Operating Instructions

Radar sensor for continuous level measurement of liquids and bulk solids

VEGAPULS 6X

Two-wire 4 … 20 mA/HART

Document ID: 66190

VEGA

Contents

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Safety instructions for Ex areas:
Take note of the Ex specific safety instructions for Ex applications. These instructions are attached as documents to each instrument with Ex approval and are part of the operating instructions.

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1 About this document

1.1 Function

This instruction provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, the exchange of parts and the safety of the user. 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 personnel. The contents of this manual must be made available to the qualified personnel and implemented.

1.3 Symbols used

Document ID
This symbol on the front page of this instruction refers to the Document ID. By entering the Document ID on www.vega.com you will reach the document download.

Information, note, tip: This symbol indicates helpful additional information and tips for successful work.

Note: This symbol indicates notes to prevent failures, malfunctions, damage to devices or plants.

Caution: Non-observance of the information marked with this symbol may result in personal injury.

Warning: Non-observance of the information marked with this symbol may result in serious or fatal personal injury.

Danger: Non-observance of the information marked with this symbol results in serious or fatal personal injury.

Ex applications
This symbol indicates special instructions for Ex applications.

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

1 **Sequence of actions**
Numbers set in front indicate successive steps in a procedure.

Disposal
This symbol indicates special instructions for disposal.

2 For your safety

2.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified 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 6X is a sensor for continuous level measurement.

You can find detailed information about the area of application 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 incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

2.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. 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. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

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. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed.

The low transmitting power of the radar sensor is far below the internationally approved limits. No health impairments are to be expected with intended use. The band range of the measuring frequency can be found in chapter " *Technical data*".

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2.5 Mode of operation - Radar signal

Country specific settings for the radar signals are determined via the mode. The operating mode must be set in the operating menu via the respective operating tool at the beginning of the setup.

Caution:
Operating the device without selecting the relevant mode constitutes a violation of the regulations of the radio approvals of the respective country.

2.6 Installation and operation in the USA and Canada

This information is only valid for USA and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code

A Class 2 power supply unit has to be used for the installation in the USA and Canada.

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- Radar sensor, possibly with accessories
  - Disc springs (flange version with encapsulated antenna system) [1)]
  - Hexagon socket wrench (for instruments with swivel holder)
  - Optional accessory
- Information sheet " *PINs and Codes*" (with SIL, IT security, Bluetooth versions) with:
  - Bluetooth access code
  - Device code
- Information sheet " *Access protection*" (with SIL, IT security, Bluetooth versions) with:
  - Bluetooth access code
  - Emergency Bluetooth unlock code
  - Device code
  - Emergency device code
- Documentation
  - Quick setup guide VEGAPULS 6X
  - Instructions for optional instrument components
  - Ex-specific " *Safety instructions*" (with Ex versions)
  - Safety Manual (with SIL version)
  - Radio licenses
  - If necessary, further certificates

Information:
Optional instrument features are also described in this operating instructions manual. The respective scope of delivery results from the order specification.

Scope of this operating instructions

This operating instructions manual applies to the following instrument versions:

- Hardware version from 1.1.2
- Hardware version (SIL) from 1.2.1.1
- Software version from 1.1.0
- Software version (SIL) from 1.1.1.1

[1)] Use see chapter "Mounting instructions, sealing to the process"

Constituent parts

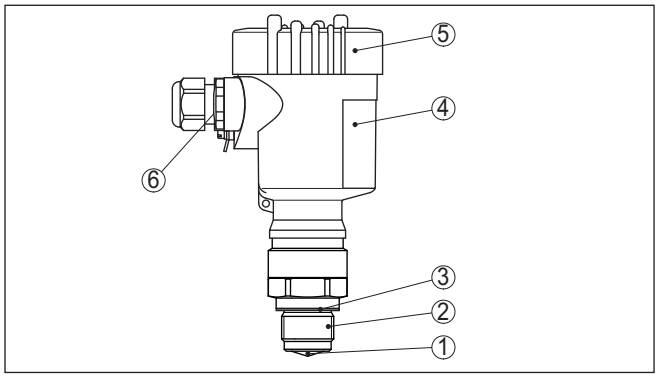


Fig. 1: Components of VEGAPULS 6X

1 Radar antenna
2 Process fitting
3 Process seal
4 Electronics housing
5 Housing cover with optional display and adjustment module
6 Ventilation

Type label

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

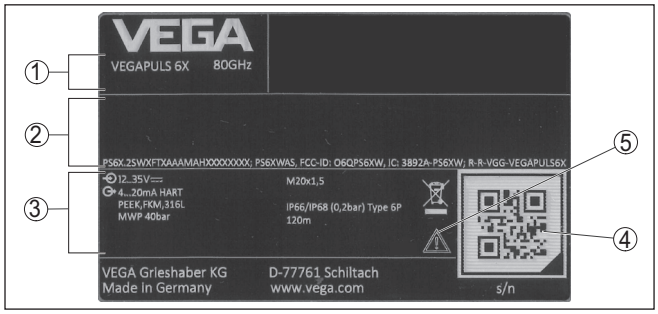


Fig. 2: Layout of the type label (example)

1 Device type, order code, radar frequency
2 Field for approvals, product code
3 Technical data
4 QR-code for VEGA Tools app
5 Reminder to observe the instrument documentation
6 Field for conformity logos

Serial number - Instrument search

The type label contains also the serial number of the instrument. With it you can find the following instrument data on our homepage:

- Product information
- Device configuration
- Related documentation
- Further documents

Move to " www.vega.com" and enter in the search field the serial number of your instrument.

Alternatively, you can access the data via your smartphone:

- Download the VEGA Tools app from the " *Apple App Store*" or the " *Google Play Store*"
- Scan the QR-code on the type label of the device or
- Enter the serial number manually in the app

3.2 Principle of operation

Application area

The VEGAPULS 6X is a radar sensor for continuous level measurement of liquids as well as bulk solids under different process conditions.

Antenna systems

The instrument is available with different antenna systems:

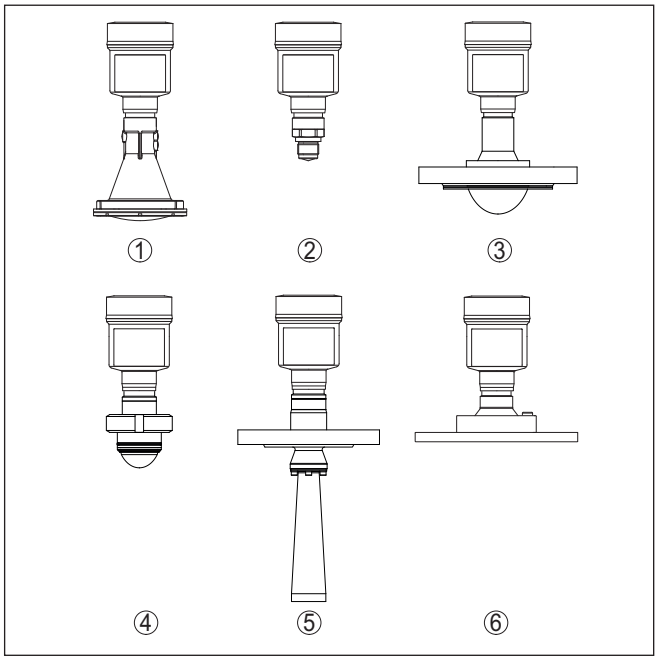


Fig. 3: Antenna systems VEGAPULS 6X

1 Plastic horn antenna
2 Thread with integrated antenna system
3 Flange with encapsulated antenna system
4 Hygienic fitting
5 Horn antenna
6 Flange with lens antenna

Functional principle

The instrument emits a continuous, frequency-modulated radar signal through its antenna. The emitted signal is reflected by the medium and received by the antenna as an echo with modified frequency. The

frequency change is proportional to the distance and is converted into the level.

3.3 Adjustment

Local adjustment

On-site adjustment of the device is carried out via the integrated display and adjustment unit.

Note:
The housing with display and adjustment unit can be rotated 330° for optimum readability and operability without tools.

