Operating Instructions

VEGAPULS 67

4 … 20 mA/HART - two-wire

Document ID: 32938

Contents

VEGAPULS 67 • 4 … 20 mA/HART - two-wire

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 operating instructions 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, tip, note
This symbol indicates helpful additional information.

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

Ex applications
This symbol indicates special instructions for Ex applications.

SIL applications
This symbol indicates instructions for functional safety which must be taken into account particularly for safety-relevant applications.

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

→ **Action**
This arrow indicates a single action.

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.

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 67 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.

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.

2.3 Warning about incorrect use

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment. Thus damage to property, to persons or environmental contamination can be caused. Also the protective characteristics of the instrument can be influenced.

2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules. For safety reasons, only the accessory specified by the manufacturer must be used.

Depending on the model, the emitting frequencies of all radar sensors are either in the C or K band range. The low transmitting power lies far below the internationally permitted limit values. When the instrument is used correctly, it presents no danger to human health. It may be operated without restriction outside of closed metallic vessels.

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.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the

current valid rules and regulations and also take note of new regulations.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

2.5 Safety label on the instrument

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

2.6 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.

You can find the EU conformity declaration on our website under www.vega.com/downloads.

2.7 Fulfillment of 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 21 – Electromagnetic compatibility of equipment
● NE 43 – Signal level for fault information from measuring transducers
● NE 53 – Compatibility of field devices and display/adjustment components

For further information see www.namur.de.

2.8 Radio license for Europe

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

● EN 302372 - Tank Level Probing Radar

It is hence approved for use inside 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.

2.9 FCC/IC conformity (only for USA/Canada)

The VEGAPULS 67 may only be used in closed vessels made of metal, concrete, or fibre-reinforced plastic.

Note about this manual:

This operating instructions manual is intended for use in a number of different countries. The illustrations show some applications of VEGAPULS 67 in atmospherically open vessels. These applications are not in conformity with the FCC/IC approvals of the instrument.

VEGAPULS 67 is FCC/IC approved with all the antenna types described in this operating instructions manual.

Conversions or modifications of the instrument not expressively approved by VEGA will lead to revocation of the operational release.

The instrument is in compliance with Part 15 of the FCC regulations. Operation is permitted only if the following two conditions are fulfilled:

1. The instrument must not emit interference radiation and

2. The instrument must operate unaffected by incoming interference radiation, also by such that may trigger unwanted operating conditions.

The instrument was tested and its compliance with the limit values for a digital Class A instrument, in conformity with Part 15 of the FCC regulations, determined. These limit values are specified to ensure a proper protection against interference radiation during operation in industrial environments. The instrument generates, uses and can emit electromagnetic waves. If the instrument is not installed and operated according to the specifications of this operating instructions manual, it can emit interference radiation that may affect communication systems. When the instrument is operated in residential areas, it is the responsibility of the operator to ensure that any interference radiation is suppressed.

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:

- Radar sensor
- Documentation
  - Quick setup guide VEGAPULS 67
  - Instructions for optional instrument features
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - If necessary, further certificates

Information:
In this operating instructions manual, the optional instrument features are described. The respective scope of delivery results from the order specification.

Constituent parts

The VEGAPULS 67 consists of the components:

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

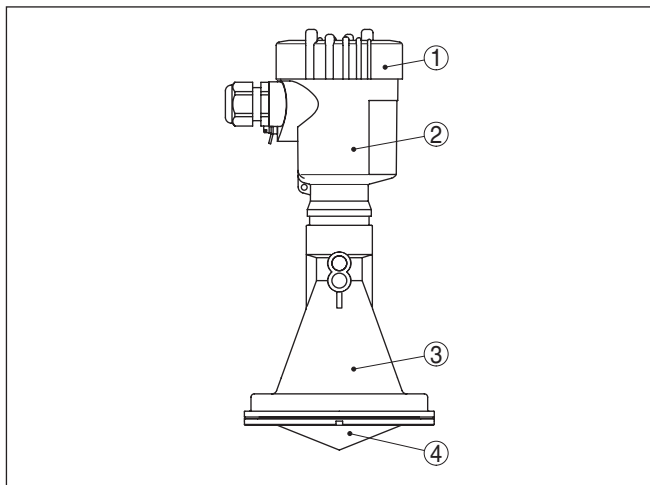The components are available in different versions.

Fig. 1: VEGAPULS 67, version with plastic housing

1   Housing cover with integrated PLICSCOM (optional)
2   Housing with electronics
3   Process fitting with plastic horn antenna
4   Antenna cover

Type label

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

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- Instrument type
- Article and serial number device
- Article numbers, documentation
- Technical data: Approvals, antenna type, process fitting, process seal/temperature, signal output, voltage supply, protection, protection class
- SIL identification (with SIL rating ex works)

With the serial number, you can access the delivery data of the instrument via "www.vega.com", "*VEGA Tools*" and "*Instrument search*". You can find the serial number on the inside of the instrument as well as on the type label on the outside.

Scope of this operating instructions

This operating instructions manual applies to the following instrument versions:

- Hardware version ≤ 1.10
- Software version ≤ 3.90

3.2 Principle of operation

Application area

The VEGAPULS 67 is particularly suitable for measurement of bulk solids in silos with up to 15 m height.

Functional principle

The antenna of the radar sensor emits short radar pulses with a duration of approx. 1 ns. These pulses are reflected by the product and received by the antenna as echoes. The transit time of the radar pulses from emission to reception is proportional to the distance and hence to the level. The determined level is converted into an appropriate output signal and outputted as measured value.

Voltage supply

4 … 20 mA/HART two-wire electronics for voltage supply and measured value transmission on the same cable.

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

The data for power supply are specified in chapter "*Technical data*".

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

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

This function is generally not available for approved instruments.

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 of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE

foil is also used. Dispose of the packaging material via specialised recycling companies.

Transport

Transport must be carried out 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 and replacement parts

PLICSCOM

The display and adjustment module PLICSCOM is used for measured value indication, adjustment and diagnosis. It can be inserted into the sensor or the external display and adjustment unit and removed at any time.

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

- Smartphone/tablet (iOS or Android operating system)
- PC/notebook with Bluetooth USB adapter (Windows operating system)

You can find further information in the operating instructions "*Display and adjustment module PLICSCOM*" (Document-ID 36433).

VEGACONNECT

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

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

VEGADIS 81	The VEGADIS 81 is an external display and adjustment unit for VEGA plics® sensors.
	For sensors with double chamber housing the interface adapter "*VEGADIS adapter*" is also required for VEGADIS 81.
	You can find further information in the operating instructions "*VEGADIS 81*" (Document-ID 43814).
VEGADIS 82	VEGADIS 82 is suitable for measured value indication and adjustment of sensors with HART protocol. It is looped into the 4 … 20 mA/HART signal cable.
	You can find further information in the operating instructions "*VEGADIS 82*" (Document-ID 45300).
PLICSMOBILE	PLICSMOBILE is an external GSM/GPRS radio unit for transmission of measured values and for remote parameter adjustment of plics® sensors. Adjustment is carried out via PACTware/DTM and the integrated USB connection.
	You can find further information in the supplementary instructions "*PLICSMOBILE T61*" (Document-ID 37700).
Protective cover	The protective cover protects the sensor housing against soiling and intense heat from solar radiation.
	You will find additional information in the supplementary instructions manual "*Protective cover*" (Document-ID 34296).
Flanges	Flanges are available in different versions according to the following standards: DIN 2501, EN 1092-1, ANSI B 16.5, JIS B 2210-1984, GOST 12821-80.
	You can find additional information in the supplementary instructions manual "*Flanges according to DIN-EN-ASME-JIS*" (Document-ID 31088).
Variable flange seal	The variable flange seal is used to direct the sensor antenna to the bulk solids surface and hence optimise the measurement.
	You can find additional information in the supplementary instructions manual "*Variable flange seal*" (Document-ID 33797).
Rinsing connection	The rinsing connection is used to blow compressed air into the antenna area of the radar sensor. This protects the surfaces of the antenna system against dust or condensation.
	You will find additional information in the supplementary instructions manual "*Rinsing connection*" (Document-ID 49552).
Electronics module	Electronics module "VEGAPULS series 60" is a replacement part for radar sensors of VEGAPULS series 60. A different version is available for each type of signal output.
	You can find further information in the operating instructions "*Electronics module VEGAPULS series 60*" (Document-ID 30176).

4 Mounting

4.1 General instructions

Installation position

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

Moisture

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

You can give your instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable gland. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or on cooled or heated vessels.

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

Make sure that the degree of contamination specified in chapter "*Technical data*" meets the existing ambient conditions.
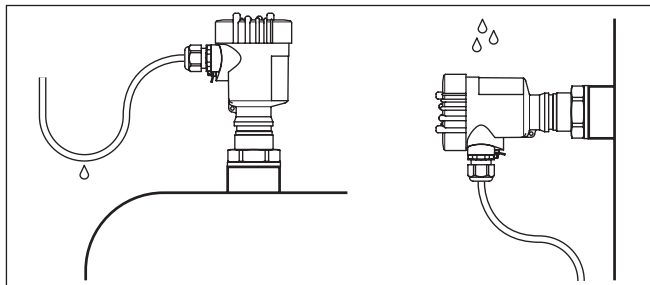

Fig. 2: Measures against moisture ingress

Cable entries - NPT thread
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.

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.

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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Measuring range

The reference plane for the measuring range of the sensors is the bearing surface on the side of the focussing lens. With the version with adapter flange, the reference plane is the lower side of the flange.
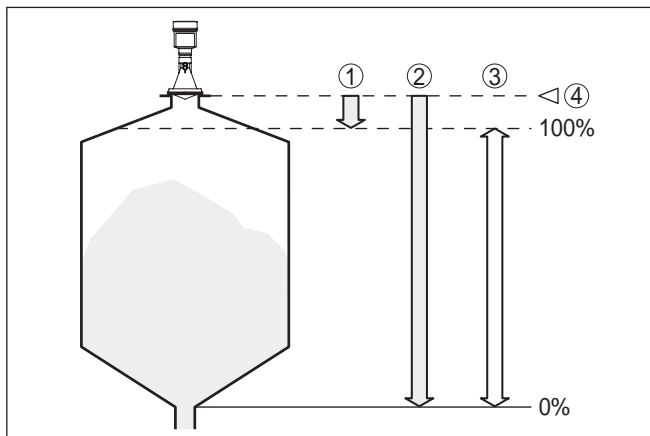

Fig. 3: Measuring range (operating range) and max. measuring distance

1   full
2   empty (max. measuring distance)
3   Measuring range
4   Reference plane

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

Polarisation plane

The emitted radar pulses of VEGAPULS 67 are electromagnetic waves. They thus have electrical and magnetical components that are perpendicular to each other. The polariation plane is defined by the direction of the electrical component. With radar sensors, the polarisation can be used to considerably reduce the effect of false echoes by turning the instrument in the connection flange or mounting boss. The position of the polarisation plane is marked on the instrument.
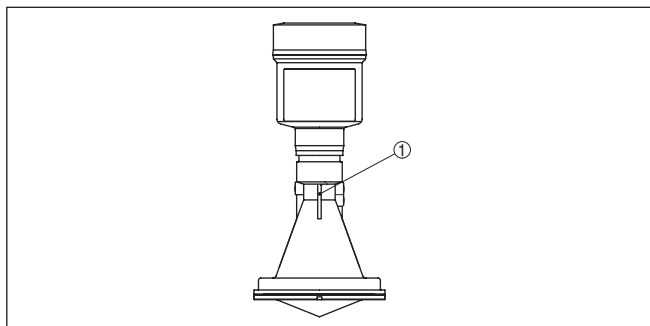

Fig. 4: Position of the polarisation plane of VEGAPULS 67

1   Marking bars

Suitability for the process conditions

Make sure that all parts of the instrument coming in direct contact with the process, especially the sensor element, process seal and process fitting, are suitable for the existing process conditions, such as process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" and on the nameplate.

