Operating Instructions

Pressure transmitter with chemical seal

VEGABAR 81

4 … 20 mA

Document ID: 45025

Contents

45025-EN-160128

Safety instructions for Ex areas

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

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1 About this document

1.1 Function

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

1.2 Target group

This operating instructions manual is directed to trained specialist personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbols used

Information, tip, note
This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.

Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

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

Ex applications
This symbol indicates special instructions for Ex applications.

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

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

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

Battery disposal
This symbol indicates special information about the disposal of batteries and accumulators.

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2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.

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

2.2 Appropriate use

The VEGABAR 81 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 the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment. Also the protective characteristics of the instrument can be influenced.

2.4 General safety instructions

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

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

2.5 CE conformity

The device fulfills the legal requirements of the applicable EC guidelines. By affixing the CE marking, we confirm successful testing of the product.

You can find the CE Certificate of Conformity in the download section of our homepage.

2.6 Permissible process pressure

The permissible process pressure is specified on the type label with "Process pressure", see chapter "*Configuration*". For safety reasons, this range may not be exceeded. This applies even if a measuring cell with a measuring range (order-related) higher than the permissible pressure range of the process fitting is installed.

2.7 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 fulfills the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for malfunction information from measuring transducers
- 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.

2.8 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfill this obligation by observing the environmental instructions in this manual:

- Chapter "*Packaging, transport and storage*"
- Chapter "*Disposal*"

3 Product description

3.1 Configuration

Type label

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

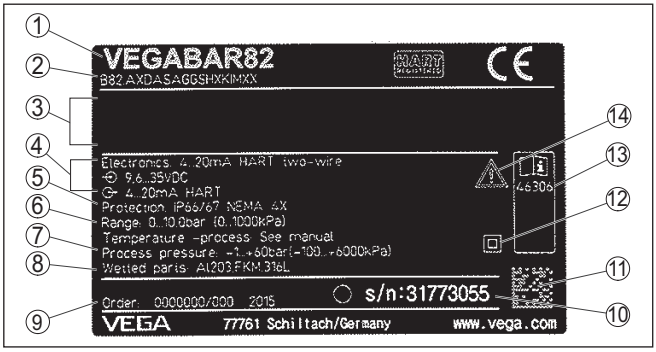

Fig. 1: Layout of the type label (example)

1 *Instrument type*
2 *Product code*
3 *Field for approvals*
4 *Power supply and signal output, electronics*
5 *Protection rating*
6 *Measuring range*
7 *Permissible process pressure*
8 *Material, wetted parts*
9 *Order number*
10 *Serial number of the instrument*
11 *Data-Matrix-Code for smartphone app*
12 *Symbol of the device protection class*
13 *ID numbers, instrument documentation*
14 *Reminder to observe the instrument documentation*

Serial number - Instrument search

The type label contains the serial number of the instrument. With it you can find the following instrument data on our homepage:

- Product code (HTML)
- Delivery date (HTML)
- Order-specific instrument features (HTML)
- Operating instructions and quick setup guide at the time of shipment (PDF)
- Order-specific sensor data for an electronics exchange (XML)
- Test certificate (PDF) - optional

Go to www.vega.com "*VEGA Tools*" and "*Instrument search*". Enter the serial number.

Alternatively, you can access the data via your smartphone:

- Download the smartphone app "*VEGA Tools*" from the "*Apple App Store*" or the "*Google Play Store*"
- Scan the Data Matrix code on the type label of the instrument or
- Enter the serial number manually in the app

Scope of this operating instructions manual

This operating instructions manual applies to the following instrument versions:

- Hardware from 1.0.0
- Software version from 1.2.0

Note:
You can find the hardware and software version of the instrument as follows:

- On the type plate of the electronics module
- In the adjustment menu under "*Info*"

Scope of delivery

The scope of delivery encompasses:

- Pressure transmitter
- Documentation
  - Quick setup guide VEGABAR 81
  - Characteristics test certificate
  - Instructions for optional instrument features
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - If necessary, further certificates
- DVD "*Software*", included therein
  - PACTware/DTM Collection
  - Driver software

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

3.2 Principle of operation

Measured variables

The VEGABAR 81 is suitable for the measurement of the following process variables:

- Process pressure
- Level

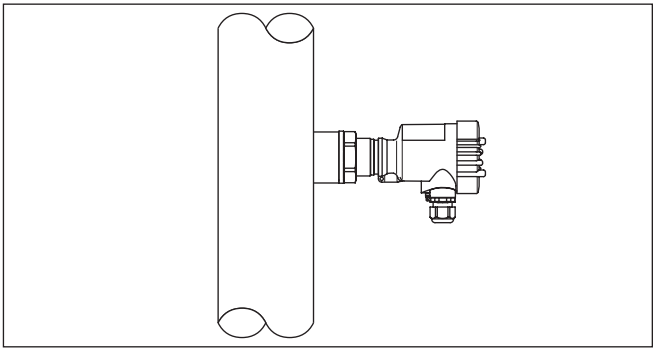

Fig. 2: Process pressure measurement VEGABAR 81

Electronic differential pressure

In combination with a slave sensor, VEGABAR 81 is also suitable for electronic differential pressure measurement.

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

Application area

VEGABAR 81 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.

The chemical seal systems of VEGABAR 81, which are optimally adapted to the process, also allow measurement of highly corrosive and hot products.

Chemical seal

The VEGABAR 81 is equipped with a chemical seal. It consists of a stainless steel diaphragm and a transmission liquid.

A chemical seal has two tasks:

- Separation of the sensor element from the medium
- Transmission of the process pressure to the sensor element

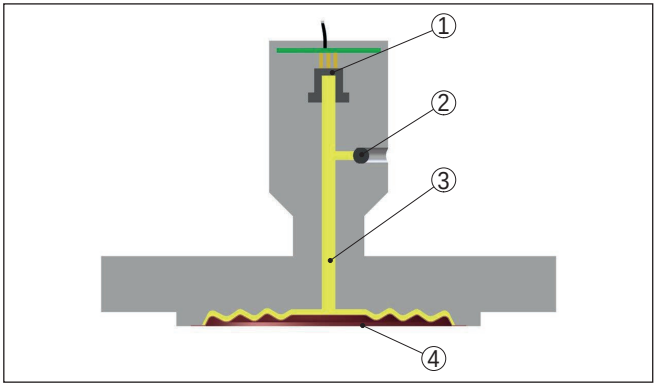

Fig. 3: Configuration of a chemical seal

1 Sensor element
2 Sealed screw
3 Transmission liquid
4 Stainless steel diaphragm

The chemical seal is available in different versions, see chapter "*Dimensions*".

Measuring system

The process pressure acts on the sensor element via the isolating diaphragm. The process pressure causes a resistance change which is converted into a corresponding output signal and outputted as measured value.

Measuring ranges up to 40 bar: piezoresistive sensor element with a transmission liquid, measuring ranges from 100 bar: a dry strain gauge (DMS) sensor element.

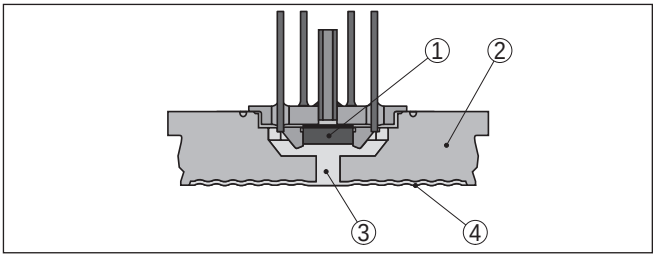

Fig. 4: Configuration of a measuring system with piezoresistive sensor element

1 Sensor element
2 Base element
3 Transmission liquid
4 Diaphragm

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 is evacuated and encapsulated. The ambient pressure is not compensated and does hence influence the measured value.

Seal concept

The measuring system is completely welded and hence sealed against the process. The sealing of the process fitting against the process is carried out by a seal provided on site.

3.3 Supplementary cleaning procedures

The VEGABAR 81 is also available in the version "*Oil, grease and silicone-free*". 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 81 in this version may not be used in oxygen applications. For this purpose, instruments of VEGABAR series 80 are available in the special version "*Oil and grease-free for oxygen applications*".

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

Transport

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

Transport inspection

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

Storage

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

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

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

Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

3.5 Accessories and replacement parts

PLICSCOM

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

You can find further information in the operating instructions "*Display and adjustment module PLICSCOM*" (Document-ID 27835).

VEGACONNECT

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

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

VEGADIS 82

VEGADIS 82 is suitable for measured value indication and adjustment of sensors with HART protocol. It is looped into the 4 … 20 mA/HART signal cable.

You can find further information in the operating instructions "*VEGADIS 82*" (Document-ID 45300).

Overvoltage protection module

The overvoltage protection module is an accessory part for 4 … 20 mA and 4 … 20 mA/HART sensors.

You can find further information in the operating instructions "*Overvoltage protection module*" (Document-ID 50708).

Protective cap

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

You will find additional information in the supplementary instructions manual "*Protective cover*" (Document-ID 34296).

Flanges

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.

You can find additional information in the supplementary instructions manual "*Flanges according to DIN-EN-ASME-JIS*".

Welding socket

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

You can find further information in the supplementary instructions "*Welded socket VEGABAR series 80*" (Document-ID 48094).

Electronics module

The electronics module VEGABAR series 80 is a replacement part for pressure transmitters of VEGABAR series 80. There is a different version available for each type of signal output.

You can find further information in the operating instructions "*Electronics module VEGABAR series 80*" (Document-ID 45054).

4 Mounting

4.1 General instructions

Suitability for the process conditions

Make sure 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 are particularly:

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

You can find detailed information on the process conditions in chapter "*Technical data*" as well as on the type label.

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use the recommended cable (see chapter "*Connecting to power supply*")
- Tighten the cable gland
- When mounting horizontally, turn the housing so that the cable gland points downward
- Loop the connection cable downward in front of the cable gland

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

Cable glands

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

You have to remove these plugs before electrical connection.

NPT thread
In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection. The dust protection caps do not provide sufficient protection against moisture.

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

Screwing in

On instruments with threaded process fitting, the hexagon must be tightened with a suitable wrench. For the proper wrench size see chapter "*Dimensions*".

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

Vibrations

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

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.

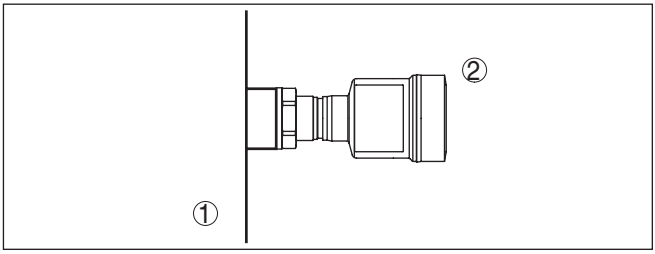

Fig. 5: Temperature ranges

1 Process temperature
2 Ambient temperature

4.2 Ventilation and pressure compensation

Filter elements

Ventilation and pressure compensation are carried out with VEGABAR 81 via a filter element. It is air permeable and moisture-blocking.

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 effective ventilation, the filter element must always be free of 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.

Instruments in non-Ex and Ex-ia version

The filter element is mounted into the electronics housing. It has the following functions:

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

→ Turn the housing so that the filter element points downward after the instrument is installed. This provides better protection against buildup.

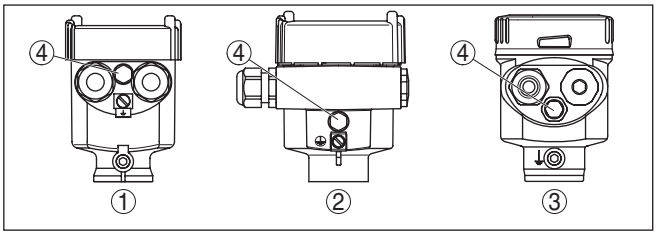

Fig. 6: Position of the filter element - non-Ex, Ex-ia version

1 Housing plastic, stainless steel precision casting
2 Housing aluminium
3 Housing stainless steel, electropolished
4 Filter element

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

- Instruments in protection IP 66/IP 68 (1 bar) - ventilation via capillaries in non-detachable cable
- Instruments with absolute pressure

Instruments in Ex-d version

The filter element is integrated in the process assembly. It is located in a rotatable metal ring and has the following function:

- Atmospheric pressure compensation (with relative pressure measuring ranges)

→ 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.

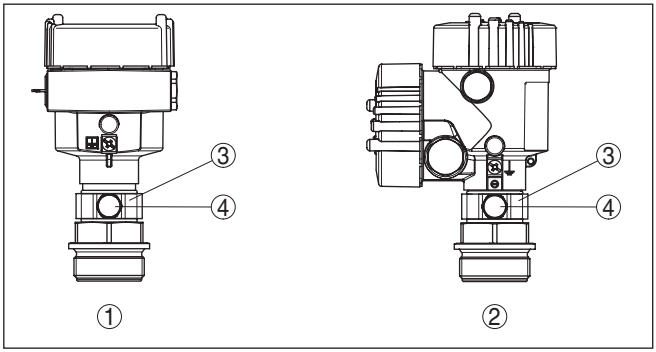

Fig. 7: Position of the filter element - Ex-d version

1 Single chamber housing, aluminium, stainless steel precision casting
2 Double chamber housing, aluminium, stainless steel precision casting
3 Rotatable metal ring
4 Filter element

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

Instruments in IP 69K version

The filter element is mounted into the electronics housing. It has the following functions:

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

→ Turn the housing so that the filter element points downward after the instrument is installed. This provides better protection against buildup.

