Operating Instructions

Pressure transmitter with chemical seal

VEGABAR 51

4 … 20 mA

Document ID: 36712

Contents

1 About this document

1.1 Function ... 4
1.2 Target group ... 4
1.3 Symbolism used ... 4

2 For your safety

2.1 Authorised personnel ... 5
2.2 Appropriate use ... 5
2.3 Warning about incorrect use ... 5
2.4 General safety instructions ... 5
2.5 Safety label on the instrument ... 5
2.6 CE conformity ... 6
2.7 Measuring range - permissible process pressure ... 6
2.8 Fulfillment of NAMUR recommendations ... 6
2.9 Safety instructions for Ex areas ... 6
2.10 Safety instructions for oxygen applications ... 6
2.11 Environmental instructions ... 6

3 Product description

3.1 Configuration ... 7
3.2 Principle of operation ... 8
3.3 Operation ... 9
3.4 Packaging, transport and storage ... 9

4 Mounting

4.1 General instructions ... 11
4.2 Mounting steps ... 13
4.3 Mounting steps, tube chemical seal according to DIN 11851 ... 13
4.4 Mounting steps, external housing ... 14

5 Connecting to power supply

5.1 Preparing the connection ... 15
5.2 Connection procedure ... 16
5.3 Wiring plan, single chamber housing ... 17
5.4 Wiring plan - version IP 66/IP 68, 1 bar ... 18
5.5 Wiring plan, external housing with version IP 68 ... 19
5.6 Switch-on phase ... 20

6 Set up with the display and adjustment module PLICSCOM

6.1 Short description ... 22
6.2 Insert display and adjustment module ... 22
6.3 Adjustment system ... 23
6.4 Setup steps ... 24
6.5 Menu schematic ... 32
6.10 Saving the parameter adjustment data ... 34

7 Set up with PACTware and other adjustment programs

7.1 Connect the PC via VEGACONNECT ... 35
7.2 Parameter adjustment with PACTware ... 35

8 Maintenance and fault rectification

8.1 Maintain ... 36

36712-EN-130321

8.2 Rectify faults 36
8.3 Exchanging the electronics module 37
8.4 Software update 38
8.5 Instrument repair 38

9 Dismounting

9.1 Dismounting steps 40
9.2 Disposal 40

10 Supplement

10.1 Technical data 41
10.2 Dimensions 49

Supplementary documentation

Information:

Supplementary documents appropriate to the ordered version come with the delivery. You can find them listed in chapter "*Product description*".

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36712-EN-130321

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 Symbolism 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**
Numbers set in front indicate successive steps in a procedure.

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

36712-EN-130321

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

VEGABAR 51 is a pressure transmitter for measurement of gauge pressure, absolute pressure and vacuum.

You can find detailed information on the application range 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.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

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.

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 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

2.6 CE conformity

This device fulfills the legal requirements of the applicable EC guidelines. By attaching the CE mark, VEGA provides a confirmation of successful testing. You can find the CE conformity declaration in the download area of "www.vega.com".

2.7 Measuring range - permissible process pressure

Due to the application, a measuring cell with a measuring range higher than the permissible pressure range of the process fitting may have been integrated. The permissible process pressure is stated with "Process pressure" on the type label, see chapter 3.1 "*Configuration*". For safety reasons, this range must not be exceeded.

2.8 Fulfillment of NAMUR recommendations

The device fulfills the requirements of the applicable NAMUR recommendations.

2.9 Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

2.10 Safety instructions for oxygen applications

For instruments in oxygen applications the special instructions in chapters "*Storage and transport*", "*Mounting*" as well as "*Technical data*" under "*Process conditions*"must be noted. Furthermore the valid national regulations, implementation instructions and memorandums of the professional assocations must be noted.

2.11 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

Scope of delivery

The scope of delivery encompasses:

- VEGABAR 51 pressure transmitter
- Documentation
  - this operating instructions manual
  - Test certificate for pressure transmitters
  - Operating instructions manual 27835 "*Display and adjustment module PLICSCOM*" (optional)
  - Supplementary instructions manual 31708 "*Heating for display and adjustment module*" (optional)
  - Supplementary instructions manual "*Plug connector for continuously measuring sensors*" (optional)
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - if necessary, further certificates

Scope of this operating instructions manual

This operating instructions manual applies to the following instrument versions:

- Software from 3.82

Constituent parts

The VEGABAR 51 consists of the components:

- Process fitting with measuring cell
- Housing with electronics, optionally available with plug connector
- Housing cover, optionally available with display and adjustment module

The components are available in different versions.

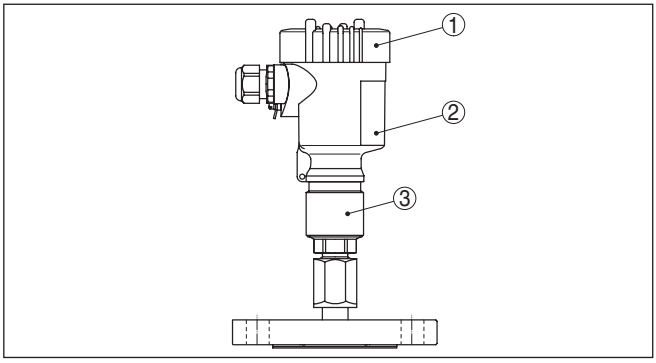


Fig. 1: Example of a VEGABAR 51 with flange connection DN 50 PN 40 and plastic housing

1 Housing cover with integrated display and adjustment module (optional)
2 Housing with electronics
3 Process fitting with measuring cell

Type plate

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

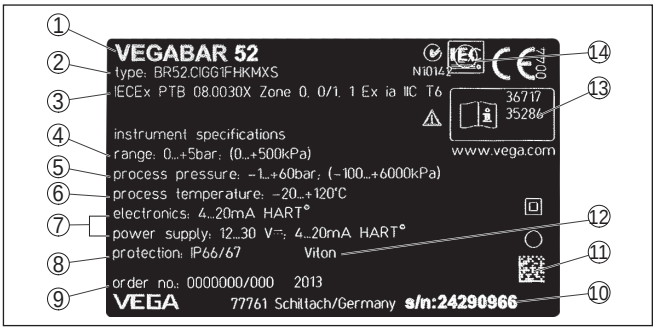


Fig. 2: Layout of the type label (example)

1 *Instrument type*
2 *Product code*
3 *Approvals*
4 *Measuring range*
5 *Process pressure*
6 *Process temperature*
7 *Electronics, voltage supply*
8 *Protection rating*
9 *Order number*
10 *Serial number*
11 *Data-Matrix-Code for Smartphone-App*
12 *Material process seal*
13 *ID numbers, instrument documentation*
14 *Notified authority for CE marking*

With the serial number, you can access the delivery data of the instrument via www.vega.com, "*VEGA Tools*" and "*serial number search*". In addition to the type label outside, you can also find the serial number on the inside of the instrument.

Optional label

Instruments in the version "*Oil and grease-free for oxygen applications*" or "*Oil, grease and silicone-free for lacquers*" are equipped with an optional label. The optional label contains references to the oil, grease and silicone-free parts of the instrument.

Scope of this operating instructions manual

This operating instructions manual applies to the following instrument versions:

- Software from 3.82.

3.2 Principle of operation

Application area

The VEGABAR 51 is a pressure transmitter with chemical seal for pressure measurement of highly corrosive and hot liquids.

Functional principle

The process pressure acts on the sensor element via the stainless steel diaphragm and an internal transmission liquid. This causes a resistance change which is converted into a corresponding output signal and outputted as a measured value. With measuring ranges up to 16 bar a pieoresistive sensor element is used, with measuring ranges from 25 bar a strain gauge (DMS) sensor element.

Voltage supply

4 … 20 mA two-wire electronics for voltage supply and measured value transmission on the same cable.

The supply voltage range can differ depending on the instrument version. The exact range is stated in chapter "*Technical data*".

The backlight of the display and adjustment module is powered by the sensor. The prerequisite for this is a supply voltage at a certain level. The exact voltage specifications are stated in chapter "*Technical data*".

The optional heating requires its own operating voltage. You can find details in the supplementary instructions manual "*Heating for display and adjustment module*".

This function is generally not available for approved instruments.

3.3 Operation

The instrument can be adjusted with the following adjustment media:

- With the display and adjustment module
- with the suitable VEGA DTM in conjunction with an adjustment software according to the FDT/DTM standard, e.g. PACTware and PC

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.

Caution:
Instruments for oxygen applications are sealed in PE foil and provided with a label "Oxygen! Use no Oil". Remove this foil just before mounting the instrument! See instruction under "*Mounting*".

Transport

Transport must be carried out under 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 %

4 Mounting

4.1 General instructions

Suitability for the process conditions

Make sure that all parts of the instrument coming in direct contact with the process, especially the sensor element, process seal and process fitting, are suitable for the existing process conditions, such as process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" and on the nameplate.

Diaphragm protection

To protect the diaphragm, the process fitting is covered by a protective cap.

Remove the protective cap just before installation so that the diaphragm will not get damaged. It is recommended to keep the cap and use it again later for storage or transport.

Installation position

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of a display and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the display and adjustment module in four different positions (each displaced by 90°).

Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or on cooled or heated vessels.

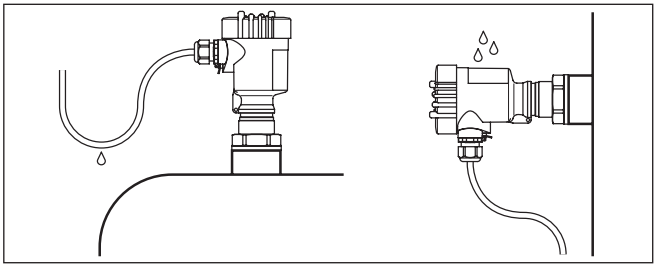


Fig. 3: Measures against moisture penetration

Ventilation and pressure compensation

The ventilation of the electronics housing as well as the atmospheric pressure compensation for the measuring cell are realised via a filter element in the area of the cable gland.

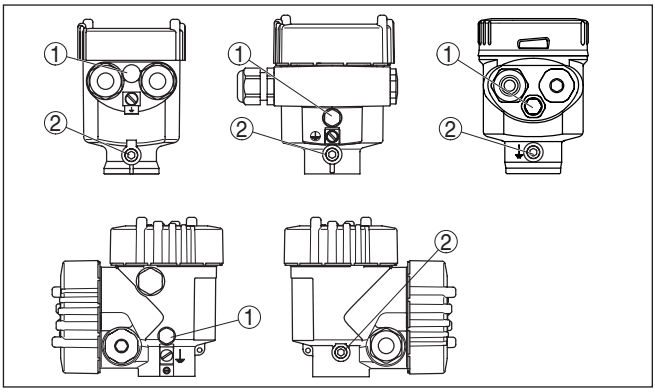


Fig. 4: Position of the filter element

1 Filter element
2 Blind plug

Caution:
Due to the filter effect, the pressure compensation is time delayed. When opening/closing the housing cover quickly, the measured value can change for a period of approx. 5 s by up to 15 mbar.

