Operating Instructions

Ultrasonic sensor for continuous level measurement

VEGASON 61

Profibus PA

Document ID: 28784

Contents

28784-EN-231026

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

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1 About this document

1.1 Function

This instruction provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, safety and the exchange of parts. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual must be made available to the qualified personnel and implemented.

1.3 Symbols used

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

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

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

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

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

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

Ex applications
This symbol indicates special instructions for Ex applications.

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

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

Disposal
This symbol indicates special instructions for disposal.

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2 For your safety

2.1 Authorised personnel

All operations described in this documentation must be carried out only by trained and authorized personnel.

During work on and with the device, the required personal protective equipment must always be worn.

2.2 Appropriate use

VEGASON 61 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

2.3 Warning about incorrect use

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

2.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operating company 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 operating company has to implement suitable measures to make sure the instrument is functioning properly.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed.

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 us. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by us must be used.

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

2.5 Conformity

The device complies with the legal requirements of the applicable country-specific directives or technical regulations. We confirm conformity with the corresponding labelling.

The corresponding conformity declarations can be found on our homepage.

2.6 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: 2012 – 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.

2.7 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 (NEC - NFPA 70) (USA).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code (CEC Part I) (Canada).

2.8 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:

- Ultrasonic sensor

The further scope of delivery encompasses:

- Documentation
  - Quick setup guide VEGASON 61
  - Instructions for optional instrument features
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - If necessary, further certificates

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

Constituent parts

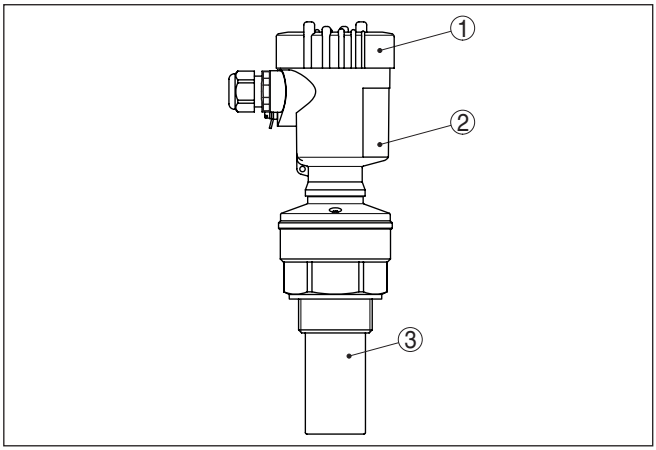


Fig. 1: VEGASON 61, version with plastic housing

1 Housing cover with integrated PLICSCOM (optional)
2 Housing with electronics, optionally available with plug connector
3 Process fitting with transducer

The VEGASON 61 consists of the components:

- Transducer with integrated temperature sensor
- Housing with electronics, optionally available with plug connector
- Housing cover, optionally available with display and adjustment module PLICSCOM

The components are available in different versions.

Type label

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

- Instrument type
- Information about approvals

- Configuration information
- Technical data
- Serial number of the instrument
- QR code for device identification
- Numerical code for Bluetooth access (optional)
- Manufacturer information

Documents and software

To find order data, documents or software related to your device, you have the following options:

- Move to "www.vega.com" and enter in the search field the serial number of your instrument.
- Scan the QR code on the type label.
- Open the VEGA Tools app and enter the serial number under "***Documentation***".

3.2 Principle of operation

Application area

VEGASON 61 is an ultrasonic sensor for continuous level measurement. It is suitable for liquids and solids in virtually all industries, particularly in the water and waste water industry.

Functional principle

The transducer of the ultrasonic sensor transmits short ultrasonic pulses to the measured product. These pulses are reflected by medium surface and received back by the transducer as echoes. The running time of the ultrasonic pulses from emission to reception is proportional to the distance and hence the level. The determined level is converted into an appropriate output signal and outputted as measured value.

Power supply and bus communication

Power supply via the Profibus DP/PA segment coupler or VEGALOG 571 EP cards. A two-wire cable according to Profibus specification serves as carrier of both power and digital data transmission for multiple sensors. The instrument profile of VEGASON 61 corresponds to profile specification version 3.0.

The backlight of the display and adjustment module is powered by the sensor. Prerequisite is a certain level of operating voltage.

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

The optional heating requires its own operating voltage. 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.

GSD/EDD

The GSD (instrument master files) and bitmap files necessary for planning your Profibus-DP-(PA) communication network are available from the download section on the VEGA homepage www.vega.com. There you can also find the appropriate certificates. In a PDM environment, an EDD (Electronic Device Description) is also required to enable the full range of sensor functions (also available as a download).A CD with the appropriate files can be ordered via e-mail under info@de.vega.com or by phone from one of the VEGA agencies under the order number "DRIVER.S".

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 moisture 20 … 85 %

Lifting and carrying

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

3.4 Accessories

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

Display and adjustment module

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

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

VEGACONNECT

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

VEGADIS 81

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

Protective cover

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

Flanges

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

4 Mounting

4.1 General instructions

Process conditions

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

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

These are mainly:

- Active measuring component
- Process fitting
- Process seal

Process conditions in particular are:

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

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. It can be used indoors as well as outdoors.

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.

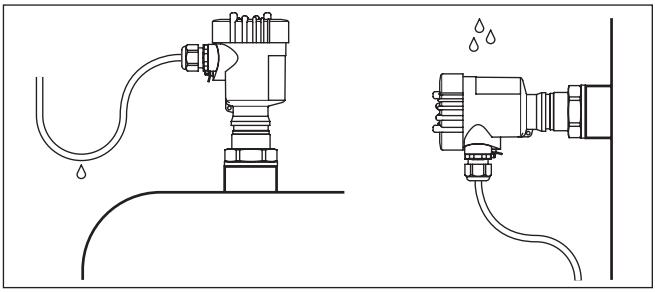


Fig. 2: Measures against moisture ingress

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.

Pressure/Vacuum

Gauge pressure in the vessel does not influence VEGASON 61. Low pressure or vacuum does, however, damp the ultrasonic pulses. This influences the measuring result, particularly if the level is very low. With pressures under -0.2 bar (-20 kPa) you should use a different measuring principle, e.g. radar or guided radar (TDR).

4.2 Housing features

Filter element

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

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

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

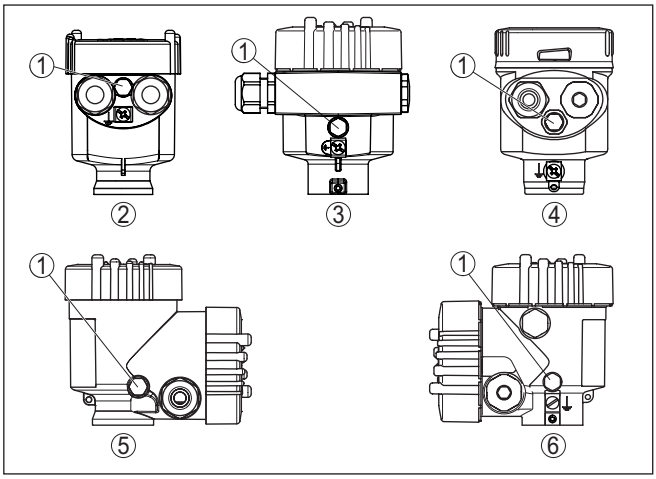


Fig. 3: Position of the filter element depending on housing

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

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

Housing orientation

The housing of VEGASON 61 can be rotated completely by 360°. This enables optimal reading of the display and easy cable entry.[1)]

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

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

[1)] No limitation by a rotation stop

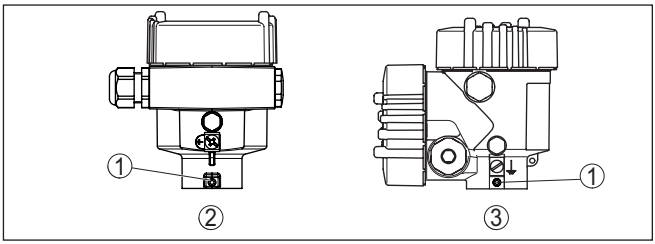


Fig. 4: Position of the locking screw depending on housing

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

Proceed as follows:

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

Cover catch

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

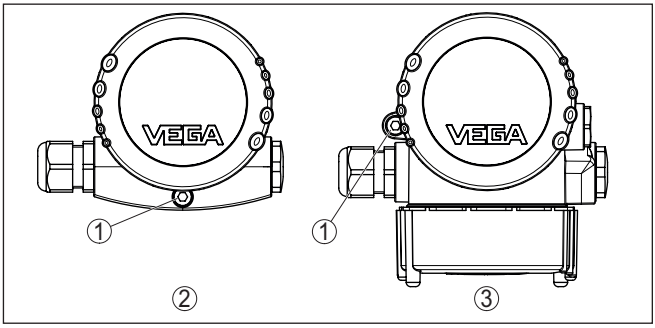


Fig. 5: Position of the safety screw depending on housing

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

Proceed as follows to secure the cover:

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

The housing cover is unlocked in the opposite way.

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

4.3 Mounting instructions

Screwing in

Screw VEGASON 61 into the mounting socket with an appropriate spanner applied to the hexagon of the process fitting. Max. torque see chapter "*Technical data*".

Warning:
The housing must not be used to screw the instrument in! Applying tightening force can damage internal parts of the housing.

Installation position

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

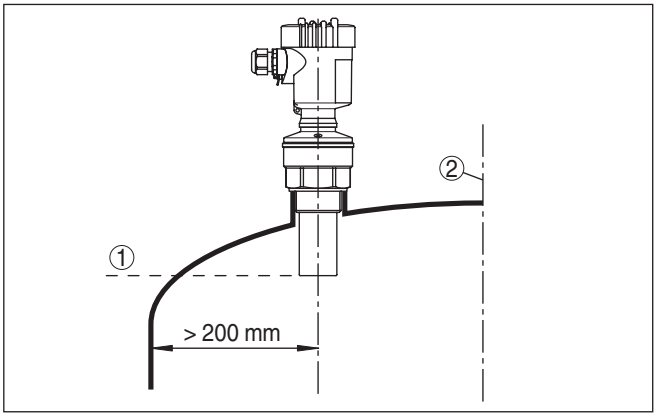


Fig. 6: Mounting on round vessel tops

1 Reference plane
2 Vessel center or symmetry axis

If this distance cannot be maintained, a false signal suppression should be carried out 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.