Suitability for the ambient conditions

The instrument is suitable for standard and extended ambient conditions acc. to DIN/EN/IEC/ANSI/ISA/UL/CSA 61010-1.

4.2 Mounting preparation

The radar sensor can be mounted in two different ways:

● with a mounting strap
● via a collar or adapter flange.

Mounting strap

The mounting strap enables simple mounting on the vessel wall or silo top. It is suitable for wall, ceiling or boom mounting. Especially in open vessels this is a very easy and effective way to align the sensor to the bulk solid surface.
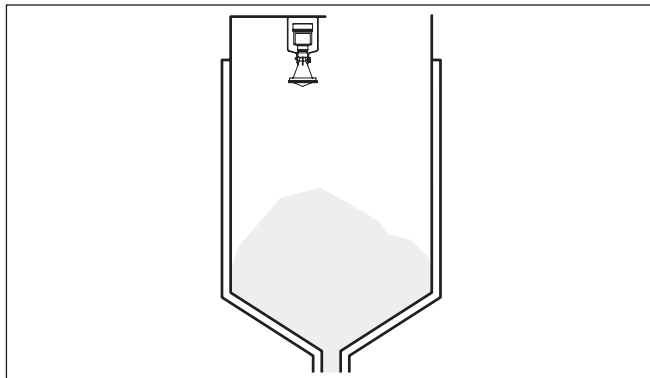

Fig. 5: Radar sensor with mounting strap

The strap is supplied unassembled 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 ways to screw the strap onto the sensor. Depending on the selected version, the sensors can be swivelled in the strap as follows:

● Single chamber housing
  – Angle of inclination 180°, infinitely variable
  – Angle of inclination in three steps 0°, 90° and 180°
● Double chamber housing
  – Angle of inclination 90°, infinitely variable
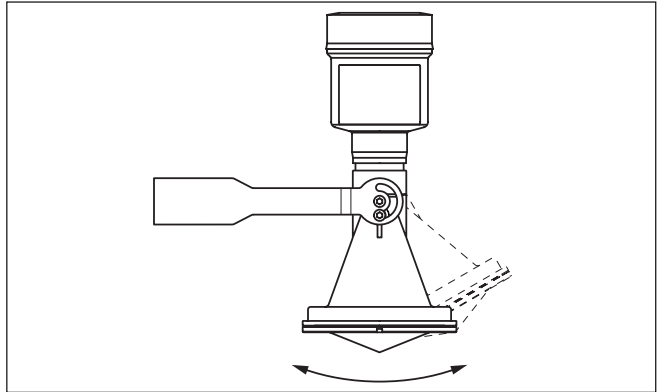 – Angle of inclination in two steps 0° and 90°
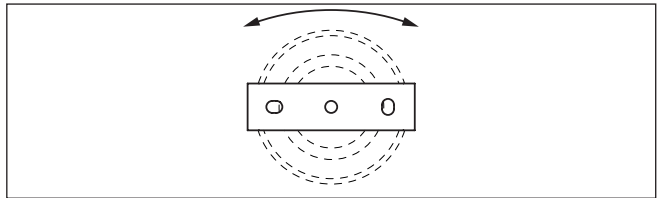
Fig. 6: Adjustment of the angle of inclination

Fig. 7: Turning by fastening in the centre

Collar or adapter flange   The compression flange allows mounting on a flange DN 80/ANSI 3",
the adapter flange on flanges DN 100/ANSI 4" and DN 150/ANSI 6"

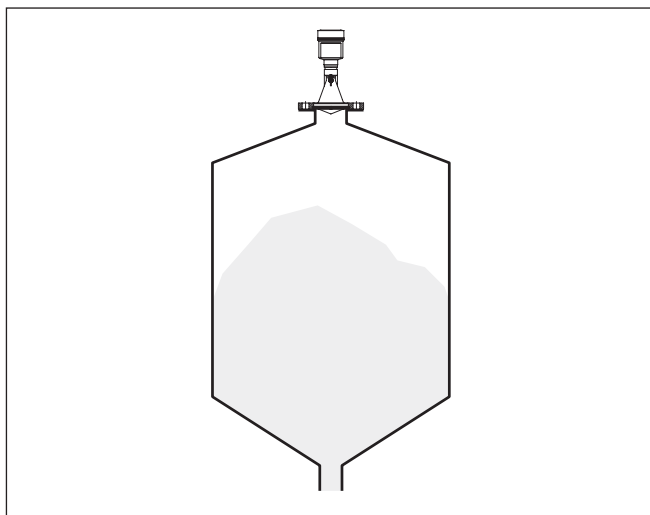You can find drawings of these mounting options in chapter "*Dimensions*".

Fig. 8: Flange mounting of the radar sensor

4.3 Mounting instructions

Installation position

Mount VEGAPULS 67 at least 200 mm (7.874 in) away from the vessel wall.

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.

Mounting socket

A corresponding collar flange for DN 80 (ASME 3" or JIS 80) as well as a suitable adapter flange are available for mounting VEGAPULS 67.

With the housing versions plastic, aluminium single chamber and stainless steel, the collar flange can be placed directly over the housing. With the aluminium double chamber housing, retroactive mounting in this way is not possible - the mounting type must be specified with the order.

Information:
The mounting socket should be as short as possible and its end rounded. This reduces false echoes from the vessel mounting socket.
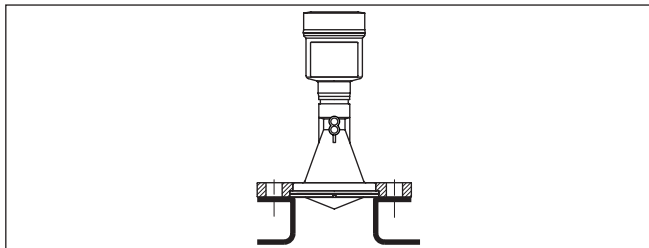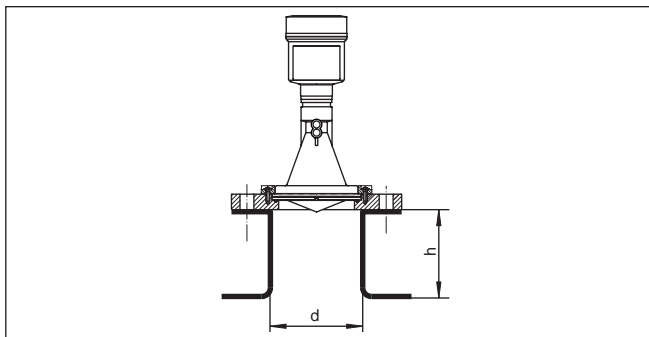
Fig. 9: Recommended socket mounting

If the medium has good reflective properties, VEGAPULS 67 can also be mounted on a longer socket piece. Recommended values for socket heights are specified in the following illustration. You must carry out a false echo storage afterwards.

The below charts specify the max. pipe socket length h depending on the diameter d.

Socket diameter d	Socket length h
80 mm	300 mm
100 mm	400 mm
150 mm	500 mm

Socket diameter d	Socket length h
3"	11.8 in
4"	15.8 in
6"	19.7 in

Tip:
In new facilities it is useful to incline the vessel socket in the direction of the outlet. False reflections from the vessel wall are thus reduced and measurement all the way down to the bottom of the conical outlet is possible.
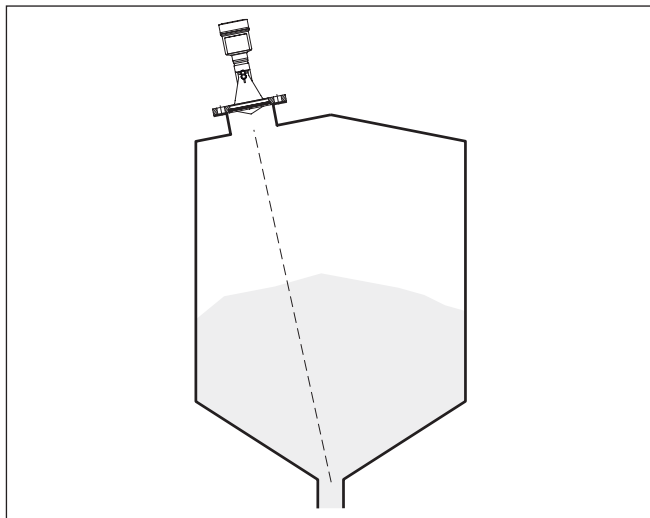
Fig. 11: Alignment in silos

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 optimum mounting position is on the outer wall of the silo with the sensor oriented towards the outlet in the silo center.
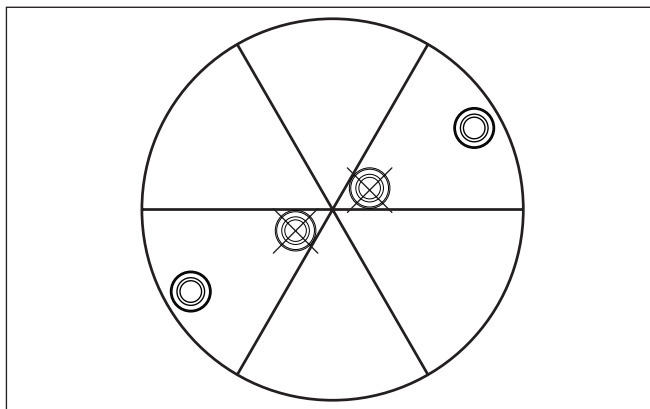

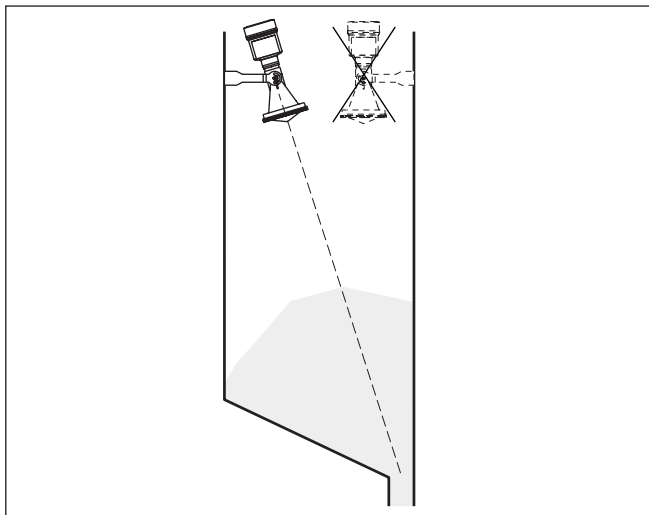*Fig. 12: Installation and orientation in multiple chamber silos*

Fig. 13: Installation and orientation in multiple chamber silos

Vessel installations

Silo installations such as e.g. ladders, level switches, struts, and also structured vessel walls, can cause false echoes that get superimposed on the useful echo. The mounting location of the radar sensor should be a place where no installations cross the microwave signals. Make sure when planning your measurement loop that the radar signals have a "clear view" to the 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.

