



# Product information

## Radar

Level measurement in liquids and bulk solids

VEGAPULS 6X



Document ID: 66377

# VEGA

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### Take note of safety instructions for Ex applications



Please note the Ex specific safety information which you can find on our homepage [www.vega.com/downloads](http://www.vega.com/downloads) under "Approvals" and which comes with every instrument. In hazardous areas you should take note of the corresponding regulations, conformity and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.

# 1 Overview

## 1.1 Application area

VEGAPULS 6X is a radar sensor for continuous level measurement of liquids and bulk solids.

The small process fittings offer particular advantages for liquids in small tanks or tight mounting spaces. The very good signal focusing ensures the use in vessels with many installations such as stirrers and heating spirals.

For bulk solids under most different process conditions, the device is ideal for level measurement in very high silos, large bunkers and segmented vessels. The VEGAPULS 6X is equipped with an encapsulated plastic antenna or a lens antenna integrated into the metal flange for this.

## 1.2 Applications

The VEGAPULS 6X can be used in almost all industrial areas and applications. It is selected and adapted simply by an application-orientated configuration and setup.

## 1.3 Your benefit

- Maintenance-free operation thanks to non-contact measuring principle
- High plant availability, because wear and maintenance free
- Exact measuring results independent of process conditions

## 1.4 Electronics versions

The device is available in different electronic versions.

In addition to 4 ... 20 mA/HART in two and four-wire versions, digital versions with Profibus PA, Foundation Fieldbus and Modbus protocol are also possible.

In addition, the VEGAPULS 6X can also be configured with integrated overvoltage arrester, additional current output as well as integrated radio module PLICSMOBILE 81.

## 1.5 Adjustment

### Adjustment directly at the measuring point

The adjustment of the instrument is carried out via the optional display and adjustment module PLICSCOM or via a PC with the adjustment software PACTware and corresponding DTM.

### Wireless adjustment via Bluetooth

The Bluetooth version of display and adjustment module enables a wireless connection to standard adjustment units. This can be smartphones/tablets with iOS or Android operating system or PCs with PACTware and Bluetooth USB adapter.



Fig. 1: Wireless connection to standard operating devices

Adjustment is hence carried out via a free-of-charge app from the Apple App Store or the Google Play Store or the adjustment software PACTware and respective DTM.

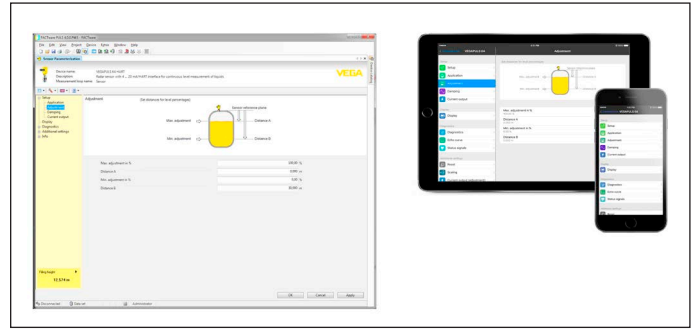


Fig. 2: Adjustment via PACTware or app

### Adjustment via remote systems

Further adjustment options are possible via a HART Communicator as well as manufacturer-specific programs such as AMS™ or PDM.

## 2 Technical data

VEGAPULS 6X



<b>Measuring range up to</b>	120 m (393.7 ft)
<b>Deviation, depending on the version</b>	≤ 1 mm
<b>Beam angle, depending on antenna</b>	3°
<b>Measuring frequency</b>	W-band (80 GHz technology) C-band (6 GHz technology) K-band (26 GHz technology)
<b>Process fitting</b>	Mounting strap Compression flanges from DN 80, 3" Thread from G $\frac{3}{4}$ , $\frac{3}{4}$ NPT Flanges from DN 20, $\frac{3}{4}$ " Encapsulated antenna system flanges from DN 50, 2" Flanges with swivelling holder from DN 100, 4"
<b>Process pressure</b>	-1 ... 25 bar (-100 ... 2500 kPa/-14.5 ... 362.6 psig)
<b>Process temperature</b>	-196 ... +450 °C (-321 ... +842 °F)
<b>Ambient, storage and transport temperature</b>	-40 ... +80 °C (-40 ... +176 °F)
<b>Operating voltage</b>	12 ... 35 V DC
<b>Output signal</b>	4 ... 20 mA/HART Profibus PA Foundation Fieldbus Modbus
<b>Bluetooth standard</b>	Bluetooth 5.0
<b>Effective range typ.</b>	25 m (82 ft) <sup>1)</sup>
<b>Adjustment</b>	Display and adjustment module PLICSCOM PACTware/DTM FDI incl. PA-DIM VEGA Tools app EDD
<b>Protection acc. to IEC 60529</b>	IP66/IP67 IP66/IP68 (0.2 bar) IP68 (1 bar) IP69K
<b>Protection acc. to NEMA</b>	Type 4X Type 6P

<sup>1)</sup> Depending on the local conditions

### 3 Functional principles

#### 3.1 Measuring principle

##### Measuring principle radar technology

The device transmits a high-frequency radar signal via its antenna. The emitted signal is reflected by the medium surface and received by the antenna as an echo. The difference between the emitted and the received signal is determined by special algorithms in the sensor electronics and converted into the level.

#### 3.2 Measured products

##### Liquids

Sensors in 80 GHz technology are suitable for continuous level measurement of liquids. The small process fittings offer particular advantages in small tanks or tight mounting spaces. The very good signal focusing ensures the use in vessels with many installations such as stirrers and heating spirals.

Sensors in 6 GHz and 26 GHz technology are used for continuous level measurement with special media such as acetone, ammonia or solvents.

##### Bulk solids

Sensors in 80 GHz technology also serve for continuous level measurement of bulk solids.

Due to the very good signal focusing, silo installations or buildups on the vessel wall have no influence. Highly sensitive electronics adapted to the requirements of bulk solids measurement enable reliable level measurement of different products up to 120 m.

#### 3.3 Antenna systems

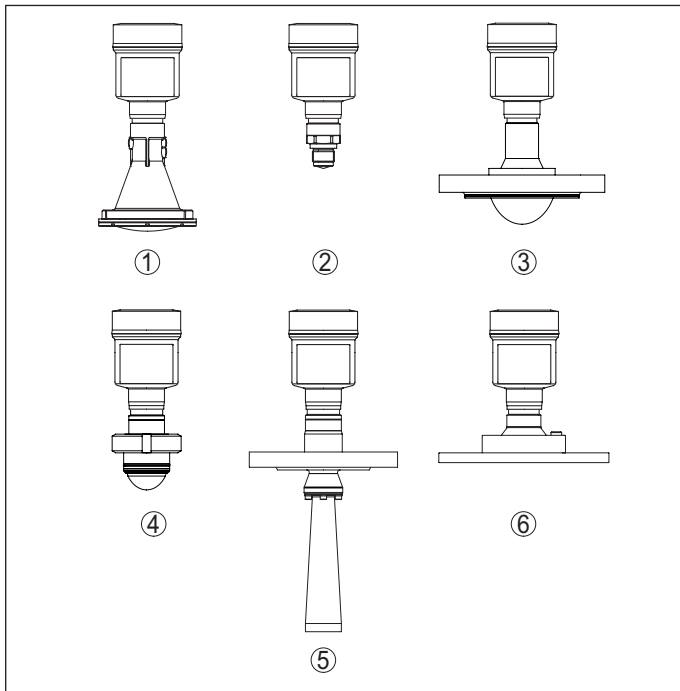


Fig. 3: Antenna systems VEGAPULS 6X for standard applications

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

##### Plastic horn antenna

The VEGAPULS 6X with plastic horn antenna is designed for continuous level measurement of liquids or bulk solids under simple process conditions.