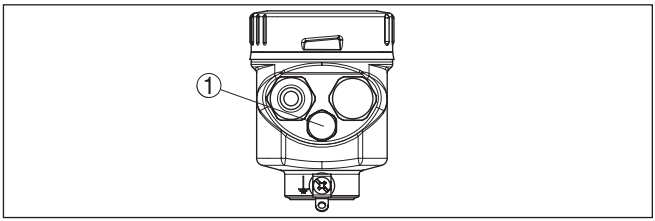

Fig. 8: Position of the filter element - IP 69K version

1 Filter element

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

4.3 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.

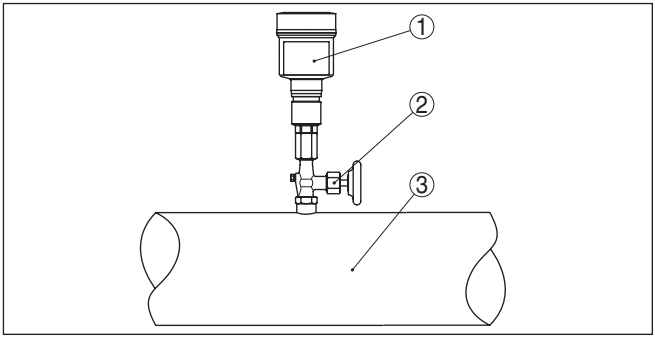

Fig. 9: Measurement setup for process pressure measurement of gases in pipelines

1 VEGABAR 81
2 Blocking 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

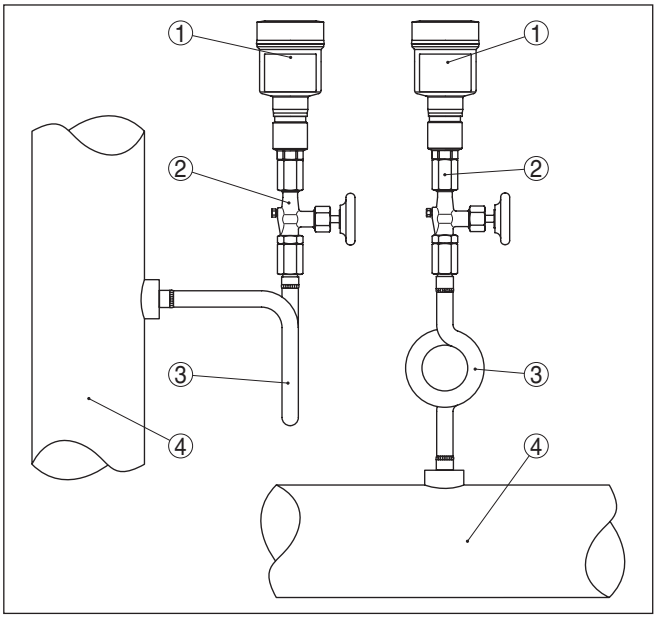

Fig. 10: Measurement setup with process pressure measurement of gases in pipelines

1 VEGABAR 81
2 Blocking 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.

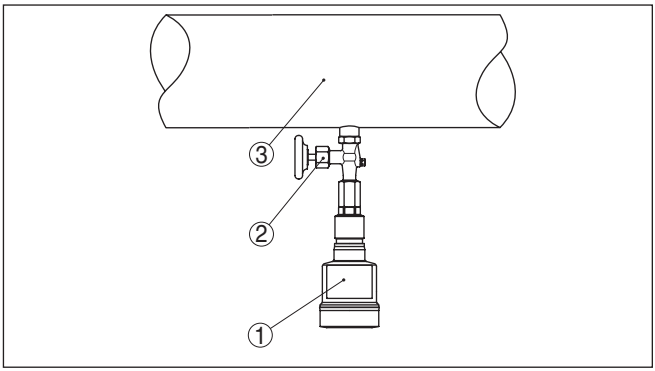

Fig. 11: Measurement setup for process pressure measurement of liquids in pipelines

1 VEGABAR 81
2 Blocking valve
3 Pipeline

4.4 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

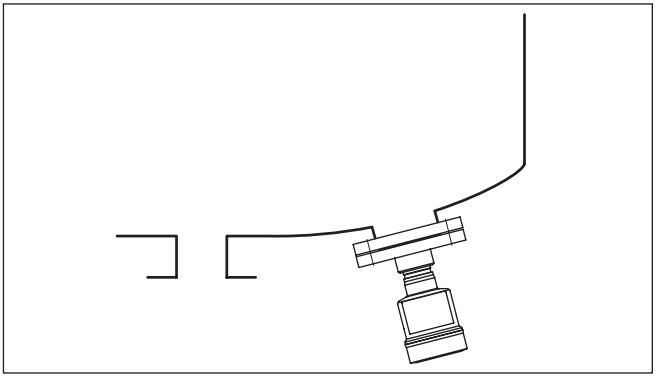

Fig. 12: Measurement setup for level measurement

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4.5 External housing

Configuration

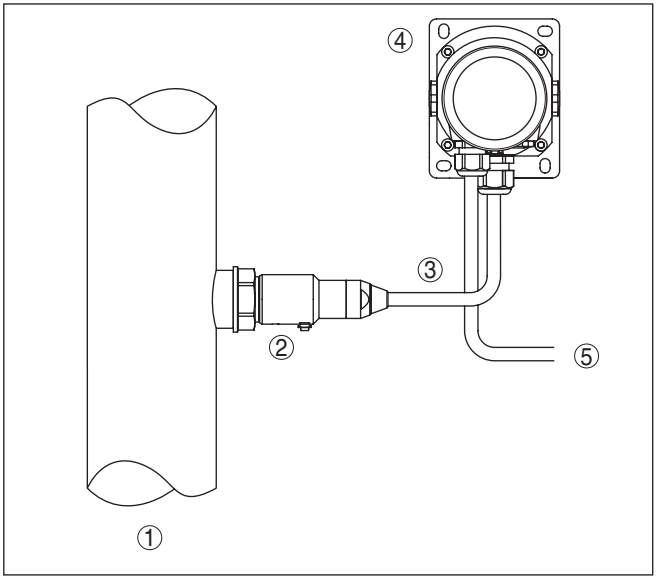


Fig. 13: Setup process assembly, external housing

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

Mounting

1. Mark the holes according to the following drilling template
2. Fasten wall mounting plate with 4 screws

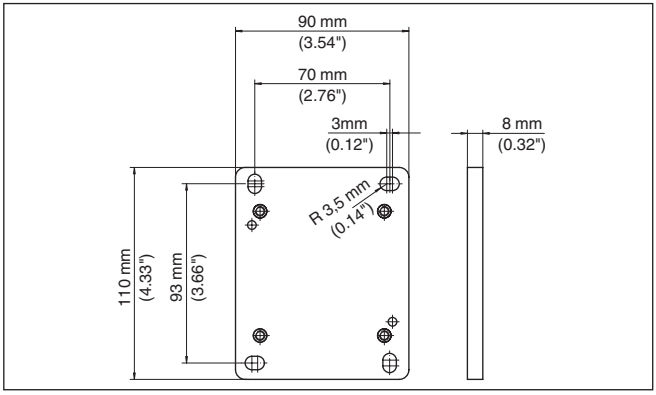


Fig. 14: Drilling template - wall mounting plate

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

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

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

Voltage supply

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

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

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

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

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

Connection cable

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

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.

Cable glands

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

You have to remove these plugs before electrical connection.

NPT thread
In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection.

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

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

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

Cable screening and grounding

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

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

In electroplating and CCP systems (cathodic corrosion protection) it must be taken into account that significant potential differences exist. This can lead to unacceptably high currents in the cable screen if it is grounded at both ends.

Information:
The metallic parts of the instrument (process fitting, sensor, concentric tube, etc.) are connected with the internal and external ground terminal on the housing. This connection exists either directly via the conductive metallic parts or, in case of instruments with external electronics, via the screen of the special connection cable.

You can find specifications on the potential connections inside the instrument in 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. 15: Connection steps 5 and 6 - Single chamber housing

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

Information:
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.

You can find further information on the max. wire cross-section under "*Technical data - Electromechanical data*"

7. Check the hold of the wires in the terminals by lightly pulling on them
8. Connect the screen 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

The following illustration applies to the non-Ex as well as to the Ex-ia version.

Electronics and terminal compartment

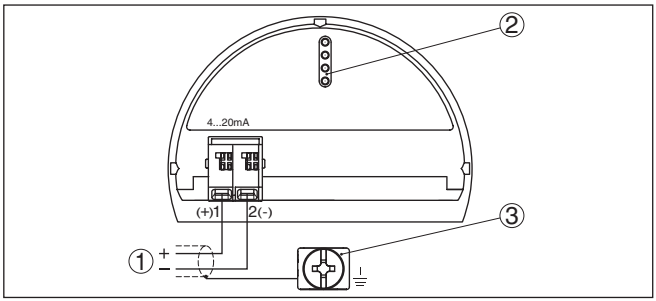


Fig. 16: Electronics and terminal compartment, single chamber housing

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

5.4 Housing IP 66/IP 68 (1 bar)

Wire assignment, connection cable

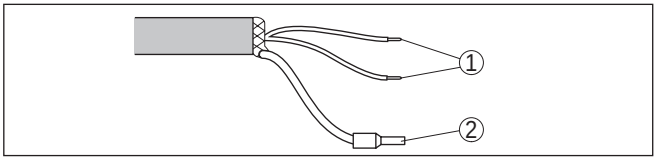


Fig. 17: Wire assignment in permanently connected connection cable

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

5.5 External housing with version IP 68 (25 bar)

Overview

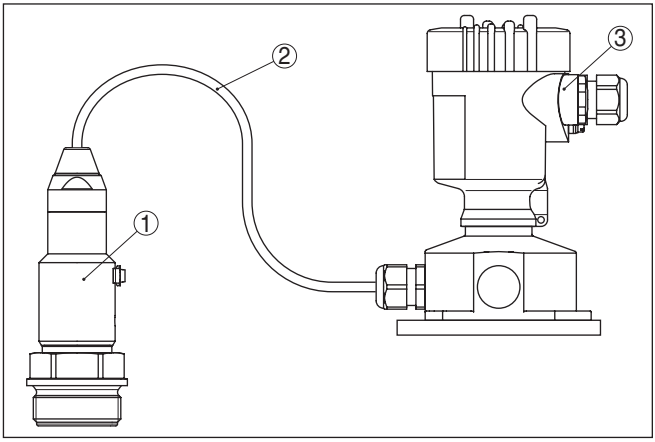


Fig. 18: VEGABAR 81 in IP 68 version 25 bar with axial cable outlet, external housing

1 Transmitter
2 Connection cable
3 External housing

Electronics and connection compartment for power supply

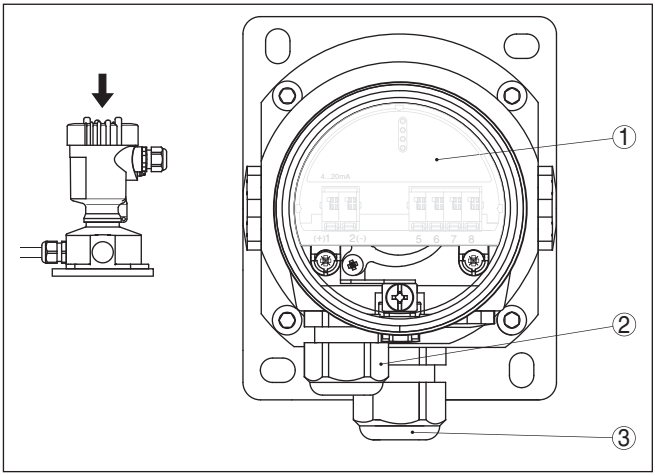


Fig. 19: Electronics and terminal compartment

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

Terminal compartment, housing socket

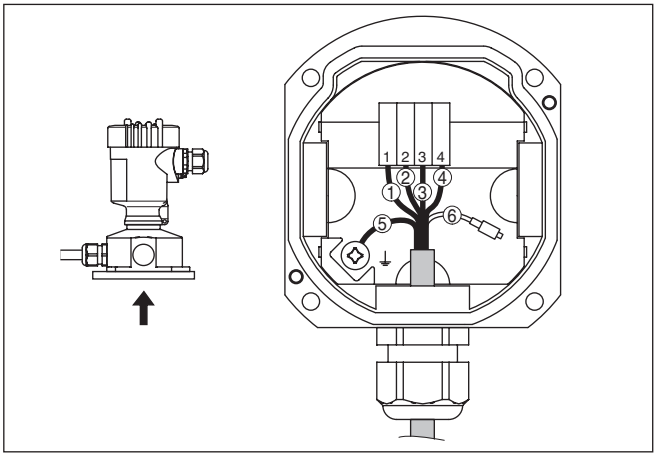


Fig. 20: Connection of the sensor in the housing base

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

Electronics and terminal compartment

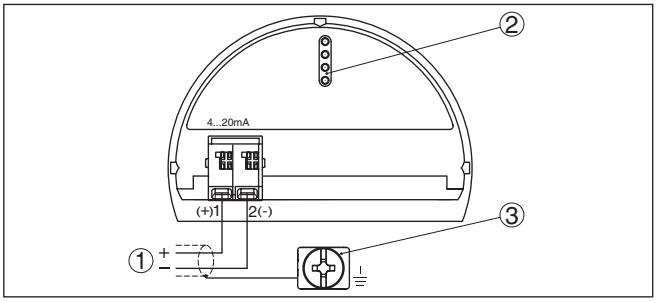


Fig. 21: Electronics and terminal compartment, single chamber housing

1 *Voltage supply, signal output*
2 *For display and adjustment module or interface adapter*
3 *Ground terminal for connection of the cable screen*