Information:
Make sure that the filter element is always free of buildup during operation. A high-pressure cleaner may not be used for cleaning.

With instrument versions in protection IP 66/IP 68, 1 bar, the ventilation is realised via the capillaries in the permanently connected cable. The filter element is replaced by a blind plug.

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.

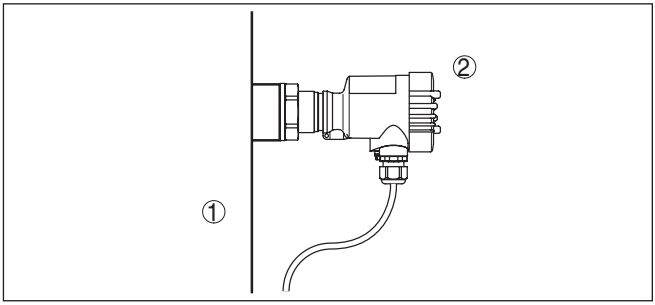


Fig. 5: Temperature ranges

1 Process temperature
2 Ambient temperature

Oxygen applications

Instruments in the version "*Oil and grease free for oxygen*" should be unpacked just before mounting. After the protective cover of the process fitting has been removed, the label "O_2" on the process fitting is visible.

Danger:
Avoid oil, grease or contamination. Explosion danger!

4.2 Mounting steps

Welding the socket

For mounting VEGABAR 51, a welded socket is required. You can find these components in the supplementary instructions manual "*Welded socket and seals*".

Sealing/Screwing in threaded versions

Seal the thread with resistant seal material on the process fitting thread 1½ NPT.

→ Screw VEGABAR 51 into the welded socket. Tighten the hexagon on the process fitting with a suitable wrench. 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.

Sealing/Screwing in flange versions

Seal the flange connections according to DIN/ANSI with a suitable, resistant seal and mount VEGABAR 51 with suitable screws.

Sealing/Screwing in hygienic fittings

Use the seal suitable for the respective process fitting. You can find the components in the supplementary instructions manual "*Welded socket and seals*".

4.3 Mounting steps, tube chemical seal according to DIN 11851

The isolating systems are temperature and pressure-aged at 80 °C and 18 bar. The zero point is adjusted at 22 °C ±2 °C and a torque of 275 Nm. The defined installation position is: Tube chemical seal horizontal, VEGABAR 51 vertical.

For mounting proceed as follows:

1. Position VEGABAR 51 with tube chemical seal
2. Tighten the threaded fittings step-by-step once on the right and on the left
3. Hold VEGABAR 51, to avoid distortion from the defined installation position.

Caution:
Apart from mounting, the tube chemical seal must not be permanently under torsion.

4. Check current after mounting. The current must be between 3.9 and 4.1 mA. In case of a deviating value, losen threaded fitting and mount again.

Information:
By slightly increasing or reducing the torque, the current can be set exactly to 20 mA.

4.4 Mounting steps, external housing

Wall mounting

1. Mark the holes according to the following drilling template
2. Depending on the mounting surface, fasten the wall mounting plate with 4 screws

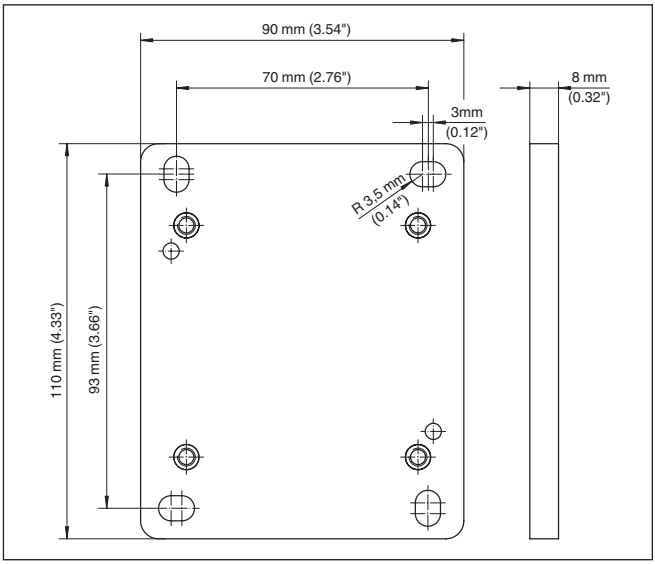


Fig. 6: Drilling template - wall mounting plate

Tip:
Mount the wall mounting plate so that the cable entry of the socket housing points downward. The socket housing can be displaced by 180° to the wall mounting plate.

Warning:
The four screws of the socket housing must only be hand screwed. A torque > 5 Nm (3.688 lbf ft) can damage the wall mounting plate.

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

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

Tip:
We recommend using VEGA overvoltage arresters B63-48 and ÜSB 62-36G.X.

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

Voltage supply

Power supply and current signal are carried on the same two-wire cable. The voltage supply range 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. The VEGA power supply units VEGATRENN 149A Ex, VEGASTAB 690 as well as all VEGAMETs and VEGASCANs meet this requirement.

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

- Output voltage of the power supply unit can be lower under nominal load (with a sensor current of 20.5 mA or 22 mA in case of fault message)
- 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 for industrial areas, screened cable should be used.

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

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

Cable gland ½ NPT

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

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

housing. This would influence the stability of the connection and the tightness of the housing.

Cable screening and grounding

If screened cable is necessary, connect 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 potential equalisation (low impedance).

If potential equalisation currents are expected, the connection on the processing side must be made via a ceramic capacitor (e. g. 1 nF, 1500 V). The low-frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Warning:
Considerable potential differences exist inside galvanic plants as well as vessels with cathodic corrosion protection. Very large equalisation currents can flow through the cable screen when the screen is grounded on both ends. To avoid this, the cable screen must be connected to ground potential only on one end (inside the switching cabinet) in such applications. The cable screen must **not** be connected to the internal ground terminal in the sensor and the outer ground terminal on the housing **not** to potential equalisation!

Information:
The metallic parts of the instrument (transmitter, process fitting, etc.) are conductively connected with the inner and outer ground terminal on the housing. This connection exists either as a direct metallic contact or via the shielding of the special connection cable on instruments with external electronics. You can find specifications on the potential connections within the instrument in chapter "*Technical data*".

Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

5.2 Connection procedure

Single/Double chamber housing

Proceed as follows:

1. Unscrew the housing cover
2. If a display and adjustment module is installed, remove it by turning it to the left.
3. Loosen compression nut of the cable entry
4. Remove approx. 10 cm of the cable mantle, strip approx. 1 cm insulation from the individual wires
5. Insert the cable into the sensor through the cable entry
6. Lift the opening levers of the terminals with a screwdriver (see following illustration)
7. Insert the wire ends into the open terminals according to the wiring plan

8. Press down the opening levers of the terminals, you will hear the terminal spring closing
9. Check the hold of the wires in the terminals by lightly pulling on them
10. Connect the screen to the internal ground terminal, connect the outer ground terminal to potential equalisation
11. Tighten the compression nut of the cable entry. The seal ring must completely encircle the cable
12. Screw the housing cover back on

The electrical connection is hence finished.

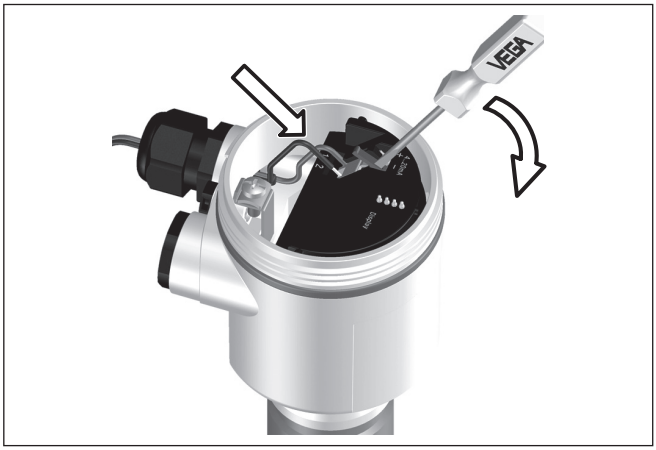


Fig. 7: Connection steps 6 and 7

5.3 Wiring plan, single chamber housing

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

Electronics and connection compartment

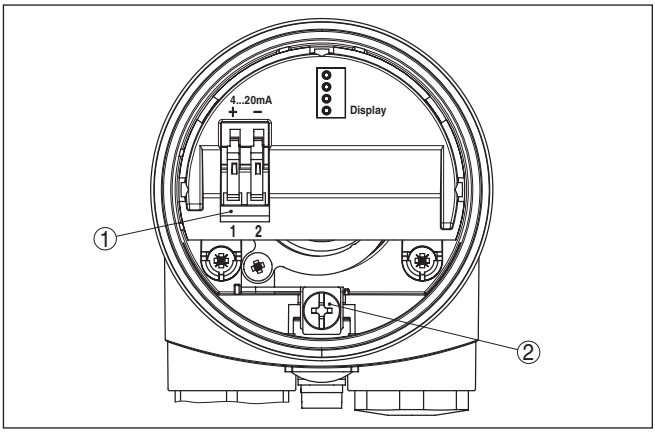


Fig. 8: Electronics and connection compartment, single chamber housing

1 Spring-loaded terminals for voltage supply
2 Ground terminal for connection of the cable screen

Wiring plan

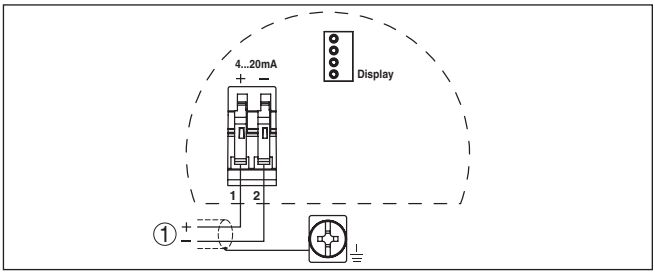


Fig. 9: Wiring plan, single chamber housing

1 Voltage supply/Signal output

5.4 Wiring plan - version IP 66/IP 68, 1 bar

Wire assignment, connection cable

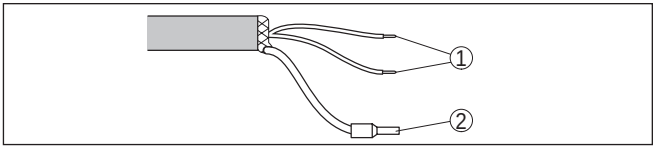


Fig. 10: Wire assignment, connection cable

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

5.5 Wiring plan, external housing with version IP 68

Overview

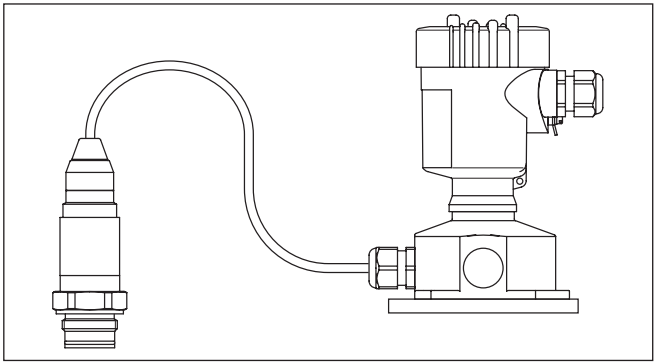


Fig. 11: VEGABAR 51 in IP 68 version 25 bar and axial cable outlet, external housing

