Product Information

Radar

Level measurement in liquids

VEGAPULS 61, 62, 63, 65, 66

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 » Approvals and which come 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.

29019-EN-100226

1 Measuring principle

Measuring principle

Extremely short microwave impulses are emitted by the antenna system in the direction of the measured product, reflected by the product surface and received back again by the antenna system. They spread out at light velocity. The time from emission to reception of the signals is proportional to the level in the vessel.

A special time stretching procedure enables reliable and precise measurement of the extremely short transmission periods. The radar sensors work with low emitted power in the C or K band frequency range. The proven ECHOFOX signal processing selects the correct level echo out of a number of interfering reflections. An adjustment with empty and full vessel is not necessary.

Applications in liquids

Two different emitting frequencies are available for these applications. The compact, high frequency K-band sensors are particularly suitable for applications where high accuracy is required. An excellent signal focussing is achieved even with small antenna sizes.

Low frequency C-band sensors are able to penetrate foam and strong condensation and are thus suitable for very difficult process conditions. Completely unaffected by vapour, gas composition, pressure and temperature changes, the sensors reliably detect the surface of widely different products.

Input variable

The measured quantity is the distance between process fitting of the sensor and product surface. Depending on the sensor version, the reference plane is the seal surface on the hexagon or the lower side of the flange.

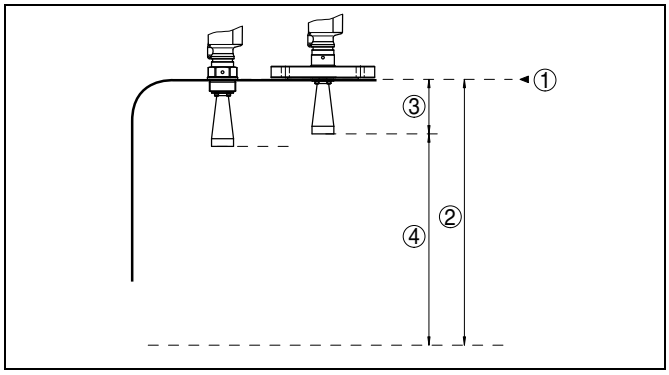

Fig. 1: Data of the input variable with VEGAPULS 62

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

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2 Type overview

	VEGAPULS 61	VEGAPULS 62	VEGAPULS 63
			
Applications	Corrosive liquids in small vessels under easy process conditions	Storage tanks and process vessels under extremely difficult process conditions	Aggressive liquids under extremely difficult process conditions
Measuring range	up to 20 m (65.62 ft)	up to 35 m (114.8 ft)	up to 20 m (65.62 ft)
Antenna, material	Plastic horn antenna, completely PVDF encapsulated	Horn antenna or standpipe antenna ½", 316L	Antenna system, completely PTFE, PFA or PVDF encapsulated
Process fitting, material	Thread G1½A, mounting strap or flange, PVDF or PP	Thread G1½A according to DIN 3852-A or flange, 316L, Hastelloy	Flange or hygienic flange, 316L, Hastelloy
Process temperature	-40 … +80 °C (-40 … +176 °F)	-200 … +450 °C (-328 … +842 °F)	-170 … +200 °C (-274 … +392 °F)
Process pressure	-1 … +3 bar/-100 … +300 kPa (-14.5 … +43.5 psi)	-1 … +160 bar/-100 … +16000 kPa (-14.5 … +2320 psig)	-1 … +16 bar/-100 … +1600 kPa (-14.5 … +232 psig)
Deviation	±2 mm	±2 mm	±2 mm
Frequency range	K-band	K-band	K-band
Signal output	• 4 … 20 mA/HART-Zweileiter • 4 … 20 mA/HART-Vierleiter • Profibus PA • Foundation Fieldbus	• 4 … 20 mA/HART-Zweileiter • 4 … 20 mA/HART-Vierleiter • Profibus PA • Foundation Fieldbus	• 4 … 20 mA/HART-Zweileiter • 4 … 20 mA/HART-Vierleiter • Profibus PA • Foundation Fieldbus
Indication/Adjustment	• PLICSCOM • PACTware • VEGADIS 61 • VEGADIS 62	• PLICSCOM • PACTware • VEGADIS 61 • VEGADIS 62	• PLICSCOM • PACTware • VEGADIS 61 • VEGADIS 62
Approvals	• ATEX • IEC • Shipbuilding • Overfill protection • FM • CSA • Gost	• ATEX • IEC • Shipbuilding • Overfill protection • FM • CSA • Gost	• ATEX • IEC • Shipbuilding • Overfill protection • FM • CSA • Gost

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VEGAPULS 65

VEGAPULS 66

Applications	Aggressive liquids under easy process conditions	Storage tanks and process vessels under most difficult process conditions
Measuring range	up to 35 m (114.8 ft)	up to 35 m (114.8 ft)
Antenna, material	Rod antenna, PVDF or PTFE encapsulated, PFA plated	Horn antenna or standpipe antenna 2", 316L
Process fitting, material	Thread G1½A similar to DIN 3852-A-B or thread G1½A according to DIN 3852-A or flange, PVDF or 316L	Flange, 316L, Hastelloy
Process temperature	-40 … +150 °C (-40 … +302 °F)	-40 … +400 °C (-40 … +752 °F)
Process pressure	-1 … +16 bar/-100 … +1600 kPa (-14.5 … +232 psig)	-1 … +160 bar/-100 … +16000 kPa (-14.5 … +2321 psi)
Deviation	±8 mm	±8 mm
Frequency range	C-band	C-band
Signal output	• 4 … 20 mA/HART-Zweileiter • 4 … 20 mA/HART-Vierleiter • Profibus PA • Foundation Fieldbus	• 4 … 20 mA/HART-Zweileiter • 4 … 20 mA/HART-Vierleiter • Profibus PA • Foundation Fieldbus
Indication/Adjustment	• PLICSCOM • PACTware • VEGADIS 61 • VEGADIS 62	• PLICSCOM • PACTware • VEGADIS 61 • VEGADIS 62
Approvals	• ATEX • IEC • Shipbuilding • Overfill protection • FM • CSA	• ATEX • IEC • Shipbuilding • Overfill protection • FM • CSA

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3 Device selection

Application areas

VEGAPULS 61

VEGAPULS 61 is suitable for applications in liquids in smaller vessels under ordinary process conditions. There are application possibilities in nearly all areas of industry.