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

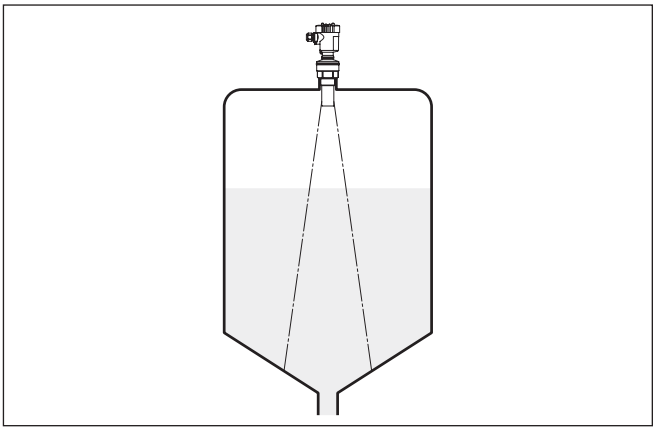


Fig. 7: Vessel with conical bottom

Nozzle

Socket pieces should be dimensioned so that the lower end of the transducer protrudes at least 10 mm (0.394 in) out of the nozzle.

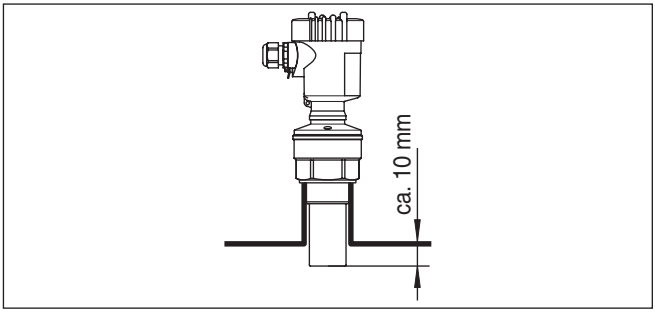


Fig. 8: Recommended socket mounting

If the reflective properties of the medium are good, you can mount VEGASON 61 on sockets which are higher than the length of the transducer. You will find recommended values for socket heights in the following illustration. The socket end should be smooth and burr-free, if possible also rounded. Carry out a false signal suppression.

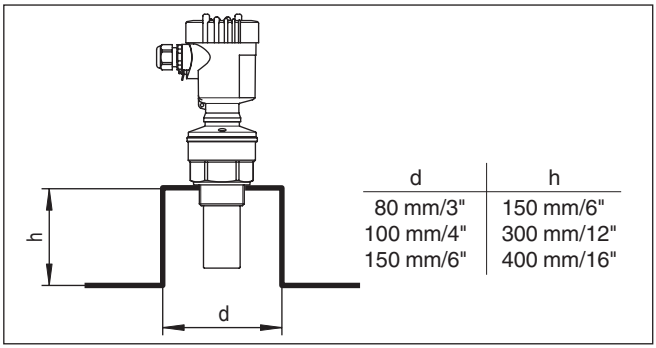


Fig. 9: Deviating socket dimensions

Sensor orientation

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

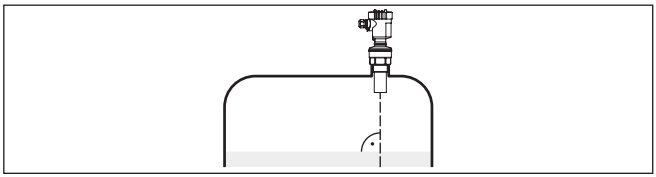


Fig. 10: Alignment in liquids

To reduce the blocking distance to the medium, you can also mount VEGASON 61 with a beam deflector. By doing this, it is possible to fill the vessel nearly to maximum. Such an arrangement is suitable primarily for open vessels such as e.g. overflow basins.

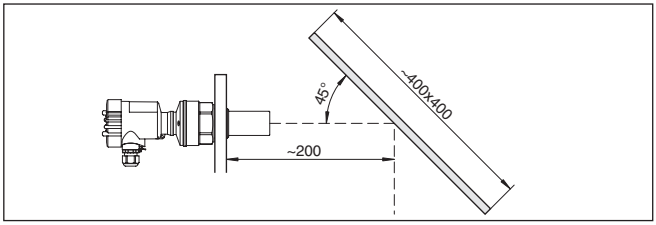


Fig. 11: Beam deflector

Vessel installations

The ultrasonic sensor should be installed at a location where no installations cross the ultrasonic beam.

Vessel installations such as for example, ladders, limit switches, heating spirals, struts etc. can cause false echoes that interfere with the useful echo. Make sure when planning your measuring site that the ultrasonic signals have a "clear view" to the measured product.

In case of existing vessel installations, a false signal suppression should be carried out during setup.

If large vessel installations such as struts or supports cause false echoes, these can be attenuated through supplementary measures. Small, inclined sheet metal or plastic baffles above the installations scatter the ultrasonic signals and avoid direct false echoes.

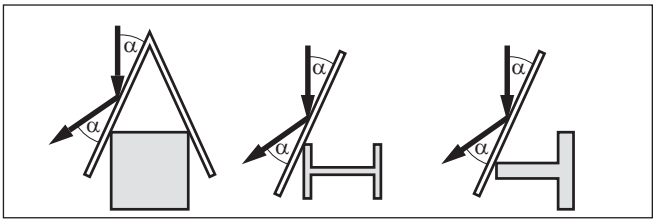


Fig. 12: Cover flat, large-area profiles with deflectors

Agitators

If there are agitators in the vessel, a false signal suppression should be carried out with the agitators in motion. This ensures that the interfering reflections from the agitators are saved with the blades in different positions.

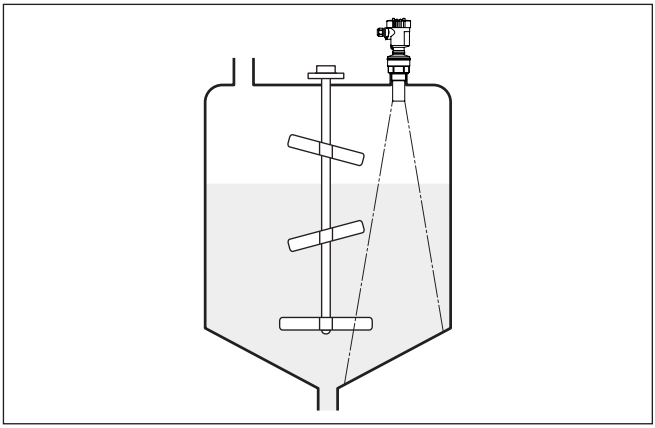


Fig. 13: Agitators

Inflowing medium

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

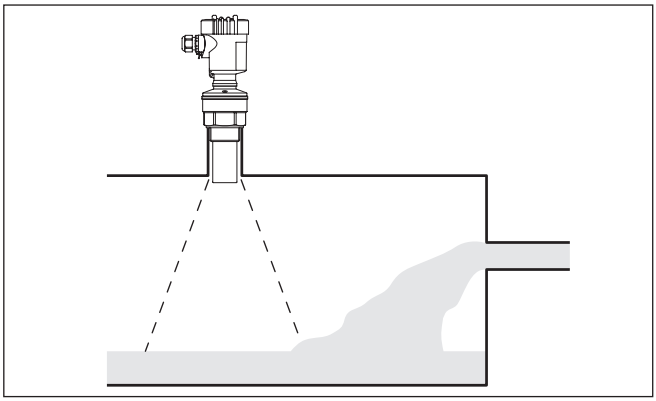


Fig. 14: Inflowing liquid

Foam

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

If foams are causing measurement errors, the device should be used in a standpipe or, alternatively, the more suitable guided radar sensors (TDR) should be used.

Guided wave radar is unaffected by foam generation and is particularly suitable for such applications.

Air turbulences

If there are strong air currents in the vessel, e.g. due to strong winds in outdoor installations or air turbulence, e.g. by cyclone extraction you should mount VEGASON 61 in a standpipe or use a different measuring principle, e.g. radar or guided radar (TDR).

Standpipe measurement

By using a standpipe (surge or bypass tube), the influence of vessel installations, foam generation and turbulence is excluded.

Standpipes must extend all the way down to the requested min. level, as measurement is only possible within the tube.

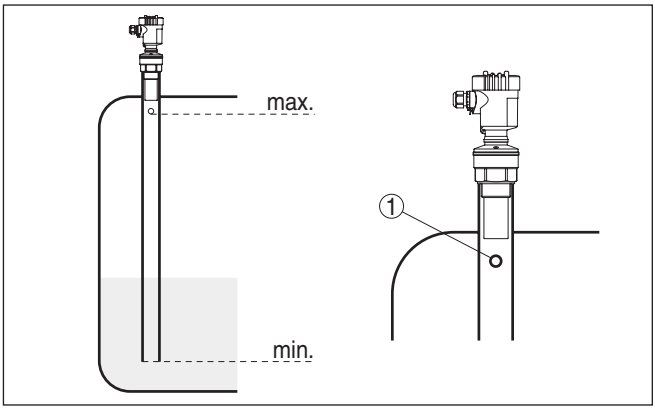


Fig. 15: Standpipe in the tank

1 Vent hole: ø 5 … 10 mm (0.197 … 0.394 in)

VEGASON 61 can be used from tube diameters of 40 mm (1.575 in).

Avoid large gaps and thick welding joints when connecting the tubes. Generally carry out a false signal suppression.

Measurement in a standpipe is not recommended for extremely adhesive products.

