Operating Instructions

Radar sensor for continuous level measurement of bulk solids

VEGAPULS 69

Profibus PA

Document ID: 47250

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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.

Battery disposal
This symbol indicates special information about the disposal of batteries and accumulators.

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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 69 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 transmission frequency can be found in chapter " *Technical data*".

2.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

2.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2.7 Radio license for Europe

The instrument was tested according to the latest issue of the following harmonized standards:

- EN 302372 - Tank Level Probing Radar
- EN 302729 - Level Probing Radar

It is hence approved for use inside and outside closed vessels in countries of the EU.

Use is also approved in EFTA countries, provided the respective standards have been implemented.

For operation inside of closed vessels, points a to f in annex E of EN 302372 must be fulfilled.

For operation outside of closed vessels, the following conditions must be fulfilled:

- The instrument must be stationary mounted and the antenna directed vertically downward
- The instrument may only be used outside closed vessels in the version with G1½ or 1½ NPT thread with integrated horn antenna.
- The mounting location must be at least 4 km away from radio astronomy stations, unless special permission was granted by the responsible national approval authority
- When installed within 4 to 40 km of a radio astronomy station, the instrument must not be mounted higher than 15 m above the ground.

A list of the respective radio astronomy stations can be found in chapter " *Appendix*" of the operating instructions.

2.8 Radio license for USA

This approval is only valid for USA. Hence the following text is only available in the English language:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause interference, and
- This device must accept any interference, including interference that may cause undesired operation of the device

This device is approved for unrestricted use only inside closed, stationary vessels made of metal or concrete. From electronics index .-03 the use in containers made of reinforced fiberglass is also permitted.

For operation outside of closed vessels, the following conditions must be fulfilled:

- This device shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna's main beam. Furthermore, the use of any mechanism that does not allow the main beam of the transmitter to be mounted vertically downward is prohibited.
- Operation of the instrument is only permitted with thread G1½ or 1½ NPT with integrated horn antenna.
- This device shall be installed only at fixed locations. The LPR device shall not operate while being moved or while inside a moving container.
- Hand-held applications are prohibited.
- Marketing to residential consumers is prohibited.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

2.9 Radio license for Canada

This approval is only valid for Canada. Hence the following texts are only available in the English/French language:

This device complies with Industry Canada's license-exempt RSS standard(s). Operation is subject to the following conditions:

- This device may not cause interference, and
- This device must accept any interference, including interference that may cause undesired operation of the device

This device has been approved for both closed containers and open-air environments with the following limitations:

- Closed Containers: For installations utilizing a tilt during installation: This device is limited to installation in a completely enclosed container made of metal or concrete to prevent RF emissions, which can otherwise interfere with aeronautical navigation, the maximum approved tilt angel is 10°. From electronics index .-03 the use in containers made of reinforced fiberglass is also permitted.
- Open Air Environment: For operation outside of closed vessels, the following condition must be fulfilled: This device shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna's main beam. Furthermore, the use of

any mechanism that does not allow the main beam of the transmitter to be mounted vertically downward is prohibited.
- Operation of the instrument outside of closed vessels is only permitted with G1½ or 1½ NPT with integrated horn antenna.
- The installation of the LPR/TLPR device shall be done by trained installers, in strict compliance with the manufacturer's instructions.
- This device shall be installed only at fixed locations. The LPR device shall not operate while being moved or while inside a moving container.
- Hand-held applications are prohibited.
- Marketing to residential consumers is prohibited.
- The use of this device is on a "no-interference, no-protection" basis. That is, the user shall accept operations of high-powered radar in the same frequency band which may interfere with or damage this device.
- However, devices found to interfere with primary licensing operations will be required to be removed at the user's expense.
- The installer/user of this device shall ensure that it is at least 10 km from the Dominion Astrophysical Radio Observatory (DRAO) near Penticton, British Columbia. The coordinates of the DRAO are latitude 49°19′15″ N and longitude 119°37′12″W. For devices not meeting this 10 km separation (e.g., those in the Okanagan Valley, British Columbia,) the installer/user must coordinate with, and obtain the written concurrence of, the Director of the DRAO before the equipment can be installed or operated. The Director of the DRAO may be contacted at 250-497-2300 (tel.)or 250-497-2355 (fax). (Alternatively, the Manager, Regulatory Standards, Industry Canada, may be contacted.)

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux conditions suivantes :

- L'appareil ne doit pas produire de brouillage; et
- L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil est homologué pour une utilisation dans les cuves fermées et les environnements ouverts avec les restrictions suivantes :

- Cuves fermées : Pour les installations impliquant une inclinaison lors de l'installation : cet appareil ne doit être installé que dans une cuve totalement fermée en métal ou en béton, pour empêcher les émissions RF susceptibles d'interférer avec la navigation aéronautique. L'angle d'inclinaison maximum autorisé est de 10°. De l'indice électronique .-03, l'utilisation dans des conteneurs fabriqués en fibre de verre est également permise.
- Environnement ouvert : Pour l'utilisation hors des cuves fermées, la condition suivante doit être remplie : L'appareil doit être installé et entretenu de manière à garantir une orientation verticale vers le bas du faisceau principal de l'antenne émettrice. De plus, l'utilisation de tout mécanisme ne permettant pas l'orientation verticale vers le bas du faisceau principal de l'émetteur est interdite

- Il est uniquement autorisé d'utiliser la version d'appareil avec le filetage G1½ ou 1½ NPT en environnements ouvertes.
- L'installation d'un dispositif LPR ou TLPR doit être effectuée par des installateurs qualifiés, en pleine conformité avec les instructions du fabricant.
- Cet appareil ne doit être installé qu'à des emplacements fixes. L'appareil LPR ne doit pas être utilisé pendant qu'il est en train d'être déplacé ou se trouve dans un conteneur en mouvement.
- Les applications portables sont interdites.
- La vente à des particuliers est interdite.
- Ce dispositif ne peut être exploité qu'en régime de non-brouillage et de non-protection, c'est-à-dire que l'utilisateur doit accepter que des radars de haute puissance de la même bande de fréquences puissent brouiller ce dispositif ou même l'endommager.
- D'autre part, les capteurs de niveau qui perturbent une exploitation autorisée par licence de fonctionnement principal doivent être enlevés aux frais de leur utilisateur.
- La personne qui installe/utilise ce capteur de niveau doit s'assurer qu'il se trouve à au moins 10 km de l'Observatoire fédéral de radioastrophysique (OFR) de Penticton en Colombie-Britannique. Les coordonnées de l'OFR sont : latitude N 49° 19′ 15″, longitude O 119° 37′ 12″. La personne qui installe/utilise un dispositif ne pouvant respecter cette distance de 10 km (p. ex. dans la vallée de l'Okanagan [Colombie-Britannique]) doit se concerter avec le directeur de l'OFR afin d'obtenir de sa part une autorisation écrite avant que l'équipement ne puisse être installé ou mis en marche. Le directeur de l'OFR peut être contacté au 250-497-2300 (tél.) ou au 250-497-2355 (fax). (Le Directeur des Normes réglementaires d'Industrie Canada peut également être contacté).

2.10 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.

2.11 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 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGAPULS 69 radar sensor
- Hexagon socket wrench (for instruments with swivel holder)

The further scope of delivery encompasses:

- Documentation
  - Quick setup guide VEGAPULS 69
  - Instructions for optional instrument features
  - Ex-specific " *Safety instructions*" (with Ex versions)
  - 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 1.0.2
- Software version from 1.2.1

Type label

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

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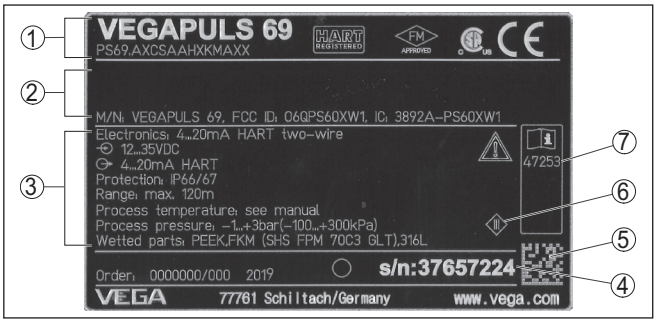

Fig. 1: Layout of the type label (example)

1 *Instrument type*
2 *Product code*
3 *Approvals*
4 *Voltage supply and signal output, electronics*
5 *Protection rating*
6 *Measuring range (measurement accuracy optional)*
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 *Data matrix code for VEGA Tools app*
13 *Symbol of the device protection class*
14 *ID numbers, instrument documentation*
15 *Reminder to observe the instrument documentation*
16 *Notified authority for CE marking*
17 *Approval directive*

Serial number - Instrument search

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

- Product code (HTML)
- Delivery date (HTML)
- Order-specific instrument features (HTML)
- Operating instructions and quick setup guide at the time of shipment (PDF)
- Order-specific sensor data for an electronics exchange (XML)
- Test certificate (PDF) - optional

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 DataMatrix code on the type label of the instrument or
- Enter the serial number manually in the app

3.2 Principle of operation

Application area

The VEGAPULS 69 is a radar sensor for continuous level measurement of bulk solids under different process conditions.

It is ideal for level measurement in very high silos, large bunkers and segmented vessels. The very good signal focussing ensures a simple setup and reliable measurement.

The VEGAPULS 69 is available with different antenna systems:

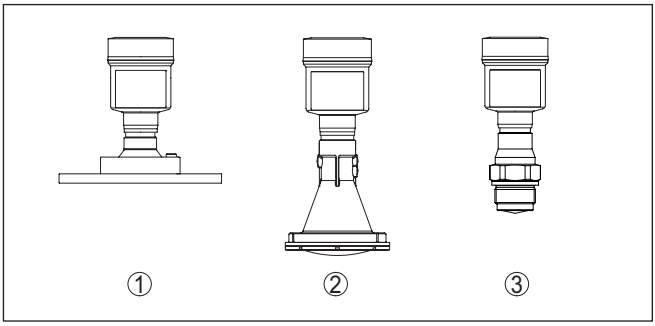

Fig. 2: Antenna systems VEGAPULS 69

1 Flange with lens antenna
2 Plastic horn antenna
3 Thread with integrated antenna system

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 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 humidity 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.

3.4 Accessories

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

PLICSCOM

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 adapter

The VEGADIS adapter is an accessory part for sensors with double chamber housings. It enables the connection of VEGADIS 81 to the sensor housing via an M12 x 1 plug.

Overvoltage protection

The overvoltage arrester B81-35 is used instead of the terminals in the single or double chamber housing.

Protective cover

The protective cover protects the sensor housing against soiling and intense heat from solar radiation.

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 Mounting

4.1 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

Radio license for USA/ Canada

The mounting position and orientation of the sensor must take into account the limitations in chapter " *For your safety*", " *Radio approval for USA*" " *Radio approval for Canada*" of this operating instructions.

4.2 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

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.

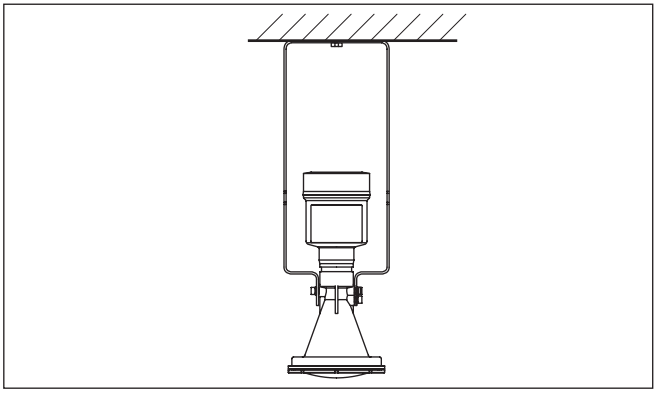

Fig. 3: Ceiling mounting via the mounting strap with length 300 mm

Mounting strap - Wall mounting

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

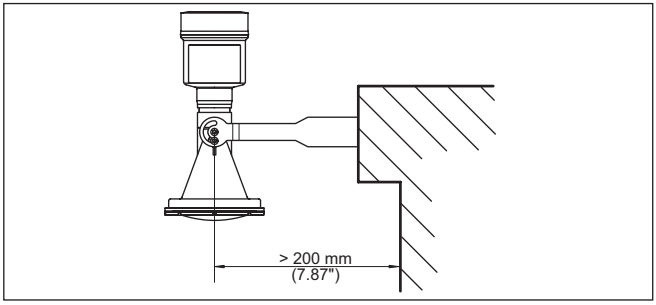

Fig. 4: Wall mounting horizontally via the mounting strap with length 170 mm

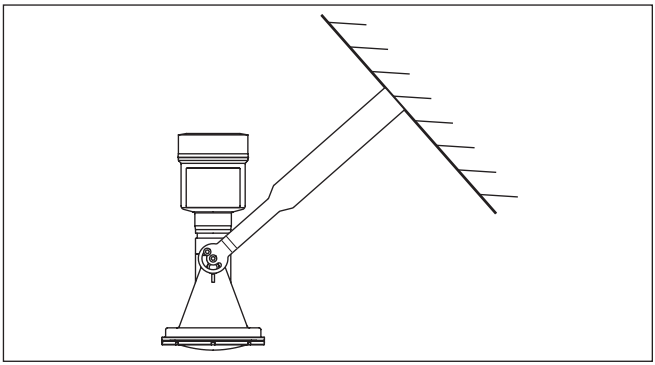

Fig. 5: Wall mounting with inclined wall via the mounting strap with length 300 mm

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.

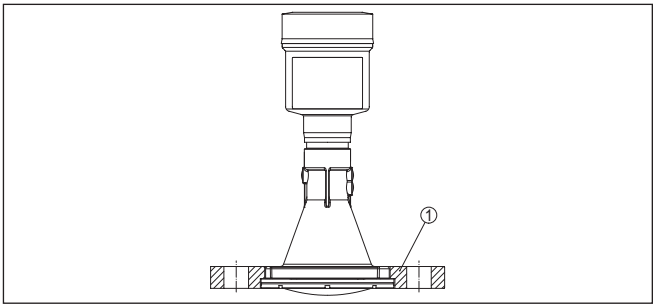

Fig. 6: Combi compression flange

1 Combi compression flange

Adapter flange

The adapter flange is available from DN 100, ASME 4" and JIS 100. It is permanently connected with the radar sensor and sealed.

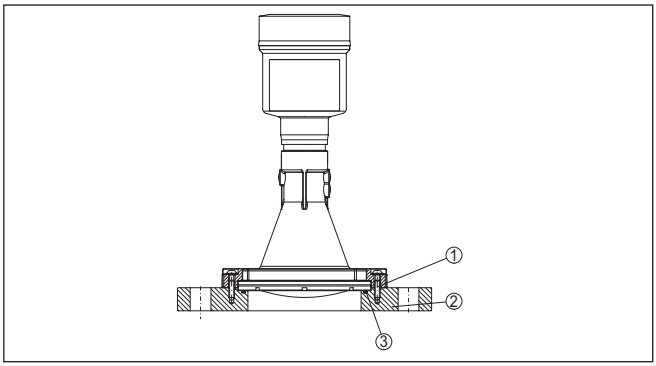

Fig. 7: Adapter flange

1 Connection screw
2 Adapter flange
3 Process seal

4.3 Mounting preparations, mounting strap

The mounting strap is supplied unassembled (optionally) and must be screwed to the sensor before setup with three hexagon socket screws M5 x 10 and spring washers. Max. torque, see chapter " *Technical data*". Required tools: Allen wrench size 4.

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

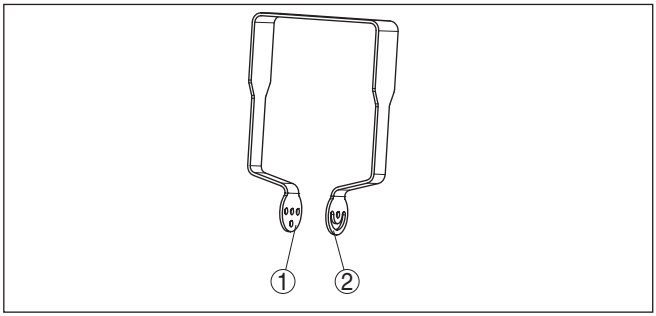

Fig. 8: Mounting strap for screwing to the sensor

1 For angle of inclination in steps
2 For angle of inclination, infinitely variable

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

- Single chamber housing
  - Angle of inclination in three steps 0°, 90° and 180°
  - Angle of inclination 180°, infinitely variable
- Double chamber housing
  - Angle of inclination in two steps 0° and 90°
  - Angle of inclination 90°, infinitely variable

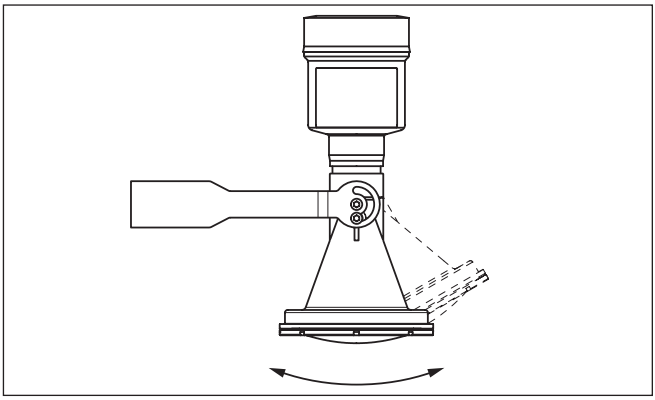

Fig. 9: Adjustment of the angle of inclination

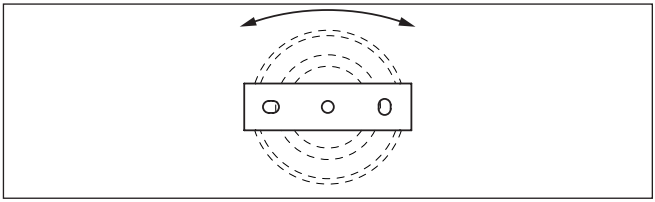

Fig. 10: Turning by fastening in the centre

4.4 Mounting instructions

Polarisation

Radar sensors for level measurement emit electromagnetic waves. The polarization is the direction of the electrical component of these waves.

The polarization direction is marked by a nose on the housing, see following drawing:

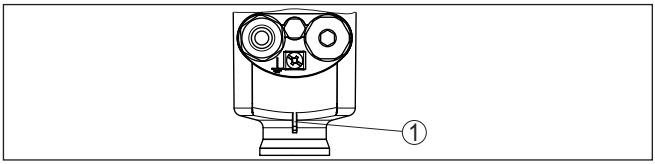

Fig. 11: Position of the polarisation

1 Nose for marking the direction of polarisation

Note:
When the housing is rotated, the direction of polarization changes and hence the influence of the false echo on the measured value. Please keep this in mind when mounting or making changes later.

Installation position

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

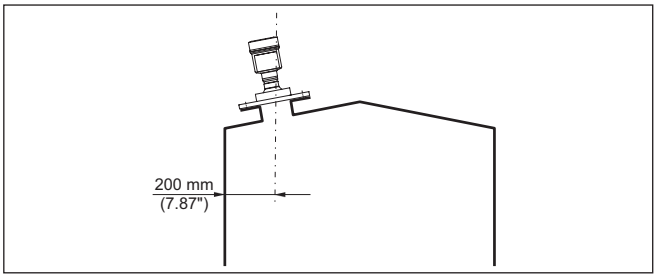

Fig. 12: Mounting the radar sensor on the vessel top

If you cannot maintain this distance, you should carry out a false signal suppression during setup. This applies particularly if buildup on the vessel wall is expected. In such cases, we recommend repeating the false signal suppression at a later date with existing buildup.