Electronics and connection compartment for power supply

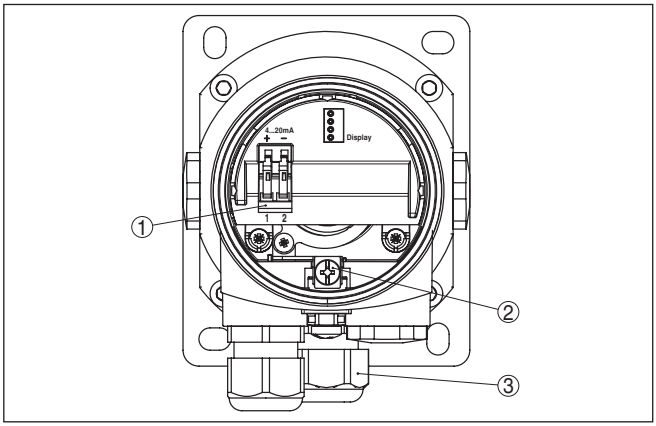


Fig. 12: Electronics and connection compartment

1 Spring-loaded terminals for voltage supply
2 Ground terminal for connection of the cable screen
3 Cable gland to the sensor

Terminal compartment, housing socket

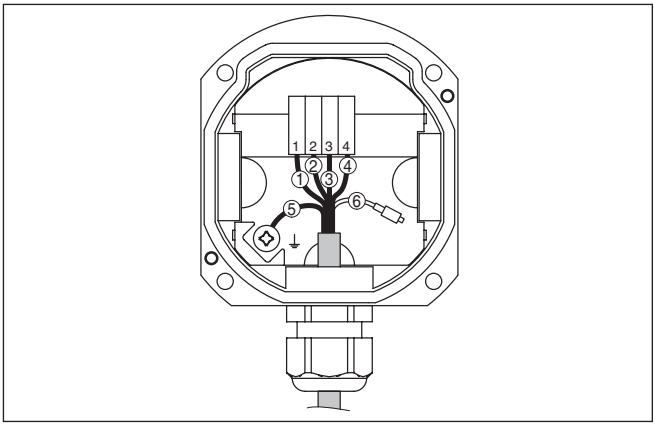


Fig. 13: Connection of the sensor in the housing socket

1 Brown
2 Blue
3 Yellow
4 White
5 Shielding
6 Breather capillaries

Wiring plan external electronics

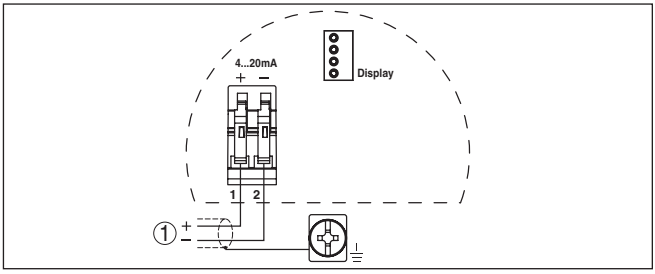


Fig. 14: Wiring plan external electronics

1 Voltage supply/Signal output

5.6 Switch-on phase

Switch-on phase

After connecting VEGABAR 51 to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

- Internal check of the electronics
- Indication of the instrument type, the firmware as well as the sensor TAGs (sensor designation)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the corresponding current is outputted to the cable (the value corresponds to the actual level as well as the settings already carried out, e.g. factory setting).

6 Set up with the display and adjustment module PLICSCOM

6.1 Short description

The display and adjustment module is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All continuously measuring sensors in single as well as double chamber housing (optionally in the electronics or connection compartment)
- External display and adjustment unit

Note:
You can find detailed information on the adjustment in the operating instructions manual "*Display and adjustment module*".

6.2 Insert display and adjustment module

Mount/Dismount display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing cover
2. Place the display and adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
3. Press the display and adjustment module onto the electronics and turn it to the right until it snaps in.
4. Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

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

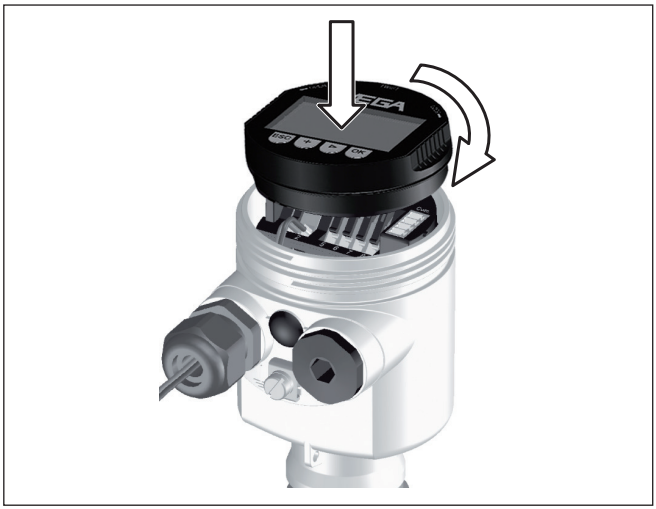


Fig. 15: Insert display and adjustment module

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

6.3 Adjustment system

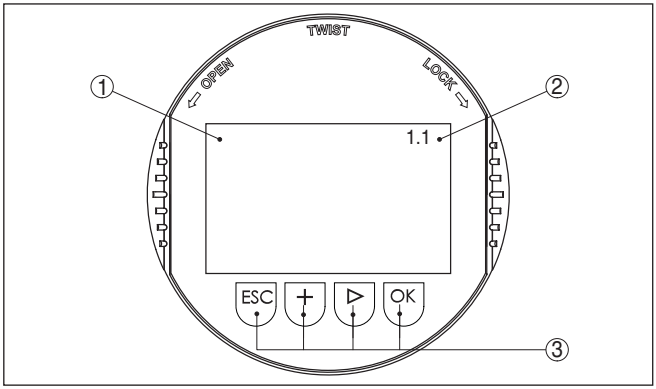


Fig. 16: Display and adjustment elements

1 LC display
2 Indication of the menu item number
3 Adjustment keys

Key functions

- ***[OK]*** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter

- Save value

- ***[->]*** key to select:
  - Menu change
  - Select list entry
  - Select editing position

- ***[+]*** key:
  - Change value of the parameter

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

Adjustment system

The sensor is adjusted via the four keys of the display and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 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.

6.4 Setup steps

Level or process pressure measurement

VEGABAR 51 can be used for level as well as for process pressure measurement. Default setting is level measurement. The mode can be changed in the adjustment menu.

Depending on the application only the respective subchapter "Level or process pressure measurement" is of importance. There, you find the individual adjustment steps.

Level measurement

Parameter adjustment "Level measurement"

Set up VEGABAR 51 in the following sequence:

1. Selecting adjustment unit/density unit
2. Carry out a position correction
3. Carry out min. adjustment
4. Carry out max. adjustment

In the menu item "*Adjustment unit*" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, psi…

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

Information:
The steps 1, 3 and 4 are not necessary for instruments which are already preset according to customer specifications!

You can find the data on the type label on the instrument or in the menu items of the min./max. adjustment.

The display and adjustment module enables the adjustment without filling or pressure. Thanks to this, you can carry out your settings already in the workshop without the instrument having to be installed.

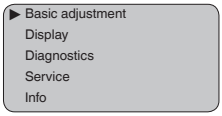
The actual measured value is also displayed in the menu items for min./max. adjustment.

Select unit

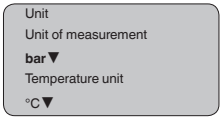
In this menu item you select the adjustment unit as well as the unit for the temperature indication in the display.

To select the adjustment unit (in the example switching over from bar to mbar), proceed as follows:[1)]

1. Push the ***[OK]*** button in the measured value display, the menu overview is displayed.



2. Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Unit*" will be displayed.



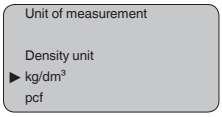
3. Activate the selection with ***[OK]*** and select "***Units of measurement*** with *[->]*.
4. Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (in the example mbar).
5. Confirm with ***[OK]*** and move to position correction with ***[->]***.

The adjustment unit is thus switched over from bar to mbar.

Information:
When switching over to adjustment in a height unit (in the example from bar to m), the density also has to be entered.

Proceed as follows:

1. Push the ***[OK]*** button in the measured value display, the menu overview is displayed.
2. Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Units of measurement*" will be displayed.
3. Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (in the example m).
4. Confirm with ***[OK]***, the submenu "*Density unit*" appears.



5. Select the requested unit, e.g. kg/dm³ with ***[->]*** and confirm with ***[OK]***, the submenu "*Density*" appears.

Unit of measurement

[1)] Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH_2O, mmH_2O.

Density
0001000
kg/dm³

6. Enter the requested density value with ***[->]*** and ***[+]***, confirm with ***[OK]*** and move to position correction with ***[->]***.

The adjustment unit is thus switched over from bar to m.

Proceed as follows to select the temperature unit:[2)]

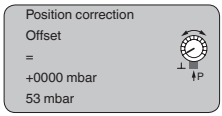
1. Activate the selection with ***[OK]*** and select "***Temperature unit*** with *[->]*.
2. Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (e.g. °F).
3. Confirm with ***[OK]***.

The temperature unit is hence switched over from °C to °F.

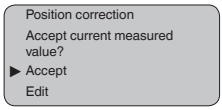
Carry out a position correction

Proceed as follows:

1. Activate in the menu item "*Position correction*" the selection with ***[OK]***.



2. Select with ***[->]***, e.g. to accept actual measured value.

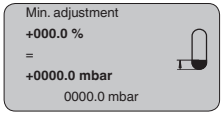


3. Confirm with ***[OK]*** and move to min.(zero) adjustment with ***[->]***.

Carry out min. adjustment

Proceed as follows:

1. Edit the % value in the menu item "*Min. adjustment*" with ***[OK]***.



2. Set the requested percentage value with ***[+]*** and ***[->]***.
3. Confirm with ***[OK]*** and edit the requested mbar value.
4. Set the requested mbar value with ***[+]*** and ***[->]***.
5. Confirm with ***[+]*** and move to max. adjustment with ***[->]***.

The min. adjustment is finished.

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

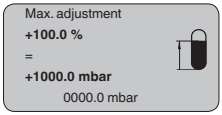
[2)] Selection options: °C, °F.

