Operating Instructions

Pressure transmitter with ceramic measuring cell

VEGABAR 82

Foundation Fieldbus

Document ID: 45032

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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 instruction 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 Intended use

The VEGABAR 82 is a pressure transmitter for process pressure and hydrostatic 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 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).

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGABAR 82 pressure transmitter
- Ventilation valves, closing screws – depending on version (see chapter "*Dimensions*")

The further scope of delivery encompasses:

- Documentation
  - Quick setup guide VEGABAR 82
  - Test certificate for pressure transmitters
  - 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. The respective scope of delivery results from the order specification.

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***".

RFID tag

An RFID tag with safety instructions relevant to explosion protection is supplied as an option. A wire and a seal for fastening are included.

The RFID tag is available in two versions:

RFID tag write-protected	RFID tag writable
● Recognisable by the DDCC RFID logo ● Written with identification link in accordance with IEC 61406, DIN Spec 91406 (syntax: sn.vega.com/12345678)	● Recognisable by the NFC logo ● Written with measurement loop identification

3.2 Principle of operation

Application area

VEGABAR 82 is suitable for applications in virtually all industries. It is used for the measurement of the following pressure types.

- Gauge pressure
- Absolute pressure
- Vacuum

Measured products

Measured products are gases, vapours and liquids.

Depending on the process fitting and measurement setup, measured products can be also viscous or contain abrasive substances.

Measured variables

The VEGABAR 82 is suitable for the measurement of the following process variables:

- Process pressure
- Level

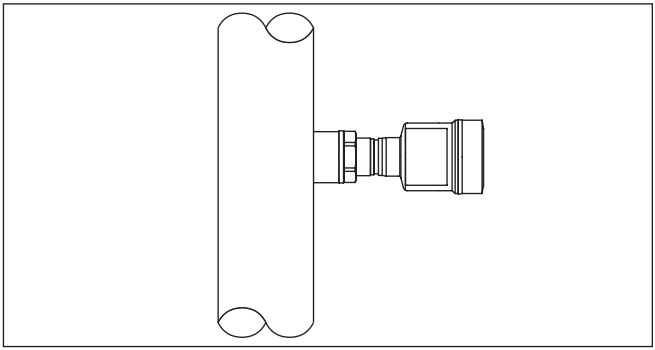

Fig. 1: Process pressure measurement VEGABAR 82

Electronic differential pressure

Depending on the version, the VEGABAR 82 is also suitable for electronic differential pressure measurement. For this, the instrument is combined with a Secondary sensor.

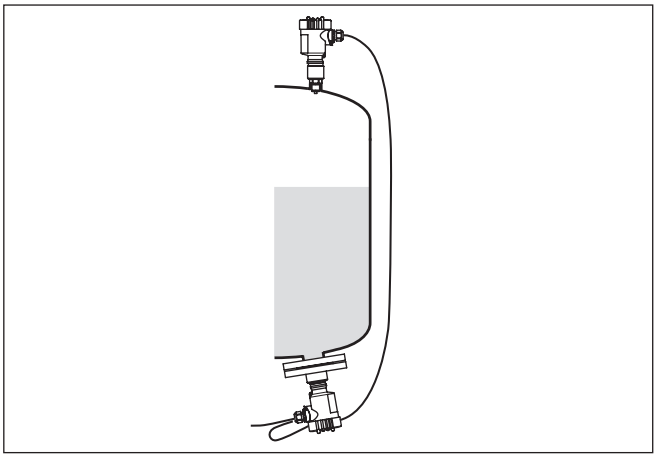

Fig. 2: Electronic differential pressure measurement via a Primary/Secondary sensor combination

You can find detailed information in the operating instructions of the respective Secondary sensor.

Measuring system pressure

The sensor element is the CERTEC® measuring cell with robust ceramic diaphragm. The process pressure deflects the ceramic diaphragm and causes a capacitance change in the measuring cell. This capacitance change is converted into an electrical signal and outputted as measured value via the output signal.

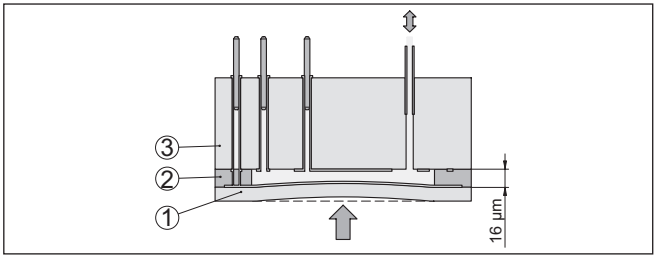

Fig. 3: Configuration of the CERTEC® measuring cell

1 Process diaphragm
2 Glass joint
3 Base element

The measuring cell is available in two sizes: CERTEC® (ø 28 mm) and Mini-CERTEC® (ø 17.5 mm).

Measuring system temperature

Temperature sensors in the ceramic diaphragm and on the ceramic body of the CERTEC® measuring cell or on the electronics of the Mini-CERTEC® measuring cell detect the current process temperature. The temperature value is output via:

- The display and adjustment module
- The current output or the additional current output

- The digital signal output

Even extreme jumps in process temperature are immediately detected by the CERTEC® measuring cell. The values in the ceramic diaphragm are compared with those on the ceramic base body. Within a few measuring cycles, the intelligent sensor electronics compensates for otherwise unavoidable measurement deviations caused by temperature shocks in the range. Depending on the adjusted damping, these cause only slight and brief changes in the output signal.

Pressure types

The measuring cell design depends on the selected pressure type.

Relative pressure: the measuring cell is open to the atmosphere. The ambient pressure is detected in the measuring cell and compensated. It thus has no influence on the measured value.

Absolute pressure: the measuring cell contains vacuum and is encapsulated. The ambient pressure is not compensated and does hence influence the measured value.

Relative pressure, climate-compensated: the measuring cell is evacuated and encapsulated. The ambient pressure is detected through a reference sensor in the electronics and compensated. It thus has no influence on the measured value.

Seal concepts

The following presentations show examples for the installation of the ceramic measuring cell into the process fitting and the different seal concepts.

Recessed installation

The recessed installation is particularly suitable for applications with gases, vapours and clear liquids. The measuring cell seal is positioned laterally as well as in addition in front.

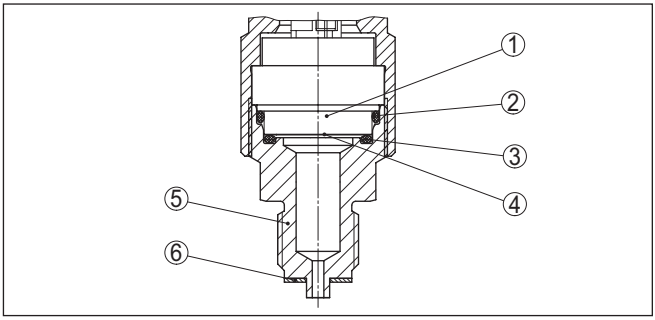

Fig. 4: Recessed installation of the measuring cell (example: manometer connection G½)

1 Measuring cell
2 Seal for the measuring cell
3 Additional, front seal for measuring cell
4 Diaphragm
5 Process fitting
6 Seal for the process fitting

Front-flush mounting with single seal

The front-flush installation is particularly suitable for applications with viscous and abrasive media and in case of buildup. The measuring cell seal is positioned laterally.

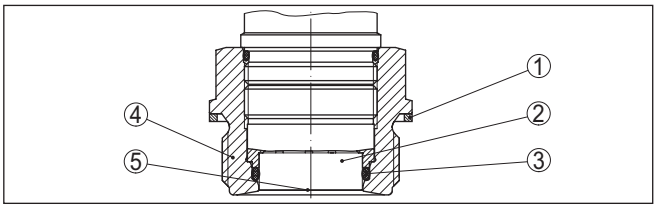

Fig. 5: Front-flush installation of the measuring cell (example: thread G1½)

1 Seal for the process fitting
2 Measuring cell
3 Seal for the measuring cell
4 Process fitting
5 Diaphragm

Completely front-flush mounting with single seal

The completely front-flush mounting is particularly suitable for applications in the paper industry. The diaphragm is in the pulp flow, is hence cleaned and protected against buildup.

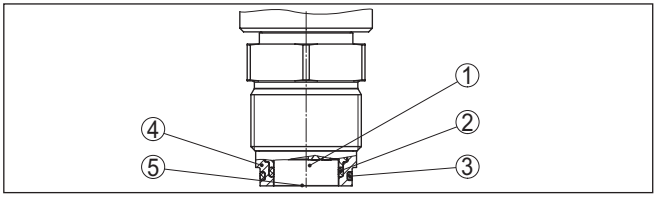

Fig. 6: Front-flush installation of the measuring cell (example: M30 x 1.5)

1 Measuring cell
2 Seal for the measuring cell
3 Seal for the process fitting
4 Process fitting
5 Diaphragm

Front-flush mounting with double seal

The front-flush installation is particularly suitable for applications with viscous media. The additional, front sealing protects the glass joint of the measuring cell against chemical attack and the measuring cell electronics against diffusion of aggressive gases from the process.

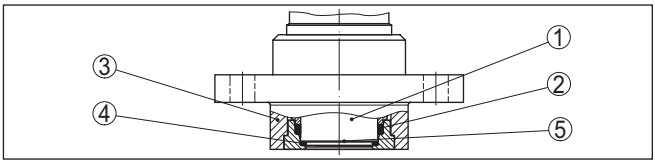

Fig. 7: Front-flush installation of the measuring cell with double seal (example: flange connection with extension)

1 *Measuring cell*
2 *Seal for the measuring cell*
3 *Process fitting*
4 *Additional, front seal for measuring cell*
5 *Diaphragm*

Installation in hygienic fitting

The front-flush, hygienic installation of the measuring cell is particularly suitable for food applications. The sealings are installed gap-free. The form seal of the measuring cell protects also the glass joint.

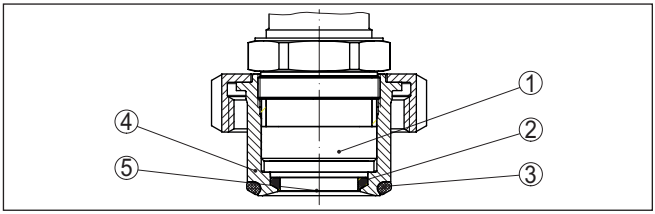

Fig. 8: Hygienic installation of the measuring cell (example: hygienic fitting with compression nut)

1 *Measuring cell*
2 *Form seal for the measuring cell*
3 *Gap-free seal for process fitting*
4 *Process fitting*
5 *Diaphragm*

Installation in hygienic fitting acc. to 3-A

The front-flush, hygienic installation of the measuring cell acc. to 3A is particularly suitable for food applications. The sealings are installed gap-free. The additional front sealing for the measuring cell protects also the glass joint. A hole in the process fitting is used for leakage detection.

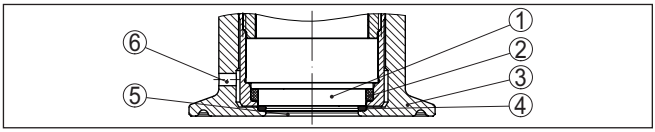

Fig. 9: Hygienic installation of the measuring cell acc. to 3-A (example: Clamp connection)

1 *Measuring cell*
2 *Seal for the measuring cell*
3 *Process fitting*
4 *Additional, front seal for measuring cell*
5 *Diaphragm*
5 *Hole for leakage detection*

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3.3 Supplementary cleaning procedures

The VEGABAR 82 is also available in the version "*Oil, grease and silicone-free*" or cleaning for paint compatible version (LABS). These instruments have passed through a special cleaning procedure to remove oil, grease and paint-wetting impairment substances (PWIS).

The cleaning is carried out on all wetted parts as well as on surfaces accessible from outside. To keep the purity level, the instruments are immediately packed in plastic foil after the cleaning process. The purity level remains as long as the instrument is kept in the closed original packaging.

Caution:
The VEGABAR 82 in these versions must not be used in oxygen applications. For this purpose, devices in the special version "*Resistance to Internal Ignition in oxygen operation according to BAM certification*" are available.

3.4 Packaging, transport and storage

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Transport

Transport must be carried out in due consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

Storage and transport temperature

- Storage and transport temperature see chapter "*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.

3.5 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.

Secondary sensors

Secondary sensors of VEGABAR series 80 enable in conjunction with VEGABAR 82 an electronic differential pressure measurement.

VEGADIS 81

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

VEGADIS adapter

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

Overvoltage protection

The overvoltage arrester B81-35 is used instead of the terminals.

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.

Welded socket, threaded and hygienic adapter

Welded sockets are used to connect the devices to the process.

Threaded and hygienic adapters enable simple adaptation of devices with standard threaded fittings to process-side hygiene connections.

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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

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "*Connecting to power supply*")
- Tighten the cable gland or plug connector
- Align the housing so that the cable gland points downwards or to the side
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

Note:
Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

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

Screwing in

Devices with threaded fitting are screwed into the process fitting with a suitable wrench via the hexagon.

See chapter "*Dimensions*" for wrench size.

Warning:
The housing or the electrical connection may not be used for screwing in! Depending on the device version, tightening can cause damage, e. g. to the rotation mechanism of the housing.

Vibrations

Avoid damages on the device by lateral forces, for example by vibrations. It is thus recommended to fix the devices with process fitting thread G½ of plastic at the installation site via a suitable measuring instrument holder.

If there is strong vibration at the mounting location, the instrument version with external housing should be used. See chapter "*External housing*".

Permissible process pressure (MWP) - Device

The permissible process pressure range is specified by "MWP" (Maximum Working Pressure) on the type label, see chapter "*Structure*". The MWP takes the element of the measuring cell and processing fitting combination with the weakest pressure into consideration and may applied permanently. The specification refers to a reference temperature of +20 °C (+68 °F). It also applies when a measuring cell with a higher measuring range than the permissible pressure range of the process fitting is installed order-related.

In addition, a temperature derating of the process fitting, e. g. with flanges, can limit the permissible process pressure range according to the respective standard.

Note:
In order to prevent damage to the device, a test pressure may only exceed the specified MWP briefly by 1.5 times at reference temperature. The pressure stage of the process fitting as well as the overload resistance of the measuring cell are taken into consideration here (see chapter "*Technical Data*").

Permissible process pressure (MWP) - Mounting accessory

The permissible process pressure range is stated on the type label. The instrument should only be operated with these pressures if the mounting accessory used also fulfils these values. This should be ensured by suitable flanges, welded sockets, tension rings with Clamp connections, sealings, etc.

Temperature limits

Higher process temperatures often mean also higher ambient temperatures. Make sure that the upper temperature limits stated in chapter "*Technical data*" for the environment of the electronics housing and connection cable are not exceeded.

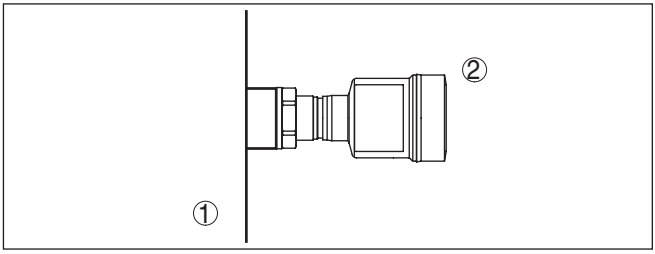

Fig. 10: Temperature ranges

1 Process temperature
2 Ambient temperature

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4.2 Instructions for oxygen applications

Warning:
As an oxidising agent, oxygen can cause or intensify fires. Oils, grease, some plastics and dirt can burn explosively on contact with oxygen. There is a risk of serious personal injury or damage to property.

Therefore, to avoid this, take the following precautions, for example:

- All components of the system - measuring instruments - must be cleaned in accordance with the requirements of recognized regulations or standards
- Depending on the seal material, certain temperatures and pressures must not be exceeded in oxygen applications, see chapter "*Technical data*"
- Devices for oxygen applications may only be unpacked from the PE foil just before assembly.
- Check whether the marking "O2" is visible on the process fitting after removing the protection for the process fitting
- Avoid any ingress of oil, grease and dirt

4.3 Ventilation and pressure compensation

Filter element - Function

The filter element in the electronics housing has the following functions:

- Ventilation of the electronics housing
- Atmospheric pressure compensation (with relative pressure measuring ranges)

Caution:
The filter element causes a time-delayed pressure compensation. When quickly opening/closing the housing cover, the measured value can change for approx. 5 s by up to 15 mbar.

For an effective ventilation, the filter element must be always free from buildup. In case of horizontal mounting, turn the housing so that the filter element points downward after the instrument is installed. This provides better protection against buildup.

Caution:
Do not use a high-pressure cleaner. The filter element could be damaged, which would allow moisture into the housing.

The following paragraphs describe how the filter element is arranged in the different instrument versions.

Filter element - Position

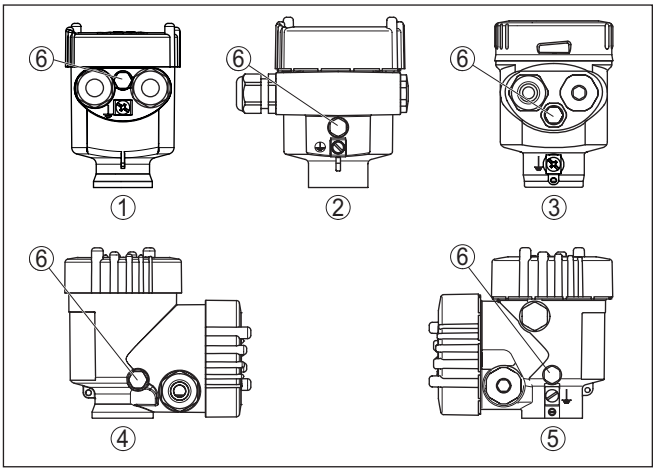


Fig. 11: Position of the filter element

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

With the following instruments a blind plug is installed instead of the filter element:

- Instruments in protection IP66/IP68 (1 bar) - ventilation via capillaries in non-detachable cable
- Instruments with absolute pressure

Filter element - Position Ex d version

→ Turn the metal ring in such a way that the filter element points downward after installation of the instrument. This provides better protection against buildup.