Reference plane

The measuring range of VEGAPULS 69 begins physically at the end of the antenna. The min./max. adjustment, however, begins at the reference plane. The reference plane is different depending on the sensor version.

- **Flange with lens antenna:** The reference plane is the lower side of the flange
- **Plastic horn antenna:** The reference plane is the sealing surface on the lower edge
- **Thread with integrated antenna system:** The reference plane is the sealing surface at the bottom of the hexagon

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

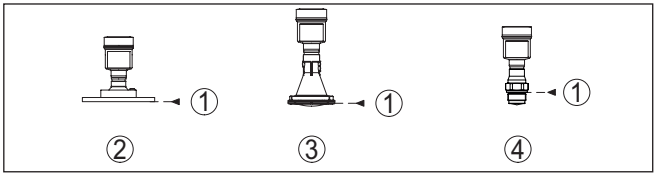

Fig. 13: Position of the reference plane

1 Reference plane
2 Flange with lens antenna
3 Plastic horn antenna
4 Thread with integrated antenna system

Inflowing medium

The instrument should not be mounted too close to the inflowing medium, as the radar signal could be disrupted.

Silo with filling from top

The optimal mounting position is opposite the filling aperture. To avoid heavy soiling, the distance to any filter or dust exhauster should be as large as possible.

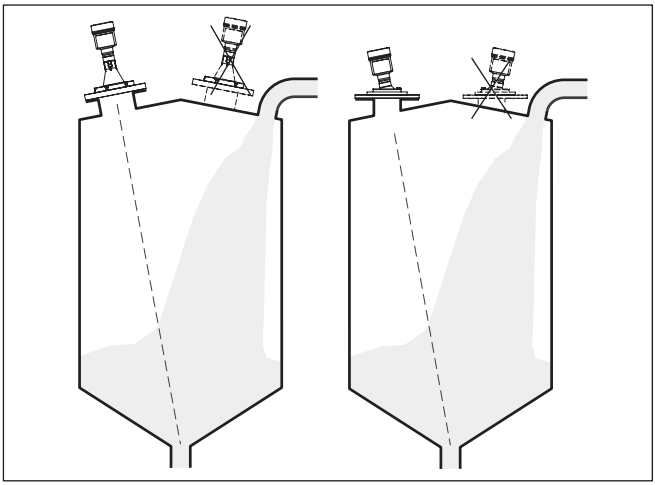

Fig. 14: Mounting of the radar sensor with inflowing medium

Silo with lateral filling

In bulk solids silos with lateral pneumatic filling the instrument should not be mounted above the filling stream, as the radar signal will be disrupted. The optimal mounting position is to the side of the filling aperture. To avoid heavy soiling, the distance to any filter or dust exhauster should be as large as possible.

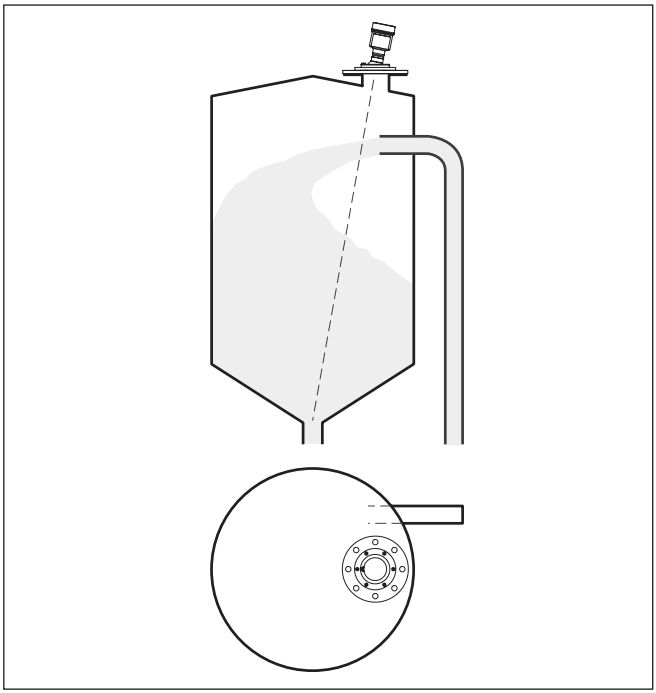

Fig. 15: Mounting of the radar sensor with inflowing medium

Nozzle

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.

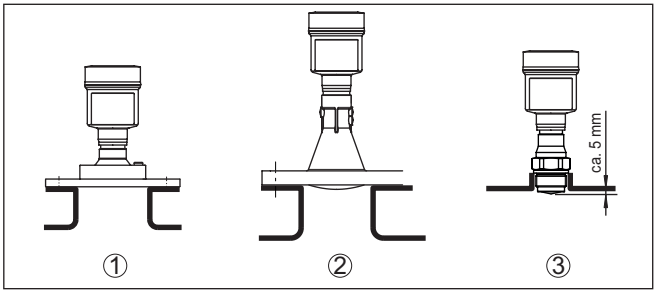

Fig. 16: Recommended socket mounting with different versions of VEGAPULS 69

1 Flange with lens antenna
2 Plastic horn antenna
3 Thread with integrated antenna system

If the reflective properties of the medium are good, you can mount VEGAPULS 69 on sockets longer than the antenna. The socket end should be smooth and burr-free, if possible also rounded.

Note:
When mounting on longer nozzles, we recommend carrying out a false signal suppression (see chapter " *Parameter adjustment*").

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.

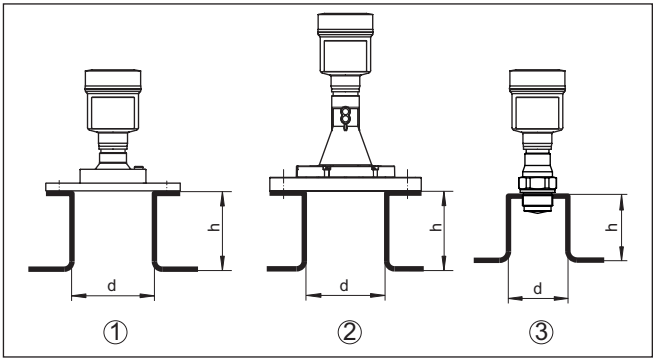

Fig. 17: Socket mounting with deviating socket dimensions with different versions of VEGAPULS 69

1 Flange with lens antenna
2 Plastic horn antenna
3 Thread with integrated antenna system

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

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

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

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Socket diameter d		Socket length h	
80 mm	3"	≤ 300 mm	≤ 11.8 in
100 mm	4"	≤ 400 mm	≤ 15.8 in
150 mm	6"	≤ 600 mm	≤ 23.6 in

Orientation

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).

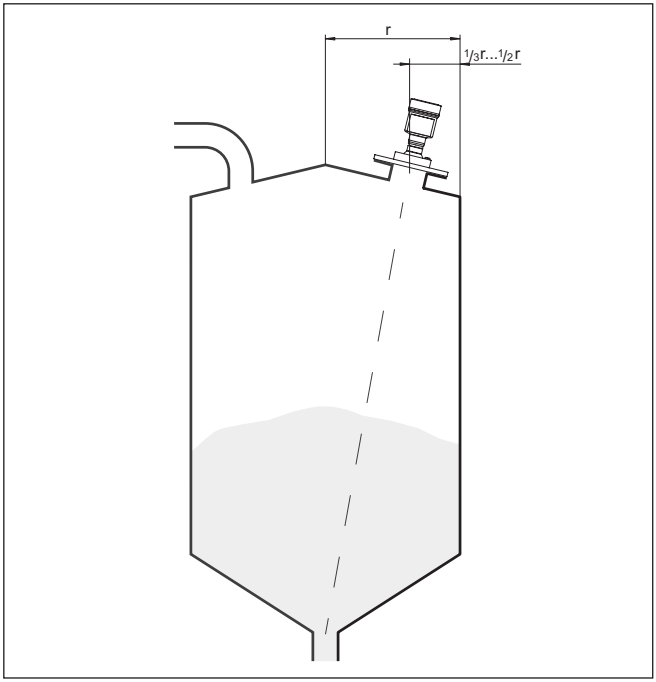

Fig. 18: Mounting position and orientation

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.

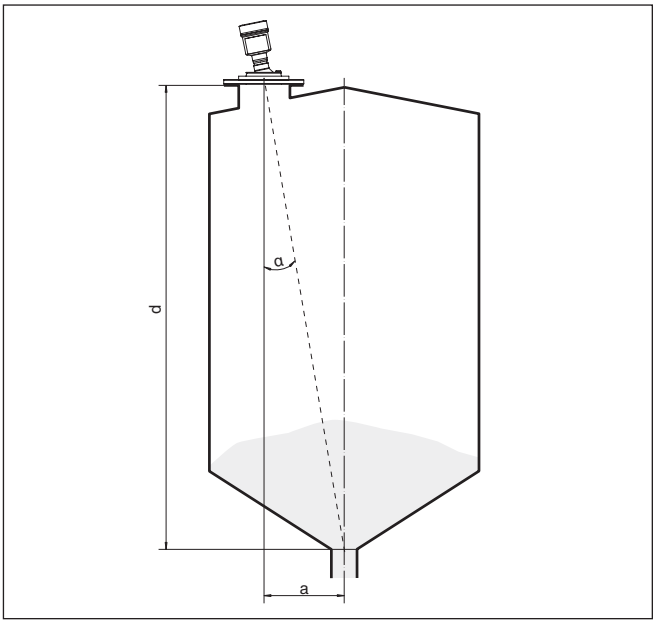

Fig. 19: Determination of the angle of inclination for alignment of VEGAPULS 69

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

Distance d (m)	2°	4°	6°	8°	10°
100	3.5	7	10.5	13.9	17.4
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.

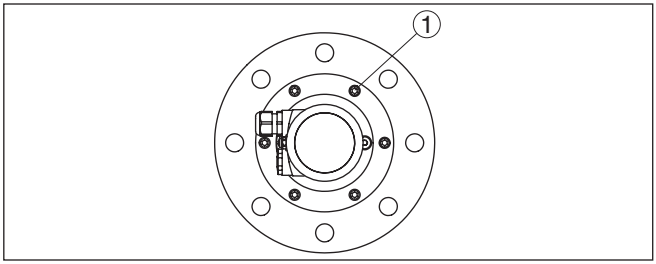

Fig. 20: VEGAPULS 69 with swivelling holder

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*".

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.

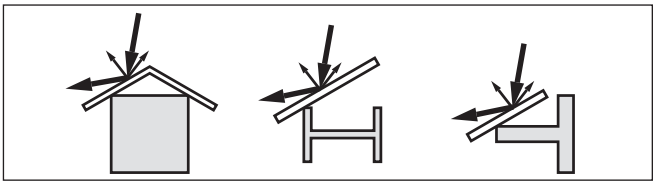

Fig. 21: Cover flat, large-area profiles with deflectors

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:
Keep in mind that for these applications, the sensors are designed for relatively slow level changes. If the sensor is used on a movable boom, the max. measuring rate must be observed (see chapter "*Technical data*").

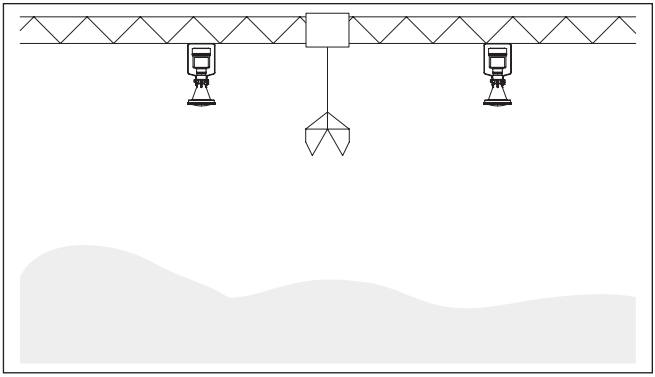

Fig. 22: Radar sensors on traverse crane

Mounting in the vessel insulation

Instruments for a temperature range up to 200° C have a spacer between process fitting and electronics housing. This spacer is used to thermally decouple the electronics from the high process temperatures.

Information:
The spacer may only be incorporated up to a maximum of 50 mm into the vessel insulation. Only then is a reliable temperature decoupling guaranteed.

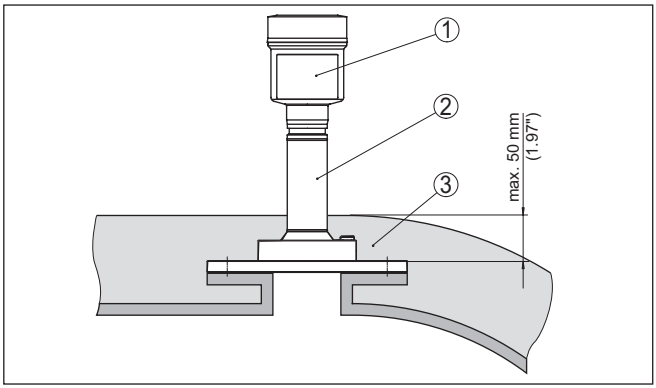

Fig. 23: Mounting the instrument on insulated vessels.

1 Electronics housing
2 Spacer
3 Vessel insulation

Mounting in multiple chamber silo

The walls of multiple-chamber silos are often made of profile material, e.g. profile sheeting, to ensure the required stability. If the radar sensor is mounted very close to a heavily structured vessel wall, substantial interfering reflections can be generated. Thus the sensor should be mounted at the largest possible distance from the separating wall.

The best mounting location is on the outer wall of the silo, with the sensor pointing towards the discharge opening in the silo centre. This can be accomplished, for example, with the mounting strap.

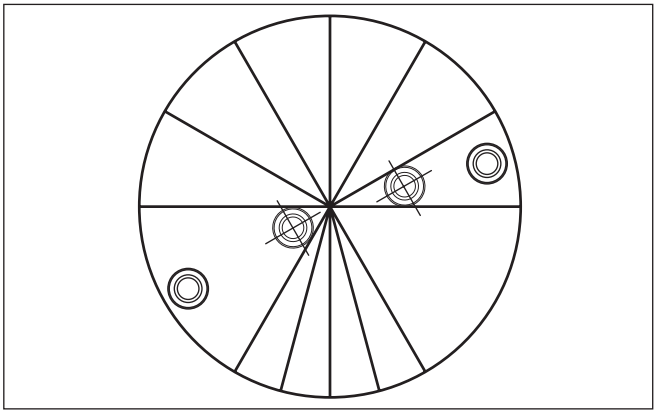

Fig. 24: Installation and orientation in multiple chamber silos

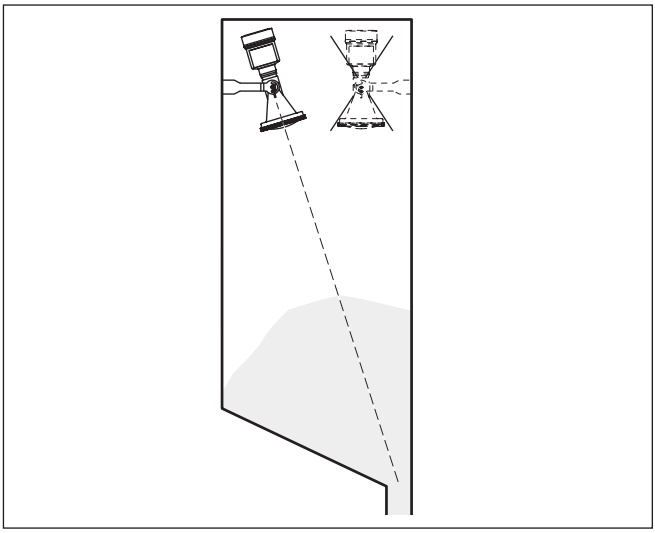

Fig. 25: Installation and orientation in multiple chamber silos

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.

Flange with lens antenna

The VEGAPULS 69 with metal-jacketed lens antenna is equipped with a rinsing air connection as a standard feature, see following graphics.

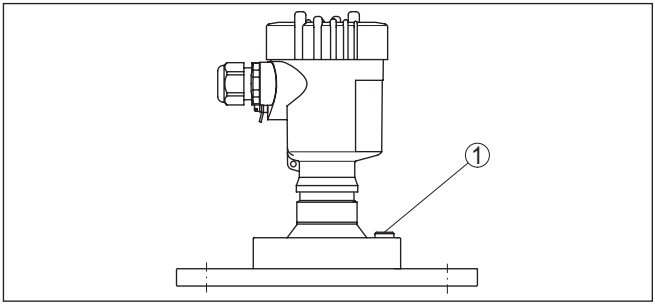

Fig. 26: Rinsing air connection on metal-jacketed lens antenna

Plastic horn antenna

The VEGAPULS 69 with plastic horn antenna is optionally available with a rinsing air connection. The mechanical configuration differs according to the flange version, see following graphics.

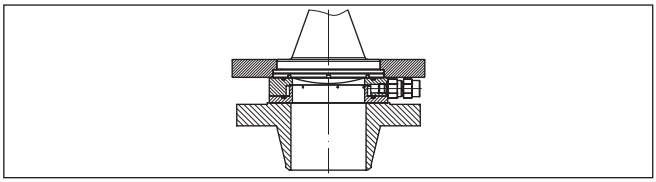

Fig. 27: Rinsing air connection with compression flange

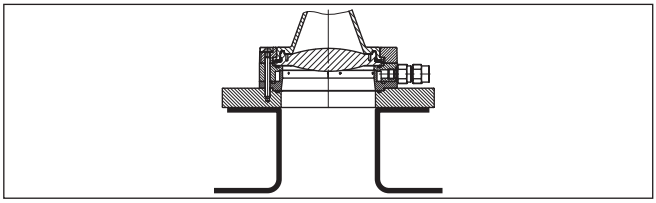

Fig. 28: Rinsing air connection with adapter flange

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

5 Connecting to the bus system

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

- Carry out electrical connection by trained, qualified personnel authorised by the plant operator
- If overvoltage surges are expected, overvoltage arresters should be installed

Warning:
Only connect or disconnect in de-energized state.

Voltage supply

The voltage supply is provided by a Profibus DP /PA segment coupler.

The voltage supply range can differ depending on the instrument version. You can find the data for voltage supply in chapter " *Technical data*".

Connection cable

Connection is made with shielded cable according to the Profibus specification. Power supply and digital bus signal are carried over the same two-wire connection cable.

Use cable with round cross section for instruments with housing and cable gland. To ensure the seal effect of the cable gland (IP protection rating), find out which cable outer diameter the cable gland is suitable for.

Use a cable gland fitting the cable diameter.

Make sure that the entire installation is carried out according to the Profibus specification. In particular, make sure that the bus is terminated with suitable terminating resistors.

You can find detailed information of the cable specification, installation and topology in the " *Profibus PA - User and Installation Guideline*" on www.profibus.com.

Cable glands

Metric threads
In the case of instrument housings with metric thread, the cable glands are screwed in at the factory. They are sealed with plastic plugs as transport protection.

Note:
You have to remove these plugs before electrical connection.

NPT thread
In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection.

Note:
Prior to setup you have to replace these protective caps with approved cable glands or close the openings with suitable blind plugs.

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On plastic housings, the NPT cable gland or the Conduit steel tube must be screwed into the threaded insert without grease.

Max. torque for all housings, see chapter " *Technical data*".

Cable screening and grounding

Make sure that the cable screen and grounding are carried out according to Fieldbus specification. We recommend to connect the cable screening to ground potential on both ends.

In systems with potential equalisation, connect the cable screening directly to ground potential at the power supply unit, in the connection box and at the sensor. The screen in the sensor must be connected directly to the internal ground terminal. The ground terminal outside on the housing must be connected to the potential equalisation (low impedance).

5.2 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.