Wireless adjustment

Devices with integrated Bluetooth module can be adjusted wirelessly via standard adjustment tools:

- Smartphone/tablet (iOS or Android operating system)
- PC/notebook (Windows operating system)

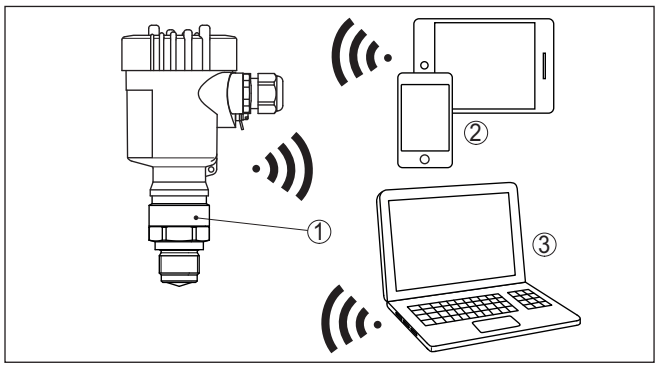


Fig. 4: Wireless connection to standard operating devices with integrated Bluetooth LE

1 Sensor
2 Smartphone/Tablet
3 PC/Notebook

Adjustment via the signal cable

Devices with signal output 4 … 20 mA/HART can also be operated via a signal cable. This is done via an interface adapter and a PC/ notebook using DTM/PACTware.

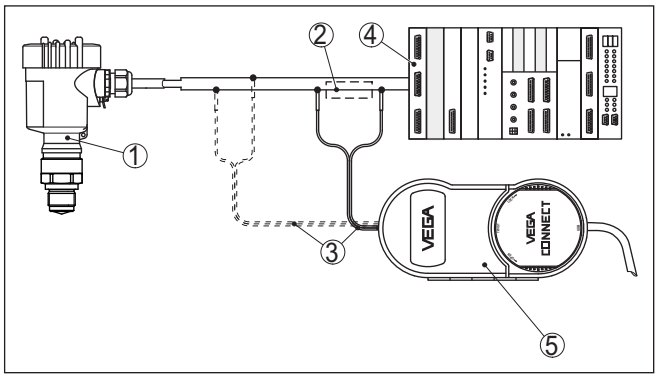


Fig. 5: Connecting the PC to the signal cable

1 Sensor
2 HART resistance 250 Ω (optional depending on evaluation)
3 Connection cable with 2 mm pins and terminals
4 Voltage supply
5 Interface adapter VEGACONNECT

3.4 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 based on ISO 4180.

The packaging 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 in due 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 moisture 20 … 85 %

Lifting and carrying

With instrument weights of more than 18 kg (39.68 lbs) suitable and approved equipment must be used for lifting and carrying.

3.5 Accessories

The instructions for the listed accessories can be found in the download area on our homepage.

Display and adjustment module

The display and adjustment module is used for measured value indication, adjustment and diagnosis.

The integrated Bluetooth module (optional) enables wireless adjustment via standard adjustment devices.

VEGACONNECT

The interface adapter VEGACONNECT enables the connection of communication-capable instruments to the USB interface of a PC.

VEGADIS 81

The VEGADIS 81 is an external display and adjustment unit for VEGA plics® sensors.

VEGADIS 82

VEGADIS 82 is suitable for measured value indication and adjustment of sensors with HART protocol. It is looped into the 4 … 20 mA/HART signal cable.

PLICSMOBILE T81

The PLICSMOBILE T81 is an external GSM/GPRS/UMTS radio unit for transmission of measured values and for remote parameter adjustment of HART sensors.

Welded socket, threaded and hygienic adapter

Welded sockets are used to connect the devices to the process.

Threaded and hygienic adapters enable simple adaptation of devices with standard threaded fittings to process-side hygiene connections.

Flanges

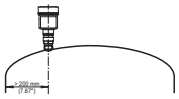
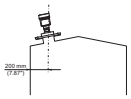
Screwed flanges are available in different versions according to the following standards: DIN 2501, EN 1092-1, BS 10, ASME B 16.5, JIS B 2210-1984, GOST 12821-80.

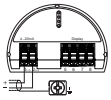
4 Setup – the most important steps

Prepare

What?	How?
Identify sensor 	Scan QR code on type label, check sensor data

Mount and connect sensor

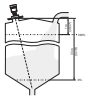
Liquids	Bulk solids
	

Connection technology	Wiring plan
	

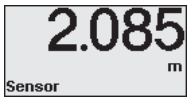
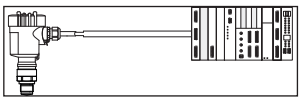
Select adjustment

Display and adjustment module	VEGA Tools app [2]
	

Parameterize sensor

Liquids	Bulk solids
Enter medium type, application, vessel height, adjustment and mode	
	

Check measured value

Indicators	Output
	

[2] Download via Apple App Store, Google Play Store, Baidu Store

5 Mounting

5.1 General instructions

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter " *Connecting to power supply*")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

Note:
Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Process conditions

Note:
For safety reasons, the instrument must only be operated within the permissible process conditions. You can find detailed information on the process conditions in chapter " *Technical data*" of the operating instructions or on the type label.

Hence make sure before mounting that all parts of the instrument exposed to the process are suitable for the existing process conditions.

These are mainly:

- Active measuring component
- Process fitting
- Process seal

Process conditions in particular are:

- Process pressure
- Process temperature
- Chemical properties of the medium
- Abrasion and mechanical influences

Second Line of Defense

As a standard feature, the VEGAPULS 6X is separate from the process through its plastic antenna encapsulation.

Optionally, the instrument is available with a Second Line of Defense (SLOD), a second process separation. It is located as gas-tight leadthrough between the process component and the electronics. This means additional safety against penetration of the medium fron the process into the instrument.

5.2 Housing features

Filter element

The filter element in the housing is used for ventilation of the housing.

For effective ventilation, the filter element must always be free of deposits. Therefore, mount the device so that the filter element is protected against deposits.

Note:
Do not use a high-pressure cleaner to clean housings in standard types of protection. The filter element could be damaged and moisture could penetrate the housing.

For applications with high-pressure cleaners, the device is available with the appropriate IP69 housing protection.

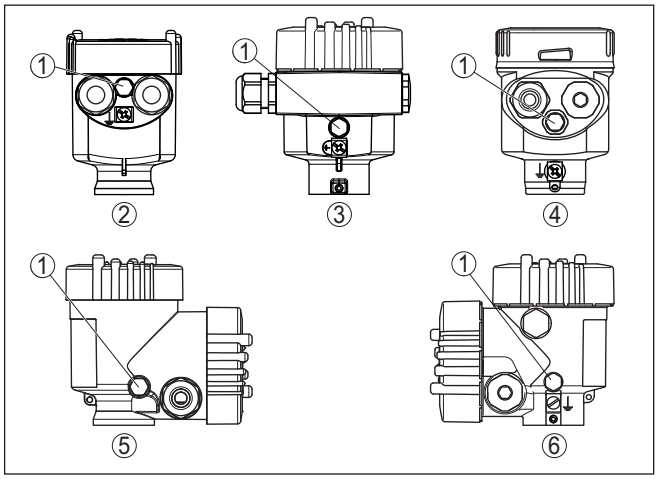


Fig. 6: Position of the filter element depending on housing

1 Filter element
2 Plastic single chamber
3 Aluminium single chamber, stainless steel single chamber (precision casting)
4 Stainless steel single chamber (electropolished)
5 Plastic double chamber
6 Aluminium, stainless steel double chamber housing (precision casting)

Information:
For devices in protection class IP66/IP68 (1 bar), ventilation is provided by a capillary in the fixed cable. In these devices, a blind plug is installed in the housing instead of the filter element.

Housing orientation

The housing of VEGAPULS 6X can be rotated completely by 360°. This enables optimal reading of the display and easy cable entry. [3]

For housings made of plastic or electropolished stainless steel, this is done without tools.

For housings made of aluminium or stainless steel (precision casting), a locking screw must be loosened for turning, see the following illustration:

[3] No limitation by a rotation stop

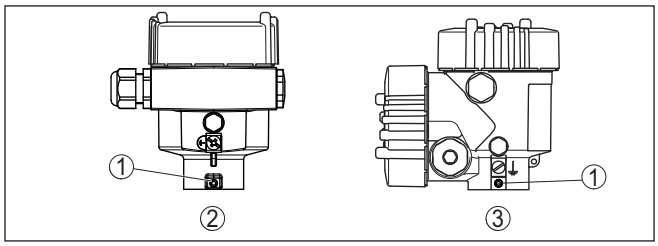


Fig. 7: Position of the locking screw depending on housing

1 Locking screw
2 Aluminium, stainless steel single chamber housing (precision casting)
3 Aluminium, stainless steel double chamber housing (precision casting)

Proceed as follows:

1. Loosen locking screw (hexagon size 2.5)
2. Turn housing into requested position
3. Re-tighten the locking screw (torque see chapter " *Technical data*").