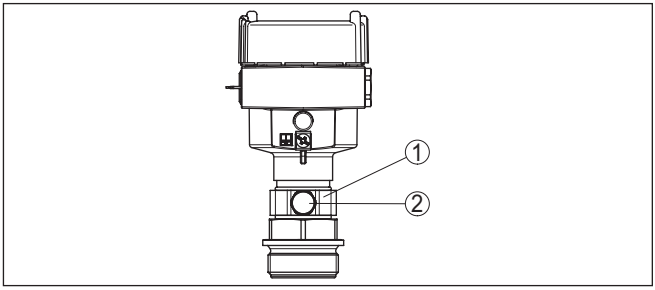


Fig. 12: Position of the filter element - Ex d version

1 Rotatable metal ring
2 Filter element

Instruments with absolute pressure have a blind plug mounted instead of the filter element.

Filter element - Position Second Line of Defense

The Second Line of Defense (SLOD) is a second level of the process separation in form of a gas-tight leadthrough in the housing neck, preventing products from penetrating into the housing.

With these instruments, the process assembly is completely encapsulated. An absolute pressure measuring cell is used so that no ventilation is required.

With relative pressure measuring ranges, the ambient pressure is detected and compensated by a reference sensor in the electronics.

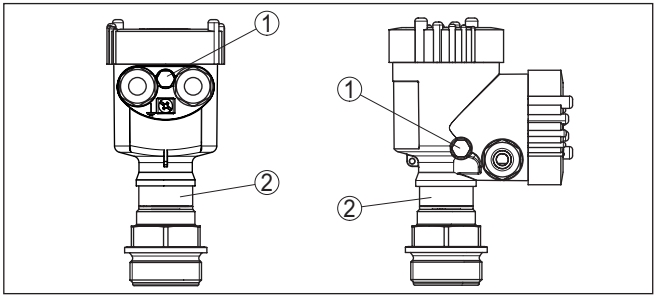


Fig. 13: Position of the filter element - gastight leadthrough

1 Filter element
2 Gas-tight leadthrough

Filter element - Position IP69 version

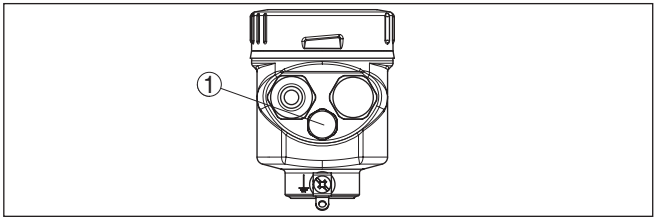


Fig. 14: Position of the filter element - IP69 version

1 Filter element

Instruments with absolute pressure have a blind plug mounted instead of the filter element.

4.4 Process pressure measurement

Measurement setup in gases

Keep the following in mind when setting up the measuring system:

- Mount the instrument above the measuring point

Possible condensation can then drain off into the process line.

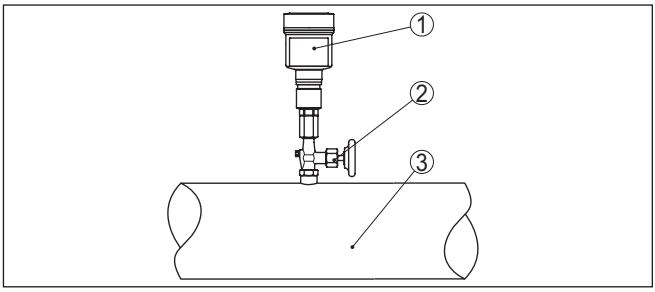


Fig. 15: Measurement setup for process pressure measurement of gases in pipelines

1 VEGABAR 82
2 Shut-off valve
3 Pipeline

Measurement setup in vapours

Keep the following in mind when setting up the measuring system:

- Connect via a siphon
- Do not insulate the siphon
- Fill the siphon with water before setup

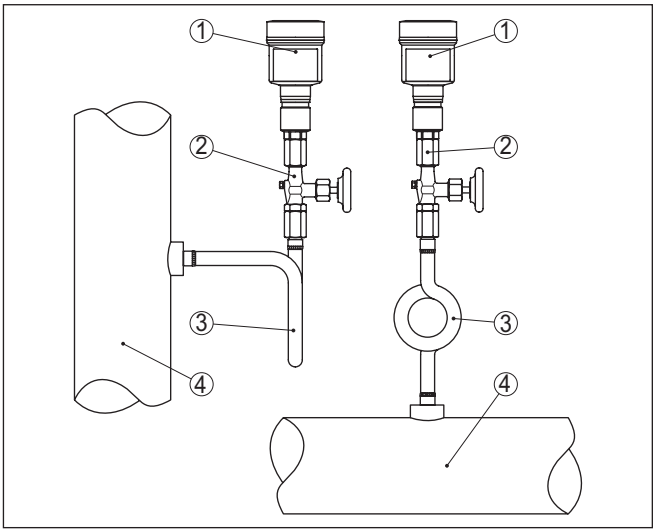


Fig. 16: Measurement setup for process pressure measurement of gases in pipelines

1 VEGABAR 82
2 Shut-off valve
3 Siphon in U or circular form
4 Pipeline

A protective accumulation of water is formed through condensation in the pipe bends. Even in applications with hot steam, a medium temperature < 100 °C on the transmitter is ensured.

Measurement setup in liquids

Keep the following in mind when setting up the measuring system:

- Mount the instrument below the measuring point

The effective pressure line is always filled with liquid and gas bubbles can bubble up to the process line.

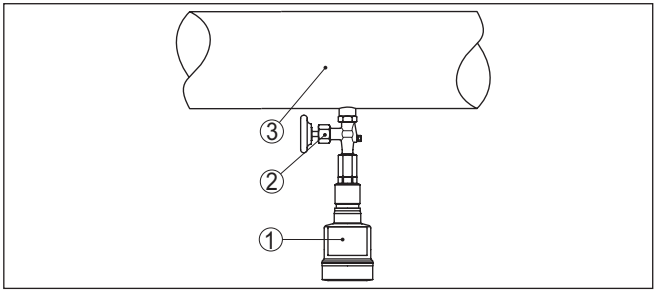


Fig. 17: Measurement setup for process pressure measurement of liquids in pipelines

1 VEGABAR 82
2 Shut-off valve
3 Pipeline

4.5 Level measurement

Measurement setup

Keep the following in mind when setting up the measuring system:

- Mount the instrument below the min. level
- Do not mount the instrument close to the filling stream or emptying area
- Mount the instrument so that it is protected against pressure shocks from the stirrer

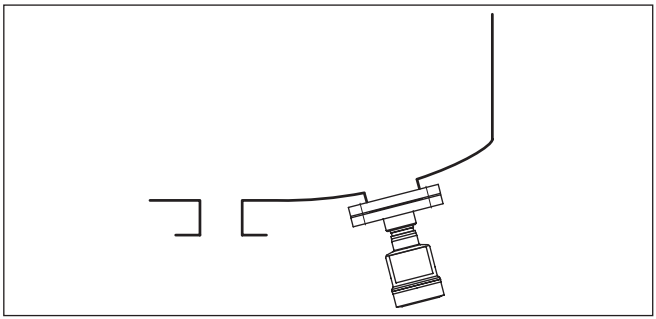


Fig. 18: Measurement setup for level measurement

4.6 External housing

Configuration

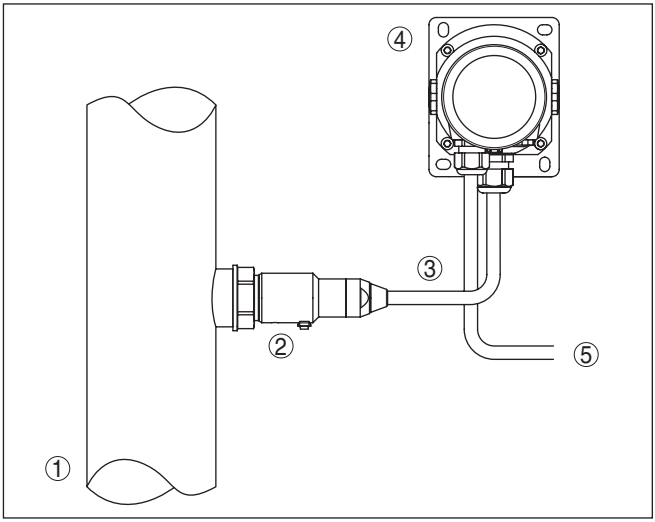


Fig. 19: Configuration, process module, external housing

1 *Pipeline*
2 *Process module*
3 *Connection cable process assembly - External housing*
4 *External housing*
5 *Signal cable*

5 Connecting to the bus system

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

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

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

Voltage supply

The instrument requires a operating voltage of 9 … 32 V DC. Operating voltage and the digital bus signal are carried on the same two-wire connection cable. Power is supplied via the H1 power supply.

Connection cable

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

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

Use a cable gland fitting the cable diameter.

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

When connecting an external display and adjustment unit VEGADIS 81, also use a suitable shielded cable according to the Fieldbus specification.

Cable screening and grounding

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

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

Cable glands

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

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

NPT thread:
In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The

free openings for the cable glands are therefore covered with red dust protection caps as transport protection.

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

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

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

5.2 Connecting

Connection technology

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

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

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

Connection procedure

Proceed as follows:

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

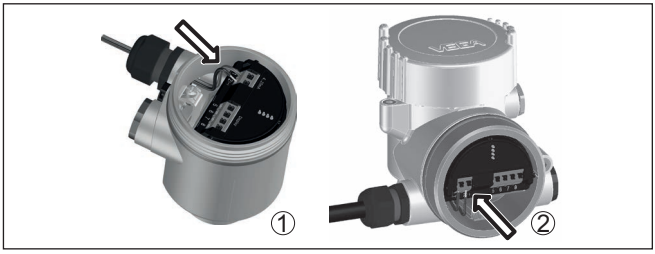


Fig. 20: Connection steps 5 and 6

1 Single chamber housing
2 Double chamber housing

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

Note:
Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver,

the terminal opening is then free. When the screwdriver is released, the terminal closes again.

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

The electrical connection is finished.

5.3 Single chamber housing

Electronics and connection compartment

The following illustration applies to the non-Ex, Ex ia and Ex d version.

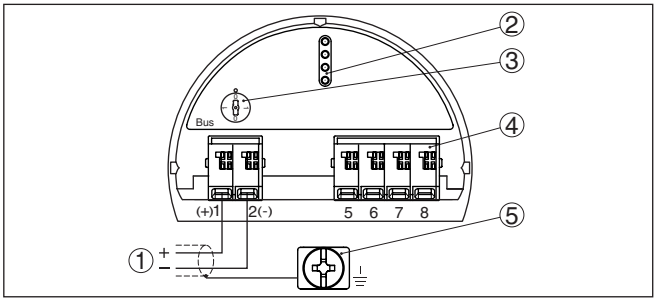


Fig. 21: Electronics and connection compartment - single chamber housing

1 Voltage supply, signal output
2 Contact pins for the display and adjustment module or interface adapter
3 Simulation switch ("1" = mode for simulation release)
4 For external display and adjustment unit
5 Ground terminal for connection of the cable screening

5.4 Double chamber housing

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

Electronics compartment

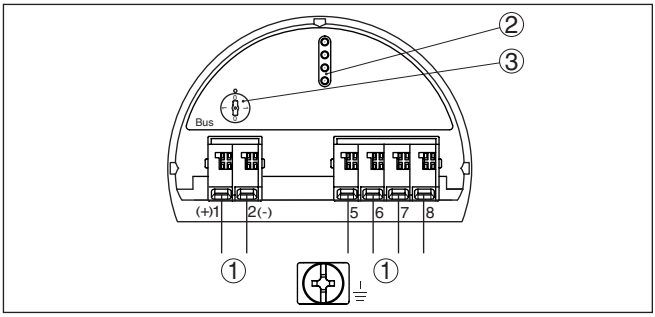


Fig. 22: Electronics compartment - double chamber housing

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

Connection compartment

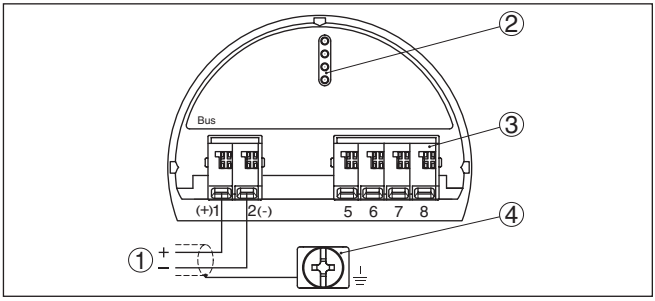


Fig. 23: Connection compartment - double chamber housing

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

5.5 Double chamber housing with VEGADIS-Adapter

Electronics compartment

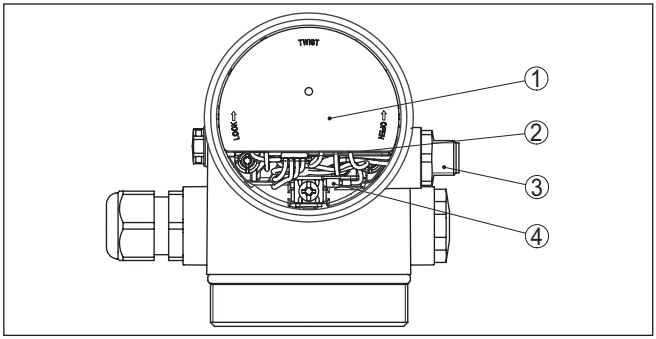


Fig. 24: View to the electronics compartment with VEGADIS adapter for connection of the external display and adjustment unit

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

Assignment of the plug connector

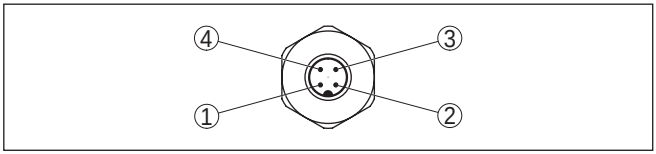


Fig. 25: Top view of the M12 x 1 plug connector

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

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

5.6 Housing IP66/IP68 (1 bar)

Wire assignment, connection cable

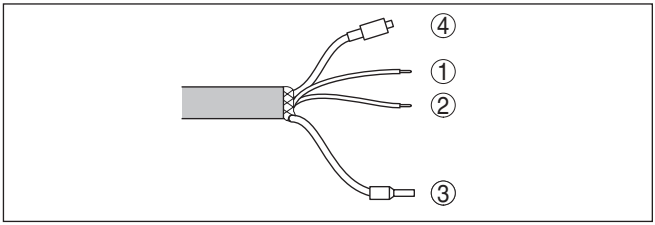


Fig. 26: Wire assignment, connection cable

1 Brown (+): to voltage supply or to the processing system
2 Blue (-): to voltage supply or to the processing system
3 Shielding
4 Breather capillaries with filter element

5.7 External housing with version IP68 (25 bar)

Overview

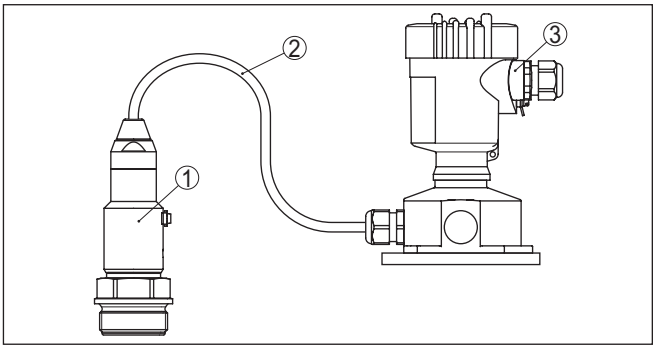


Fig. 27: VEGABAR 82 in IP68 version 25 bar with axial cable outlet, external housing

1 Transmitter
2 Connection cable
3 External housing

Electronics and connection compartment for power supply

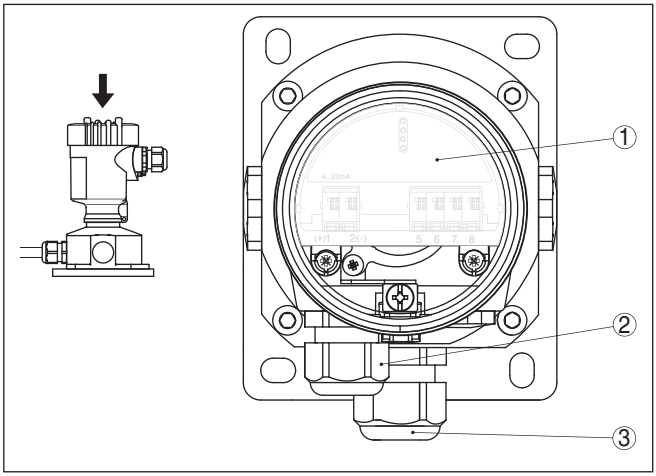


Fig. 28: Electronics and connection compartment

1 Electronics module
2 Cable gland for voltage supply
3 Cable gland for connection cable, transmitter

Terminal compartment, housing socket

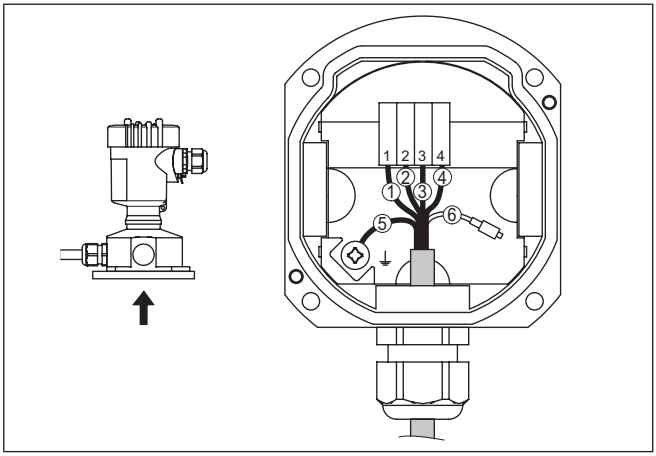


Fig. 29: Connection of the process component in the housing base

1 Yellow
2 White
3 Red
4 Black
5 Shielding
6 Breather capillaries

Electronics and connection compartment

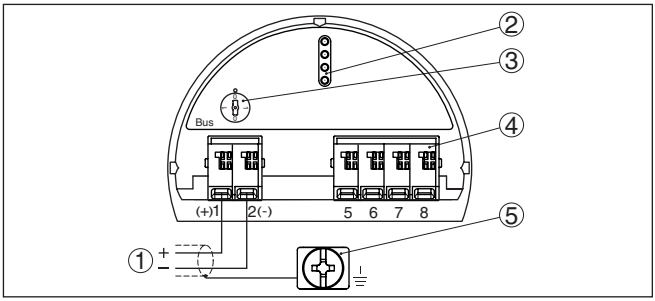


Fig. 30: Electronics and connection compartment - single chamber housing

1 Voltage supply, signal output
2 Contact pins for the display and adjustment module or interface adapter
3 Simulation switch ("1" = mode for simulation release)
4 For external display and adjustment unit
5 Ground terminal for connection of the cable screening

5.8 Switch-on phase

After connecting the instrument to power supply or after a voltage recurrence, the instrument carries out a self-check:

- Internal check of the electronics
- Indication of a status message on the display or PC

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

6 Set up with the display and adjustment module

6.1 Insert display and adjustment module

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

Proceed as follows:

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

Disassembly is carried out in reverse order.