Information:
The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

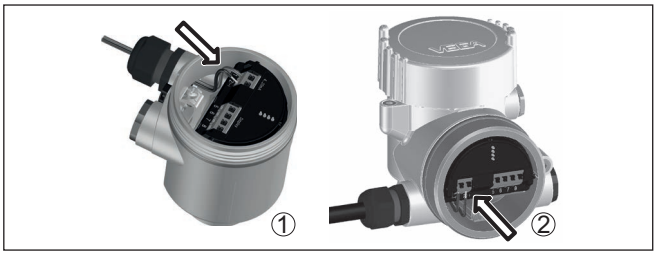


Fig. 29: Connection steps 5 and 6

1 Single chamber housing
2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan

Note:
Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

7. Check the hold of the wires in the terminals by lightly pulling on them
8. Connect the shielding to the internal ground terminal, connect the external ground terminal to potential equalisation
9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
10. Reinsert the display and adjustment module, if one was installed
11. Screw the housing lid back on

The electrical connection is finished.

5.3 Wiring plan, single chamber housing

The following illustration applies to the non-Ex as well as to the Ex-ia version.

Electronics and connection compartment

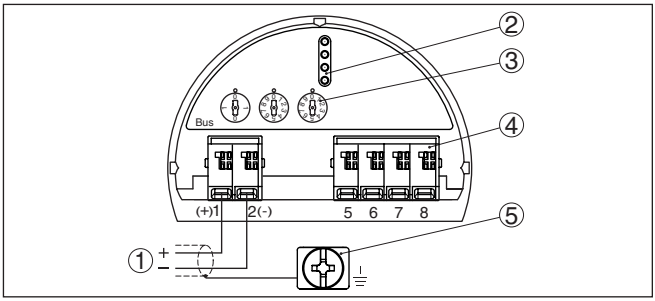


Fig. 30: Electronics and connection compartment - single chamber housing

1 Voltage supply, signal output
2 For display and adjustment module or interface adapter
3 Selection switch for instrument address
4 For external display and adjustment unit
5 Ground terminal for connection of the cable screening

5.4 Wiring plan, double chamber housing

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

Electronics compartment

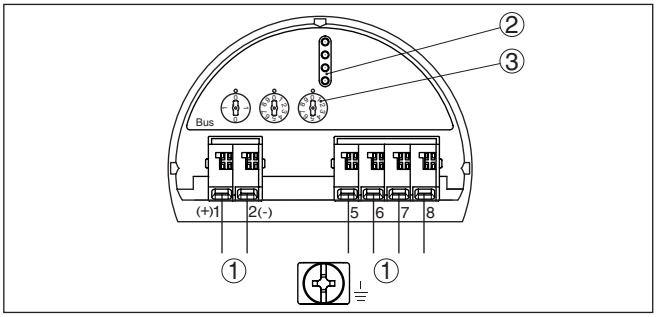


Fig. 31: Electronics compartment - double chamber housing

1 Internal connection to the connection compartment
2 Contact pins for the display and adjustment module or interface adapter
3 Selection switch for bus address

Connection compartment

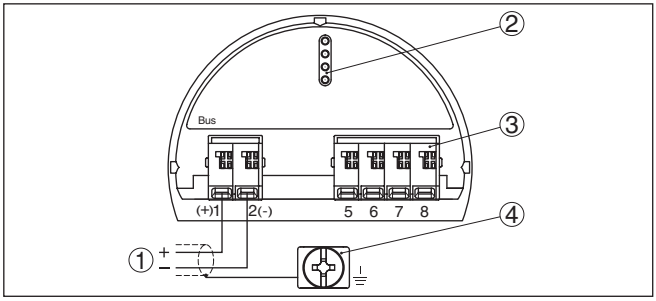


Fig. 32: Connection compartment - double chamber housing

1 Voltage supply, signal output
2 For display and adjustment module or interface adapter
3 For external display and adjustment unit
4 Ground terminal for connection of the cable screening

Information:
Parallel use of an external display and adjustment unit and a display and adjustment module in the connection compartment is not supported.

5.5 Double chamber housing with VEGADIS-Adapter

Electronics compartment

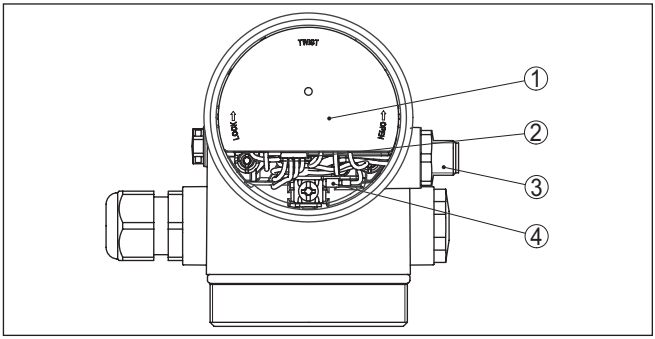


Fig. 33: View to the electronics compartment with VEGADIS adapter for connection of the external display and adjustment unit

1 VEGADIS adapter
2 Internal plug connection
3 M12 x 1 plug connector

Assignment of the plug connector

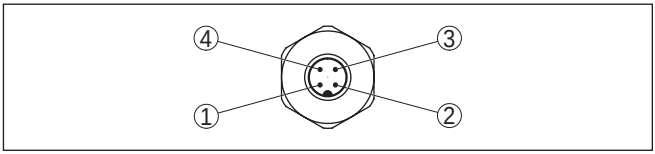


Fig. 34: Top view of the M12 x 1 plug connector

1 Pin 1
2 Pin 2
3 Pin 3
4 Pin 4

Contact pin	Colour, connection cable in the sensor	Terminal, electronics module
Pin 1	Brown	5
Pin 2	White	6
Pin 3	Blue	7
Pin 4	Black	8

5.6 Wiring plan - version IP66/IP68, 1 bar

Wire assignment, connection cable

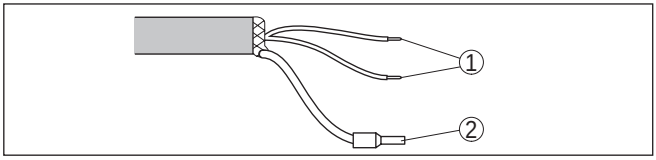


Fig. 35: Wire assignment in permanently connected connection cable

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

5.7 Set instrument address

Instrument address

An address must be assigned to each Profibus PA instrument. The approved addresses are between 0 and 126. Each address must only be assigned once in the Profibus PA network. The sensor is only recognized by the control system if the address is set correctly.

When the instrument is shipped, address 126 is set. This address can be used to test the function of the instrument and to connect it to a Profibus PA network. Then the address must be changed to integrate additional instruments.

The address setting is carried out either via:

- The address selection switch in the electronics compartment of the instrument (address setting via hardware)
- The display and adjustment module (address setting via software)
- PACTware/DTM (address setting via software)

Hardware addressing

The hardware addressing is effective if an address <126 is set with the address selection switches on the instrument. Software addressing is then no longer effective, the set hardware address applies.

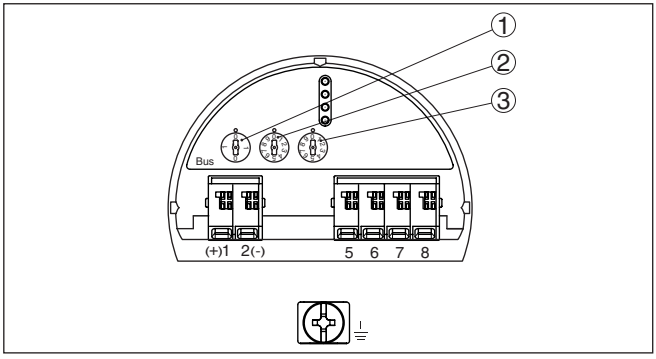


Fig. 36: Address selection switch

1 Addresses <100 (selection 0), addresses >100 (selection 1)
2 Decade of the address (selection 0 to 9)
3 Unit position of the address (selection 0 to 9)

Software addressing

Software addressing is only effective if address 126 or higher is set on the instrument with the address selection switches.

The addressing procedure is described in the operating instructions manual " *Display and adjustment module*.

5.8 Switch-on phase

After connecting VEGAPULS 69 to the bus system, the device first performs a self-test:

- Internal check of the electronics
- Indication of the status message " *F 105 Determine measured value*" on the display or PC
- Status byte goes to fault value

Then the actual measured value is output to the signal cable. The value takes into account settings that have already been carried out, e.g. default setting.

6 Set up with the display and adjustment module

6.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.

Fig. 37: Installing the display and adjustment module in the electronics compartment of the single chamber housing

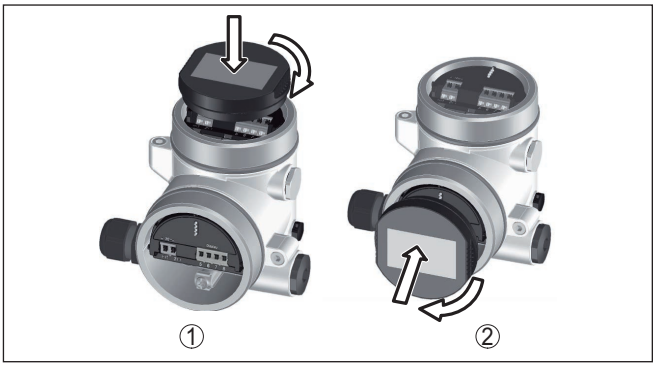


Fig. 38: Installing the display and adjustment module in the double chamber housing

1 In the electronics compartment
2 In the connection compartment

Note:
If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

6.2 Adjustment system

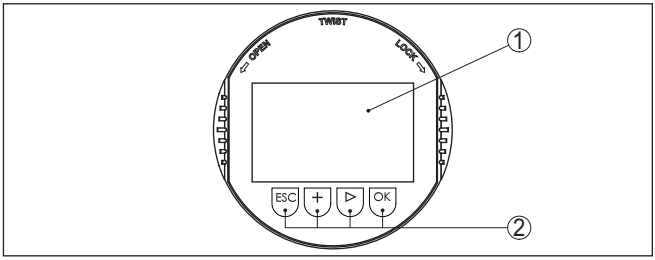


Fig. 39: Display and adjustment elements

1 LC display
2 Adjustment keys

Key functions

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- ***[->]*** key:
  - Change measured value presentation
  - Select list entry
  - Select menu items
  - Select editing position
- ***[+]*** key:

- Change value of the parameter

- ***[ESC]*** key:
  - Interrupt input
  - Jump to next higher menu

Operating system - Keys direct

The instrument is operated via the four keys of the display and adjustment module. The individual menu items are shown on the LC display. You can find the function of the individual keys in the previous illustration.

Adjustment system - keys via magnetic pen

With the Bluetooth version of the display and adjustment module you can also adjust the instrument with the magnetic pen. The pen operates the four keys of the display and adjustment module right through the closed lid (with inspection window) of the sensor housing.

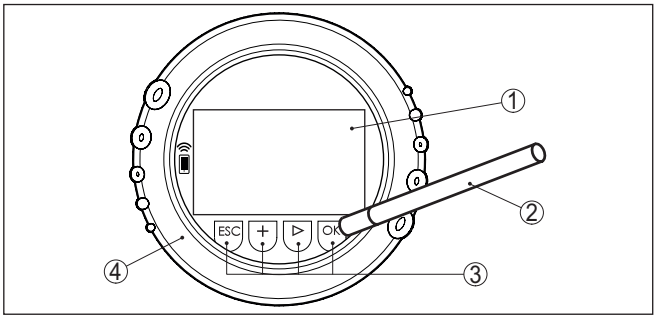


Fig. 40: Display and adjustment elements - with adjustment via magnetic pen

1 LC display
2 Magnetic pen
3 Adjustment keys
4 Lid with inspection window

Time functions

When the ***[+]*** and ***[->]*** keys are pressed quickly, the edited value, or the cursor, changes one value or position at a time. If the key is pressed longer than 1 s, the value or position changes continuously.

When the ***[OK]*** and ***[ESC]*** keys are pressed simultaneously for more than 5 s, the display returns to the main menu. The menu language is then switched over to " *English*".

Approx. 60 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with ***[OK]*** will not be saved.

6.3 Measured value indication - Selection of national language

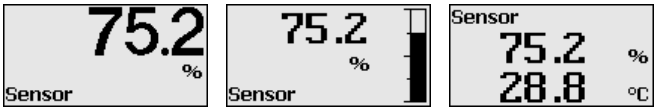
Measured value indication

With the ***[->]*** key you move between three different indication modes.

In the first view, the selected measured value is displayed in large digits.

In the second view, the selected measured value and a respective bargraph presentation are displayed.

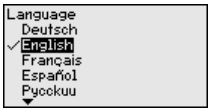
In the third view, the selected measured value as well as a second selectable value, e.g. the temperature of the electronics, are displayed.



During the initial setup of an instrument shipped with factory settings, use the " ***OK***" key to get to the menu " *National language*".

Selection of national language

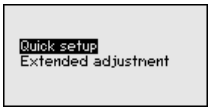
This menu item is used to select the national language for further parameter adjustment. You can change the selection via the menu item " *Setup - Display, Menu language*".



With the " ***OK***" key you move to the main menu.

6.4 Parameter adjustment - Quick setup

To quickly and easily adapt the sensor to the application, select the menu item " *Quick setup*" in the start graphic on the display and adjustment module.



Select the individual steps with the ***[->]*** key.

After the last step, " *Quick setup terminated successfully*" is displayed briefly.

Information:
The echo curve of setup is stored automatically during the quick setup.

The return to the measured value indication is carried out through the ***[->]*** or ***[ESC]*** keys or automatically after 3 s

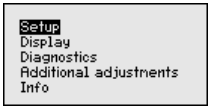
You can find " *Extended adjustment*" in the next sub-chapter.

6.5 Parameter adjustment

The instrument is adapted to the application conditions via the parameter adjustment. The parameter adjustment is carried out with an adjustment menu.

Main menu

The main menu is divided into five sections with the following functions:



Setup: Settings, for example, to measurement loop name, medium, application, vessel, adjustment, AI FB 1 Channel - scaling - damping

Display: Language setting, settings for the measured value indication as well as lighting

Diagnosis: Information, for example on the instrument status, pointer, measurement reliability, AI FB 1 simulation, echo curve

Further settings: Instrument units, false signal suppression, linearization, sensor address, PIN, date/time, reset, copy sensor data

Info: Instrument name, hardware and software version, date of manufacture, instrument features

In the main menu item "*Setup*", the individual submenu items should be selected one after the other and provided with the correct parameters to ensure optimum setting of the measurement. The procedure is described in the following.

Setup - Instrument address

An address must be assigned to each Profibus PA instrument. Each address may only be assigned once in the Profibus PA network. The sensor is only recognized by the control system if the address is set correctly.

When the instrument is shipped, address 126 is set. This address can be used to test the function of the instrument and to connect it to a Profibus PA network. Then the address must be changed to integrate additional instruments.

The address setting is carried out either via:

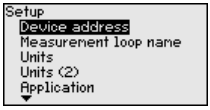
- The address selection switch in the electronics compartment of the instrument (hardware addressing)
- The display and adjustment module (software addressing)
- PACTware/DTM (address setting via software)

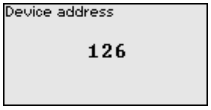
Hardware addressing

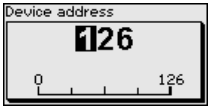
Hardware addressing is effective if an address less than 126 is set with the address selection switches on the electronics module of VEGAPULS 69. In such case, software addressing has no effect - only the set hardware address applies.

Software addressing

Software addressing is only effective if address 126 or higher is set on the instrument with the address selection switches.







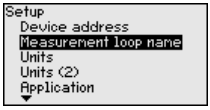
Setup - Measurement loop name

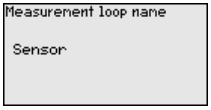
Here you can assign a suitable measurement loop name. Push the "***OK***" key to start the editing. With the "**+**" key you change the sign and with the "**->**" key you jump to the next position.

You can enter names with max. 19 characters. The character set comprises:

- Capital letters from A … Z
- Numbers from 0 … 9

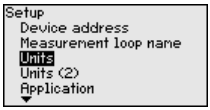
- Special characters + - / _ blanks

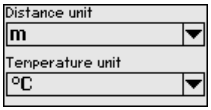




Setup - Units

In this menu item you select the distance unit and the temperature unit.

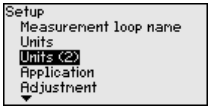


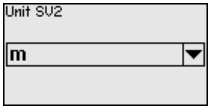


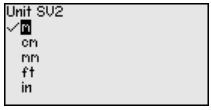
For the distance units you can choose between m, in and ft and for the temperature units °C, °F and K.

Setup - Unit SV2

In this menu item, you define the unit of the Secondary Values 2 (SV2):





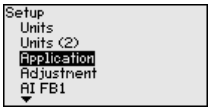


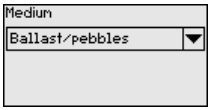
Enter the requested parameters via the appropriate keys, save your settings with ***[OK]*** and jump to the next menu item with the ***[ESC]*** and the ***[->]*** key.

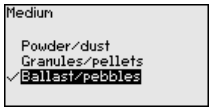
Setup - Application

With this menu item, the sensor can be optimally adapted to the application, the installation location or the measurement conditions. It includes selection options for medium, application as well as vessel height/measuring range.

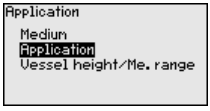
Medium:
Every medium has a different reflective behaviour. With this selection, the sensor can be perfectly adapted to the medium and measurement reliability, particularly with media with poor reflective properties, is considerably increased.

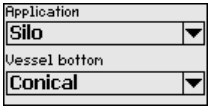


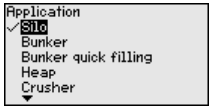




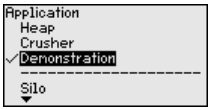
Application:
Depending on the type of bulk solids application, material cones and additional echoes from the vessel wall or bottom can become further interfering factors. Through this selection, the sensor is adapted perfectly to the application.

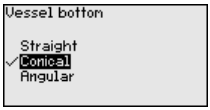




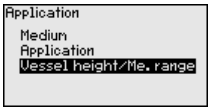


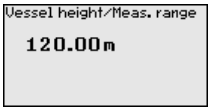
47250-EN-210205





Vessel height/Measuring range:
The VEGAPULS 69 is a bulk solids radar sensor for high, slender vessels. It covers a measuring range up to 120 m. This menu item lets you limit the active measuring range in which the instrument searches for level echoes.





Information:
The min. adjustment must be carried out independently of this.

The following features form the basis of the applications:

Silo (slender and high):
- Process/measurement conditions:
  - Filling aperture too close to the sensor
  - System noise in completely empty silo increased
  - Interfering reflections due to weld seams on the vessel
- Properties, sensor:
  - Stable measured values through higher averaging
  - False signal suppression recommended during setup

Bunker (large-volumed)
- Process/measurement conditions:
  - Large distance to the medium
  - Large angles of repose
  - Interfering reflections due to structured vessel walls or internals
- Properties, sensor:
  - Mean averaging
  - High measured value jumps are accepted

Bunker with fast filling:
- Vessel of concrete or metal, also multiple chamber silo:
  - Structured vessel walls
  - Installations present
- Process/measurement conditions:
  - Measured value jumps, e.g. through truck loading
  - Large distance to the medium
  - Large angles of repose
- Properties, sensor:
  - Lower averaging
  - Very high measured value jumps are accepted

Heap:
- Process/measurement conditions:

- Measured value jumps, e.g. by the profile of the heap or traverses
- Large angles of repose
- Measurement near the filling stream
- Sensor mounting on movable conveyor belts

- Properties, sensor:
  - Mean averaging
  - High measured value jumps are accepted

Crusher:

- Process/measurement conditions:
  - Measured value jumps, e.g. through truck loading
  - Fast reaction time
  - Large distance to the medium
  - Interfering reflections due to internal installations or wear and protective devices
- Properties, sensor:
  - Little averaging
  - Max. reaction speed, very high measured value jumps are accepted

Demonstration:

- Setting for all applications which are not typically level measurement
  - Instrument demonstration
  - Object recognition/monitoring (additional settings required)
- Properties, sensor:
  - Sensor accepts all measured value changes within the measuring range immediately
  - High sensitivity to interference, because virtually no averaging

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

Setup - Adjustment

Since the radar sensor is a distance measuring instrument, the distance from the sensor to the medium surface is measured. To indicate the actual level, an allocation of the measured distance to the percentage height must be carried out.