The version with encapsulated antenna system is particularly suitable for level measurement of aggressive liquids in small vessels. The version with plastic horn antenna ist particularly suitable for flow measurement in open flumes or gauge measurement in waters.

VEGAPULS 62

VEGAPULS 62 is suitable for applications in liquids in storage tanks and process vessels under difficult process conditions. Application possibilities are in the chemical industry, in environmental and recycling technology as well as in the petrochemical industry.

The version with horn antenna is particularly suitable for storage tanks and process vessels for measurement of products like solvents, hydrocarbons and fuels. The version with parabolic antenna is particularly suitable for measurement of products with low ε_r value at large measuring distances.

VEGAPULS 63

The VEGAPULS 63 is suitable for the measurement of aggressive liquids or applications with special hygienic requirements. The application possibilities are in the chemical industry as well as on the food processing and pharmaceutical sector.

VEGAPULS 65

The VEGAPULS 65 is suitable for vessels with liquids under easy process conditions with smal process fitting. The application possibilities are in virtually all industries.

VEGAPULS 66

The VEGAPULS 66 is suitable for the measurement of liquids under difficult and extreme process conditions such as buildup, condensation and foam generation as well as strong product movements. The application possibilities are in the chemical industry, in the environmental and recycling technology as well as in the petrochemistry.

Applications

Level measurement in vessels

For level measurement in vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible down to the lowest point of the vessel bottom.

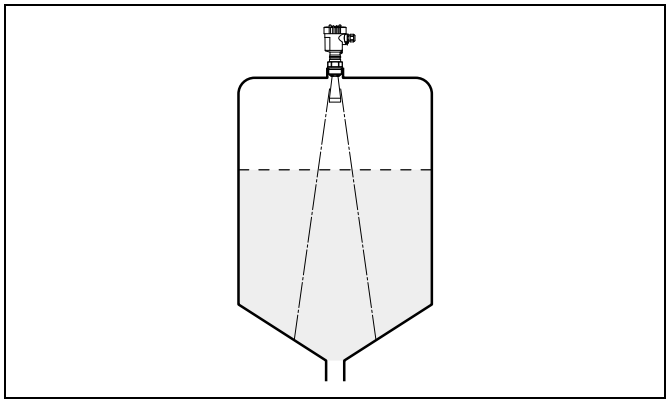

Fig. 2: Level measurement in vessels with conical bottom

Measurement in a surge pipe

When using a surge pipe in a vessel, influences from vessel installations and turbulences can be excluded. Under these prerequisites, the measurement of products with low dielectric values (ε_r value ≥ 1.6) is possible. In very adhesive products, measurement in a surge pipe is not recommended.

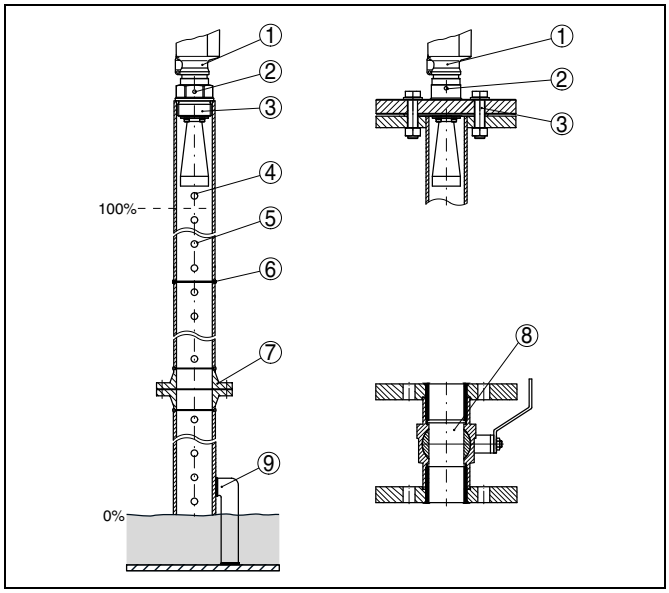

Fig. 3: Configuration surge pipe

1 *Radar sensor*
2 *Marking of the polarisation plane*
3 *Thread or flange on the instrument*
4 *Vent hole*
5 *Holes*
6 *Weld joint*
7 *Welding neck flange*
8 *Ball valve with complete opening*
9 *Fastening of the surge pipe*

Measurement in difficult applications

The electronics version with increased sensitivity enables the use of the instrument also in applications with very poor reflective properties and products with low ε_r value.

Flow measurement

Flow measurement in open flumes with a defined constriction, such as e. g. a rectangular overflow, can be realized with a level measurement.