5.6 Overvoltage protection module

Electronics and terminal compartment

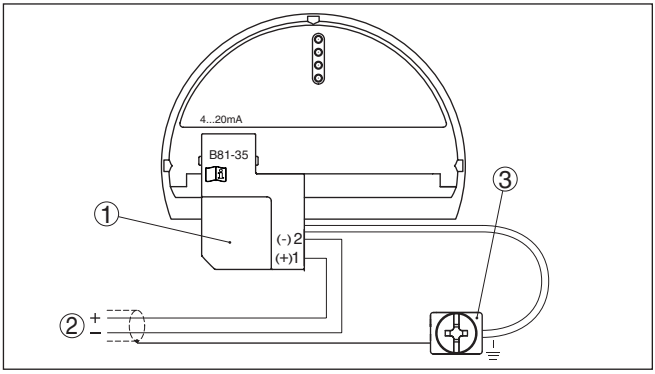


Fig. 22: Electronics and terminal compartment, single chamber housing, terminal compartment, double chamber housing

1 *Overvoltage protection module*
2 *Voltage supply/Signal output*
3 *Ground terminal for connection of the cable screenand the connection cable of the overvoltage protection module*

5.7 Switch-on phase

After connecting the instrument to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 10 s:

- Internal check of the electronics
- Indication of the instrument type, hardware and software version, measurement loop name on the display or PC
- Indication of a status message on the display or PC
- The output signal jumps to the set fault current

Then the actual measured value is outputted 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. 23: Installing the display and adjustment module in the electronics compartment of the single chamber housing

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

6.2 Adjustment system

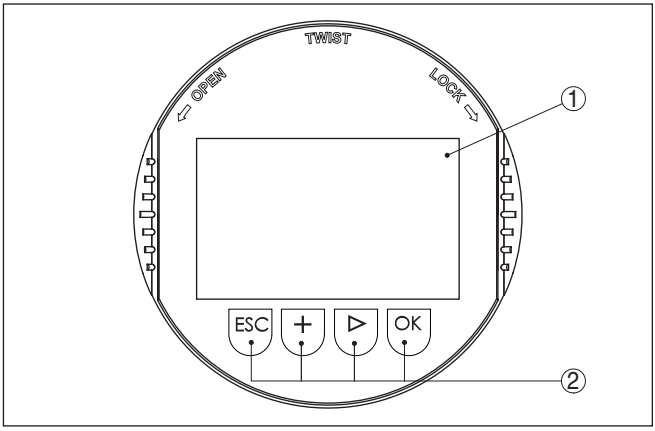


Fig. 24: Display and adjustment elements

1 LC display
2 Adjustment keys

Key functions

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- ***[->]*** key:
  - Presentation, change measured value
  - Select list entry
  - Select menu items in the quick setup
  - 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 functions of the individual keys in the previous illustration.

Time functions

When the ***[+]*** and ***[->]*** keys are pressed quickly, the edited value, i.e. the cursor, moves by one position. When the keys are pressed longer than 1 s, the cursor moves 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

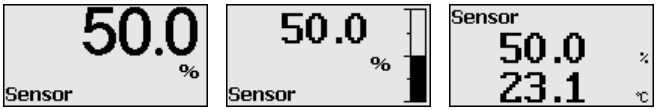
Measured value indication

With the ***[->]*** key you can move between three different indication modes.

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

In the second view, the selected measured value and a corresponding bar graph presentation are displayed.

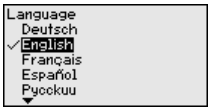
In the third view, the selected measured value as well as a second selectable value, e.g. the temperature, are displayed.



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.

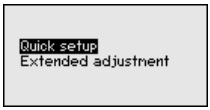


With the "***[->]***" button, you can select the requested language, with "***OK***" you confirm the selection and move to the main menu.

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

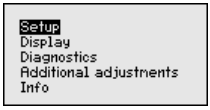
You can find "*Extended adjustment*" in the next sub-chapter.

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, e.g. on instrument status, pointer, measurement reliability, simulation

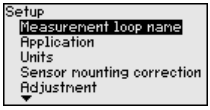
Additional adjustments: PIN, date/time, reset, copy function

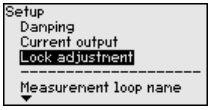
Info: Instrument name, hardware and software version, date of manufacture, sensor features

Note:
For optimum adjustment 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 described below.

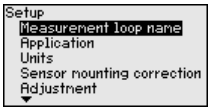
Setup - Measurement loop name

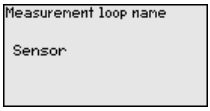
In the menu item "*Sensor TAG*" you edit a twelve digit measurement loop designation label.

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

The available digits comprise:

- Letters from A … Z
- Numbers from 0 … 9
- Special characters +, -, /, -





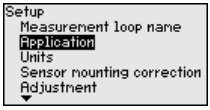
Setup - Application

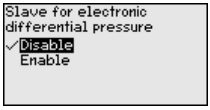
In this menu item you activate/deactivate the slave sensor for electronic differential pressure and select the application.

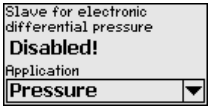
VEGABAR 81 can be used for process pressure and level measurement. Default setting is process pressure measurement. The mode can be changed in this adjustment menu.

If you have connected **no** slave sensor, 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.





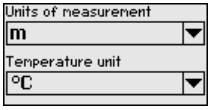


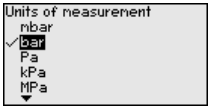
Enter the requested parameters via the appropriate keys, save your settings with ***[OK]*** and jump to the next menu item with the ***[ESC]*** and the ***[->]*** key.

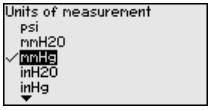
Setup - Units

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:



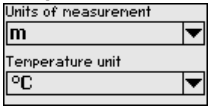


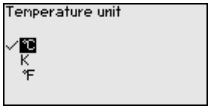


If the level should be adjusted in a height unit, the density of the medium must also be entered later during the adjustment.

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

Temperature unit:



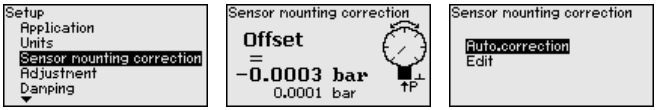


Enter the requested parameters via the appropriate keys, save your settings with ***[OK]*** and jump to the next menu item with the ***[ESC]*** and the ***[->]*** key.

Setup - Position correction

Especially with chemical seal systems, the installation position of the instrument can shift (offset) the measured value. Position correction compensates this offset. In the process, the actual measured value

is taken over automatically. With relative pressure measuring cells a manual offset can also be carried out.



If the actual measured value should be taken over as correction value during automatic position correction, this value must not be influenced by product 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 20 % of the nominal measuring range, then no position correction is possible.

Setup - Adjustment

VEGABAR 81 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:

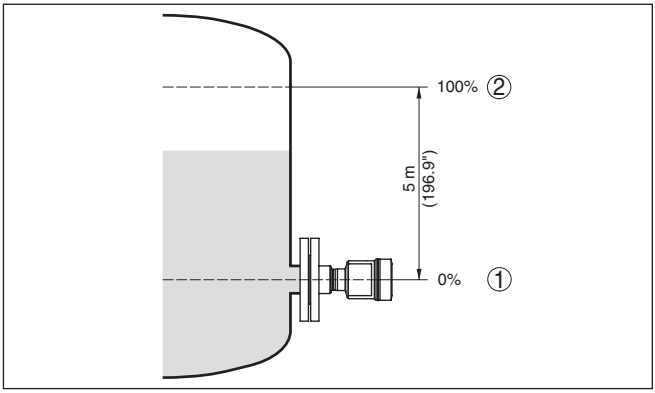


Fig. 25: Parameter adjustment example "Min./max. adjustment, level measurement"

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.

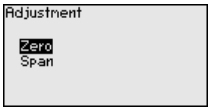
Note:
If the adjustment ranges are exceeded, the entered value will not be accepted. Editing can be interrupted with ***[ESC]*** or corrected to a value within the adjustment ranges.

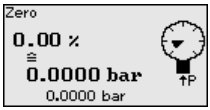
For the other process variables such as e.g. process pressure, differential pressure or flow, the adjustment is performed in like manner.

Setup - Zero adjustment

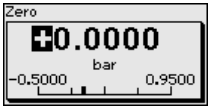
Proceed as follows:

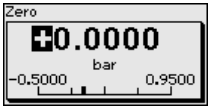
1. Select the menu item "*Setup*" with ***[->]*** and confirm with ***[OK]***. Now select with ***[->]*** the menu item "*Zero adjustment*" and confirm with ***[OK]***.





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. Go 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.

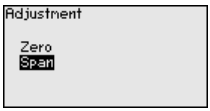
For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

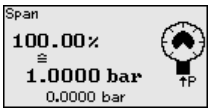
If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

Setup - Span adjustment

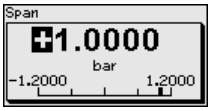
Proceed as follows:

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.

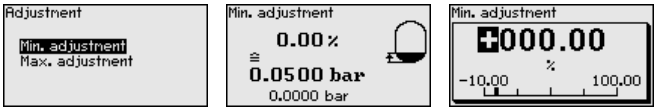
If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

The span adjustment is finished.

Setup - 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.

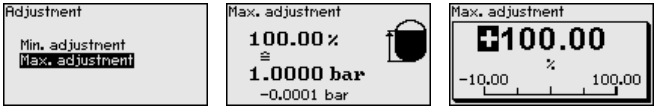
The min. adjustment is finished.

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

Setup - Max. adjustment Level

Proceed as follows:

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



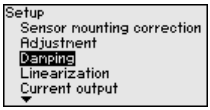
2. Edit the percentage value with ***[OK]*** and set the cursor to the requested position with ***[->]***.
3. Set the requested percentage value (e.g. 90 %) with ***[+]*** and save with ***[OK]***. The cursor jumps now to the pressure value.
4. Enter the pressure value for the full vessel (e.g. 900 mbar)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

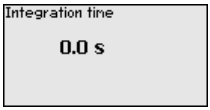
The max. adjustment is finished.

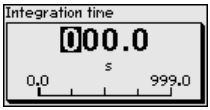
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

Setup - Damping

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



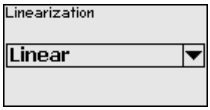


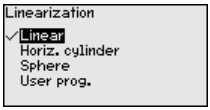


The default setting depends on the sensor type.

Setup - Linearization

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 adjusting the switching point on the limit signal transmitter.

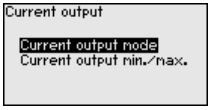
Setup - Current output

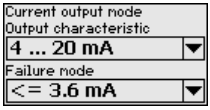
In the menu items "*Current output*" you determine the properties of the current output.

On instruments with a 2nd integrated current output, the properties for each current output are adjusted individually. The following descriptions apply to both current outputs.

Setup - Current output 1 and 2 (mode)

In the menu item "*Current output mode*" you determine the output characteristics and reaction of the current output in case of failure.

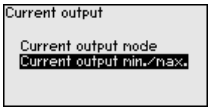


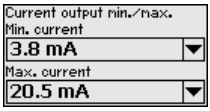


The default setting is output characteristics 4 … 20 mA, failure mode < 3.6 mA.

Setup - Current output 1 and 2 (min./max.)

In the menu item "*Current output Min./Max.*", you determine the reaction of the current output during operation.





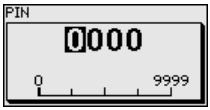
The default setting is min. current 3.8 mA and max. current 20.5 mA.

Lock/unlock setup - Adjustment

In the menu item "*Lock/unlock adjustment*", you can protect the sensor parameters against unauthorized or inadvertent modification. The PIN is activated/deactivated permanently.

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.

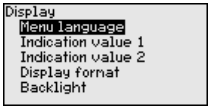


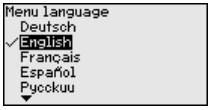
Caution:
With active PIN, adjustment via PACTware/DTM as well as other systems is also blocked.

You can change the PIN number under "*Additional settings - PIN*".

Display - Language

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





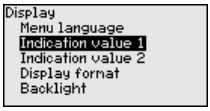
The following languages are available:

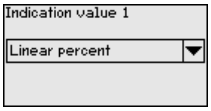
- German
- English
- French
- Spanish
- Russian
- Italian
- Dutch
- Portuguese
- Japanese
- Chinese
- Polish
- Czech
- Turkish

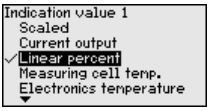
In the delivery status, the VEGABAR 81 is set to English or the ordered national language.

Display - Displayed value 1 and 2

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



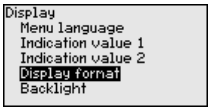


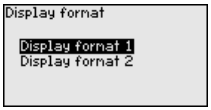


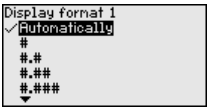
The default setting for the display value is "*Lin. percent*".

Display - Display format 1 and 2

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



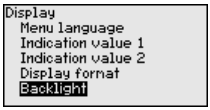




The default setting for the display format is "*Automatically*".

Display - Backlight

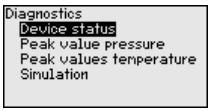
The display and adjustment module has a backlight for the display. In this menu item you can switch on the lighting. You can find the required operating voltage in chapter "*Technical data*".

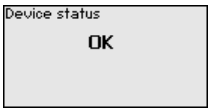


In delivery status, the lighting is switched on.