Flow measurement with rectangular overfall

The short examples give you introductory information on flow measurement. Detailed planning information is available from flume manufacturers and in special literature.

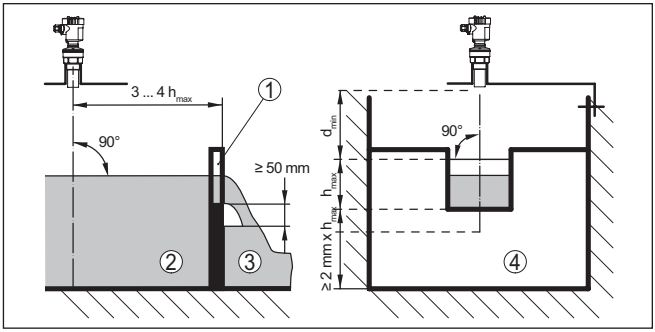


Fig. 16: Flow measurement with rectangular overfall: $d_{min.}$ = blocking distance of the sensor (see chapter "Technical data"); $h_{max.}$ = max. filling of the rectangular spillway

1 Overfall orifice (side view)
2 Upstream water
3 Tailwater
4 Overfall orifice (view from tailwater)

In general, the following points must be observed:

- Install the sensor on the headwater side

- Installation in the centre of the flume and vertical to the liquid surface
- Distance to the overfall orifice
- Distance of orifice opening above ground
- Min. distance of the orifice opening to tailwater
- Distance of the sensor to the max. height of damming by taking the blocking distance into account

Flow measurement with Khafagi Venturi flume

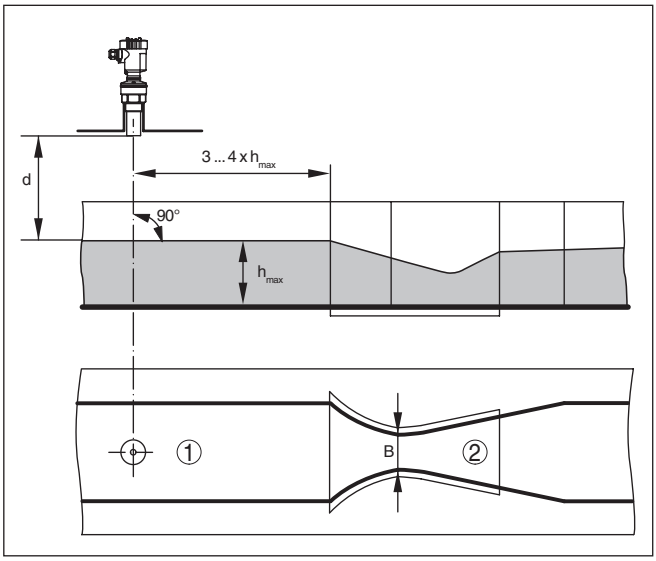


Fig. 17: Flow measurement with Khafagi-Venturi flume: d = Blocking distance to sensor; $h_{max.}$ = max. filling of the flume; B = tightest constriction in the flume

1 Position sensor
2 Venturi flume

In general, the following points must be observed:

- Installation of the sensor at the inlet side
- Installation in the centre of the flume and vertical to the liquid surface
- Distance to the Venturi flume
- Distance of the sensor to the max. height of damming by taking the blocking distance into account

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage
- If voltage surges are expected, overvoltage arresters should be installed according to Profibus specifications

Take note of safety instructions for Ex applications

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

Voltage supply

Power supply is provided by a Profibus DP/PA segment coupler. The power supply range can differ depending on the instrument version.

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

Connection cable

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

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. A cable outer diameter of 5 … 9 mm (0.2 … 0.35 in) ensures the seal effect of the cable gland. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

Please make sure that your 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 gland ½ NPT

On the instrument with cable entry ½ NPT and plastic housing there is a metallic ½" threaded insert moulded into the plastic housing.

Caution:
No grease should be used when screwing the NPT cable gland or steel tube into the threaded insert. Standard grease can contain additives that corrode the connection between threaded insert and housing. This would influence the stability of the connection and the tightness of the housing.

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 screening directly to ground potential at the power supply unit and at the sensor. In the connection box or T-distributor, the screening of the short stub to the sensor must not be connected to ground potential or to another cable screening. The cable screenining 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.

The total capacitance of the cable and of all capacitors must not exceed 10 nF in Ex applications.

Connection cable for Ex applications

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 described above.

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

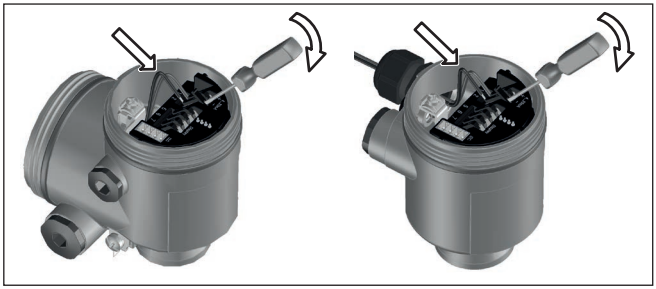


Fig. 18: Connection steps 6 and 7

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 shielding 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.

Housing overview

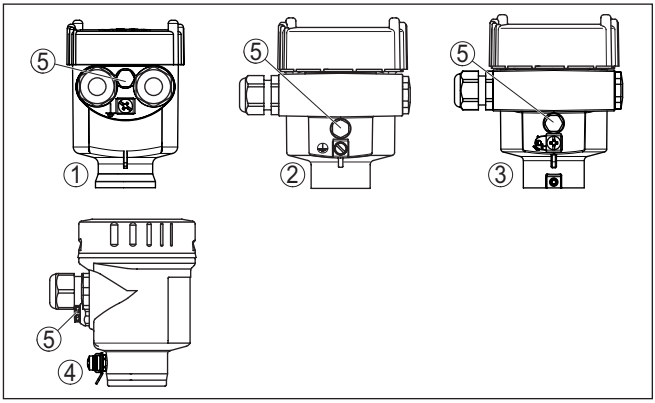


Fig. 19: Material versions, single chamber housing

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 IP66/IP68 (1 bar) for Aluminium and stainless steel*

Electronics and connection compartment

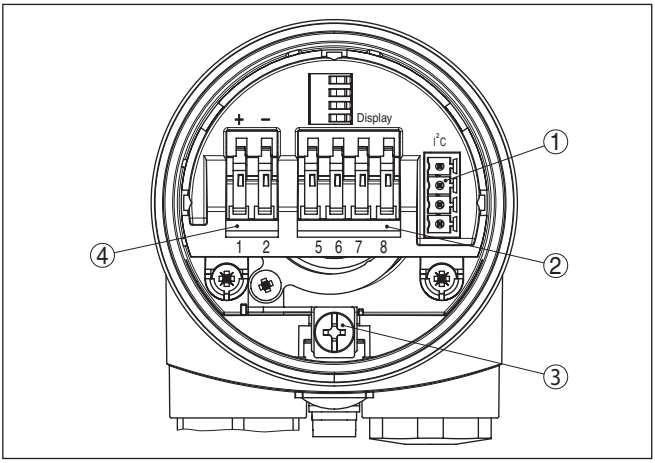


Fig. 20: Electronics and connection compartment - single chamber housing

1 *Plug connector for VEGACONNECT (I^2C 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

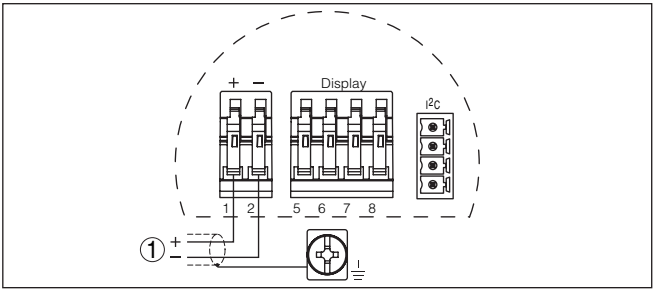


Fig. 21: Wiring plan - single chamber housing

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

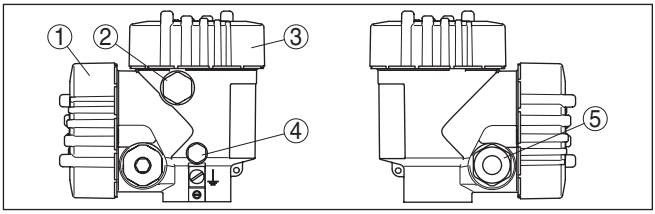


Fig. 22: Double chamber housing

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

Electronics compartment

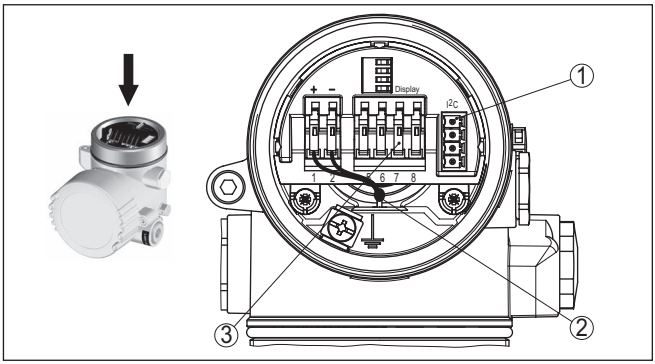


Fig. 23: Electronics compartment - double chamber housing

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

Connection compartment

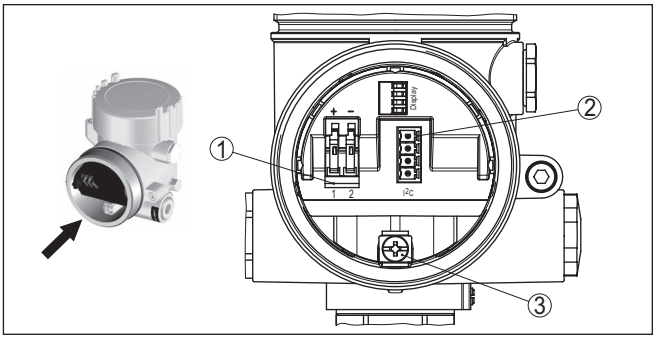


Fig. 24: Connection compartment - double chamber housing

1 Spring-loaded terminals for voltage supply
2 Plug connector for service (I^2C interface)
3 Ground terminal for connection of the cable screening