This version is particularly suitable for flow measurement in open chan-

nels, for level measurement in waters as well as for bulk solids measurement in vessels of all kinds.

##### Thread with integrated antenna system

The VEGAPULS 6X with thread with integrated antenna system serves for continuous level measurement of liquids.

The small process connections offer special advantages in small tanks and the very good focusing in applications in large tanks.

##### Flange with encapsulated antenna system, hygienic fitting

The VEGAPULS 6X with this antenna system serves for continuous level measurement of aggressive liquids or with hygienic requirements. It is suitable for applications in storage tanks, process vessels, dosing vessels and reactors.

##### Flange with lens antenna

The VEGAPULS 6X with flange with lens antenna is used for continuous measurement of bulk solids.

This version is ideal for level measurement in very high silos, large bunkers and segmented vessels.

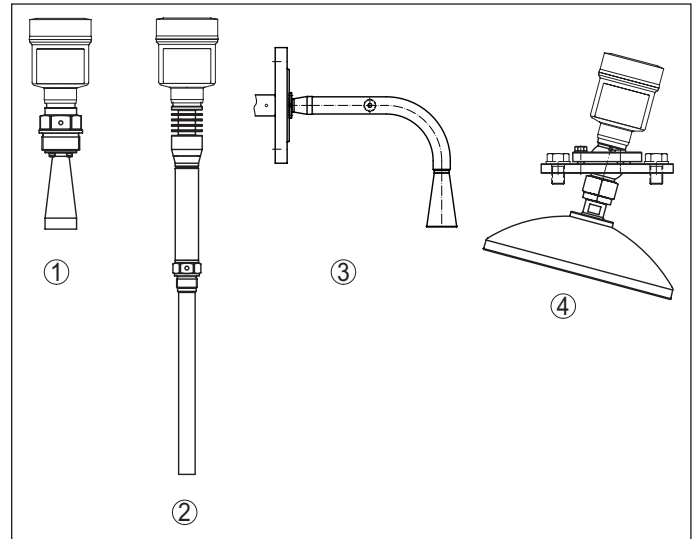


Fig. 4: Antenna systems VEGAPULS 6X for special applications

- 1 Horn antenna
- 2 Standpipe antenna
- 3 Angled antenna tube
- 4 Parabolic antenna

##### Horn antenna, standpipe antenna

The VEGAPULS 6X with horn or standpipe antenna serves for continuous level measurement of liquids. This version is suitable for applications in storage vessels, reactors and process vessels, even under extremely difficult process conditions.

Typical products are solvents, hydrocarbons and fuels.

##### Angled antenna tubes

The VEGAPULS 6X with angled antenna tube serves for continuous level measurement of liquids under difficult process conditions and confined installation conditions.

This version is suitable for applications in process vessels or reactors.

##### Parabolic antenna







The VEGAPULS 6X with parabolic antenna is particularly suitable for measurement of products with low  $\epsilon_r$  value at great measuring distances.

## 4 Instrument selection

Application		Antenna version							
		Plastic horn antenna	Thread with integrated antenna system	Flange with encapsulated antenna system, hygienic fitting	Flange with lens antenna	Horn antenna	Stand-pipe antenna	Antenna extension	Parabolic antenna
Liquids	Storage tank	●	●	●	-	-	-	-	-
	Stirrer vessel	○	●	●	-	●	○	-	-
	Dosing vessel	○	●	●	-	●	-	-	-
	Reaction vessel	-	○	●	-	●	●	-	-
	Filling vessels	-	○	●	-	-	-	-	-
	Measurement in the bypass tube	●	○	●	-	●	●	-	-
	Vessel/Collecting basin	●	●	-	-	-	-	-	-
	Plastic tank (measurement through vessel ceiling)	●	●	-	-	-	-	-	-
	Transportable plastic tank (IBC)	●	●	-	-	-	-	-	-
	Gauge measurement in waters	●	●	-	-	-	-	-	○
	Flow measurement flume/Overfall	●	○	-	-	-	-	-	-
	Pumping station/Pump shaft	●	○	-	-	-	-	-	-
	Overflow basin	●	○	-	-	-	-	-	-
	Bulk solids	Silo (slender and high)	●	-	-	●	○	-	-
Bunker (large-volume)		●	-	-	●	○	-	-	●
Bunker with fast filling		●	-	-	●	-	-	-	●
Crusher		●	-	-	●	-	-	-	●
Heap (point measurement/profile detection)		●	-	-	●	-	-	-	●
Processes	Simple process conditions	●	●	●	●	○	○	○	-
	Difficult process conditions	-	●	●	●	●	●	●	●
	Aggressive liquids	○	○	●	-	○	-	-	-
	Bubble or foam generation	●	○	●	-	●	●	●	-
	Wave movements at the surface	●	○	●	-	●	●	●	●
	Steam or condensation	●	●	●	●	●	●	●	-
	Buildup	●	●	●	●	○	-	-	○
Industries	Chemical	-	●	●	●	●	●	●	○
	Power generation	●	●	●	●	●	●	-	●
	Foodstuffs	-	●	●	●	●	-	-	○
	Metal production	●	●	●	●	●	●	●	○
	Offshore	-	●	●	-	●	●	●	-
	Paper	●	●	●	●	●	-	-	-
	Petrochemical	-	●	●	○	●	●	●	-
	Pharmaceutical	●	●	●	●	●	●	-	-
	Shipbuilding	-	-	●	●	●	-	●	-
	Environment and recycling industry	●	●	●	●	●	○	-	●
	Water, waste water	○	○	-	-	●	○	-	●
	Cement industry	●	●	-	●	●	-	●	●

- Recommended, typical use
- Possible but not typical use
- Unintended use

## 5 Antenna selection

Version	Size	Beam angle <sup>2)</sup>	Process temperature <sup>3)</sup>	Process pressure <sup>4)</sup>	Wetted materials	Liquids	Bulk solids
Plastic horn antenna 	DN 80	3°	-40 ... +80 °C -40 ... +176 °F	-1 ... 2 bar -100 ... 200 kPa/-14.5 ... 29.1 psig	Antenna: PP	●	●
Thread with integrated antenna system 	G¾, ¾ NPT	14°	-40 ... +250 °C -40 ... +482 °F	-1 ... 40 bar -100 ... 4000 kPa/-14.5 ... 580.2 psig	Antenna: PEEK Seal: FKM, FFKM, EPDM	●	–
	G1, 1 NPT	10°				●	–
	G1½, 1½ NPT (+250 °C)	10°				●	○
	G1½, 1½ NPT (+150 °C)	7°				●	○
Flange with encapsulated antenna system 	≥ DN 25	10°	-60 ... +200 °C 76 ... +392 °F	-1 ... 25 bar -100 ... 2500 kPa/-14.5 ... 362.6 psig	Antenna: PTFE, PFA	●	–
	≥ DN 50, 2"	6°				●	○
	≥ DN 80, 3"	3°				●	○
Hygienic fittings 	≥ DN 25	10°	-40 ... +150 °C -40 ... +302 °F	-1 ... 25 bar -100 ... 2500 kPa/-14.5 ... 362.6 psig	Antenna: PEEK Seal: PTFE, FKM, FFKM, EPDM	●	–
	≥ DN 50, 2"	8°				●	○
Horn antenna 	ø40 mm	7°	-40 ... +150 °C	-1 ... 160 bar -100 ... 16000 kPa/-14.5 ... 2320 psig	Antenna impedance cone: ceramic Seal: FKM, FFKM, Grafit	●	○
	ø48 mm	6°	-40 ... +302 °F			●	○
	ø75 mm	3°	-40 ... +250 °C -40 ... +482 °F -196 ... +450 °C -321 ... +842 °F			●	●
Flange with lens antenna 	≥ DN 80, 3"	3°	-40 ... +250 °C -40 ... +482 °F	-1 ... 3 bar -100 ... 300 kPa/-14.5 ... 43.5 psig	Antenna: PEEK Seal: FKM, FFKM, EPDM	○	●