Diagnostics - Device status

In this menu item, the device status is displayed.

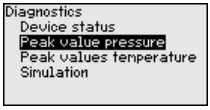


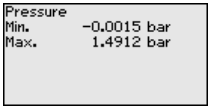


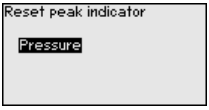
Diagnostics - Peak values, pressure

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

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



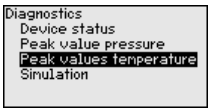


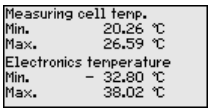


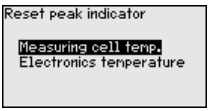
Diagnostics - Peak values, temperature

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

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

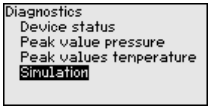


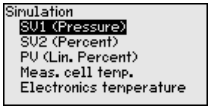


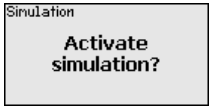


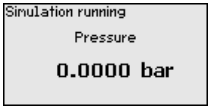
Diagnosis - Simulation

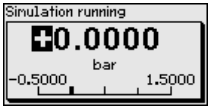
In this menu item you can simulate measured values. This allows the signal path to be tested, e.g. through downstream indicating instruments or the input card of the control system.

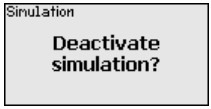












Select the requested simulation variable and set the requested value.

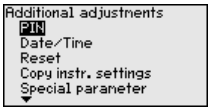
To deactivate the simulation, you have to push the ***[ESC]*** key and confirm the message "*Deactivate simulation*" with the ***[OK]*** key.

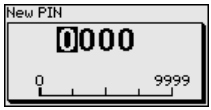
Caution:
During simulation, the simulated value is outputted as 4 … 20 mA current value and as digital HART signal. The status message within the context of the asset management function is "*Maintenance*".

Note:
Without manual deactivation, the sensor terminates the simulation automatically after 60 minutes.

Additional settings - PIN

In this menu item, the PIN is displayed or edited as well as modified. However, it is only available when the adjustment is released in the menu "*Setup/Lock/unlock adjustment* ".

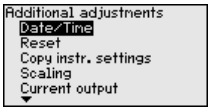


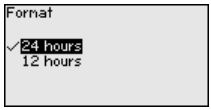


In delivery status, the PIN is "*0000*".

Additional adjustments - Date/Time

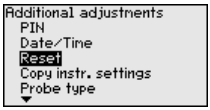
In this menu item, you adjust the internal clock of the sensor. There is no adjustment for summer/winter (daylight saving) time.





Additional adjustments - Reset

With a reset, certain parameter adjustments carried out 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: Resetting of the parameter settings incl. special parameters to the default values of the respective instrument. Any user programmable linearization curve as well as the measured value memory are deleted.

The following table shows the default values of the instrument. Depending on the instrument version or application, all menu items may not be available or some may be differently assigned:

Reset - Setup

Menu item	Parameter	Default value
Measurement loop name		Sensor
Application		Application level
Units	Unit of measurement	mbar (with nominal measuring range ≤400 mbar) bar (with nominal measuring ranges ≥1 bar)
	Temperature unit	°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	0.0 s
Current output	Current output - Mode	Output characteristics 4 … 20 mA Reaction when malfunctions occur ≤ 3.6 mA
	Current output - Min./Max.	3.8 mA 20.5 mA
Lock adjustment		Released

Reset - Display

Menu item	Default value
Menu language	Order-specific
Displayed value 1	Current output in %
Displayed value 2	Ceramic measuring cell: Measuring cell temperature in °C Metallic measuring cell: Electronics temperature in °C

Menu item	Default value
Display format 1 and 2	Number of positions after the decimal point, automatically
Backlight	Switched on

Reset - Diagnosis

Menu item	Parameter	Default value
Sensor status		-
Peak value	Pressure	Actual measured value
	Temperature	Actual temperature values from measuring cell, electronics
Simulation		Process pressure

Reset - Additional settings

Menu item	Parameter	Default value
PIN		0000
Date/Time		Actual date/Actual time
Copy instrument settings		
Special parameters		No reset
Scaling	Scaling size	Volume in l
	Scaling format	0 % corresponds to 0 l 100 % corresponds to 0 l
Current output	Current output - Meas. variable	Lin. percent - Level
	Current output - Adjustment	0 … 100 % correspond to 4 … 20 mA

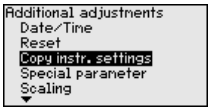
Additional adjustments - Copy instrument settings

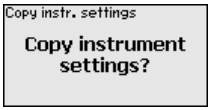
The instrument settings are copied with this function. The following functions are available:

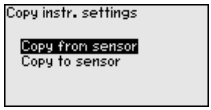
- Read from sensor: Read data from sensor and save in the display and adjustment module
- Write to sensor: Save data from the display and adjustment module

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







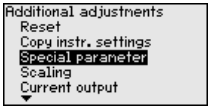
The copied data are permanently saved in an EEPROM memory in the display and adjustment module and remain there even in case of power failure. From there, they can be written into one or more sensors or kept as backup for a possible electronics exchange.

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.

Additional adjustments - Special parameters

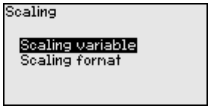
In this menu item you gain access to the protected area where you can enter special parameters. In exceptional cases, individual parameters can be modified in order to adapt the sensor to special requirements.

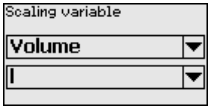
Change the settings of the special parameters only after having contacted our service staff.

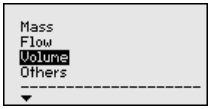


Additional settings - Scaling (1)

In menu item "*Scaling*" you define the scaling variable and the scaling unit for the level value on the display, e.g. volume in l.

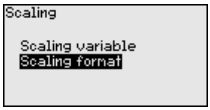


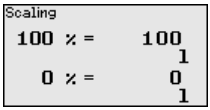




Additional settings - Scaling (2)

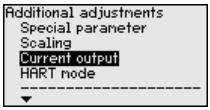
In menu item "*Scaling (2)*" you define the scaling format on the display and the scaling of the measured level value for 0 % and 100 %.

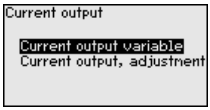


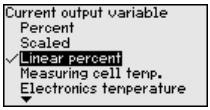


Additional settings - Current output 1 and 2 (size)

In menu item "*Current output, variable*" you specify which measured variable is outputted via the current output.







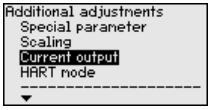
The following selection is possible:

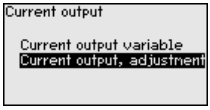
- Filling height
- Density
- Differential pressure
- Static pressure
- Percent
- Scaled

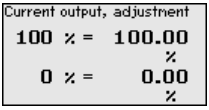
- Percent linearized
- Measuring cell temperature (ceramic measuring cell)
- Electronics temperature

Additional settings - Current output 1 and 2 (adjustment)

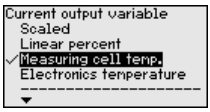
Depending on the selected measured variable, you assign in the menu item "*Current output, adjustment*" the measured values that 4 mA (0 %) and 20 mA (100 %) of the current output refer to.

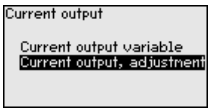


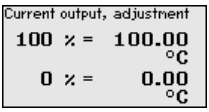




If the measuring cell temperature is selected as measured variable, then e.g. 0 °C refers to 4 mA and 100 °C to 20 mA.

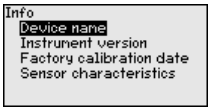






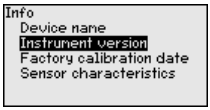
Info - Instrument name

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



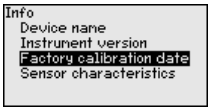
Info - Instrument version

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



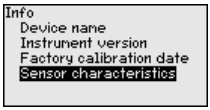
Info - Factory calibration date

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.



Info - 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 Saving the parameter adjustment data

Backup on paper

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

Backup in the display and adjustment module

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

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 settings*" the items "*Sensor-specific units, temperature unit and linearization*"
- The values of the user programmable linearization curve

The function can also be used to transfer settings from one instrument to another instrument of the same type. If it is necessary to exchange a sensor, the display and adjustment module is inserted into the replacement instrument and the data are likewise written into the sensor via the menu item "*Copy sensor data*".

7 Setup with PACTware

7.1 Connect the PC

Via the interface adapter directly on the sensor

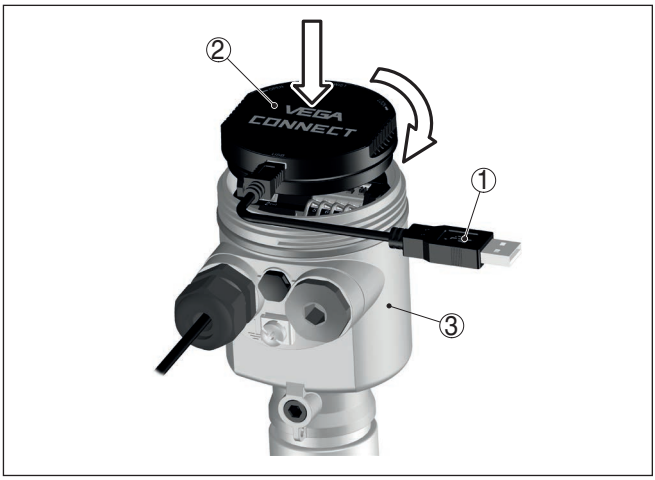


Fig. 26: Connection of the PC directly to the sensor via the interface adapter

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.

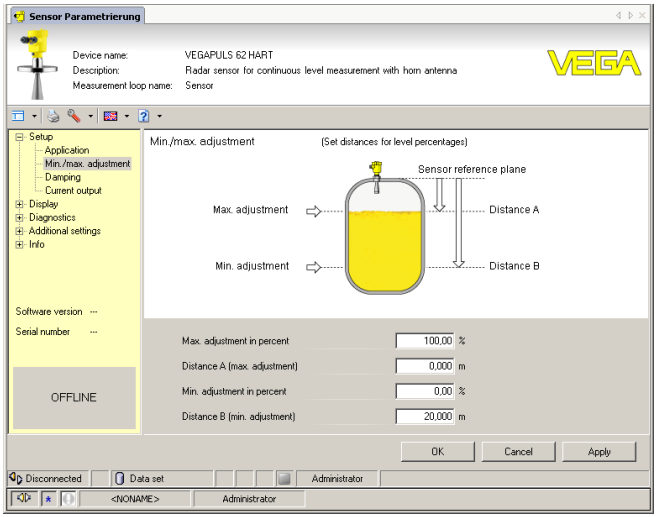


Fig. 27: Example of a DTM view

Standard/Full version

All device DTMs are available as a free-of-charge standard version and as a full version that must be purchased. In the standard version, all functions for complete setup are already included. An assistant for simple project configuration simplifies the adjustment considerably. Saving/printing the project as well as import/export functions are also part of the standard version.

In the full version there is also an extended print function for complete project documentation as well as a save function for measured value and echo curves. In addition, there is a tank calculation program as well as a multiviewer for display and analysis of the saved measured value and echo curves.

The standard version is available as a download under www.vega.com/downloads and "*Software*". The full version is available on CD from the agency serving you.

7.3 Saving the parameter adjustment data

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

8 Set up with other systems

8.1 DD adjustment programs

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

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

8.2 Field Communicator 375, 475

Device descriptions for the instrument are available as EDD for parameter adjustment with the Field Communicator 375 or 475.

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

9 Diagnostics and servicing

9.1 Maintenance

Maintenance

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

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.

9.2 Rectify faults

Reaction when malfunction occurs

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

Procedure for fault rectification

The first measures are:

- Evaluation of fault messages, for example via the display and adjustment module
- Checking the output signal
- Treatment of measurement errors

Further comprehensive diagnostics options are available with a PC with PACTware and the suitable DTM. In many cases, the reasons can be determined in this way and faults rectified.

Check the 4 … 20 mA signal

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

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

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "*Setup*" must be carried out again or must be checked for plausibility and completeness.

24 hour service hotline

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

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

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

9.3 Exchanging the electronics module

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.

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

You can find detailed information on the electronics exchange in the booklet "*Operating instructions for electronics module VEGABAR series 80*".

9.4 Exchange process assembly with version IP 68 (25 bar)

With version IP 68 (25 bar), the user can exchange the process assembly 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 assembly

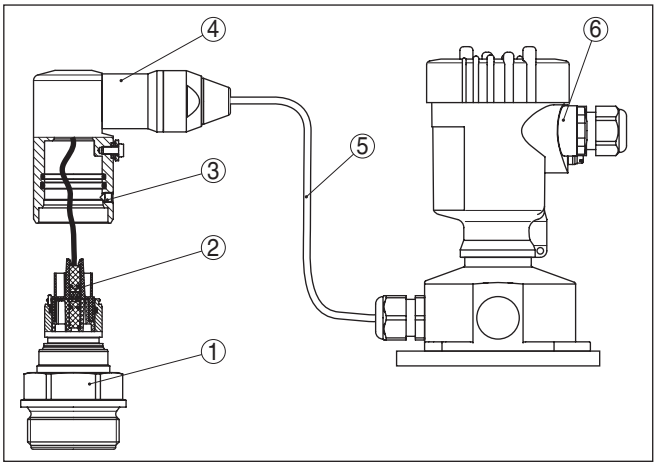


Fig. 28: VEGABAR 81 in IP 68 version, 25 bar and lateral cable outlet, external housing

1 Process assembly
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 assembly on the measuring point
5. Plug the connector back in
6. Mount the cable assembly on the process assembly and turn it to the desired position
7. Tighten the fixing screw with the hexagon key wrench

The exchange is finished.