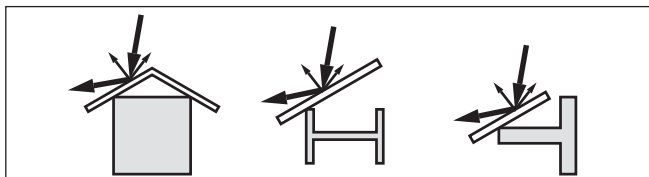*Fig. 14: Cover flat, large-area profiles with deflectors*

Air rinsing

Air rinsing is useful for avoiding buildup, particularly when there is strong condensation. Since VEGAPULS 67 has no direct rinsing air connection, a separate rinsing air connection must be provided in the mounting socket. By inclining this connection towards the top, a particularly effective cleaning of the antenna cover is achieved.
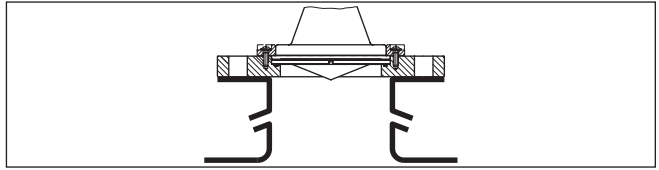
Fig. 15: Purging air connection

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.

ℹ 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. 16: Radar sensors on traverse crane

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

⚠️ **Warning:**
Connect only in the complete absence of line voltage.

- The electrical connection must only be carried out by trained, qualified personnel authorised by the plant operator.
- If overvoltage surges are expected, overvoltage arresters should be installed.

Voltage supply

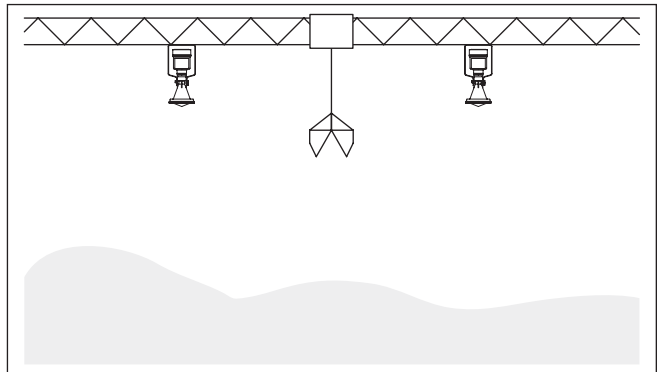Power supply and current signal are carried on the same two-wire cable. The operating voltage can differ depending on the instrument version.

The data for power supply are specified in chapter "*Technical data*".

Provide a reliable separation between the supply circuit and the mains circuits according to DIN EN 61140 VDE 0140-1.

Power the instrument via an energy-limited circuit acc. to DIN/EN/IEC/ANSI/ISA/UL/CSA 61010-1, e.g. via Class 2 power supply unit acc. to UL 1310 or an SELV power supply unit with suitable external current limitation.[1]

Keep in mind the following additional factors that influence the operating voltage:

- Lower output voltage of the power supply unit under nominal load (e.g. with a sensor current of 20.5 mA or 22 mA in case of fault)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*")

Connection cable

The instrument is connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326-1 for industrial areas, screened cable should be used.

Make sure that the cable used has the required temperature resistance and fire safety for max. occurring ambient temperature

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.

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

[1] Class 2 power supply unit: limited voltage and power level, special insulation against circuits with higher voltage. SELV (Safety Extra Low Voltage) power supply unit: limited voltage level, special insulation against circuits with higher voltage

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.

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.

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

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

Cable screening and grounding

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

In Ex systems, the grounding is carried out according to the installation regulations.

In electroplating plants as well as plants that apply cathodic corrosion protection, it must be taken into account that significant potential differences exist. This can lead to unacceptably high currents in the cable screen if it is grounded at both ends.

> **Information:**
> The metallic parts of the instrument (process fitting, housing, etc.) are conductively connected to the ground terminal.

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

5.2 Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it 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

6. Lift the opening levers of the terminals with a screwdriver (see following illustration)

7. Insert the wire ends into the open terminals according to the wiring plan
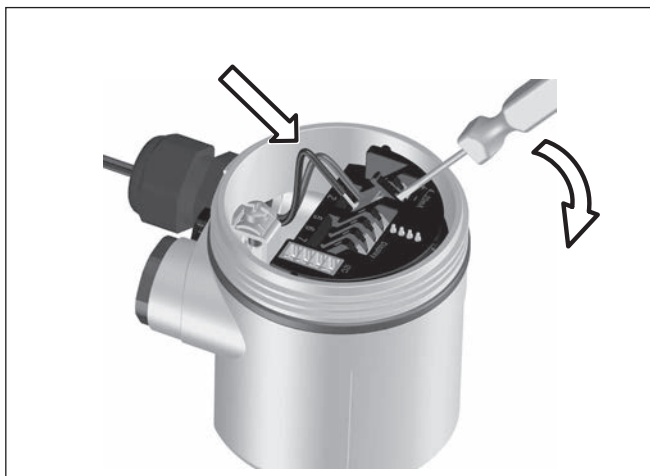
Fig. 17: Connection steps 6 and 7

8. Press down the opening levers of the terminals, you will hear the terminal spring closing

9. Check the hold of the wires in the terminals by lightly pulling on them

10. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation

11. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable

12. Screw the housing lid back on

The electrical connection is finished.

5.3   Wiring plan, single chamber housing

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

VEGA

Housing overview

Fig. 18: Material versions, single chamber housing

1   Plastic
2   Aluminium
3   Stainless steel (precision casting)
4   Stainless steel (electro-polished)
5   Filter element for air pressure compensation of all material versions. Blind plug with version IP 66/IP 68, 1 bar for Aluminium and stainless steel

Electronics and connection compartment
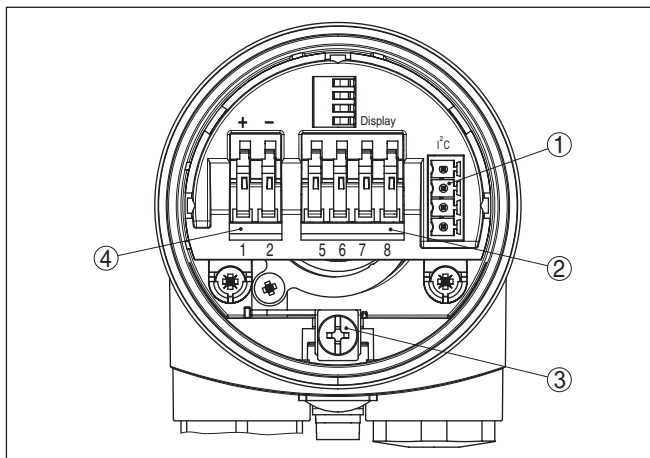
Fig. 19: Electronics and connection compartment - single chamber housing

1   Plug connector for VEGACONNECT (I²C interface)
2   Spring-loaded terminals for connection of the external indication VEGADIS 81
3   Ground terminal for connection of the cable screening
4   Spring-loaded terminals for voltage supply

Wiring plan
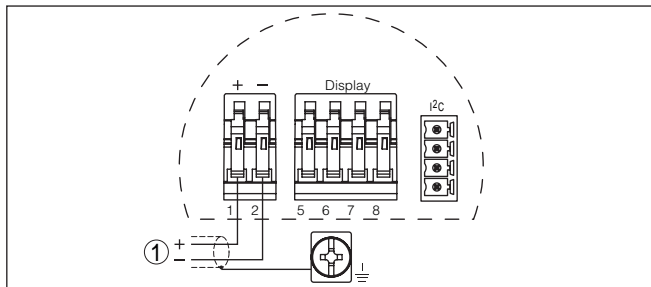
Fig. 20: Wiring plan - single chamber housing

1   Voltage supply, signal output

5.4   Wiring plan, double chamber housing

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

Housing overview

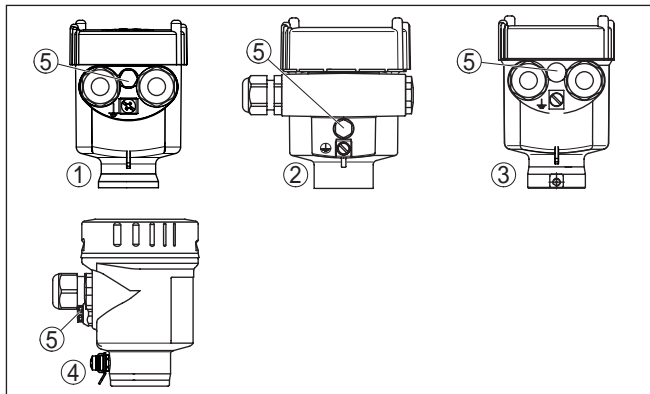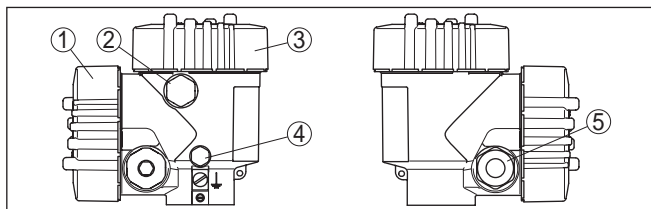
Fig. 21: Double chamber housing

1   Housing cover - connection compartment
2   Blind plug or plug M12 x 1 for VEGADIS 81 (optional)
3   Housing cover - electronics compartment
4   Filter element for air pressure compensation
5   Cable gland

VEGA

Electronics compartment
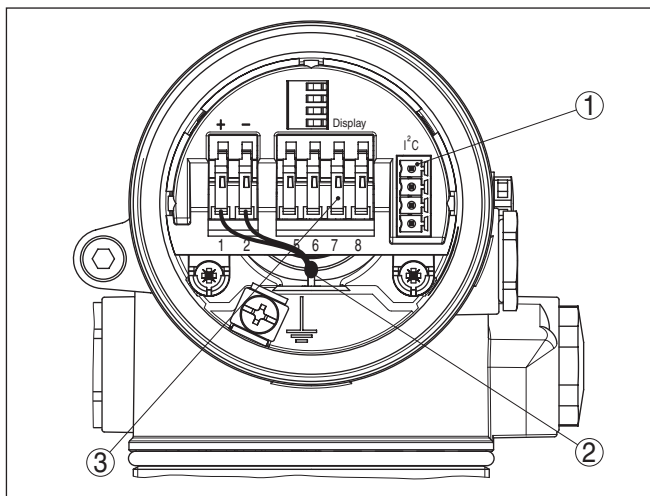
Fig. 22: Electronics compartment - double chamber housing

1 Plug connector for VEGACONNECT (I²C interface)
2 Internal connection cable to the connection compartment
3 Terminals for VEGADIS 81

Connection compartment
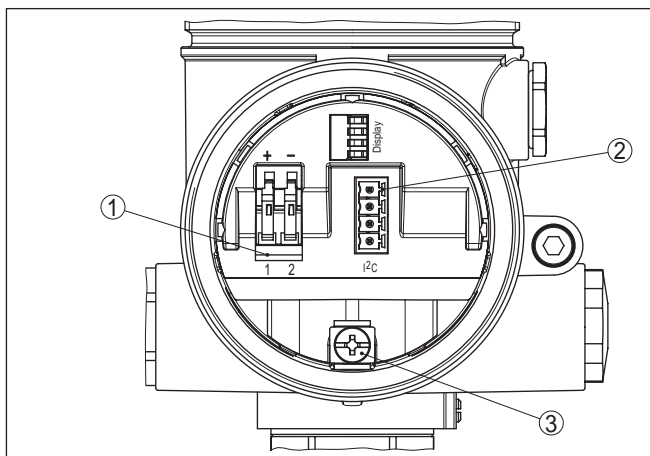
Fig. 23: Connection compartment - double chamber housing