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]***.

Carry out max. adjustment

Proceed as follows:

1. Edit the % value in the menu item "*Max. adjustment*" with ***[OK]***.



Information:
The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1 bar = 1000 mbar).

2. Set the requested percentage value with ***[->]*** and ***[OK]***.
3. Confirm with ***[OK]*** and edit the requested mbar value.
4. Set the requested mbar value with ***[+]*** and ***[->]***.
5. Confirm with ***[OK]*** and move to the menu overview with ***[ESC]***.

The max. adjustment is finished.

Information:
For an adjustment with filling, 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]***.

Process pressure measurement

Parameter adjustment "Process pressure measurement"

Set up VEGABAR 51 in the following sequence:

1. Select application "Process pressure measurement"
2. Select the unit of measurement
3. Carry out a position correction
4. Carrying out zero adjustment
5. Carry out span adjustment

In the menu item "*Adjustment unit*" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, psi…

The position correction compensates the influence of the mounting position or static pressure on the measurement. It does not influence the adjustment values.

In the menu items "*zero*" and "*span*" you determine the span of the sensor, the span corresponds to the end value.

Information:
The steps 1, 3 and 4 are not necessary for instruments which are already preset according to customer specifications!

You can find the data on the type label on the instrument or in the menu items of the zero/span adjustment.

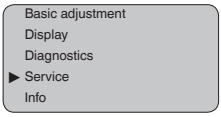
The display and adjustment module enables the adjustment without filling or pressure. Thanks to this, you can carry out your settings already in the workshop without the instrument having to be installed.

The actual measured value is displayed in addition to the menu items for zero/span adjustment.

Select application "Process pressure measurement"

VEGABAR 51 is preset to application "Level measurement". Proceed as follows when switching over to application "Process pressure measurement":

1. Push the ***[OK]*** button in the measured value display, the menu overview is displayed.
2. Select the menu "***Service***" with *[->]* and confirm with ***[OK]***.



3. Select the menu item "***Application***" with *[->]* and edit with ***[OK]***.

Warning:
Note the warning: "*Output can change*".

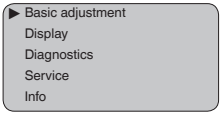
4. Select with ***[->]*** "*OK*" and confirm with ***[OK]***.
5. Select "*Process pressure*" from the list and confirm with ***[OK]***.

Select unit

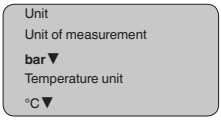
In this menu item you select the adjustment unit as well as the unit for the temperature indication in the display.

To select the adjustment unit (in the example switching over from bar to mbar), proceed as follows:[3)]

1. Push the ***[OK]*** button in the measured value display, the menu overview is displayed.



2. Confirm the menu "***Basic adjustment***" with *[OK]*, the menu item "*Unit*" will be displayed.



3. Activate the selection with ***[OK]*** and select "***Units of measurement*** with *[->]*.
4. Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (in the example mbar).
5. Confirm with ***[OK]*** and move to position correction with ***[->]***.

[3)] Selection options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH_2O, mmH_2O.

The adjustment unit is thus switched over from bar to mbar.

Proceed as follows to select the temperature unit:[4)]

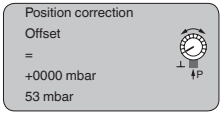
1. Activate the selection with ***[OK]*** and select "***Temperature unit*** with *[->]*.
2. Activate the selection with ***[OK]*** and select the requested unit with ***[->]*** (e.g. °F).
3. Confirm with ***[OK]***.

The temperature unit is hence switched over from °C to °F.

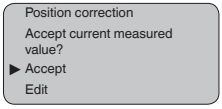
Carry out a position correction

Proceed as follows:

1. Activate in the menu item "*Position correction*" the selection with ***[OK]***.



2. Select with ***[->]***, e.g. to accept actual measured value.

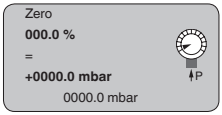


3. Confirm with ***[OK]*** and move to min.(zero) adjustment with ***[->]***.

Carrying out zero adjustment

Proceed as follows:

1. Edit the mbar value in the menu item "*zero*" with ***[OK]***.



2. Set the requested mbar value with ***[+]*** and ***[->]***.
3. Confirm with ***[+]*** and move to span adjustment with ***[->]***.

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.

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

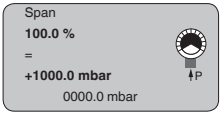
If the adjustment ranges are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with ***[ESC]*** or the displayed limit value can be accepted with ***[OK]***.

[4)] Selection options: °C, °F.

Carry out span adjustment

Proceed as follows:

1. Edit the mbar value in the menu item "*span*" with ***[OK]***.



Information:
The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1 bar = 1000 mbar).

2. Set the requested mbar value with ***[->]*** and ***[OK]***.
3. Confirm with ***[OK]*** and move to the menu overview with ***[ESC]***.

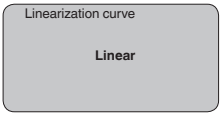
The span adjustment is finished.

Information:
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]***.

Linearization curve

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "*Display*".



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

Caution:
Note the following if the VEGABAR 51 with corresponding approval is used as part of an overfill protection system according to WHG (Water Resources Act):

If a linearization curve is selected, the measuring signal is no longer linearly proportional to the level. This must be taken into consideration by the user, particularly when setting the switching point on the limit signal indicator.

Copy sensor data

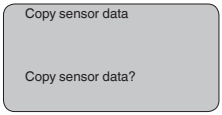
This function enables reading out parameter adjustment data as well as writing parameter adjustment data into the sensor via the display and adjustment module. A description of the function is available in the operating instructions manual "*Display and adjustment module*".

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

- Measured value presentation
- Adjustment
- Damping
- Linearization curve
- Sensor-TAG
- Displayed value
- Display unit
- Scaling
- Current output
- Unit of measurement
- Language

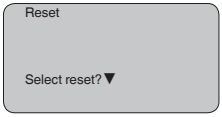
The following safety-relevant data are **not** read out or written:

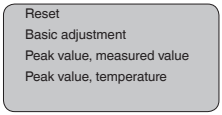
- SIL
- HART mode[5)]
- PIN
- Application



Reset

The reset function resets all parameters adjusted by the user to the delivery status and the peak values to the actual values.





Basic adjustment

The "*Reset*" "*Basic adjustment*" resets the values of the following menu items:

Menu section	Function	Reset value
Basic settings	Zero/Min. adjustment	Measuring range begin
	Span/Max. adjustment	Measuring range end
	Density	1 kg/l
	Density unit	kg/l
	Damping	1 s
	Linearization	Linear
	Sensor-TAG	Sensor

5) With instruments with signal output 4 … 20 mA/HART

Menu section	Function	Reset value
Display	Displayed value 1	bar
	Displayed value 2	%
	Display unit	Volume/l
	Scaling	0.00 to 100.0
	Decimal point indication	8888.8
Service	Current output - characteristics	4 … 20 mA
	Current output - failure	< 3.6 mA
	Current output - min. current	3.8 mA
	Current output - max. current	20.5 mA

The values of the following menu items are *not* reset with "**Reset**:

Menu section	Function	Reset value
Basic settings	Unit of measurement	No reset
	Temperature unit	No reset
	Position correction	No reset
Display	Backlight	No reset
Service	Language	No reset
	Application	No reset

Peak value
The min. and max. temperature or pressure values are each reset to the actual value.

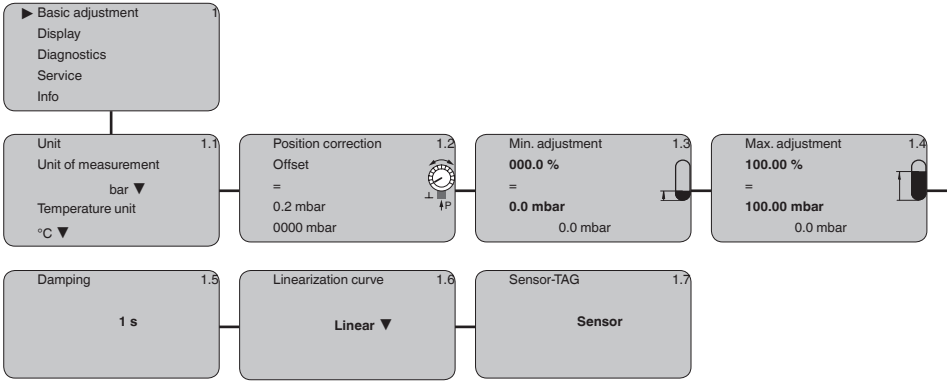
Optional settings

Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual "*Display and adjustment module*".

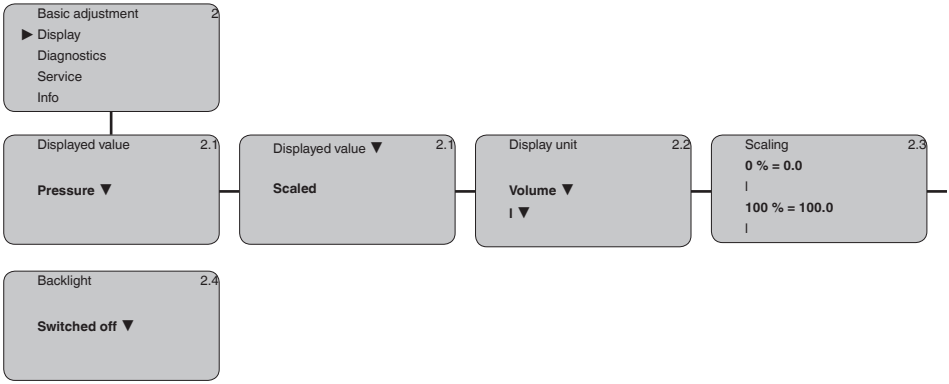
6.5 Menu schematic

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

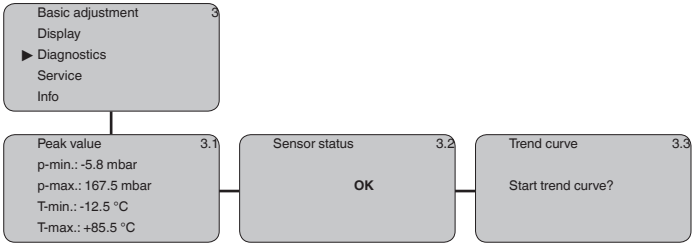
Basic adjustment



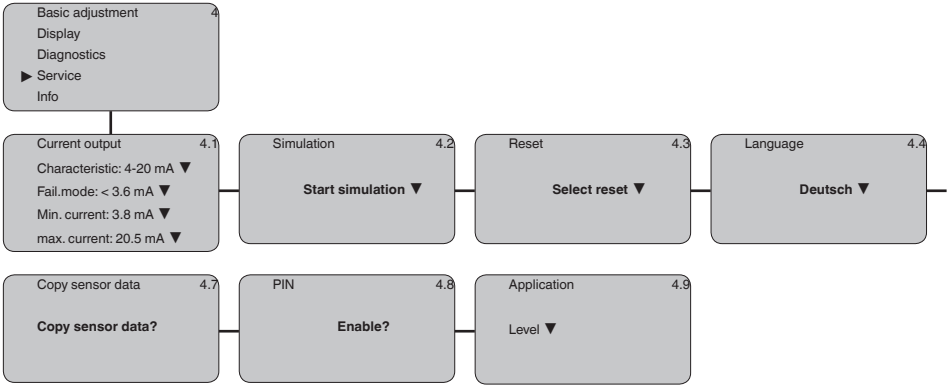
Display



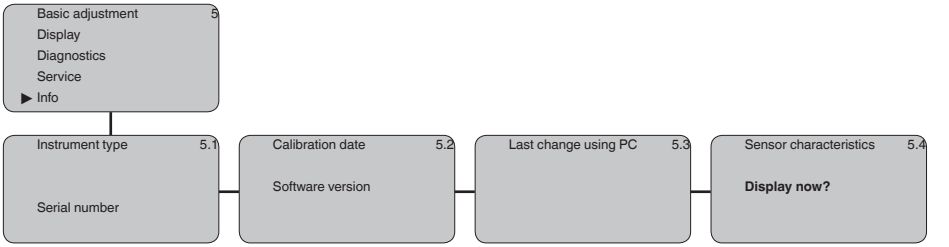
Diagnostics



Service



Info



6.10 Saving the parameter adjustment data

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.