To perform the adjustment, enter the distance with full and empty vessel, see the following example:

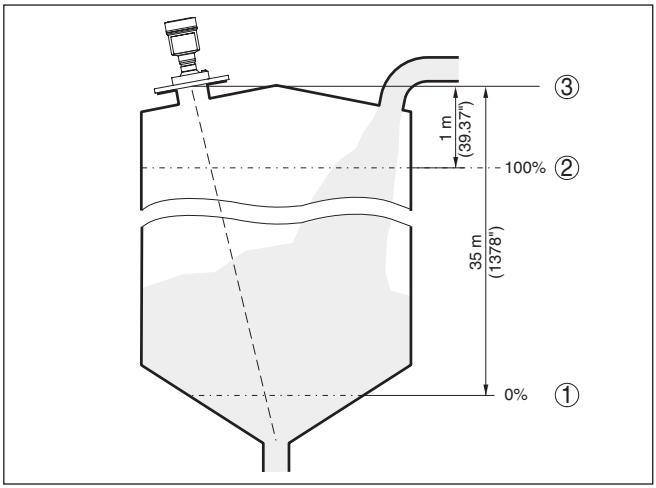


Fig. 41: Parameterisation example, Min./max. adjustment

1 Min. level = max. measuring distance
2 Max. level = min. measuring distance
3 Reference plane

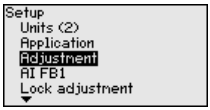
If these values are not known, an adjustment with the distances of e.g. 10 % and 90 % is possible. Starting point for these distance specifications is always the sealing surface of the thread or flange. You can find specifications on the reference plane in chapter " *Technical data*". The actual level is calculated on the basis of these settings.

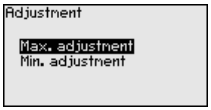
The actual product level during this adjustment is not important, because the min./max. adjustment is always carried out without changing the product level. These settings can be made ahead of time without the instrument having to be installed.

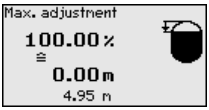
Setup - Max. adjustment

Proceed as follows:

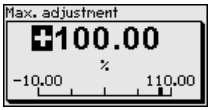
1. Select with ***[->]*** the menu item Max. adjustment and confirm with ***[OK]***.



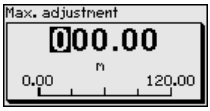




2. Prepare the percentage value for editing with ***[OK]*** and set the cursor to the requested position with ***[->]***.



3. Set the requested percentage value with ***[+]*** and save with ***[OK]***. The cursor jumps now to the distance value.

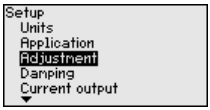


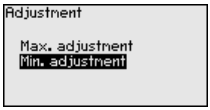
4. Enter the corresponding distance value in meters for the full vessel.
5. Save settings with ***[OK]*** and move with ***[ESC]*** and ***[->]*** to Min. adjustment.

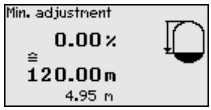
Setup - Min. adjustment

Proceed as follows:

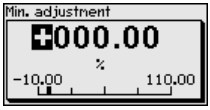
1. Select with ***[->]*** the menu item " *Min. adjustment*" and confirm with ***[OK]***.



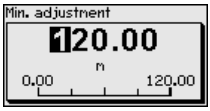




2. Edit the percentage value with ***[OK]*** and set the cursor to the requested position with ***[->]***.



3. Set the requested percentage value with ***[+]*** and save with ***[OK]***. The cursor jumps now to the distance value.

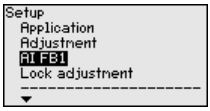


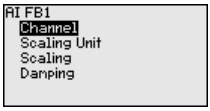
4. Enter the suitable distance value in m for empty vessel (e.g. distance from the sensor to the vessel bottom) corresponding to the percentage value.

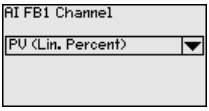
Setup - AI FB1 Channel

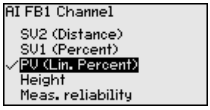
The channel is the input selector switch for function block (FB) of the sensor. Within the function block, additional scalings (Out-Scale) are carried out. In this menu item, the value fir the function block is selected:

- PV (Primary Value):
  - Linearised percentage value
- SV1 (Secondary Value 1):
  - Percent with radar, guided microwave and ultrasonic sensors
  - Pressure or height with pressure transmitters
- SV2 (Secondary Value 2):
  - Distance with radar, guided microwave and ultrasonic sensors
  - Percent with pressure transmitters
- Height



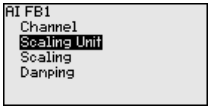


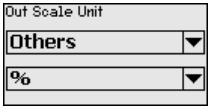


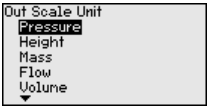


Setup - AI FB1 Scaling unit

Additional scalings (Out-Scale) are carried out within the function block. In this menu item, the scaling unit is selected. For a better overview, the units are combined in groups:

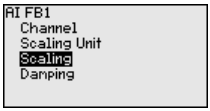


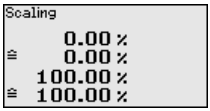


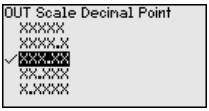


Setup - AI FB1 Scaling

Additional scalings (Out-Scale) are carried out within the function block. In this menu item, the unit of the scaling is entered.



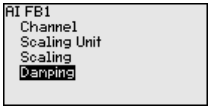


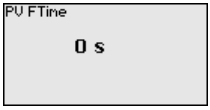


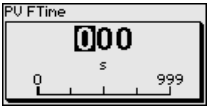
Setup - AI FB1 Damping

To damp process-dependent measured value fluctuations, set an integration time of 0 … 999 s in this menu item.

Depending on the sensor type, the factory setting is 0 s or 1 s.

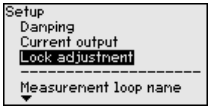


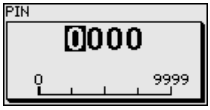




Lock/unlock setup - Adjustment

In the menu item " *Lock/unlock adjustment*" you safeguard the sensor parameters against unauthorized or unintentional modifications.





With active PIN, only the following adjustment functions are possible without entering a PIN:

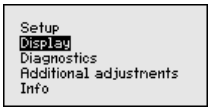
- Select menu items and show data
- Read data from the sensor into the display and adjustment module

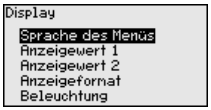
Releasing the sensor adjustment is also possible in any menu item by entering the PIN.

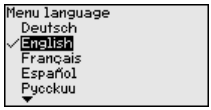
Caution:
With active PIN, adjustment via PACTware/DTM and other systems is also blocked.

Display - Menu language

This menu item enables the setting of the requested national language.







The following languages are available:

- German
- English
- French
- Spanish
- Russian
- Italian
- Dutch
- Portuguese
- Japanese
- Chinese
- Polish
- Czech
- Turkish

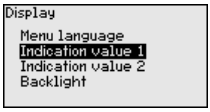
In the delivery status, the VEGAPULS 69 is set to the ordered national language.

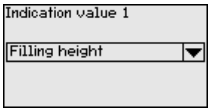
Display - Displayed values 1 and 2

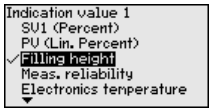
In the menu item " *Display*" you can define which measured value should be presented on the display.

The sensor delivers the following measured values:

- Distance
- SV2 (Secondary Value 2): Distance value before the adjustment
- SV1 (Secondary Value 1): Percentage value after the adjustment
- PV (Primary Value): Linearised percentage value
- Filling height
- Measurement reliability
- Electronics temperature
- AI FB1 (OUT)
- AI FB2 (OUT)
- AI FB3 (OUT)



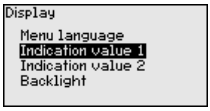


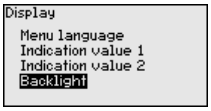


Display - Backlight

The display and adjustment module has a backlight for the display. In this menu item you can switch the lighting on or off. You can find the required operating voltage in chapter " *Technical data*".

To maintain the function of the device, the lighting is temporarily switched off if the power supply is insufficient.

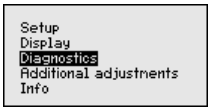


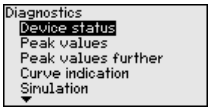


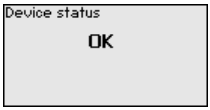
In delivery status, the lighting is switched on.

Diagnostics - Device status

In this menu item, the device status is displayed.



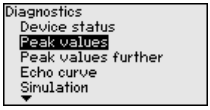


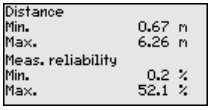


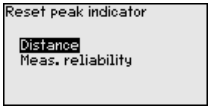
Diagnosis - Peak value

The min. and max. measured value, the measurement reliability as well as the min. and max. electronics temperature are stored in the sensor. The values are displayed in menu item " *Peak value*" or " *Further peak values*".

A reset menu is opened with the ***[OK]*** key in the respective peak value window:



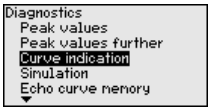


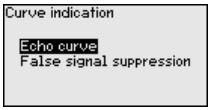


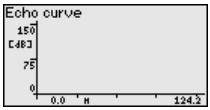
With the ***[OK]*** key in the reset menu, the peak values are reset to the current measured value.

Diagnosis - Curve indication

The " *Echo curve*" shows the signal strength of the echoes over the measuring range in dB. The signal strength enables an evaluation of the quality of the measurement.





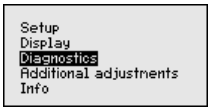


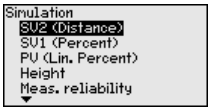
The selected curve is continuously updated. A submenu with zoom functions is opened with the ***[OK]*** key:

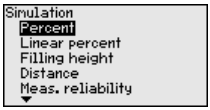
- "X-Zoom": Zoom function for the meas. distance
- "Y-Zoom": 1, 2, 5 and 10x signal magnification in " *dB*"
- "Unzoom": Reset the presentation to the nominal measuring range without magnification

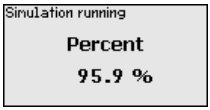
Diagnosis - Simulation

In this menu item you can simulate measured values via the current output. This allows the signal path to be tested, e.g. through downstream indicating instruments or the input card of the control system.





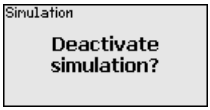




Select the requested simulation variable and set the requested value.

Caution:
During simulation, the simulated value is output as digital signal to the bus. The status message along with the Asset Management function is " *Maintenance*".

To deactivate the simulation, you have to push the ***[ESC]*** key and confirm the message



with the ***[OK]*** key.

Information:
The sensor terminates the simulation automatically after 60 minutes.

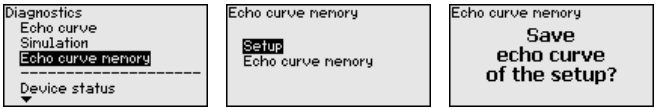
Diagnostics - Echo curve memory

The function " *Setup*" allows the echo curve to be saved at the time of setup.

Information:
This is generally recommended, however, for use of the Asset Management functions it is absolutely necessary. Saving should be carried out with a very low level.

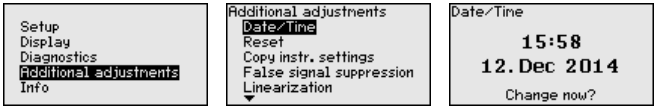
The function " *Echo curve memory*" allows up to ten individual echo curves to be stored, for example to detect the measurement behaviour of the sensor in different operating conditions.

With the adjustment software PACTware and the PC, the stored echo curves can be displayed with high resolution and used to recognize signal changes over time. In addition, the echo curve saved during setup can also be displayed in the echo curve window and compared with the current echo curve.



Additional settings - Date/ Time

In this menu item, the internal clock of the sensor is set to the requested time and time format. At the time of shipment from factory, the instrument is set to CET (Central European Time).

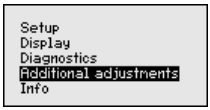


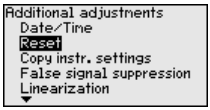
Additional settings - Reset

During a reset, the parameter settings carried out by the user are reset to the default values (see below table).

Proceed as follows:

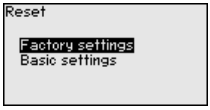
1. Select with ***[->]*** under " *Additional adjustments*" the menu item " *Reset*" and confirm with ***[OK]***.





2. Confirm with ***[OK]*** and select the requested reset function with ***[->]***

3. Confirm with ***[OK]***, for approx. 5 s the message " *Resetting*" is displayed, then the selection window appears.



Caution:
For the duration of the reset, the set trouble signal is output via the current output. Within the context of the asset management function, the message " *Maintenance*" is output.

The following reset functions are available:

Delivery status: Restores the parameter settings at the time of shipment from the factory, incl. the order-specific settings. Any created false signal suppression, user-programmable linearization curve as well as measured value and echo curve memory is deleted. The event and parameter modification memories remain unaffected.

Basic settings: Resets the parameter settings, incl. special parameters, to the default values of the respective instrument. Any stored false signal suppression or user programmable linearisation curve, as well as the measured value memory, is deleted. Order-related settings are not taken over into the current parameters after this reset.

The following table shows the scope of the reset function and the default values of the instrument:

Menu	Menu item	Default value
Setup	Instrument address	126
	Measurement loop name	no reset
	Units	Distance in m Temperature in °C
	Units	Unit SV2
	Application	Medium: Crushed stones/gravel Application: Silo Vessel bottom: Flat Vessel height/Measuring range: 120 m
	Min. adjustment	120 m
	Max. adjustment	0,000 m(d)
	AI FB1 Channnel	PV (lin. perc.)
	AI FB1 scaling unit	Height %
	AI FB1 scaling	0.00 lin %, 0.00 % 100.00 lin %, 100.00 %
	AI FB1 damping	0 s
	Lock adjustment	Released PIN: 0000
Display	Displayed value 1	Filling height
	Displayed value 2	Temperature
	Backlight	Switched off
Additional adjustments	Date/Time	Time format: 24 h
	Linearisation	Linear

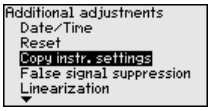
Additional settings - Copy instrument settings

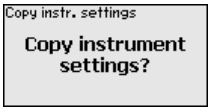
The instrument settings are copied with this function. The following functions are available:

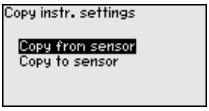
- **Read from sensor:** Read data from sensor and store into the display and adjustment module
- **Write into sensor:** Store data from the display and adjustment module back into the sensor

The following data or settings for adjustment of the display and adjustment module are saved:

- All data of the menu " *Setup*" and " *Display*"
- The menu items " *Reset, Date/Time*" in the menu " *Additional settings*"
- The user-programmable linearization curve







The copied data are permanently saved in an EEPROM memory in the display and adjustment module and remain there even in case of power failure. From there, they can be written into one or more sensors or kept as backup for a possible electronics exchange.

Note:
Before the data are saved in the sensor, a safety check is carried out to determine if the data match the sensor. In the process the sensor type of the source data as well as the target sensor are displayed. If the data do not match, a fault message is outputted or the function is blocked. The data are saved only after release.

Additional settings - False signal suppression

The following circumstances cause interfering reflections and can influence the measurement:

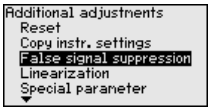
- High mounting nozzles
- Vessel internals such as struts
- Agitators
- Buildup or welded joints on vessel walls

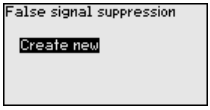
Note:
A false signal suppression detects, marks and saves these false signals to ensure that they are ignored in the level measurement.

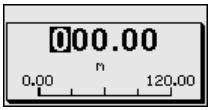
This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Proceed as follows:

1. Select with ***[->]*** the menu item " *False signal suppression*" and confirm with ***[OK]***.



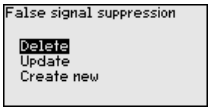




2. Confirm 3-times with ***[OK]*** and enter the actual distance from the sensor to the product surface.
3. All interfering signals in this range are detected by the sensor and stored after being confirmed with ***[OK]***.

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

If a false signal suppression has already been saved in the sensor, the following menu window appears when selecting " *False signal suppression*":

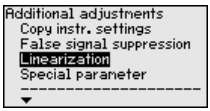


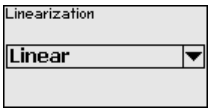
Delete: An already created false signal suppression will be completely deleted. This is useful if the saved false signal suppression no longer matches the metrological conditions in the vessel.

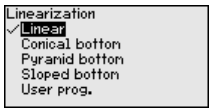
Extend: is used to extend an already created false signal suppression. This is useful if a false signal suppression was carried out with too high a level and not all false signals could be detected. When selecting " *Extend*", the distance to the product surface of the created false signal suppression is displayed. This value can now be changed and the false signal suppression can be extended to this range.

Additional settings - Linearization

A linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level. Corresponding linearization curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. The linearization applies to the measured value indication and the current output.



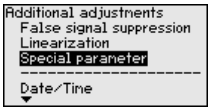




Additional settings - Special parameters

In this menu item you gain access to the protected area where you can enter special parameters. In exceptional cases, individual parameters can be modified in order to adapt the sensor to special requirements.

Change the settings of the special parameters only after having contacted our service staff.

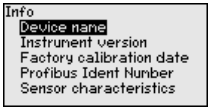


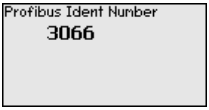
Info

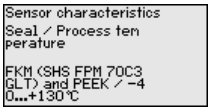
In this menu item the following information of the instrument can be read out:

- Instrument name and serial number
- Hardware and software version
- Date of the factory calibration as well as the last change via adjustment instruments
- Profibus ident number

- Sensor characteristics such as approval, process fitting, seal, meas. range etc.







6.6 Saving the parameterisation data

On paper

We recommended writing down the adjustment data, e.g. in this operating instructions manual, and archiving them afterwards. They are thus available for multiple use or service purposes.

In the display and adjustment module

If the instrument is equipped with a display and adjustment module, the parameter adjustment data can be saved therein. The procedure is described in menu item " *Copy device settings*".