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

Wiring plan
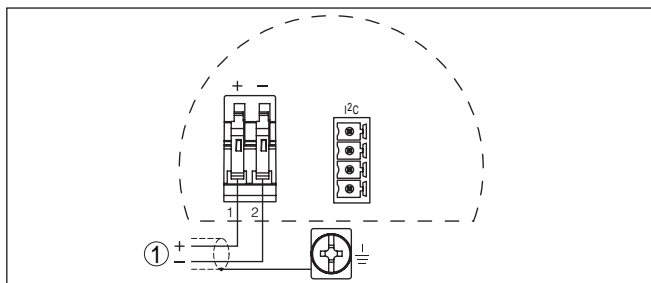
Fig. 24: Wiring plan - double chamber housing
1   Voltage supply, signal output

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

**Wire assignment, con-
nection cable**
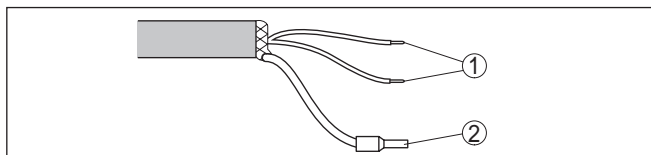
Fig. 25: Wire assignment, connection cable
1   Brown (+) and blue (-) to power supply or to the processing system
2   Shielding

5.6   Switch-on phase

Switch-on phase

After connecting VEGAPULS 67 to power supply or after a voltage
recurrence, the instrument carries out a self-check for approx. 30
seconds:

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

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

6 Set up with the display and adjustment module PLICSCOM

6.1 Short description

Function/Configuration

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

● All continuously measuring sensors in single as well as double chamber housing version (optionally in the electronics or connection compartment)
● External display and adjustment unit

6.2 Insert display and adjustment module

Mount/dismount display and adjustment module

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

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
3. Press the display and adjustment module onto the electronics and turn it to the right until it snaps in
4. 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. 26: Insert display and adjustment module

> **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.
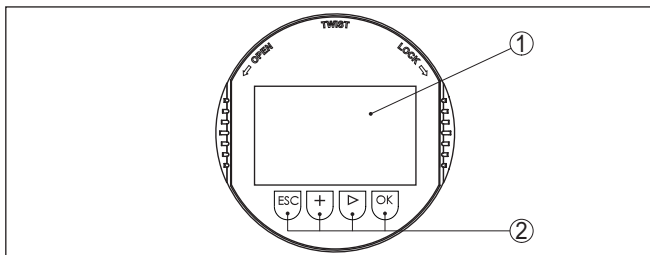
6.3 Adjustment system

Fig. 27: Display and adjustment elements

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

Key functions

- **[OK]** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value

- **[->]** key to select:
  - Menu change

VEGA

– Select list entry
– Select editing position

● *[+]* key:
– Change value of the parameter

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

Adjustment system

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

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.

6.4 Setup steps

Address setting HART multidrop

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

HART mode

Standard
Address 0
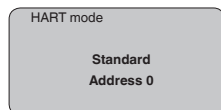
Parameterization example

The radar sensor measures the distance from the sensor to the product surface. For indication of the real level, an allocation of the measured distance to the percentage height must be carried out.
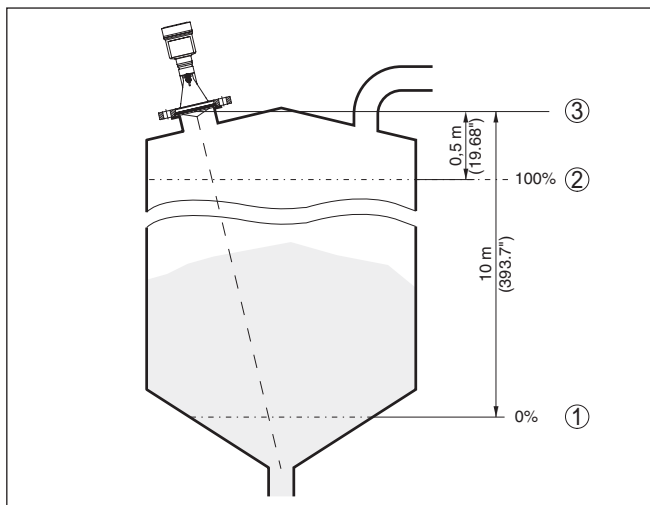
Fig. 28: Parameterization example

1   Min. level ≙ max. meas. distance
2   Max. level ≙ min. meas. distance
3   Reference plane

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Basic adjustment - Min. adjustment

Proceed as follows:

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

    ```
    ▶ Basic adjustment
      Display
      Diagnostics
      Service
      Info
    ```
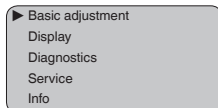
2. Select the menu item "*Basic adjustment*" with *[->]* and confirm with *[OK]*. Now the menu item "*Min. adjustment*" is displayed.

    ```
    Min. adjustment
    0.00 %
    =
    5.000 m(d)
         4.000 m(d)
    ```

VEGAPULS 67 • 4 … 20 mA/HART - two-wire
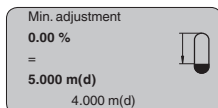
3. Prepare the % value for editing with *[OK]* and set the cursor to the requested position with *[->]*. Set the requested percentage value with *[+]* and save with *[OK]*. The cursor jumps now to the distance value.

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

5. Save the settings with *[OK]* and move to "Max. adjustment" with *[->]*.

Medium selection

Each product has different reflective properties. In solids, these are dust generation, material cones and additional echoes caused by the vessel wall. Due to the medium selection, the sensor is adapted in an optimum way to the product and the measurement reliability, particularly for products with bad reflective properties, is increased considerably.

Medium

Bulk solid

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

In liquids, fluctuating surfaces and foam generation are further interfering factors. To adapt the sensor to the different conditions, a general selection is made in this menu item, i.e. "*Solid*" or "*Liquid*".

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

Basic adjustment - Medium selection

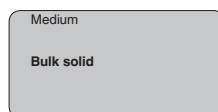Each product has different reflective properties. In addition, there are various interfering factors which have to be taken into account: agitated product surfaces and foam generation (with liquids); dust generation, material cones and echoes from the vessel wall (with solids). To adapt the sensor to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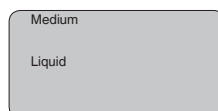
Medium

Liquid

ℹ Information:
With VEGAPULS 67 with electronics version "*Increased safety*", "*Solid*" is preset as factory setting. However, the instrument should be used preferably in liquids. In such cases, the medium selection should be set to "*Liquid*" during setup.

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

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

Through this additional selection, the sensor is adapted perfectly to the product and measurement reliability, particularly in products with poor reflective properties, is considerably increased.
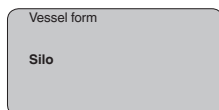
Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the *[->]* key.

Vessel form

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

Vessel form

Silo

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

Basic adjustment - Damping

To suppress fluctuations in the measured value display, e. g. caused by an agitated product surface, a damping can be set. This time can be between 0 and 999 seconds. Keep in mind that the reaction time of the entire measurement will then be longer and the sensor will react to measured value changes with a delay. In general, a period of a few seconds is sufficient to smooth the measured value display.
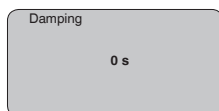
Damping

0 s

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

Basic adjustment - Linearization curve

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "*Display*".

Linearisation curve

Linear

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

Caution:
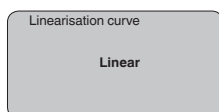Note the following if the VEGAPULS 67 with corresponding approval is used as part of an overfill protection system according to WHG (Water Resources Act):

If a linearisation curve is selected, the measuring signal is no longer necessarily linear to the filling height. This must be considered by the user especially when setting the switching point on the limit signal transmitter.

Basic adjustment - Sensor TAG

In this menu item you can enter an unambiguous designation for the sensor, e.g. the measurement loop name or the tank or product designation. In digital systems and in the documentation of larger plants, a singular designation should be entered for exact identification of individual measuring points.

Sensor-TAG

Sensor
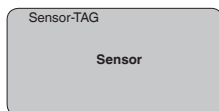
With this menu item, the Basic adjustment is finished and you can now jump to the main menu with the *[ESC]* key.

Display - Indicated value

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

The following indication values are available:

● Height
● Distance
● Current
● Scaled
● Percent
● Lin. percent

The selection "*scaled*" opens the menu items "*Display unit*" and "*Scaling*". In "*Display unit*" there are the following options:

● Height
● Ground
● Flow
● Volume
● Without unit

Depending on selection, the different units are in turn available.

In the menu item "*Scaling*", the requested numerical value with decimal point is entered for 0 % and 100 % of the measured value.

There is the following relationship between the indication value in the menu "*Display*" and the adjustment unit in the menu "*Device settings*":

● Indication value "*Distance*": Presentation of the measured value in the selected adjustment unit, e.g. m(d).

```
Displayed value

Scaled ▼
```

```
Display unit

Volume ▼
              I ▼
```

```
Scaling

0 % = 0.0 l
100 % = 100.0 l
```
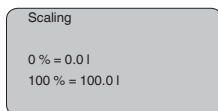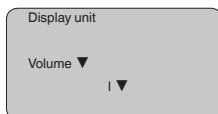
Display - Backlight   A background lighting integrated by default can be adjusted via the adjustment menu. The function depends on the height of the supply voltage. See "*Technical data/Voltage supply*".

```
Backlight
```

In the default setting, the lightning is switched off.

Diagnosis - Peak value   The respective min. and max. measured values are saved in the sensor. The values are displayed in the menu item "*Peak values*".

● Min. and max. distance in m(d)
● Min. and max. temperature

```
Peak value indicator
```
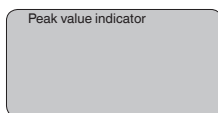
Diagnosis - Measurement reliability   When non-contact level sensors are used, the measurement can be influenced by the respective process conditions. In this menu item, the measurement reliability of the level echo is displayed as a dB value. Measurement reliability equals signal strength minus noise. The higher the value, the more reliable the measurement. A well functioning measurement normally has a value > 10 dB.

Diagnosis - Curve selection   With ultrasonic sensors, the "**Echo curve**" represents the signal strength of the echoes over the measuring range. The unit of signal strength is "dB". The signal strength enables the jusgement of the quality of the measurement.

The "**False echo curve**" displays the saved false echoes (see menu "*Service*") of the empty vessel as signal strength in "dB" over the measuring range.

Up to 3000 measured values are recorded (depending on the sensor) when starting a "**Trend curve**". Then the values can be displayed on a time axis. The oldest measured values are always deleted.

In the menu item "*Choose curve*", the respective curve is selected.

```
Curve selection

Echo curve ▼
```

Information:

The trend recording is not activated when being shipped. It must be started by the user via the menu item "*Start trend curve*".

Diagnosis - Curve presentation

A comparison of the echo curve and the false echo curve allows a more detailed evaluation of measurement reliability. The selected curve is updated continuously. With the *[OK]* key, a submenu with zoom functions is opened.