If there is no replacement part available on site, one can be ordered from the agency serving you.

The necessary serial number can be found on the type label of the instrument or on the delivery note.

9.5 Software update

The following components are required to update the instrument software:

- Instrument
- Voltage supply
- Interface adapter VEGACONNECT
- PC with PACTware
- Current instrument software as file

You can find the current instrument software as well as detailed information on the procedure in the download area of our homepage: www.vega.com.

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

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

9.6 How to proceed if a repair is necessary

You can find an instrument return form as well as detailed information of the procedure in the download area on our homepage: www.vega.com.

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

If a repair is necessary, please proceed as follows:

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging
- Please contact the agency serving you to get the address for the return shipment. You can find the agency on our home page www.vega.com.

10 Dismount

10.1 Dismounting steps

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

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

10.2 Disposal

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

Correct disposal avoids negative effects on humans and the environment and ensures recycling of useful raw materials.

Materials: see chapter "*Technical data*"

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

WEEE directive 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

11 Supplement

11.1 Technical data

Materials and weights

Materials, wetted parts	
Process fitting	316L
Diaphragm	316L, Alloy C276 (2.4819), Alloy C22 (2.4602), Monel 400 (2.4360), Tantalum, Titanium, 316L ECTFE coated, 1.4435 with gold coating (25 µm)
Seal for process fitting (in the scope of delivery)	
– Thread G½ (EN 837)	Klingersil C-4400
– Thread G1½ (DIN 3852-A)	Klingersil C-4400
Materials for applications in foodstuffs	
Surface quality, hygienic process fittings, typ.	R_a < 0.8 µm
Seal below wall mounting plate with 3A approval	EPDM
Materials, non-wetted parts	
Electronics housing	Plastic PBT (polyester), Alu die-casting, powder-coated, 316L
Cable gland	PA, stainless steel, brass
Sealing, cable gland	NBR
Blind plug, cable gland	PA
External housing	
– Housing	plastic PBT (Polyester), 316L
– Socket, wall mounting plate	plastic PBT (Polyester), 316L
– Seal between base and wall mounting plate	EPDM (fixed connected)
Seal between housing and housing lid	Silicone SI 850 R, NBR silicone-free
Inspection window in housing cover	Polycarbonate (UL-746-C listed)
Ground terminal	316Ti/316L
Connection cable with IP 68 (25 bar) version[1)]	
– Cable cover	PE, PUR
– type label support on cable	PE hard
Connection cable with IP 68 (1 bar) version[2)]	PE
Weights	
Total weight VEGABAR 81 approx.	0.8 … 8 kg (1.764 … 17.64 lbs), depending on process fitting and housing

[1)] Between transmitter and external electronics housing
[2)] Fix connected to the sensor

Torques

Max. torque for process fitting with thread 40 Nm (29.50 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 - Piezoresistive/Thin film measuring cell

Nominal measuring ranges and overload capability in bar/kPa

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.

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
Gauge pressure		
0 … +0.4 bar/0 … +40 kPa	+1.2 bar/+120 kPa	-1 bar/-100 kPa
0 … +1 bar/0 … +100 kPa	+3 bar/+300 kPa	-1 bar/-100 kPa
0 … +2.5 bar/0 … +250 kPa	+7.5 bar/+750 kPa	-1 bar/-100 kPa
0 … +10 bar/0 … +1000 kPa	+30 bar/+3000 kPa	-1 bar/-100 kPa
0 … +25 bar/0 … +2500 kPa	+50 bar/+5000 kPa	-1 bar/-100 kPa
0 … +40 bar/0 … +4000 kPa	+80 bar/+8000 kPa	-1 bar/-100 kPa
0 … +100 bar/0 … +10 MPa	+200 bar/+20 MPa	-1 bar/-100 kPa
0 … +250 bar/0 … +25 MPa	+500 bar/+50 MPa	-1 bar/-100 kPa
0 … +600 bar/0 … +60 kPa	+1200 bar/+120 MPa	-1 bar/-100 kPa
0 … +1000 bar/0 … +100 MPa	+1500 bar/+150 MPa	-1 bar/-100 kPa
-1 … 0 bar/-100 … 0 kPa	+3 bar/+300 kPa	-1 bar/-100 kPa
-1 … +1.5 bar/-100 … +150 kPa	+7.5 bar/+750 kPa	-1 bar/-100 kPa
-1 … +10 bar/-100 … +1000 kPa	+30 bar/+3000 kPa	-1 bar/-100 kPa
-1 … +25 bar/-100 … +2500 kPa	+50 bar/+5000 kPa	-1 bar/-100 kPa
-1 … +40 bar/-100 … +4000 kPa	+80 bar/+8000 kPa	-1 bar/-100 kPa
-0.2 … +0.2 bar/-20 … +20 kPa	+1.2 bar/+120 kPa	-1 bar/-100 kPa
-0.5 … +0.5 bar/-50 … +50 kPa	+3 bar/+300 kPa	-1 bar/-100 kPa
Absolute pressure		
0 … 1 bar/0 … 100 kPa	3 bar/300 kPa	0 bar abs.
0 … 2.5 bar/0 … 250 kPa	7.5 bar/750 kPa	0 bar abs.
0 … 10 bar/0 … 1000 kPa	30 bar/3000 kPa	0 bar abs.
0 … 25 bar/0 … 2500 kPa	50 bar/5000 kPa	0 bar abs.
0 … 40 bar/0 … 4000 kPa	80 bar/8000 kPa	0 bar abs.

Nominal measuring ranges and overload capacity in psi

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.

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
Gauge pressure		
0 … +5 psig	+15 psig	-14.5 psig
0 … +15 psig	+45 psig	-14.5 psig
0 … +30 psig	+90 psig	-14.5 psig
0 … +150 psig	+450 psig	-14.5 psig
0 … +300 psig	+600 psig	-14.5 psig
0 … +500 psig	+1000 psig	-14.5 psig
0 … +1500 psig	+3000 psig	-14.5 psig
0 … +3000 psig	+6000 psig	-14.5 psig
0 … +9000 psig	+18000 psig	-14.5 psig
0 … +15000 psig	+30000 psig	-14.5 psig
-14.5 … 0 psig	+45 psig	-14.5 psig
-14.5 … +20 psig	+90 psig	-14.5 psig
-14.5 … +150 psig	+450 psig	-14.5 psig
-14.5 … +300 psig	+600 psig	-14.5 psig
-14.5 … +600 psig	+1200 psig	-14.5 psig
-3 … +3 psig	+15 psig	-14.5 psig
-7 … +7 psig	+45 psig	-14.5 psig
Absolute pressure		
0 … +15 psi	+45 psig	0 psi
0 … +30 psi	+90 psig	0 psi
0 … +150 psi	+450 psig	0 psi
0 … +300 psi	+600 psig	0 psi
0 … +500 psig	+1000 psig	0 psi

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

Run-up time approx.: ≤ 5 s

Starting current	
– for 5 ms after switching on	≤ 10 mA
– for run-up time	≤ 3.6 mA

Output variable	
Output signal	4 … 20 mA
Range of the output signal	3.55 … 22.0 mA (default setting)
Signal resolution	0.3 µA
Failure signal current output (adjustable)	Last valid measured value, ≥ 21 mA, ≤ 3.6 mA
Max. output current	21.5 mA
Load	see load under Power supply
Damping (63 % of the input variable), adjustable	0 … 999 s
Indication value - DIsplay and adjustment module[3)]	
– Displayed value 1	Pressure in bar/mbar
– Displayed value 2	Pressure in bar/mbar

Output variable - Additional current output	
For details on the operating voltage see chapter "Voltage supply"	
Output signal	4 … 20 mA (passive)
Range of the output signal	3.8 … 20.5 mA (default setting)
Signal resolution	0.3 µA
Failure signal current output (adjustable)	Last valid measured value, ≥ 21 mA, ≤ 3.6 mA
Max. output current	21.5 mA
Starting current	≤ 10 mA for 5 ms after switching on, ≤ 3.6 mA
Load	Load resistor, see chapter "Voltage supply"
Damping (63 % of the input variable), adjustable	0 … 999 s

Dynamic behaviour output

Dynamic characteristics depending on medium and temperature

3) The indication values can be assigned individually

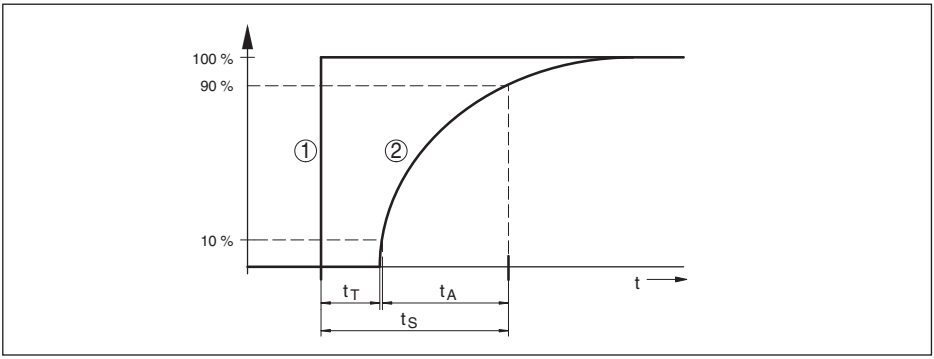


Fig. 29: Sudden change of the process variable. t_T: dead time; t_A: rise time; t_S: jump response time

1 Process variable
2 Output signal

	VEGABAR 81	VEGABAR 81 - IP 68 (25 bar)
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

To this amounts the reaction time of the isolatng system. This time varies from values < 1 s with compact chemical seals to several seconds with capillary systems.

Example: Flange-type chemical seal DN 80, filling silicone oil KN 2.2, capillary length 10 m, measuring range 1 bar

Process temperature	Reaction time approx.
+40 °C (+104 °F)	ca. 1,5 s
+20 °C (+58 °F)	approx. 3 s
-20 °C (-4 °F)	approx. 11 s

Damping (63 % of the input variable) 0 … 999 s, adjustable

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

Reference conditions according to DIN EN 61298-1

- Temperature +18 … +30 °C (+64 … +86 °F)
- Relative humidity 45 … 75 %
- Air pressure 860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psi)

Determination of characteristics Limit point adjustment according to IEC 61298-2

Characterstic curve Linear

Reference installation position upright, diaphragm points downward

Influence of the installation position depending on the chemical seal version

Deviation in the current output due to strong, high-frequency electromagnetic fields acc. to EN 61326 < ±150 µA

Deviation (according to IEC 60770)

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".

Accuracy class	Non-linearity, hysteresis and repeatability with TD 1 : 1 up to 5 : 1	Non-linearity, hysteresis and repeatability with 5 : 1
0.2 %	< 0.2 %	< 0.04 % x TD

Influence of the medium or ambient 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".

Average temperature coefficient, zero signal	In the compensated temperature range 10 … +70 °C (+50 … +158 °F)	Outside the compensated temperature range
Turn down 1 : 1	< 0.05 %/10 K	typ. < 0.05 %/10 K
Turn down 1 : 1 up to 5 : 1	< 0.1 %/10 K	-
Turn down up to 10 : 1	< 0.15 %/10 K	-

Thermal change current output through ambient temperature

Applies also to the **analogue** 4 … 20 mA current output and refers to the set span.

Thermal change, current output < 0.05 %/10 K, max. < 0.15 %, each with -40 … +80 °C (-40 … +176 °F)

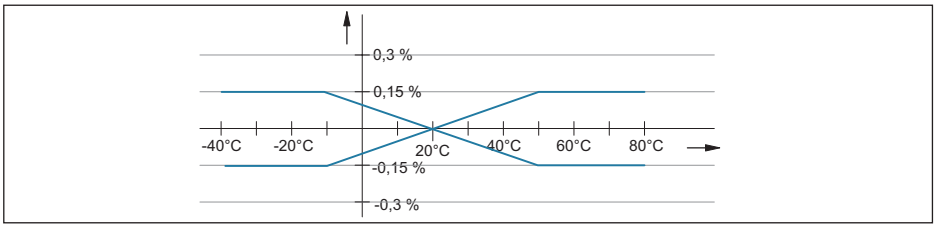


Fig. 30: Thermal change, current output

Additional temperature influence through chemical seal

The specifications refer to diaphragm material 316L as well as isolating liquid silicone oil. They are only used for estimation. The actual values depend on the diameter, material and strength of the diaphragm as well as the isolating liquid. They are available on request.