Wiring plan

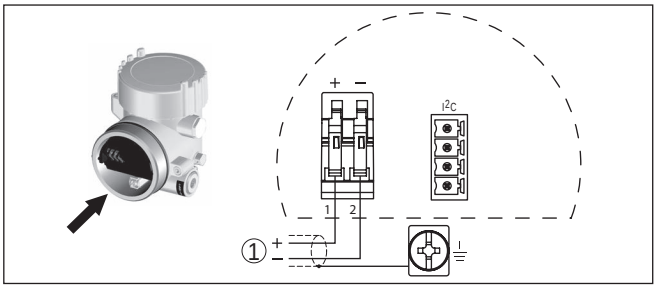


Fig. 25: Wiring plan - double chamber housing

1 Voltage supply, signal output

5.5 Wiring plan - version IP66/IP68 (1 bar)

Wire assignment, connection cable

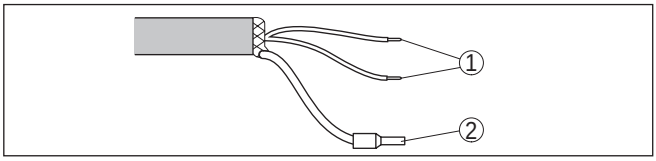


Fig. 26: Wire assignment, connection cable

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

5.6 Switch-on phase

Switch-on phase

After VEGASON 61 is connected to voltage supply or after voltage recurrence, the instrument carries out a self-check for approx. 30 seconds. The following steps are carried out:

- Internal check of the electronics
- Indication of the instrument type, the firmware as well as the sensor TAGs (sensor designation)
- Status byte goes briefly to fault value

Then the current measured value will be displayed and the corresponding digital output signal will be output to the cable.[2)]

[2)] The values correspond to the actual measured level as well as to the settings already carried out, e.g. default setting.

6 Set up with the display and adjustment module PLICSCOM

6.1 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 (four positions in 90° offset can be selected) and turn to the right until it clicks into place.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

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

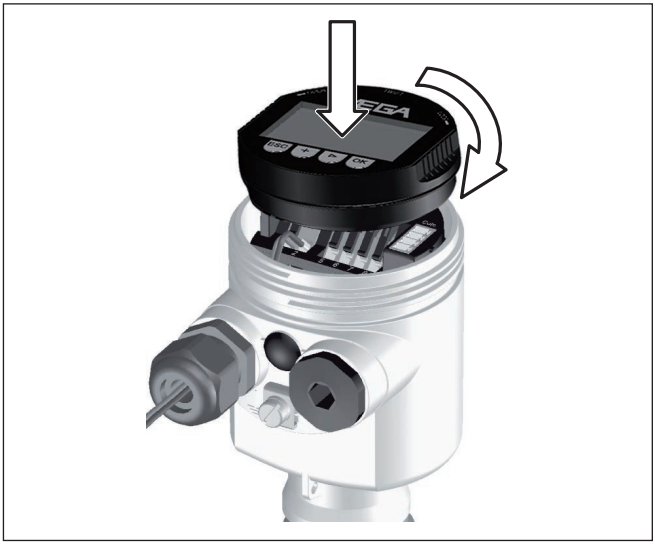


Fig. 27: Insert display and adjustment module in the single chamber housing

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

6.2 Adjustment system

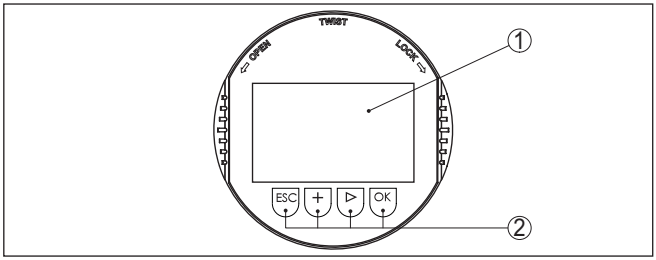


Fig. 28: Display and adjustment elements

1 LC display
2 Adjustment keys

Key functions

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- ***[->]*** key:
  - Change measured value presentation
  - Select list entry
  - Select menu items in the quick setup menu
  - Select editing position
- ***[+]*** key:
  - Change value of the parameter
- ***[ESC]*** key:
  - Interrupt input
  - Jump to next higher menu

Operating system - Keys direct

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

Time functions

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

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

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

6.3 Setup steps

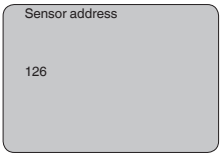
Address setting

Before starting the actual parameter adjustment of a Profibus PA sensor, the address setting must first be carried out. You will find a

detailed description in the operating instructions manual of the display and adjustment module or in the online help of PACTware or DTM.

Basic adjustment - Sensor address

Level and pressure sensors operate as slaves on the Profibus PA. To be identified as a bus participant, each sensor must have a unique address. Each instrument is delivered with address 126. With this address, it can at first be connected to an existing bus. However, the address must be changed. This can be done in this menu item.



Parameter adjustment

The sensor measures the distance from the sensor to the medium surface. For indication of the real level, an allocation of the measured distance to the percentage height must be carried out.

The actual level is then calculated on the basis of these entered values. At the same time, the operating range of the sensor is limited from maximum range to the requested range.

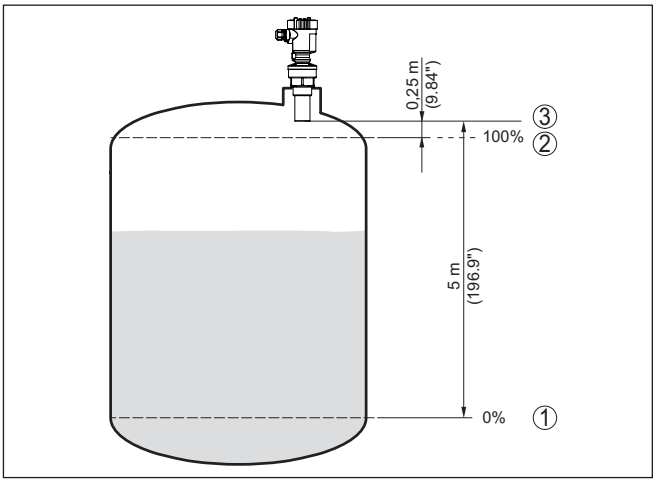


Fig. 29: Parameterisation example, Min./max. adjustment

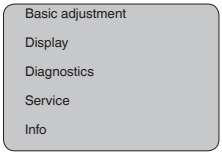
1 *Min. level = max. distance (depending on the sensor)*
2 *Max. level = min. distance (final value of the blocking distance, depending on the sensor)*
3 *Reference plane*

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

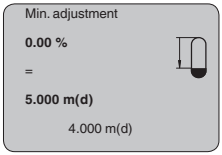
Basic adjustment - Min. adjustment

Proceed as follows:

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



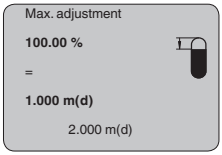
2. Select the menu item "*Basic adjustment*" with ***[->]*** and confirm with ***[OK]***. Now the menu item "*Min. adjustment*" is displayed.



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 ***[->]***.

Basic adjustment - Max. adjustment

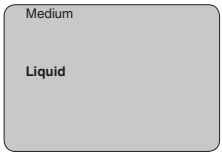
Proceed as follows:



1. 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.
2. Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. Keep in mind that the max. level must lie below the blocking distance.
3. Save the settings with ***[OK]*** and move to "Medium selection" with ***[->]***.

Basic adjustment - Medium

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*".



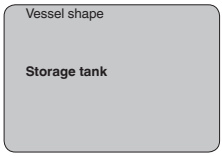
With solids, you can also choose between "*Powder/Dust*", "*Granular/Pellets*" or "*Ballast/Pebbels*".

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.

Basic adjustment - Vessel form

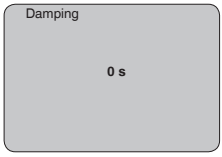
Apart from the medium, the vessel shape can also influence the measurement. To adapt the sensor to these measuring conditions, this menu item offers different options depending on whether liquid or bulk solid is selected. With "*Liquids*" these are "*Storage tank*", "*Stilling tube*", "*Open vessel*"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



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 medium 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.

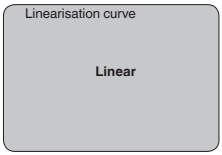


Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the ***[->]*** key.

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*".

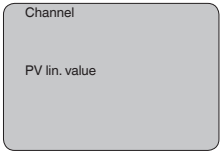


Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the ***[->]*** key.

Basic adjustment - Channel

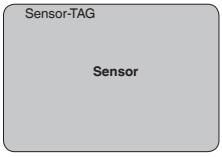
The channel is the input selector switch for function block (FB) of the sensor. Within the function block, additional scalings (Out-Scale) are carried out. In this menu item, the value fir the function block is selected:

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



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.



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

Menu section, display

Display - Indicated value

Radar, guided microwave and ultrasonic sensors deliver the following measured values:

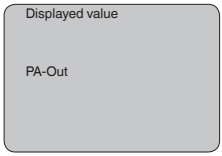
- SV1 (Secondary Value 1): Percentage value after the adjustment
- SV2 (Secondary Value 2): Distance value before the adjustment

- PV (Primary Value): Linearised percentage value
- PA-Out (value after passing the function block): PA output

A pressure transmitter delivers the following measured values:

- SV1 (Secondary Value 1): Pressure or height value before adjustment
- SV2 (Secondary Value 2): Percentage value after the adjustment
- PV (Primary Value): Linearised percentage value
- PA-Out (value after passing the function block): PA output
- Temperature

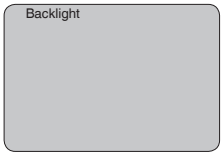
In the menu item "*Display*" you can define which value should be indicated on the display.