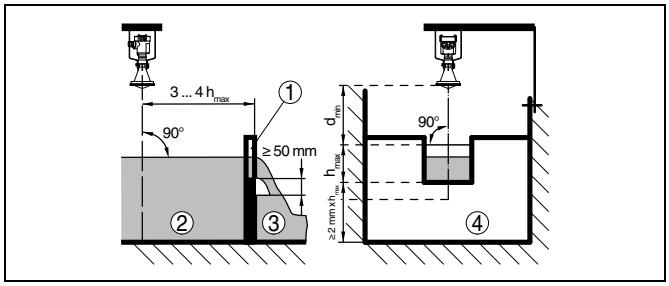

Fig. 4: Flow measurement with rectangular overflow: $d_{min.}$ minimum distance of the sensor; $h_{max.}$ = max. filling of the rectangular overflow

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

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4 Selection criteria

		VEGAPULS 61	VEGAPULS 62	VEGAPULS 63	VEGAPULS 65	VEGAPULS 66
Vessel	Small vessels	●	–	●	–	–
	Storage tanks	●	●	●	●	●
	Process vessels	–	●	●	–	●
Process	Easy process conditions	●	●	●	●	●
	Most difficult process conditions	–	●	●	–	●
	Aggressive liquids	●	–	●	●	●
	Bubble or foam generation	–	–	–	●	●
	Wave movements at the surface	–	–	–	●	●
	Steam or condensation	–	–	–	●	●
	Buildup	–	–	–	●	●
	Flow measurement	●	●	–	–	–
Installation	Front-flush installation	●	–	●	–	–
	Threaded fittings	●	●	–	●	–
	Flange connections	–	●	●	●	●
	Hygienic fittings	●	–	●	●	–
	Mounting strap	●	–	–	–	–
Antenna	Antenna extension	–	●	–	–	●
	Standpipe antenna	–	●	–	–	●
	Narrow transmission lobe	–	●	●	–	–
	Measurement in a by-pass tube or surge pipe	●	●	●	–	●
	Rinsing air connection	–	●	–	–	●
Suitability for industry-specific applications	Chemical	–	●	●	–	–
	Power generation	●	–	●	–	–
	Sanitary	–	–	●	–	–
	Metal generation	–	●	–	–	–
	Offshore	–	–	–	–	●
	Paper	●	●	●	–	–
	Petrochemistry	–	●	●	–	●
	Pharmaceutical	●	–	●	–	–
	Shipbuilding	–	–	●	–	●
	Environment and recycling industry	–	●	●	–	●
	Water and waste water industry	●	–	–	–	●
	Cement industry	–	●	–	–	–

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5 Housing overview

Plastic PBT		
Protection rating	IP 66/IP 67	IP 66/IP 67
Version	Single chamber	Double chamber
Application area	Industrial environment	Industrial environment

Aluminium		
Protection rating	IP 66/IP 67, IP 66/IP 68 (1 bar)	IP 66/IP 67, IP 66/IP 68 (1 bar)
Version	Single chamber	Double chamber
Application area	Industrial environment with increased mechanical wear	Industrial environment with increased mechanical wear

Stainless steel 316L			
Protection rating	IP 66/IP 67	IP 66/IP 67, IP 66/IP 68 (1 bar)	IP 66/IP 67, IP 66/IP 68 (1 bar)
Version	Single chamber electropolished	Single chamber precision casting	Double chamber precision casting
Application area	Aggressive environment, food processing, pharmaceutical	Aggressive environment, strong mechanical wear	Aggressive environment, strong mechanical wear

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6 Mounting

Mounting examples

The following illustrations show mounting examples and measurement setups.

Acid tank

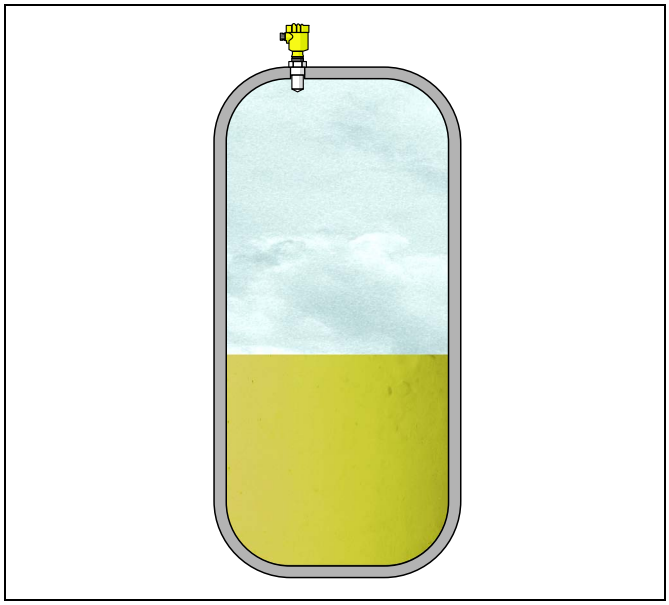

Fig. 5: Level measurement in an acid tank with VEGAPULS 61

A non-contact measuring principle is particularly suitable for level measurement in acid tanks.

VEGAPULS 61 is characterised by a small process fitting and a PVDF encapsulated antenna. The sensor is insensitive to temperature fluctuations and gas phases.

Bitumen vessel

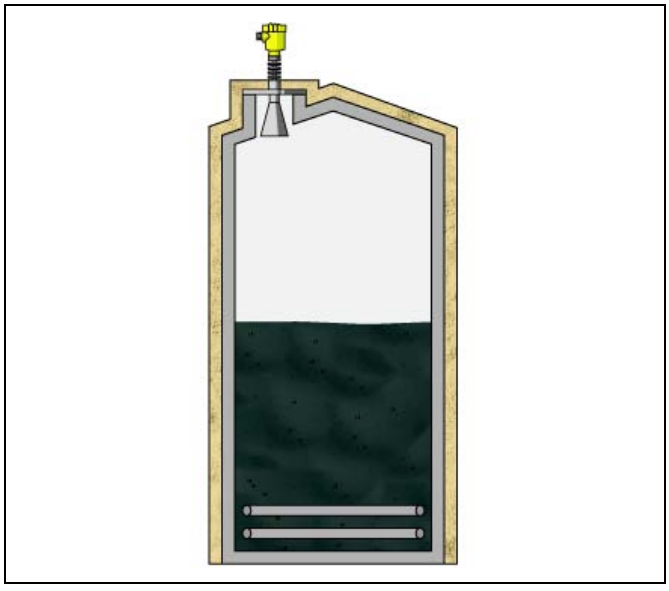

Fig. 6: Level measurement in a bitumen vessel with VEGAPULS 62

Bitumen accrues during the crude oil destillation and is stored at temperatures around 200 °C (392 °F). The non-contact measuring principle radar is particularly suitable for level measurement at high temperatures and gasing products such as bitumen.