The following functions are available with "**Echo and false echo curve**":

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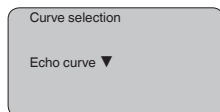● "Unzoom": Reset the presentation to the nominal measuring range without magnification

In the menu item "**Trend curve**" the following are available:

● "X-Zoom": Resolution
  – 1 minute
  – 1 hour
  – 1 day
● "Stop/Start": Interrupt a recording or start a new recording
● "Unzoom": Reset the resolution to minutes

As default setting, the recording pattern has 1 minute. With the adjustment software PACTware, this pattern can be also set to 1 hour or 1 day.

```
Echo curve
```
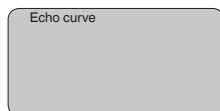
Service - False signal suppression

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

False signal suppression

Change now?
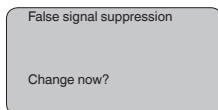
Proceed as follows:

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

2. Select the menu item "*Service*" with *[->]* and confirm with *[OK]*. Now the menu item "*False signal suppression*" is displayed.

3. Confirm "*False signal suppression - Change now*" with *[OK]* and select in the below menu "*Create new*". Enter the actual distance from the sensor to the product surface. All false signals in this area are detected by the sensor and saved after confirming with *[OK]*.

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

Service - Extended setting

The menu item "*Extended setting*" offers the possibility to optimise VEGAPULS 67 for applications in which the level changes very quickly. To do this, select the function "*Quick level change > 1 m/min.*".

Extended setting

quick level change > 1 m/min.
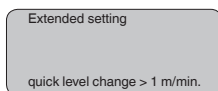
Note:
● Since with the function "*Quick level change > 1 m/min.*" the generation of an average value of the signal processing is considerably reduced, false reflections by agitators or vessel installations can cause measured value fluctuations. A false signal suppression is thus recommended.

Service - Current output

In the menu item "*Current output*" you determine the behaviour of the current output during operation and in case of failure. The following options are available:

Current output

Characteristics	**4 … 20 mA**
	20 … 4 mA
Failure mode[2)	Hold value
	20.5 mA
	22 mA
	< 3.6 mA

[2) Value of the current output in case of failure, e.g. if no valid measured value is delivered.

Min. current[3)]	**3.8 mA**
	4 mA
Max. current[4)]	**20 mA**
	20.5 mA

The values in bold font represent the data of the factory setting.

In HART multidrop mode, the current is constantly 4 mA. This value does not change even in case of failure.

Current output

Characteristic: 4-20 mA ▼
Failure mode: 22 mA ▼
Min. current 3.8 mA ▼
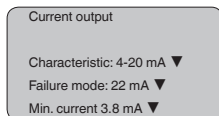
Service - Simulation

In this menu item you simulate a user-defined level or pressure value via the current output. This allows you to test the signal path, e.g. through connected indicating instruments or the input card of the control system.

The following simulation variables are available:

● Percent
● Current
● Pressure (with pressure transmitters)
● Distance (with radar and guided microwave)

With Profibus PA sensors, the selection of the simulated value is made via the "Channel" in the menu "*Basic adjustments*".

How to start the simulation:

1. Push *[OK]*
2. Select the requested simulation variable with *[->]* and confirm with *[OK]*.
3. Set the requested numerical value with *[+]* and *[->]*.
4. Push *[OK]*

The simulation is now running, with 4 … 20 mA/HART a current is output and with Profibus PA or Foundation Fieldbus a digital value.

How to interrupt the simulation:

→ Push *[ESC]*

● **Information:**
ⓘ The simulation is automatically terminated 10 minutes after the last pressing of a key.

Simulation

Start simulation?
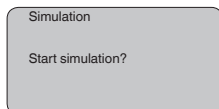
[3)] This value is not underrun during operation.
[4)] This value is not exceeded during operation.

VEGAPULS 67 • 4 … 20 mA/HART - two-wire

Service - Reset

Basic adjustment

If the "*Reset*" is carried out, the sensor resets the values of the following menu items to the reset values (see table):[5]

Menu item	Reset value
Max. adjustment	0 m(d)
Min. adjustment	Meas. range end in m(d)[6]
Medium	Liquid
Vessel form	not known
Damping	0 s
Linearisation	Linear
Sensor-TAG	Sensor
Displayed value	Distance
Extended settings	None
Current output - characteristics	4 … 20 mA
Current output - max. current	20 mA
Current output - min. current	4 mA
Current output - failure	< 3.6 mA
Unit of measurement	m(d)

The values of the following menu items are *not* reset to the reset values (see table) with "**Reset**":

Menu item	Reset value
Backlight	No reset
Language	No reset
SIL	No reset
HART mode	No reset

Default setting

Like basic adjustment, but in addition, special parameters are reset to default values.[7]

Peak value indicator

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

Service - Adjustment unit

In this menu item you select the internal arithmetic unit of the sensor.

Unit of measurement

m(d)

---
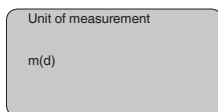
[5] Sensor-specific basic adjustment.
[6] Depending on the sensor type, see chapter "Technical data".
[7] Special parameters are parameters which are set customer-specifically on the service level with the adjustment software PACTware.

Service - Language

The sensor is already set to the ordered national language. In this menu item you can change the language. The following languages are available as of software version 3.50:

- Deutsch
- English
- Français
- Espanõl
- Pycckuu
- Italiano
- Netherlands
- Japanese
- Chinese

```
Language

German
```
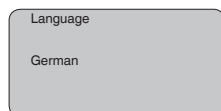
Service - SIL

The functional safety is already activated Ex factory for instruments with SIL qualification. For instruments Ex factory without SIL qualification, the functional safety must be activated by the user for applications according to SIL via the indicating and adjustment module. The SIL factory setting cannot be deactivated by the user.

The activation of SIL has the following impact:

- In the menu item "*Failure mode*" under "*Current output*", the parameters "*Hold value*" and "*20.5 mA*" are blocked
- In the menu item "*HART mode*", the function "*Multidrop*" is blocked

Note:
For such applications, it is absolutely necessary to take note of "*Safety Manual*".

Service - HART mode

HART offers standard and multidrop mode.

The mode "standard" with the fixed address 0 means outputting the measured value as a 4 … 20 mA signal.

In Multidrop mode, up to 15 sensors can be operated on one two-wire cable. An address between 1 and 15 must be assigned to each sensor.[8]

In this menu item you determine the HART mode and enter the address for multidrop.

```
HART mode

Standard
Address 0
```
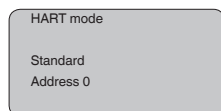
The default setting is standard with address 0.

---

[8] The 4 … 20 mA signal of the sensor is switched off. The sensor uses a constant current of 4 mA. The measuring signal is transmitted exclusively as a digital HART signal.

32938-EN-190102

Copy sensor data

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

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

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

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

- HART mode
- PIN
- SIL

```
Copy sensor data


Copy sensor data?
```
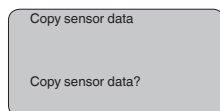
Service - PIN

In this menu item, the PIN is activated/deactivated permanently. Entering a 4-digit PIN protects the sensor data against unauthorized access and unintentional modifications. If the PIN is activated permanently, it can be deactivated temporarily (i.e. for approx. 60 min.) in any menu item. The instrument is delivered with the PIN set to 0000.

```
PIN

Disable permanently?
```
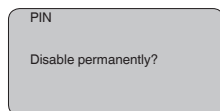
Only the following functions are permitted with activated PIN:

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

Info

In this menu item the most important sensor information can be displayed:

- Instrument type
- Serial number: 8-digit number, e.g. 12345678

VEGA

Instrument type

Serial number

- Date of manufacture: Date of the factory calibration
- Software version: Edition of the sensor software

Date of manufacture

Software version

- Date of last change using PC: Date of the last change of sensor parameters via PC

Last change using PC

- Sensor details, e.g. approval, process fitting, seal, measuring cell, measuring range, electronics, housing, cable entry, plug, cable length etc.

Sensor characteristics

Display now?

6.5 Menu schematic

Information:

i Depending on the version and application, the light-coloured menu windows are not always available or offer nor selection possibility.

Basic adjustment

▶ Basic adjustment	1
Display	
Diagnostics	
Service	
Info	

Min. adjustment	1.1
0.00 %	
=	
30.000 m(d)	
0.665 m(d)	

Max. adjustment	1.2
100.00 %	
=	
0.000 m(d)	
0.665 m(d)	

Medium	1.3
Bulk solid ▼	
not known ▼	

Vessel form	1.4
not known ▼	

Damping	1.5
0 s	

Linearisation curve	1.6
Linear	

Sensor-TAG	1.7
Sensor	

Display

Basic adjustment 2			
▶ Display			
Diagnostics			
Service			
Info			

Displayed value 2.1	Display unit 2.2	Scaling 2.3	Backlight 2.4
Scaled	**Volume ▼** **l ▼**	**0 % = 0.0 l** **100 % = 100.0 l**	**Switched off ▼**

Diagnostics

Basic adjustment 3			
Display			
▶ Diagnostics			
Service			
Info			

Peak value indicator 3.1	Measurement reliability 3.2	Curve selection 3.3	Echo curve 3.4
Distance min.: 0.234 m(d) Distance max.: 5.385 m(d)	**15 dB** Sensor status **OK**	**Echo curve ▼**	**Presentation of the echo curve**

Service

Basic adjustment 4			
Display			
Diagnostics			
▶ Service			
Info			

False signal suppression 4.1	Extended setting 4.2	Current output 4.3	Simulation 4.4
Change now?	**None ▼** Quick level change ▼	Characteristic: 4-20 mA ▼ Fail.mode: < 3.6 mA ▼ min. current: 4 mA ▼ max. current: 20 mA ▼	**Start simulation ▼**

Reset 4.6	Unit of measurement 4.7	Language 4.8	SIL 4.9
Select reset?	**m(d)▼**	**Deutsch ▼**	**Not activated▼**

HART mode	Copy sensor data	PIN
Standard **Address 0**	**Copy sensor data?**	**Enable?**

Info

```
Basic adjustment        5
Display
Diagnostics
Service
▶ Info
```

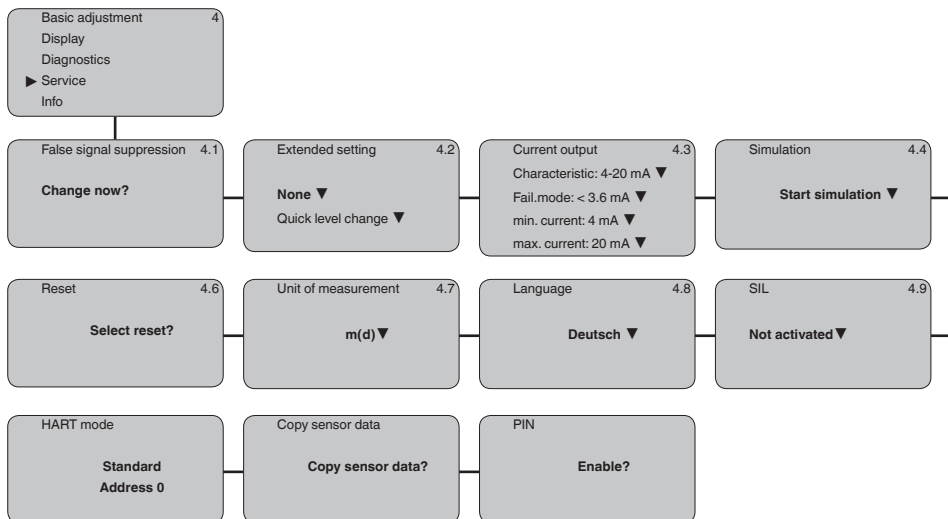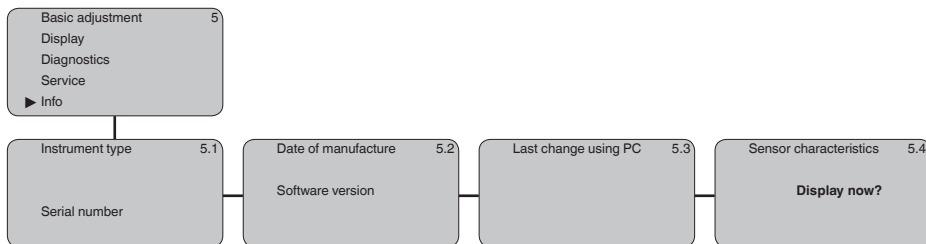| Instrument type	5.1		Date of manufacture	5.2		Last change using PC	5.3		Sensor characteristics	5.4
			Software version							
Serial number									**Display now?**	

6.10 Saving the parameterisation data

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.