If VEGABAR 51 is equipped with a display and adjustment module, the most important data can be read out of the sensor into the display and adjustment module. The procedure is described in the operating instructions manual "*Display and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

If it is necessary to exchange the sensor, the display and adjustment module is inserted into the replacement instrument and the data are written into the sensor under the menu item "*Copy sensor data*".

36712-EN-130321

7 Set up with PACTware and other adjustment programs

7.1 Connect the PC via VEGACONNECT

VEGACONNECT directly on the sensor

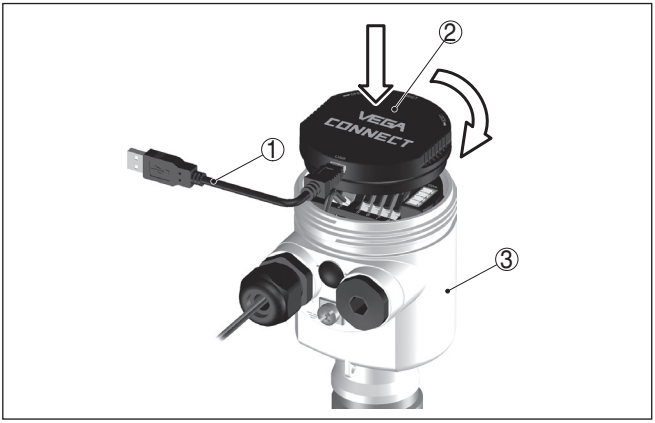


Fig. 17: Connection of the PC via VEGACONNECT directly to the sensor

1 USB cable to the PC
2 VEGACONNECT
3 Sensor

7.2 Parameter adjustment with PACTware

Further setup steps are described in the operating instructions manual "*DTM Collection/PACTware*" attached to each CD and which can also be downloaded from our homepage. A detailed description is available in the online help of PACTware and the VEGA DTMs.

Note:
Keep in mind that for setup of VEGABAR 51, DTM-Collection in the actual version must be used.

All currently available VEGA DTMs are included as a DTM Collection on a CD. They can be purchased for a token fee from the responsible VEGA agency. In addition, the actual PACTware version is also available on this CD.

In addition, this DTM Collection incl. the basic version of PACTware can be downloaded free of charge from the Internet. Move via www.vega.com and "*Downloads*" to "*Software*".

8 Maintenance and fault rectification

8.1 Maintain

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.

Cleaning

If necessary, clean the diaphragm. Make sure that the materials are resistant to the cleaning process, see resistance list under "*Services*" on "www.vega.com". The wide variety of applications of chemical seals makes special cleaning instructions necessary for each application. Please ask the VEGA agency serving you.

8.2 Rectify faults

Reaction when malfunctions occur

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

Failure reasons

VEGABAR 51 offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the display and adjustment module. The procedure is described below. Further comprehensive diagnostics can be carried out on a PC with the software PACTware and the suitable DTM. In many cases, the causes can be determined and the faults rectified this way.

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 available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

Check the 4 … 20 mA signal

Connect a handheld multimeter in the suitable measuring range according to the wiring plan.

36712-EN-130321

Error code	Cause	Rectification
4 … 20 mA signal not stable	Level fluctuations	– Set the integration time via the display and adjustment module or PACTware
	No atmospheric pressure compensation	– Check the pressure compensation in the housing and clean the filter element, if necessary
4 … 20 mA signal missing	Connection to voltage supply wrong	– Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"
	No power supply	– 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 or measuring cell defective	– Exchange the instrument or send it in for repair

In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

Error messages via the display and adjustment module

Error code	Cause	Rectification
E013	no measured value available[6)]	– Exchange the instrument or send it in for repair
E017	Adjustment span too small	– repeat with modified values
E036	no operable sensor software	– Carry out a software update or send instrument for repair
E041	Hardware error	– 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 "*Set up*" may have to be carried out again.

8.3 Exchanging the electronics module

In case of a defect, the electronics module can be exchanged by the user against an identical type. If no electronics module is available on side, the module can be ordered from the agency serving you.

Ordering and exchange are possible **with** or **without** sensor serial number. The electronics module **with** serial number includes **order-specific** data such as factory setting, seal material etc. These are not included in the electronics module **without** serial number.

[6)] Fault message can also appear if the pressure is higher than the nominal range.

The serial number is stated on the type label of VEGABAR 51 or on the delivery note.

8.4 Software update

The software version of VEGABAR 51 can be determined as follows:

- on the type label of the electronics
- Via the display and adjustment module
- via PACTware

You can view all software histories on our website www.vega.com. Make use of this advantage and get registered for update information via e-mail.

The following components are required to update the sensor software:

- Sensor
- Voltage supply
- VEGACONNECT
- PC with PACTware
- Current sensor software as file

Load sensor software to PC

At "www.vega.com/downloads" go to "*Software*". Select under "*plics sensors and instruments*", "*Firmware updates*" the respective instrument series and software version. Load the zip file via the right mouse key with "*Save target as*" e.g. on the desktop of your PC. Move with the right mouse key to the folder and select "*Extract all*". Save the extracted files, for example on the desktop.

Prepare update

Connect the signal conditioning instrument to power supply and provide the connection from the PC to the instrument via the interface adapter. Start PACTware and go via the menu "*Project*" to the *VEGA project assistant*. Select "*USB*" and "*Set instruments online*". Activate the project assistant with "*Start*". The assistant establishes the connection automatically and opens the parameter adjustment window "*Sensor # online parameter adjustment*". Connect this parameter adjustment window before you carry out further steps.

Load software into sensor

Select with the right mouse key the sensor in the project and go to "*Additional function*". Then click to "*Software update*". The window "*Sensor # software update*" opens. PACTware checks now the sensor data and displays the actual hardware and software version of the sensor. This takes approximately 60 s.

Push the button "*Update software*" and select the previously extracted hex file. Then the software update can be started. The additional files are installed automatically. Depending on the sensor, this procedure lasts up to 1 h. Then the message appears ""*Software update successfully executed*".

8.5 Instrument repair

If a repair is necessary, please proceed as follows:

You can download a return form (23 KB) from our Internet homepage www.vega.com under: "*Downloads - Forms and certificates - Repair form*".

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

- 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 ask the agency serving you for the address of your return shipment. You can find the respective contact data on our website www.vega.com under: "*Company - VEGA worldwide*"

9 Dismounting

9.1 Dismounting steps

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, 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.

9.2 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.

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.

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.

10 Supplement

10.1 Technical data

General data	
Pressure type	Gauge pressure or gauge pressure
Measuring principle	Depending on the measuring range ceramic-capacitive or strain gauge (DMS), each with isolating system
Communication interface	I^2C bus

Materials and weights	
Material 316L corresponds to 1.4404 or 1.4435	
Materials, wetted parts	
– Process fitting	316L
– Diaphragm	316L, Hastelloy C276, Tantalum, PTFE, 1.4435 with gold coating
Surface quality hygienic fittings, typ.	R_a < 0.8 µm
– Surface quality, typ.	
Materials, non-wetted parts	
– Electronics housing	Plastic PBT (polyester), Alu die-casting powder-coated, 316L
– External housing	plastic PBT (Polyester), 316L
– Socket, wall mounting plate external housing	plastic PBT (Polyester), 316L
– Seal between socket and wall mounting plate	EPDM (fixed connected)
– Seal below wall mounting plate	EPDM (only with 3A approval)
– Seal ring, housing cover	NBR (stainless steel housing), silicone (Alu/plastic housing)
– Inspection window in housing cover for display and adjustment module	Polycarbonate (UL-746-C listed)
– Ground terminal	316Ti/316L
– Ohmic contact	Between ground terminal and process fitting
– Connection cable between transmitter and external electronics housing with IP 68 version	PUR
– Type label support on connection cable	PE hard
– Connection cable with IP 68 1 bar version	PE, PUR
Weight approx.	0.8 … 8 kg (1.764 … 17.64 lbs), depending on process fitting

Output variable	
Output signal	4 … 20 mA
Signal resolution	1.6 µA

Failure signal output current	mA value unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable)
Max. output current	22 mA
Load	see load diagram under Power supply
Met NAMUR recommendation	NE 43

Dynamic behaviour output

Run-up time approx.	10 s

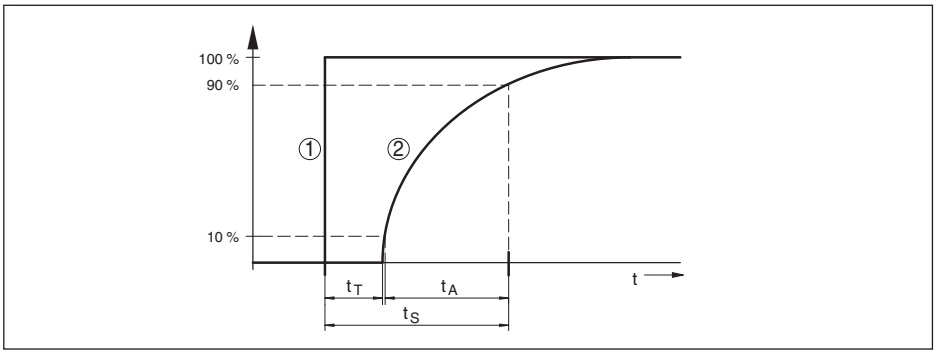


Fig. 18: Sudden change of the process variable, dead time t_T, rise time t_A and step response time t_S