The VEGAPULS 62 radar sensor is suitable for temperatures up to 450 °C (842 °F) due to a temperature adapter.

Sugar evaporator

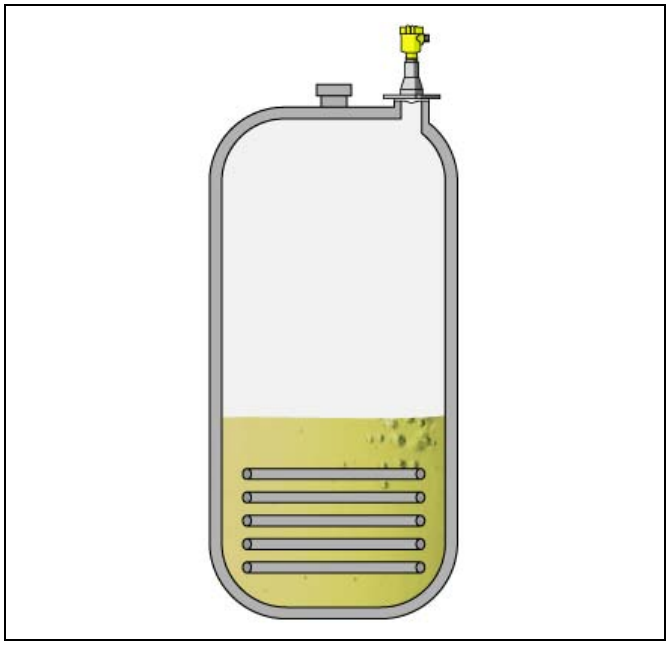

Fig. 7: Level measurement in a sugar evaporator with VEGAPULS 63

The VEGAPULS 63 radar sensor is particularly suitable for level measurement in the sugar evaporator.

The PTFE encapsulated horn antenna is protected against contamination or adhesion by the juice. The instrument is gauge and low pressure resistant, even with dynamic pressure and suctions.

Ammonia vessel

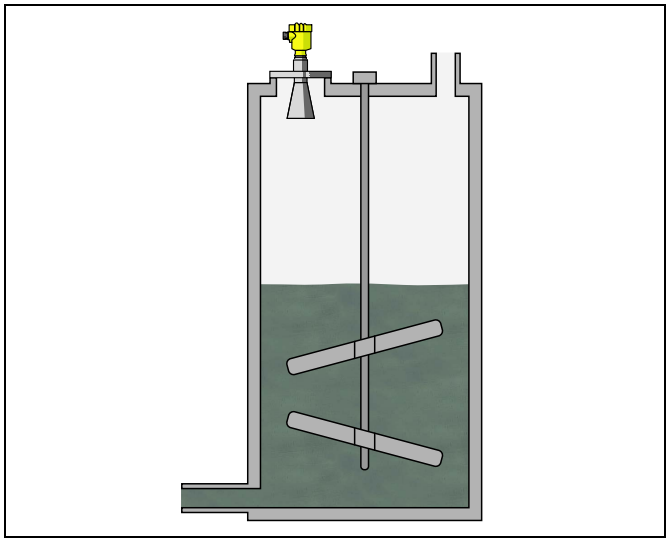

Fig. 8: Level measurement in a mud vessel with VEGAPULS 66

Drilling mud, as a lubricating and cooling agent for the drill bit, as well as a sealing material for the well bore, is an important resource for the development of oil and gas deposits.

The levels in the mud pits are measured without contact with VEGAPULS 66 radar sensors. This measurement delivers reliable results even in case of extreme buildup and fluctuating pressures and temperatures.

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7 Electronics - 4 … 20 mA/HART - two-wire

Configuration of the electronics

The pluggable 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 contact pins with I^2C interface for parameter adjustment are located on the upper side of the electronics. With the double chamber housing, the terminals are located in the separate connection compartment.

Voltage supply

Depending on the version, the supply voltage and the current signal are carried on the same two-wire connection cable.

The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as VEGAMET signal conditioning instruments are suitable for power supply. When one of these instruments is used, a reliable separation of the supply circuits from the mains circuits according to DIN VDE 0106 part 101 is ensured for the sensor.

- Operating voltage
  - 9.6 … 36 V DC
- Permissible residual ripple - Non-Ex, Ex-ia instrument
  - for 9.6 $V_{< U_N}$ < 14 V: ≤ 0.7 V_{eff} (16 … 400 Hz)
  - for 18 $V_{< U_N}$ < 36 V: ≤ 1.0 V_{eff} (16 … 400 Hz)

Connection cable

The sensors are connected with standard cable without screen. An outer cable diameter of 5 … 9 mm ensures the seal effect of the cable entry.

If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used. In HART multidrop mode the use of screened cable is generally recommended.

Cable screening and grounding

If screened cable is necessary, the cable screen must be connected on both ends to ground potential. If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V).