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

Fig. 31: Installing the display and adjustment module in the electronics compartment of the single chamber housing

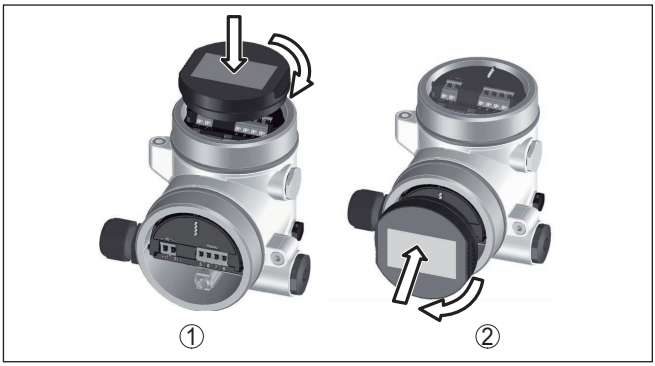


Fig. 32: Installing the display and adjustment module in the double chamber housing

1 In the electronics compartment
2 In the connection compartment

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

6.2 Adjustment system

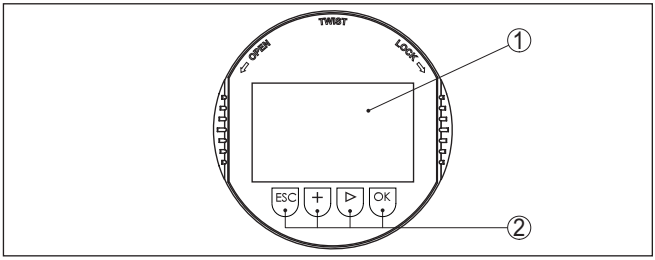


Fig. 33: Display and adjustment elements

1 LC display
2 Adjustment keys

Key functions

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

- Change value of the parameter

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

Adjustment system

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

Adjustment system - keys via magnetic pen

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

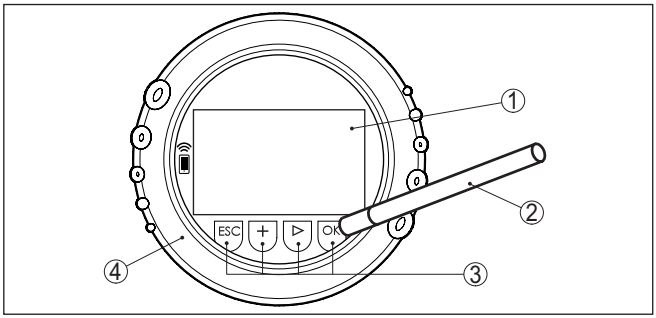


Fig. 34: Display and adjustment elements - with adjustment via magnetic pen

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

Time functions

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

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

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

6.3 Measured value indication

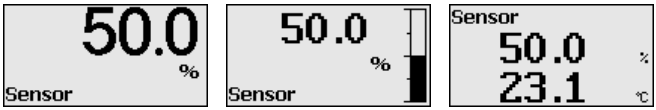
Measured value indication

With the ***[->]*** key you can move between three different display options.

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

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

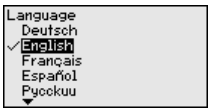
In the third view, the selected measured value as well as a second selectable value, e.g. the temperature, are displayed.



With the "***OK***" key you move (during the initial setup of the instrument) to the selection menu "*Language*".

Selection language

In this menu item, you can select the national language for further parameterization.

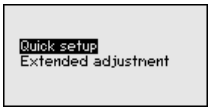


With the "***[->]***" button, you can select the requested language, with "***OK***" you confirm the selection and move to the main menu.

You can change your selection afterwards with the menu item "*Setup - Display, Menu language*".

6.4 Parameter adjustment - Quick setup

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



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

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

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

Note:
You can find a description of the individual steps in the quick setup guide of the sensor.

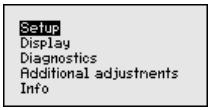
You can find "*Extended adjustment*" in the next sub-chapter.

6.5 Parameter adjustment - Extended adjustment

For technically demanding measuring points, you can carry out extended settings in "*Extended adjustment*".

Main menu

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



Setup: Settings, e.g., for measurement loop name, application, units, position correction, adjustment, signal output

Display: Settings, e.g., for language, measured value display, lighting

Diagnosis: Information, for example, of device status, peak indicator, simulation

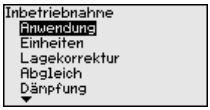
Additional adjustments: date/time, reset, copy function

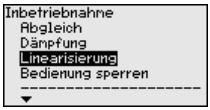
Info: Instrument name, hardware and software version, factory calibration date, device ID, sensor features

Note:
For optimum setting of the measuring point, the individual submenu items in the main menu item "*Setup*" should be selected one after the other and provided with the correct parameters. If possible, go through the items in the given sequence.

The procedure is described below.

The following submenu points are available:





The submenu points are described below.

6.5.1 Setup

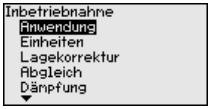
Application

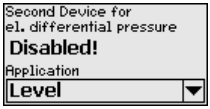
In this menu item you activate/deactivate the Secondary sensor for electronic differential pressure and select the application.

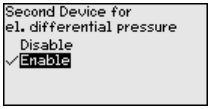
VEGABAR 82 can be used for process pressure and level measurement. Default setting is process pressure measurement. The mode can be changed in this adjustment menu.

If you have **no** Secondary sensor connected, you confirm this with "*Deactivate*".

Depending on the selected application, different subchapters in the following adjustment steps are important. There you can find the individual adjustment steps.





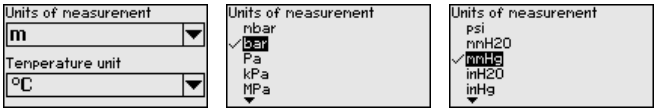


Enter the requested parameters via the appropriate keys, save your settings with ***[OK]*** and jump to the next menu item with the ***[ESC]*** and the ***[->]*** key.

Units

In this menu item, the adjustment units of the instrument are determined. The selection determines the unit displayed in the menu items "*Min. adjustment (Zero)*" and "*Max. adjustment (Span)*".

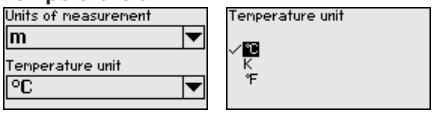
Unit of measurement:



If the level should be adjusted in a height unit, the density of the medium must also be entered later during the adjustment.

In addition, the temperature unit of the instrument is specified. The selection determines the unit displayed in menu items "*Peak indicator, temperature*" and "in the variables of the digital output signal".

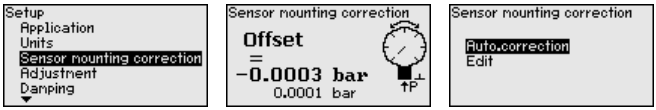
Temperature unit:



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

Position correction

The installation position of the device can shift the measured value (offset), especially in chemical seal systems. The position correction compensates for this offset. The offset can be entered manually. In the case of relative pressure measuring cells, the current measured value can also be adopted as the offset.



Note:
If the current measured value is automatically accepted, it must not be falsified by medium coverage or static pressure.

With the manual position correction, the offset value can be determined by the user. Select for this purpose the function "*Edit*" and enter the requested value.

Save your settings with ***[OK]*** and move with ***[ESC]*** and ***[->]*** to the next menu item.

After the position correction is carried out, the actual measured value is corrected to 0. The corrective value appears with an inverse sign as offset value in the display.

The position correction can be repeated as often as necessary. However, if the sum of the corrective values exceeds -50 … +100 % of the nominal measuring range, then no position correction is possible.

Adjustment

VEGABAR 82 always measures pressure independently of the process variable selected in the menu item "*Application*". To output the

selected process variable correctly, an allocation of the output signal to 0 % and 100 % must be carried out (adjustment).

With the application "*Level*", the hydrostatic pressure, e.g. with full and empty vessel, is entered for adjustment. See following example:

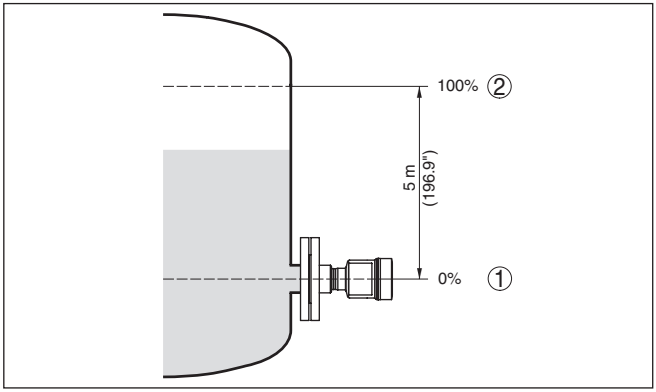


Fig. 35: Parameter adjustment example Min./max. adjustment, level measurement

1 Min. level = 0 % corresponds to 0.0 mbar
2 Max. level = 100 % corresponds to 490.5 mbar

If these values are not known, an adjustment with filling levels of e.g. 10 % and 90 % is also possible. By means of these settings, the real filling height is then calculated.

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.

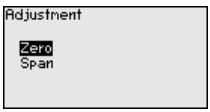
Note:
If the adjustment ranges are exceeded, the entered value will not be accepted. Editing can be interrupted with ***[ESC]*** or corrected to a value within the adjustment ranges.

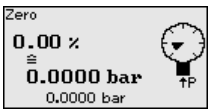
For the other process variables such as e.g. process pressure, differential pressure or flow, the adjustment is performed in like manner.

Zero adjustment

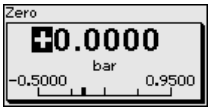
Proceed as follows:

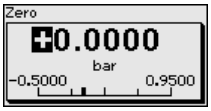
1. Select the menu item "*Setup*" with ***[->]*** and confirm with ***[OK]***. Now select with ***[->]*** the menu item "*Zero adjustment*" and confirm with ***[OK]***.





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





3. Set the requested mbar value with ***[+]*** and store with ***[OK]***.
4. Change with ***[ESC]*** and ***[->]*** to the span adjustment

The zero adjustment is finished.

Information:
The Zero adjustment shifts the value of the span adjustment. The span, i.e. the difference between these values, however, remains unchanged.

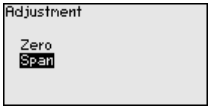
For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

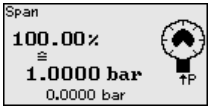
If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Span adjustment

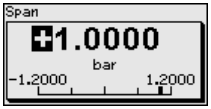
Proceed as follows:

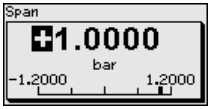
1. Select with ***[->]*** the menu item "*Span adjustment*" and confirm with ***[OK]***.





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





3. Set the requested mbar value with ***[+]*** and store with ***[OK]***.

For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

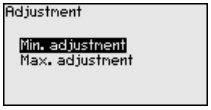
If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

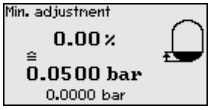
The span adjustment is finished.

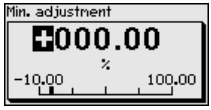
Min. adjustment - Level

Proceed as follows:

1. Select the menu item "*Setup*" with ***[->]*** and confirm with ***[OK]***. Now select with ***[->]*** the menu item "*Adjustment*", then "*Min. adjustment*" and confirm with ***[OK]***.







2. Edit the percentage value with ***[OK]*** and set the cursor to the requested position with ***[->]***.
3. Set the requested percentage value (e.g. 10 %) with ***[+]*** and save with ***[OK]***. The cursor jumps now to the pressure value.
4. Enter the pressure value corresponding to the min. level (e.g. 0 mbar).
5. Save settings with ***[OK]*** and move with ***[ESC]*** and ***[->]*** to the max. adjustment.

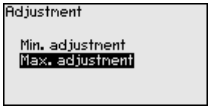
The min. adjustment is finished.

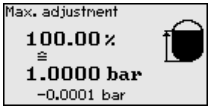
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

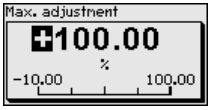
Max. adjustment - Level

Proceed as follows:

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







2. Edit the percentage value with ***[OK]*** and set the cursor to the requested position with ***[->]***.
3. Set the requested percentage value (e.g. 90 %) with ***[+]*** and save with ***[OK]***. The cursor jumps now to the pressure value.
4. Enter the pressure value for the full vessel (e.g. 900 mbar) corresponding to the percentage value.
5. Save settings with ***[OK]***

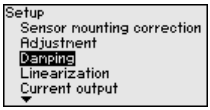
The max. adjustment is finished.

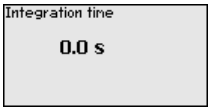
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

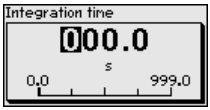
Damping

To damp process-dependent measured value fluctuations, set an damping of 0 … 999 s in this menu item. The increment is 0.1 s.

The set damping is effective for level and process pressure measurement as well as for all applications of electronic differential pressure measurement.



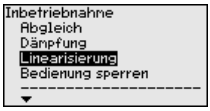


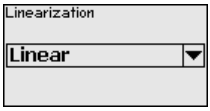


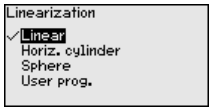
The default setting is a damping of 0 s.

Linearisation

A linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearization curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. The linearization applies to the measured value indication and the current output.







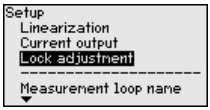
Caution:
Note the following, if the respective sensor is used as part of an overfill protection system according to WHG:

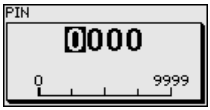
If a linearisation curve is selected, the measuring signal is no longer necessarily linear to the filling height. This must be considered by the user especially when setting the switching point on the limit signal transmitter.

Lock/Unlock adjustment

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

This is done by entering a four-digit PIN.





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

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

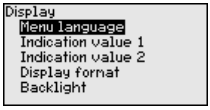
Releasing the sensor adjustment is also possible in any menu item by entering the PIN.

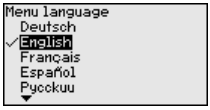
Caution:
With active PIN, adjustment via PACTware/DTM and other systems is also blocked.

6.5.2 Display

Language

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





The following languages are available:

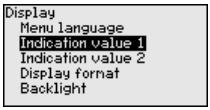
- German
- English
- French
- Spanish
- Russian
- Italian
- Dutch
- Portuguese
- Japanese
- Chinese

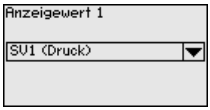
- Polish
- Czech
- Turkish

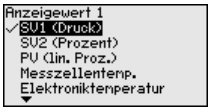
In delivery status, the VEGABAR 82 is set to English.

Display value 1 and 2

In this menu item, you define which measured value is displayed.



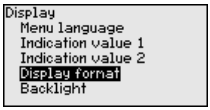


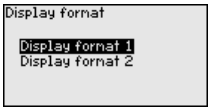


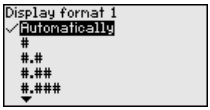
The default setting for the display value is "*Lin. percent*".

Display format 1 and 2

In this menu item you define the number of decimal positions with which the measured value is displayed.



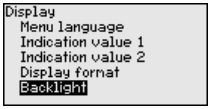




The default setting for the display format is "*Automatic*".

Backlight

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

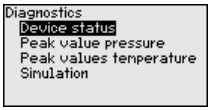


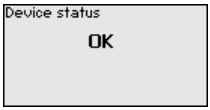
In delivery status, the lighting is switched on.

6.5.3 Diagnostics

Device status

In this menu item, the device status is displayed.