- Recommended, typical use
- Possible but not typical use
- Unintended use

<sup>2)</sup> Area with the highest energy of the radar signal

<sup>3)</sup> Depending on process fitting

<sup>4)</sup> Depending on process fitting

## 6 Housing overview

<b>Plastic PBT</b>			
<b>Protection rating</b>	IP66/IP67	IP66/IP67	
<b>Version</b>	Single chamber	Double chamber	
<b>Application area</b>	Industrial environment	Industrial environment	
<b>Aluminium</b>			
<b>Protection rating</b>	IP66/IP67, IP66/IP68 (1 bar)	IP66/IP67, IP66/IP68 (1 bar)	
<b>Version</b>	Single chamber	Double chamber	
<b>Application area</b>	Industrial environment with increased mechanical stress	Industrial environment with increased mechanical stress	
<b>Stainless steel 316L</b>			
<b>Protection rating</b>	IP66/IP67	IP66/IP67, IP66/IP68 (1 bar)	IP66/IP67, IP66/IP68 (1 bar)
<b>Version</b>	Single chamber, electropolished	Single chamber, precision casting	Double chamber, precision casting
<b>Application area</b>	Aggressive environment, food processing, pharmaceutical	Aggressive environment, extreme mechanical stress	Aggressive environment, extreme mechanical stress



## 7 Electronics - Two-wire 4 ... 20 mA/HART

### Configuration of the electronics

The plug-in electronics is mounted in the electronics compartment of the instrument and can be exchanged by the user when servicing is required. The electronics is completely encapsulated to protect against vibration and moisture.

The terminals for voltage supply as well as the contact pins with I<sup>2</sup>C interface for parameter adjustment are located on the upper side of the electronics. In the double-chamber housing, the terminals are located in the separate terminal compartment.

### 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.

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

Specifications of the voltage supply:

- Operating voltage
  - 12 ... 35 V DC

Further data on the power supply can be found in chapter " *Technical data*" in the operating instructions manual of the respective instrument.

### Connection cable

The instrument is connected with standard two-wire cable without shielding. If electromagnetic interference is expected which is above the test values of EN 61326-1 for industrial areas, shielded cable should be used. We generally recommend the use of shielded cable for HART multidrop mode.

### Cable screening and grounding

If shielded cable is required, we recommend connecting the cable screening on both ends to ground potential. In the sensor, the cable screening 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).

### Connection single chamber housing

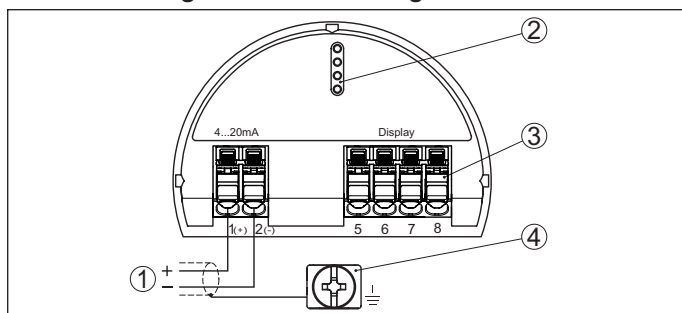


Fig. 5: Electronics and connection compartment - single chamber housing

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

### Connection, double chamber housing

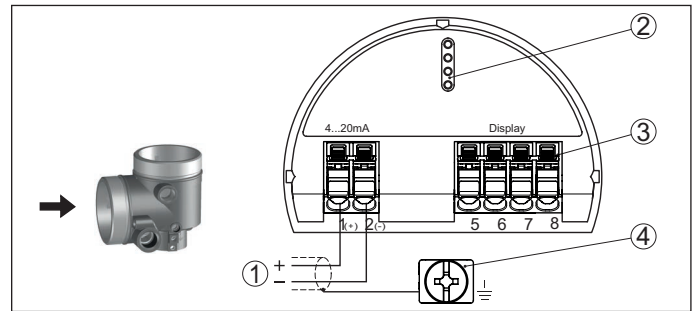


Fig. 6: Connection compartment - double chamber housing

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

### Connection double chamber housing - with overvoltage arrester

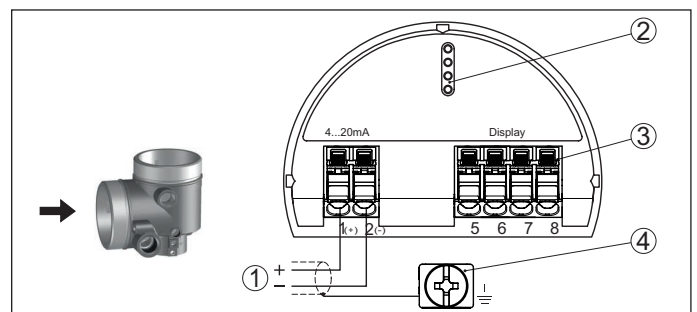


Fig. 7: Connection compartment - double chamber housing

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

### Connection double chamber housing - plus second current output

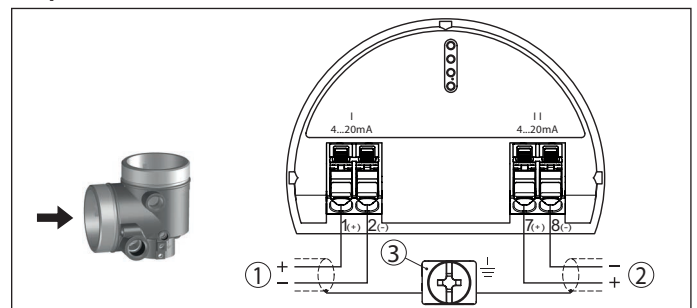


Fig. 8: Connection compartment double chamber housing - plus second current output

- 1 First current output (I) - Voltage supply and signal output, sensor (HART)
- 2 Second current output (II) - Voltage supply and signal output (without HART)
- 3 Ground terminal for connection of the cable screening

## 8 Electronics - Two-wire 4 ... 20 mA/HART, with integrated radio module PLICSMOBILE 81

### Configuration of the electronics

The plug-in electronics is mounted in the electronics compartment of the instrument and can be exchanged by the user when servicing is required. The electronics is completely encapsulated to protect against vibration and moisture.

The terminals for voltage supply as well as the contact pins with I<sup>2</sup>C interface for parameter adjustment are located on the upper side of the electronics. In the double-chamber housing, the terminals are located in the separate terminal compartment.

### Voltage supply

The voltage is supplied by the integrated radio module PLICSMOBILE 81.

You can find the data of the voltage supply in chapter " *Technical data* " in the operating instructions manual of the respective instrument.

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

Specifications of the voltage supply:

- Operating voltage
  - 9.6 ... 32 V DC

Further data on the power supply can be found in chapter " *Technical data* " in the operating instructions manual of the respective instrument.

### Connection cable

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

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

### Cable screening and grounding

If shielded cable is required, we recommend connecting the cable screening on both ends to ground potential. In the sensor, the cable screening 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).