Connection single chamber housing

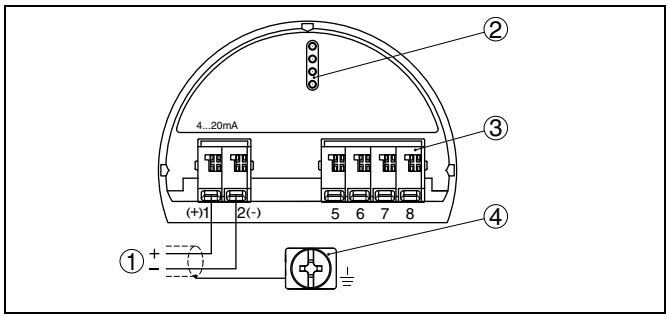

Fig. 9: Electronics and connection compartment with single chamber housig

1 Voltage supply/Signal output
2 For indicating and adjustment module or interface adapter
3 For external indicating and adjustment unit
4 Ground terminal for connection of the cable screen

Connection double chamber housing

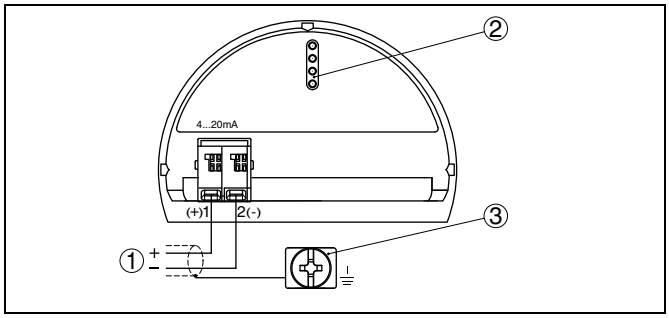

Fig. 10: Connection compartment, double chamber housing

1 Voltage supply/Signal output
2 For indicating and adjustment module or interface adapter
3 Ground terminal for connection of the cable screen

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8 Electronics - 4 … 20 mA/HART - four-wire

Configuration of the electronics

The pluggable 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 contact pins with I^2C interface for parameter adjustment are located on the upper side of the electronics. With the double chamber housing, the terminals are located in the separate connection compartment.

Voltage supply

If a reliable separation is required, the voltage supply and the current output are carried out via separate two-wire connection cables.

- Operating voltage
  - 20 … 72 V DC, 20 … 253 V AC, 50/60 Hz

Connection cable

For power supply, an approved installation cable with PE conductor is necessary.

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

Cable screening and grounding

If screened cable is necessary, the cable screen must be connected on both ends to ground potential. If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V).

Connection double chamber housing

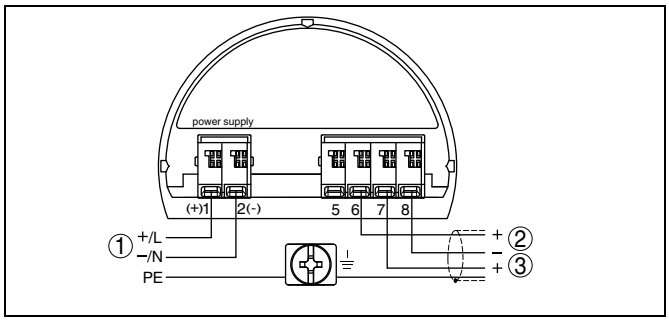

Fig. 11: Connection compartment, double chamber housing

1 Voltage supply
2 4 … 20 mA signal output active
3 4 … 20 mA signal output passive

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9 Electronics - Profibus PA

Configuration of the electronics

The pluggable 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 plug with I^2C interface for parameter adjustment are located on the upper side of the electronics. With the double chamber housing, these connection elements are located in the separate connection compartment.

Voltage supply

Power supply via the H1 Fieldbus cable.

- Operating voltage
  - 9 … 32 V DC
- Max. number of sensors with DP/PA segment coupler
  - 32
- Max. number of sensors with VEGALOG 571 EP input card
  - 10

Connection cable

Connection is made with screened cable according to Profibus specification. A cable diameter of 5 … 9 mm ensures the seal effect of the cable gland.

Make sure that the entire installation is carried out according to the Profibus specification. In particular, make sure that the termination of the bus is done with appropriate terminating resistors.

Cable screening and grounding

In systems with potential equalisation, connect the cable screen 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 screen directly to ground potential at the power supply unit and at the sensor. In the connection box or T-distributor, the screen of the short stub to the sensor must not be connected to ground potential or to another cable screen. The cable screens to the power supply unit and to the next distributor must be connected to each other and also connected to ground potential via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Connection single chamber housing

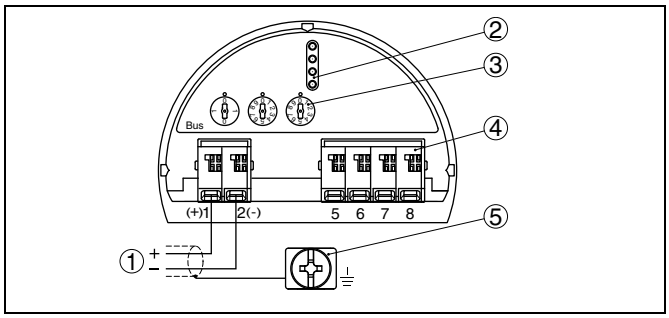

Fig. 12: Electronics and connection compartment with single chamber housig

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

Connection double chamber housing

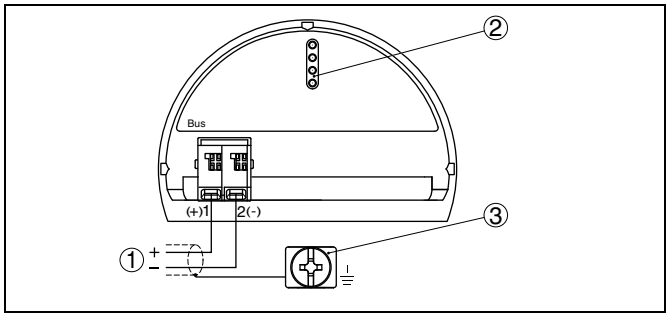

Fig. 13: Connection compartment, double chamber housing

1 Voltage supply/Signal output
2 For indicating and adjustment module or interface adapter
3 Ground terminal for connection of the cable screen

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10 Electronics - Foundation Fieldbus

Configuration of the electronics

The pluggable 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 plug with I^2C interface for parameter adjustment are located on the upper side of the electronics. With the double chamber housing, these connection elements are located in the separate connection compartment.