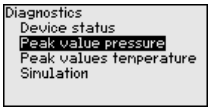


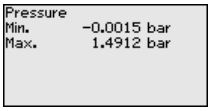
In case of error, e.g. the error code F017, e.g. the error description "*Adjustment span too small*" and a four digit figure are displayed for service purposes. You can find the error codes with description, reason as well as rectification in chapter "*Asset Management*".

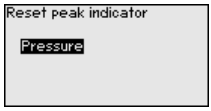
Peak indicator, pressure

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

In another window you can carry out a reset of the peak values separately.



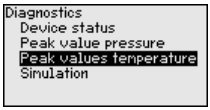


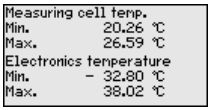


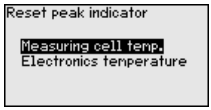
Peak indicator, temperature

The respective min. and max. measured values of the measuring cell and the electronics temperature are stored in the sensor. In menu item "*Peak indicator, temperature*", both values are displayed.

In another window you can carry out a reset of the two peak values separately.

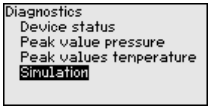


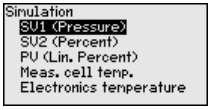


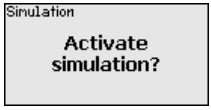


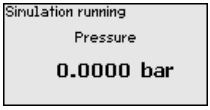
Simulation

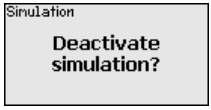
In this menu item you simulate measured values. Hence, the signal path can be tested via the bus system to the input card of the control system.











Select the requested simulation variable and set the requested value.

To deactivate the simulation, you have to push the ***[ESC]*** key and confirm the message "*Deactivate simulation*" with the ***[OK]*** key.

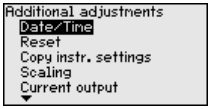
Caution:
During simulation, the simulated value is output as digital signal. The status message along with the Asset Management function is "*Maintenance*".

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

6.5.4 Additional adjustments

Date/Time

In this menu item, you adjust the internal clock of the sensor. There is no adjustment for summer/winter (daylight saving) time.



Reset

After a reset, certain parameter adjustments made by the user are reset.

The following reset functions are available:

Delivery status: Restores the parameter settings at the time of shipment from the factory, incl. the order-specific settings. Any user-defined linearisation curve as well as the measured value memory are deleted.

Basic settings: Resets the parameter settings, incl. special parameters, to the default values of the respective instrument. Any programmed linearisation curve as well as the measured value memory are deleted.

Note:
You can find the default values of the device in chapter "*Menu overview*".

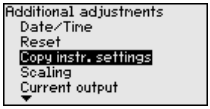
Copy instrument settings

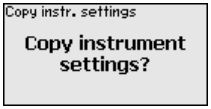
The instrument settings are copied with this function. The following functions are available:

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

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

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





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

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

Special parameters

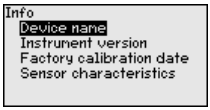
In this menu item you gain access to the protected area where you can enter special parameters. In exceptional cases, individual parameters can be modified in order to adapt the sensor to special requirements.

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

6.5.5 Info

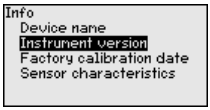
Device name

In this menu item, you can read out the instrument name and the instrument serial number:



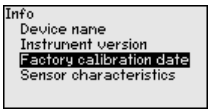
Instrument version

In this menu item, the hardware and software version of the sensor is displayed.



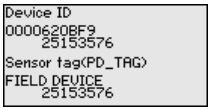
Factory calibration date

In this menu item, the date of factory calibration of the sensor as well as the date of the last change of sensor parameters are displayed via the display and adjustment module or via the PC.



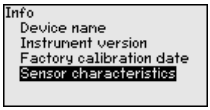
Device ID

In this menu item, the identification number of the instrument in a Foundation Fieldbus system is shown.



Sensor characteristics

In this menu item, the features of the sensor such as approval, process fitting, seal, measuring range, electronics, housing and others are displayed.



6.6 Menu overview

The following tables show the adjustment menu of the instrument. Depending on the instrument version or application, all menu items may not be available or some may be differently assigned.

Setup

Menu item	Parameter	Default value
Application	Application	Level
	Secondary sensor for electronic differential pressure	Deactivated
Units	Adjustment unit (m, bar, Pa, psi … user-defined)	mbar (with nominal measuring range ≤ 400 mbar) bar (with nominal measuring ranges ≥ 1 bar)
	Temperature unit (°C, °F)	°C
Position correction		0.00 bar
Adjustment	Zero/Min. adjustment	0.00 bar 0.00 %
	Span/Max. adjustment	Nominal measuring range in bar 100.00 %
Damping	Integration time	1 s
Linearisation	Linear, cylindrical tank, … user-defined	Linear
Lock adjustment	Blocked, released	Released

Display

Menu item	Default value
Menu language	Selected language
Displayed value 1	Signal output in %
Displayed value 2	Ceramic measuring cell: Measuring cell temperature in °C Metallic measuring cell: Electronics temperature in °C
Display format	Number of positions after the decimal point, automatically
Backlight	Switched on

Diagnostics

Menu item	Parameter	Default value
Device status		-
Peak indicator	Pressure	Current pressure measured value
Peak indicator temp.	Temperature	Actual measuring cell and electronic temperature
Simulation	Pressure, percent, current output, linearized percent, measuring cell temperature, electronics temperature	Process pressure

Additional adjustments

Menu item	Parameter	Default value
Date/Time		Actual date/Actual time

Menu item	Parameter	Default value
Reset	Delivery status, basic settings	
Copy instrument settings	Read from sensor, write into sensor	
Scaling	Scaling size	Volume in l
	Scaling format	0 % corresponds to 0 l 100 % corresponds to 100 l
Special parameters	Service-Login	No reset

Info

Menu item	Parameter
Device name	Device name
Instrument version	Hardware and software version
Factory calibration date	Date
Device ID	Identification number of the instrument on a Foundation Fieldbus system
Sensor characteristics	Order-specific characteristics

6.7 Save parameter adjustment data

On paper

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

Display and adjustment module

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

7 Setup with PACTware

7.1 Connect the PC

Via the interface adapter directly on the sensor

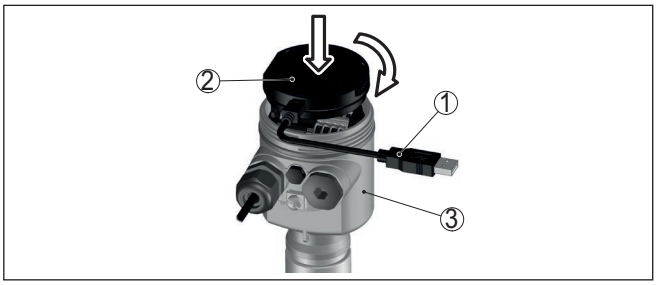


Fig. 36: Connection of the PC directly to the sensor via the interface adapter

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

7.2 Parameter adjustment

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.

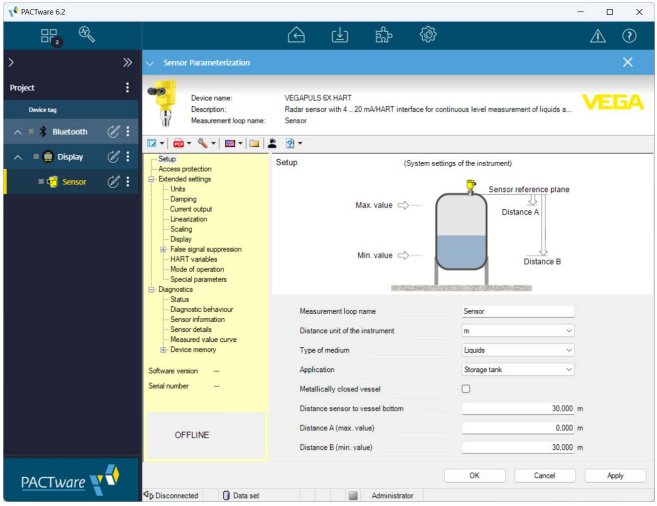


Fig. 37: Example of a DTM view

7.3 Save parameter adjustment data

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

8 Set up with other systems

8.1 DD adjustment programs

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

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

9 Diagnosis, asset management and service

9.1 Maintenance

Maintenance

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

Precaution measures against buildup

In some applications, product buildup on the diaphragm can influence the measuring result. Depending on the sensor and application, take precautions to ensure that heavy buildup, and especially a hardening thereof, is avoided.

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 Cleaning - hygienic connection with compression nut

Overview

The hygienic connection with compression nut can be disassembled and the diaphragm cleaned.

The following graphic shows the structure:

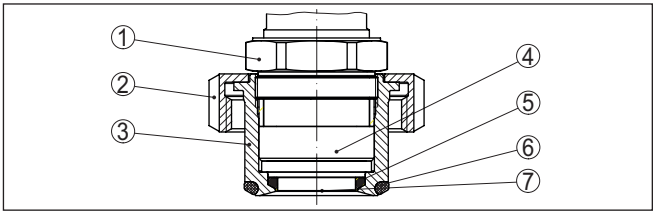


Fig. 38: VEGABAR 82, structure of the hygienic connection with compression nut

1 Hexagon
2 Compression nut
3 Process fitting
4 Process module
5 Form seal for the measuring cell
6 O-ring seal for the process fitting
7 Diaphragm

Procedure

To do so, proceed as follows:

1. Loosen compression nut and remove the pressure transmitter from the welded socket
2. Remove the O-ring seal for the process fitting
3. Clean the diaphragm with brass brush and cleaning detergent

45032-EN-260315

4. Loosen the hexagon and remove the process component from the process fitting
5. Remove the form seal for the measuring cell and remove it by a new one
6. Screw the process component into the process fitting, tighten the hexagon (wrench size see chapter "*Dimensions*", max. torque see chapter "*Technical data*")
7. Insert new O-ring seal for the process fitting
8. Install the process pressure transmitter in the welded socket, tighten compression nut

The cleaning is finished.

The pressure transmitter is directly ready for operation, a fresh adjustment is not required.

9.3 Diagnosis memory

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

Measured value memory

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

Depending on the instrument version, values that can be stored are for example:

- Level
- Process pressure
- Differential pressure
- Static pressure
- Percentage value
- Scaled values
- Current output
- Lin. percent
- Measuring cell temperature
- Electronics temperature

When the instrument is shipped, the measured value memory is active and stores pressure value and measuring cell temperature every 10 s, with electronic differential pressure also the static pressure.

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

Event memory

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

Event types are for example:

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

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

9.4 Asset Management function

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

Status messages

The status messages are divided into the following categories:

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

and explained by pictographs:

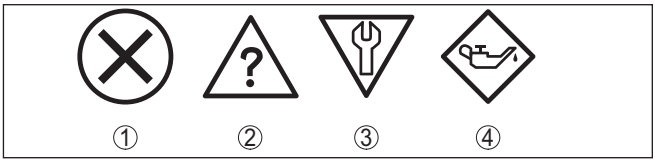


Fig. 39: Pictographs of the status messages

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

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

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

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

This status message is inactive by default.

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

This status message is inactive by default.

Maintenance required:
Due to external influences, the instrument function is limited. The measurement is affected, but the measured value is still valid. Plan in maintenance for the instrument because a failure is expected in the near future (e.g. due to buildup).

This status message is inactive by default.

Failure

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
F013 No valid measured value available	Gauge pressure or low pressure Measuring cell defective	Exchange measuring cell Send instrument for repair	Bit 0
F017 Adjustment span too small	Adjustment not within specification	Change the adjustment according to the limit values	Bit 1
F025 Error in the linearization table	Index markers are not continuously rising, for example illogical value pairs	Check linearization table Delete table/Create new	Bit 2
F036 no operable sensor software	Failed or interrupted software update	Repeat software update Check electronics version Exchanging the electronics Send instrument for repair	Bit 3
F040 Error in the electronics	Hardware defect	Exchanging the electronics Send instrument for repair	Bit 4
F041 Communication error	No connection to the sensor electronics	Check connection between sensor and main electronics (with separate version)	Bit 13
F042 Communication error Secondary sensor	No connection to the Secondary sensor	Check connection between Primary and Secondary sensor	Bit 28 of Byte 0 … 5
F080 General software error	General software error	Disconnect operating voltage briefly	Bit 5
F105 Measured value is determined	The instrument is still in the switch-on phase, the measured value could not yet be determined	Wait for the end of the switch-on phase	Bit 6
F113 Communication error	Error in the internal instrument communication	Disconnect operating voltage briefly Send instrument for repair	Bit 12
F260 Error in the calibration	Error in the calibration carried out in the factory Error in the EEPROM	Exchanging the electronics Send instrument for repair	Bit 8
F261 Error in the instrument settings	Error during setup Error when carrying out a reset	> Repeat setup Repeat reset	Bit 9
F264 Installation/Setup error	Inconsistent settings (e.g.: distance, adjustment units with application process pressure) for selected application Invalid sensor configuration (e.g.: application electronic differential pressure with connected differential pressure measuring cell)	Modify settings Modify connected sensor configuration or application	Bit 10

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
F265 Measurement function disturbed	Sensor no longer carries out a measurement	Carry out a reset Disconnect operating voltage briefly	Bit 11

Tab. 8: Error codes and text messages, information on causes as well as corrective measures

Function check

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
C700 Simulation active	A simulation is active	Finish simulation Wait for the automatic end after 60 mins.	Bit 27

Out of specification

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
S600 Impermissible electronics temperature	Temperature of the electronics in the non-specified range	Check ambient temperature Insulate electronics Use instrument with higher temperature range	Bit 23
S603 Impermissible operating voltage	Operating voltage below specified range	Check electrical connection If necessary, increase operating voltage	Bit 26
S605 Impermissible pressure value	Measured process pressure below or above the adjustment range	Check nominal measuring range of the instrument If necessary, use an instrument with a higher measuring range	Bit 29

Maintenance

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
M500 Error in the delivery status	The data could not be restored during the reset to delivery status	Repeat reset Load XML file with sensor data into the sensor	Bit 15
M501 Error in the non-active linearisation table	Index markers are not continuously rising, for example illogical value pairs	Check linearization table Delete table/Create new	Bit 16
M502 Error in the event memory	Hardware error EEPROM	Exchanging the electronics Send instrument for repair	Bit 17
M504 Error at a device interface	Hardware defect	Exchanging the electronics Send instrument for repair	Bit 19

Code Text message	Cause	Rectification	DevSpec Diagnosis Bits
M507 Error in the instrument settings	Error during setup Error when carrying out a reset	Carry out reset and repeat setup	Bit 22

Tab. 11: Error codes and text messages, information on causes as well as corrective measures

9.5 Rectify faults

Reaction when malfunction occurs

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

Fault rectification

The first measures are:

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

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

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.

9.6 Exchange process module on version IP68 (25 bar)

On version IP68 (25 bar), the user can exchange the process module on site. Connection cable and external housing can be kept.

Required tools:

- Hexagon key wrench, size 2

Caution:
The exchange may only be carried out in the complete absence of line voltage.

In Ex applications, only a replacement part with appropriate Ex approval may be used.

Caution:
During exchange, protect the inner side of the parts against contamination and moisture.

Proceed as follows when carrying out the exchange:

1. Losen the fixing screw with the hexagon key wrench
2. Carefully detach the cable assembly from the process module

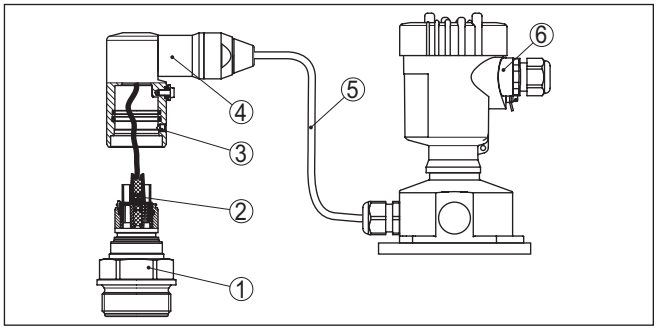


Fig. 40: VEGABAR 82 in IP68 version, 25 bar and lateral cable outlet, external housing

1 Process module
2 Plug connector
3 Fixing screw
4 Cable assembly
5 Connection cable
6 External housing

3. Loosen the plug connector
4. Mount the new process module on the measuring point
5. Plug the connector back in
6. Mount the cable assembly on the process module and turn it to the desired position
7. Tighten the fixing screw with the hexagon key wrench

The exchange is finished.

9.7 Exchanging the electronics module

In case of a defect, the user can replace the electronics module with another one of identical type.

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

You can find detailed information you need to carry out an electronics exchange in the handbook of the electronics module.

9.8 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**.

9.9 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.

The following is required:

- The serial number of the instrument
- A short description of the fault
- Details of the medium, if applicable

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

To remove the device, carry out the steps in chapters "*Mounting*" and "*Connecting to power suplly*" in reverse.

Warning:
When dismounting, pay attention to the process conditions in vessels or pipelines. There is a risk of injury, e.g. due to high pressures or temperatures as well as aggressive or toxic media. Avoid this by taking appropriate protective measures.

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 Certificates and approvals

11.1 Approvals for Ex areas

Approved versions for use in hazardous areas are available or in preparation for the device or the device series.

You can find the relevant documents on our homepage.

11.2 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.

Due to the design of its process fittings, the device does not subject of EU pressure device directive if it is operated at process pressures ≤ 200 bar.

11.3 NAMUR recommendations

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

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see **www.namur.de**.

11.4 Environment management system

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.

Help us to meet these requirements and observe the environmental instructions in the chapters "*Packaging, transport and storage*", "*Disposal*" of this instructions manual.

12 Supplement

12.1 Technical data

Note for approved instruments

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

All approval documents can be downloaded from our homepage.