### Connection single chamber housing

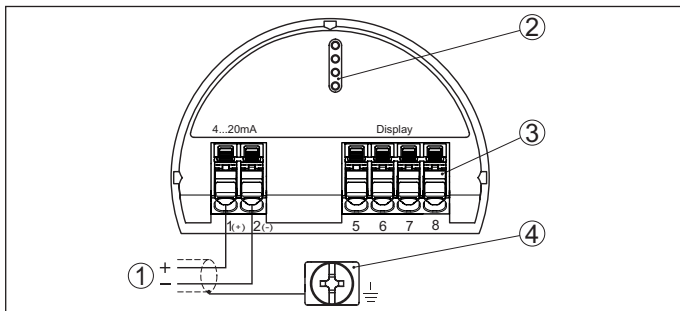


Fig. 9: Electronics and connection compartment - single chamber housing

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

### Connection - radio module PLICSMOBILE 81

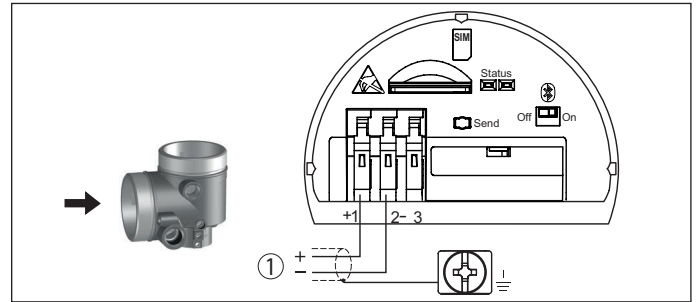


Fig. 10: Connection compartment - Radio module PLICSMOBILE 81

- 1 Voltage supply

### Connection of other sensors via HART-Multidrop

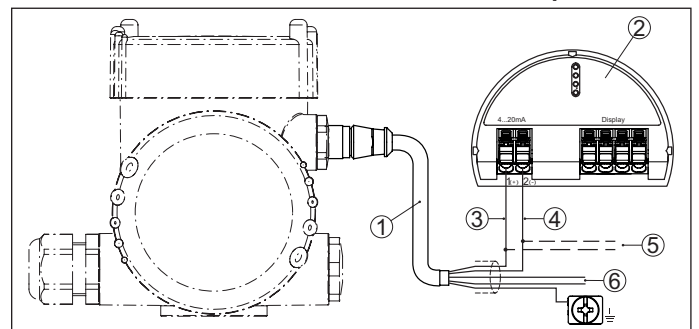


Fig. 11: Connection of other plics® sensors

- 1 Sensor connection cable
- 2 HART sensor from the plics® series
- 3 Brown wire (+) for sensor power supply/HART communication
- 4 Blue wire (-) for sensor power supply/HART communication
- 5 Connection of additional HART sensors
- 6 Unused wires that must be insulated (not present on Ex version)

## 9 Electronics - Four-wire 4 ... 20 mA/HART

### Configuration of the electronics

The plug-in electronics is mounted in the electronics compartment of the instrument and can be exchanged by the user when servicing is required. The electronics is completely encapsulated to protect against vibration and moisture.

The contact pins with I<sup>2</sup>C interface for parameter adjustment are located on the upper side of the electronics. The terminals for the power supply are located in the separate connection compartment.

### Voltage supply

If a reliable separation is required, the power supply and the current output are transmitted over separate two-wire connection cables.

- Operating voltage with version for low voltage
  - 9.6 ... 48 V DC, 20 ... 42 V AC, 50/60 Hz
- Operating voltage with version for mains voltage
  - 90 ... 253 V AC, 50/60 Hz

### Connection cable

The 4 ... 20 mA current output is connected with standard two-wire cable without shielding. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, shielded cable should be used.

For voltage supply, an approved installation cable with PE conductor is required.

### Cable screening and grounding

If shielded cable is required, we recommend connecting the cable screening on both ends to ground potential. In the sensor, the cable screening 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).

### Electronics compartment - double chamber housing

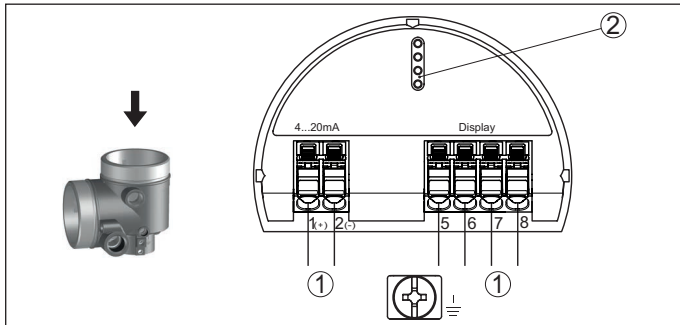


Fig. 12: Electronics compartment - double chamber housing

- 1 Internal connection to the connection compartment
- 2 For display and adjustment module or interface adapter

### Connection double chamber housing - low voltage

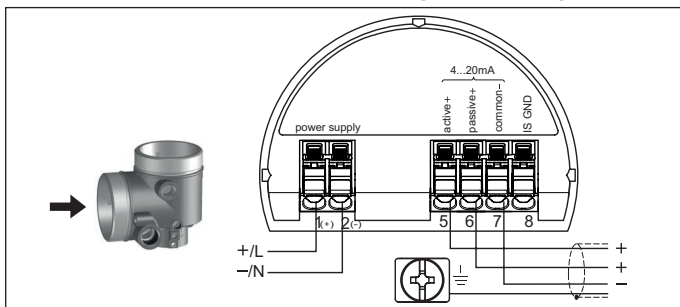


Fig. 13: Connection compartment with double chamber housing - low voltage

### Connection double chamber housing - mains voltage

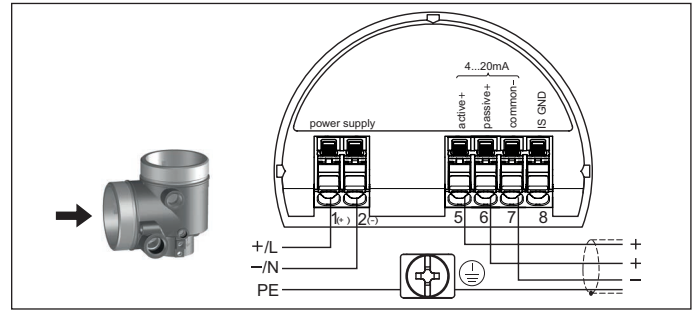


Fig. 14: Connection compartment with double chamber housing - mains voltage

Terminal	Function	Polarity
1	Voltage supply	+/L
2	Voltage supply	-/N
5	4 ... 20 mA output (active)	+
6	4 ... 20 mA output (passive)	+
7	Mass - output	-
8	Functional ground with installation according to CSA	

## 10 Electronics - Profibus PA

### Configuration of the electronics

The plug-in electronics is mounted in the electronics compartment of the instrument and can be exchanged by the user when servicing is required. The electronics is completely encapsulated to protect against vibration and moisture.

The terminals for voltage supply as well as the contact pins with I<sup>2</sup>C interface for parameter adjustment are located on the upper side of the electronics. In the double-chamber housing, the terminals are located in the separate terminal compartment.

### Voltage supply

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

Specifications of the voltage supply:

- Operating voltage
  - 9 ... 32 V DC
- Max. number of sensors per DP/PA segment coupler
  - 32

### Connection cable

Connection is carried out with shielded cable according to Profibus specification.

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

### Cable screening and grounding

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

In systems without potential equalisation, connect the cable shielding directly to ground potential on the power supply unit and the sensor. In the connection box or T-distributor, the shielding of the short stub to the sensor may not be connected to ground potential or to another cable screening.