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*".

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

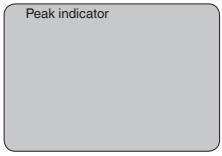


In the default setting, the lightning is switched off.

Diagnosis - Peak indicator

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

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



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.

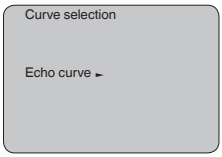
Diagnosis - Curve selection

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.



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 detailled evaluation of measurement reliability. The selected curve is updated continuously. With the ***[OK]*** key, a submenu with zoom functions is opened.

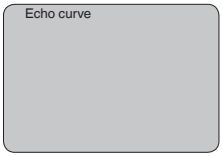
The following functions are available with "**Echo and false echo curve**":

- "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:

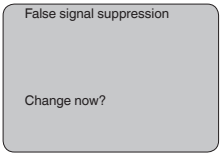
- "X-Zoom": Resolution
  - 1 minute
  - 1 hour
  - 1 day
- "Stop/Start": Interrupt a recording or start a new recording
- "Unzoom": Reset the resolution to minutes

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.



Service - False signal suppression

High nozzles 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 will be detected.



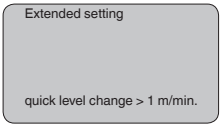
Proceed as follows:

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 medium surface. All false signals in this area are detected by the sensor and saved after confirming with ***[OK]***.

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

Service - Extended setting

The menu item "*Extended setting*" offers the possibility to optimise VEGASON 61 for applications in which the level changes very quickly. To do this, select the function "*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 - Additional PA value

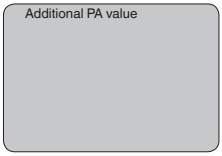
Profibus transmits two values cyclically. The first value is determined in the menu item "*Channel*". The selection of the additional cyclical value is made in the menu item "*Additional PA value*".

The following values are available with radar, guided microwave and ultrasonic sensors:

- SV1 (Secondary Value 1): Percentage value after the adjustment
- SV2 (Secondary Value 2): Distance value before the adjustment
- PV (Primary Value): Linearised percentage value

With pressure transmitters the following values are available:

- SV1 (Secondary Value 1): Pressure or height value before adjustment
- SV2 (Secondary Value 2): Percentage value after the adjustment
- PV (Primary Value): Linearised percentage value



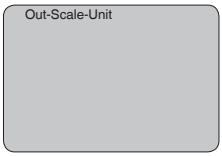
Service - Determine Out-Scale

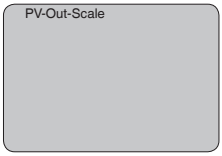
Here, you determine the unit and scaling for PA-Out. These settings also apply to the values displayed on the display and adjustment module if in the menu item "*Displayed value*" PA-Out was selected.

The following displayed values are available in "Out-Scale unit":

- Pressure (only with pressure transmitters)
- Height
- Ground
- Flow
- Volume
- Others (no unit, %, mA)

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





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 radar (GWR))

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:

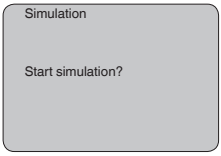
1. Push ***[OK]***
2. Select the requested simulation variable with ***[->]*** and confirm with ***[OK]***.
3. Set the requested numerical value with ***[+]*** and ***[->]***.
4. Push ***[OK]***

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.



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):[3)]

Menu section	Function	Reset value
Basic settings	Max. adjustment	Final value dead zone in m(d)[4)]
	Min. adjustment	Meas. range end in m(d)[5)]
	Medium	Liquid
	Vessel shape	not known
	Damping	0 s
	Linearisation	Linear
	Channel	PV lin. %
	Sensor-TAG	Sensor
Display	Displayed value	PA-Out
Service	Additional PA value	Secondary Value 1 %
	Out-Scale-Unit	%
	PV-Out-Scale	0.00 lin % = 0.0 % 100.0 lin % = 100 %

3) Sensor-specific basic adjustment.
4) Depending on the sensor type, see chapter "Technical data".
5) Depending on the sensor type, see chapter "Technical data".

Menu section	Function	Reset value
	Unit of measurement	m(d)

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

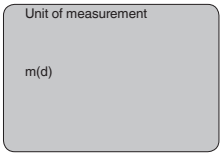
Menu section	Function	Reset value
Basic settings	Sensor address	No reset
Service	Language	No reset

Default setting
Like basic adjustment, but in addition, special parameters are reset to default values.[6)]

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

Service - Adjustment unit

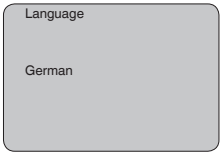
In this menu item you select the internal arithmetic unit of the sensor.



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



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*".

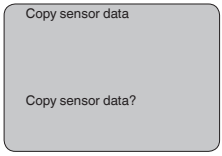
[6)] Special parameters are parameters which are set customer-specifically on the service level with the adjustment software PACTware.

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

- Measured value presentation
- Adjustment
- Medium
- Vessel shape
- Damping
- Linearisation curve
- Sensor-TAG
- Displayed value
- Scaling unit (Out-Scale unit)
- Positions after the decimal point (scaled)
- Scaling PA/Out-Scale 4 values
- Unit of measurement
- Language

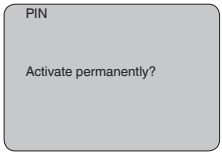
The following safety-relevant data are **not** read out or written:

- Sensor address
- PIN



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.



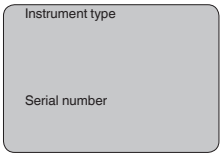
Only the following functions are permitted with activated PIN:

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

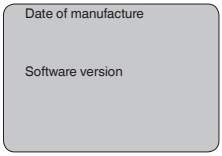
Info

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

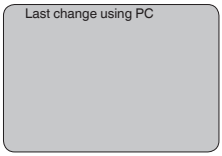
- Instrument type
- Serial number: 8-digit number, e.g. 12345678



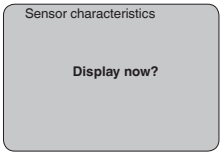
- Date of manufacture: Date of the factory calibration
- Software version: Edition of the sensor software



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



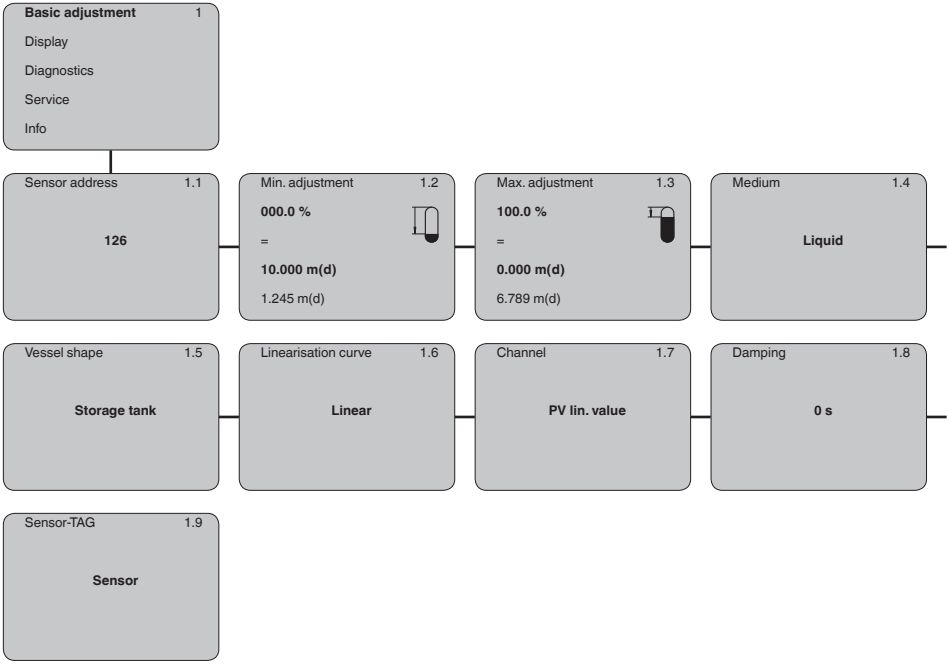
- Sensor details, e.g. approval, process fitting, seal, measuring cell, measuring range, electronics, housing, cable entry, plug, cable length etc.



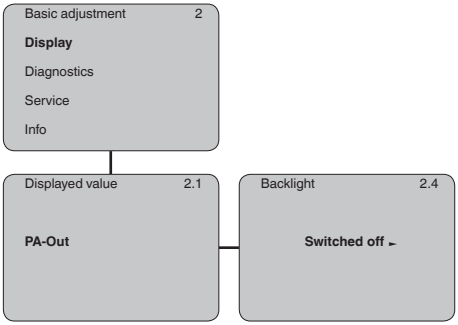
6.4 Menu schematic

Information:
Depending on the version and application, the highlighted menu windows may not always be available.