Note:
By rotating the housing, polarisation changes. For this reason, please also observe the notes on polarisation in chapter " *Mounting instructions*".

Cover catch

With the aluminium and stainless steel housing (precision casting), the housing cover can be secured with a screw. This protects the device against unauthorised opening of the cover.

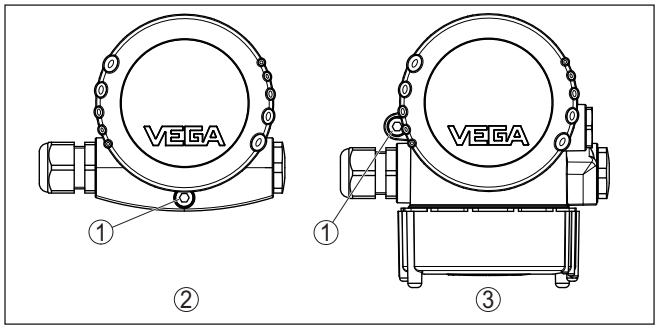


Fig. 8: Position of the safety screw depending on housing

1 Safety screw
2 Aluminium, stainless steel single chamber housing (precision casting)
3 Aluminium, stainless steel double chamber housing (precision casting)

Proceed as follows to secure the cover:

1. Screw the housing cover on tightly by hand
2. Unscrew the locking screw from the cover up to the stop using a size 4 hexagonal spanner
3. Check if the cover can no longer be turned

The housing cover is unlocked in the opposite way.

Note:
The locking screw has two holes drilled through the head. Thus it can also be sealed.

5.3 Mounting preparations, mounting strap

The mounting bracket is supplied loose as an optional accessory for the plastic horn antenna. It must be screwed onto the sensor with the three M5 x 10 hexagon socket screws and spring washers before setup:

- Required tool: Hexagon spanner size 4
- Max. torque: see chapter " *Technical data*"

There are two different variants of screwing the strap to the sensor, see following illustration:

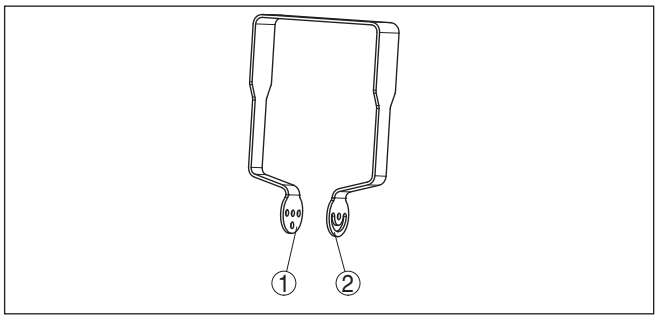


Fig. 9: Mounting strap for screwing to the sensor

1 Variant 1: Inclination adjustable in steps
2 Variant 1: Inclination steplessly adjustable

Depending on the selected variant, the sensor can be rotated in the strap:

- Single chamber housing
  - Inclination in three steps 0°, 90° and 180°
  - Inclination 180° steplessly
- Double chamber housing
  - Inclination in two steps 0° and 90°
  - Inclination 90° steplessly

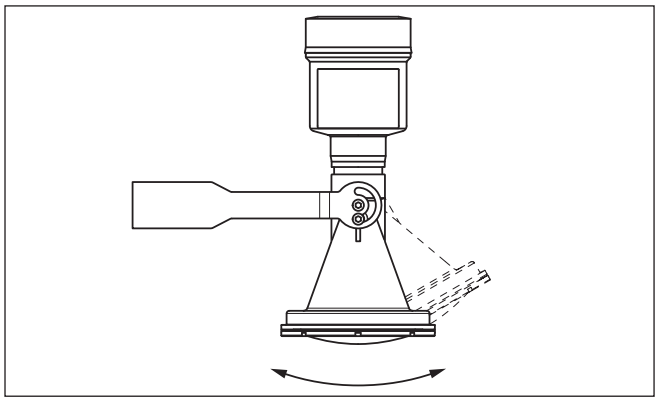


Fig. 10: Adjustment of the inclination when mounted horizontally on the wall

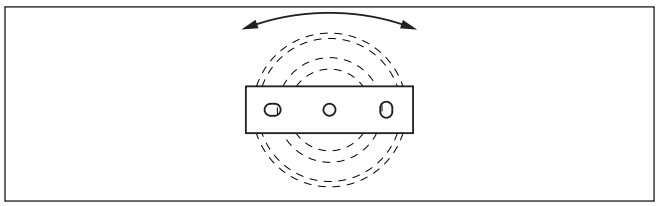


Fig. 11: Rotate when mounted vertically on the ceiling

5.4 Mounting versions, plastic horn antenna

Mounting strap

The optional mounting strap allows simple mounting of the instrument on a wall, ceiling or boom. Especially in the case of open vessels, this is a simple and effective way to align the sensor to the surface of the bulk solid material.

The following versions are available:

- Length 300 mm
- Length 170 mm

Note:
For safe operation of the device, stable, permanent mounting on a load-bearing surface (concrete, wood, steel, etc.) is required. Take this into account when choosing the installation location and use suitable fastening materials (screws, dowels, pipe clamps, etc.).

Mounting strap - Ceiling mounting

The instrument is normally mounted vertically with a bracket on the ceiling.

This allows swivelling the sensor up to 180° for optimal orientation and rotating for optimal connection.

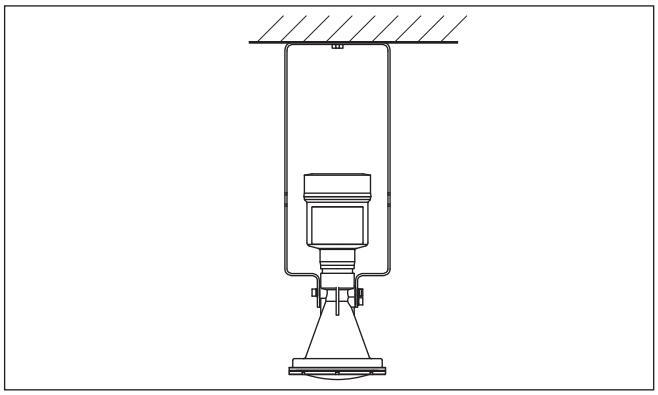


Fig. 12: Ceiling mounting via the mounting strap with length 300 mm

Mounting strap - Wall mounting

As an alternative the strap mounting is carried out horizontally or obliquely.

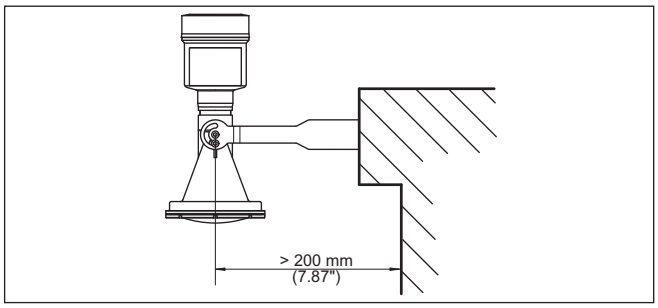


Fig. 13: Wall mounting horizontally via the mounting strap with length 170 mm

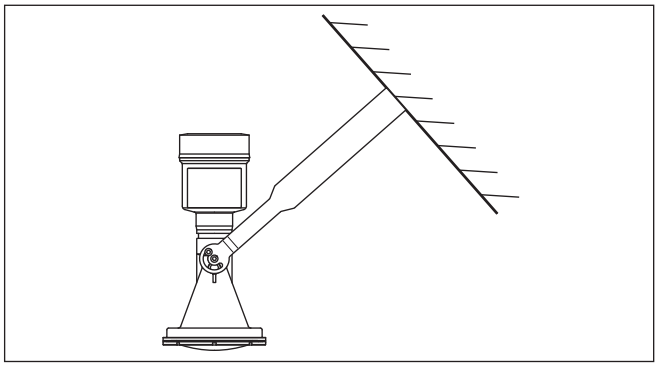


Fig. 14: Wall mounting with inclined wall via the mounting strap with length 300 mm

Flange

Two versions are available for mounting the instrument on a nozzle:

- Combi compression flange
- Adapter flange

Combi compression flange:
The combi compression flange is suitable for different vessel flanges DN 80, ASME 3" and JIS 80. It comes not sealed against the radar sensor and can thus only be used unpressurized. It can be retrofitted on instruments with single chamber housing, retrofitting to a double chamber housing is not possible.