### Connection single chamber housing

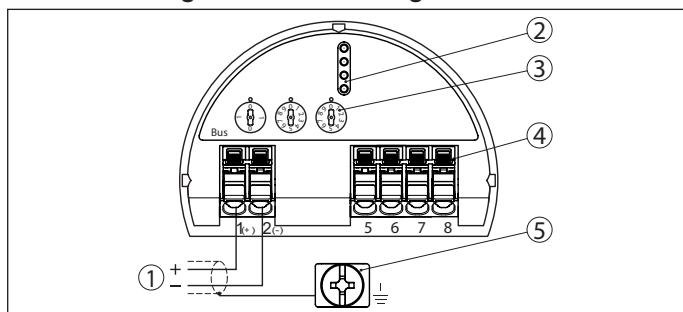


Fig. 15: Electronics and connection compartment - single chamber housing

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

### Electronics compartment - double chamber housing

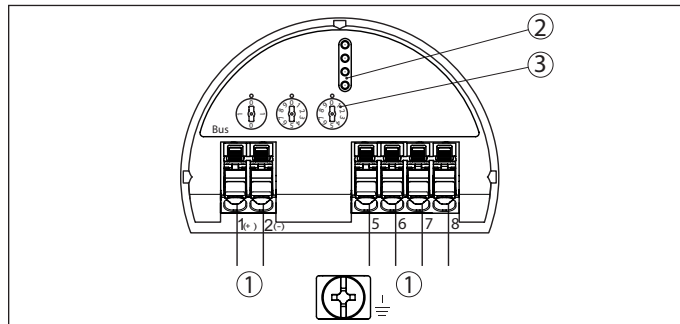


Fig. 16: Electronics compartment - double chamber housing

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

### Connection, double chamber housing

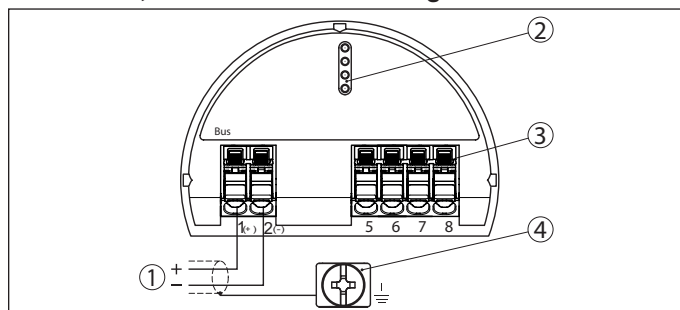


Fig. 17: Connection compartment, double chamber housing

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

## 11 Electronics - Foundation Fieldbus

### Configuration of the electronics

The plug-in electronics is mounted in the electronics compartment of the instrument and can be exchanged by the user when servicing is required. The electronics is completely encapsulated to protect against vibration and moisture.

The terminals for voltage supply as well as the contact pins with I<sup>2</sup>C interface for parameter adjustment are located on the upper side of the electronics. In the double-chamber housing, the terminals are located in the separate terminal compartment.

### Voltage supply

Power supply via the H1 Fieldbus cable.

Specifications of the voltage supply:

- Operating voltage
  - 9 ... 32 V DC
- max. number of sensors
  - 32

### Connection cable

Connection is carried out with shielded cable according to Fieldbus specification.

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

### Cable screening and grounding

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

In systems without potential equalisation, connect the cable shielding directly to ground potential on the power supply unit and the sensor. In the connection box or T-distributor, the shielding of the short stub to the sensor may not be connected to ground potential or to another cable screening.

### Single chamber housing

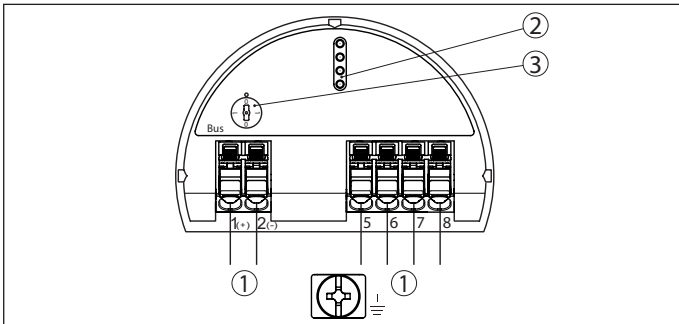


Fig. 18: Electronics and connection compartment - single chamber housing

- 1 Voltage supply/Signal output
- 2 Contact pins for the display and adjustment module or interface adapter
- 3 Selection switch for bus address
- 4 For external display and adjustment unit
- 5 Ground terminal for connection of the cable screening

### Electronics compartment - double chamber housing

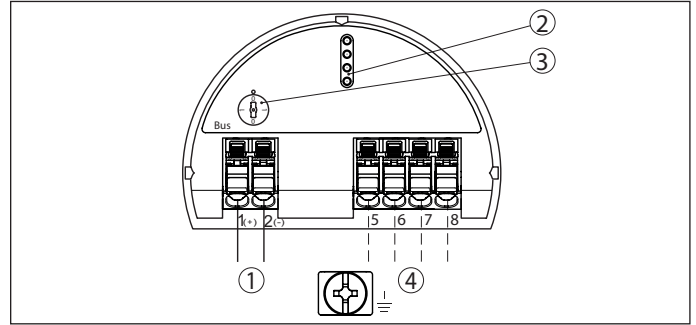


Fig. 19: Electronics compartment - double chamber housing

- 1 Internal connection to the connection compartment
- 2 Contact pins for the display and adjustment module or interface adapter
- 3 Simulation switch ("1" = mode for simulation release)

### Connection, double chamber housing

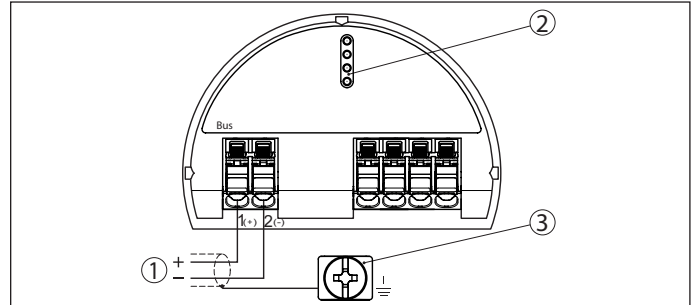


Fig. 20: Connection compartment - double chamber housing

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

## 12 Electronics - Modbus, Levelmaster protocol

### Configuration of the electronics

The plug-in electronics is mounted in the electronics compartment of the instrument and can be exchanged by the user when servicing is required. The electronics is completely encapsulated to protect against vibration and moisture.

A plug with USB interface for parameter adjustment is located on top of the electronics.

The supplementary electronics with connection terminals for connection to the voltage supply and the Modbus are accommodated in the separate connection compartment.

### Voltage supply

Power supply via the Modbus host (RTU)

- Operating voltage
  - 8 ... 30 V DC
- max. number of sensors
  - 32

### Connection cable

The instrument is connected with standard two-wire, twisted cable suitable for RS 485. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, shielded cable should be used.

For power supply, a separate two-wire cable is required.

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

### Cable screening and grounding

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

In systems without potential equalisation, connect the cable shielding directly to ground potential on the power supply unit and the sensor. In the connection box or T-distributor, the shielding of the short stub to the sensor may not be connected to ground potential or to another cable screening.