7 Setup with PACTware

7.1 Connect the PC

Via the interface adapter directly on the sensor

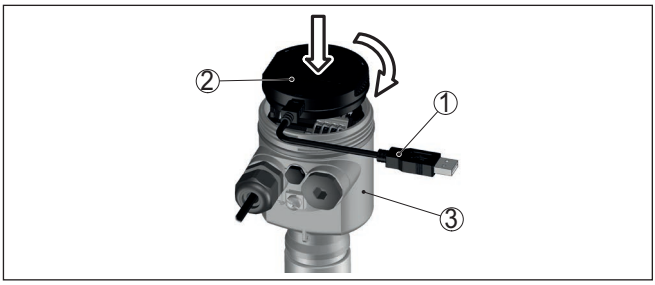


Fig. 42: Connection of the PC directly to the sensor via the interface adapter

1 USB cable to the PC
2 Interface adapter VEGACONNECT
3 Sensor

7.2 Parameter adjustment with PACTware

Prerequisites

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

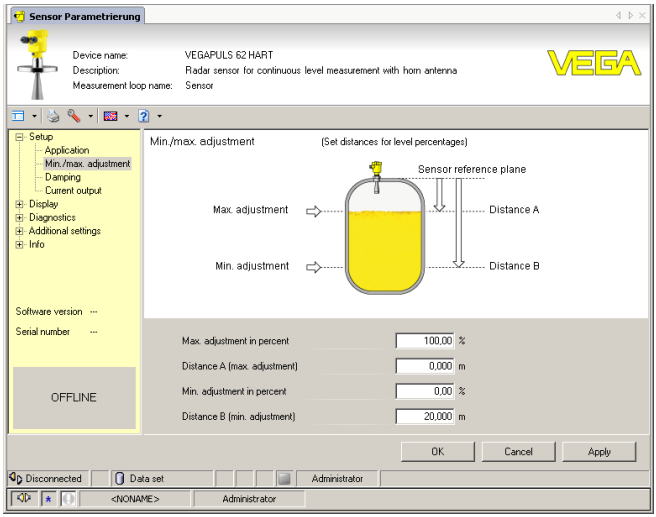


Fig. 43: Example of a DTM view

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 download under www.vega.com/downloads and " *Software*". The full version is available on CD from the agency serving you.

7.3 Saving the parameterisation data

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

8 Set up with other systems

8.1 DD adjustment programs

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

The files can be downloaded at www.vega.com/downloads under "*Software*".

9 Diagnosis, asset management and service

9.1 Maintenance

Maintenance

If the device is used properly, no special maintenance is required in normal operation.

Precaution measures against buildup

In some applications, buildup on the antenna system can influence the measuring result. Depending on the sensor and application, take measures to avoid heavy soiling of the antenna system. If necessary, clean the antenna system in certain intervals.

Cleaning

The cleaning helps that the type label and markings on the instrument are visible.

Take note of the following:

- Use only cleaning agents which do not corrode the housings, type label and seals
- Use only cleaning methods corresponding to the housing protection rating

9.2 Measured value and event memory

The instrument has several memories available for diagnostic purposes. The data remain there even in case of voltage interruption.

Measured value memory

Up to 100,000 measured values can be stored in the sensor in a ring memory. Each entry contains date/time as well as the respective measured value. Storable values are for example:

- Distance
- Filling height
- Percentage value
- Lin. percent
- Scaled
- Current value
- Measurement reliability
- Electronics temperature

When the instrument is shipped, the measured value memory is active and stores distance, measurement reliability and electronics temperature every 3 minutes.

The requested values and recording conditions are set via a PC with PACTware/DTM or the control system with EDD. Data are thus read out and also reset.

Event memory

Up to 500 events are automatically stored with a time stamp in the sensor (non-deletable). Each entry contains date/time, event type, event description and value. Event types are for example:

- Modification of a parameter
- Switch-on and switch-off times
- Status messages (according to NE 107)
- Error messages (according to NE 107)

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

Echo curve memory

The echo curves are stored with date and time and the corresponding echo data. The memory is divided into two sections:

Echo curve of the setup: This is used as reference echo curve for the measurement conditions during setup. Changes in the measurement conditions during operation or buildup on the sensor can thus be recognized. The echo curve of the setup is stored via:

- PC with PACTware/DTM
- Control system with EDD
- Display and adjustment module

Further echo curves: Up to 10 echo curves can be stored in a ring buffer in this memory section. Additional echo curves are stored via:

- PC with PACTware/DTM
- Control system with EDD

9.3 Asset Management function

The instrument features self-monitoring and diagnostics according to NE 107 and VDI/VDE 2650. In addition to the status messages in the following tables there are more detailed error messages available under the menu item " *Diagnostics*" via the respective adjustment module.

Status messages

The status messages are divided into the following categories:

- Failure
- Function check
- Out of specification
- Maintenance required

and explained by pictographs:

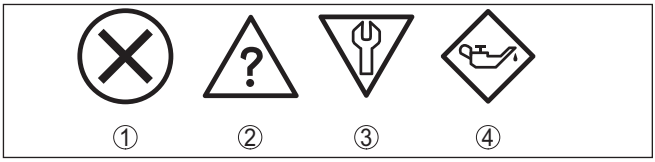


Fig. 44: Pictographs of the status messages

1 Failure - red
2 Out of specification - yellow
3 Function check - orange
4 Maintenance required - blue

Failure: Due to a malfunction in the instrument, a fault message is output.

This status message is always active. It cannot be deactivated by the user.

Function check: The instrument is being worked on, the measured value is temporarily invalid (for example during simulation).

This status message is inactive by default.

Out of specification: The measured value is unreliable because an instrument specification was exceeded (e.g. electronics temperature).

This status message is inactive by default.

Maintenance required: 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 inactive by default.

Failure (failure)

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
F013 no measured value available	Sensor does not detect an echo during operation Antenna system dirty or defective	Check or correct installation and/or parameter settings Clean or exchange process component or antenna	Bit 0
F017 Adjustment span too small	Adjustment not within specification	Change adjustment according to the limit values (difference between min. and max. ≥ 10 mm)	Bit 1
F025 Error in the linearization table	Index markers are not continuously rising, for example illogical value pairs	Check linearization table Delete table/Create new	Bit 2
F036 No operable software	Failed or interrupted software update	Repeat software update Check electronics version Exchanging the electronics Send instrument for repair	Bit 3
F040 Error in the electronics	Hardware defect	Exchanging the electronics Send instrument for repair	Bit 4
F080	General software error	Disconnect operating voltage briefly	Bit 5
F105 Determine measured value	The instrument is still in the switch-on phase, the measured value could not yet be determined	Wait for the end of the switch-on phase Duration up to approx. 3 minutes depending on the version and parameter settings	Bit 6
F113 Communication error	Error in the internal instrument communication	Disconnect operating voltage briefly Send instrument for repair	Bit 12
F125 Impermissible electronics temperature	Temperature of the electronics in the non-specified range	Check ambient temperature Insulate electronics Use instrument with higher temperature range	Bit 7
F260 Error in the calibration	Error in the calibration carried out in the factory Error in the EEPROM	Exchanging the electronics Send instrument for repair	Bit 8

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
F261 Error in the configuration	Error during setup False signal suppression faulty Error when carrying out a reset	Repeat setup Repeat reset	Bit 9
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 settings Use an instrument with bigger measuring range	Bit 10
F265 Measurement function disturbed	Sensor no longer carries out a measurement Operating voltage too low	Check operating voltage Carry out a reset Disconnect operating voltage briefly	Bit 11

Tab. 7: Error codes and text messages, information on causes as well as corrective measures

Function check

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
C700 Simulation active	A simulation is active	Finish simulation Wait for the automatic end after 60 mins.	Bit 19

Out of specification

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
S600 Impermissible electronics temperature	Temperature of the electronics in the non-specified range	Check ambient temperature Insulate electronics Use instrument with higher temperature range	Bit 23
S601 Overfilling	Danger of vessel overfilling	Make sure that there is no further filling Check level in the vessel	Bit 24

Maintenance

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
M500 Error during the reset "delivery status"	The data could not be restored during the reset to delivery status	Repeat reset Load XML file with sensor data into the sensor	Bit 15
M501 Error in the non-active linearisation table	Hardware error EEPROM	Exchanging the electronics Send instrument for repair	Bit 16
M502 Error in the event memory	Hardware error EEPROM	Exchanging the electronics Send instrument for repair	Bit 17

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
M503 Measurement reliability too low	The echo/noise ratio is too small for reliable measurement Antenna dirty or defective	Check installation and process conditions Change polarisation direction Use instrument with higher sensitivity Clean the antenna	Bit 18
M504 Error at a device interface	Hardware defect	Check connections Exchanging the electronics Send instrument for repair	Bit 19
M505 No echo available	Sensor does not detect an echo during operation Antenna dirty or defective	Clean the antenna Use a more suitable antenna/ sensor Remove possible false echoes Optimize sensor position and orientation	Bit 20
M506 Installation/Setup error	Error during setup	Check or correct installation and/ or parameter settings	Bit 21
M507 Error in the instrument settings	Error during setup Error when carrying out a reset False signal suppression faulty	Carry out reset and repeat setup	Bit 22

Tab. 10: Error codes and text messages, information on causes as well as corrective measures

9.4 Rectify faults

Reaction when malfunction occurs

The operator of the system is responsible for taking suitable measures to rectify faults.

Fault rectification

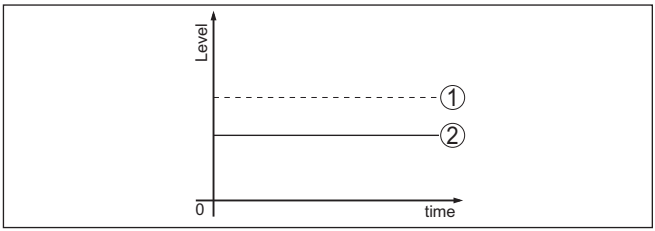
The first measures are:

- Evaluation of fault messages
- Checking the output signal
- Treatment of measurement errors

A smartphone/tablet with the adjustment app or a PC/notebook with the software PACTware and the suitable DTM offer you further comprehensive diagnostic possibilities. In many cases, the causes can be determined in this way and the faults eliminated.

The tables below give typical examples of application-related measurement errors.

The images in column " *Error description*" show the actual level as a dashed line and the output level as a solid line.

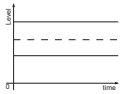
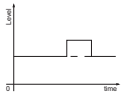


1 Real level
2 Level displayed by the sensor

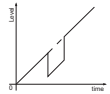
Note:
If the output level is constant, the cause could also be the fault setting of the current output to " *Hold value*".

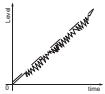
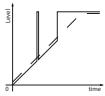
If the level is too low, the reason could be a line resistance that is too high

Measurement error with constant level

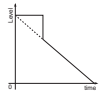
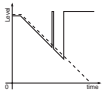
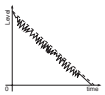
Fault description	Cause	Rectification
Measured value shows a too low or too high level 	Min./max. adjustment not correct	Adapt min./max. adjustment
	Incorrect linearization curve	Adapt linearization curve
Measured value jumps towards 100 % 	Due to the process, the amplitude of the product echo decreases A false signal suppression was not carried out	Carry out a false signal suppression
	Amplitude or position of a false signal has changed (e.g. condensation, buildup); false signal suppression no longer matches actual conditions	Determine the reason for the changed false signals, carry out false signal suppression, e.g. with condensation

Measurement error during filling

Fault description	Cause	Rectification
Measured value jumps towards 0 % during filling 	Amplitude of a multiple echo (vessel top - medium surface) is larger than the level echo	Check parameter "Application", especially vessel top, type of medium, dished bottom, high dielectric constant, and adapt if necessary.
	The level echo cannot be distinguished from the false signal at a false signal position (jumps to multiple echo)	Remove/reduce false signal: minimize interfering installations by changing the polarization direction Chose a more suitable installation position
	Transverse reflection from an extraction funnel, amplitude of the transverse reflection larger than the level echo	Direct sensor to the opposite funnel wall, avoid crossing with the filling stream.

Fault description	Cause	Rectification
Measured value fluctuates around 10 … 20 % 	Various echoes from an uneven medium surface, e.g. a material cone	Check parameter "Material Type" and adapt, if necessary Optimize installation position and sensor orientation
	Reflections from the medium surface via the vessel wall (deflection)	Select a more suitable installation position, optimize sensor orientation, e.g. with a swivelling holder
Measured value jumps sporadically to 100 % during filling 	Changing condensation or contamination on the antenna	Carry out a false signal suppression or increase false signal suppression with condensation/contamination in the close range by editing. With bulk solids use radar sensor with purging air connection or flexible antenna cover.

Measurement error during emptying

Fault description	Cause	Rectification
Measured value remains unchanged in the close range during emptying 	False signal larger than the level echo Level echo too small	Eliminate false signals in the close range. Check: Antenna must protrude out of the nozzle. Remove contamination on the antenna. Minimize interfering installations in the close range by changing the polarization direction. After eliminating the false signals, the false signal suppression must be deleted. Carry out a new false signal suppression.
Measured value jumps sporadically towards 100 % during emptying 	Changing condensation or contamination on the antenna	Carry out false signal suppression or increase false signal suppression in the close range by editing. With bulk solids use radar sensor with purging air connection or flexible antenna cover.
Measured value fluctuates around 10 … 20 % 	Various echoes from an uneven medium surface, e.g. an extraction funnel	Check parameter "Type of medium" and adapt, if necessary. Optimize installation position and sensor orientation.
	Reflections from the medium surface via the vessel wall (deflection)	

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter " *Setup*" must be carried out again or must be checked for plausibility and completeness.

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 also available outside normal working hours, seven days a week around the clock.

Since we offer this service worldwide, the support is provided in English. The service itself is free of charge, the only costs involved are the normal call charges.

9.5 Exchanging the electronics module

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

In Ex applications, only instruments and electronics modules with appropriate Ex approval may be used.

If there is no electronics module available on site, the electronics module can be ordered through the agency serving you. The electronics modules are adapted to the respective sensor and differ in signal output or voltage supply.

The new electronics module must be loaded with the default settings of the sensor. These are the options:

- In the factory
- Or on site by the user

In both cases, the serial number of the sensor is needed. The serial numbers are stated on the type label of the instrument, on the inside of the housing as well as on the delivery note.

When loading on site, the order data must first be downloaded from the Internet (see operating instructions " *Electronics module*").

Caution:
All application-specific settings must be entered again. That's why you have to carry out a fresh setup after exchanging the electronics.

If you saved the parameter settings during the first setup of the sensor, you can transfer them to the replacement electronics module. A fresh setup is then not necessary.

9.6 Software update

The following components are required to update the instrument software:

- Instrument
- Voltage supply
- Interface adapter VEGACONNECT
- PC with PACTware
- Current instrument software as file

You can find the current instrument software as well as detailed information on the procedure in the download area of our homepage: www.vega.com.

You can find information about the installation in the download file.

Caution:
Instruments with approvals can be bound to certain software versions. Therefore make sure that the approval is still effective after a software update is carried out.

You can find detailed information in the download area at www.vega.com.

9.7 How to proceed if a repair is necessary

You can find an instrument return form as well as detailed information about the procedure in the download area of our homepage. By doing this you help us carry out the repair quickly and without having to call back for needed information.

In case of repair, proceed as follows:

- 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
- Ask the agency serving you to get the address for the return shipment. You can find the agency on our homepage.

10 Dismount

10.1 Dismounting steps

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

Take note of chapters " *Mounting*" and " *Connecting to voltage 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
The instrument does not fall in the scope of the EU WEEE directive. Article 2 of this Directive exempts electrical and electronic equipment from this requirement if it is part of another instrument that does not fall in the scope of the Directive. These include stationary industrial plants.

Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points.

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

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Materials and weights

316L corresponds to 1.4404 or 1.4435

Materials, wetted parts

Metal-jacketed lens antenna	
– Process fitting	316L, Alloy C22 (2.4602), Alloy 400 (2.4360)
– Process seal	On site
– Antenna	PP, PEEK
– Seal, antenna system	FKM (SHS FPM 70C3 GLT), EPDM (COG AP310)
Plastic horn antenna	
– Adapter flange	PP-GF30 black
– Seal, adapter flange	FKM (COG VI500), EPDM (COG AP310)
– Focussing lense	PP
Thread with integrated antenna	
– Process fitting	316L
– Antenna	PEEK
– Seal, antenna system	FKM, FFKM
– Process seal	Klingersil C-4400
Rinsing connection	
– Flushing ring	PP-GFK
– O-ring seal, rinsing connection	FKM (SHS FPM 70C3 GLT), EPDM (COG AP310)
– Reflux valve	316 Ti
– Sealing, reflux valve	FKM (SHS FPM 70C3 GLT), EPDM (COG AP310)

Materials, non-wetted parts

Mounting parts	
– Antenna cone	PBT-GF 30
– Compression flange	PP-GF30 black
– Mounting strap	316L
– Fixing screws, mounting strap	316L
– Fixing screws, adapter flange	304
– Plastic housing	Plastic PBT (Polyester)
Housing	
– Aluminium die-cast housing	Aluminium die-casting AlSi10Mg, powder-coated (Basis: Polyester)

– Stainless steel housing	316L
– Cable gland	PA, stainless steel, brass
– Sealing, cable gland	NBR
– Blind plug, cable gland	PA
– Seal between housing and housing lid	Silicone SI 850 R, NBR silicone-free
– Inspection window housing cover	Polycarbonate (UL-746-C listed), glass [1]
– Ground terminal	316L
Weights	
– Instrument (depending on housing, process fitting and antenna)	approx. 2 … 17.2 kg (4.409 … 37.92 lbs)

Torques

Max. torque, version flange with lens antenna	
– Terminal screws for swivelling holder	8 Nm (5.9 lbf ft)
Max. torque, version plastic horn antenna	
– Mounting screws, mounting strap on sensor housing	4 Nm (2.950 lbf ft)
– Flange screws, compression flange DN 80	5 Nm (3.689 lbf ft)
– Terminal screws, adapter flange - antenna	2.5 Nm (1.844 lbf ft)
– Flange screws, adapter flange DN 100	7 Nm (5.163 lbf ft)
Max. torque, thread with integrated antenna system	
– G1½	200 Nm (147.5 lbf ft)
Max. torque for NPT cable glands and Conduit tubes	
– Plastic housing	10 Nm (7.376 lbf ft)
– Aluminium/Stainless steel housing	50 Nm (36.88 lbf ft)

Input variable

Measured variable	The measured quantity is the distance between the end of the sensor antenna and the medium surface. The reference plane for the measurement is the lower side of the flange.

[1] Glass with Aluminium and stainless steel precision casting housing

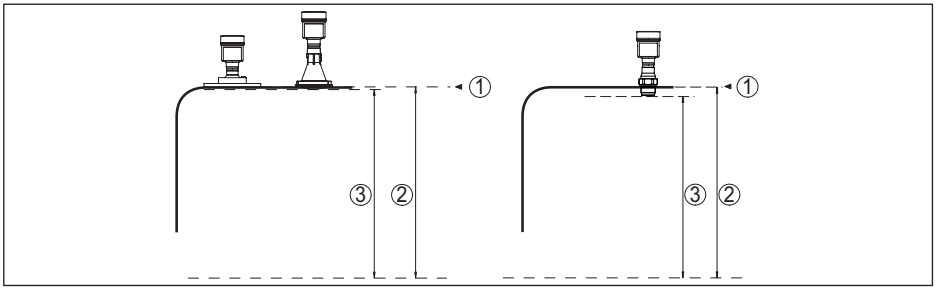


Fig. 45: Data of the input variable, on the left flange with lens antenna and plastic horn antenna, on the right thread with integrated horn antenna

1 Reference plane
2 Measured variable, max. measuring range
3 Usable measuring range (recommended min. distance see " Deviation")

Measuring range

– Max. measuring range	120 m (393.7 ft)
– Recommended measuring range for thread version with integrated horn antenna	up to 20 m (65.62 ft)

Output variable

Output signal	digital output signal, Profibus protocol
Transmission rate	31.25 Kbit/s
Sensor address	126 (default setting)
Damping (63 % of the input variable)	0 … 999 s, adjustable
Profibus PA profile	3.02
Number of FBs with AI (function blocks with analogue input)	3
Default values	
– 1. FB	Primary Value (filling height linearized in %)
– 2. FB	Secondary Value 1 (filling height in %)
– 3. FB	Secondary Value 2 (distance value)
Current value	
– Non-Ex and Ex ia instrument	10 mA, ±0.5 mA
– Ex-d-ia instruments	16 mA, ±0.5 mA
Resolution, digital	< 1 mm (0.039 in)

Deviation (according 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 internal installations	> 200 mm (7.874 in)
– Reflector	Flat plate reflector, surface 1 x 1 m (3.281 x 3.281 ft)
– False reflections	Biggest false signal, 20 dB smaller than the useful signal
Deviation with liquids	≤ 5 mm (meas. distance > 1.0 m/3.280 ft)
Non-repeatability [2]	≤ 1 mm
Deviation with bulk solids	The values depend to a great extent on the application. Binding specifications are thus not possible.