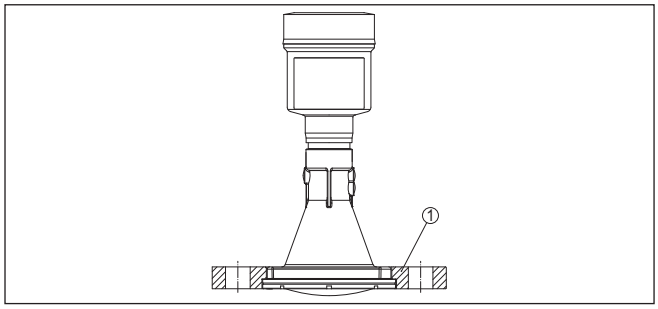


Fig. 15: Combi compression flange

1 Combi compression flange

Adapter flange:
The adapter flange is available from DN 100, ASME 3" and JIS 100. It is permanently connected with the radar sensor and sealed.

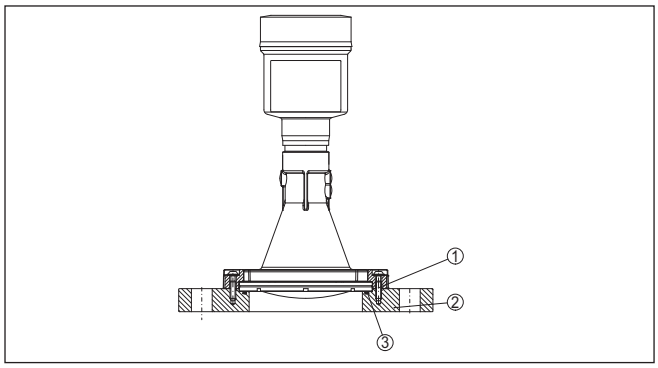


Fig. 16: Adapter flange

1 Connection screw
2 Adapter flange
3 Process seal

5.5 Mounting instructions

Polarisation

Radar sensors for level measurement emit electromagnetic waves. The polarisation is the direction of the electrical share of these waves. It is identifiable by a mark on the housing, see the following drawing:

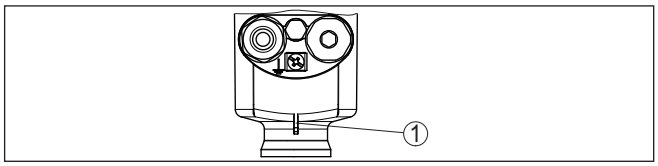


Fig. 17: Position of the polarisation

1 Nose for marking the direction of polarisation

Turning the housing changes the polarisation and thus also the effect of false echoes on the measured value.

Note:
Therefore, pay attention to the position of the polarisation when mounting or when making subsequent changes. Fix the housing to prevent a change in the metrological properties (see chapter " *Housing features*").

Measuring surface

Radar sensors emit their measurement signal in the form of a beam. Depending on the distance and antenna size (beam angle), a measurement area of different size results, see table below: [4]

Presentation	Distance	Diameter of the measurement surface depending on the antenna size (beam angle)		
		G¾, ¾ NPT (14°)	G1½, 1½ NPT (7°)	80 mm, 3" (3°)
	1 m	0.25 m	0.12 m	0.05 m
	2 m	0.5 m	0.25 m	0.1 m
	3 m	0.75 m	0.25 m	0.15 m
	5 m	1.2 m	0.35 m	0.25 m
	8 m	2 m	1 m	0.4 m
	10 m	2.4 m	1.2 m	0.5 m
	20 m	4.8 m	2.4 m	1 m
	30 m	7.25 m	3.5 m	1.5 m

Mounting position - liquids

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

Note:
If you cannot maintain this distance, you should carry out a false signal suppression during setup. This applies especially if buildup on the vessel wall is to be expected. [5]

[4] The measurement surface is the area with the highest energy of the radar signal.
[5] In this case, it is recommended to repeat the false signal suppression at a later time with existing buildup.

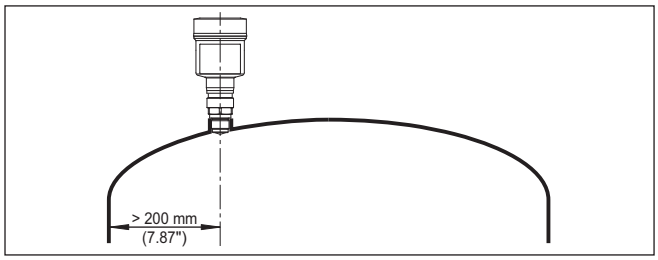


Fig. 18: Mounting of the radar sensor on round vessel tops

In vessels with conical bottom it can be advantageous to mount the device in the centre of the vessel, as measurement is then possible down to the bottom.

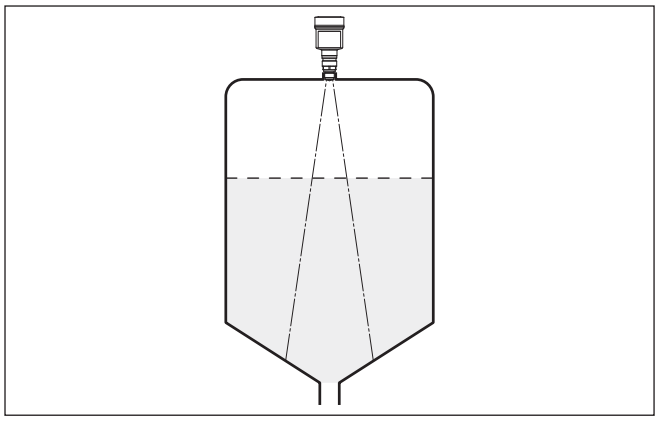


Fig. 19: Mounting of the radar sensor on vessels with conical bottom

Mounting position - bulk solids

Mount the instrument at least 200 mm (7.874 in) away from the vessel wall.

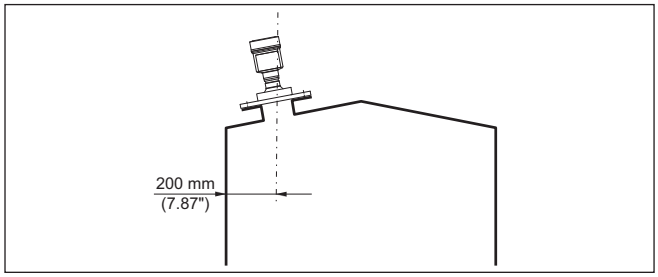


Fig. 20: Mounting the radar sensor on the vessel top

Note:
If you cannot maintain this distance, you should carry out a false signal suppression during setup. This applies especially if buildup on the vessel wall is to be expected. [6)]

Reference plane

The measuring range of the VEGAPULS 6X physically begins with the antenna end.

However, the min./max. adjustment begins mathematically with the reference plane, which is located differently depending on the sensor version.

Plastic horn antenna:
The reference plane is the sealing surface on the lower side.

Thread with integrated antenna system:
The reference plane is the sealing surface at the bottom of the hexagon.

Flange with encapsulated antenna system:
The reference plane is the lower side of the flange plating.

Hygienic fitting:
The reference plane is the highest contact point between sensor process fitting and welded socket.

Horn antenna:
The reference plane is the seal surface on the hexagon or the lower side of the flange.

Flange with lens antenna:
The reference plane is the lower side of the flange.

The following graphic shows the position of the reference plane with different sensor versions.