Voltage supply

Power supply via the H1 Fieldbus cable.

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

Connection cable

Connection is made with screened cable according to Fieldbus specification. A cable diameter of 5 … 9 mm ensures the seal effect of the cable gland.

Make sure that the entire installation is carried out according to the Fieldbus specification. In particular, make sure that the termination of the bus is done with appropriate terminating resistors.

Cable screening and grounding

In systems with potential equalisation, connect the cable screen 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 screen directly to ground potential at the power supply unit and at the sensor. In the connection box or T-distributor, the screen of the short stub to the sensor must not be connected to ground potential or to another cable screen. The cable screens to the power supply unit and to the next distributor must be connected to each other and also connected to ground potential via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Connection single chamber housing

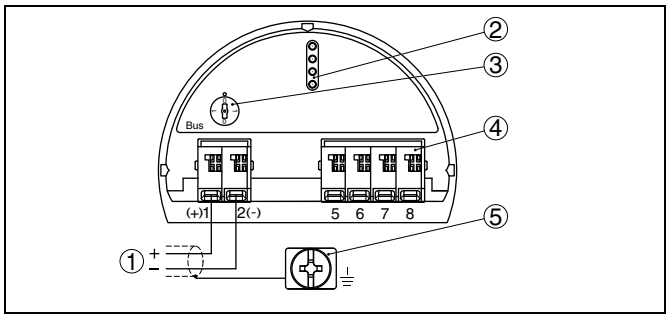

Fig. 14: Electronics and connection compartment with single chamber housig

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

Connection double chamber housing

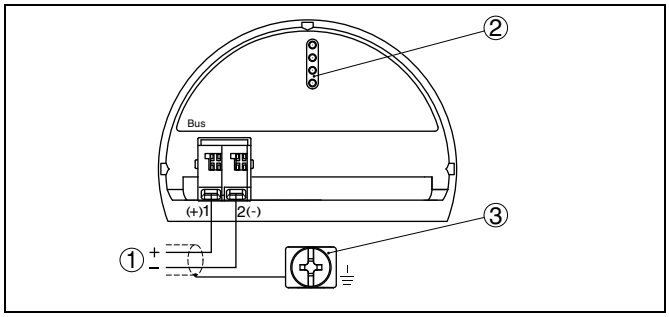

Fig. 15: Connection compartment, double chamber housing

1 Voltage supply/Signal output
2 For indicating and adjustment module or interface adapter
3 Ground terminal for connection of the cable screen

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11 Operation

11.1 Overview

The sensors can be adjusted with the following adjustment media:
- with indicating and adjustment module
- an adjustment software according to FDT/DTM standard, e.g. PACTware and PC

and, depending on the signal output, also with:
- A HART handheld (4 … 20 mA/HART)
- The adjustment program AMS (4 … 20 mA/HART and Foundation Fieldbus)
- The adjustment program PDM (Profibus PA)
- A configuration tool (Foundation Fieldbus)

The entered parameters are generally saved in the sensor, optionally also in the indicating and adjustment module or in the adjustment program.

11.2 Adjustment with the indicating and adjustment module PLICSCOM

The pluggable indicating and adjustment module is used for measured value indication, adjustment and diagnosis with level and pressure sensors. It is equipped with a display with full dot matrix as well as four keys for adjustment. An integrated background lighting can be adjusted via the adjustment menu.

Fig. 16: Indicating and adjustment module PLICSCOM

The indicating and adjustment module is integrated in the respective sensor housing or in the external indicating and adjustment unit. After mounting, the sensor and the indicating and adjustment module are splash-proof even without housig cover.

11.3 Adjustment with PACTware

PACTware/DTM

Independent of the respective signal output 4 … 20 mA/HART, Profibus PA or Foundation Fieldbus, the sensors can be adjusted with PACTware directly on site. The sensors with signal output 4 … 20 mA/HART can be also operated via the HART signal on the signal cable.

A VEGACONNECT interface adapter as well as an instrument driver for the respective sensor is necessary for adjustment with PACTware. All currently available VEGA DTMs are included as a DTM Collection with the current PACTware version on a CD. They can be purchased for a token fee from the responsible VEGA agency. In addition, this DTM Collection incl. the basic version of PACTware can be downloaded free of charge from the Internet.

To use the entire range of functions of a DTM, including project documentation, a DTM licence is required for that particular instrument family. This licence can be bought from the VEGA agency serving you.