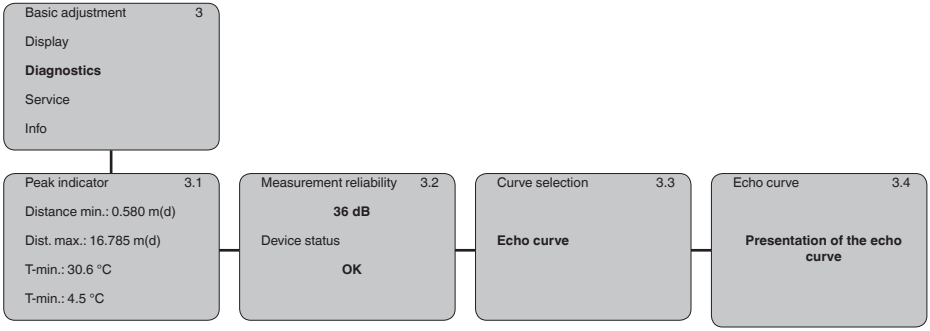
Basic adjustment



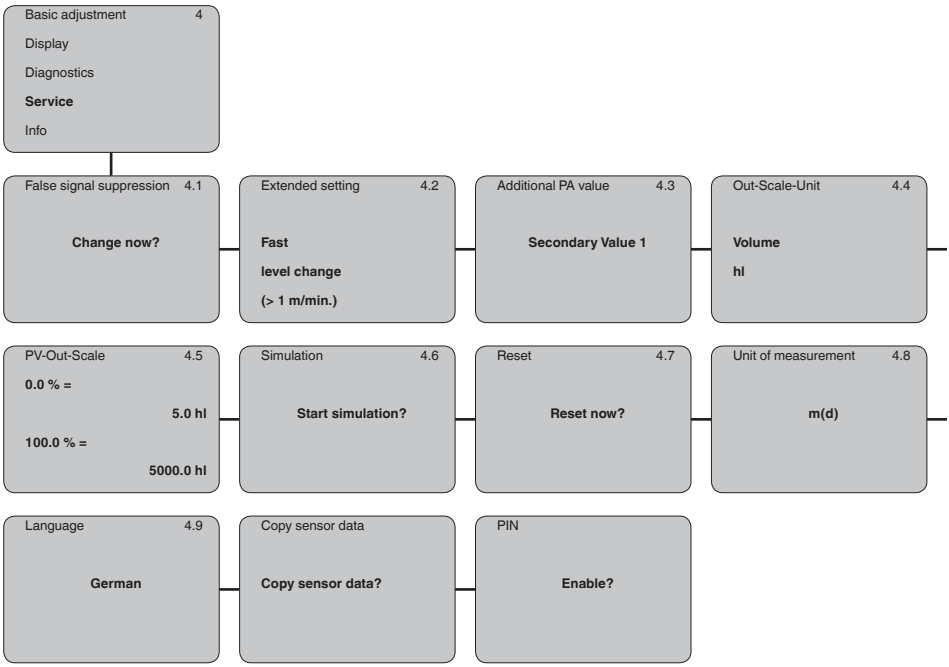
Display



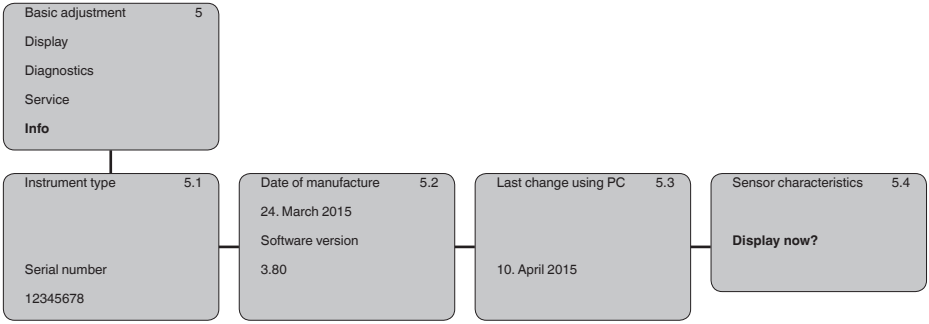
Diagnostics



Service



Info



6.5 Saving the parameterisation data

On paper

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

In the display and adjustment module

If the instrument is equipped with a display and adjustment module, the parameter adjustment data can be saved in it. The data remain permanently stored there even if the sensor supply fails. The procedure is described in menu item "*Copy sensor data*".

7 Setup with PACTware

7.1 Connect the PC via VEGACONNECT

Via the interface adapter directly on the sensor

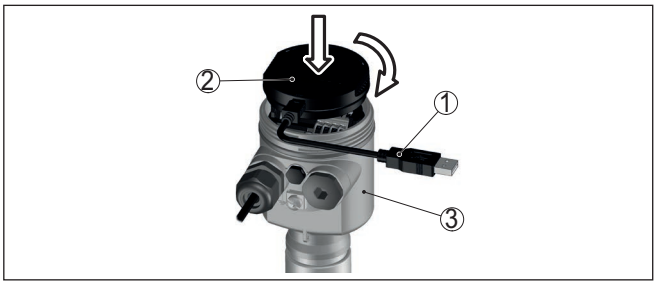


Fig. 30: Connection of the PC directly to the sensor via the interface adapter

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

Via interface adapter external

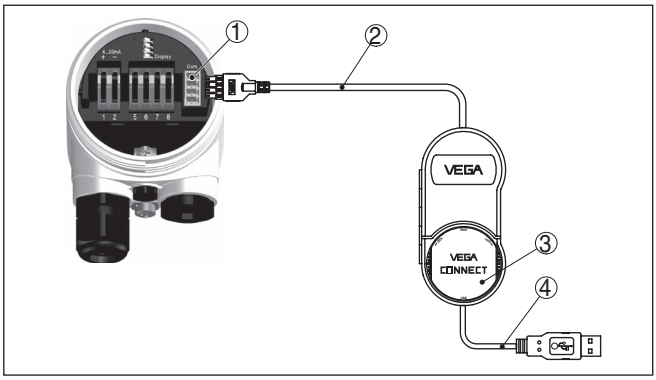


Fig. 31: Connection via interface adapter VEGACONNECT external

1 I^2C bus (com.) interface on the sensor
2 I^2C connection cable of VEGACONNECT
3 Interface adapter VEGACONNECT
4 USB cable to the PC

Via the interface adapter and HART

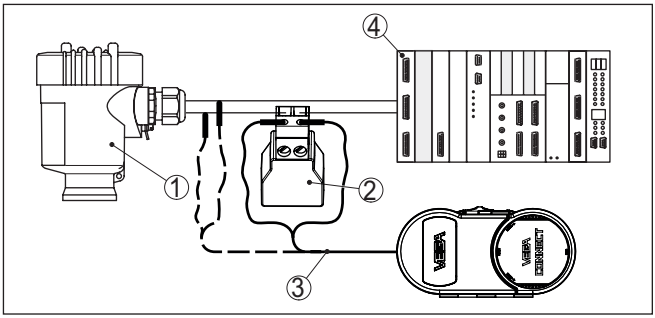


Fig. 32: Connecting the PC via HART to the signal cable

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

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 VEGAMET 381, VEGAMET 391. Common Ex separators are also usually equipped with a sufficient current limiting resistance. In such cases, the interface adapter can be connected parallel to the 4 … 20 mA cable (dashed line in the previous illustration).

7.2 Parameter adjustment

Prerequisites

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

Note:
To ensure that all instrument functions are supported, you should always use the latest DTM Collection. Furthermore, not all described functions are included in older firmware versions. You can download the latest instrument software from our homepage. A description of the update procedure is also available in the Internet.

Further setup steps are described in the operating instructions manual "*DTM Collection/PACTware*" attached to each DTM Collection and which can also be downloaded from the Internet. Detailed descriptions are available in the online help of PACTware and the DTMs.

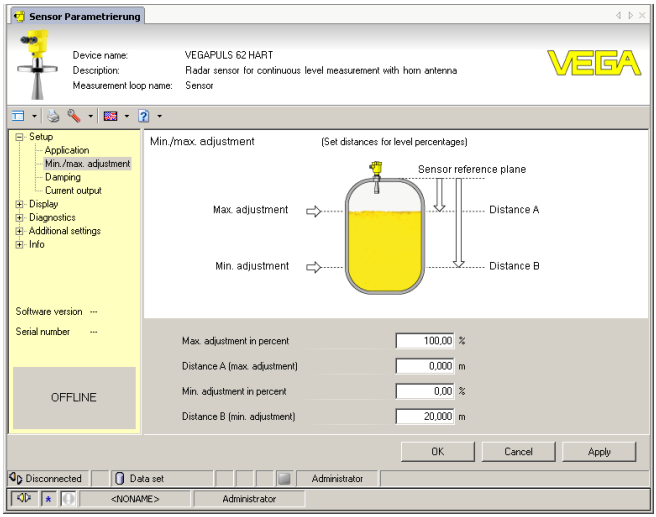


Fig. 33: Example of a DTM view

7.3 Save parameter adjustment data

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

8 Set up with other systems

8.1 DD adjustment programs

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

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

9 Maintenance and fault rectification

9.1 Maintenance

Maintenance

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

Cleaning

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

Take note of the following:

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

9.2 Rectify faults

Reaction when malfunction occurs

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

Causes of malfunction

The device 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 are:

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

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

Checking Profibus PA

The following table describes possible errors and helps to remove them:

Error	Cause	Rectification
When an additional instrument is connected, the segment fails.	Max. supply current of the segment coupler exceeded	Measure the current consumption, reduce size of segment
Wrong presentation of the measured value in Simatic S5	Simatic S5 cannot interpret the number format IEEE of the measured value	Insert converting component from Siemens
In Simatic S7 the measured value is always presented as 0	Only four bytes are consistently loaded in the PLC	Use function component SFC 14 to load 5 bytes consistently

Error	Cause	Rectification
Measured value on the display and adjustment module does not correspond to the value in the PLC	The menu item "*Display - Display value*" is not set to "*PA-Out*"	Check values and correct, if necessary
No connection between PLC and PA network	Incorrect adjustment of the bus parameter and the segment coupler-dependent baud rate	Check data and correct, if necessary
Instrument does not appear during connection setup	Profibus DP cable pole-reversed	Check cable and correct, if necessary
	Incorrect termination	Check termination at the beginning and end points of the bus and terminate, if necessary, according to the specification
	Instrument not connected to the segment, double assignment of an address	Check and correct, if necessary

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	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 "*Setup*" must be carried out again or must be checked for plausibility and completeness.

24 hour service hotline

Should these measures not be successful, please call in urgent cases the VEGA service hotline under the phone no. **+49 1805 858550**.