If VEGAPULS 67 is equipped with a display and adjustment module, the most important data can be read out of the sensor into the display and adjustment module. The procedure is described in the operating instructions manual "*Display and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

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

7 Set up with PACTware and other adjustment programs

7.1 Connect the PC via VEGACONNECT

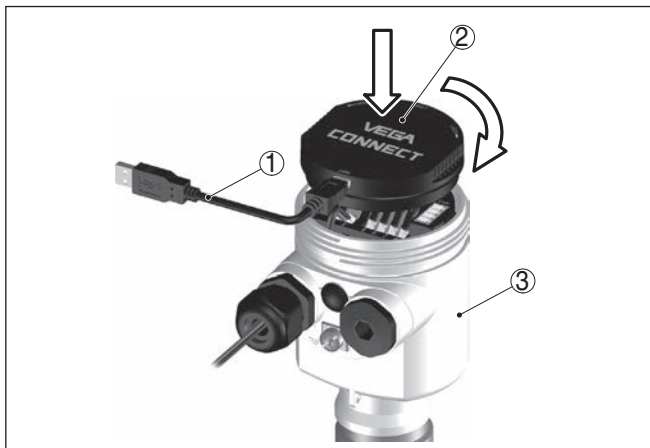**VEGACONNECT directly on the sensor**

Fig. 29: Connection of the PC via VEGACONNECT directly to the sensor

1   USB cable to the PC
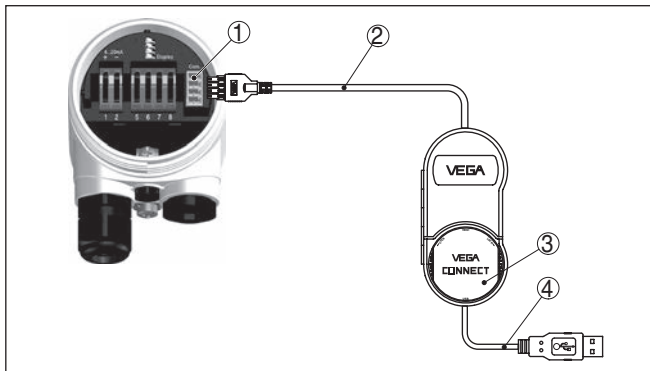2   VEGACONNECT
3   Sensor

VEGACONNECT externally

Fig. 30: Connection via VEGACONNECT externally

1   I²C bus (com.) interface on the sensor
2   I²C connection cable of VEGACONNECT
3   VEGACONNECT
4   USB cable to the PC

Necessary components:

● VEGAPULS 67
● PC with PACTware and suitable VEGA DTM

VEGA

- VEGACONNECT
- Power supply unit or processing system
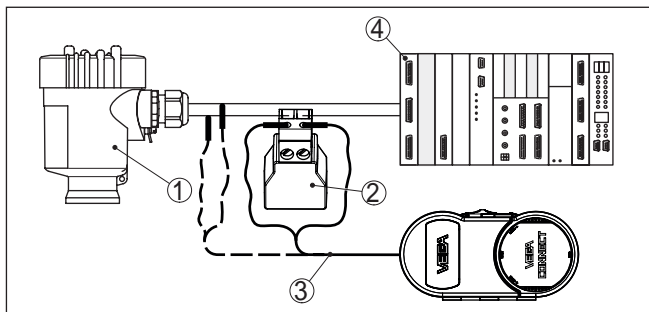
VEGACONNECT via HART

Fig. 31: Connecting the PC via HART to the signal cable

1   VEGAPULS 67
2   HART resistance 250 Ω (optional depending on evaluation)
3   Connection cable with 2 mm pins and terminals
4   Processing system/PLC/Voltage supply

Necessary components:

- VEGAPULS 67
- PC with PACTware and suitable VEGA DTM
- VEGACONNECT
- HART resistance approx. 250 Ω
- Power supply unit or processing system

Note:
■ With power supply units with integrated HART resistance (internal resistance approx. 250 Ω), an additional external resistance is not necessary. This applies, e. g. to the VEGA instruments VEGATRENN 149A, VEGADIS 371, VEGAMET 381. Common Ex separators are also usually equipped with a sufficient current limitation resistance. In such cases, VEGACONNECT 4 can be connected parallel to the 4 … 20 mA cable.

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.

VEGAPULS 67 • 4 … 20 mA/HART - two-wire

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.
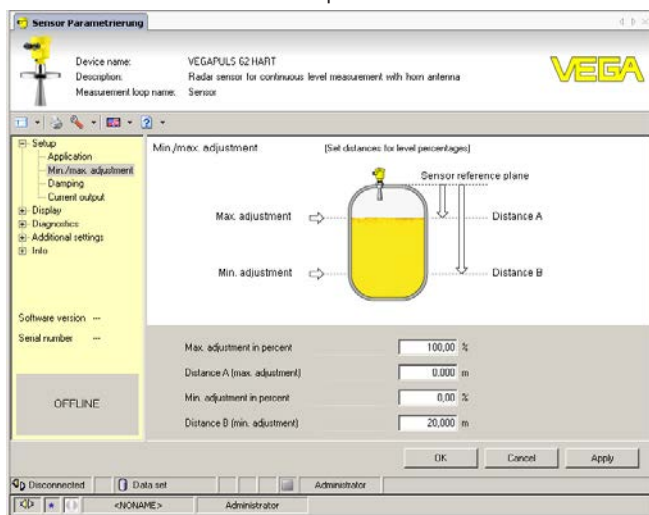

Fig. 32: Example of a DTM view

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. The full version is available on CD from the agency serving you.

7.3 Parameter adjustment with AMS™ and PDM

For VEGA sensors, instrument descriptions for the adjustment programs AMS™ and PDM are available as DD or EDD. The instrument descriptions are already implemented in the current versions of AMS™ and PDM.

For older versions of AMS™ and PDM, a free-of-charge download is available via Internet. Move to www.vega.com.

7.4 Saving the parameterisation data

It is recommended to document or save the parameter adjustment data. That way they are available for multiple use or service purposes.

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

8 Maintenance and fault rectification

8.1 Maintenance, cleaning

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

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.

8.2 Rectify faults

Reaction when malfunction occurs

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

Causes of malfunction

VEGAPULS 67 offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

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

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 manned 7 days a week round-the-clock. Since we offer this service worldwide, the support is only available in the English language. The service is free, only standard call charges are incurred.

Check the 4 … 20 mA signal

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

Error	Cause	Rectification
4 … 20 mA signal not stable	Level fluctuations	Set damping via the display and adjustment module
4 … 20 mA signal missing	Electrical connection faulty	Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"
	Voltage supply missing	Check cables for breaks; repair if necessary
	Operating voltage too low or load resistance too high	Check, adapt if necessary
Current signal greater than 22 mA or less than 3.6 mA	Electronics module in the sensor defective	Exchange the instrument or send it in for repair

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

Error messages via the display and adjustment module

Error	Cause	Rectification
E013	no measured value available	Sensor in boot phase
		Sensor does not find an echo, e.g. due to faulty installation or wrong parameter adjustment
E017	Adjustment span too small	Carry out a fresh adjustment and increase the distance between min. and max. adjustment
E036	no operable sensor software	Carry out a software update or send instrument for repair
E041, E042, E043	Hardware error, electronics defective	Exchange the instrument or send it in for repair

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "*Set up*" may have to be carried out again.

8.3 Exchanging the electronics module

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

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

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

Sensor serial number

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

● At the factory by VEGA
● Or on site by the user

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

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

Assignment

The electronics modules are adapted to the respective sensor and distinguish also in the signal output or power supply.

8.4 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.

⚠ **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.

8.5 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: www.vega.com.

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

If a repair is necessary, please 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
- Please contact the agency serving you to get the address for the return shipment. You can find the agency on our home page www.vega.com.

9 Dismount

9.1 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 products etc.

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

9.2 Disposal

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

10 Supplement

10.1 Technical data

General data

316L corresponds to 1.4404 or 1.4435	
Materials, wetted parts	
– Horn antenna	PBT-GF30
– Focussing lense	PP
– Adapter flange	PPH
– Seal, adapter flange	FKM
Materials, non-wetted parts	
– Compression flange	PPH
– Mounting strap, fixing screws mounting strap	316L
– Fixing screws, adapter flange	304
– Housing	Plastic PBT (polyester), Alu die-casting powder-coated, stainless steel 316L
– Seal between housing and housing lid	Silicone SI 850 R, NBR silicone-free
– Inspection window housing cover	Polycarbonate (UL-746-C listed), glass[9]
– Ground terminal	316Ti/316L
– Cable gland	PA, stainless steel, brass
– Sealing, cable gland	NBR
– Blind plug, cable gland	PA
Max. torque, mounting screws - strap on the sensor housing	4 Nm (2.95 lbf ft)
Weight, depending on housing material and version	0.7 … 3.4 kg (1.543 … 7.496 lbs)

Torques

Max. torques	
– 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. torques 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)

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

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Output variable

Output signal	4 … 20 mA/HART
Cycle time	min. 1 s (dependent on the parameter setting)
Signal resolution	1.6 µA
Resolution, digital	1 mm (0.039 in)
Fault signal, current output (adjustable)	mA value unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable)
Max. output current	22 mA
Load	see load diagram under Power supply
Damping (63 % of the input variable)	0 … 999 s, adjustable
Met NAMUR recommendation	NE 43
HART output values	
− 1. HART value (Primary Value)	Distance to the level
− 2. HART value (Secondary Value)	Distance to the level - scaled (for example hl, %)

Input variable

Measured variable	distance between process fitting and product surface
Min. distance from antenna end	50 mm (1.969 in)[10]
Measuring range	up to 15 m (49.21 ft)

Reference conditions to measurement accuracy (according to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1	
− Temperature	+18 … +30 °C (+64 … +86 °F)
− Relative humidity	45 … 75 %
− Air pressure	860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psig)
Other reference conditions	
− Reflector	Ideal reflector, e.g. metal plate 2 x 2 m
− False reflections	Biggest false signal, 20 dB smaller than the useful signal

Characteristics and performance data

Measuring frequency	K-band
Interval	approx. 1 s
Beam angle -3 dB[11]	10°
Step response or adjustment time[12]	> 1 s (dependent on the parameter setting)
Max. level change	Adjustable up to 1 m/min. (dependent on the parameter settings)
Max. emitted HF power of the antenna system	
− Pulse peak power	< 10 mW
− Pulse duration	< 2 ns
− Average power	< 25 µW

---

[10] For products with a low dielectric figure up to 50 cm (19.69 in).
[11] Corresponds to the range with 50 % of the emitted power
[12] Time to output the correct level (with max. 10 % deviation) after a sudden level change.