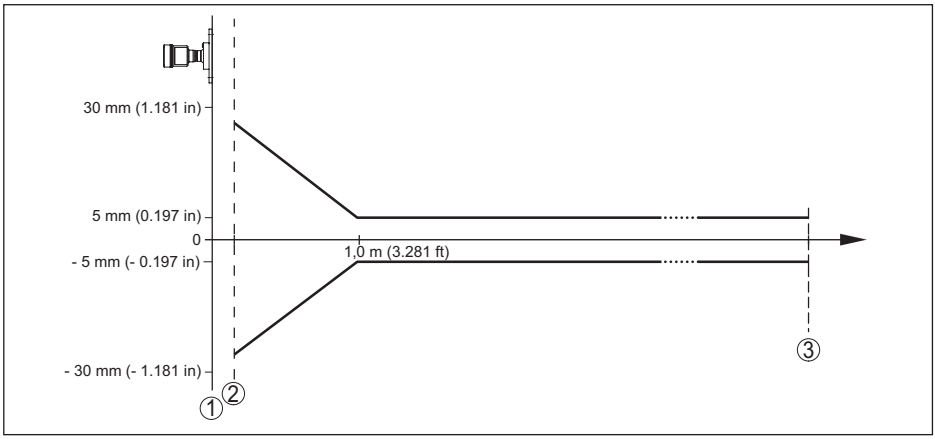


Fig. 46: Deviation under reference conditions

1 Reference plane
2 Recommended min. distance, specifications see below
3 Measuring range end

Recommended min. distance for typical bulk solids applications [3]

– Plastic horn antenna, flange with lens antenna	250 mm (9.843 in)
– Thread with integrated antenna system	500 mm (19.69 in)
blocking distance	150 mm (5.906 in)

Variables influencing measurement accuracy

Temperature drift - Digital output	< 3 mm/10 K, max. 10 mm

Characteristics and performance data

Measuring frequency	W-band (within 75 - 85 GHz)
Measuring cycle time	approx. 700 ms

[2] Already included in the meas. deviation
[3] Depending of the reflective properties of the measured media.

Step response time [4]	≤ 3 s
Beam angle [5]	
– Plastic horn antenna	3.5°
– Flange with lens antenna	4°
– Thread with integrated horn antenna	7°
Emitted HF power (depending on the parameter setting) [6]	
– Average spectral transmission power density	-3 dBm/MHz EIRP
– Max. spectral transmission power density	+34 dBm/50 MHz EIRP
– Max. power density at a distance of 1 m	< 3 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 lowest value always applies.

Process temperature

Antenna lens	Seal	Process temperature (measured on the process fitting)
PEEK	FKM (SHS FPM 70C3 GLT)	-40 … +130 °C (-40 … +266 °F)
		-40 … +200 °C (-40 … +392 °F)
	EPDM (COG AP302)	-40 … +130 °C (-40 … +266 °F)
PP	FKM (SHS FPM 70C3 GLT)	-40 … +80 °C (-40 … +176 °F)
	EPDM (COG AP310)	-40 … +80 °C (-40 … +176 °F)

Derating, ambient temperature

[4] Time span (after a sudden measuring distance change of max. 2 m in bulk solids applications) until the output signal has taken on 90 % of the final value for the first time (IEC 61298-2).
[5] Outside the specified beam angle, the energy level of the radar signal is 50% (-3 dB) less.
[6] EIRP: Equivalent Isotropic Radiated Power

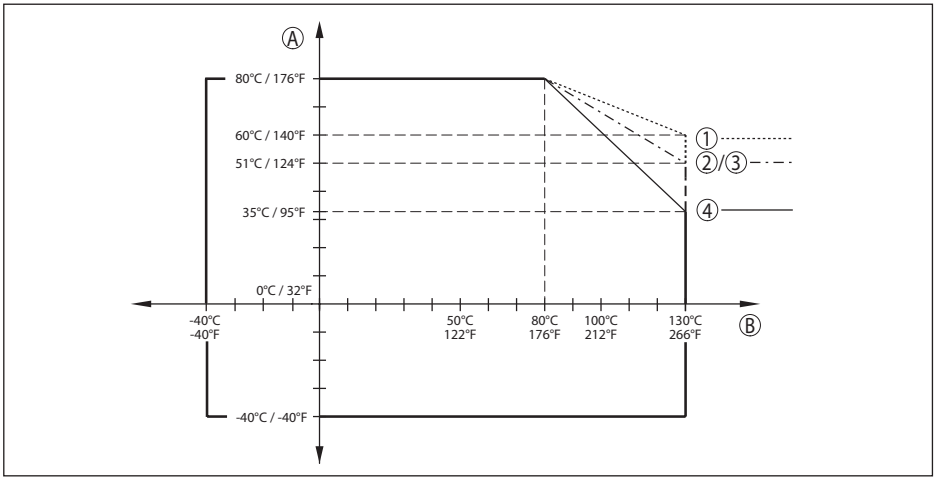


Fig. 47: Derating, ambient temperature, metal-jacketed lens antenna up to +130 °C (+266 °F)

A Ambient temperature
B Process temperature
1 Aluminium housing
2 Plastic housing
3 Stainless steel housing (precision casting)
4 Stainless steel housing (electropolished)

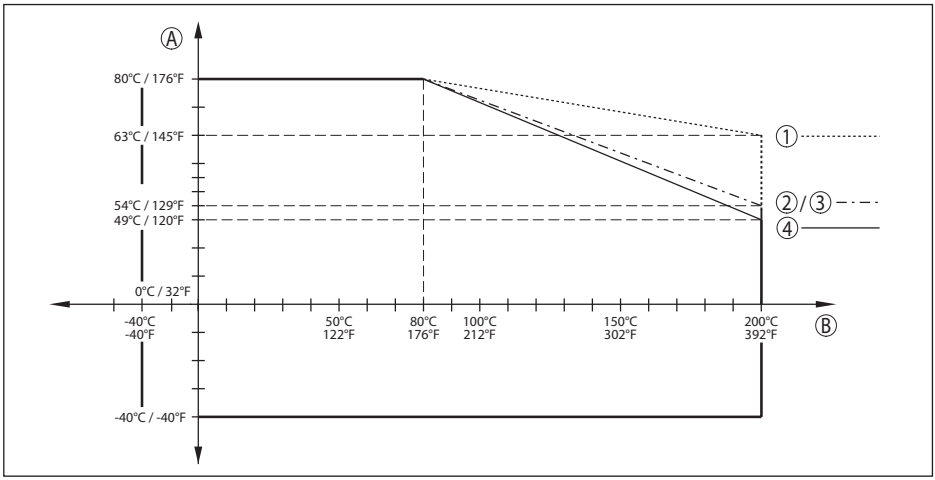


Fig. 48: Derating, ambient temperature, metal-jacketed lens antenna up to +200 °C (+392 °F)

A Ambient temperature
B Process temperature
1 Aluminium housing
2 Plastic housing
3 Stainless steel housing (precision casting)
4 Stainless steel housing (electropolished)

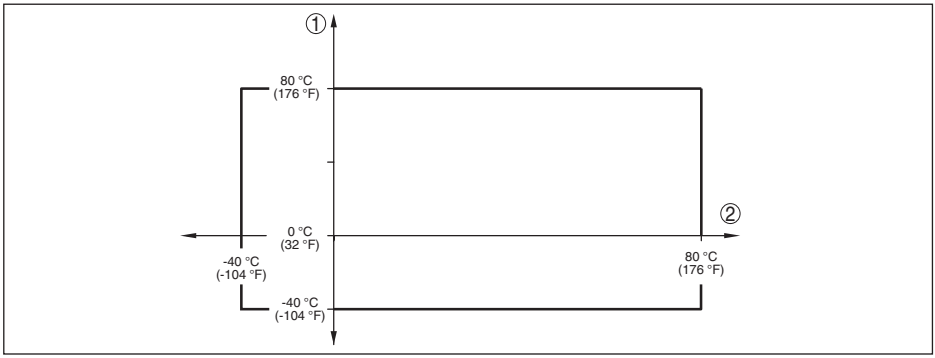


Fig. 49: Derating, ambient temperature, plastic horn antenna

1 Ambient temperature
2 Process temperature

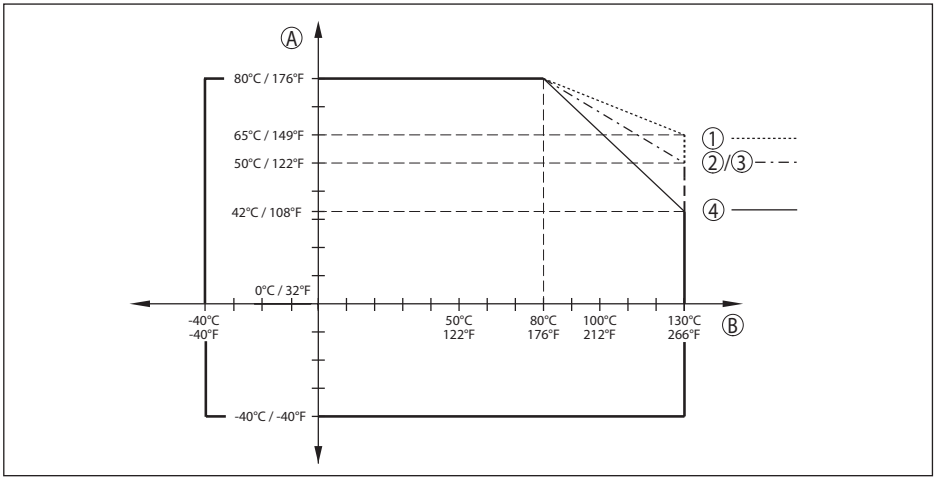


Fig. 50: Derating, ambient temperature, thread G1½ with integrated horn antenna up to +130 °C (+266 °F)

A Ambient temperature
B Process temperature
1 Aluminium housing
2 Plastic housing
3 Stainless steel housing (precision casting)
4 Stainless steel housing (electropolished)

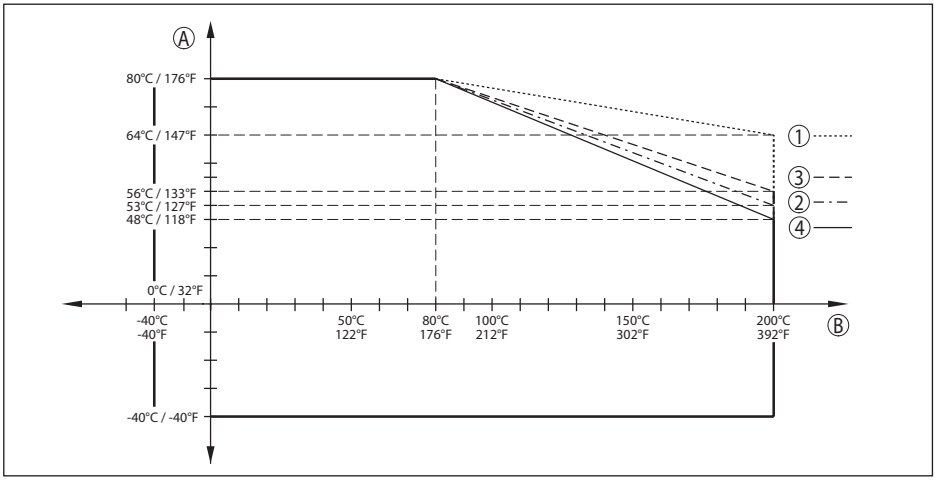


Fig. 51: Derating, ambient temperature, thread G1½ with integrated horn antenna up to +200 °C (+392 °F)

A Ambient temperature
B Process temperature
1 Aluminium housing
2 Plastic housing
3 Stainless steel housing (precision casting)
4 Stainless steel housing (electropolished)

Vessel pressure

– Metal-jacketed lens antenna	-1 … 3 bar (-100 … 300 kPa/-14.5 … 43.5 psig)
– Plastic horn antenna	-1 … 2 bar (-100 … 200 kPa/-14.5 … 29.1 psig)
– Plastic horn antenna, version with adapter flange from DN 100 PP or PP-GF 30	-1 … 1 bar (-100 … 100 kPa/-14.5 … 14.5 psig)
– Thread with integrated horn antenna	-1 … 20 bar (-100 … 2000 kPa/-14.5 … 290.1 psig)

Mechanical stress

Vibration resistance: Metal jacketed lens antenna	4 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance)
Vibration resistance: Plastic horn antenna	
– With adapter flange	2 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance)
– with mounting strap	1 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance)
Vibration resistance: thread with integrated horn antenna	4 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance)
Shock resistance	100 g, 6 ms according to EN 60068-2-27 (mechanical shock)

Data on rinsing air connection

Recommended max. pressure with continuous rinsing	1 bar (14.50 psig)

Max. permissible pressure 6 bar (87.02 psig)

Air quality Filtered

Air volume, depending on pressure

Flange with lens antenna	Air volume	
Pressure	**Without reflux valve**	**With reflux valve**
0.2 bar (2.9 psig)	1.7 m³/h	-
0.4 bar (5.8 psig)	2.5 m³/h	-
0.6 bar (8.7 psig)	2.9 m³/h	0.8 m³/h
0.8 bar (11.6 psig)	3.3 m³/h	1.5 m³/h
1 bar (14.5 psig)	3.6 m³/h	2 m³/h
1.2 bar (17.4 psig)	3.9 m³/h	2.3 m³/h
1.4 bar (20.3 psig)	4 m³/h	2.7 m³/h
1.6 bar (23.2 psig)	4.3 m³/h	3 m³/h
1.8 bar (20.3 psig)	4.5 m³/h	3.5 m³/h
2 bar (23.2 psig)	4.6 m³/h	4 m³/h

Plastic horn antenna	Air volume	
Pressure	**Without reflux valve**	**With reflux valve**
0.2 bar (2.9 psig)	3.3 m³/h	-
0.4 bar (5.8 psig)	5 m³/h	-
0.6 bar (8.7 psig)	6 m³/h	1 m³/h
0.8 bar (11.6 psig)	-	2.1 m³/h
1 bar (14.5 psig)	-	3 m³/h
1.2 bar (17.4 psig)	-	3.5 m³/h
1.4 bar (20.3 psig)	-	4.2 m³/h
1.6 bar (23.2 psig)	-	4.4 m³/h
1.8 bar (20.3 psig)	-	4.8 m³/h
2 bar (23.2 psig)	-	5.1 m³/h

Connection

- Thread G⅛
- Seal at flange with lens antenna Threaded plug of 316Ti

Reflux valve (optional, is absolutely necessary for Ex applications)

- Material 316Ti
- Thread G⅛
- Seal FKM (SHS FPM 70C3 GLT), EPDM (COG AP310)
- For connection G⅛
- Opening pressure 0.5 bar (7.25 psig)
- Nominal pressure stage PN 250

Electromechanical data - version IP66/IP67 and IP66/IP68 (0.2 bar)

Options of the cable entry

- Cable entry — M20 x 1.5; ½ NPT
- Cable gland — M20 x 1.5; ½ NPT (cable ø see below table)
- Blind plug — M20 x 1.5; ½ NPT
- Closing cap — ½ NPT

Material cable gland	Material seal insert	Cable diameter				
		4.5 … 8.5 mm	5 … 9 mm	6 … 12 mm	7 … 12 mm	10 … 14 mm
PA	NBR	–	●	●	–	●
Brass, nickel-plated	NBR	●	●	●	–	–
Stainless steel	NBR	–	●	●	–	●

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire — 0.2 … 2.5 mm² (AWG 24 … 14)
- Stranded wire with end sleeve — 0.2 … 1.5 mm² (AWG 24 … 16)

Electromechanical data - version IP66/IP68 (1 bar)

Options of the cable entry

- Cable gland with integrated connection cable — M20 x 1.5 (cable ø 5 … 9 mm)
- Cable entry — ½ NPT
- Blind plug — M20 x 1.5; ½ NPT

Connection cable

- Wire cross-section — 0.5 mm² (AWG 20)
- Wire resistance — < 0.036 Ω/m
- Tensile strength — < 1200 N (270 lbf)
- Standard length — 5 m (16.4 ft)
- Max. length — 180 m (590.6 ft)
- Min. bending radius (at 25 °C/77 °F) — 25 mm (0.984 in)
- Diameter — approx. 8 mm (0.315 in)
- Colour - Non-Ex version — Black
- Colour - Ex-version — Blue

Interface to the external display and adjustment unit

Data transmission — Digital (I²C-Bus)

Connection cable — Four-wire

Sensor version	Configuration, connection cable			
	Cable length	Standard cable	Special cable	Shielded
4 … 20 mA/HART	50 m	●	–	–

Sensor version	Configuration, connection cable			
	Cable length	Standard cable	Special cable	Shielded
Profibus PA, Foundation Fieldbus	25 m	–	●	●

Integrated clock

Date format	Day.Month.Year
Time format	12 h/24 h
Time zone, factory setting	CET
Max. rate deviation	10.5 min/year

Additional output parameter - Electronics temperature

Range	-40 … +85 °C (-40 … +185 °F)
Resolution	< 0.1 K
Deviation	±3 K
Output of the temperature values	
– Indication	Via the display and adjustment module
– Output	Via the respective output signal

Voltage supply

Operating voltage U_B	9 … 32 V DC
Operating voltage - with Bluetooth switched on	11.6 … 32 V DC
Operating voltage U_B with lighting switched on	13.5 … 32 V DC
Number of sensors per DP/PA segment coupler, max.	32

Potential connections and electrical separating measures in the instrument

Electronics	Not non-floating
Reference voltage [7]	500 V AC
Conductive connection	Between ground terminal and metallic process fitting

Electrical protective measures

Housing material	Version	Protection acc. to IEC 60529	Protection acc. to NEMA
Plastic	Single chamber	IP66/IP67	Type 4X
	Double chamber	IP66/IP67	Type 4X
Aluminium	Single chamber	IP66/IP68 (0.2 bar) IP66/IP68 (1 bar)	Type 6P -
	Double chamber	IP66/IP68 (0.2 bar) IP66/IP68 (1 bar)	Type 6P -

[7] Galvanic separation between electronics and metal housing parts

Housing material	Version	Protection acc. to IEC 60529	Protection acc. to NEMA
Stainless steel (electro-polished)	Single chamber	IP66/IP68 (0.2 bar)	Type 6P
Stainless steel (precision casting)	Single chamber	IP66/IP68 (0.2 bar) IP66/IP68 (1 bar)	Type 6P -
	Double chamber	IP66/IP68 (0.2 bar) IP66/IP68 (1 bar)	Type 6P -

Connection of the feeding power supply unit	Networks of overvoltage category III
Altitude above sea level	
– by default	up to 2000 m (6562 ft)
– with connected overvoltage protection	up to 5000 m (16404 ft)
Pollution degree (with fulfilled housing protection)	4
Protection rating (IEC 61010-1)	III

11.2 Radio astronomy stations

Certain restrictions on the use of VEGAPULS 69 outside closed vessels result from the radio license. You can find these restrictions in chapter " *Radio license for Europe*". Some of these restrictions have to do radio astronomy stations. The following table states the geographic positions of radio astronomy stations in Europe:

Country	Name of the Station	Geographic Latitude	Geographic Longitude
Finland	Metsähovi	60°13'04" N	24°23'37" E
France	Plateau de Bure	44°38'01" N	05°54'26" E
Germany	Effelsberg	50°31'32" N	06°53'00" E
Italy	Sardinia	39°29'50" N	09°14'40" E
Spain	Yebes	40°31'27" N	03°05'22" W
	Pico Veleta	37°03'58" N	03°23'34" W
Sweden	Onsala	57°23'45" N	11°55'35" E

11.3 Device communication Profibus PA

In the following, the necessary device-specific details are shown. You can find further information of Profibus PA on www.profibus.com.