Materials and weights

Materials, wetted parts

Process fitting	316L, PVDF, PEEK, Alloy C22 (2.4602), Alloy C276 (2.4819), Duplex steel (1.4462), Titanium Grade 2
Diaphragm	Sapphire-ceramic® (> 99.9 % Al_2O_3 ceramic)
Joining material measuring cell	Glass (with double and form seal, non-wetted parts)
Measuring cell seal	
– Standard (O-ring seal)	FKM (VP2/A, A+P 70.16), EPDM (A+P 70.10-02/70.503-00), FFKM (Kalrez 6375, Perlast G74S, Perlast G75B)
– Hygienic fitting with compression nut (form seal)	FKM (ET 6067), EPDM (EPDM 7076), FFKM (Perlast G75 LT), FEPM (Fluoraz SD890)
Seal for process fitting (in the scope of delivery)	
– Thread G½ (EN 837), G1½ (DIN 3852-A)	Klingersil C-4400
– Thread M44 x 1.25 (DIN 13), M30 x 1.5	FKM, FFKM, EPDM
– Hygienic connection with compression nut	FKM, EPDM, FFKM, FEPM
Surface quality, hygienic fittings, typ.	
– Process fitting	R_a < 0.8 µm
– Diaphragm	R_a < 0.38 µm

Materials, non-wetted parts

Sensor housing	
– Housing	Plastic PBT (Polyester), Aluminium AlSi10Mg (powder-coated, basis: Polyester), 316L
– Cable gland, blind plug cable gland	PA, stainless steel, brass
– Sealing, cable gland	CR/NBR
– Seal, housing lid	Silicone SI 850 R, NBR silicone-free
– Inspection window housing cover	Polycarbonate (UL-746-C listed), glass[1)]
– Ground terminal	316L
External housing - deviating materials	
– Housing and socket	Plastic PBT (Polyester), 316L

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

45032-EN-260315

– Socket seal	EPDM
– Seal below wall mounting plate[2]	EPDM
– Inspection window housing cover	Polycarbonate (UL-746-C listed)
Ground terminal	316Ti/316L
Connection cable with IP68 (25 bar)[3]	
– Cable cover	PE, PUR
– Type label support on cable	PE hard
Connection cable with IP68 (1 bar)[4]	PE, PUR
Weights	
Total weight	approx. 0.8 … 8 kg (1.764 … 17.64 lbs), depending on process fitting and housing

Torques

Max. torque for process fitting	
– G½ PVDF	5 Nm (3.688 lbf ft)
– G½ PEEK,	10 Nm (7.376 lbf ft)
– G½, G¾	30 Nm (22.13 lbf ft)
– Fittings according to 3A with exchangeable sealing	20 Nm (14.75 lbf ft)
– Hygienic fitting with compression nut (hexagon)	40 Nm (29.50 lbf ft)
– G1, M30 x 1.5	50 Nm (36.88 lbf ft)
– G1 for PASVE	100 Nm (73.76 lbf ft)
– G1½	200 Nm (147.5 lbf ft)
Max. torque for screws	
– PMC 1", PMC 1¼"	2 Nm (1.475 lbf ft)
– PMC 1½"	5 Nm (3.688 lbf ft)
Max. torque for NPT cable glands and Conduit tubes	
– Plastic housing	10 Nm (7.376 lbf ft)
– Aluminium/Stainless steel housing	50 Nm (36.88 lbf ft)

Input variable

The specifications are only an overview and refer to the measuring cell. Limitations due to the material and version of the process fitting as well as the selected pressure type are possible. The specifications on the nameplate apply.[5]

[2] Only for 316L with 3A approval
[3] Between transmitter and external electronics housing.
[4] Fix connected to the sensor.
[5] Data on overload capability apply for reference temperature.

Nominal measuring ranges and overload capability in bar/kPa

Nominal range	Overload capability	
	Maximum pressure	Minimum pressure
Gauge pressure		
0 … +0.025 bar/0 … +2.5 kPa(only for measuring cell ø 28 mm)	+5 bar/+500 kPa	-0.05 bar/-5 kPa
0 … +0.1 bar/0 … +10 kPa	+15 bar/+1500 kPa	-0.2 bar/-20 kPa
0 … +0.4 bar/0 … +40 kPa	+30 bar/+3000 kPa	-0.8 bar/-80 kPa
0 … +1 bar/0 … +100 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
0 … +2.5 bar/0 … +250 kPa	+50 bar/+5000 kPa	-1 bar/-100 kPa
0 … +5 bar/0 … +500 kPa	+65 bar/+6500 kPa	-1 bar/-100 kPa
0 … +10 bar/0 … +1000 kPa	+90 bar/+9000 kPa	-1 bar/-100 kPa
0 … +25 bar/0 … +2500 kPa	+125 bar/+12500 kPa	-1 bar/-100 kPa
0 … +60 bar/0 … +6000 kPa	+200 bar/+20000 kPa	-1 bar/-100 kPa
0 … +100 bar/0 … +10000 kPa (only for measuring cell ø 28 mm)	+200 bar/+20000 kPa	-1 bar/-100 kPa
-1 … 0 bar/-100 … 0 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
-1 … +1.5 bar/-100 … +150 kPa	+40 bar/+4000 kPa	-1 bar/-100 kPa
-1 … +5 bar/-100 … +500 kPa	+65 bar/+6500 kPa	-1 bar/-100 kPa
-1 … +10 bar/-100 … +1000 kPa	+90 bar/+9000 kPa	-1 bar/-100 kPa
-1 … +25 bar/-100 … +2500 kPa	+125 bar/+12500 kPa	-1 bar/-100 kPa
-1 … +60 bar/-100 … +6000 kPa	+200 bar/+20000 kPa	-1 bar/-100 kPa
-1 … +100 bar/-100 … +10000 kPa (only for measuring cell ø 28 mm)	+200 bar/+20000 kPa	-1 bar/-100 kPa
-0,025 … +0,025 bar/-2.5 … +2.5 kPa	+5 bar/+500 kPa	-0.05 bar/-5 kPa
-0.05 … +0.05 bar/-5 … +5 kPa	+15 bar/+1500 kPa	-0.2 bar/-20 kPa
-0.2 … +0.2 bar/-20 … +20 kPa	+20 bar/+2000 kPa	-0.4 bar/-40 kPa
-0.5 … +0.5 bar/-50 … +50 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
Absolute pressure		
0 … 0.1 bar/0 … 10 kPa	15 bar/1500 kPa	0 bar abs.
0 … 1 bar/0 … 100 kPa	35 bar/3500 kPa	0 bar abs.
0 … 2.5 bar/0 … 250 kPa	50 bar/5000 kPa	0 bar abs.
0 … +5 bar/0 … +500 kPa	65 bar/+6500 kPa	0 bar abs.
0 … 10 bar/0 … 1000 kPa	90 bar/9000 kPa	0 bar abs.
0 … 25 bar/0 … 2500 kPa	125 bar/12500 kPa	0 bar abs.
0 … 60 bar/0 … 6000 kPa	200 bar/20000 kPa	0 bar abs.
0 … 100 bar/0 … +10000 kPa (only for measuring cell ø 28 mm)	200 bar/20000 kPa	0 bar abs.

Nominal measuring ranges and overload capacity in psi

Nominal range	Overload capability	
	Maximum pressure	Minimum pressure
Gauge pressure		
0 … +0.4 psig (only for measuring cell ø 28 mm)	+75 psig	-0.7 psig
0 … +1.5 psig	+225 psig	-3 psig
0 … +5 psig	+375 psig	-11.50 psig
0 … +15 psig	+525 psig	-14.51 psig
0 … +30 psig	+725 psig	-14.51 psig
0 … +75 psig	+975 psig	-14.51 psig
0 … +150 psig	+1350 psig	-14.51 psig
0 … +300 psig	+1900 psig	-14.51 psig
0 … +900 psig	+2900 psig	-14.51 psig
0 … +1450 psig (only for measuring cell ø 28 mm)	+2900 psig	-14.51 psig
-14.5 … 0 psig	+525 psig	-14.51 psig
-14.5 … +20 psig	+600 psig	-14.51 psig
-14.5 … +75 psig	+975 psig	-14.51 psig
-14.5 … +150 psig	+1350 psig	-14.51 psig
-14.5 … +300 psig	+1900 psig	-14.51 psig
-14.5 … +900 psig	+2900 psig	-14.51 psig
-14.5 … +1500 psig (only for measuring cell ø 28 mm)	+2900 psig	-14.51 psig
-0.7 … +0.7 psig	+75 psig	-2.901 psig
-3 … +3 psig	+225 psi	-5.800 psig
-7 … +7 psig	+525 psig	-14.51 psig
Absolute pressure		
0 … 1.5 psi	225 psig	0 psi
0 … 15 psi	525 psi	0 psi
0 … 30 psi	725 psi	0 psi
0 … 75 psi	975 psi	0 psi
0 … 150 psi	1350 psi	0 psi
0 … 300 psi	1900 psi	0 psi
0 … 900 psi	2900 psi	0 psi
0 … 1450 psi (only for measuring cell ø 28 mm)	2900 psi	0 psi

Repeated operation of the pressure measuring device at the limit of its overload capacity may result in additional measurement deviations, which, however, typically do not exceed 0.2 %.

Adjustment ranges

Specifications refer to the nominal measuring range, pressure values lower than -1 bar cannot be set

Min./Max. adjustment:	
– Percentage value	-10 … 110 %
– Pressure value	-20 … 120 %
Zero/Span adjustment:	
– Zero	-20 … +95 %
– Span	-120 … +120 %
– Difference between zero and span	max. 120 % of the nominal range
Max. permissible Turn Down	Unlimited (recommended 20 : 1)

Switch-on phase

Start-up time with operating voltage U_B	
– ≥ 12 V DC	≤ 9 s
– < 12 V DC	≤ 22 s

Output variable

Output signal	digital output signal, Foundation Fieldbus protocol
Transmission rate	31.25 Kbit/s
Damping (63 % of the input variable)	0 … 999 s, adjustable
Channel Numbers	
– Channel 1	Process value
– Channel 8	Electronics temperature
Current value	
– Non-Ex, Ex ia and Ex d instruments	12 mA, ±0.5 mA

Dynamic behaviour output

Dynamic characteristics depending on medium and temperature

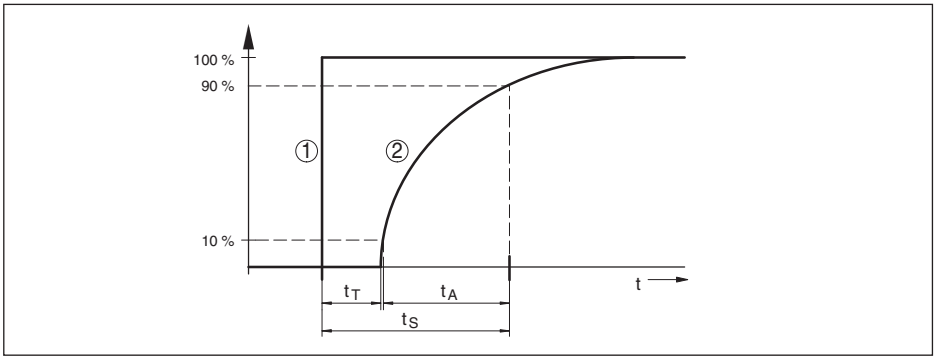


Fig. 41: Behaviour in case of sudden change of the process variable. t_T: dead time; t_A: rise time; t_S: jump response time

1 Process variable
2 Output signal

	VEGABAR 82	VEGABAR 82, IP68 (25 bar), connection cable > 25 m (82.01 ft)
Dead time	≤ 25 ms	≤ 50 ms
Rise time (10 … 90 %)	≤ 55 ms	≤ 150 ms
Step response time (ti: 0 s, 10 … 90 %)	≤ 80 ms	≤ 200 ms

Damping (63 % of the input variable) 0 … 999 s, adjustable via menu item "*Damping*"

Additional output parameter - Measuring cell temperature

Range	-60 … +150 °C (-76 … +302 °F)
Resolution	< 0.2 K
Deviation	
– Range of 0 … +100 °C (+32 … +212 °F)	±2 K
– Range of -60 … 0 °C (-76 … +32 °F) and +100 … +150 °C (+212 … +302 °F)	typ. ±4 K
Output of the temperature values	
– Indication	Via the display and adjustment module
– Analogue	Via the current output, the additional current output
– Digital	Via the digital output signal (depending on the electronics version)

Reference conditions and influencing variables (according to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1	
– Temperature	+15 … +25 °C (+59 … +77 °F)
– Relative humidity	45 … 75 %
– Air pressure	860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psig)
Determination of characteristics	Limit point adjustment according to IEC 61298-2
Characteristic curve	Linear
Reference installation position	upright, diaphragm points downward
Influence of the installation position	< 0.2 mbar/20 Pa (0.003 psig)

Deviation (according to IEC 60770-1)

Specifications refer to the set span. Turn down (TD) is the ratio: nominal measuring range/set span.

Measuring ranges > 25 mbar

Accuracy class	Non-linearity, hysteresis and repeatability with TD 1 : 1 up to 5 : 1	Non-linearity, hysteresis and repeatability at TD > 5 : 1
0.05 %	< 0.05 %	< 0.01 % x TD
0.1 %	< 0.1 %	< 0.02 % x TD
0.2 %	< 0.2 %	< 0.04 % x TD

Measuring ranges 0 … 25 mbar (0… … +2.5 kPa) und -25 … +25 mbar (-2.5 … +2.5 kPa)

Accuracy class	Non-linearity, hysteresis and non-repeatability
0.05 %	< 0.05 % x TD
0.1 %	< 0.1 % x TD
0.2 %	< 0.1 % + 0.1 % x TD

Influence of the product temperature

Thermal change zero signal and output span through product temperature

Applies to the **digital** signal output (HART, Profibus PA, Foundation Fieldbus) as well as to the **analogue** current output 4 … 20 mA and refers to the set span. Turn down (TD) is the ratio "nominal measuring range/set span".

The thermal change of the zero signal and output span corresponds to the temperature error F_T in chapter "*Calculation of the total deviation (according to DIN 16086)*".

Basic temperature error F_T

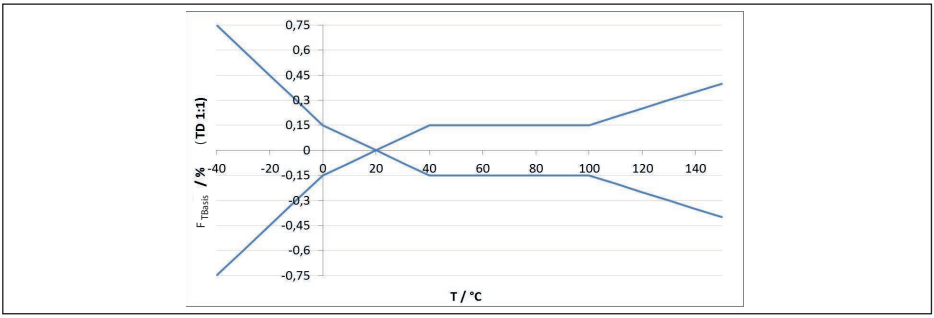


Fig. 42: Basic temperature error F_{TBasis} at TD 1 : 1

The basic temperature error in % from the above graphic can increase due to the additional factors, depending on the measuring cell version (factor FMZ) and the Turn Down (factor FTD). The additional factors are listed in the following tables.

Additional factor through measuring cell version

Measuring cell version	Measuring cell standard, depending on the accuracy class		
	0.05 %, 0.1 %	0.2 % (with measuring range 0.1 bar_{abs})	0.2 % 0.05 %, 0.1 % with measuring range 25 mbar
Factor FMZ	1	2	3

Measuring cell version	Measuring cell climate-compensated, depending on measuring range		
	-1 … 0 bar, -1 … 1,5 bar, 5 bar, 10 bar, 25 bar, 60 bar, 100 bar	-0.5 … 0.5 bar, 1 bar, 2,5 bar	0.4 bar, -0.2 … 0.2 bar
Factor FMZ	1	2	3

Additional factor through Turn Down

The additional factor F_{TD} through Turn down is calculated according to the following formula:

$F_{TD} = 0.5 \times TD + 0.5$

In the table, example values for typical Turn downs are listed.

Turn Down	TD 1 : 1	TD 2.5 : 1	TD 5 : 1	TD 10 : 1	TD 20 : 1
Factor FTD	1	1.75	3	5.5	10.5

Long-term stability (according to DIN 16086)

Applies to the respective **digital** signal output (e.g. HART, Profibus PA) as well as to **analogue** current output 4 … 20 mA under reference conditions. Specifications refer to the set span. Turn down (TD) is the ratio nominal measuring range/set span.

Long-term stability zero signal and output span

Time period	Measuring cell ø 28 mm		Measuring cell ø 17.5 mm
	Measuring ranges from 0 … +0.1 bar (0 … +10 kPa)	Measuring range 0 … +0.025 bar (0 … +2.5 kPa)	
One year	< 0.05 % x TD	< 0.1 % x TD	< 0.1 % x TD
Five years	< 0.1 % x TD	< 0.2 % x TD	< 0.2 % x TD
Ten years	< 0.15 % x TD	< 0.4 % x TD	< 0.4 % x TD

For measuring cells with a diameter of 28 mm, a measuring range of 0.4 bar and a PTFE film as the diaphragm coating, long-term stability is reduced by a factor of 2.