VEGAPULS 67 • 4 … 20 mA/HART - two-wire

– Average power with 1 m distance $\qquad$ < 1 µW/cm²

Deviation (according to DIN EN 60770-1)

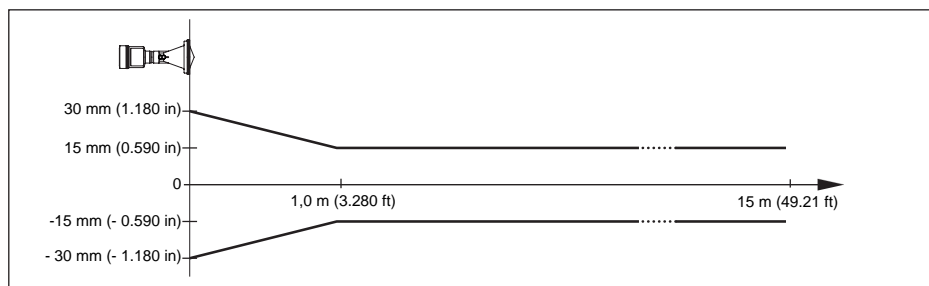| Deviation[13]	≤ 15 mm (meas. distance > 1.0 m/3.280 ft)

Fig. 33: Deviation VEGAPULS 67

Influence of the ambient temperature to the sensor electronics[14]

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

Ambient conditions

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

Process conditions

Vessel pressure	-100 … 200 kPa/-1 … 2 bar (-14.5 … 29.0 psig)
Process temperature (measured on the process fitting)	-40 … +80 °C (-40 … +176 °F)
Vibration resistance[15]	
– Plastic horn antenna with compression or adapter flange	mechanical vibrations up to 2 g in the frequency range 5 … 200 Hz
– Plastic horn antenna with mounting strap	mechanical vibrations up to 1 g in the frequency range 5 … 200 Hz

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

Options of the cable entry	
– Cable entry	M20 x 1.5; ½ NPT
– Cable gland	M20 x 1.5; ½ NPT
– Blind plug	M20 x 1.5; ½ NPT
– Closing cap	½ NPT

[13] Incl. non-linearity, hysteresis and non-repeatability.
[14] Relating to the nominal measuring range, in the temperature range -40 … +80 °C .
[15] Tested according to the guidelines of German Lloyd, GL directive 2.

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 IP 66/IP 68 (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	25 mm (0.984 in) with 25 °C (77 °F)
– Diameter	approx. 8 mm (0.315 in)
– Colour - Non-Ex version	Black
– Colour - Ex-version	Blue

Display and adjustment module

Voltage supply and data transmission	through the sensor
Indication	LC display in dot matrix
Adjustment elements	4 keys
Protection rating	
– unassembled	IP 20
– Mounted into the sensor without cover	IP 40
Ambient temperature - Display and adjustment module	-20 … +70 °C (-4 … +158 °F)
Material	
– Housing	ABS
– Inspection window	Polyester foil

Voltage supply

Operating voltage U_B	
– Non-Ex instrument	15 … 36 V DC
– EEx-ia instrument	15 … 30 V DC
– EExd-ia instrument	20 … 36 V DC
Operating voltage U_B - illuminated display and adjustment module	
– Non-Ex instrument	20 … 36 V DC
– EEx-ia instrument	20 … 30 V DC

− EExd-ia instrument	20 … 36 V DC

Permissible residual ripple

− < 100 Hz	$U_{ss} < 1$ V
− 100 Hz … 10 kHz	$U_{ss} < 10$ mV

Load resistor

− Calculation	$(U_B - U_{min})/0.022$ A
− Example - Non-Ex instrument with U_B= 24 V DC	(24 V - 15 V)/0.022 A = 410 Ω

Potential connections and electrical separating measures in the instrument

Electronics	Not non-floating
Reference voltage[16]	500 V AC
Conductive connection	Between ground terminal and metallic process fitting

Electrical protective measures

Protection rating

Housing material	Version	IP-protection class	NEMA protection
Plastic	Single chamber	IP 66/IP 67	Type 4X
	Double chamber	IP 66/IP 67	Type 4X
Aluminium	Single chamber	IP 66/IP 68 (0.2 bar)	Type 6P
		IP 68 (1 bar)	Type 6P
	Double chamber	IP 66/IP 67	Type 4X
		IP 66/IP 68 (0.2 bar)	Type 6P
		IP 68 (1 bar)	Type 6P
Stainless steel (electro-polished)	Single chamber	IP 66/IP 68 (0.2 bar)	Type 6P
Stainless steel (precision casting)	Single chamber	IP 66/IP 68 (0.2 bar)	Type 6P
		IP 68 (1 bar)	Type 6P
	Double chamber	IP 66/IP 67	Type 4X
		IP 66/IP 68 (0.2 bar)	Type 6P
		IP 68 (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[17]	4
Protection class	II (IEC 61010-1)

[16] Galvanic separation between electronics and metal housing parts
[17] When used with fulfilled housing protection

Functional safety (SIL)

Functional safety is already activated on instruments with SIL qualification ex factory. On instruments without SIL qualification ex factory, the functional safety must be activated by the user via the display and adjustment module or via PACTware for applications according to SIL.

Functional safety according to IEC 61508-4

 − Single channel architecture (1oo1D)   up to SIL2

 − double channel diversitary redundant   up to SIL3
   architecture (1oo2D)

You can find detailed information in the supplied Safety Manual of the instrument series or under "www.vega.com", "*Downloads*", "*Approvals*".

Approvals

Instruments with approvals can have different technical specifications depending on the version.

For that reason the associated approval documents of these instruments have to be carefully noted. They are part of the delivery or can be downloaded under www.vega.com, "*Instrument search (serial number)*" as well as in the general download area.

10.2 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
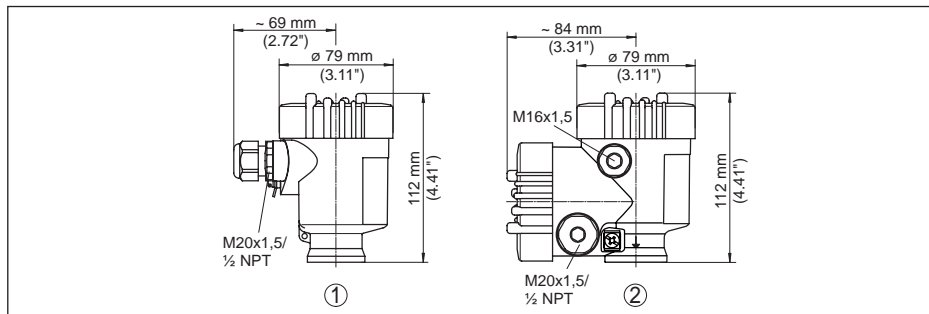
Fig. 34: Housing versions in protection IP 66/IP 67 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)

1   *Plastic single chamber*
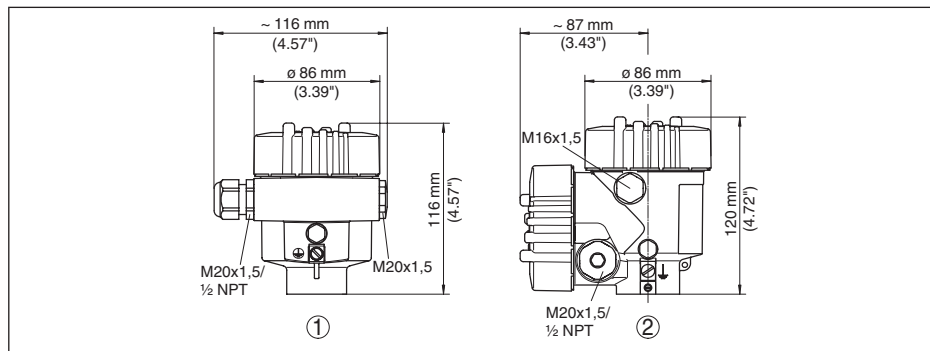2   *Plastic double chamber*

Aluminium housing

Fig. 35: Housing versions with protection rating IP 66/IP 68 (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

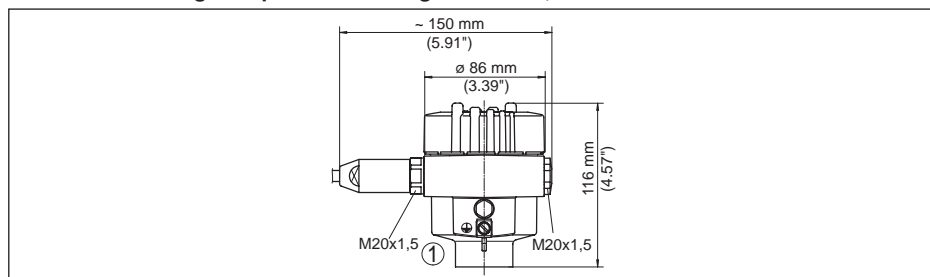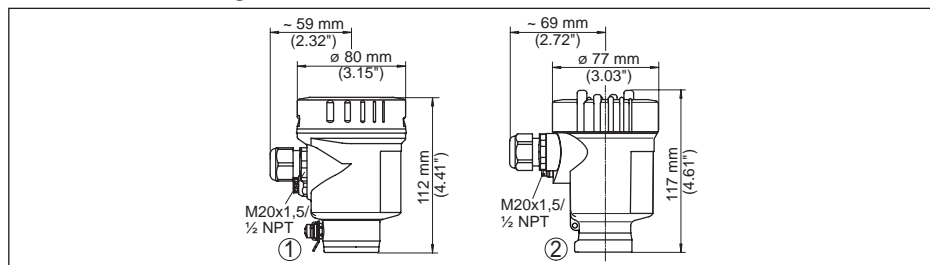## Aluminium housing with protection rating IP 66/IP 68, 1 bar

Fig. 36: Housing version with protection rating IP 66/IP 68 (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. 37: Housing versions with protection rating IP 66/IP 68 (0.2 bar), (with integrated display and adjustment module the housing at position 1 is 9 mm/0.35 in higher, with position 2 18 mm/0.71 in)

1   Stainless steel single chamber (electropolished)
2   Stainless steel single chamber (precision casting)

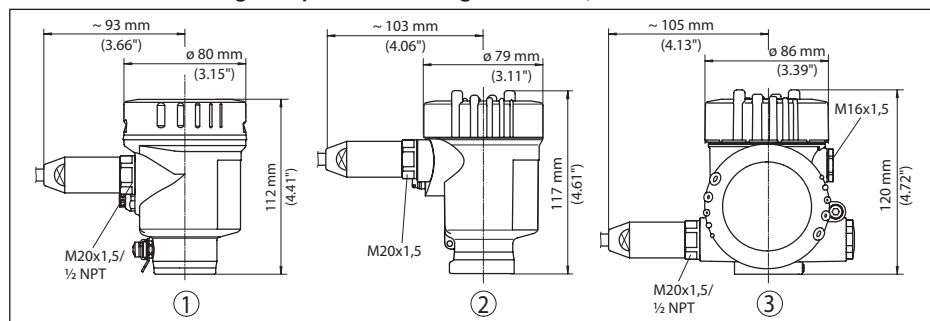**Stainless steel housing with protection rating IP 66/IP 68, 1 bar**

