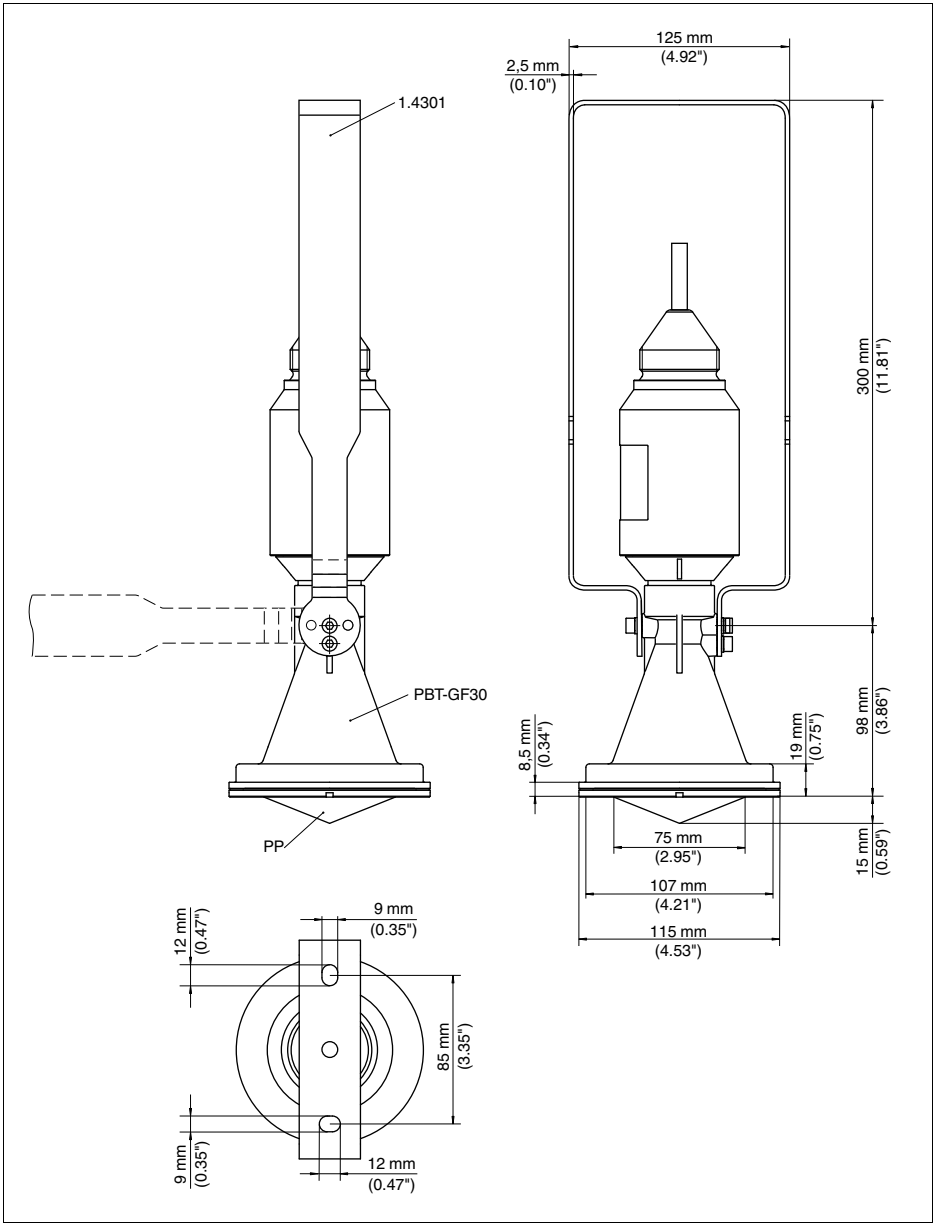


Fig. 26: VEGAPULS WL 61 - version with mounting bracket 170 or 300 mm in length

VEGAPULS WL 61 - version with compression flange

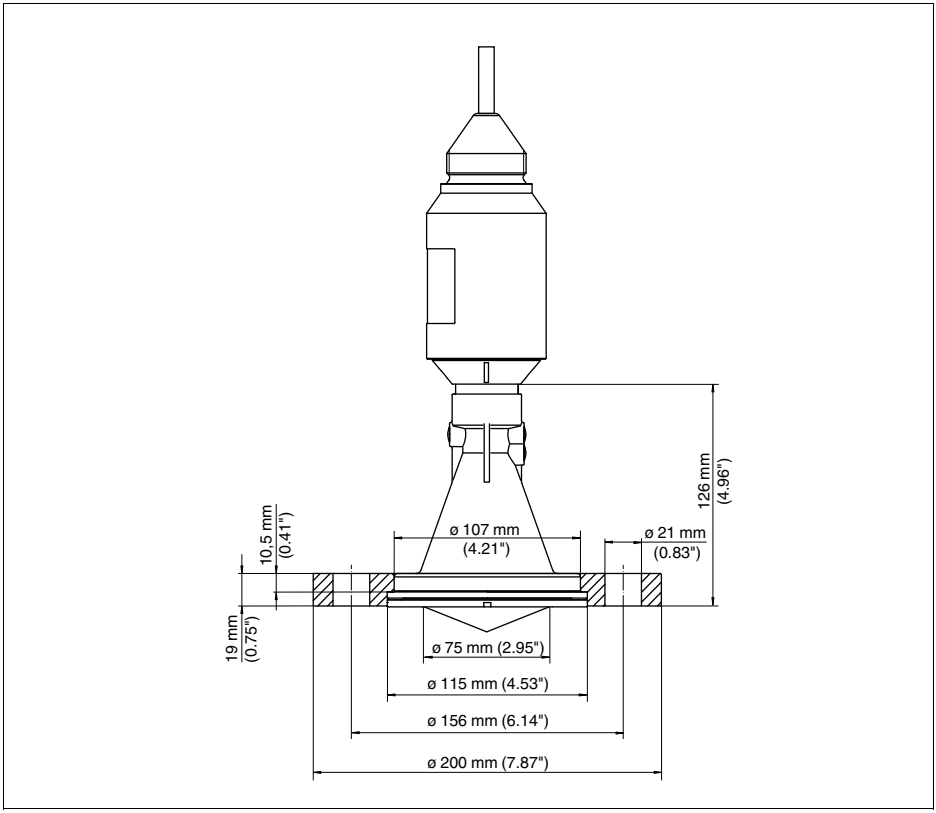
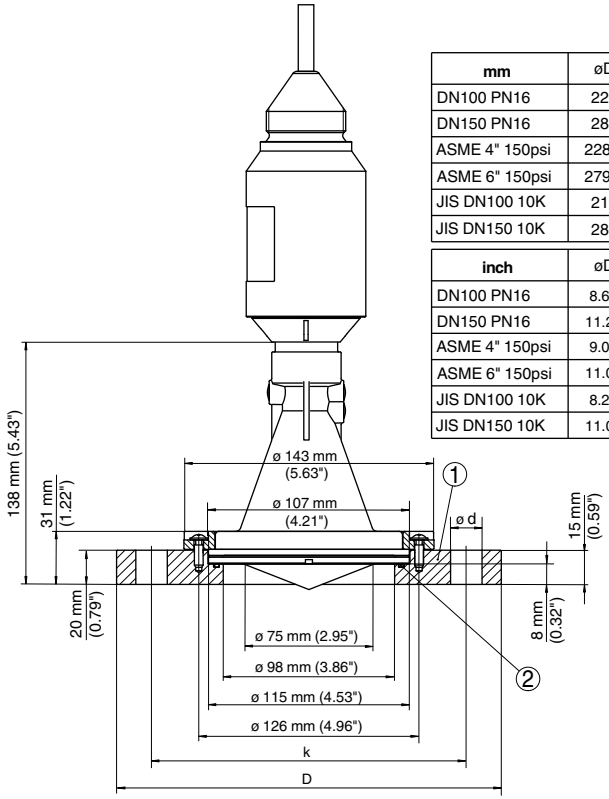


Fig. 27: VEGAPULS WL 61 - compression flange DN 80/3"/JIS80

VEGAPULS WL 61 - version with adapter flange



mm	øD	øk	ød	
DN100 PN16	220	180	18	8x45°(=360°)
DN150 PN16	285	240	22	8x45°(=360°)
ASME 4" 150psi	228,6	190,5	19,1	8x45°(=360°)
ASME 6" 150psi	279,4	241,3	22,4	8x45°(=360°)
JIS DN100 10K	210	175	19	8x45°(=360°)
JIS DN150 10K	280	240	23	8x45°(=360°)

inch	øD	øk	ød	
DN100 PN16	8.66"	7.09"	0.71"	8x45°(=360°)
DN150 PN16	11.22"	9.45"	0.87"	8x45°(=360°)
ASME 4" 150psi	9.00"	7.50"	0.75"	8x45°(=360°)
ASME 6" 150psi	11.00"	9.50"	0.88"	8x45°(=360°)
JIS DN100 10K	8.27"	6.89"	0.75"	8x45°(=360°)
JIS DN150 10K	11.02"	9.45"	0.91"	8x45°(=360°)

Fig. 28: VEGAPULS WL 61 - adapter flange DN 100/4"/JIS 100 as well as DN 150/6"/JIS 150

1 Adapter flange
2 Seal

11.3 Industrial property rights

VEGA product lines are global protected by industrial property rights. Further information seehttp://www.vega.com.

Only in U.S.A.: Further information see patent label at the sensor housing.

VEGA Produktfamilien sind weltweit geschützt durch gewerbliche Schutzrechte.

Nähere Informationen unterhttp://www.vega.com.

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11.4 Trademark

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