Long-term stability zero signal and output span - version climate-compensated

Nominal measuring range in bar/kPa	Nominal measuring range in psig	Measuring cell ø 28 mm	Measuring cell ø 17.5 mm
0 … 0.4 bar/0 … 40 kPa	0 … 6 psig	< (1 % x TD)/year	< (1.5 % x TD)/year
-0.2 … 0.2 bar/-20 … 20 kPa	-3 … 3 psig		
0 … 1 bar/0 … 100 kPa	0 … 15 psig	< (0.25 % x TD)/year	< (0.375 % x TD)/year
0 … 2.5 bar/0 … 250 kPa	0 … 35 psig		
-1 … 0 bar/-100 … 0 kPa	-15 … 0 psig		
-1 … 1.5 bar/-100 … 150 kPa	-15 … 25 psig		
-0.5 … 0.5 bar/-50 … 50 kPa	-7 … 7 psig		

Nominal measuring range in bar/ kPa	Nominal measuring range in psig	Measuring cell ø 28 mm	Measuring cell ø 17.5 mm
0 … 5 bar/0 … 500 kPa	0 … 75 psig	< (0.1 % x TD)/year	< (0.15 % x TD)/year
0 … 10 bar/0 … 1000 kPa	0 … 150 psig		
0 … 25 bar/0 … 2500 kPa	0 … 350 psig		
0 … 60 bar/0 … 6000 kPa	0 … 900 psig		
0 … 100 bar/0 … 6000 kPa	0 … 1450 psig		
-1 … 10 bar/-100 … 1000 kPa	-15 … 150 psig		
-1 … 25 bar/-100 … 2500 kPa	-15 … 350 psig		
-1 … 60 bar/-100 … 6000 kPa	-15 … 900 psig		

Ambient conditions

Version	Ambient temperature	Storage and transport temperature
Standard version	-40 … +80 °C (-40 … +176 °F)	-60 … +80 °C (-76 … +176 °F)
Version IP66/IP68 (1 bar)	-20 … +80 °C (-4 … +176 °F)	-20 … +80 °C (-4 … +176 °F)
Version IP68 (25 bar), with connection cable PUR	-20 … +80 °C (-4 … +176 °F)	-20 … +80 °C (-4 … +176 °F)
Version IP68 (25 bar), connection cable PE	-20 … +60 °C (-4 … +140 °F)	-20 … +60 °C (-4 … +140 °F)

Relative humidity < 100 % non-condensing

Process conditions

Process temperature - Process fittings stainless steel

Measuring cell seal		Sensor version	
		Standard	Extended temperature range[6)]
FKM	VP2/A	-20 … +130 °C (-4 … +266 °F)	-20 … +150 °C (-4 … +302 °F)
	A+P 70.16	-40 … +130 °C (-40 … +266 °F)	-
	V70SW	-	-10 … +150 °C (14 … +302 °F)
EPDM	A+P 70.10-02/70.503-00	-40 … +130 °C (-40 … +266 °F)	-40 … +150 °C (-40 … +302 °F)
	ET 7056	-40 … +130 °C (-40 … +266 °F)	-
	E70Q	-	-40 … +150 °C (-40 … +302 °F)
	Fluoraz SD890	-5 … +130 °C (-22 … +266 °F)	-
FFKM	Kalrez 6375	-20 … +130 °C (-4 … +266 °F)	-20 … +150 °C (-4 … +302 °F)
	Perlast G74S	-15 … +130 °C (5 … +266 °F)	-15 … +150 °C (5 … +302 °F)
	Perlast G75B	-15 … +130 °C (5 … +266 °F)	-15 … +150 °C (5 … +302 °F)
	Perlast G92E	-15 … +130 °C (… +266 °F)	-15 … +150 °C (5 … +302 °F)
	Perlast G75LT	-40 … +130 °C (-40 … +266 °F)	-40 … +150 °C (-40 … +302 °F)

[6)] Measuring cell ø 28 mm

Process temperature - Process fittings plastic

Measuring cell seal		Process temperature		
		Process fitting PEEK[7]	Process fitting PP	Process fitting PVDF[8]
FKM	VP2/A	-20 … +100 °C (-4 … +212 °F)	0 … +100 °C (32 … +212 °F)	-20 … +80 °C (-4 … +176 °F)[9]
	A+P 70.16	-40 … +100 °C (-40 … +212 °F)		
EPDM	A+P 70.10-02/70.503-00			
FFKM	Kalrez 6375	-20 … +100 °C (-4 … +212 °F)		
	Perlast G74S	-15 … +100 °C (5 … +212 °F)		
	Perlast G75B			

Temperature derating

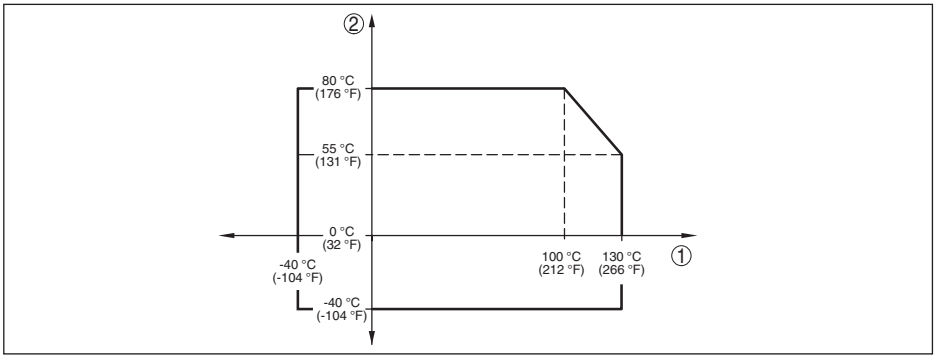


Fig. 43: Temperature derating VEGABAR 82, version up to +130 °C (+266 °F)

1 Process temperature
2 Ambient temperature

[7] Max. permissible process pressure depending on the process fitting 25 bar resp. 30 bar (siehe type label)
[8] Max. permissible process pressure thread versions: 10 bar
[9] Process pressures > 5 bar: 20 … +60 °C (-4 … +140 °F)

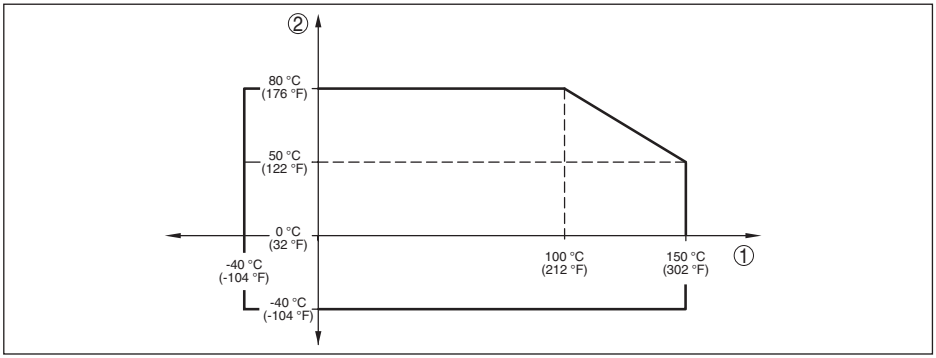


Fig. 44: Temperature derating VEGABAR 82, version up to +150 °C (+302 °F)

1 Process temperature
2 Ambient temperature

SIP process temperature (SIP = Sterilization in place)

Applies to instruments configurations suitable for vapour, i.e. material measuring cell seal EPDM or FFKM (Perlast G74S).

Vapour stratification up to 2 h	+150 °C (+302 °F)

Process pressure

Permissible process pressure	see specification "*Process pressure*" on the type label

Mechanical stress[10)]

Vibration resistance	4 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance)
Shock resistance	50 g, 2.3 ms according to EN 60068-2-27 (mechanical shock)[11)]

Electromechanical data - version IP66/IP67 and IP66/IP68 (0.2 bar)[12)]

Options of the cable entry

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

Material cable gland	Cable diameter			
	5 … 9 mm	6 … 12 mm	7 … 12 mm	10 … 14 mm
PA	√	√	–	√
Brass, nickel-plated	√	√	–	–
Stainless steel	–	–	√	–

[10)] Depending on the instrument version.
[11)] 2 g with housing version stainless steel double chamber
[12)] IP66/IP68 (0.2 bar), only with absolute pressure.

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)

Connection cable, mechanical data

– Configuration	Wires, strain relief, breather capillaries, screen braiding, metal foil, mantle
– Standard length	5 m (16.4 ft)
– Min. bending radius (at 25 °C/77 °F)	25 mm (0.984 in)
– Diameter	approx. 8 mm (0.315 in)
– Colour - version PE	Black
– Colour - version PUR	Blue

Connection cable, electrical data

– Wire cross-section	0.5 mm² (AWG 20)
– Wire resistance R´	0.037 Ω/m (0.012 Ω/ft)

Electromechanical data - version IP68 (25 bar)

Connection cable transmitter - external housing, mechanical data

– Configuration	Wires, strain relief, breather capillaries, screen braiding, metal foil, mantle[13)]
– Standard length	5 m (16.40 ft)
– Max. length	180 m (590.5 ft)
– Min. bending radius at 25 °C/77 °F	25 mm (0.985 in)
– Diameter	approx. 8 mm (0.315 in)
– Material	PE, PUR
– Colour	Black, blue

Connection cable transmitter - external housing, electrical data

– Wire cross-section	0.5 mm² (AWG 20)
– Wire resistance	0.037 Ω/m (0.012 Ω/ft)

Interface to the external display and adjustment unit

Data transmission	Digital (I²C-Bus)
Connection cable	Four-wire

Sensor version	Configuration, connection cable		
	Cable length	Standard cable	Shielded
4 … 20 mA/HART Modbus	50 m	●	–
Profibus PA, Foundation Fieldbus	25 m	–	●

13) Breather capillaries not with Ex d version.

Interface to the Secondary sensor	
Data transmission	Digital (I^2C-Bus)
Configuration, connection cable	4-wire, shielded
Max. cable length	70 m (229.7 ft)

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

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

Voltage supply	
Operating voltage U_B	9 … 32 V DC
Operating voltage U_B with lighting switched on	13.5 … 32 V DC
Power supply by/max. number of sensors	Fieldbus/32

Potential connections and electrical separating measures in the instrument	
Electronics	Non-floating
Galvanic separation	
– between electronics and metallic parts of the device	Reference voltage 500 V AC
Conductive connection	Between ground terminal and metallic process fitting

Electrical protective measures[14)]

Housing material	Version	Protection acc. to IEC 60529	Protection acc. to NEMA
Plastic	Single chamber	IP66/IP67	Type 4X
	Double chamber		

[14)] Protection rating IP66/IP68 (0.2 bar) only in conjunction with absolute pressure, as no air compensation is possible when the sensor is completely flooded

Housing material	Version	Protection acc. to IEC 60529	Protection acc. to NEMA
Aluminium	Single chamber	IP66/IP67 IP66/IP68 (0.2 bar) IP66/IP68 (1 bar)	Type 4X Type 6P Type 6P
	Double chamber	IP66/IP67 IP66/IP68 (0.2 bar)	Type 4X Type 6P
Stainless steel (electro-polished)	Single chamber	IP66/IP67 IP69	Type 4X
Stainless steel (precision casting)	Single chamber	IP66/IP67 IP66/IP68 (0.2 bar) IP66/IP68 (1 bar)	Type 4X Type 6P Type 6P
	Double chamber	IP66/IP67 IP66/IP68 (0.2 bar)	Type 4X Type 6P
Stainless steel	Transmitter, version with external housing	IP68 (25 bar)	-

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[15)]	2
Protection rating (IEC/EN 61010-1)	II

12.2 Device communication Foundation Fieldbus

In the following, the necessary device-specific details are shown. You can find further information of Foundation Fieldbus on **www.fieldbus.com**.

Overview

The following table gives you an overview of the instrument versions and the corresponding device descriptions, the electrical characteristics of the bus system as well as the applied function blocks.

Revisions Data	DD-Revision	Rev_01
	CFF-File	020101.cff
	Device Revision	0101.ff0, 0101.ff5
	Cff-Revision	xx xx 01
	Device software revision	> 1.1.0
	ITK (Interoperability Test Kit) Number	6.2.0

15) When used with fulfilled protection.

Electricial Characteristics	Physicial Layer Type	Low-power signaling, bus-powered, FISCO I.S.
	Input Impedance	> 3000 Ohms between 7.8 KHz - 39 KHz
	Unbalanced Capacitance	< 250 pF to ground from either input terminal
	Output Amplitude	0.8 V P-P
	Electrical Connection	2 Wire
	Polarity Insensitive	Yes
	Max. Current Load	11 mA
	Device minimum operating voltage	9 V
Transmitter Function Blocks	Resource Block (RB)	1
	Transducer Block (TB)	1
	Standard Block (AI)	3
	Execution Time	30 mS
Advanced Function Blocks	Discret Input (DI)	Yes
	PID Control	Yes
	Output Splitter (OS)	Yes
	Signal Characterizer (SC)	Yes
	Integrator	Yes
	Input Selector (IS)	Yes
	Arithmetic (AR)	Yes
Diagnostics	Standard	Yes
	Advanced	Yes
	Performance	No
	Function Blocks Instantiable	No
General Information	LAS (Link Active Scheduler)	Yes
	Master Capable	Yes
	Number of VCRs (Virtual Communication Relationships)	47

12.3 Calculation of the total deviation

The total deviation of a pressure transmitter indicates the maximum measurement error to be expected in practice. It is also called maximum practical deviation or operational error.

According to DIN 16086, the total deviation F_{total} is the sum of the basic deviation F_{perf} and the long-term stability F_{stab}:

$F_{total} = F_{perf} + F_{stab}$

The basic deviation F_{perf} in turn consists of the thermal change of the zero signal and the output span F_T (temperature error) as well as the deviation F_{KI}:

$F_{perf} = \sqrt{((F_T)^2 + (F_{KI})^2)}$

The thermal change of zero signal and output span F_T is specified in chapter "*Technical data*". The

basic temperature error F_T is shown in a graphic. Depending on the measuring cell version and Turn down, this value must be multiplied with the additional factors FMZ and FTD:

F_T x FMZ x FTD

Also these values are specified in chapter "*Technical data*".

This applies initially to the digital signal output through HART, Profibus PA, Foundation Fieldbus or Modbus.

With 4 … 20 mA output, the thermal change of the current output F_a must be added:

$F_{perf} = \sqrt{((F_T)^2 + (F_{KI})^2 + (F_a)^2)}$

To provide a better overview, the formula symbols are listed together below:

- F_{total}: Total deviation
- F_{perf}: Basic deviation
- F_{stab}: Long-term stability
- F_T: Thermal change of zero signal and output span (temperature error)
- F_{KI}: Deviation
- F_a: Thermal change of the current output
- FMZ: Additional factor measuring cell version
- FTD: Additional factor Turn down

12.4 Calculation of the total deviation - Practical example

Data

Pressure measurement in the pipeline 4 bar (400 KPa)

Product temperature up to 50 °C

VEGABAR 82 with measuring range 10 bar, deviation < 0.2 %, process fitting G1½ (measuring cell ø 28 mm)

1. Calculation of the Turn down

TD = 10 bar/4 bar, TD = 2.5 : 1

2. Determination temperature error F_T

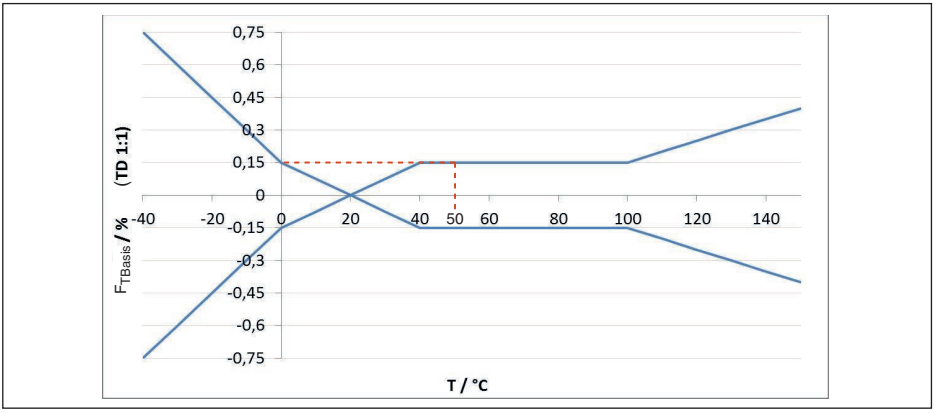


Fig. 45: Determination of the basic temperature error for the above example: F_{TBasis} = 0.15 %

Measuring cell version	Measuring cell standard, depending on the accuracy class		
	0.05 %, 0.1 %	0.2 % (0.1 bar_{abs})	0.2 %
Factor FMZ	1	2	3

Tab. 28: Determination of the additional factor measuring cell for above example: F_{MZ} = 3

Turn Down	TD 1 : 1	TD 2.5 : 1	TD 5 : 1	TD 10 : 1	TD 20 : 1
Factor FTD	1	1.75	3	5.5	10.5

Tab. 29: Determination of the additional factor "turn down" for the above example: F_{TD} = 1.75

$F_T = F_{TBasis} \times F_{MZ} \times F_{TD}$

$F_T = 0.15\ \% \times 3 \times 1.75$

$F_T = 0.79\ \%$

3. Determination of deviation and long-term stability

The required values for deviation F_{KI} and long-term stability F_{stab} are available in the technical data:

Accuracy class	Non-linearity, hysteresis and non-repeatability	
	TD ≤ 5 : 1	TD > 5 : 1
0.05 %	< 0.05 %	< 0.01 % x TD
0.1 %	< 0.1 %	< 0.02 % x TD
0.2 %	< 0.2 %	< 0.04 % x TD

Tab. 30: Determination of the deviation from table: F_{KI} = 0.2 %

Time period	Measuring cell ø 28 mm		Measuring cell ø 17.5 mm	
	All measuring ranges	Measuring range 0 … +0.025 bar (0 … +2.5 kPa)	All process fittings	Process fitting G½ (ISO 228-1)
One year	< 0.05 % x TD	< 0.1 % x TD	< 0.1 % x TD	< 0.25 % x TD
Five years	< 0.1 % x TD	< 0.2 % x TD	< 0.2 % x TD	< 0.5 % x TD
Ten years	< 0.15 % x TD	< 0.4 % x TD	< 0.4 % x TD	< 1 % x TD

Tab. 31: Determination of the long-term stability from the table, consideration for one year: F_{stab} = 0.05 % x TD

4. Calculation of the total deviation - digital signal outputs

1. step: Basic deviation F_{perf}

$F_{perf} = \sqrt{((F_T)^2 + (F_{KI})^2)}$

$F_T = 0.79\ \%$

$F_{KI} = 0.2\ \%$

$F_{perf} = \sqrt{(0.79\ \%)^2 + (0.2\ \%)^2}$

$F_{perf} = 0.81\ \%$

2. step: Total deviation F_{total}

$F_{total} = F_{perf} + F_{stab}$

$F_{perf} = 0.81\ \%$ (result of step 1)

F_{stab} = (0.05 % x TD)

F_{stab} = (0.05 % x 2.5)

F_{stab} = 0.125 %

F_{total} = 0.81 % + 0.125 % = 0.94 %

The total deviation of the measurement is hence 0.94 %.