Temperature coefficient of the chemical seal in mbar/10 K with

- Flange DN 50 PN 40, Form C, DIN 2501 1.2 mbar/10 K

– Flange DN 80 PN 40, Form C, DIN 2501	0.25 mbar/10 K
– Flange DN 80 PN 40, Form C, DIN 2501 with extension 50 mm	1.34 mbar/10 K
– Flange 2" 150 lbs RF, ASME B16.5	1.2 mbar/10 K
– Flange 3" 150 lbs RF, ASME B16.5	0.25 mbar/10 K
– Flange 3" 150 lbs RF, ASME B16.5 with extension 2"	1.34 mbar/10 K
Temperature coefficient of a cooling element, depending on the diaphragm-ø	0.1 … 1.5 mbar/10 K
Temperature coefficient of a 1 m long capillary line, depending on the diaphragm-ø	0.1 … 15 mbar/10 K

Long-term stability (according to DIN 16086 and IEC 60770-1)

Applies to **digital** HART interface 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 drift of the zero signal[4)]	< (0.1 % x TD)/year

Ambient conditions

Version	Ambient temperature	Storage and transport temperature
Standard version	-40 … +80 °C (-40 … +176 °F)	-60 … +80 °C (-76 … +176 °F)
Version IP 66/IP 68 (1 bar)	-20 … +80 °C (-4 … +176 °F)	-20 … +80 °C (-4 … +176 °F)
Version IP 68 (25 bar) with connection cable PUR	-20 … +80 °C (-4 … +176 °F)	-20 … +80 °C (-4 … +176 °F)
Version IP 68 (25 bar), connection cable PE	-20 … +60 °C (-4 … +140 °F)	-20 … +60 °C (-4 … +140 °F)

Process conditions

Medium temperature depending on the isolating liquid and instrument version for p_{abs} > 1 bar/14.5 psi and oxygen applications. For the medium temperature with instrument version for p_{abs} < 1 bar/14.5 psi, see chapter "Chemical seal for vacuum applications".

Isolating liquid	p_{abs} > 1 bar/14.5 psi	Version for oxygen applications
silicone oil KN2.2	-40 … +150 °C (-40 … +302 °F)	-40 … +60 °C (-40 … +140 °F)
Silicone oil KN2.2 with cooling element	-40 … +200 °C (-40 … +392 °F)	-40 … +60 °C (-40 … +140 °F)
Silicone oil KN2.2 with capillaries 2 m, 3 m	-40 … +200 °C (-40 … +392 °F)	-40 … +60 °C (-40 … +140 °F)
Silicone oil KN17	-90 … +180 °C (-130 … +356 °F	-90 … +60 °C (-130 … +140 °F)
High temperature oil KN32 with cooling element	-10 … +300 °C (+14 … +572 °F)	-10 … +60 °C (+14 … +140 °F)

[4)] Depending on which chemical seal is used, the values can also be higher.

Isolating liquid	p_{abs} > 1 bar/14.5 psi	Version for oxygen applications
High temperature oil KN3.2 with cooling element	-10 … +330 °C (+14 … +626 °F)	-10 … +60 °C (+14 … +140 °F)
High temperature oil KN3.2 with cooling element 300 mm	-10 … +400 °C (+14 … +752 °F)	-10 … +60 °C (+14 … +140 °F)
High temperature oil KN32 with capillaries 1 m, 2 m or 5 m	-10 … +400 °C (+14 … +752 °F)	-10 … +60 °C (+14 … +140 °F)
Halocarbon oil KN21	-40 … +150 °C (-40 … +302 °F)	-
Halocarbon oil KN21 for oxygen applications	-40 … +60 °C (40 … +140 °F)	-40 … +60 °C (-40 … +140 °F)
Silicone-free liquid KN70	-40 … +70 °C (-40 … +158 °F)	-40 … +60 °C (-40 … +140 °F)
Med. white oil KN92 (FDA)	-10 … +150 °C (+14 … +302 °F)	-10 … +60 °C (+14 … +140 °F)
Med. white oil KN92 (FDA) with cooling element	-10 … +250 °C (+14 … +482 °F)	-10 … +60 °C (+14 … +140 °F)
Med. white oil KN92 (FDA) with cooling element 300 mm	-	-10 … +60 °C (+14 … +140 °F)

Mechanical stress, depending on the instrument version

Vibration resistance	1 to 4 g at 5 … 200 Hz according to EN 60068-2-6 (vibration with resonance)
Shock resistance	100 g, 6 ms according to EN 60068-2-27 (mechanical shock)

Electromechanical data - version IP 66/IP 67

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	Material seal insert	Cable diameter				
		4.5 … 8.5 mm	5 … 9 mm	6 … 12 mm	7 … 12 mm	10 … 14 mm
PA black	NBR	–	●	●	–	●
PA blue	NBR	–	●	●	–	●
Brass, nickel-plated	NBR	●	●	●	–	–
Stainless steel	NBR	–	●	●	–	●

Wire cross-section (spring-loaded terminals)

– Massive wire, stranded wire	0.2 … 2.5 mm² (AWG 24 … 14)
– Stranded wire with end sleeve	0.2 … 1.5 mm² (AWG 24 … 16)

Electromechanical data - version IP 66/IP 68 (1 bar)	
Connection cable, mechanical data	
– Configuration	Wires, breather capillaries, strain relief, screen braiding, metal foil, mantle
– Standard length	5 m (16.4 ft)
– Min. bending radius	25 mm (0.984 in) with 25 °C (77 °F)
– Diameter approx.	8 mm (0.315 in)
– Colour - Non-Ex version	Black
– Colour - Ex-version	Blue
Connection cable, electrical data	
– Wire cross-section	0.5 mm² (AWG 20)
– Wire resistance R'	0.037 Ω/m (0.012 Ω/ft)
– Inductance L_i'	0.6 µH/m (0.018 µH/ft)
– Capacitance Wire/Wire C_i'	133 pF/m (40 pF/ft)
– Capacitance Wire/Screen C_i'	215 pF/m (65 pF/ft)

Electromechanical data - version IP 68 (25 bar)	
Connection cable, mechanical data	
– Configuration	Wires, strain relief, breather capillaries, screen braiding, metal foil, mantle
– 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)
– Colour	Blue
Connection cable, electrical data	
– Wire cross-section	0.5 mm² (AWG 20)
– Wire resistance R'	0.037 Ω/m (0.012 Ω/ft)
– Inductance L_i'	0.6 µH/m (0.018 µH/ft)
– Capacitance Wire/Wire C_i'	133 pF/m (40 pF/ft)
– Capacitance Wire/Screen C_i'	215 pF/m (65 pF/ft)
External housing	
– Cable gland	M20 x 1.5 or ½ NPT
– Spring-loaded terminals for wire cross-section up to	2.5 mm² (AWG 14)

Display and adjustment module	
Display element	Display with backlight
Measured value indication	
– Number of digits	5
– Size of digits	W x H = 7 x 13 mm
Adjustment elements	4 keys

Protection rating	
– unassembled	IP 20
– mounted in the housing without lid	IP 40
Materials	
– Housing	ABS
– Inspection window	Polyester foil

Additional output parameter - Electronics temperature

Output of the temperature values	
– Analogue	Via the additional current output
– Digital	Depending on the electronics version via the HART, Profibus PA, Foundation Fieldbus or Modbus signal
Range	-40 … +85 °C (-40 … +185 °F)
Resolution	< 0.1 K
Accuracy	±3 K

Voltage supply

Operating voltage U_B	
– Non-Ex instrument	9.6 … 35 V DC
– Ex ia instrument	9.6 … 30 V DC
Operating voltage U_B - illuminated display and adjustment module	
– Non-Ex instrument	16 … 35 V DC
– Ex ia instrument	16 … 30 V DC
Reverse voltage protection	Integrated
Permissible residual ripple - Non-Ex, Ex-ia instrument	
– for U_N 12 V DC (9.6 V< U_B < 14 V)	≤ 0.7 V_{eff} (16 … 400 Hz)
– for U_N 24 V DC (18 V< U_B < 35 V)	≤ 1.0 V_{eff} (16 … 400 Hz)
Load resistor	
– Calculation	(U_B - U_{min})/0.022 A
– Example - Non-Ex instrument with U_B= 24 V DC	(24 V - 9.6 V)/0.022 A = 655 Ω

Overvoltage protection

Operating voltage	35 V DC
Max. input voltage	40 V DC
Max. input current	131 mA
Nominal leakage current	< 10 kA (8/20 µs)

Potential connections in the instrument

Electronics	Not non-floating
Ground terminal	Galvanically connected with the process fitting

Electrical protective measures

Housing material	Version	IP-protection class	NEMA protection
Plastic	Single chamber	IP 66/IP 67	NEMA 6P
	Double chamber	IP 66/IP 67	NEMA 6P
Aluminium	Single chamber	IP 66/IP 67 IP 68 (1 bar)	NEMA 6P -
	Double chamber	IP 66/IP 67	NEMA 6P
Stainless steel, electro-polished	Single chamber Single chamber	IP 66/IP 67 IP 69K	NEMA 6P -
Stainless steel, precision casting	Single chamber	IP 66/IP 67 IP 68 (1 bar)	NEMA 6P -
	Double chamber	IP 66/IP 67	NEMA 6P
Stainless steel	Transmitter, version with external housing	IP 68 (25 bar)	-

Protection rating (IEC 61010-1) II

Approvals

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

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

11.2 Chemical seal with vacuum applications

Introduction

A chemical seal has two tasks:

- Separation of the sensor element from the medium
- Transmission of the process pressure hydraulically to the sensor element

The chemical seal is closed off from the medium with a metallic diaphragm. The interior space between this diaphragm and the sensor element is completely filled with a pressure transmission liquid. The chemical seal thus forms a closed system.

Vacuum

With decreasing pressure, the boiling temperature of the pressure transmission liquid decreases. With pressure values < 1 bar_{abs}, gas molecules dissolved in the isolating liquid may be released depending on the temperature. This causes measurement deviations.

For that reason, chemical seal systems can only be used to a limited extent in a vacuum, depending on the pressure transmission liquid, process temperature and pressure. To extend the area of application, we offer a so-called vacuum service as an option. The following graphics show the areas of application for the different pressure transmission liquids.