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

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

9.3 Exchanging the electronics module

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

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

If there is no electronics module available on site, 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.

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.

9.4 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.

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

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

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

9.5 How to proceed if a repair is necessary

On our homepage you will find detailed information on how to proceed in the event of a repair.

So that we can carry out the repair quickly and without queries, generate a instrument return form there with the data of your device.

You will need:

- The serial number of the instrument
- A short description of the problem

- Details of the medium

Print the generated instrument return form.

Clean the instrument and pack it damage-proof.

Send the printed instrument return form and possibly a safety data sheet together with the device.

You will find the address for the return on the generated instrument return form.

10 Dismount

10.1 Dismounting steps

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

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

10.2 Disposal

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

Remove any batteries in advance, if they can be removed from the device, and dispose of them separately.

If personal data is stored on the old device to be disposed of, delete it before disposal.

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.

11 Supplement

11.1 Technical data

Note for approved instruments

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

All approval documents can be downloaded from our homepage.

General data	
Materials, wetted parts	
– Transducer	PVDF
– Seal transducer/process fitting	EPDM, FKM
– Process fitting G1½, DIN 3852-A-B	PVDF
– Process fitting 1½ NPT, ASME B1.20.1	PVDF
Materials, non-wetted parts	
– Housing	Plastic PBT (polyester), Alu die-casting, powder-coated, 316L
– Seal, housing lid	Silicone SI 850 R
– Inspection window housing cover	Polycarbonate (UL-746-C listed), glass[7)]
– Ground terminal	316Ti/316L
– Cable gland	PA, stainless steel, brass
– Sealing, cable gland	NBR
– Blind plug, cable gland	PA
Weight	1.8 … 4 kg (4 … 8.8 lbs), depending on the process fitting and housing
Max. torque mounting boss	25 Nm (18.44 lbf ft)

Input variable	
Measured variable	distance between lower edge of the transducer and medium surface
Measuring range	
– Liquids	up to 5 m (16.4 ft)
– Bulk solids	up to 2 m (6.562 ft)
blocking distance	0.25 m (0.82 ft)

Output variable	
Output signal	digital output signal, format according to IEEE-754
Cycle time	min. 1 s (dependent on the parameter setting)
Sensor address	126 (default setting)
Current value	10 mA, ±0.5 mA

[7)] Glass (with Aluminium and stainless steel precision casting housing)

Damping (63 % of the input variable)	0 … 999 s, adjustable
Met NAMUR recommendation	NE 43
Resolution, digital	> 1 mm (0.039 in)

Deviation

Deviation[8)]	≤ 4 mm (meas. distance ≤ 2.0 m/6.562 ft)

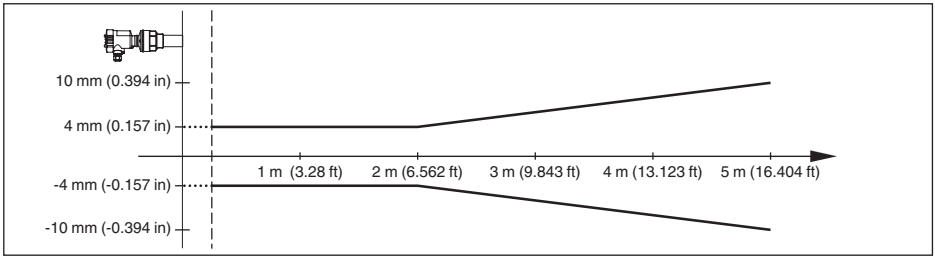


Fig. 34: Deviation VEGASON 61

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 (6.56 x 6.56 ft)
– False reflections	Biggest false signal, 20 dB smaller than the useful signal

Measuring characteristics

Ultrasonic frequency	70 kHz
Interval	> 2 s (dependent on the parameter adjustment)
Abstrahlwinkel at -3 dB	11°
Step response or adjustment time[9)]	> 3 s (dependent on the parameter adjustment)

Deviation

Deviation[10)]	≤ 4 mm (meas. distance ≤ 2.0 m/6.562 ft)

[8)] Incl. non-linearity, hysteresis and non-repeatability.
[9)] Time to output the correct level (with max. 10 % deviation) after a sudden level change.
[10)] Incl. non-linearity, hysteresis and non-repeatability.

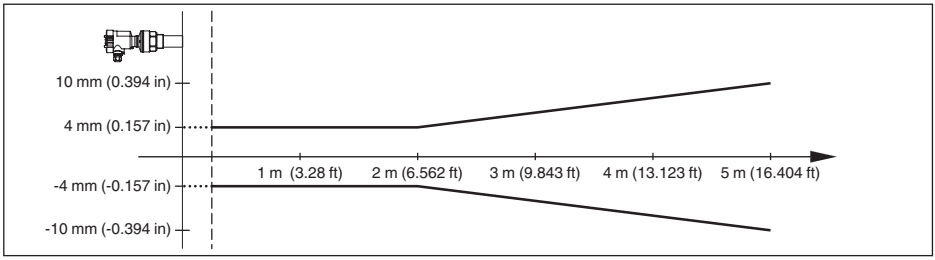


Fig. 35: Deviation VEGASON 61

Influence of the ambient temperature to the sensor electronics[11)]

Average temperature coefficient of the zero signal (temperature error)	0.06 %/10 K

Ambient conditions

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

Process conditions

Process pressure	-20 … 200 kPa/-0.2 … 2 bar (-2.9 … 29 psig)
Process temperature (transducer temperature)	
– Seal EPDM	-40 … +80 °C (-40 … +176 °F)
– Seal FKM	-20 … +80 °C (-4 … +176 °F)
Vibration resistance	mechanical vibrations with 4 g and 5 … 100 Hz[12)]

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

Options of the cable entry	
– Cable entry	M20 x 1.5; ½ NPT
– Cable gland	M20 x 1.5; ½ NPT
– Blind plug	M20 x 1.5; ½ NPT
– Closing cap	½ NPT
Wire cross-section (spring-loaded terminals)	
– Massive wire, stranded wire	0.2 … 2.5 mm² (AWG 24 … 14)
– Stranded wire with end sleeve	0.2 … 1.5 mm² (AWG 24 … 16)

Electromechanical data - version IP66/IP68 (1 bar)

Options of the cable entry	
– Cable gland with integrated connection cable	M20 x 1.5 (cable: ø 5 … 9 mm)
– Cable entry	½ NPT
– Blind plug	M20 x 1.5; ½ NPT

[11)] Relating to the nominal measuring range.
[12)] Tested according to the guidelines of German Lloyd, GL directive 2.

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

Display element	Display with backlight
Measured value indication	
– Number of digits	5
Adjustment elements	
– 4 keys	***[OK]***, ***[->]***, ***[+]***, ***[ESC]***
– Switch	Bluetooth On/Off
Bluetooth interface	
– Standard	Bluetooth LE
– Effective range	25 m (82.02 ft)
Protection rating	
– unassembled	IP20
– Mounted in the housing without lid	IP40
Materials	
– Housing	ABS
– Inspection window	Polyester foil
Functional safety	SIL non-reactive

Voltage supply

Operating voltage	9 … 32 V DC
Operating voltage U_B with lighting switched on	12 … 32 V DC
Power supply by	DP/PA segment coupler
Max. number of sensors	32

Electrical protective measures

Protection rating

Housing material	Version	IP-protection class	NEMA protection
Plastic	Single chamber	IP66/IP67	Type 4X
	Double chamber	IP66/IP67	Type 4X

Housing material	Version	IP-protection class	NEMA protection
Aluminium	Single chamber	IP66/IP68 (0.2 bar) IP68 (1 bar)	Type 6P Type 6P
	Double chamber	IP66/IP67 IP66/IP68 (0.2 bar) IP68 (1 bar)	Type 4X Type 6P Type 6P
Stainless steel (electro-polished)	Single chamber	IP66/IP68 (0.2 bar)	Type 6P
Stainless steel (precision casting)	Single chamber	IP66/IP68 (0.2 bar) IP68 (1 bar)	Type 6P 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[13)]	4
Protection class	II (IEC 61010-1)

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 by entering the serial number of your instrument into the search field under www.vega.com as well as in the general download area.

11.2 Device communication Profibus PA

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

Instrument master file

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

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

Ident number

Each Profibus instrument gets an unambiguous ident number (ID number) from the Profibus user organisation (PNO). This ID number is also included in the name of the GSD file. For VEGASON 61 the ID number is **0x0770(hex)** and the GSD file "**SN__0770.GSD**". As an option to this manufacturer-specific GSD file, PNO provides also a general so-called profile-specific GSD file. For VEGASON 61 you have to use the general GSD file "**PA139701.GSD**". If the general GSD file is used, the sensor must be set to the profile-specific ident number via the DTM software. By default, the sensor operates with the manufacturer-specific ID number.

[13)] When used with fulfilled housing protection

Note:

When using the profile-specific GSD file, the PA-OUT value as well as the temperature value are transmitted to the PLC (see block diagram "*Cyclical data traffic*").