Deviation in bar: 0.94 % of 4 bar = 0.038 bar

The example shows that the measurement error in practice can be considerably higher than the basic deviation. Reasons are temperature influence and Turn down.

12.5 Dimensions

The following dimensional drawings represent only an extract of the possible versions. Detailed dimensional drawings can be downloaded at **www.vega.com** under "*Downloads*" and "*Drawings*".

Plastic housing

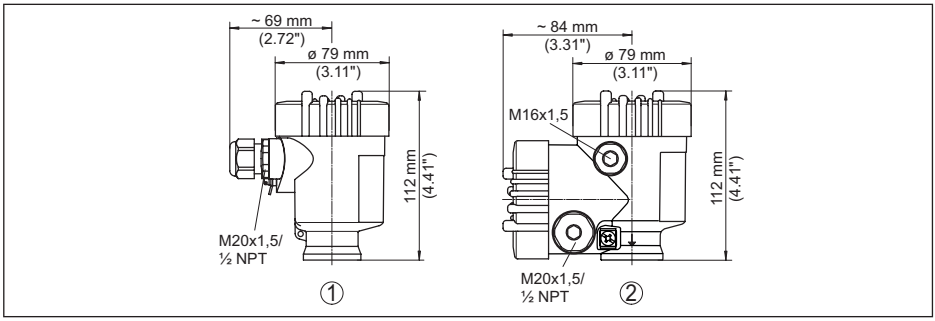


Fig. 46: Housing versions in protection IP66/IP67 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)

1 Plastic single chamber
2 Plastic double chamber

Aluminium housing

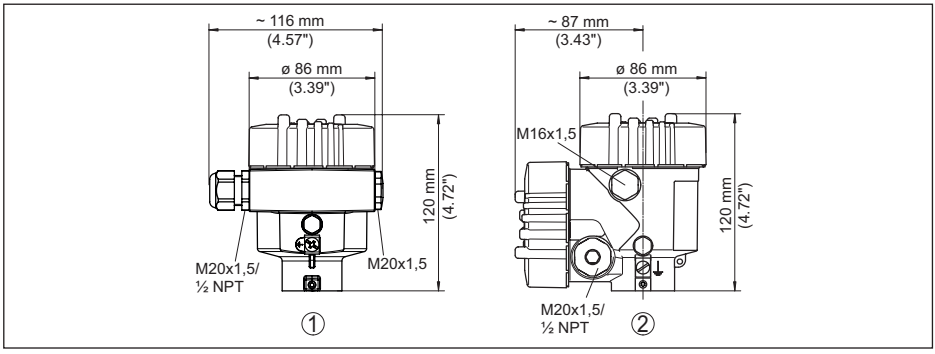


Fig. 47: Housing versions with protection rating IP66/IP68 (0.2 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Aluminium - single chamber
2 Aluminium - double chamber

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

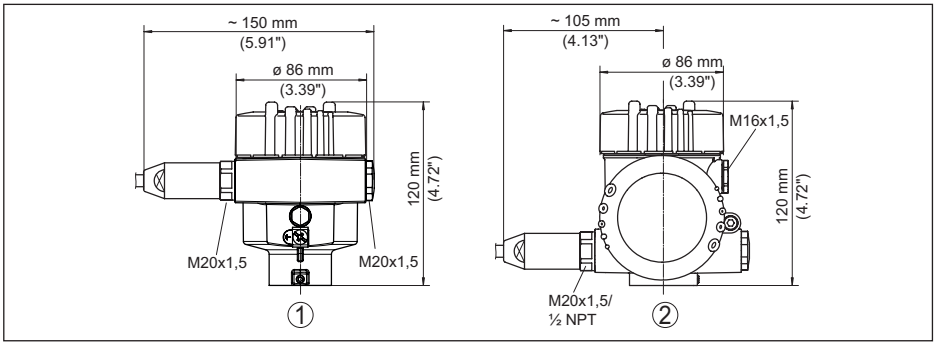


Fig. 48: Housing versions with protection rating IP66/IP68 (1 bar), (with integrated display and adjustment module the housing is 18 mm/0.71 in higher)

1 Aluminium - single chamber
2 Aluminium - double chamber

Stainless steel housing

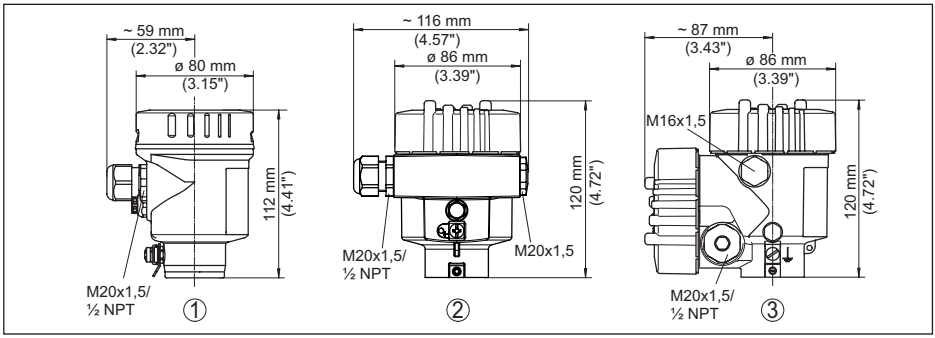


Fig. 49: Housing versions in protection rating IP66/IP68 (0.2 bar), (with integrated display and adjustment module the housing is 9 mm/0.35 in or 18 mm/0.71 in higher)

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

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

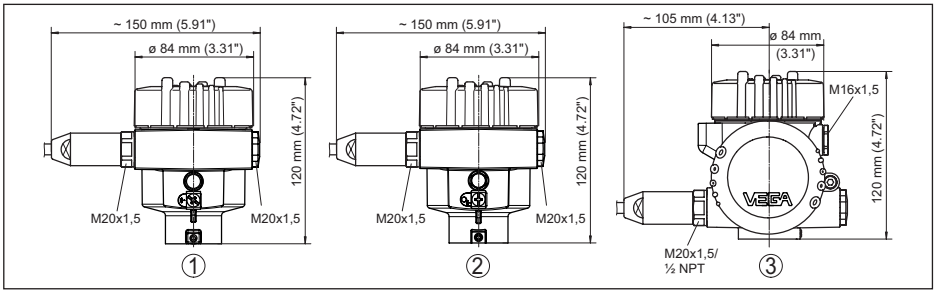


Fig. 50: Housing versions in protection rating IP66/IP68 (1 bar), (with integrated display and adjustment module the housing is 9 mm/0.35 in or 18 mm/0.71 in higher)

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

Stainless steel housing with protection rating IP69

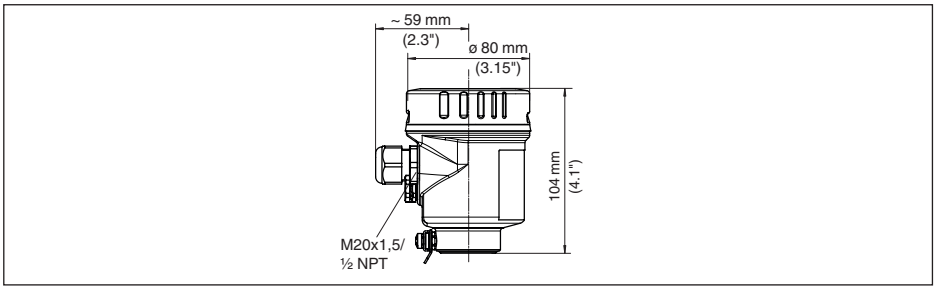


Fig. 51: Housing version with protection rating IP69 (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)

1 Stainless steel single chamber (electropolished)

External housing on IP68 version

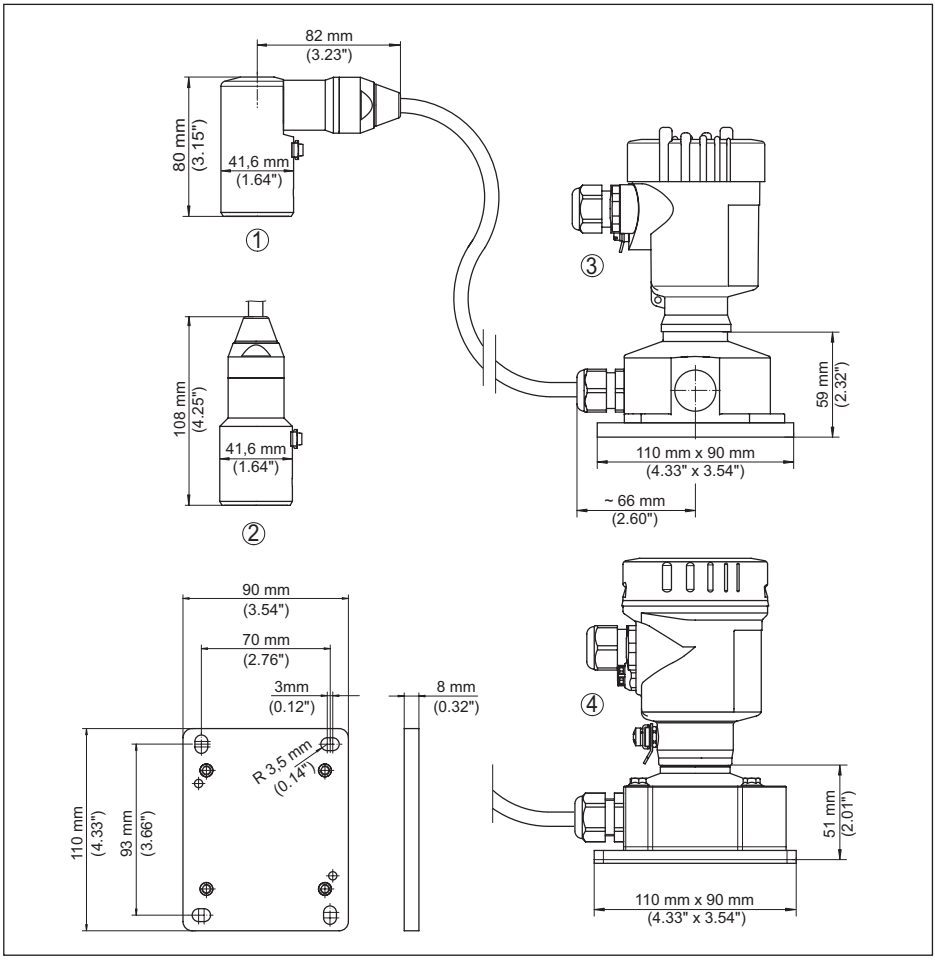


Fig. 52: VEGABAR 82, IP68 version with external housing

1 *Lateral cable outlet*
2 *Axial cable outlet*
3 *Plastic single chamber*
4 *Stainless steel single chamber*
5 *Seal 2 mm (0.079 in), (only with 3A approval)*

VEGABAR 82, threaded fitting not front-flush[16)]

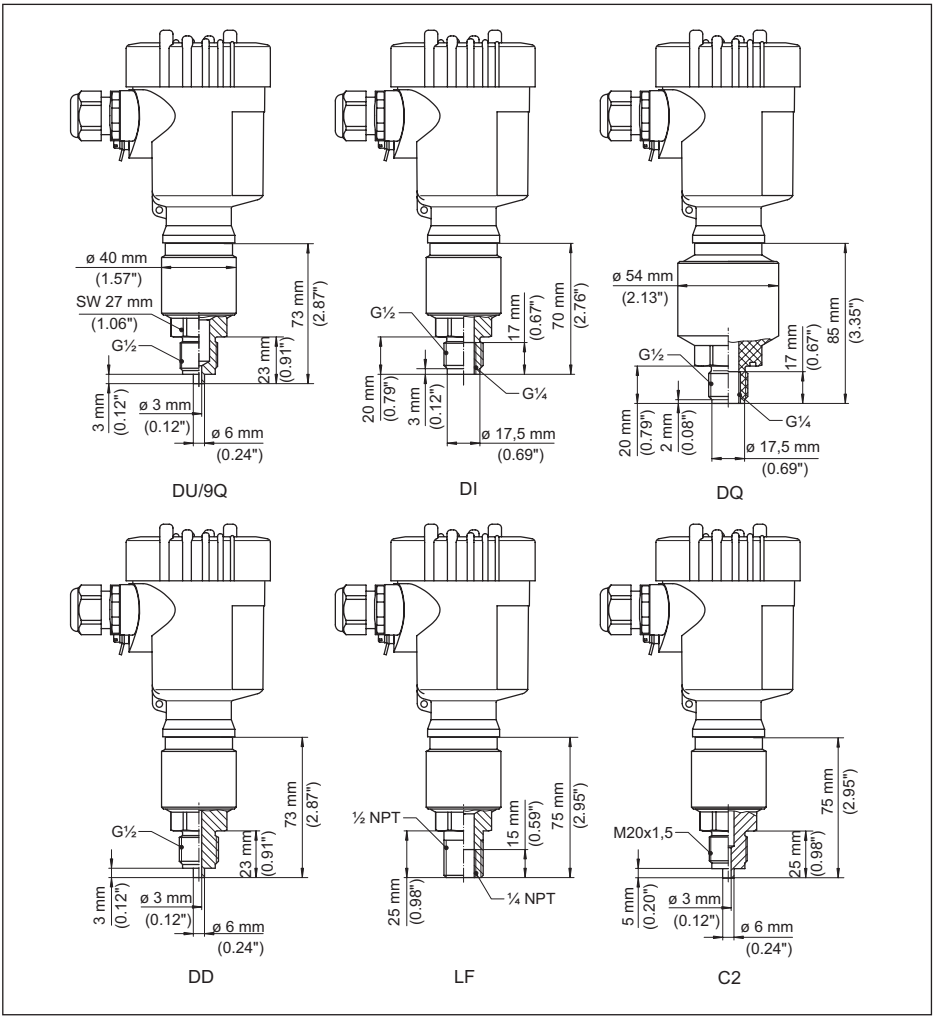


Fig. 53: VEGABAR 82, threaded fitting not front-flush

DU/9Q G½ (EN 837); manometer connection 316L/PEEK
DI G½, inside G¼ A (ISO 228-1)
DQ G½, inner G¼ A (ISO 228-1), PVDF
DD G½ (EN 837); volume-reduced
LF ½ NPT, inside ¼ NPT (ASME B1.20.1)
C2 M20 x 1.5 (EN 837); manometer connection

Notes:

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

16)

VEGABAR 82, threaded fitting front-flush

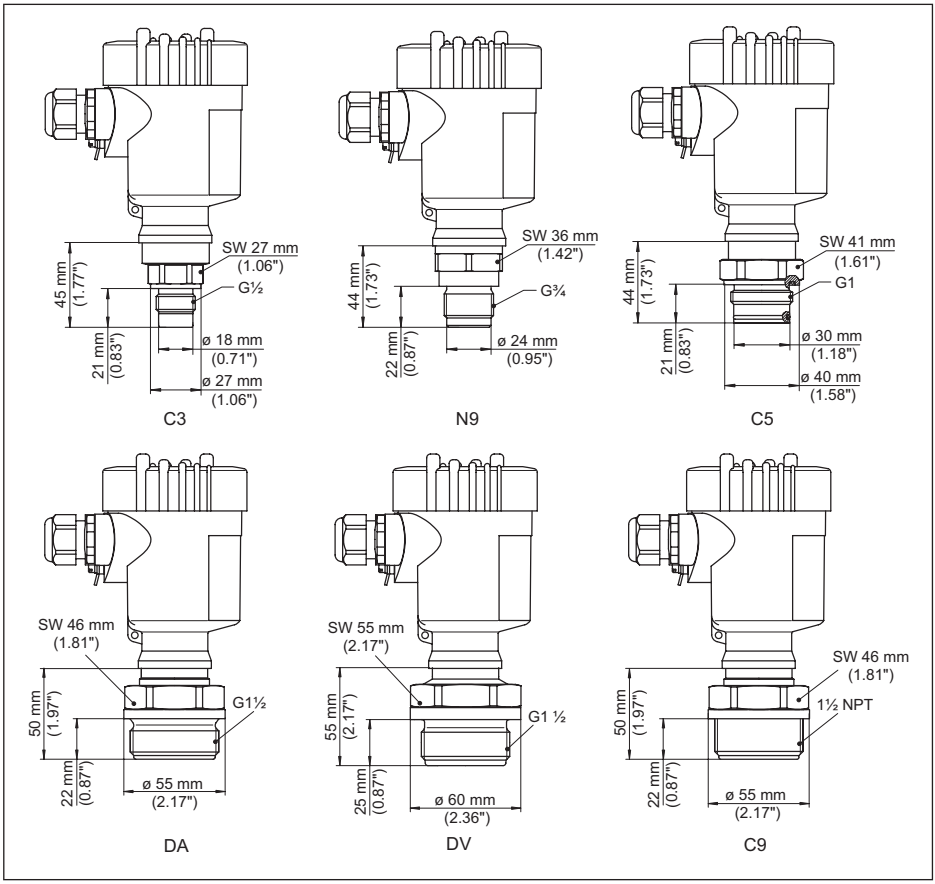


Fig. 54: VEGABAR 82, threaded fitting front-flush

C3 G½ (ISO 228-1); front-flush
N9 G¾ (DIN 3852-E)
C5 G1 (ISO 228-1)
DA G1½ (DIN 3852-A)
DV G1½ (DIN 3852-A-B), PVDF
C9 1½ NPT (ASME B1.20.1)