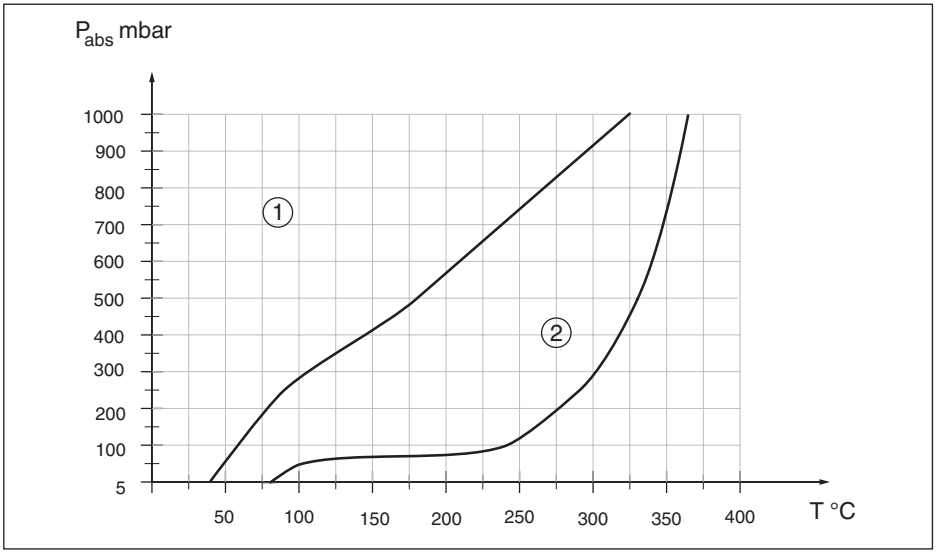


Fig. 31: Area of application for high temperature oil KN 32

1 Standard chemical seal
2 Chemical seal with vacuum service

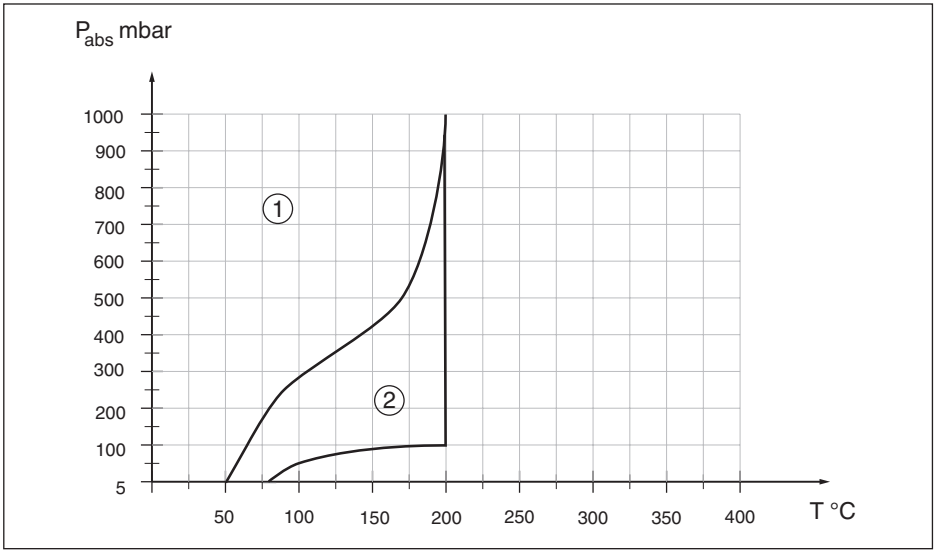


Fig. 32: Area of application for silicone oil KN 2.2

1 Standard chemical seal
2 Chemical seal with vacuum service

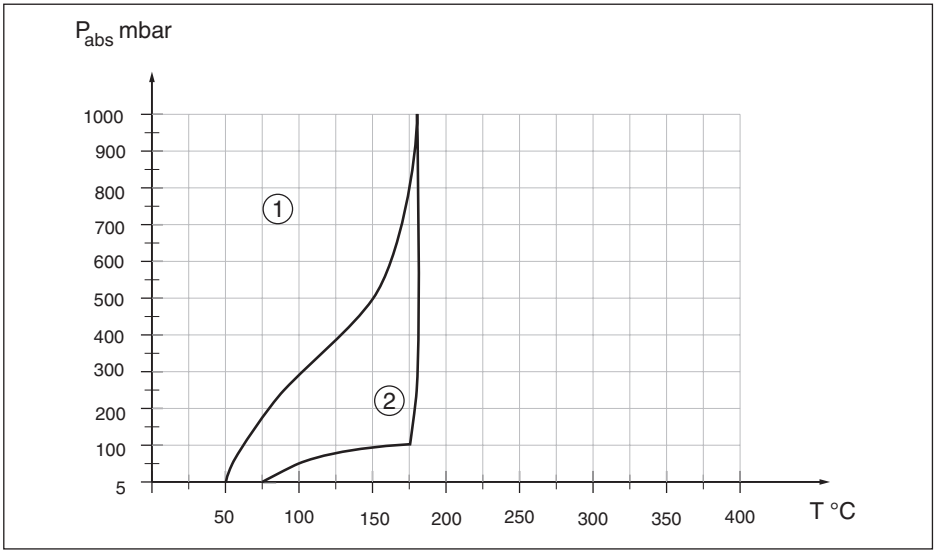


Fig. 33: Area of application for silicone oil KN 17

1 Standard chemical seal
2 Chemical seal with vacuum service

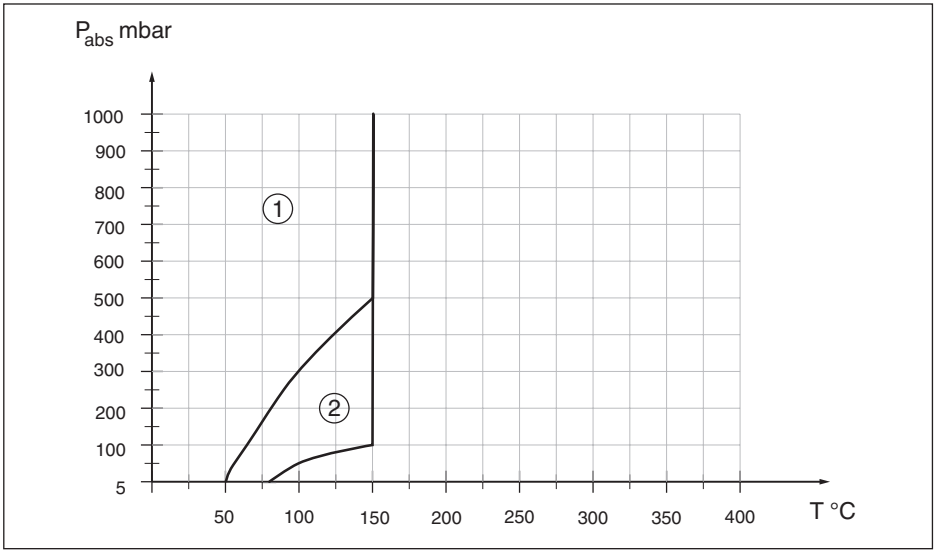


Fig. 34: Area of application for Halocarbon oil KN 21

1 Standard chemical seal
2 Chemical seal with vacuum service

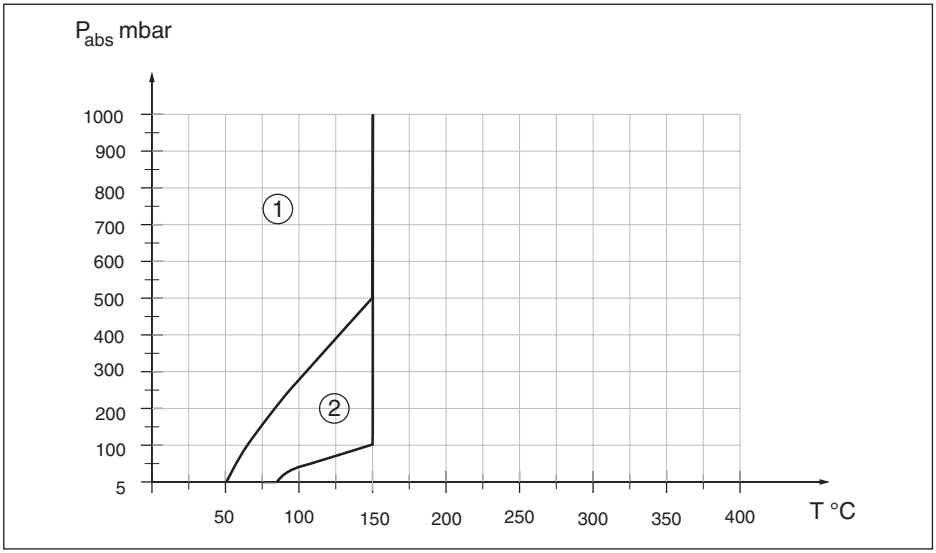


Fig. 35: Area of application for Neobee KN 59

1 Standard chemical seal
2 Chemical seal with vacuum service

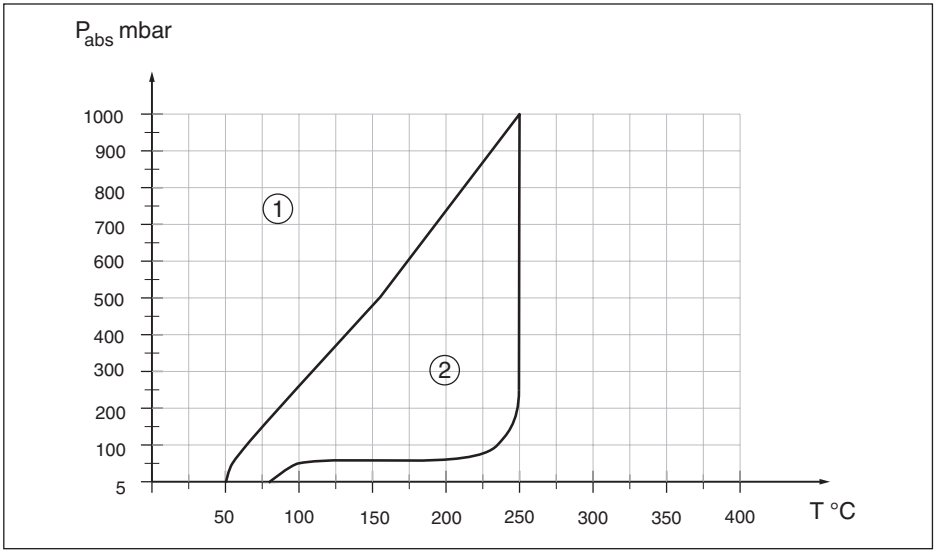


Fig. 36: Area of application for med. white oil KN 92

1 Standard chemical seal
2 Chemical seal with vacuum service

11.3 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*".

Housing

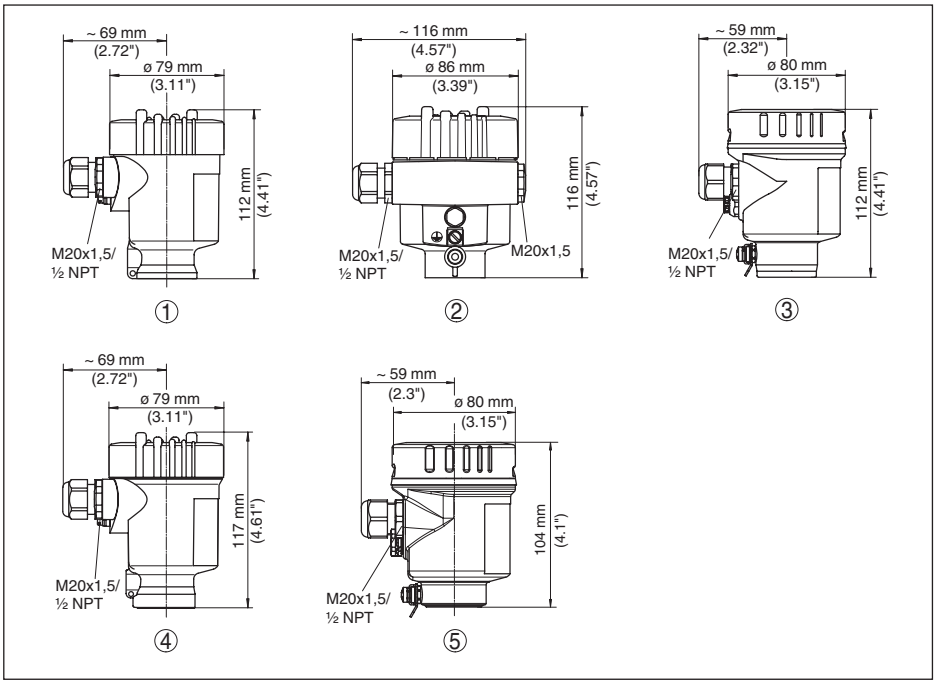


Fig. 37: Housing versions in protection IP 66/IP 67 and IP 66/IP 68 (0.2 bar)

1 *Plastic housing (IP 66/67)*
2 *Aluminium housing*
3 *Stainless steel housing, electropolished*
4 *Stainless steel housing, precision casting*
5 *Stainless steel housing, electropolished IP 69K*

External housing with IP 68 (25 bar) version

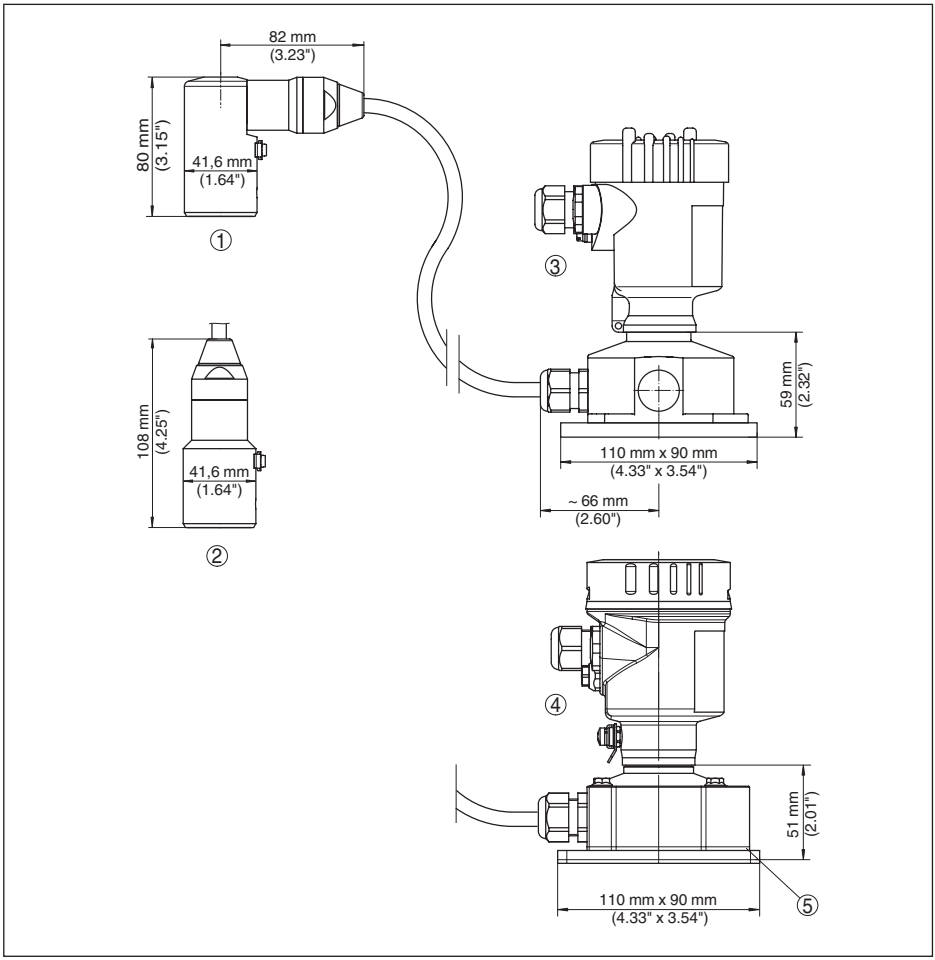


Fig. 38: IP 68 version with external housing

1 *Lateral cable outlet*
2 *Axial cable outlet*
3 *Plastic housing*
4 *Stainless steel housing, electropolished*