Cyclical data traffic

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

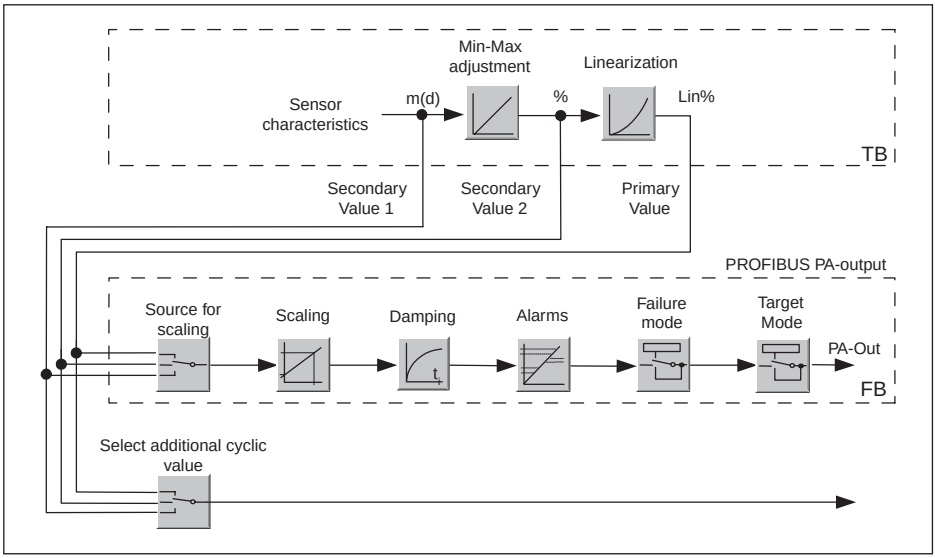


Fig. 36: VEGASON 61: Block diagram with AI (PA-OUT) value and additional cyclical value

TB Transducer Block
FB Function Block

Module of the PA sensors

For the cyclic data traffic, VEGASON 61 provides the following modules:

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

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

Note:

The modules are available in two versions:

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

Examples of telegram configuration

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

Example 1 (standard setting) with distance value, temperature value and additional cyclical value:

- AI (PA-OUT)
- Temperature
- Additional Cyclic Value

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

Example 2 with distance value and temperature value without additional cyclic value:

- AI (PA-OUT)
- Temperature
- Free Place

Byte-No.	1	2	3	4	5	6	7	8	9	10
Format	IEEE-754-Floating point value				Status	IEEE-754-Floating point value				Status
Value	PA-OUT (FB1)				Status (FB1)	Temperature (FB2)				Status (FB2)

Example 3 with distance value and additional cyclical value without temperature value:

- AI (PA-OUT)
- Free Place
- Additional Cyclic Value

Telegram configuration:

Byte-No.	1	2	3	4	5	6	7	8	9	10
Format	IEEE-754-Floating point value				Status	IEEE-754-Floating point value				Status
Value	PA-OUT (FB1)				Status (FB1)	Additional Cyclic Value				Status

Data format of the output signal

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

Fig. 37: Data format of the output signal

The status byte corresponds to profile 3.0 "Profibus PA Profile for Process Control Devices" coded. The status "Measured value OK" is coded as 80 (hex) (Bit7 = 1, Bit6 … 0 = 0).

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

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

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

Fig. 38: Data format of the measured value

Coding of the status byte associated with the PA output value

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

11.3 Dimensions

The listed drawings represent only an excerpt of the available process fittings. You can find more drawings at www.vega.com via the configurator of VEGASON 61.

Plastic housing

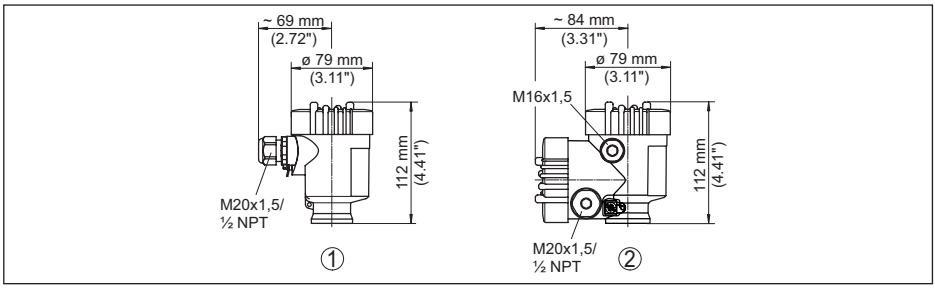


Fig. 39: Housing versions in protection IP66/IP67 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)

1 Plastic single chamber
2 Plastic double chamber

Aluminium housing

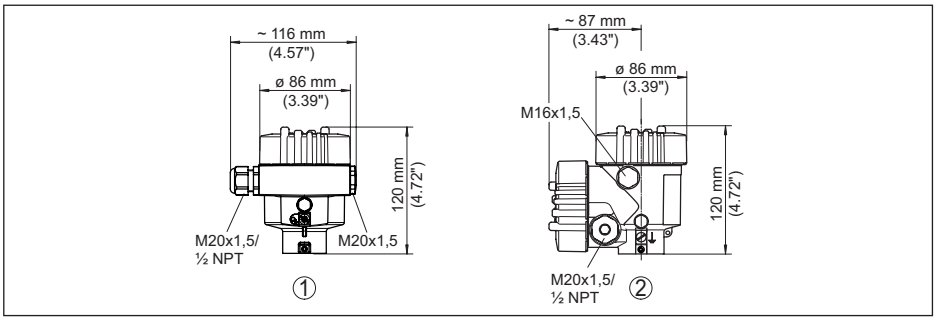


Fig. 40: Housing versions with protection rating IP66/IP68 (0.2 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Aluminium - single chamber
2 Aluminium - double chamber

Aluminium housing with protection rating IP66/IP68 (1 bar)

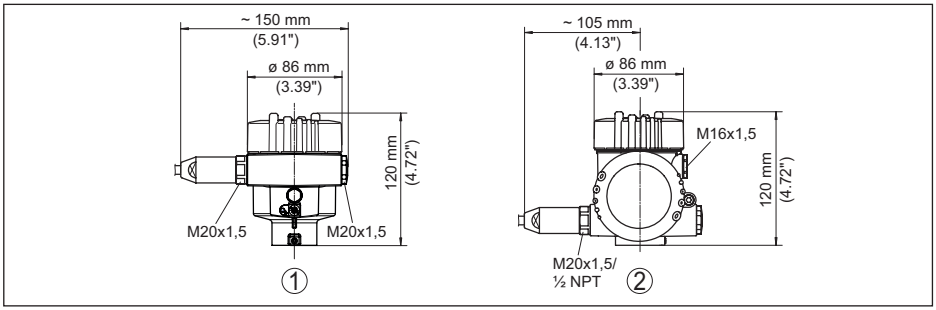


Fig. 41: Housing version with protection rating IP66/IP68 (1 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Aluminium - single chamber
2 Aluminium - double chamber

Stainless steel housing

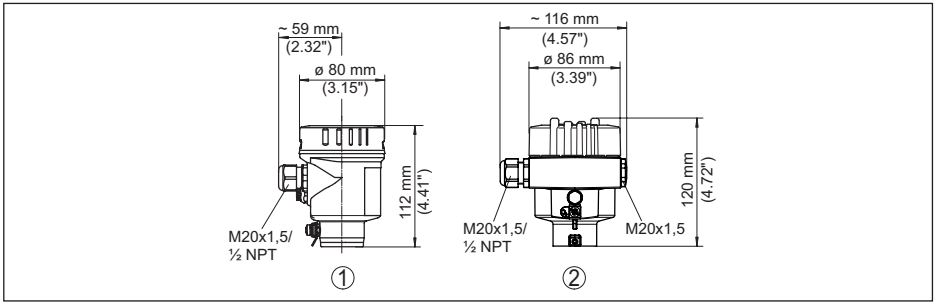


Fig. 42: Housing versions with protection rating IP66/IP68 (0.2 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

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

Stainless steel housing with protection rating IP66/IP68 (1 bar)

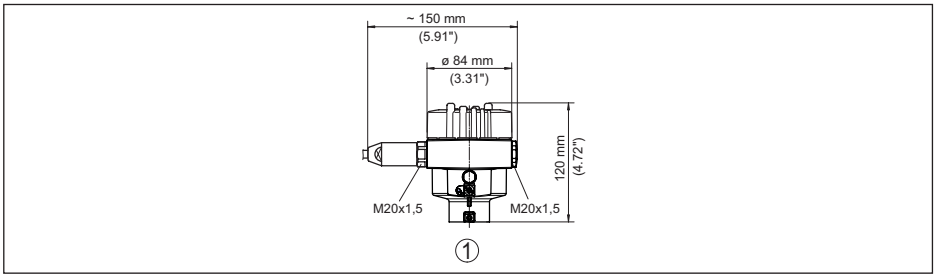


Fig. 43: Housing version with protection rating IP66/IP68 (1 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Stainless steel single chamber (precision casting)

VEGASON 61

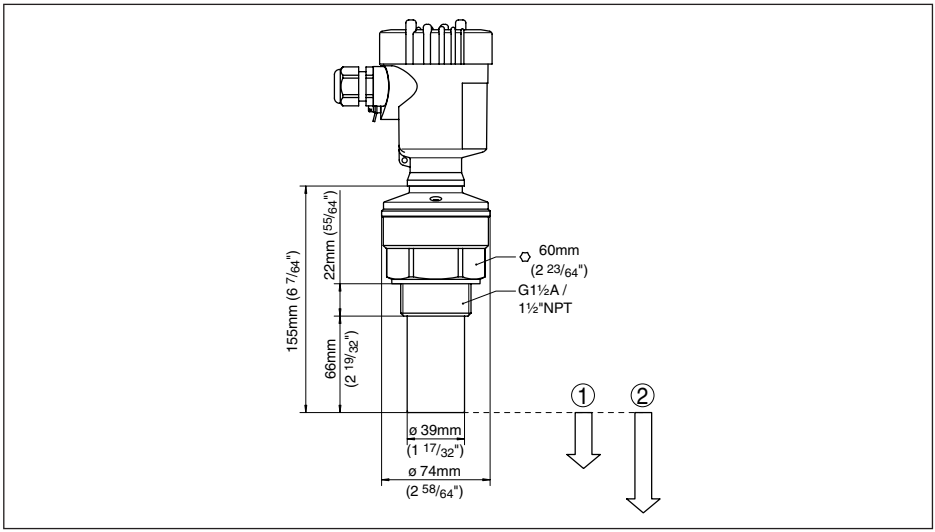


Fig. 44: VEGASON 61

1 Blocking distance: 0.25 m (0.82 ft)
2 Measuring range: with liquids up to 5 m (16.4 ft), with solids up to 2 m (6.562 ft)

11.4 Industrial property rights

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