1 Process variable
2 Output signal

Dead time	≤ 150 ms
Rise time	≤ 100 ms (10 … 90 %)
Step response time	≤ 250 ms (ti: 0 s, 10 … 90 %)

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
40 °C	approx. 2 s
20 °C	approx. 3 s
-20 °C	approx. 11 s

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

Input variable

Adjustment

Adjustment range of the min./max. adjustment relating to the nominal measuring range:

– Percentage value	-10 … 110 %
– Pressure value	-20 … 120 %

Adjustment range of the zero/span adjustment relating to the nominal measuring range:

– zero	-20 … +95 %

- Span -120 … +120 % [7)]
- Difference between zero and span max. 120 % of the nominal range

Adjustment range with measuring ranges from 100 bar, relating to the nominal measuring range:

- zero/Min. -5 … +95 %
- span/Max. -5 … +105 %

Recommended max. turn down 10 : 1 (no limitation)

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 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	+2 bar/+200 kPa	-1 bar/-100 kPa
0 … +1 bar/0 … +100 kPa	+10 bar/+1000 kPa	-1 bar/-100 kPa
0 … +2.5 bar/0 … +250 kPa	+35 bar/+3500 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 … +400 bar/0 … +40 MPa	+1200 bar/+80 MPa	-1 bar/-100 kPa
0 … +5 bar/0 … +500 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
0 … +10 bar/0 … +1000 kPa	+80 bar/+8000 kPa	-1 bar/-100 kPa
0 … +25 bar/0 … +2500 kPa	+80 bar/+8000 kPa	-1 bar/-100 kPa
0 … +40 bar/0 … +4000 kPa	+80 bar/+8000 kPa	-1 bar/-100 kPa
0 … +60 bar/0 … +6000 kPa	+200 bar/+20 MPa	-1 bar/-100 kPa
-1 … 0 bar/-100 … 0 kPa	+10 bar/+1000 kPa	-1 bar/-100 kPa
-1 … +1.5 bar/-100 … +150 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
-1 … +5 bar/-100 … +500 kPa	+35 bar/+3500 kPa	-1 bar/-100 kPa
-1 … +10 bar/-100 … +1000 kPa	+80 bar/+8000 kPa	-1 bar/-100 kPa
-1 … +25 bar/-100 … +2500 kPa	+80 bar/+8000 kPa	-1 bar/-100 kPa
-1 … +60 bar/-100 … +6000 kPa	+200 bar/+12000 kPa	-1 bar/-100 kPa
-0.2 … +0.2 bar/-20 … +20 kPa	+2 bar/+200 kPa	-1 bar/-100 kPa
-0.5 … +0.5 bar/-50 … +50 kPa	+10 bar/+1000 kPa	-1 bar/-100 kPa
Absolute pressure		
0 … 1 bar/0 … 100 kPa	10 bar/1000 kPa	0 bar abs.
0 … 2.5 bar/0 … 250 kPa	35 bar/3500 kPa	0 bar abs.
0 … 5 bar/0 … 500 kPa	35 bar/3500 kPa	0 bar abs.
0 … 10 bar/0 … 1000 kPa	80 bar/8000 kPa	0 bar abs.
0 … 25 bar/0 … 2500 kPa	80 bar/8000 kPa	0 bar abs.

Nominal measuring ranges and overload capacity in psi

[7)] Values less than -1 bar cannot be set.

The specifications are only an overview and refer to the measuring cell. Limitations due to the material and version of the process fitting are possible. The specifications on the nameplate apply.

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
Gauge pressure		
0 … +5.801 psig	+29.00 psig	-14.50 psig
0 … +14.50 psig	+145.0 psig	-14.50 psig
0 … +36.26 psig	+507.6 psig	-14.50 psig
0 … +1450 psig	+2901 psig	-14.50 psig
0 … +3626 psig	+7252 psig	-14.50 psig
0 … +5802 psig	+17404 psig	-14.50 psig
0 … +72.52 psig	+507.6 psig	-14.5 psig
0 … +145.0 psig	+1160 psig	-14.50 psig
0 … +362.6 psig	+1160 psig	-14.50 psig
0 … +580.2 psig	+1160 psig	-14.50 psig
0 … +870.2 psig	+2901 psig	-14.50 psig
-14.50 … 0 psig	+145.0 psig	-14.50 psig
-14.50 … +1.5 psig	+311.8 psig	-14.50 psig
-14.50 … +362.6 psig	+507.6 psig	-14.50 psig
-14.50 … +145.0 psig	+1160 psig	-14.50 psig
-14.50 … +362.6 psig	+1160 psig	-14.50 psig
-14.50 … +870.2 psig	+2901 psig	-14.50 psig
-2.901 … +2.901 psig	+2.901 psig	-14.50 psig
-7.252 … +7.252 psig	+145.0 psig	-14.50 psig
Absolute pressure		
0 … 14.50 psi	145.0 bar	0 psi
0 … 36.26 bar	507.6 psi	0 psi
0 … 72.52 psi	507.6 psi	0 psi
0 … 145.0 bar	1160 psi	0 psi
0 … 362.6 psi	1160 bar	0 psi

Reference conditions and actuating 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 determined according to the limit point method according to IEC 60770[8)]

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

Deviation

– Turn down 1 : 1	< 0.2 %
– Turn down up to 5 : 1	< 0.2 %
– Turn down up to 10 : 1	< 0.3 %

Influence of the product or ambient temperature

Thermal change zero signal and output span

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

Thermal change zero signal and output span, reference temperature 20 °C (68 °F):

– In the compensated temperature range 0 … +100 °C (+32 … +212 °F)	< 0.05 %/10 K x TD
– Outside the compensated temperature range	typ. < 0.05 %/10 K x TD

Thermal change, current output

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)

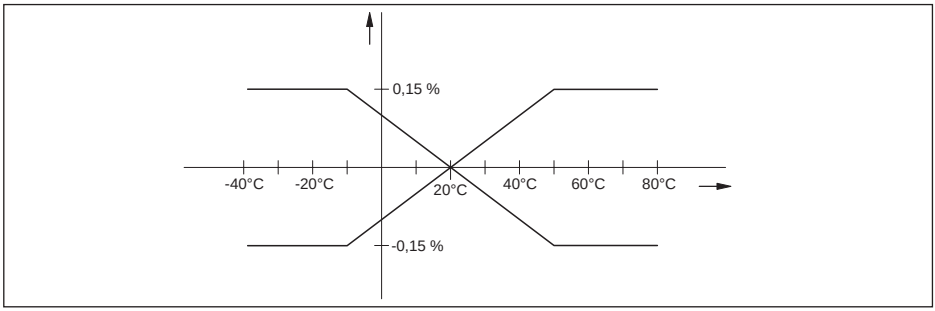


Fig. 19: Thermal change, current output

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

Applies to **digital** interfaces (HART, Profibus PA, Foundation Fieldbus) as well as to **analogue** current output 4 … 20 mA. Specifications refer to the set span. Turn down (TD) = nominal measuring range/set span.

Long-term drift of the zero signal	< (0.1 % x TD)/year

Ambient conditions

Ambient, storage and transport temperature

[8)] Incl. non-linearity, hysteresis and non-repeatability.

– Standard version	-40 … +80 °C (-40 … +176 °F)
– Version for oxygen applications[9)]	-40 … +60 °C (-40 … +140 °F)
– Versions IP 66/IP 68 (1 bar) and IP 68 (25 bar), connection cable PUR	-20 … +80 °C (-4 … +176 °F)
– Version IP 66/IP 68 (1 bar), connection cable PE	-20 … +60 °C (-4 … +140 °F)

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, ANSI B16.5	1.2 mbar/10 K
– Flange 3" 150 lbs RF, ANSI B16.5	0.25 mbar/10 K
– Flange 3" 150 lbs RF, ANSI 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

Process conditions

The specifications of the pressure stage and product temperature are used as an overview. The specifications on the type label are applicable.

Pressure stages

– Thread	PN 160 … PN 600
– Flanges	PN 16 … PN 100
– Hygienic fittings	PN 16 … PN 40

Product temperature depending on the isolating liquid (temperature: p_{abs} > 1 bar/14.5 psi/p_{abs} < 1 bar/14.5 psi)[10)]

– silicone oil KN2.2	-40 … +150 °C/-40 … +150 °C (-40 … +302 °F/-40 … +302 °F)
– Silicone oil KN2.2 and cooling element or capillaries	-40 … +200 °C/-40 … +150 °C (-40 … +392 °F/-40 … +302 °F)
– High temperature oil KN3.2 and cooling element	-10 … +300 °C/-10 … +200 °C (+14 … +572 °F/+14 … +572 °F)

9) Up to 60 °C (140 °F).

10) Version for oxygen applications up to 60 °C (140 °F).

– High temperature oil KN3.2 and cooling element 300 mm or capillaries	-10 … +400 °C/-10 … +200 °C (+14 … +752 °F/+14 … +572 °F)
– Silicone oil KN17	-90 … +180 °C/-90 … +80 °C (-130 … +356 °F/-130 … +176 °F)
– Halocarbon oil KN21	-40 … +150 °C/-40 … +80 °C (-40 … +302 °F/-40 … +176 °F)
– Halocarbon oil KN21 for oxygen applications	-40 … +60 °C/-40 … +60 °C (-40 … +140 °F/-40 … +140 °F)
– Silicone-free liquid KN70	-40 … +70 °C (-40 … +158 °F), no vacuum
– Med. white oil KN92 (FDA)	-10 … +150 °C/-10 … +160 °C (+14 … +302 °F/+14 … +320 °F)
– Med. white oil KN92 (FDA) and cooling element	-10 … +250 °C/-10 … +160 °C (+14 … +482 °F/+14 … +320 °F)
– Med. white oil KN92 (FDA) and cooling element 300 mm	-10 … +400 °C/-10 … +160 °C (+14 … +482 °F/+14 … +320 °F)
Vibration resistance	mechanical vibrations with 4 g and 5 … 100 Hz[11]
Shock resistance	Acceleration 100 g/6 ms[12]

Electromechanical data - version IP 66/IP 67

Cable entry/plug[13]	
– Single chamber housing	– 1 x cable gland M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind plug M20 x 1.5 or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT or: – 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5 or: – 2 x blind plug M20 x 1,5
Spring-loaded terminals for wire cross-section	< 2.5 mm² (AWG 14)

Electromechanical data - version IP 66/IP 68 (1 bar)

Cable entry	
– Single chamber housing	– 1 x IP 68 cable gland M20 x 1.5; 1 x blind plug M20 x 1.5 or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT
Connection cable	
– Configuration	four wires, one suspension wire, one breather capillary, screen braiding, metal foil, mantle
– Wire cross-section	0.5 mm² (AWG 20)
– Wire resistance	< 0.036 Ω/m (0.011 Ω/ft)

[11] Tested according to the guidelines of German Lloyd, GL directive 2.
[12] Tested according to EN 60068-2-27.
[13] Depending on the version M12 x 1, according to ISO 4400, Harting, 7/8" FF.