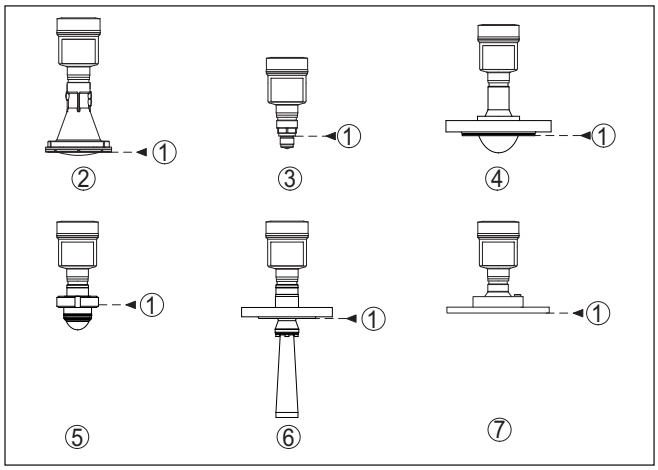


Fig. 21: Position of the reference plane

1 Reference plane
2 Plastic horn antenna
3 Threaded fitting
4 Flange connection
5 Hygienic fitting
6 Horn antenna
7 Flange with lens antenna

Inflowing medium - liquids

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

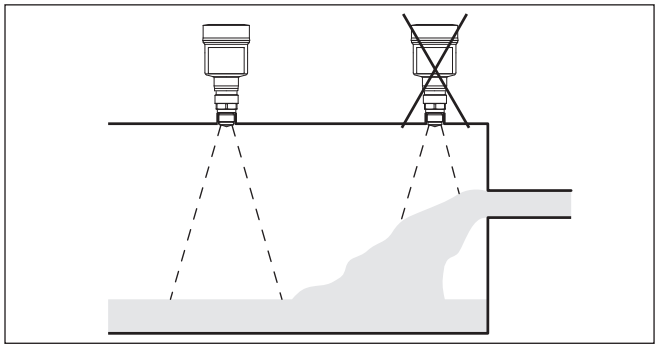


Fig. 22: Mounting of the radar sensor with inflowing medium

Inflowing medium - bulk solids

As a general rule, the device must not be mounted too close to or above the inflowing medium, otherwise the radar signal could be disturbed.

Silo with filling from top:
The optimal mounting position is opposite the filling aperture. To avoid heavy soiling of the antenna, the distance to any filter or dust exhauster should be as large as possible.

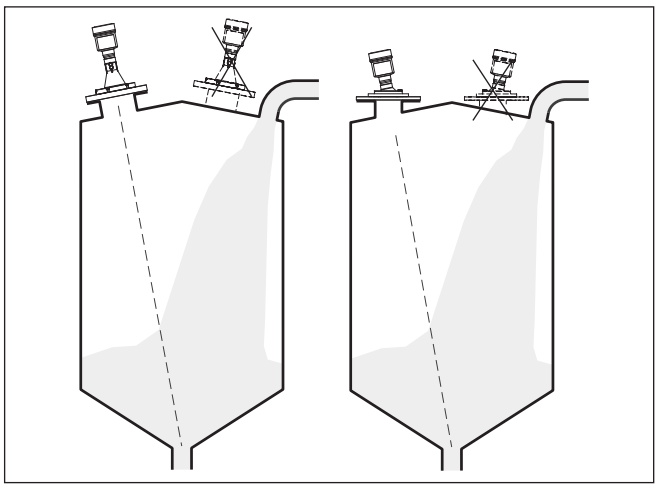


Fig. 23: Mounting of the radar sensor with inflowing medium – filling from top

Silo with lateral filling:
The optimal mounting position is next to the filling. To avoid heavy soiling of the antenna, the distance to any filter or dust exhauster should be as large as possible.

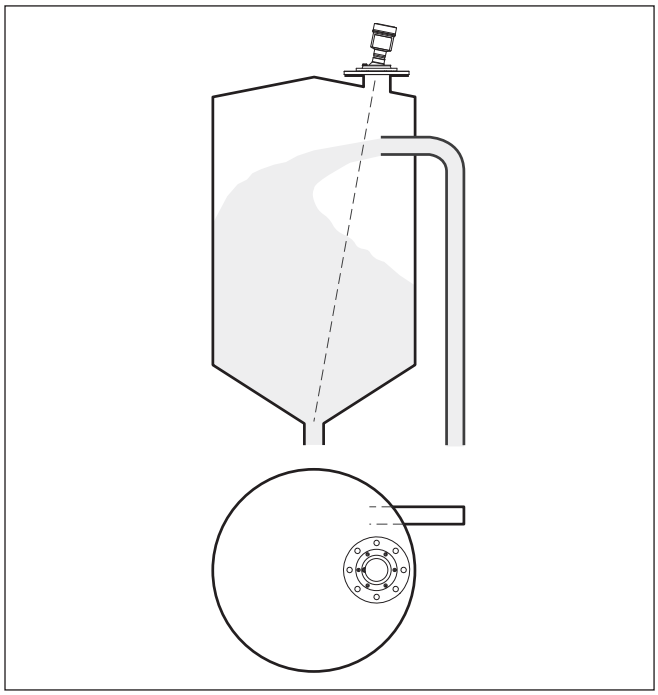


Fig. 24: Mounting of the radar sensor with inflowing medium – filling from the side

Socket mounting - short nozzles

For nozzle mounting, the nozzle should be as short as possible and its end rounded. This reduces false reflections from the nozzle.

With threaded connection, the antenna end should protrude at least 5 mm (0.2 in) out of the nozzle.

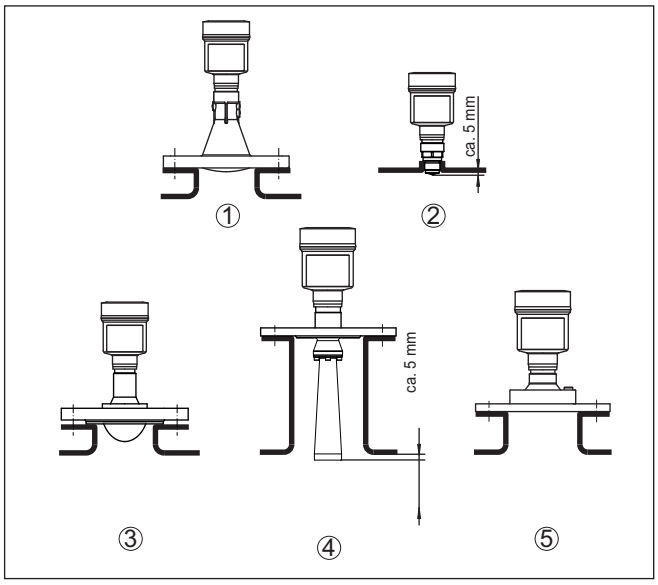


Fig. 25: Recommended socket mounting with different versions of VEGAPULS 6X

1 Plastic horn antenna
2 Thread with integrated antenna system
3 Flange with encapsulated antenna system
4 Horn antenna
5 Flange with lens antenna

Socket mounting - longer nozzles

If the reflective properties of the medium are good, you can mount VEGAPULS 6X on sockets longer than the antenna. The socket end should be smooth and burr-free, if possible also rounded.

Note:
When mounting on a longer socket piece, we recommend to carry out a false signal suppression (see chapter " *Parameter adjustment*"). This adapts the device to the metrological properties of the socket.

You will find recommended values for socket heights in the following illustration or the tables. The values come from typical applications. Deviating from the proposed dimensions, also longer sockets are possible, however the local conditions must be taken into account.

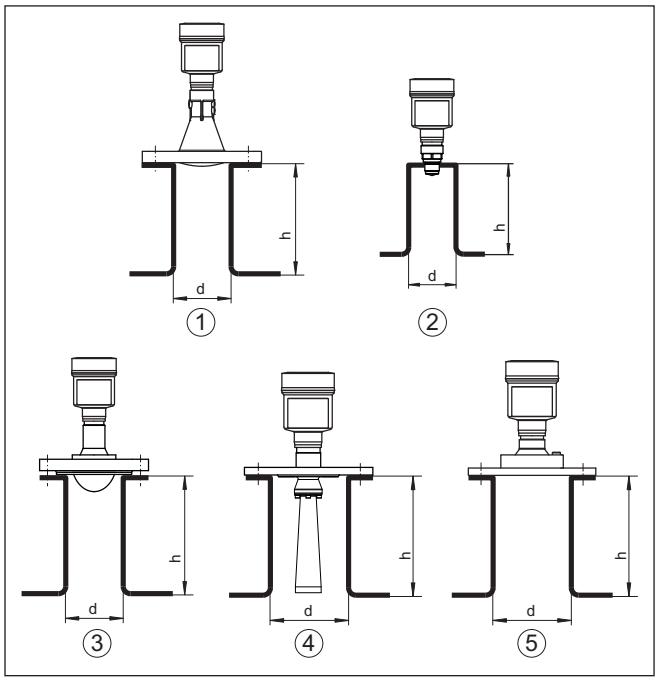


Fig. 26: Socket mounting with deviating socket dimensions with different versions of VEGAPULS 6X