Instrument master file

The instrument master file (GSD) contains the characteristic data of the Profibus PA instrument. These data are, e.g. the permissible transmission rates as well as information on diagnostics values and the format of the measured value output by the PA instrument.

A bitmap file is also provided for the Profibus network planning tool. This file is installed automatically when the GSD file is integrated. The bitmap file is used for symbolic indication of the PA instrument in the configuration tool.

ID number

Each Profibus instrument gets an unambiguous ident number (ID number) from the Profibus user organisation (PNO). This ID number is also included in the name of the GSD file. Optionally in addition to this manufacturer-specific GSD file, PNO also provides a general so-called profile-specific GSD file. If the general GSD file is used, the sensor must be set to the profile-specific ident number via the DTM software. By default, the sensor operates with the manufacturer-specific ID number. When using the instruments on a segment coupler SK-2 or SK-3, no special GSD files are required.

The following table shows the instrument ID and the GSD file names for VEGAPULS radar sensors.

Device name	Instrument ID		GSD file name	
	VEGA	Instrument class in profile 3.02	VEGA	Profile-specific
VEGAPULS WL 61	0x0CDB	0x9702	PSWL0CDB.GSD	PA139702.GSD
VEGAPULS 61	0x0BFC	0x9702	PS610BFC.GSD	PA139702.GSD
VEGAPULS 62	0x0BFD	0x9702	PS620BFD.GSD	PA139702.GSD
VEGAPULS 63	0x0BFE	0x9702	PS630BFE.GSD	PA139702.GSD
VEGAPULS 65	0x0BFF	0x9702	PS650BFF.GSD	PA139702.GSD
VEGAPULS 66	0x0C00	0x9702	PS660C00.GSD	PA139702.GSD
VEGAPULS 67	0x0C01	0x9702	PS670C01.GSD	PA139702.GSD
VEGAPULS SR 68	0x0CDC	0x9702	PSSR0CDC.GSD	PA139702.GSD
VEGAPULS 68	0x0C02	0x9702	PS680C02.GSD	PA139702.GSD
VEGAPULS 69	0x0BFA	0x9702	VE010BFA.GSD	PA139702.GSD

Cyclical data traffic

The master class 1 (e.g. PLC) cyclically reads out measured values from the sensor during operation. The below block diagram below shows which data can be accessed by the PLC.

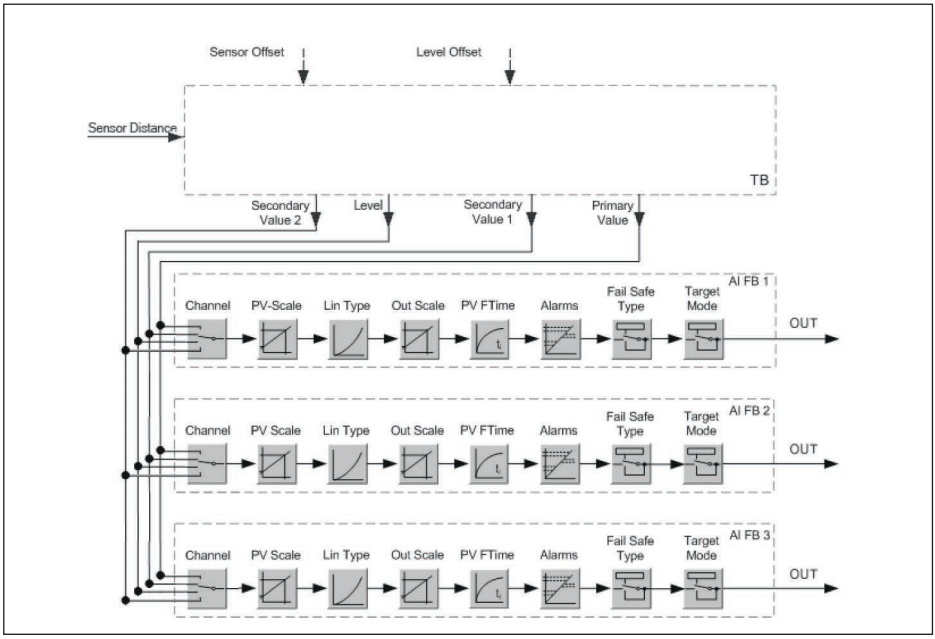


Fig. 52: VEGAPULS 69: Block diagram with AI FB 1 … AI FB 3 OUT values

TB Transducer Block
FB 1 … FB 3 Function Block

Module of the PA sensors

For the cyclic data traffic, VEGAPULS 69 provides the following modules:

- AI FB1 (OUT)
  - Out value of the AI FB1 after scaling
- AI FB2 (OUT)
  - Out value of the AI FB2 after scaling
- AI FB3 (OUT)
  - Out value of the AI FB3 after scaling
- Free Place
  - This module must be used if a value in the data telegram of the cyclical data traffic should not be used (e.g. replacement of temperature and Additional Cyclic Value)

A maximum of three modules can be active. By means of the configuration software of the Profibus master you can determine the configuration of the cyclical data telegram with these modules. The procedure depends on the respective configuration software.

Note:

The modules are available in two versions:

- Short for Profibus master supporting only one "Identifier Format" byte, e.g. Allen Bradley
- Long for Profibus master only supporting the "Identifier Format" byte, e.g. Siemens S7-300/400

Examples of telegram configuration

In the following you will see how the modules can be combined and how the appendant data telegram is structured.

Example 1

- AI FB1 (OUT)
- AI FB2 (OUT)
- AI FB3 (OUT)

Byte-No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Format	IEEE-754-Floating point value				Status	IEEE-754-Floating point value				Status	IEEE-754-Floating point value				Status
Value	AI FB1 (OUT)				AI FB1	AI FB2 (OUT)				AI FB2	AI FB3 (OUT)				AI FB3

Example 2

- AI FB1 (OUT)
- Free Place
- Free Place

Byte-No.	1	2	3	4	5
Format	IEEE-754-Floating point value				Status
Value	AI FB1 (OUT)				AI FB1

Note:

Bytes 6-15 are not used in this example.

Data format of the output signal

Byte4	Byte3	Byte2	Byte1	Byte0
Status	Value (IEEE-754)			

Fig. 53: Data format of the output signal

The status byte corresponds to profile 3.02 "Profibus PA Profile for Process Control Devices" coded. The status "Measured value OK" is coded as 80 (hex) (Bit7 = 1, Bit6 … 0 = 0).

The measured value is transferred as a 32 bit floating point number in the IEEE-754 format.

Byte n								Byte n+1								Byte n+2								Byte n+3							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
VZ	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
Sign Bit	Exponent							Significant								Significant								Significant							

$$\text{Value} = (-1)^{VZ} \bullet 2^{(\text{Exponent} - 127)} \bullet (1 + \text{Significant})$$

Fig. 54: Data format of the measured value

Coding of the status byte associated with the PA output value

Status code	Description according to Profibus standard	Possible cause
0 x 00	bad - non-specific	Flash-Update active
0 x 04	bad - configuration error	● Adjustment error ● Configuration error with PV-Scale (PV-Span too small) ● Unit irregularity ● Error in the linearization table
0 x 0C	bad - sensor failure	● Hardware error ● Converter error ● Leakage pulse error ● Trigger error
0 x 10	bad - sensor failure	● Measured value generation error ● Temperature measurement error
0 x 1f	bad - out of service constant	"Out of Service" mode switched on
0 x 44	uncertain - last unstable value	Failsafe replacement value (Failsafe-Mode = "Last value" and already valid measured value since switching on)
0 x 48	uncertain substitute set	● Switch on simulation ● Failsafe replacement value (Failsafe-Mode = "Fsafe value")
0 x 4c	uncertain - initial value	Failsafe replacement value (Failsafe-Mode = "Last valid value" and no valid measured value since switching on)
0 x 51	uncertain - sensor; conversion not accurate - low limited	Sensor value < lower limit
0 x 52	uncertain - sensor; conversion not accurate - high limited	Sensor value > upper limit
0 x 80	good (non-cascade) - OK	OK
0 x 84	good (non-cascade) - active block alarm	Static revision (FB, TB) changed (10 sec. active, after the parameter of the static category has been written)
0 x 89	good (non-cascade) - active advisory alarm - low limited	Lo-Alarm
0 x 8a	good (non-cascade) - active advisory alarm - high limited	Hi-Alarm
0 x 8d	good (non-cascade) - active critical alarm - low limited	Lo-Lo-Alarm
0 x 8e	good (non-cascade) - active critical alarm - high limited	Hi-Hi-Alarm

11.4 Dimensions

The following dimensional drawings represent only an extract of all possible versions. Detailed

dimensional drawings can be downloaded at www.vega.com/downloads under " *Drawings*".

Plastic housing

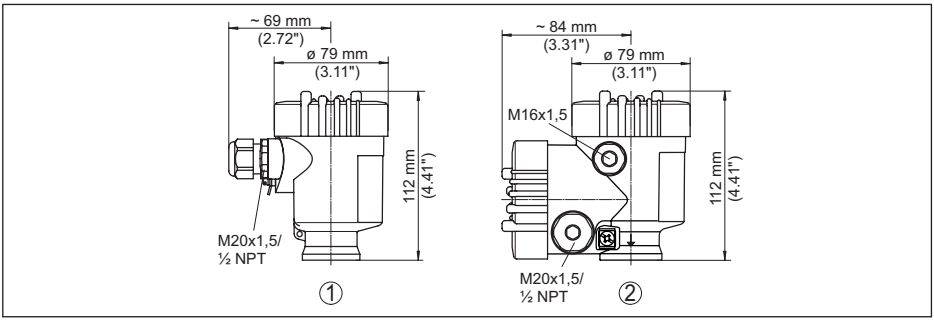


Fig. 55: Housing versions in protection IP66/IP67 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)

1 Plastic single chamber
2 Plastic double chamber

Aluminium housing

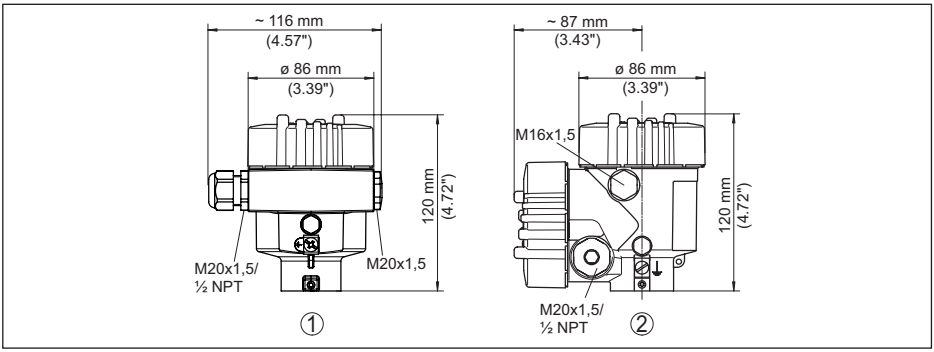


Fig. 56: Housing versions with protection rating IP66/IP68 (0.2 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Aluminium - single chamber
2 Aluminium - double chamber

Aluminium housing with protection rating IP66/IP68, 1 bar

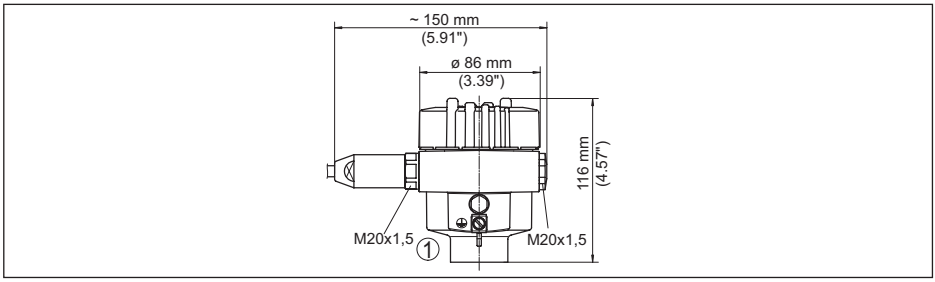


Fig. 57: Housing version with protection rating IP66/IP68 (1 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Aluminium - single chamber

Stainless steel housing

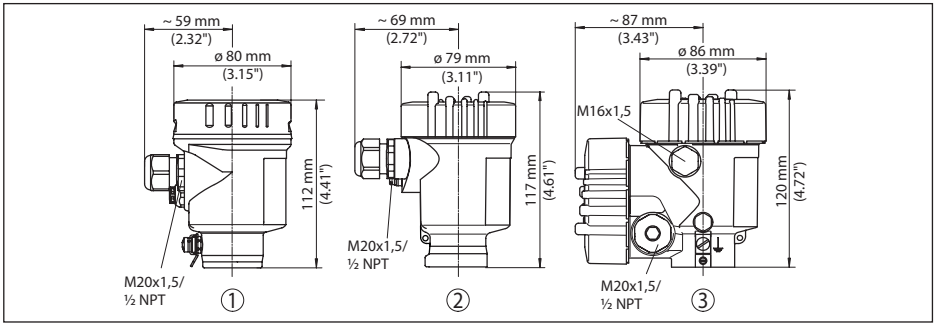


Fig. 58: Housing versions with protection rating IP66/IP68 (0.2 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Stainless steel single chamber (electropolished)
2 Stainless steel single chamber (precision casting)
3 Stainless steel double chamber housing (precision casting)

Stainless steel housing with protection rating IP66/IP68, 1 bar

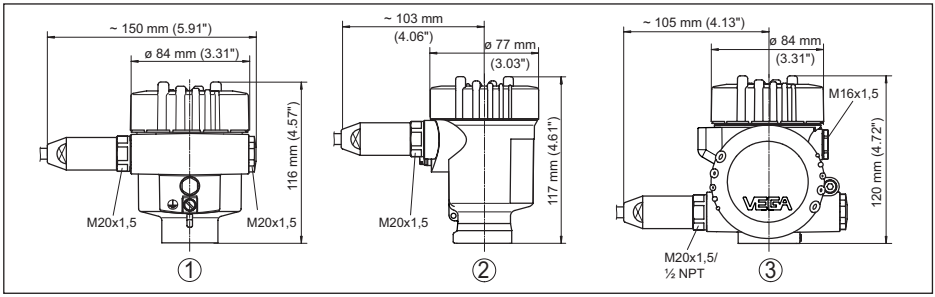


Fig. 59: Housing version with protection rating IP66/IP68 (1 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Stainless steel single chamber (precision casting)

VEGAPULS 69, metal-jacketed lens antenna

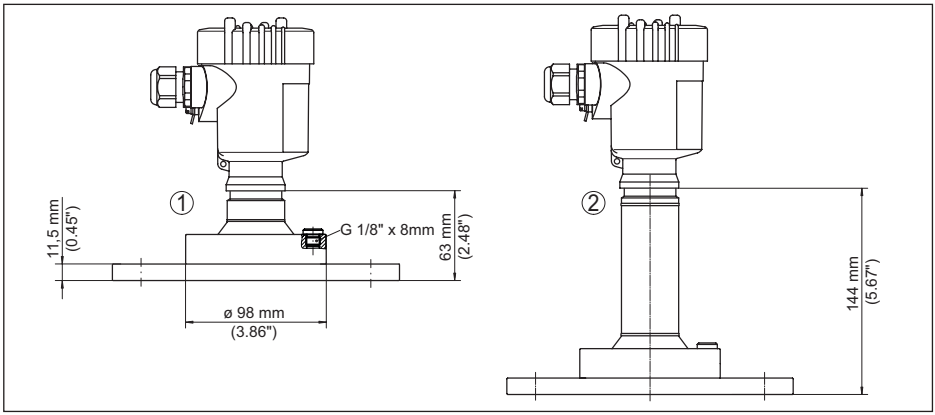


Fig. 60: VEGAPULS 69, metal-jacketed lens antenna (flange thickness acc. to drawing, flange dimensions acc. to DIN, ASME, JIS)

1 Version up to 130 °C (266 °F)
2 Version up to 200 °C (392 °F)

VEGAPULS 69, metal-jacketed lens antenna with rinsing connection

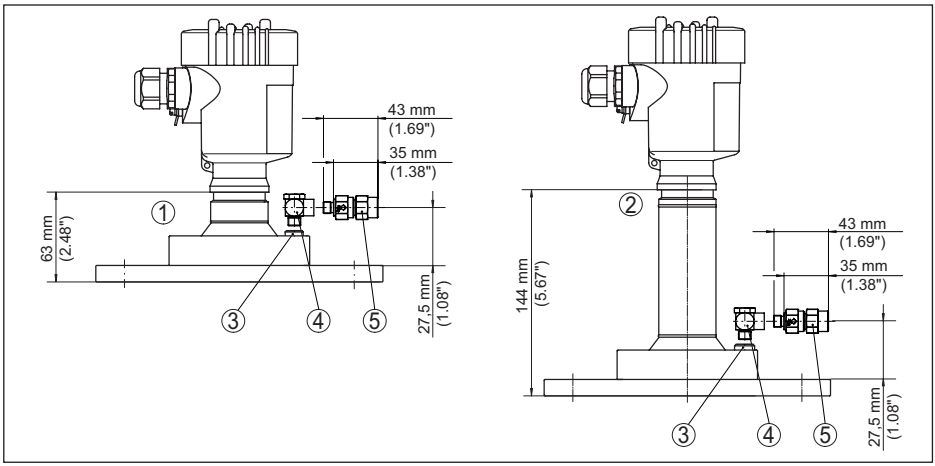


Fig. 61: VEGAPULS 69, metal-jacketed lens antenna with rinsing connection

1 Version up to 130 °C (266 °F)
2 Version up to 200 °C (392 °F)
3 Blind plug
4 90° angle joint
5 Reflux valve

VEGAPULS 69, metal-jacketed lens antenna with swivelling holder

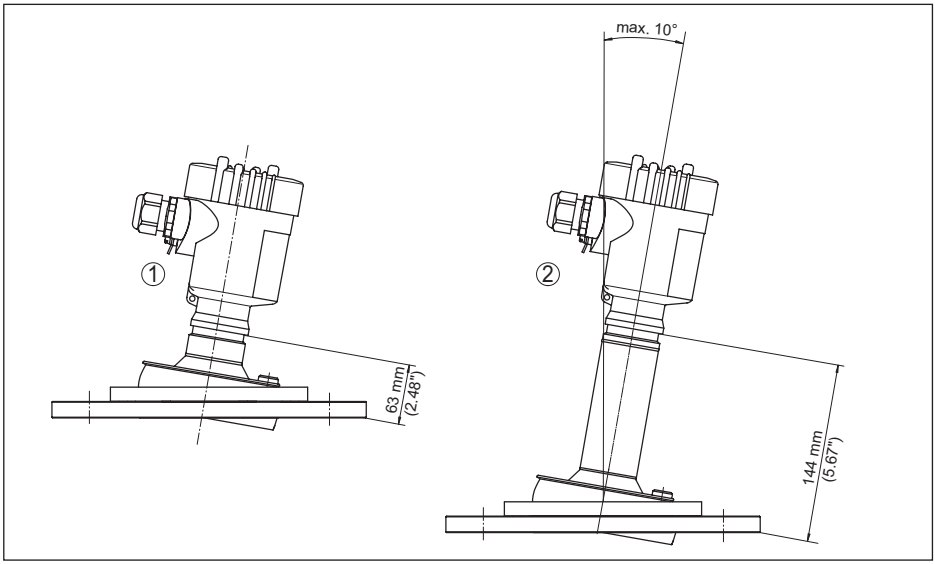


Fig. 62: VEGAPULS 69, metal-jacketed lens antenna and swivelling holder

1 Version up to 130 °C (266 °F)
2 Version up to 200 °C (392 °F)

VEGAPULS 69, metal-jacketed lens antenna with swivelling holder and rinsing connection