Notes:

For the version with temperature range up to +150 °C (+302 °F), the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

VEGABAR 82, thread for hygienic adapter

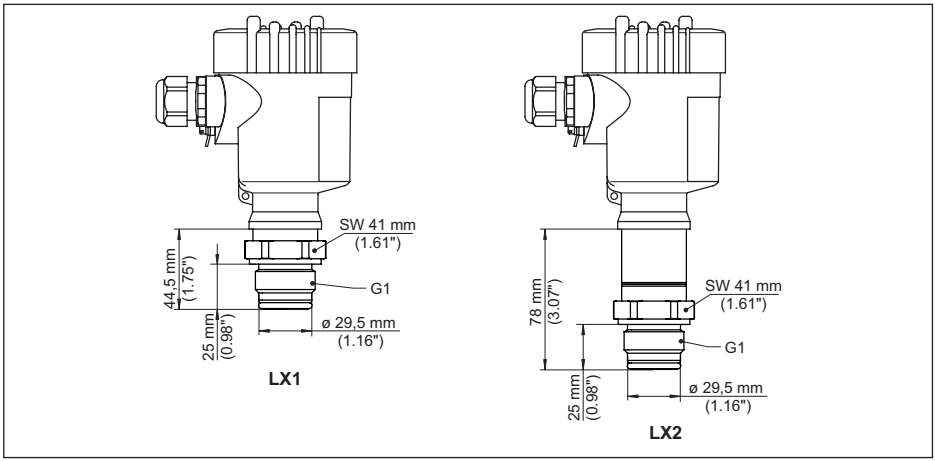


Fig. 55: VEGABAR 82, thread for hygienic adapter

LX1 G1 (ISO 228-1) for hygienic adapter sealing with O-ring up to +130 °C (+266 °F)
LX2 G1 (ISO 228-1) for hygienic adapter sealing with O-ring +150 °C (+302 °F)

VEGABAR 82, hygienic fitting

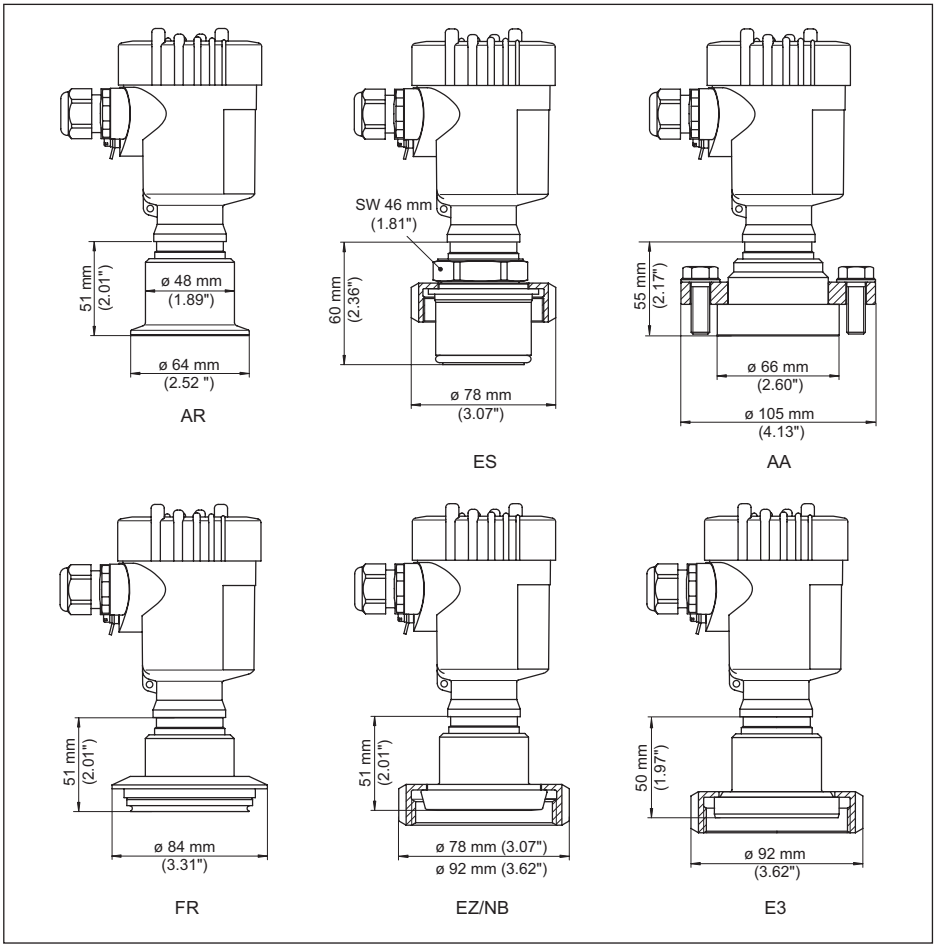


Fig. 56: VEGABAR 82, hygienic fitting

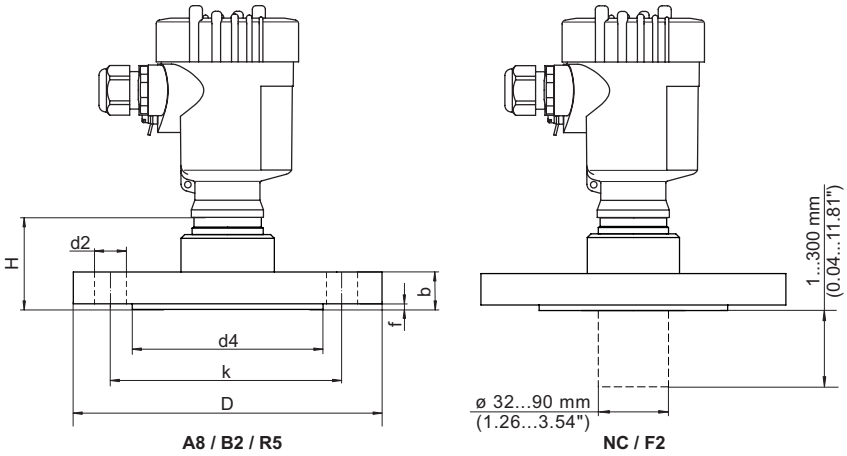
AR Clamp 2" PN 16 (ø 64 mm), (DIN 32676, ISO 2852)
ES Hygienic connection with compression nut F40 PN 25
AA DRD PN 40
FR Varivent N50-40 PN 25
EZ Collar socket DN 40 PN 40 (DIN 11851)
NB Collar socket DN 50 PN 25 (DIN 11851)
E3 Collar socket DN 50 acc. to DIN, Form A (DIN 11864-1); for tube 53 x 1.5

Notes:

For the version with temperature range up to +150 °C (+302 °F), the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

VEGABAR 82, flange connection



	mm	DN	PN	D	b	k	d2	d4	f	H
①	A8	40	40	150	18	110	4xø18	88	3	50
	B2	50	40	165	20	125	4xø18	102	3	50
	R5	80	40	200	24	160	8xø18	138	3	51
②	CA	2"	150 lbs	152,4	19,1	120,7	4xø19,1	91,9	3,2	51
	CB	3"	150 lbs	190,5	23,9	152,4	8xø19,1	127	3,2	51

	inch	DN	PN	D	b	k	d2	d4	f	H
①	A8	40	40	5.91"	0.71"	4.33"	4xø 0.71"	3.46"	0.12"	1.97"
	B2	50	40	6.50"	0.79"	4.92"	4xø 0.71"	4.02"	0.12"	1.97"
	B5	80	40	7.87"	0.95"	6.30"	8xø 0.71"	5.43"	0.12"	2.01"
②	CA	2"	150 lbs	6"	0.75"	4.75"	4xø 0.75"	3.62"	0.13"	2.01"
	CB	3"	150 lbs	7.5"	0.94"	6"	8xø 0.75"	5"	0.13"	2.01"

Fig. 57: VEGABAR 82, flange connection

1 Flange connection according to DIN 2501
2 Flange connection according to ASME B16.5
F7 Flange DN 50 PN 40 Form C (DIN 2501); with extension
F2 Flange DN 80 PN 40 Form C (DIN 2501); with extension

Notes:

For the version with temperature range up to +150 °C (+302 °F), the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

VEGABAR 82, extension fitting

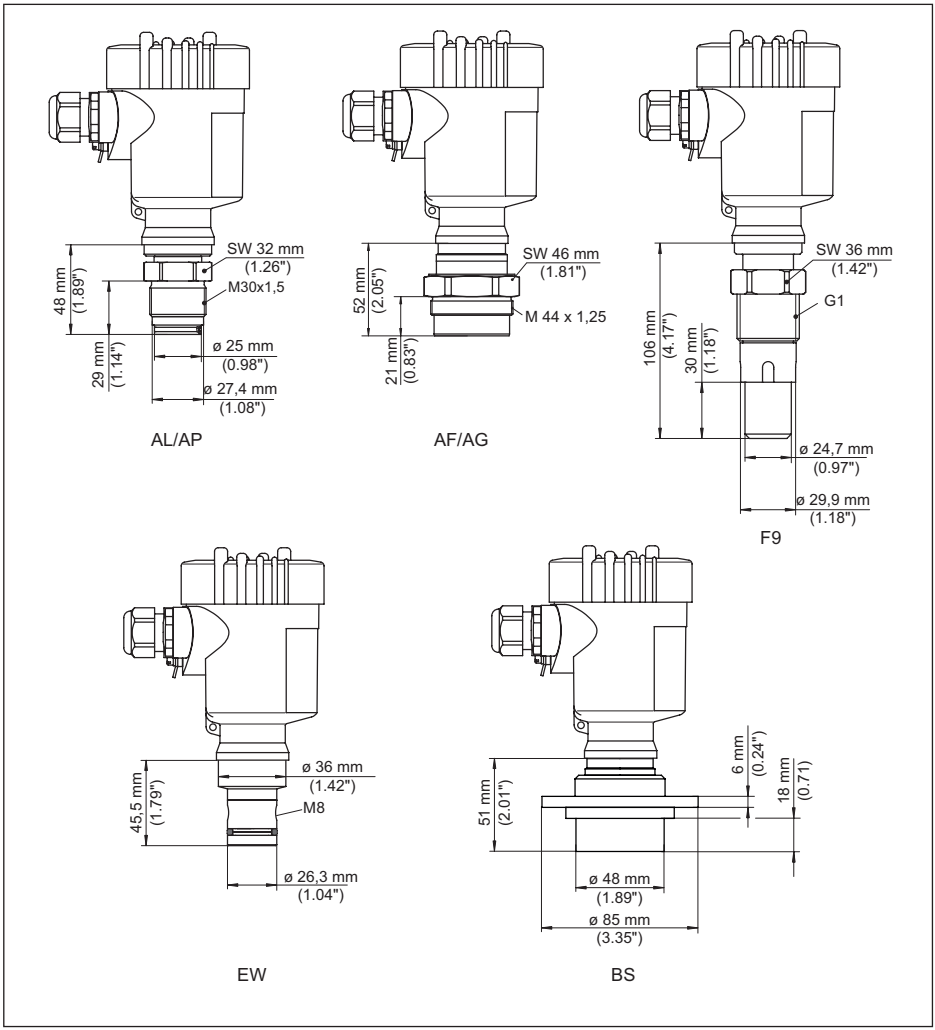


Fig. 58: VEGABAR 82, extension fitting

AL/AP *M30 x 1.5 (DIN 13); completely front-flush/for headbox*
AF/AG *M44 x 1.25 (DIN 13); pressure screw: Aluminium/316L*
F9 G1 (ISO 228-1) suitable for PASVE
EW PMC 1" front-flush PN 6
BS DN 48 with tension flange PN 25

Notes:

For the version with temperature range up to +150 °C (+302 °F), the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

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VEGABAR 82, extension fitting for headbox

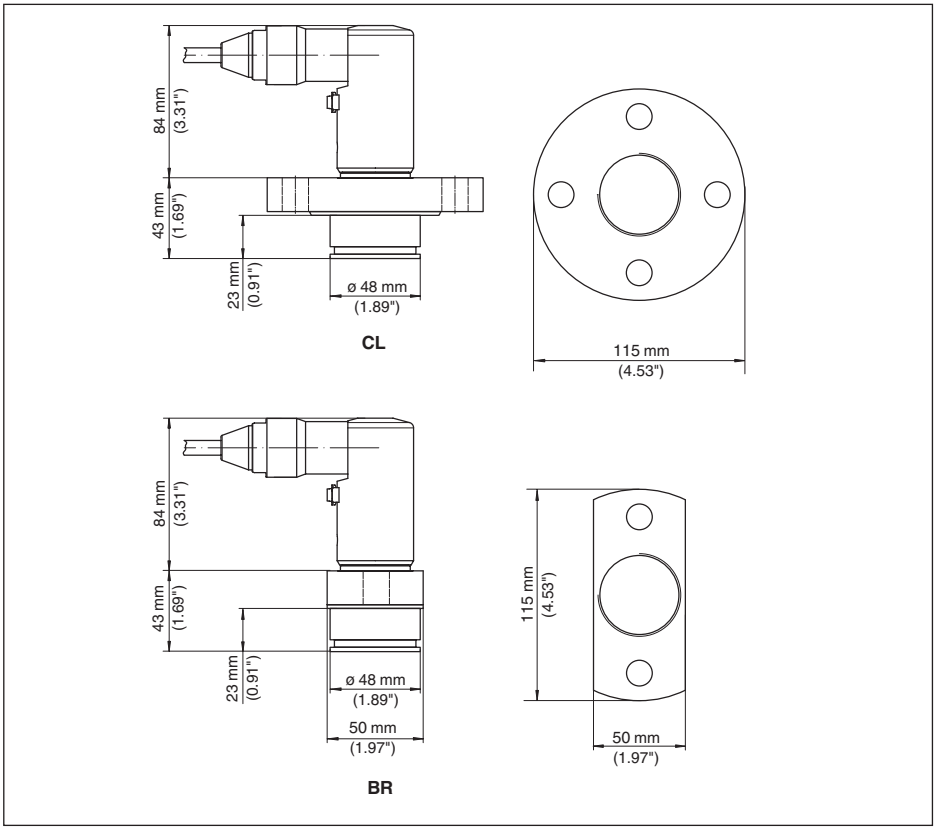

Fig. 59: VEGABAR 82, extension fitting for headbox

CL Completely front-flush for headbox
BR Completely front-flush for headbox (flange 2-times flattened)

VEGABAR 82, connection acc. to IEC 61518

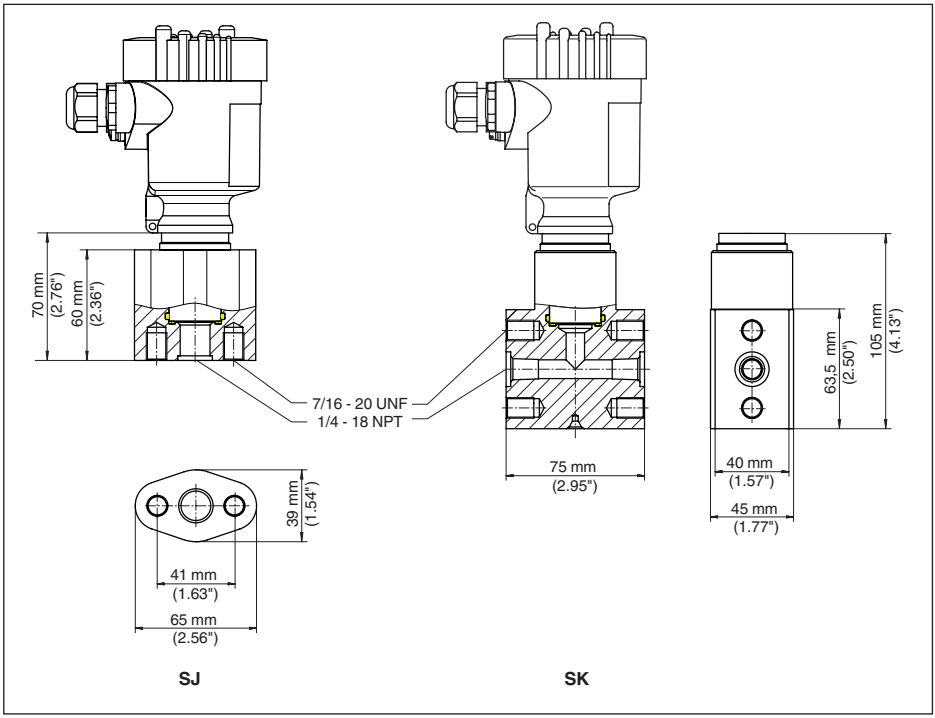

Fig. 60: VEGABAR 82, connection acc. to IEC 61518

SJ Oval flange adapter
SK Top flange

Notes:

For the version with temperature range up to +150 °C (+302 °F), the measure of length increases by 28 mm (1.1 in).

For the version with "*Second Line of Defense*", the measure of length increases by 17 mm (0.67 in).

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