Connection of the PC via VEGACONNECT

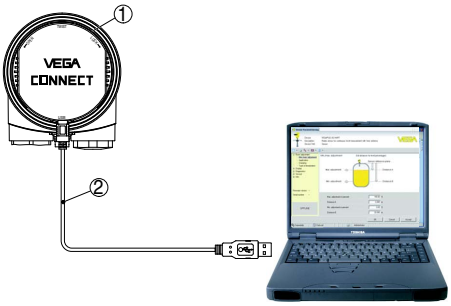

Fig. 17: Connection via I²C connection cable

1 VEGACONNECT
2 USB cable to the PC

Necessary components:
- VEGAPULS
- PC with PACTware and suitable VEGA DTM
- VEGACONNECT
- Power supply unit or processing system

11.4 Adjustment with other adjustment programs

PDM

For VEGA Profibus PA sensors, instrument descriptions for the adjustment program PDM are available as EDD. The instrument descriptions are already implemented in the current version of PDM. For older versions of PDM, a free-of-charge download is available via Internet.

AMS

For VEGA Foundation Fieldbus sensors, instrument descriptions for the adjustment program AMS™ are available as DD. The instrument descriptions are already implemented in the current version of AMS™. For older versions of AMS™, a free-of-charge download is available via Internet.

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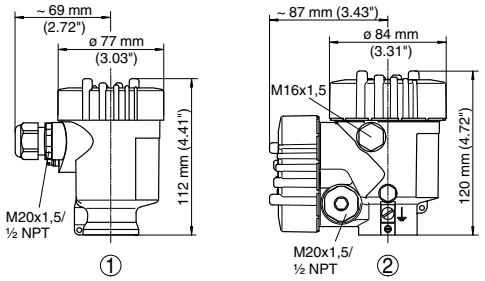
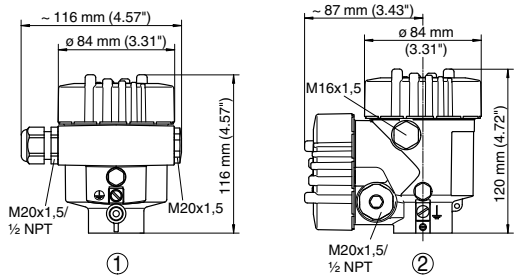
12 Dimensions

Plastic housing



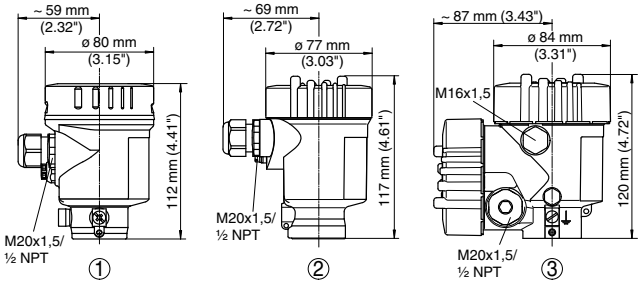
1 Single chamber housing
2 Double chamber housing

Aluminium housing



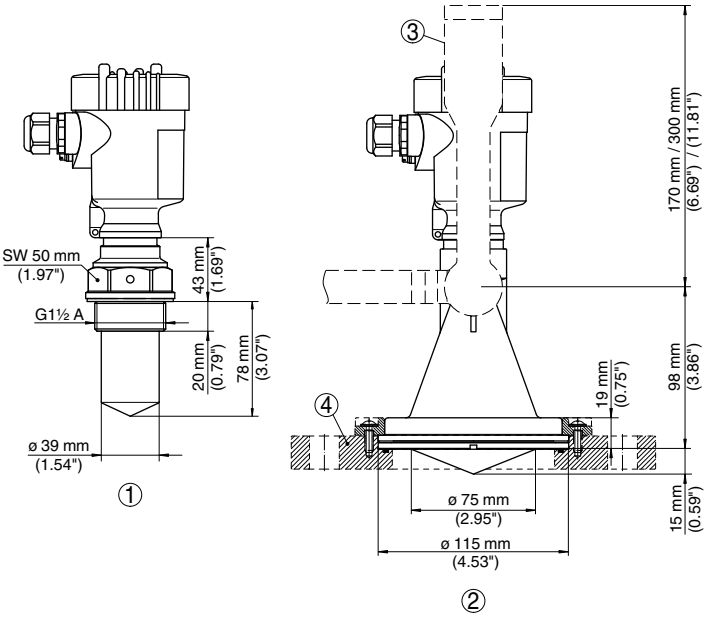
1 Single chamber housing
2 Double chamber housing

Stainless steel housing



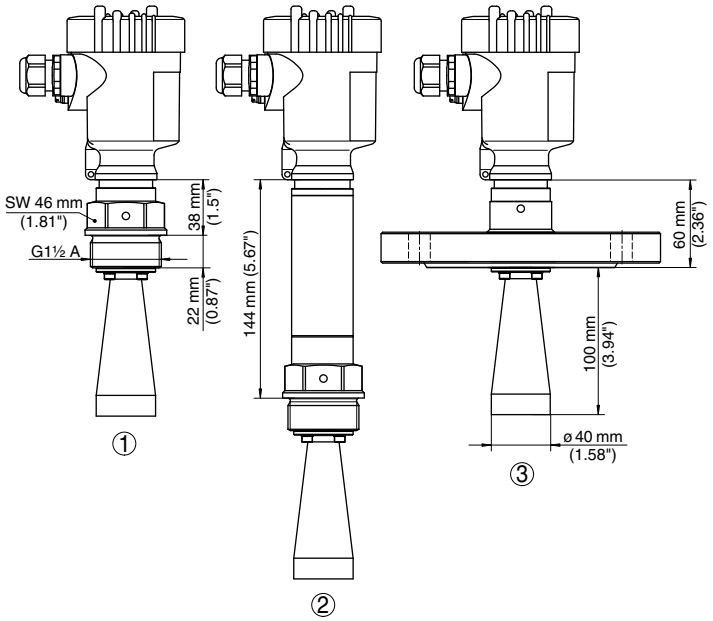
1 Single chamber housing electropolished
2 Single chamber housing precision casting
2 Double chamber housing precision casting