– Tensile strength	> 1200 N (270 pounds force)
– Standard length	5 m (16.4 ft)
– Max. length	1000 m (3281 ft)
– Min. bending radius at 25 °C/77 °F	25 mm (0.985 in)
– Diameter approx.	8 mm (0.315 in)
– Colour - Non-Ex version	Black
– Colour - Ex-version	Blue

Electromechanical data - version IP 68

Connection cable between IP 68 instrument and external housing:	
– Configuration	four wires, one suspension wire, one breather capillary, screen braiding, metal foil, mantle
– Wire cross-section	0.5 mm² (AWG 20)
– Wire resistance	< 0.036 Ω/m (0.011 Ω/ft)
– 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
Cable entry/plug[14]	
– External housing	– 1 x cable gland M20 x 1.5 (cable: ø 5 … 9 mm), 1 x blind plug M20 x 1.5 or: – 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5
Spring-loaded terminals for wire cross-section up to	2.5 mm² (AWG 14)

Display and adjustment module

Voltage supply and data transmission	through the sensor
Indication	LC display in dot matrix
Adjustment elements	4 keys
Protection rating	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Material	
– Housing	ABS
– Inspection window	Polyester foil

Voltage supply

Operating voltage	
– Non-Ex instrument	14 … 36 V DC

[14] Depending on the version M12 x 1, according to ISO 4400, Harting, 7/8" FF.

– Ex-ia instrument	14 … 30 V DC
Operating voltage with illuminated display and adjustment module	
– Non-Ex instrument	20 … 36 V DC
– Ex-ia instrument	20 … 30 V DC
Permissible residual ripple	
– < 100 Hz	U_{ss} < 1 V
– 100 Hz … 10 kHz	U_{ss} < 10 mV
Load	see diagram

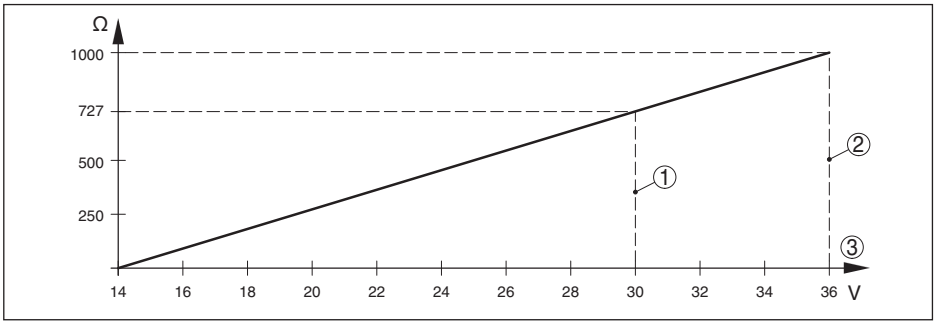


Fig. 20: Voltage diagram

1 Voltage limit Ex-ia instrument
2 Voltage limit non-Ex/Ex-d instrument
3 Operating voltage

Electrical protective measures

Protection rating	
– Housing, standard	IP 66/IP 67[15]
– Aluminium and stainless housing (optionally available)	IP 68 (1 bar)[16]
– Process component in IP 68 version	IP 68 (25 bar)
– External housing	IP 65, IP 66/IP 68 (0.2 bar)
Overvoltage category	III
Protection class	II

Approvals

Instruments with approvals can have different technical data 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 via "*VEGA Tools*" and "*serial number search*" as well as via "*Downloads*" and "*Approvals*".

10.2 Dimensions

The following dimensional drawings represent only an extract of the possible versions. Detailed

[15] Instruments with gauge pressure measuring ranges cannot detect the ambient pressure when submerged, e.g. in water. This can lead to falsification of the measured value.

[16] Only with instruments with absolute pressure ranges.

dimensional drawings can be downloaded on www.vega.com under "*Downloads*" and "*Drawings*".
The two chamber housings are not available with instruments with 4 … 20 mA signal output

Plastic housing

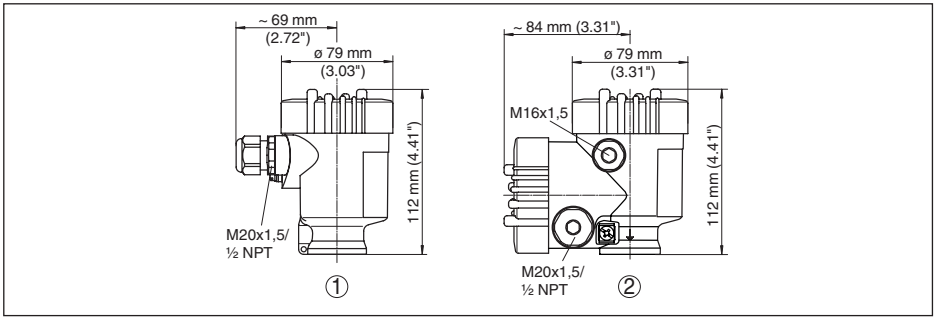


Fig. 21: Housing versions in protection IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Single chamber version
2 Double chamber version

Aluminium housing

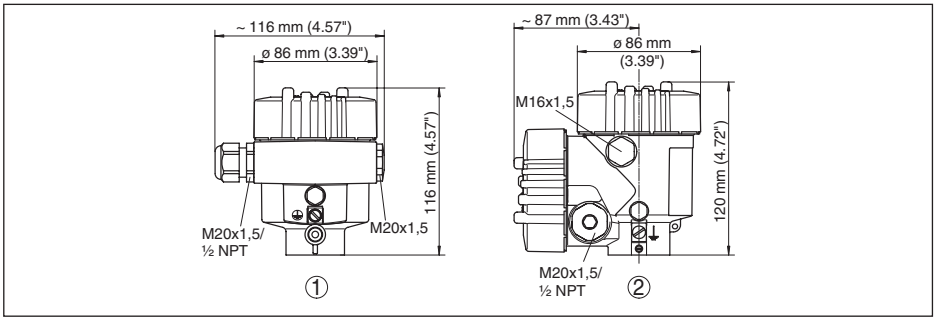


Fig. 22: Housing versions in protection IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Single chamber version
2 Double chamber version

Aluminium housing in protection rating IP 66/IP 68 (1 bar)

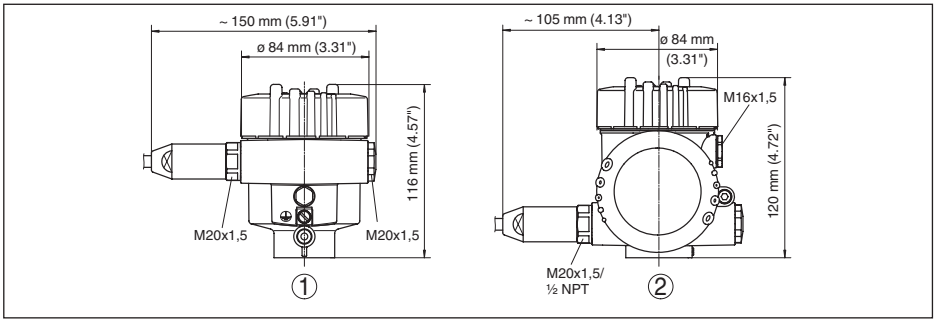


Fig. 23: Housing versions in protection IP 66/IP 68 (1 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Single chamber version
2 Double chamber version

Stainless steel housing

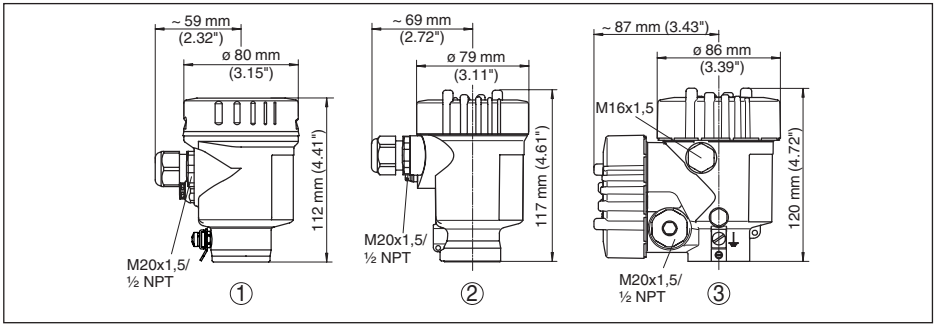


Fig. 24: Housing versions in protection IP 66/IP 68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Single chamber version, electropolished
2 Single chamber version, precision casting
2 Double chamber version, precision casting

Stainless steel housing in protection rating IP 66/IP 68 (1 bar)

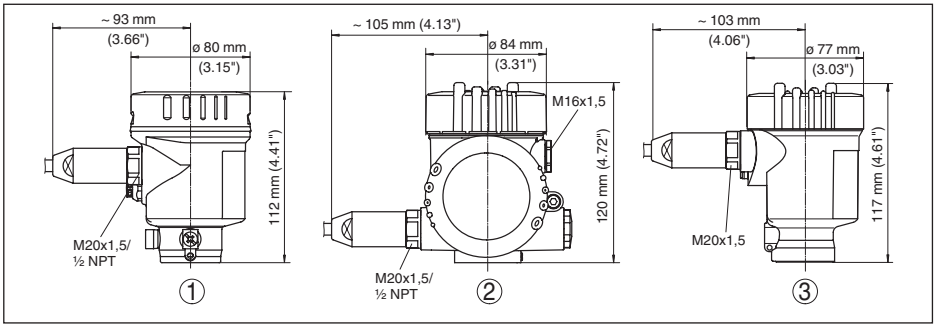


Fig. 25: Housing versions in protection IP66/IP68 (1 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher

1 Single chamber version, electropolished
2 Single chamber version, precision casting
2 Double chamber version, precision casting