VEGABAR 81, threaded fitting

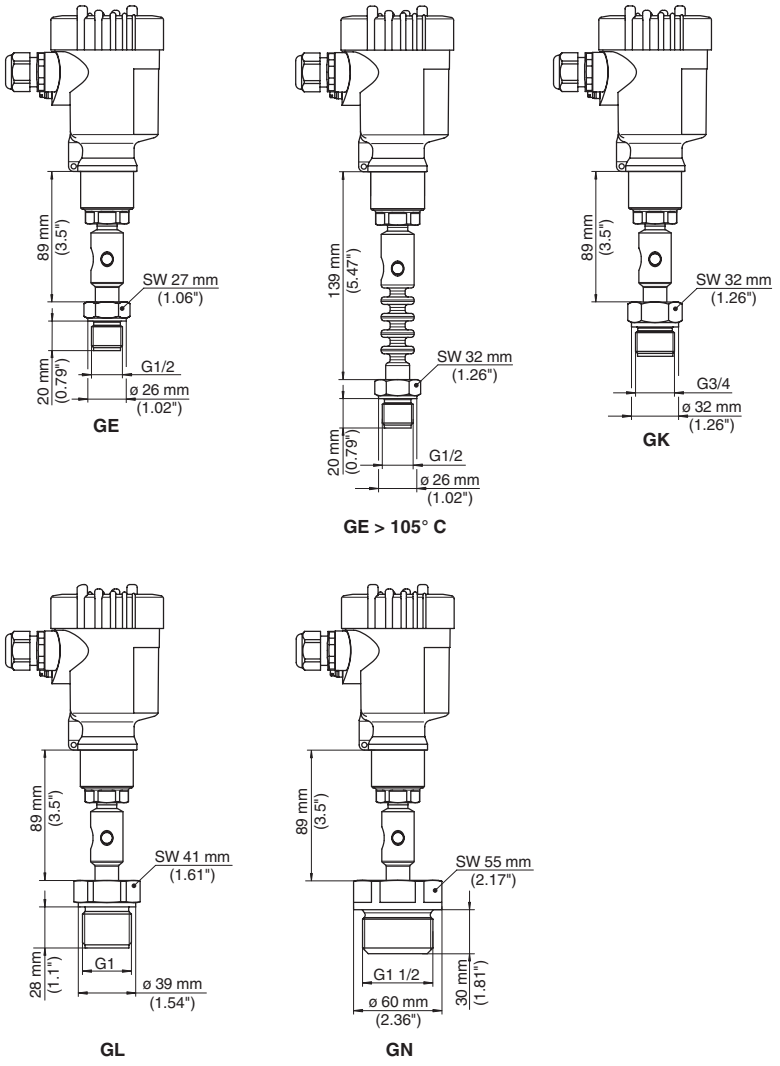
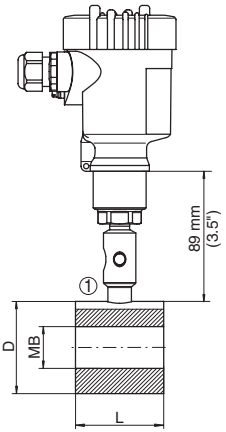
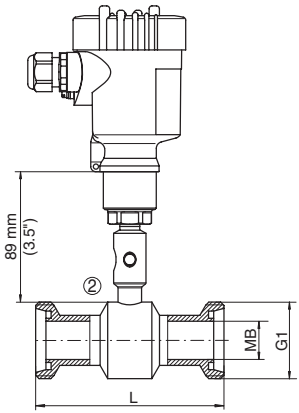


Fig. 39: VEGABAR 81, threaded fitting

GE G½ (ISO 228-1), >105 °C with temperature adapter
GK G¾ (DIN 3852-E)
GL G1 (DIN 3852-E)
GN G1½ (DIN 3852-A)

VEGABAR 81, tube isolating diaphragm





mm

	DN	PN	D	Mb	L
H3	25	6…100	63	28,5	60
	40	6…100	85	43	60
	50	6…100	95	54,5	60

inch

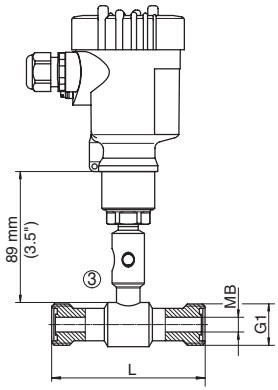
DN	PN	D	Mb	L
25	6…100	2.48"	1.12"	2.36"
40	6…100	3.35"	1.69"	2.36"
50	6…100	3.74"	2.15"	2.36"

mm

	DN	PN	G1	L	Mb
H7	25	40	Rd52x1/6"	128	26
	32	40	Rd58x1/6"	140	32
	50	25	Rd78x1/6"	156	50

inch

DN	PN	G1	L	Mb
25	40	Rd52x1/6"	5.04"	1.02"
32	40	Rd58x1/6"	5.51"	1.26"
50	25	Rd78x1/6"	6.14"	1.97"



mm

DN	PN	G1	L	Mb
10	40	RD28x1/8"	104	10
20	40	RD44x1/6"	104	20

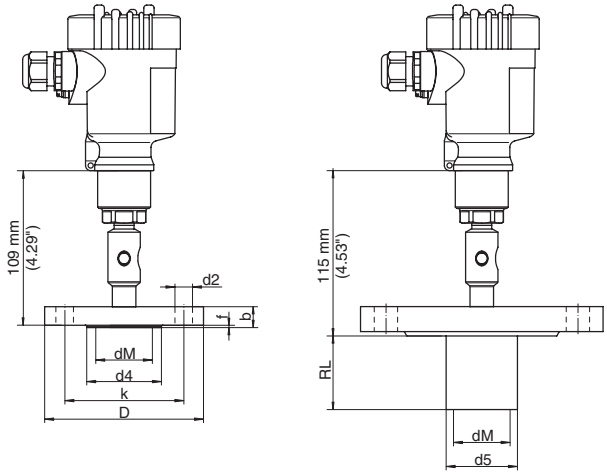
inch

DN	PN	G1	D	d
10	40	RD28x1/8"	4.09"	0.39"
20	40	RD44x1/6"	4.09"	0.79"

Fig. 40: VEGABAR 81, tube isolating diaphragm

1 *Tube isolating diaphragm for mounting between flanges*
2 *Tube isolating diaphragm according to DIN 11851*
3 *Tube isolating diaphragm according to DIN 11864-1*

VEGABAR 81, flange connection, dimensions in mm



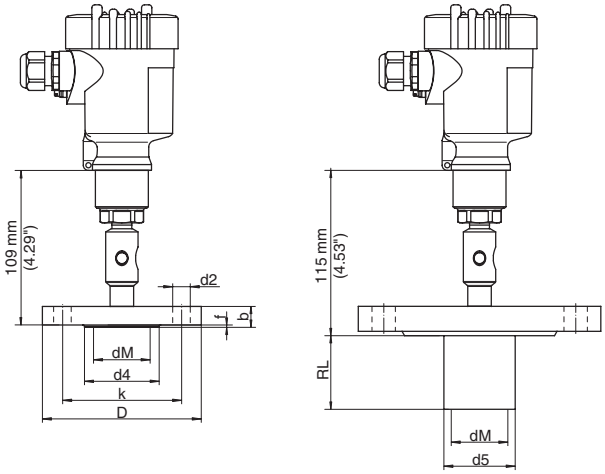
①	DN	PN	D	b	k	d2	d4	f	RL	d5	dM ③
	20	40	105	18	75	4 x ø14	58	2	-	-	-
HU	25	40	115	18	85	4 x ø14	68	2	-	-	32
NE	32	40	140	18	100	4 x ø18	78	2	-	-	-
I2	40	40	150	18	110	4 x ø18	88	2	-	-	45
I5	50	40	165	20	125	4 x ø18	102	2	-	-	59
NC	50	40	165	20	125	4 x ø18	102	2	50	48,3	47
	50	40	165	20	125	4 x ø18	102	2	100	48,3	47
I7	50	40	165	20	125	4 x ø18	102	2	200	48,3	47
ID	80	40	200	24	160	8 x ø18	138	2	-	-	89
	80	40	200	24	160	8 x ø18	138	2	50	76	72
IG	80	40	200	24	160	8 x ø18	138	2	100	76	72
IE	80	40	200	24	160	8 x ø18	138	2	200	76	72
IF	100	40	235	24	190	8 x ø22	162	2	100	94	89

②	"	lbs	D	b	k	d2	d4	f	RL	d5	dM ③
BW	1"	150	110	14,5	79,4	4 x ø16	51	2	-	-	-
CA	2"	150	150	19,5	120,7	4 x ø19	92	2	-	-	-
F3	2"	150	150	19,5	120,7	4 x ø19	92	2	50	48,3	47
CB	3"	150	190	24,3	152,4	4 x ø19	127	2	-	-	-
	3"	150	190	24,3	152,4	4 x ø19	127	2	152,5	76	72

Fig. 41: VEGABAR 81, flange connection, dimensions in mm

1 Flange connection according to DIN 2501
2 Flange connection according to ASME B16.5
3 Diaphragm diameter

VEGABAR 81, flange connection, dimensions in inch



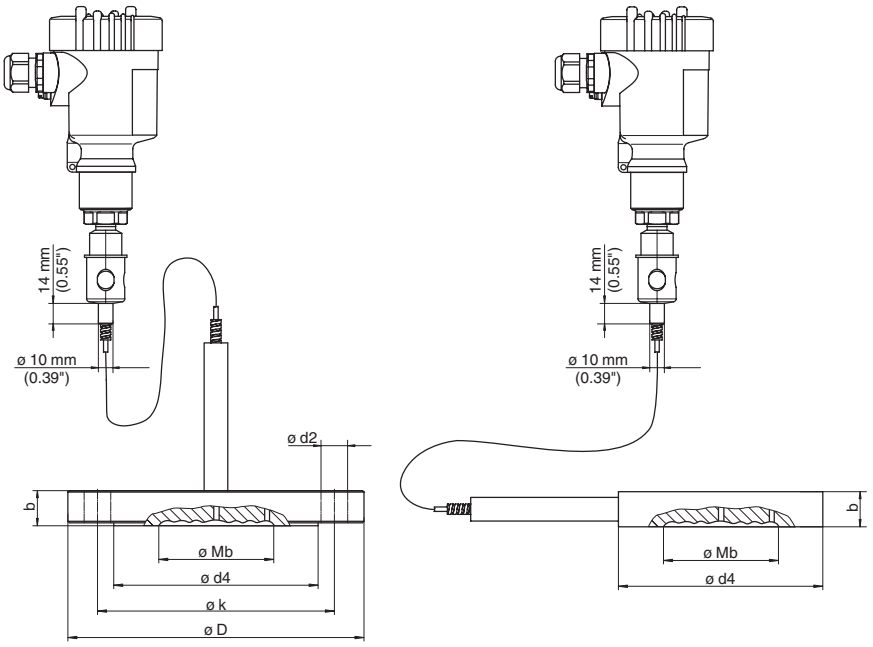
①	DN	PN	D	b	k	d2	d4	f	RL	d5	dM ③
	20	40	4.13"	0.71"	2.95"	4 x ø0.55"	2.28"	0.08"	-	-	-
HU	25	40	4.53"	0.71"	3.35"	4 x ø0.55"	2.68"	0.08"	-	-	1.26"
NE	32	40	5.51"	0.71"	3.94"	4 x ø0.71"	3.07"	0.08"	-	-	-
I2	40	40	5.91"	0.71"	4.33"	4 x ø0.71"	3.47"	0.08"	-	-	1.77"
I5	50	40	6.5"	0.79"	4.92"	4 x ø0.71"	4.02"	0.08"	-	-	2.32"
NC	50	40	6.5"	0.79"	4.92"	4 x ø0.71"	4.02"	0.08"	1.97"	1,9"	1.85"
	50	40	6.5"	0.79"	4.92"	4 x ø0.71"	4.02"	0.08"	3.94"	1,9"	1.85"
I7	50	40	6.5"	0.79"	4.92"	4 x ø0.71"	4.02"	0.08"	7.87"	1,9"	1.85"
ID	80	40	7.87"	0.95"	6.3"	8 x ø0.71"	5.43"	0.08"	-	-	3.5"
	80	40	7.87"	0.95"	6.3"	8 x ø0.71"	5.43"	0.08"	1.97"	2.99"	2.84"
IG	80	40	7.87"	0.95"	6.3"	8 x ø0.71"	5.43"	0.08"	3.94"	2.99"	2.84"
IE	80	40	7.87"	0.95"	6.3"	8 x ø0.71"	5.43"	0.08"	7.87"	2.99"	2.84"
IF	100	40	9.25"	0.95"	7.48"	8 x ø0.87"	6.38"	0.08"	3.94"	3.70"	3.5"

②	"	lbs	D	b	k	d2	d4	f	RL	d5	dM ③
BW	1"	150	4.33"	0.57"	3.13"	4 x ø0.63"	2.01"	0.08"	-	-	-
CA	2"	150	5.91"	0.77"	4.75"	4 x ø0.75"	3.62"	0.08"	-	-	-
F3	2"	150	5.91"	0.77"	4.75"	4 x ø0.75"	3.62"	0.08"	2"	1.9"	1.85"
CB	3"	150	7.48"	0.96"	6"	4 x ø0.75"	5"	0.08"	-	-	-
	3"	150	7.48"	0.96"	6"	4 x ø0.75"	5"	0.08"	6"	2.99"	2.84"

Fig. 42: VEGABAR 81, flange connection, dimensions in inch

1 Flange connection according to DIN 2501
2 Flange connection according to ASME B16.5
3 Diaphragm diameter

VEGABAR 81, flange and cell isolating diaphragm with capillary line



mm

DN	PN	D	b	d4	k	d2	Mb
25	40	115	18	68	85	14	32
40	40	150	18	88	110	18	45
50	40	165	20	102	125	18	59
80	40	200	20	138	160	18	89

inch

DN	PN	D	b	d4	k	d2	Mb
25	40	4.53"	0.71"	2.68"	3.35"	0.55"	1.26"
40	40	5.91"	0.71"	3.47"	4.33"	0.71"	1.77"
50	40	6.5"	0.79"	4.02"	4.92"	0.71"	2.32"
80	40	7.87"	0.79"	5.43"	6.3"	0.71"	3.5"

mm

DN	PN	b	d4	Mb
25	16....100	18	68	32
40	16....100	18	88	45
50	16....100	20	102	59
80	16....100	20	138	89

inch

DN	PN	b	d4	Mb
25	16....100	0.71"	2.68"	1.26"
40	16....100	0.71"	3.47"	1.77"
50	16....100	0.79"	4.02"	2.32"
80	16....100	0.79"	5.43"	3.5"

Fig. 43: VEGABAR 81, flange and cell isolating diaphragm with capillary line

1 Flange isolating diaphragm with capillary line
2 Cell isolating diaphragm with capillary line

11.4 Industrial property rights

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