1 Plastic horn antenna
2 Thread with integrated antenna system
3 Flange with encapsulated antenna system
4 Horn antenna
5 Flange with lens antenna

Thread with integrated antenna system

Socket diameter "d"		Socket length "h"	
40 mm	1½"	≤ 150 mm	≤ 5.9 in
50 mm	2"	≤ 200 mm	≤ 7.9 in
80 mm	3"	≤ 300 mm	≤ 11.8 in
100 mm	4"	≤ 400 mm	≤ 15.8 in
150 mm	6"	≤ 600 mm	≤ 23.6 in

Plastic horn antenna

Socket diameter "d"		Socket length "h"	
80 mm	3"	≤ 400 mm	≤ 15.8 in
100 mm	4"	≤ 500 mm	≤ 19.7 in
150 mm	6"	≤ 800 mm	≤ 31.5 in

Flange with encapsulated antenna system

Socket diameter "d"		Socket length "h"	
50 mm	2"	≤ 200 mm	≤ 7.9 in
80 mm	3"	≤ 400 mm	≤ 15.8 in
100 mm	4"	≤ 500 mm	≤ 19.7 in
150 mm	6"	≤ 800 mm	≤ 31.5 in

Horn antenna

Socket diameter d		Socket length h		Recommended antenna diameter	
40 mm	1½"	≤ 100 mm	≤ 3.9 in	40 mm	1½"
50 mm	2"	≤ 150 mm	≤ 5.9 in	48 mm	2"
80 mm	3"	≤ 300 mm	≤ 11.8 in	75 mm	3"

Flange with lens antenna

Socket diameter "d"		Socket length "h"	
100 mm	4"	≤ 500 mm	≤ 19.7 in
150 mm	6"	≤ 800 mm	≤ 31.5 in

Sealing to the process

The device is also available with flange and encapsulated antenna system. In this version, the PTFE washer of the antenna encapsulation is also the process seal.

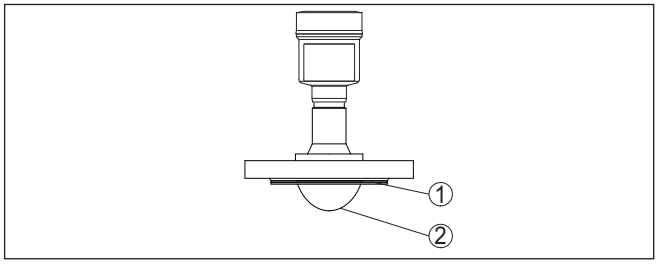


Fig. 27: VEGAPULS 6X with flange and encapsulated antenna system

1 PTFE washer
2 Antenna encapsulation

Note:
PTFE-plated flanges, however, have a preload loss over time with large temperature changes. This can negatively the sealing properties.

To avoid this, use the disc springs from the scope of delivery during mounting. They fit the required flange screws.

Proceed as follows to seal effectively:

1. Use flange screws according to the number of flange holes

2. Insert the disc springs as described above

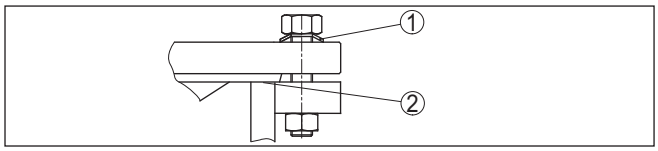


Fig. 28: Use of disc springs

1 Disc spring
2 Sealing surface

3. Tighten screws with the necessary torque (see chapter " *Technical data*", " *Torques*")

Note:
We recommend retightening the screws at regular intervals depending on the process pressure and temperature. This will maintain the sealing properties of the antenna encapsulation against the process.

Mounting, PTFE threaded adapter

PTFE threaded adapters are available for VEGAPULS 6X with thread G1½ resp. 1½ NPT. Due to this, only PTFE is in contact with the medium.

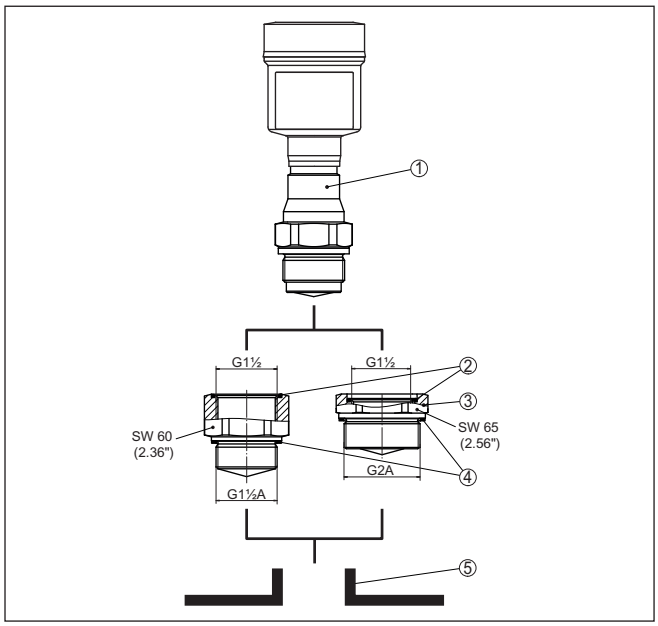


Fig. 29: VEGAPULS 6X with PTFE threaded adapter (example VEGAPULS 6X with thread G1½)

1 Sensor
2 O-ring seal (sensor side)
3 PTFE threaded adapter
4 Flat seal (process side)
5 Welded socket

Proceed as follows to mount the PTFE adapter:

1. Remove existing Klingersil flat seal on the thread of the device

Information:
With the adapter in NPT version, the Klingersil flat seal is omitted.

2. Insert the supplied O-ring seal (1) into the threaded adapter on the sensor side
3. Place the supplied flat seal (4) on the process side onto the thread of the adapter

Information:
With the adapter in NPT version, the Klingersil flat seal on the process side is omitted.

4. Screw the threaded adapter on the hexagon into the welded socket. Torque see chapter " *Technical data*", " *Torques*".
5. Screw the sensor on the hexagon into the threaded adapter. Torque see chapter " *Technical data*", " *Torques*".

Mounting in the vessel insulation

Instruments for a temperature range from 200 °C have a spacer for temperature decoupling. It is located between process fitting and electronics housing.

Note:
Incorrect installation of the device can render this temperature decoupling ineffective. Damage to the electronics can be the result.

Hence ensure effective temperature decoupling. Include the spacer in the vessel insulation only up to max. 40 mm, see the following figure.

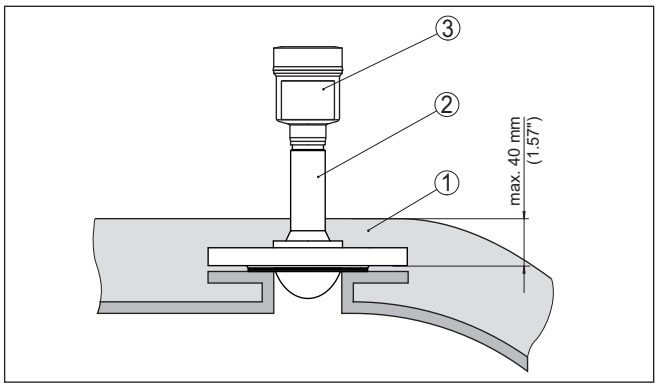


Fig. 30: Mounting the instrument on insulated vessels

1 Vessel insulation
2 Distance piece for temperature decoupling
3 Electronics housing

Vessel installations

The mounting location of the radar sensor should be a place where no other equipment or fixtures cross the path of the radar 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 point that the radar sensor has a " *clear view*" to the measured product.

In case of existing vessel installations, a false signal suppression 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.

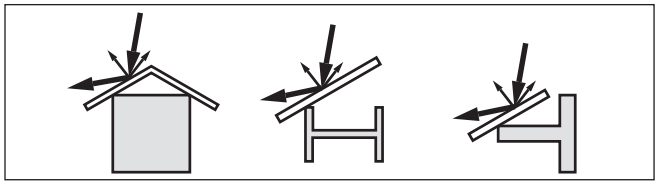


Fig. 31: Cover flat, large-area profiles with deflectors

Alignment - Liquids

In liquids, direct the device as perpendicular as possible to the medium surface to achieve optimum measurement results.