### Connection, double chamber housing

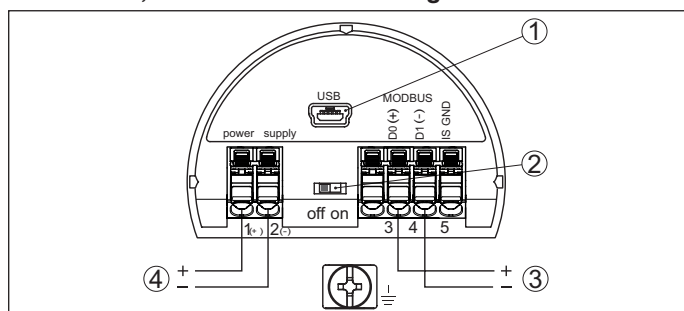


Fig. 21: Connection compartment - double chamber housing

- 1 USB interface
- 2 Slide switch for integrated termination resistor (120 Ω)
- 3 Modbus signal
- 4 Voltage supply

## 13 Adjustment

### 13.1 Adjustment directly at the measuring point

#### Via the display and adjustment module through keys

The plug-in display and adjustment module is used for measured value indication, adjustment and diagnosis. It is equipped with an illuminated full dot matrix as well as four keys for adjustment.



Fig. 22: Display and adjustment module with single chamber housing

#### Via a PC with PACTware/DTM

The interface converter VEGACONNECT is required for connection of the PC. The converter is placed on the sensor instead of the display and adjustment module and connected to the USB interface of the PC.



Fig. 23: Connection of the PC via VEGACONNECT and USB

- 1 VEGACONNECT
- 2 Sensor
- 3 USB cable to the PC
- 4 PC with PACTware/DTM

PACTware is an adjustment software for configuration, parameter adjustment, documentation and diagnosis of field devices. The corresponding device drivers are called DTMs.

### 13.2 Operation in the measurement loop environment - wireless via Bluetooth

#### Via a smartphone/tablet

The display and adjustment module with integrated Bluetooth functionality allows wireless connection to smartphones/tablets with iOS or Android operating system. The adjustment is carried out via the VEGA Tools app from the Apple App Store or Google Play Store.

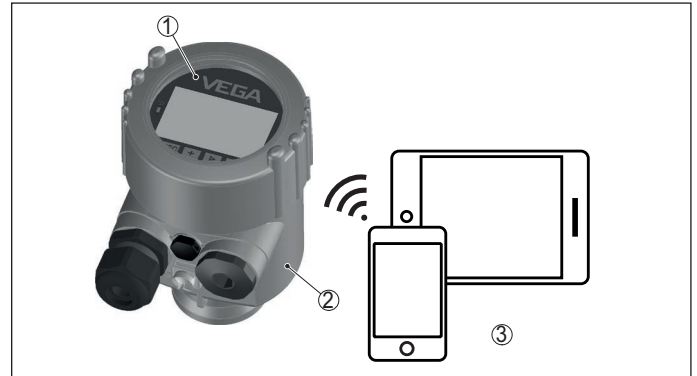


Fig. 24: Wireless connection to smartphones/tablets

- 1 Display and adjustment module
- 2 Sensor
- 3 Smartphone/Tablet

#### Via a PC with PACTware/DTM

The wireless connection from the PC to the sensor is carried out via the Bluetooth USB adapter and a display and adjustment module with integrated Bluetooth function. The adjustment is carried out via the PC with PACTware/DTM.

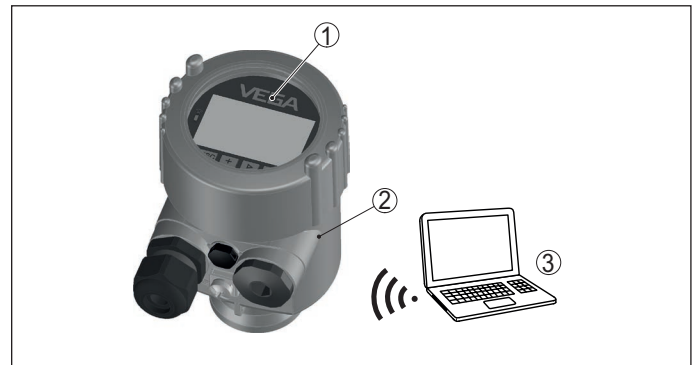


Fig. 25: Connection of the PC via Bluetooth USB adapter

- 1 Display and adjustment module
- 2 Sensor
- 3 PC with PACTware/DTM

### 13.3 Adjustment carried out at position remote from the measuring point - wired

#### Via external display and adjustment units

For this, the external display and adjustment units VEGADIS 81 and 82 are available. The adjustment is carried out via the keys of the built-in display and adjustment module.

The VEGADIS 81 is mounted at a distance of 50 m from the sensor and directly to the sensor electronics. VEGADIS 82 is looped directly into the signal cable at any point.

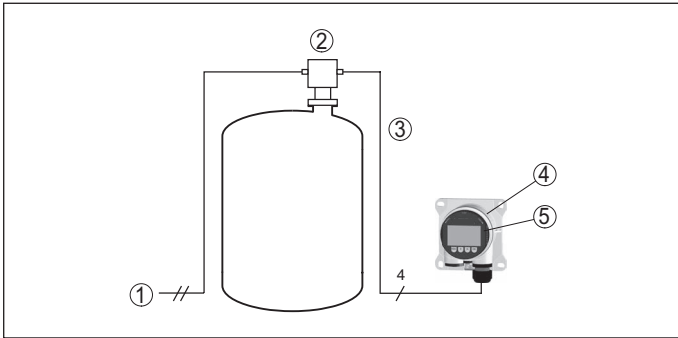


Fig. 26: Connection of VEGADIS 81 to the sensor

- 1 Voltage supply/Signal output sensor
- 2 Sensor
- 3 Connection cable sensor - external display and adjustment unit
- 4 External display and adjustment unit
- 5 Display and adjustment module

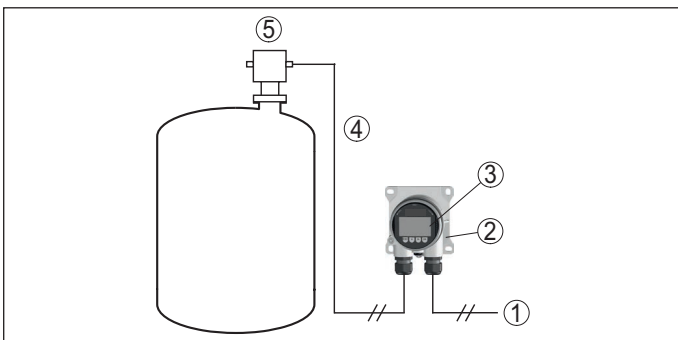


Fig. 27: Connection of VEGADIS 82 to the sensor

- 1 Voltage supply/Signal output sensor
- 2 External display and adjustment unit
- 3 Display and adjustment module
- 4 ... 20 mA/HART signal cable
- 5 Sensor

#### Via a PC with PACTware/DTM

The sensor adjustment is carried out via a PC with PACTware/DTM.

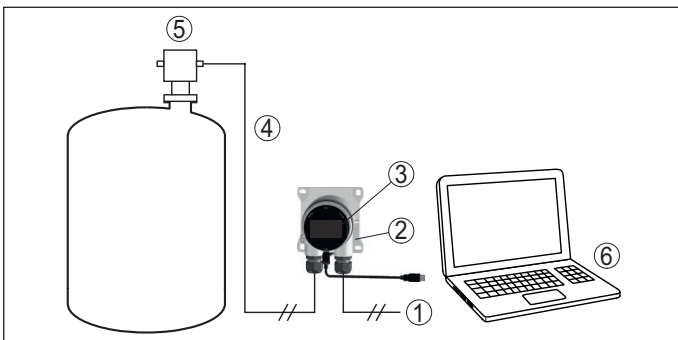


Fig. 28: Connection of VEGADIS 82 to the sensor, adjustment via PC with PACTware

- 1 Voltage supply/Signal output sensor
- 2 External display and adjustment unit
- 3 VEGACONNECT
- 4 ... 20 mA/HART signal cable
- 5 Sensor
- 6 PC with PACTware/DTM

### 13.4 Adjustment carried out at position remote from the measuring point - wireless through mobile network

As an option, the radio module PLICSMOBILE can be mounted into a plics® sensor with double chamber housing. It is used for transmission of measured values and for remote parameter adjustment of the sensor.