VEGAPULS 61



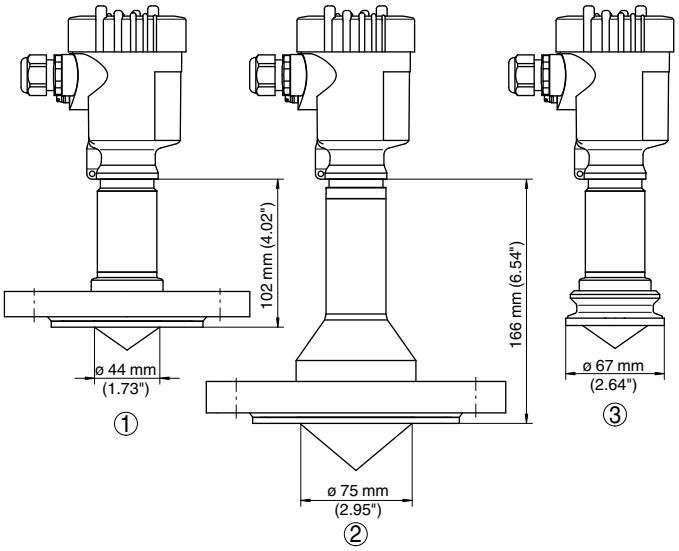
1 Version with encapsulated antenna system
2 Version with plastic horn antenna
3 Mounting strap
4 Adapter flange

VEGAPULS 62



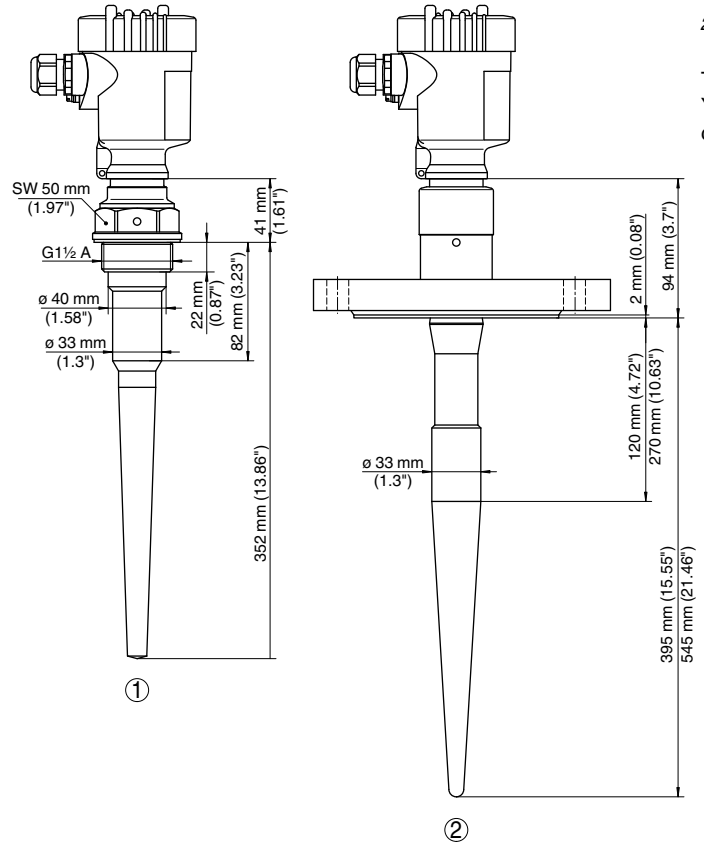
1 Threaded version
2 Threaded version with temperature adapter up to 250 °C
3 Flange version

VEGAPULS 63



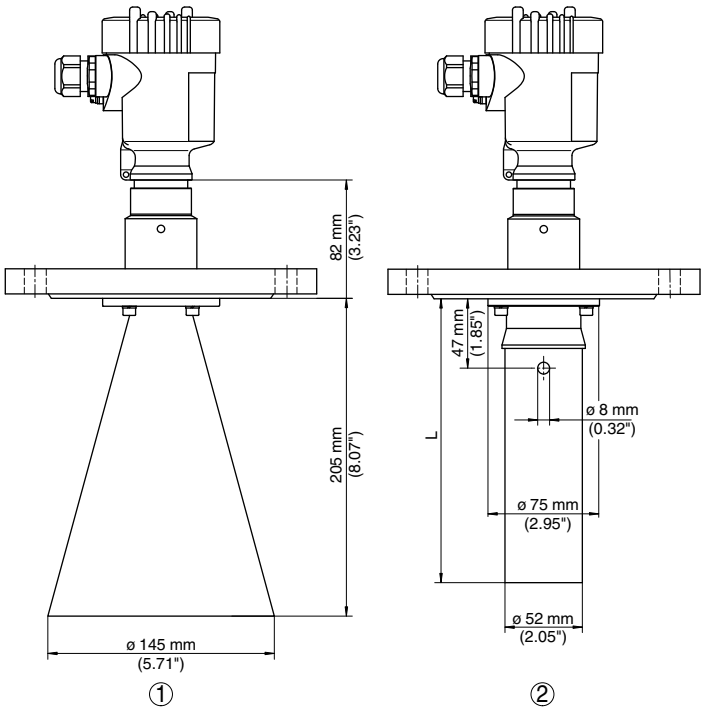
1 Flange version DN 50
2 Flange version DN 80
3 Tri-Clamp version 2"

VEGAPULS 65



1 Threaded version G1½ A
2 Flange version DN 80

VEGAPULS 66



1 Version with horn antenna ø 145 mm
2 Version with standpipe antenna

The listed drawings are only an excerpt of the available process fittings. You can find further drawings on our homepage www.vega.com » Downloads » Drawings.

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