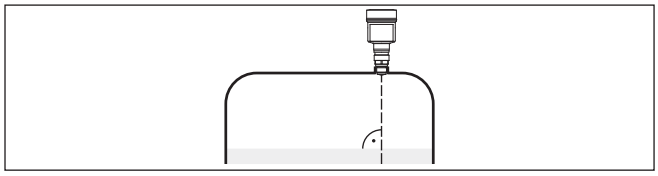


Fig. 32: Alignment in liquids

Orientation - Bulk solids

In a cylindrical silo with conical outlet, the mounting is carried out on a third up to the half of the vessel radius from outside (see following drawing).

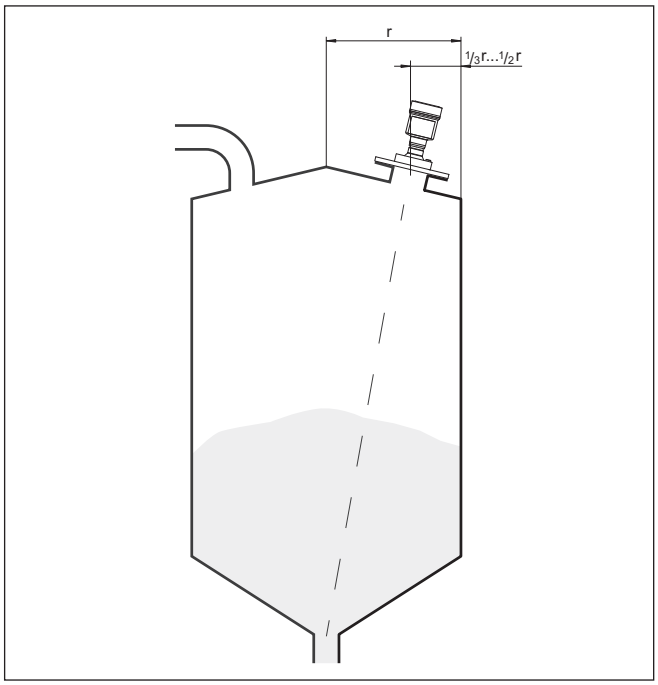


Fig. 33: Mounting position and orientation

Direct the device in such a way that the radar signal reaches the lowest vessel level. Hence it is possible to detect the complete vessel volume.

Tip:
The easiest way to align the device is with the optional swivelling holder. Determine the suitable inclination angle and check the alignment with the alignment aid in the VEGA Tools app on the device.

Alternatively, the angle of inclination can be determined using the following drawing and table. It depends on the measuring distance "d" and the distance "a" between vessel centre and mounting position.

Check the alignment with a suitable level or water level.

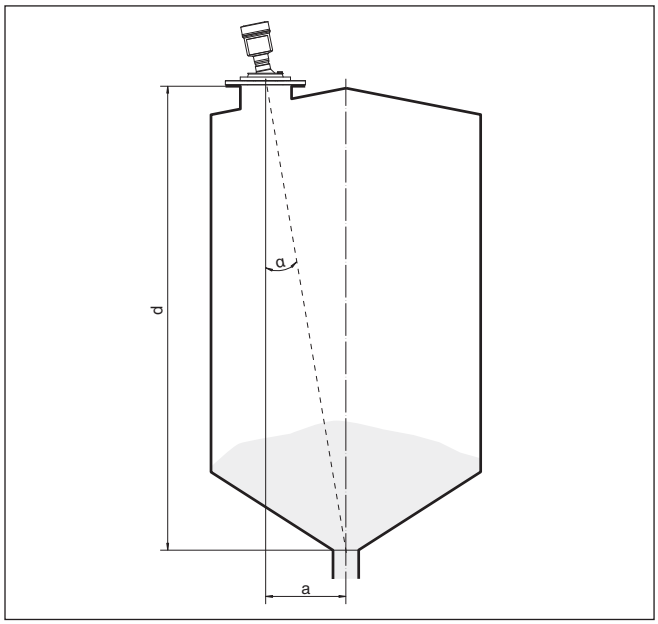


Fig. 34: Determination of the angle of inclination for alignment of VEGAPULS 6X

Distance d (m)	2°	4°	6°	8°	10°
2	0.1	0.1	0.2	0.3	0.4
4	0.1	0.3	0.4	0.6	0.7
6	0.2	0.4	0.6	0.8	1.1
8	0.3	0.6	0.8	1.1	1.4
10	0.3	0.7	1.1	1.4	1.8
15	0.5	1	1.6	2.1	2.6
20	0.7	1.4	2.1	2.8	3.5
25	0.9	1.7	2.6	3.5	4.4
30	1	2.1	3.2	4.2	5.3
35	1.2	2.4	3.7	4.9	6.2
40	1.4	2.8	4.2	5.6	7.1
45	1.6	3.1	4.7	6.3	7.9
50	1.7	3.5	5.3	7	8.8
60	2.1	4.2	6.3	8.4	10.5
70	2.4	4.9	7.3	9.7	12.2
80	2.8	5.6	8.4	11.1	13.9
90	3.1	6.3	9.4	12.5	15.6
100	3.5	7	10.5	13.9	17.4

Distance d (m)	2°	4°	6°	8°	10°
110	3.8	7.7	11.5	15.3	19.1
120	4.2	8.4	12.5	16.7	20.8

Example:
In a vessel 20 m high, the installation position of the device is 1.4 m from the vessel centre.

The necessary angle of inclination of 4° can be read out from this table.

Proceed as follows to adjust the angle of inclination with the swivelling holder:

1. Loosen the terminal screws of the swivel holder by one turn. Use a hexagon socket wrench, size 5.

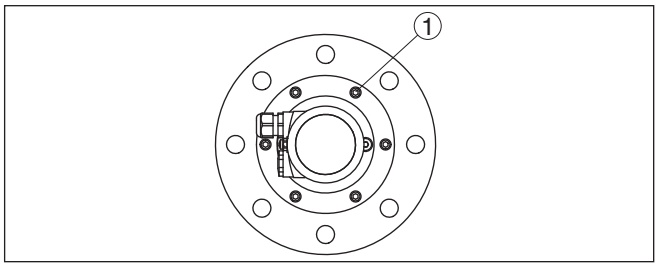


Fig. 35: VEGAPULS 6X with swivelling holder

1 Terminal screws (6 pieces)

2. Align the device, check angle of inclination

Note:
The max. angle of inclination of the swivelling holder is approx. 10°

3. Re-tighten the terminal screws, max. torque see chapter " *Technical data*".

Agitators

Agitators in the vessel can reflect the measurement signal and thus lead to undesired incorrect measurements.

Note:
To avoid this, a false signal suppression 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.

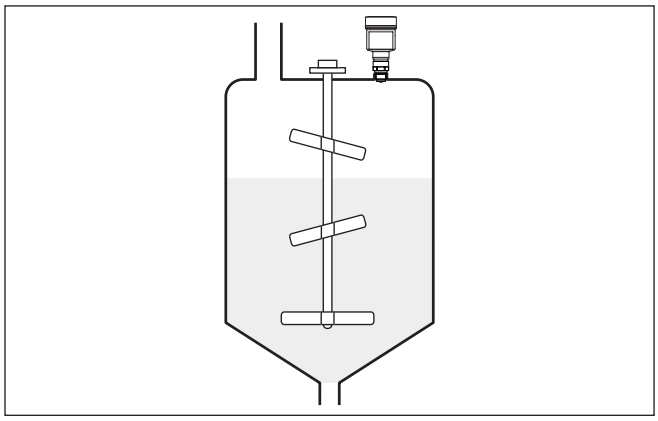


Fig. 36: Agitators

Foam generation

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

Note:
If foams lead to measurement errors, you should use the biggest possible radar antennas or as an alternative, sensors with guided radar.

Material heaps

Large material heaps are best measured with several instruments, which can be mounted on e.g. traverse cranes. For this type of application it is advantageous to orient the sensor perpendicular to the bulk solid surface.

The sensors do not influence each other.

Information:
In these applications, it must be taken into account that the radar sensors are designed for relatively slow level changes. Therefore, when using on moving parts, observe the measurement characteristics of the device (see chapter " *Technical data*").