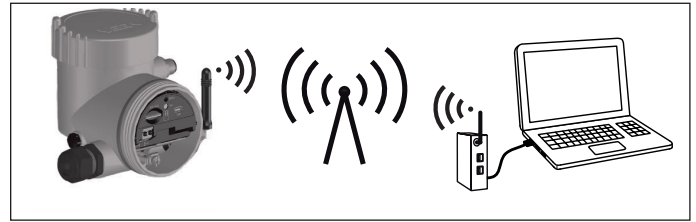


Fig. 29: Transmission of measured values and remote parameter adjustment of the sensor via mobile phone network.

### 13.5 Alternative adjustment programs

#### DD adjustment programs

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

The files can be downloaded at [www.vega.com/downloads](http://www.vega.com/downloads) under "Software".

#### Field Communicator 375, 475

Device descriptions for the instruments are available as EDD for parameterisation with Field Communicator 375 or 475.

Integrating the EDD into the Field Communicator 375 or 475 requires the "Easy Upgrade Utility" software, which is available from the manufacturer. This software is updated via the Internet and new EDDs are automatically accepted into the device catalogue of this software after they are released by the manufacturer. They can then be transferred to a Field Communicator.



## 14 Safety concept

### 14.1 Safety Integrity Level (SIL)

#### Background

In case of dangerous failures, processing facilities and machines can cause risks for persons, environment and property. The risk of such failures must be judged by the plant operator. Dependent thereon are measures for risk reduction through error prevention, error detection and fault control.

#### Plant safety by risk reduction

The part of plant safety depending on the correct functioning of safety-related components for risk reduction is called functional safety. Components used in such safety-instrumented systems (SIS) must therefore execute their intended function (safety function) with a defined high probability.

#### Standards and safety levels

The safety requirements for such components are described in the international standards IEC 61508 and 61511, which set the standard for uniform and comparable judgement of instrument and plant (or machine) safety and hence contribute to worldwide legal certainty. We distinguish between four safety levels, from SIL1 for low risk to SIL4 for very high risk (SIL = Safety Integrity Level), depending on the required degree of risk reduction.

#### Properties and requirements

When developing instruments that can be used in safety-instrumented systems, the focus is on avoiding systematic errors as well as determining and controlling random errors.

Here are the most important characteristics and requirements from the perspective of functional safety according to IEC 61508 (Edition 2):

- Internal monitoring of safety-relevant circuit parts
- Extended standardization of the software development
- In case of failure, switching of the safety-relevant outputs to a defined safe state
- Determination of the failure probability of the defined safety function
- Reliable parameterization with non-safe user environment
- Proof test

#### Safety Manual

The SIL qualification of components is specified in a manual on functional safety (Safety Manual). Here, you can find all safety-relevant characteristics and information the user and the planner need for planning and operating the safety-instrumented system. This document is attached to each instrument with SIL rating and can be also found on our homepage via the search.

### 14.2 IT Security

#### Overview

The device is available as a version with IT security according to IEC 62443-4-2 or in preparation. To ensure that the staggered safety strategy of the device is effective as intended, the requirements from the VEGA "Security Guidelines" as well as the "Component Requirements" must be observed.

You can find the corresponding VEGA "Security Guidelines" as well as the certification on our homepage, the "Component Requirements" via "myVEGA".

#### Defense-in-Depth strategy

The defence-in-depth strategy is a staggered security concept that encompasses several IT security layers. It includes plant security, network security and the system component security strategy.

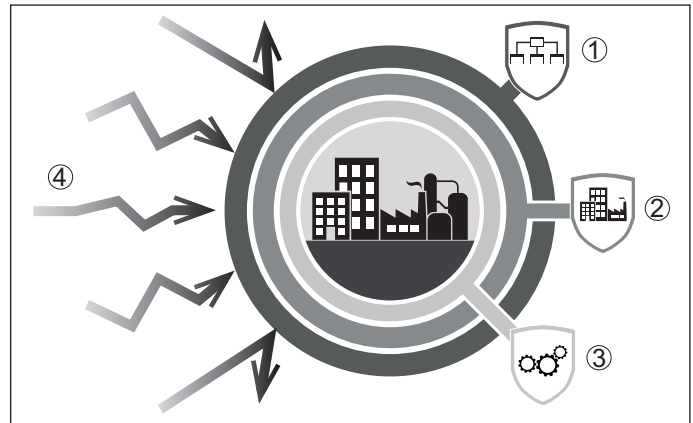


Fig. 30: Defense-in-Depth strategy

- 1 IT security management
- 2 System security
- 3 Device safety
- 4 Cyber threats

#### Security scope

In compliance with the application guidelines, the device provides protection against the following threats:

- Data manipulation (violation of integrity)
- Denial of Service DoS (violation of availability)
- Spying (breach of confidentiality)

#### Safety functions

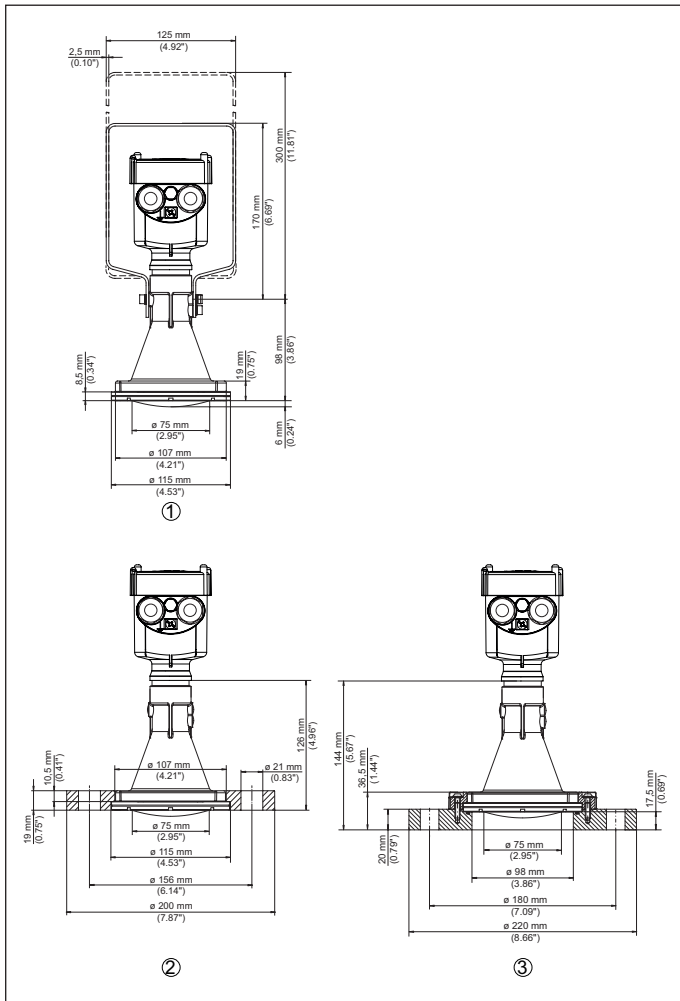
The device has proven safety functions:

- User authentication
- Event memory (logging)
- Integrity check of the software
- Resource management
- Data backup for recovery

## 15 Dimensions

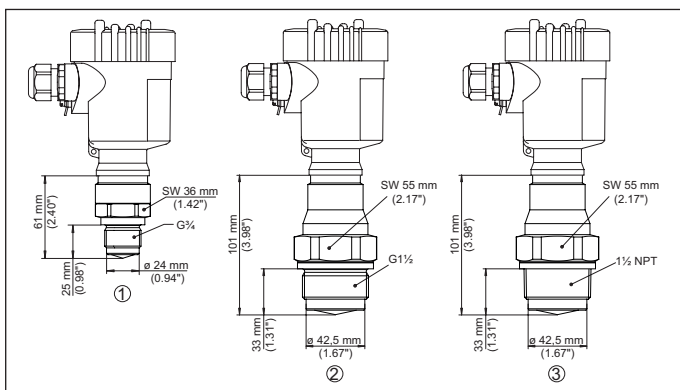
The drawings listed represent only a section of the possible process fittings. Further 2D and 3D drawings in all common formats are available at [www.vega.com](http://www.vega.com) via the configurator of VEGAPULS 6X.