Fig. 38: Housing version with protection rating IP 66/IP 68 (1 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1   *Stainless steel single chamber (precision casting)*
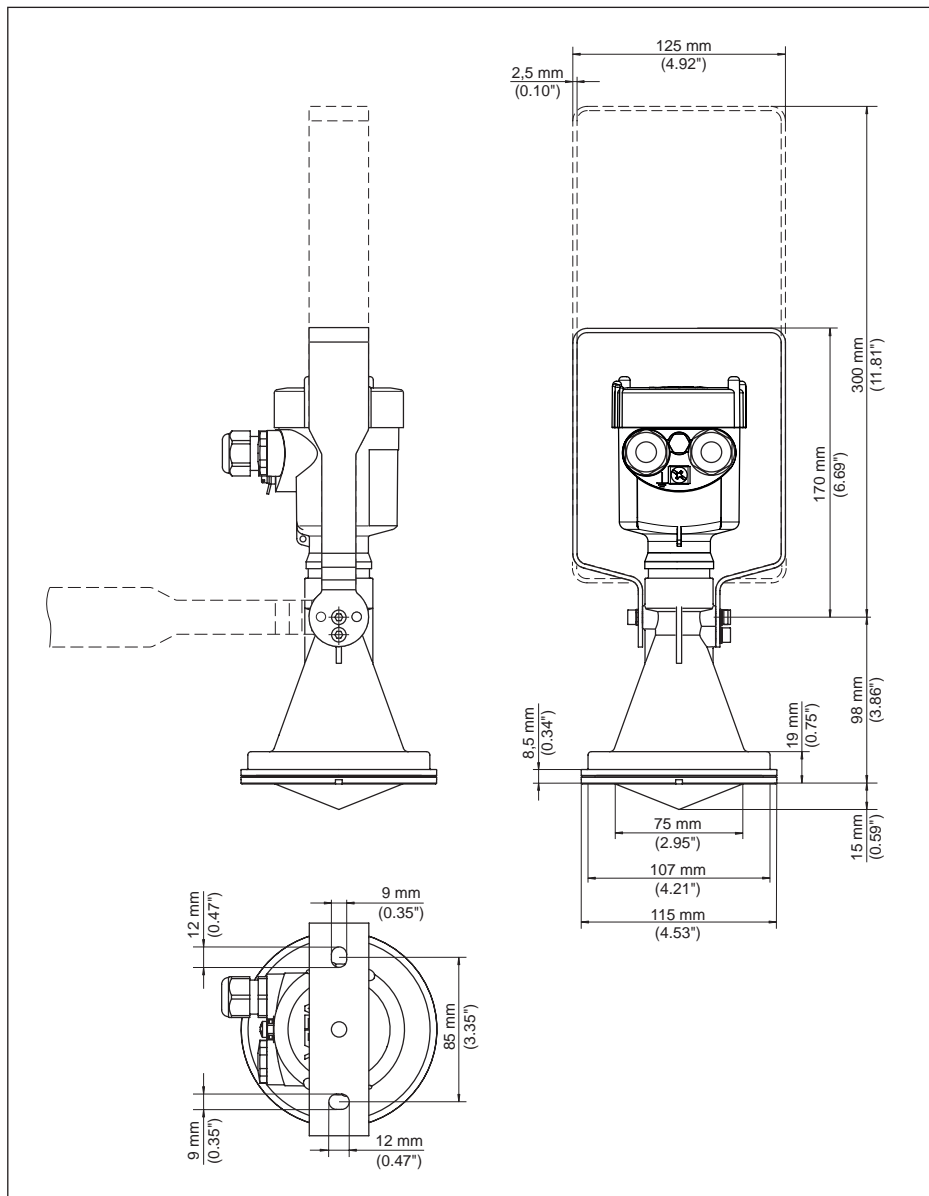
VEGAPULS 67, version with mounting strap

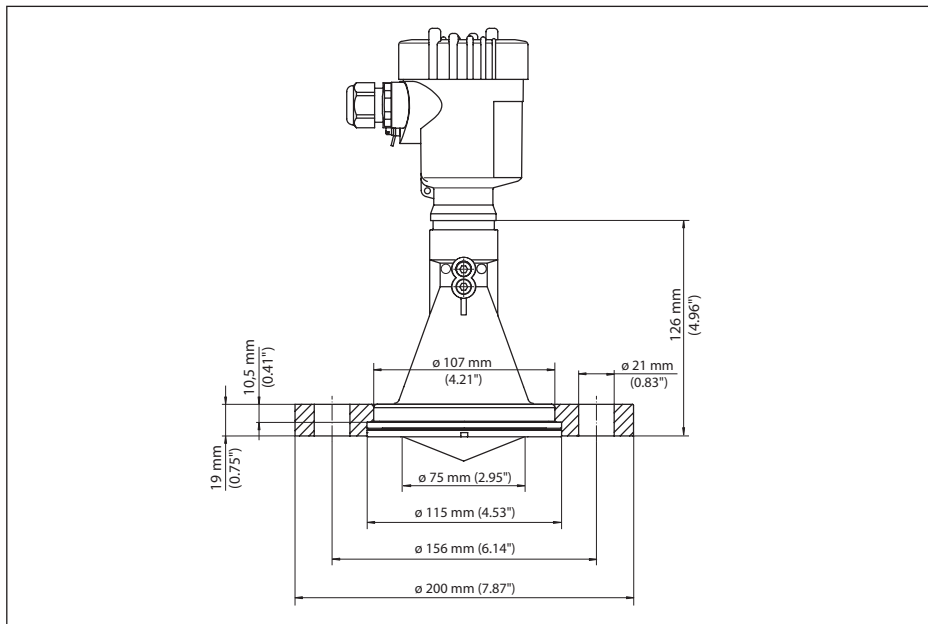*Fig. 39: VEGAPULS 67, version with mounting strap in 170 or 300 mm length*

VEGAPULS 67, version with compression flange

Fig. 40: VEGAPULS 67, compression flange DN 80, 3", JIS80
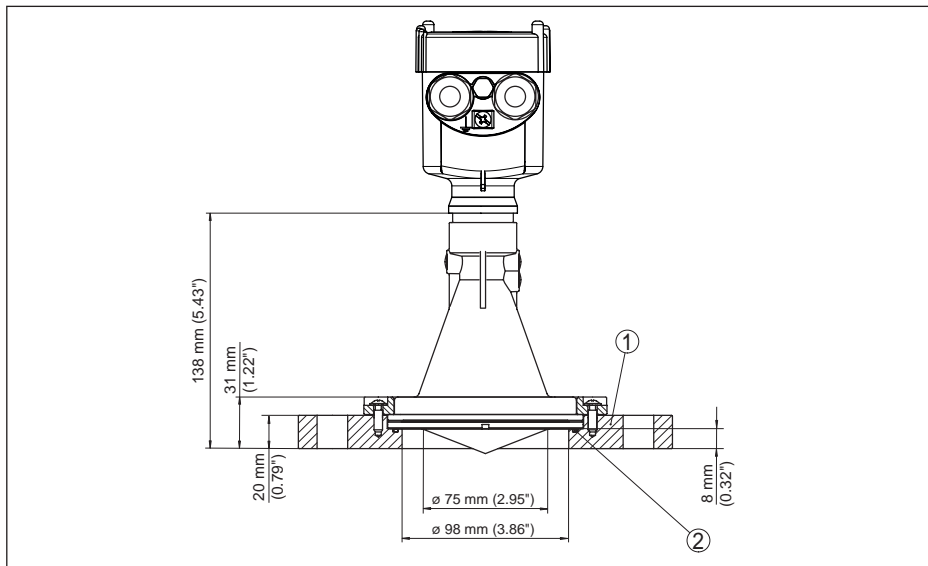
VEGAPULS 67, version with adapter flange

Fig. 41: VEGAPULS 67, adapter flange DN 100, DN 150

1   Adapter flange
2   Seal

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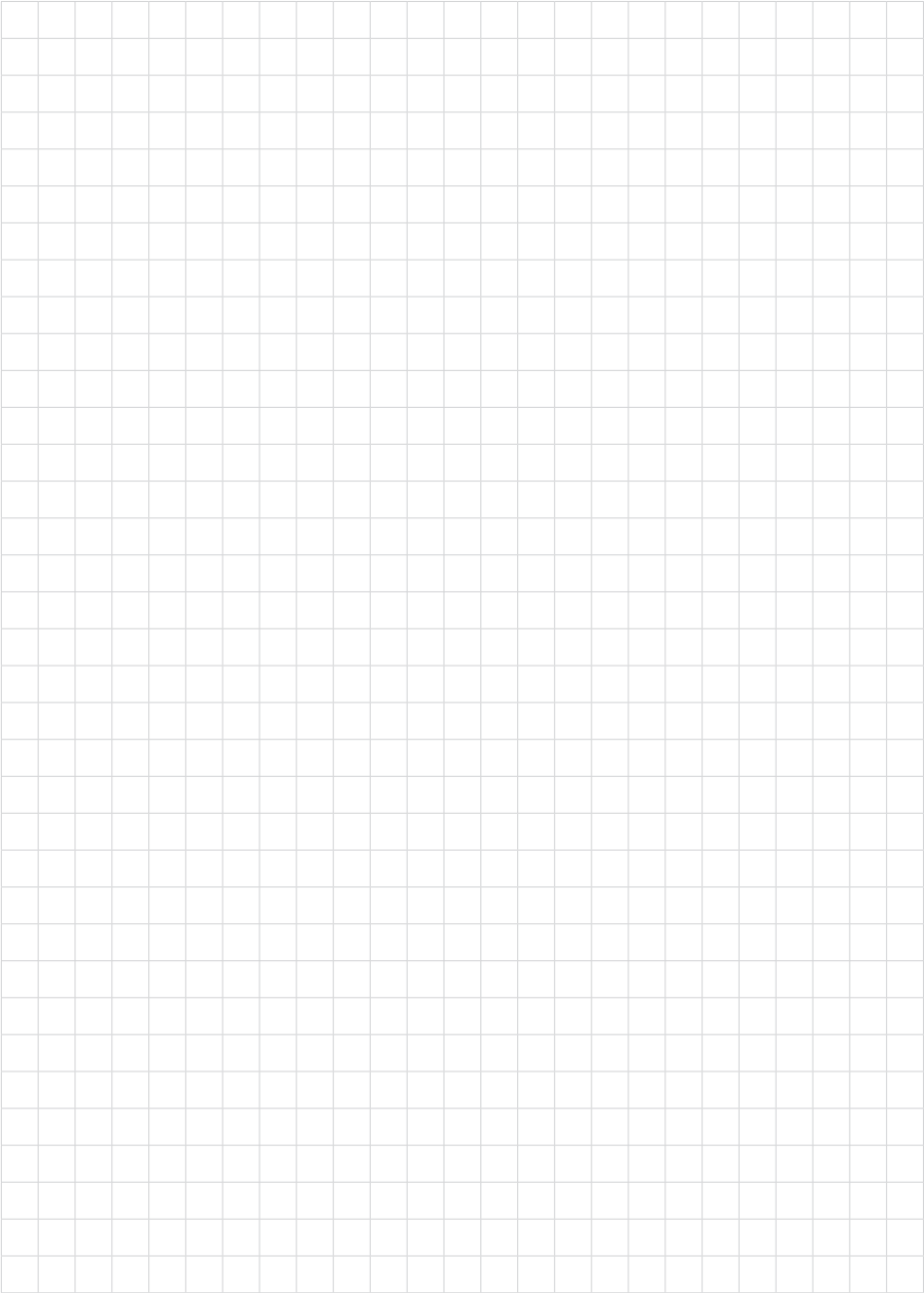
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