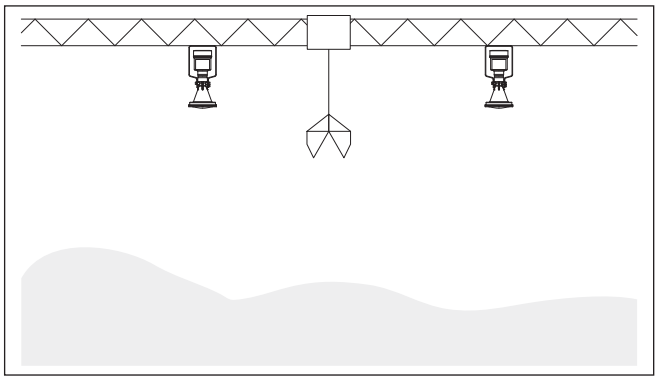


Fig. 37: Radar sensors on traverse crane

Mounting in multiple chamber silo

The separating walls in multi-chamber silos are often constructed from trapezoidal sheets to ensure the required stability.

Note:
If the radar sensor is mounted too close to such a separating wall, considerable interfering reflections may occur. To avoid this, the sensor should be installed at the greatest possible distance from the separating walls.

The optimal installation of the device is therefore on the outer wall of the silo. The sensor should be directed towards the emptying point in the centre of the silo. This can be done, for example, using the mounting strap.

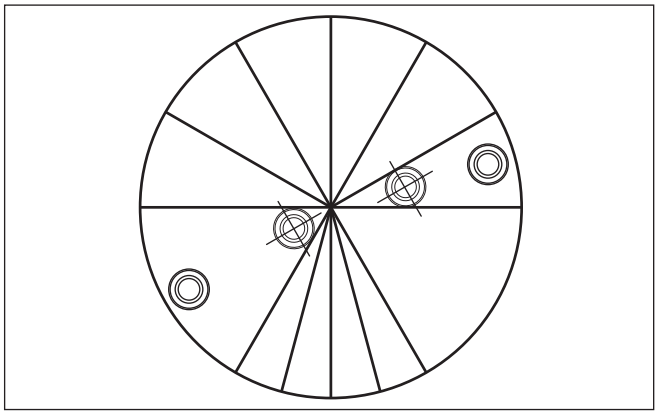


Fig. 38: Installation and orientation in multiple chamber silos

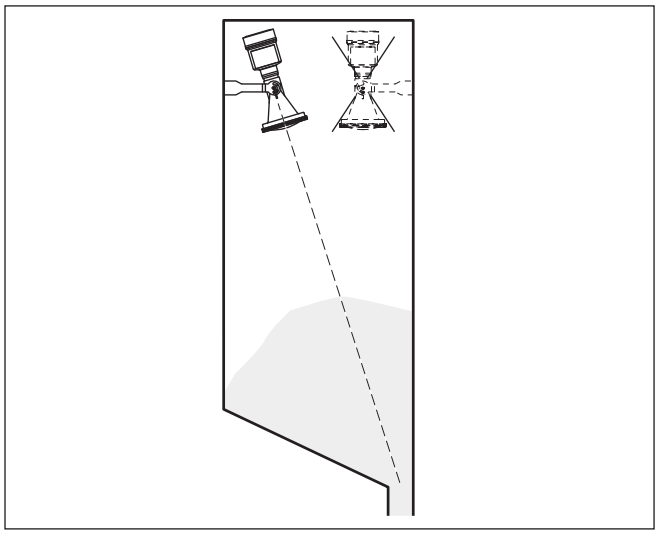


Fig. 39: Installation and orientation in multiple chamber silos

Dust deposits - Rinsing air connection

To avoid heavy buildup and dust on the antenna, the device should not be mounted close to the dust exhauster inside the vessel.

To protect the device against buildup, particularly in case of strong condensation, air rinsing is recommended.

Plastic horn antenna:
The VEGAPULS 6X with plastic horn antenna is optionally available with a rinsing air connection. The mechanical configuration differs according to the flange version, see following graphics.

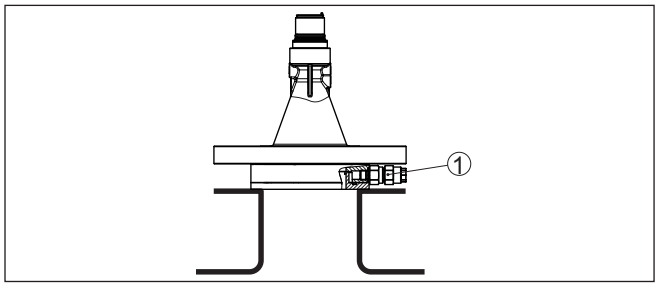


Fig. 40: Plastic horn antenna with compression flange

1 Rinsing air connection

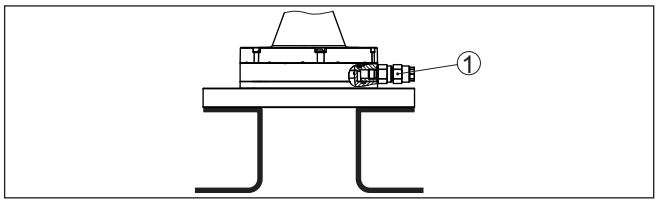


Fig. 41: Plastic horn antenna with adapter flange

1 Rinsing air connection

Flange with lens antenna:
The VEGAPULS 6X with metal-jacketed lens antenna is equipped with a rinsing air connection as a standard feature, see following graphics.

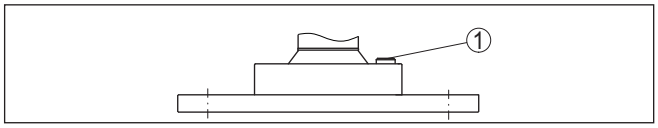


Fig. 42: Metal-jacketed lens antenna

1 Rinsing air connection

You can find details on the rinsing air connection in chapter " *Technical data*".

5.6 Measuring rigs - bypass

Measurement in the bypass tube

A bypass consists of a standpipe with lateral process fittings. It is attached to the outside of a container as a communicating vessel.

The VEGAPULS 6X in 80 GHz technology is suitable as standard for non-contact level measurement in such a bypass.

Information:
For standpipe lengths > 3 m (9.842 ft) a special standpipe version is available in the configurator.

Configuration bypass

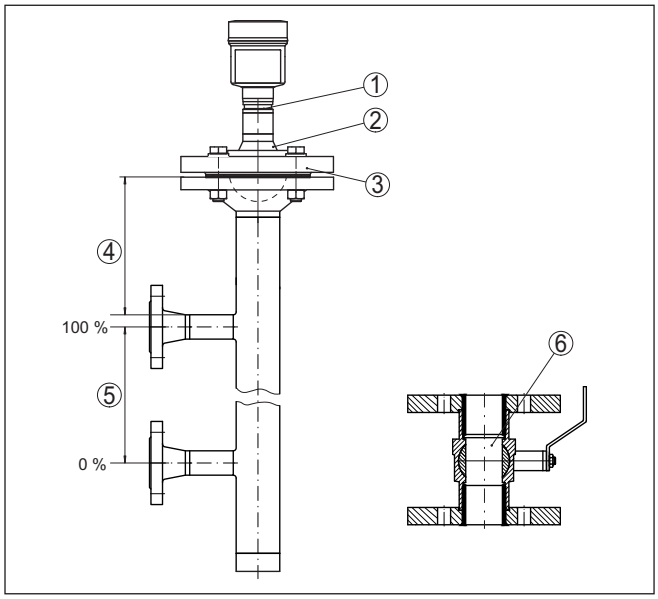


Fig. 43: Configuration bypass

1 Radar sensor
2 Polarisation marking
3 Instrument flange
4 Distance sensor reference plane to upper tube connection
5 Distance of the tube connections
6 Ball valve with complete opening

Instructions and requirements, bypass

Instructions of orientation of the polarisation:

- Note marking of the polarisation on the sensor
- With threaded versions, the marking is on the hexagon, with flange versions between two flange holes
- The marking must be in one plane with the tube connections to the vessel

Instructions for the measurement:

- The 100 % point may not be above the upper tube connection to the vessel
- The 0 % point may not be below the lower tube connection to the vessel
- Min. distance, sensor reference plane to upper edge of upper tube connection > 200 mm
- The antenna diameter of the sensor should correspond to the inner diameter of the tube
- For stand pipe lengths > 3 m the " *Application stand pipe > 3 m*" must be selected for the parametrisation
- For stand pipe lengths > 3 m, the antenna diameter must be chosen as large as possible, but at least 80 mm/3"