### VEGAPULS 6X, plastic horn antenna



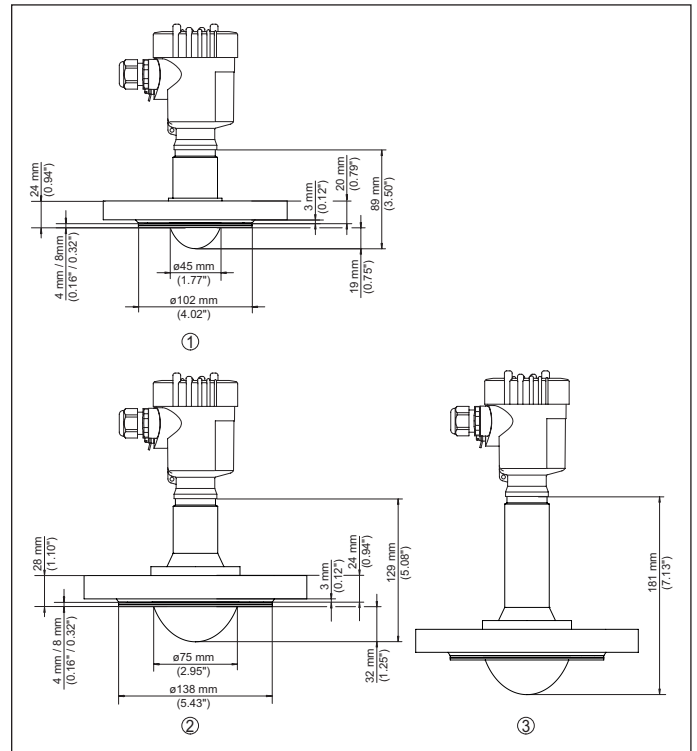
- 1 Mounting strap
- 2 Compression flange
- 3 Adapter flange

### VEGAPULS 6X, thread with integrated antenna system



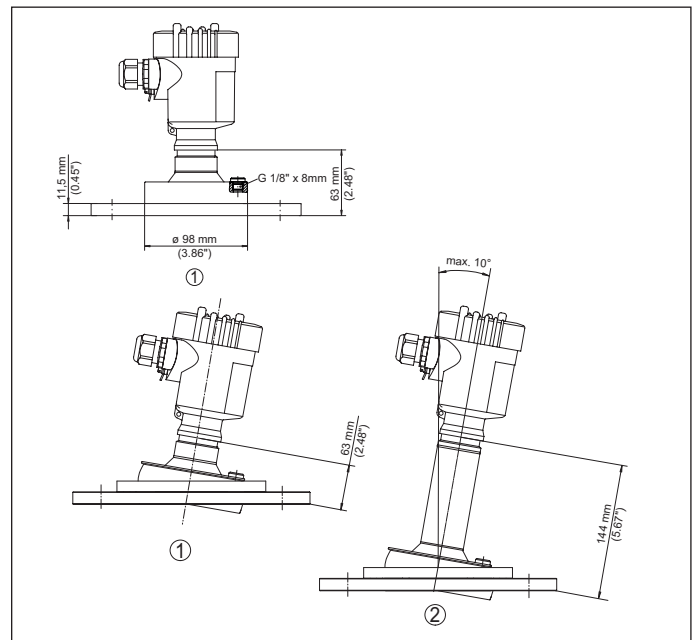
- 1 Thread G $\frac{3}{4}$
- 2 Thread G1 $\frac{1}{2}$
- 3 Thread 1 $\frac{1}{2}$  NPT

### VEGAPULS 6X, flange with encapsulated antenna system



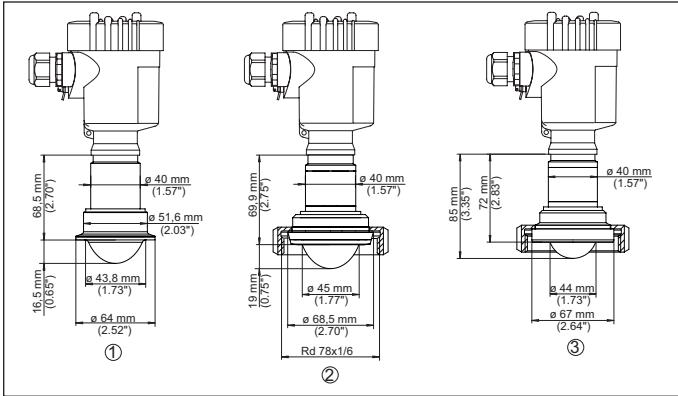
- 1 Flange DN 50
- 2 Flange DN 80
- 3 Flange DN 80 up to +250 °C

### VEGAPULS 6X, flange with lens antenna



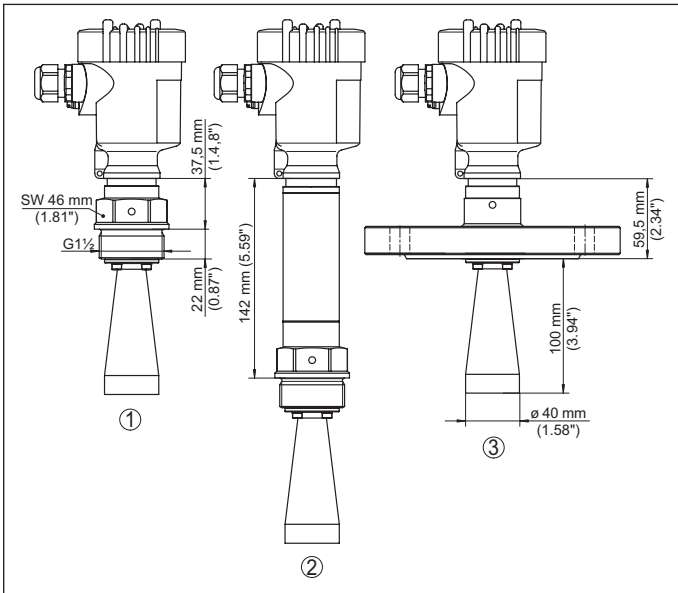
- 1 Flange DN 100
- 2 Flange DN 100 with swivelling holder
- 3 Flange DN 100 with swivelling holder up to +200 °C

**VEGAPULS 6X, hygienic fitting**



- 1 Clamp 2" PN 16 (DIN 32676, ISO 2852)
- 2 Slotted nut DN 50 PN 16 (DIN 11851)
- 3 Collar socket DN 50 Form A (DIN 11864-1)

**VEGAPULS 6X, horn antenna**



- 1 Threaded version
- 2 Threaded version with temperature adapter up to +250 °C
- 3 Flange version











All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.  
Subject to change without prior notice

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