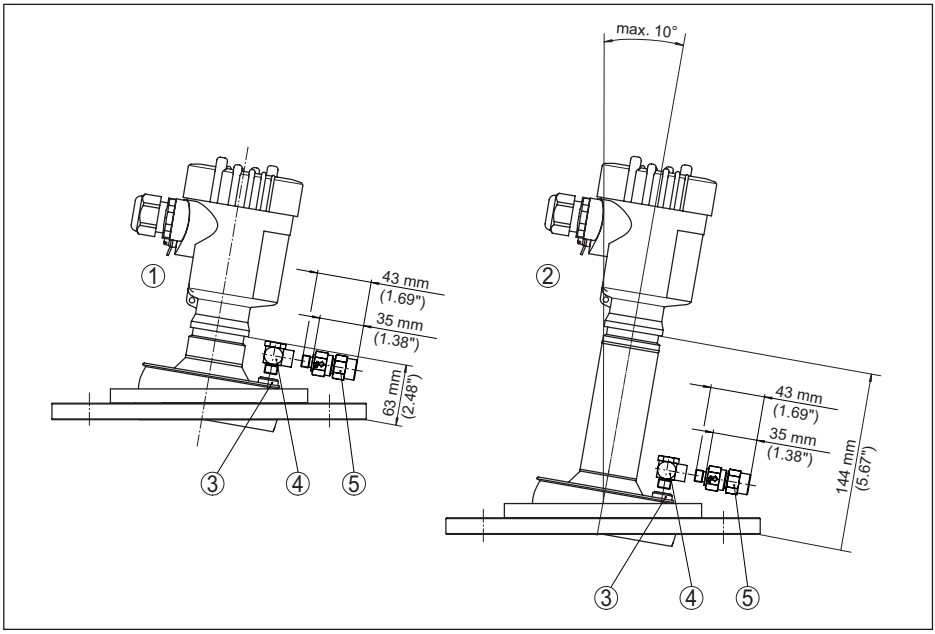


Fig. 63: VEGAPULS 69, metal-jacketed lens antenna with swivelling holder and rinsing connection

1 Version up to 130 °C (266 °F)
2 Version up to 200 °C (392 °F)
3 Blind plug
4 90° angle joint
5 Reflux valve

VEGAPULS 69, plastic horn antenna with compression flange

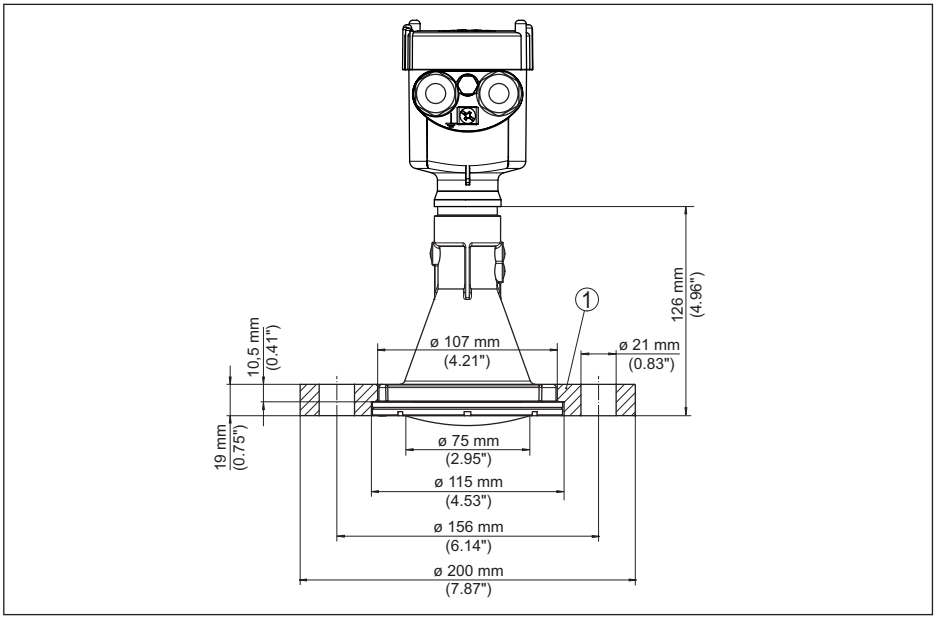


Fig. 64: VEGAPULS 69 with compression flange suitable for flanges 3" 150 lbs, DN 80 PN 16

1 Compression flange

VEGAPULS 69, plastic horn antenna with compression flange and rinsing connection

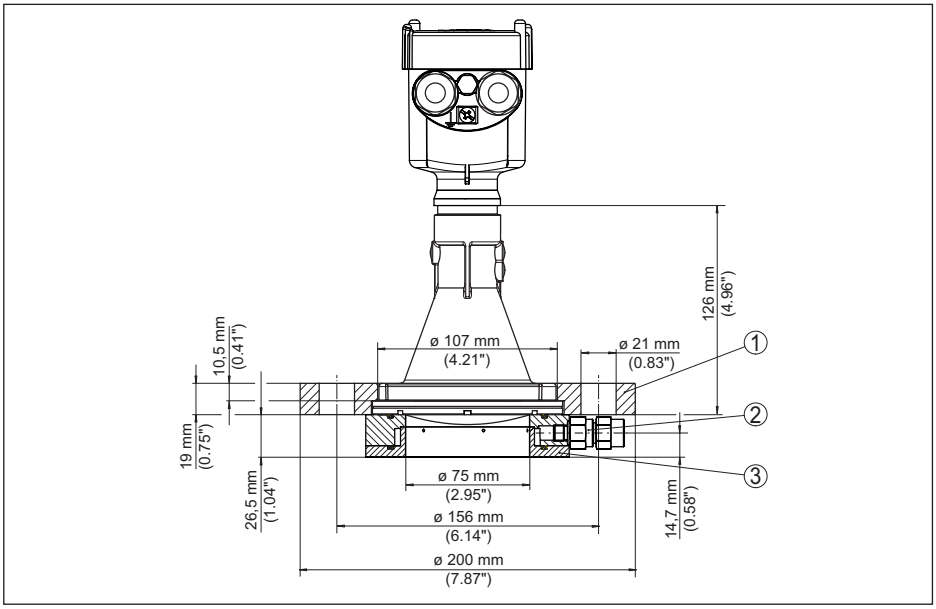


Fig. 65: VEGAPULS 69 with compression flange suitable for flanges 3" 150 lbs, DN 80 PN 16 and rinsing connection

1 Compression flange
2 Reflux valve
3 Rinsing connection

VEGAPULS 69, plastic horn antenna with adapter flange

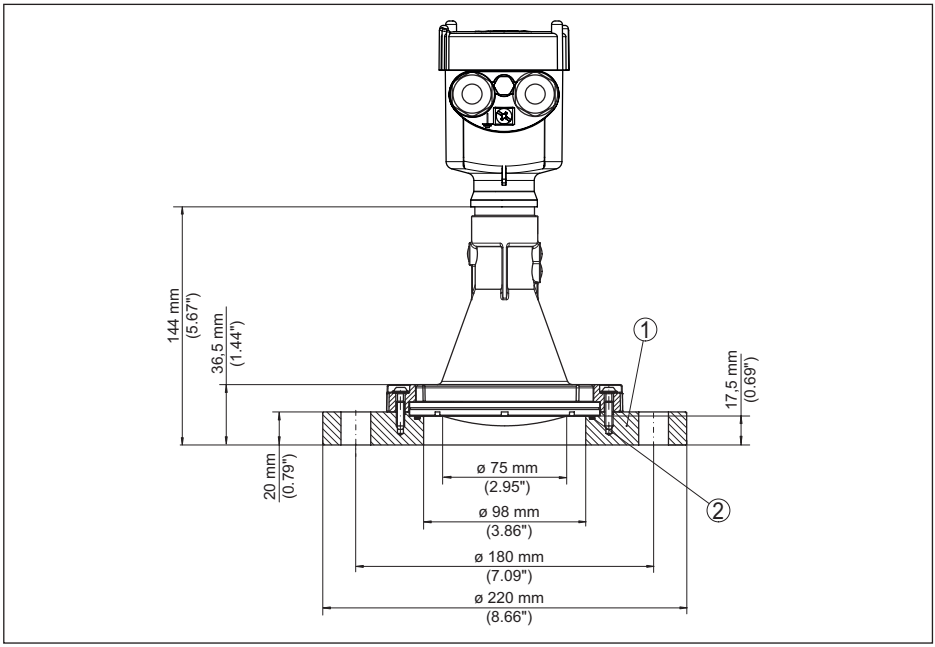


Fig. 66: VEGAPULS 69 with adapter flange DN 100 PN 16

1 Adapter flange
2 Process seal

VEGAPULS 69, plastic horn antenna mit adapter flange und rinsing connection

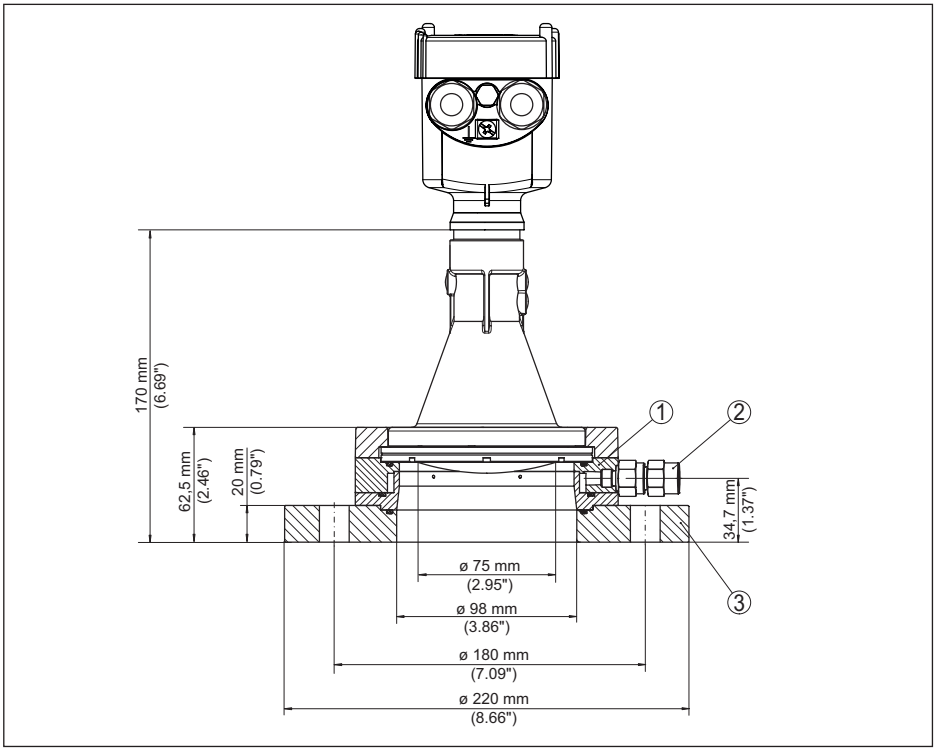


Fig. 67: VEGAPULS 69, adapter flange DN 100 PN 16 and rinsing connection

1 Rinsing air connection
2 Reflux valve
3 Adapter flange

VEGAPULS 69, plastic horn antenna with mounting strap

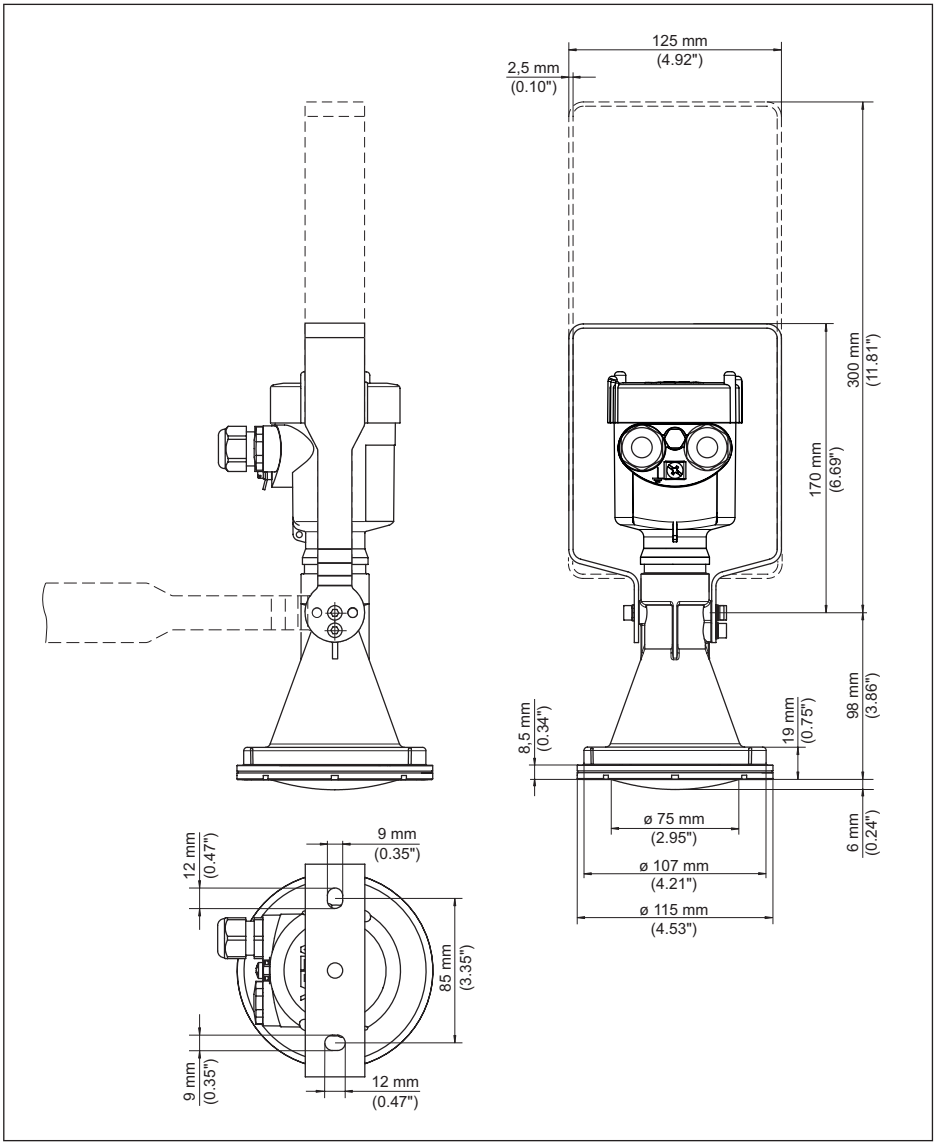


Fig. 68: VEGAPULS 69, plastic horn antenna, mounting strap in 170 or 300 mm length

VEGAPULS 69, thread with integrated horn antenna

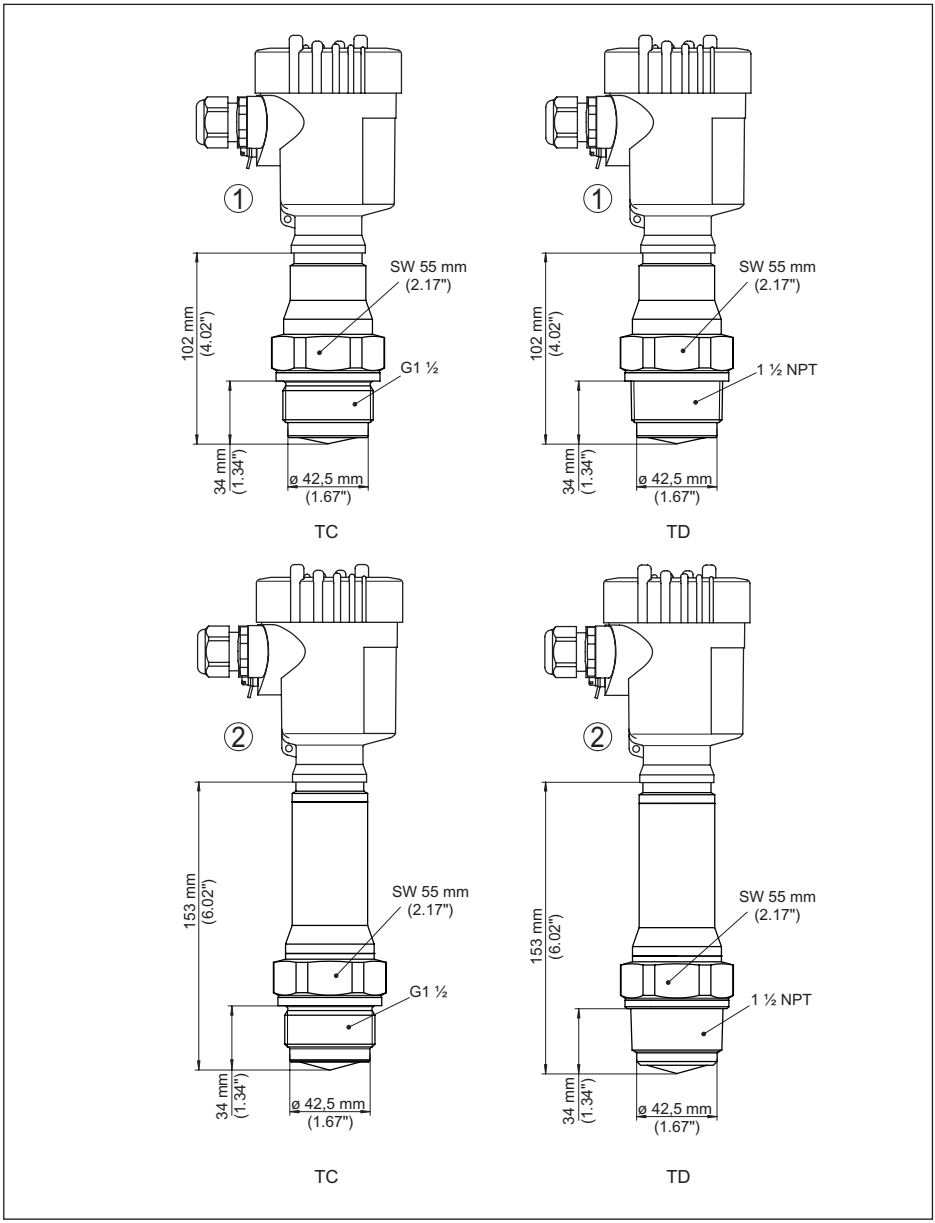


Fig. 69: VEGAPULS 69, thread with integrated horn antenna

TC G1½ (DIN 3852-A)
TD 1½ NPT (ASME B1.20.1)
1 Version up to 130 °C (266 °F)

2 Version up to 200 °C (392 °F)

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