External housing with version IP 68

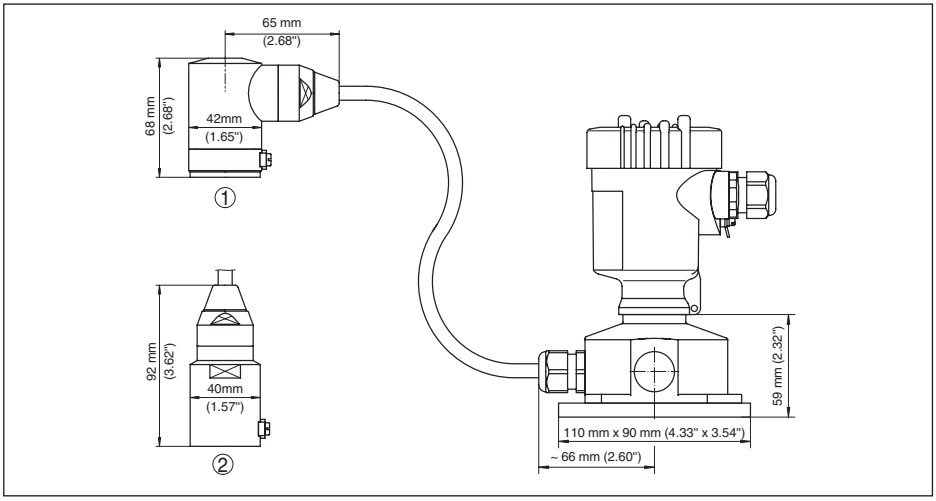


Fig. 26: IP 68 version with external housing - plastic version

1 Lateral cable outlet
2 Axial cable outlet

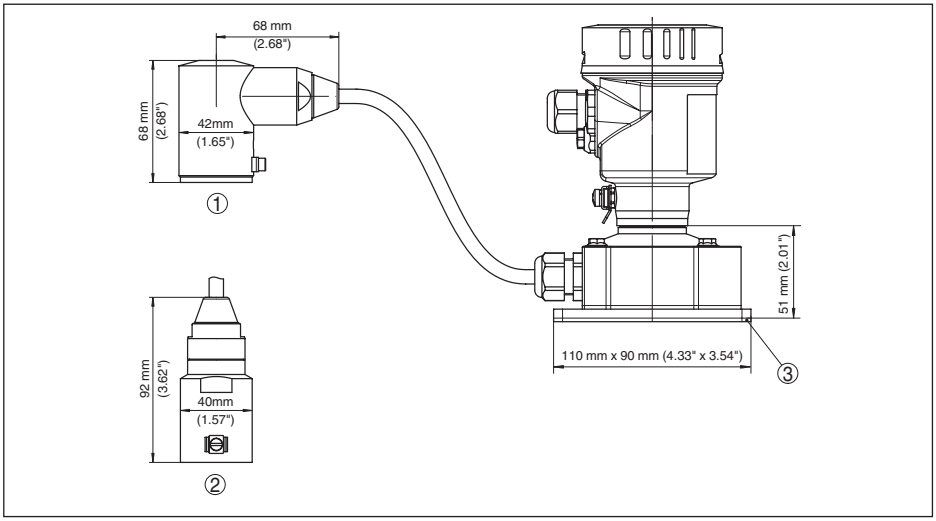
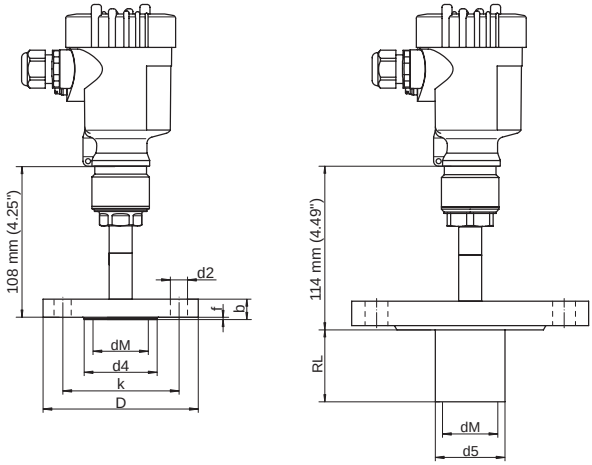


Fig. 27: External housing - Stainless steel version

1 Lateral cable outlet
2 Axial cable outlet
3 Seal 2 mm (0.079 in) - only with 3A approval

VEGABAR 51, flange-type chemical seal



①

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

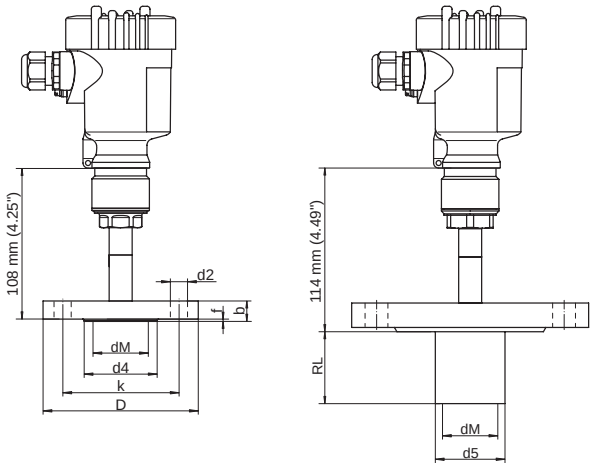
②

"	lbs	D	b	k	d2	d4	f	RL	d5	dM ③
1"	150	110	14,5	79,4	4 x ø16	51	2	-	-	-
2"	150	150	19,5	120,7	4 x ø19	92	2	-	-	-
2"	150	150	19,5	120,7	4 x ø19	92	2	50	48,3	47
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. 28: VEGABAR 51, flange version, dimensions in mm

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

VEGABAR 51, flange-type chemical seal



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"	-	-	-
25	40	4.53"	0.71"	3.35"	4 x ø0.55"	2.68"	0.08"	-	-	1.26"
32	40	5.51"	0.71"	3.94"	4 x ø0.71"	3.07"	0.08"	-	-	-
40	40	5.91"	0.71"	4.33"	4 x ø0.71"	3.47"	0.08"	-	-	1.77"
50	40	6.5"	0.79"	4.92"	4 x ø0.71"	4.02"	0.08"	-	-	2.32"
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"
50	40	6.5"	0.79"	4.92"	4 x ø0.71"	4.02"	0.08"	7.87"	1,9"	1.85"
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"
80	40	7.87"	0.95"	6.3"	8 x ø0.71"	5.43"	0.08"	3.94"	2.99"	2.84"
80	40	7.87"	0.95"	6.3"	8 x ø0.71"	5.43"	0.08"	7.87"	2.99"	2.84"
100	40	9.25"	0.95"	7.48"	8 x ø0.87"	6.38"	0.08"	3.94"	3.70"	3.5"

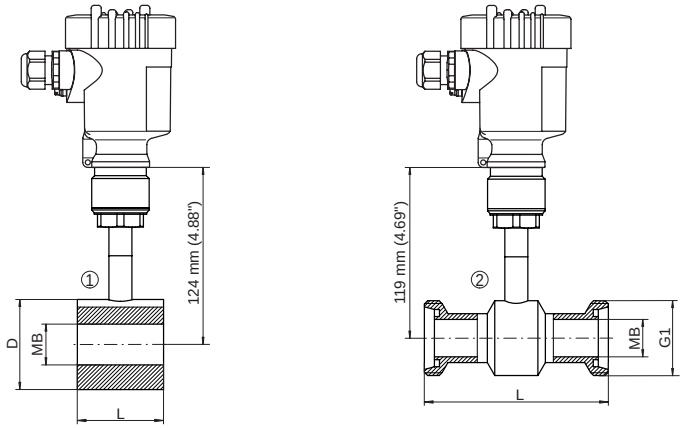
②

"	lbs	D	b	k	d2	d4	f	RL	d5	dM ③
1"	150	4.33"	0.57"	3.13"	4 x ø0.63"	2.01"	0.08"	-	-	-
2"	150	5.91"	0.77"	4.75"	4 x ø0.75"	3.62"	0.08"	-	-	-
2"	150	5.91"	0.77"	4.75"	4 x ø0.75"	3.62"	0.08"	2"	1.9"	1.85"
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. 29: VEGABAR 51, flange version, dimensions in inch

1 *Flange connection according to DIN 2501*
2 *Flange fitting according to ANSI B16.5*
3 *Diaphragm diameter*

VEGABAR 51, tube isolating diaphragm 1



mm

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

mm

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

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"

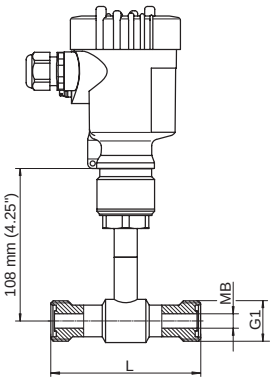
inch

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"

Fig. 30: VEGABAR 51, tube isolating diaphragm

1 Tube isolating diaphragm for mounting between flanges
2 Tube isolating diaphragm according to DIN 11851

VEGABAR 51, tube isolating diaphragm 2



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. 31: VEGABAR 51, tube isolating diaphragm according to DIN 11864

VEGABAR 51, tube isolating diaphragm 3

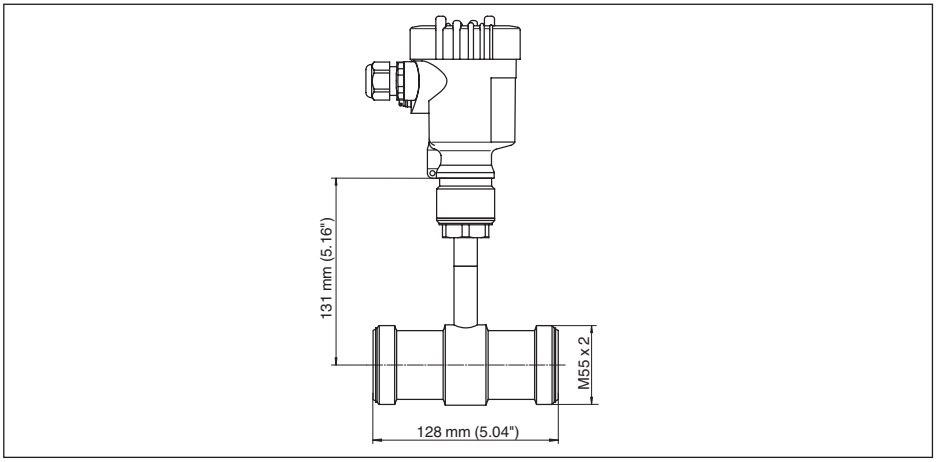


Fig. 32: VEGABAR 51, tube isolation diaphragm - ECO

VEGABAR 51, hygienic fitting

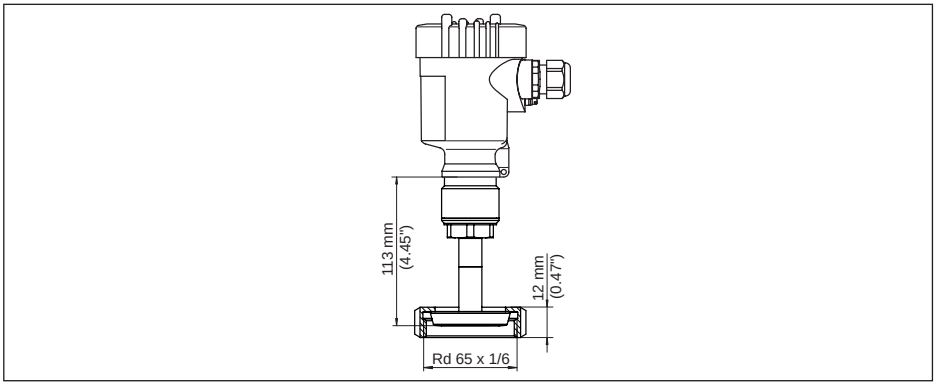
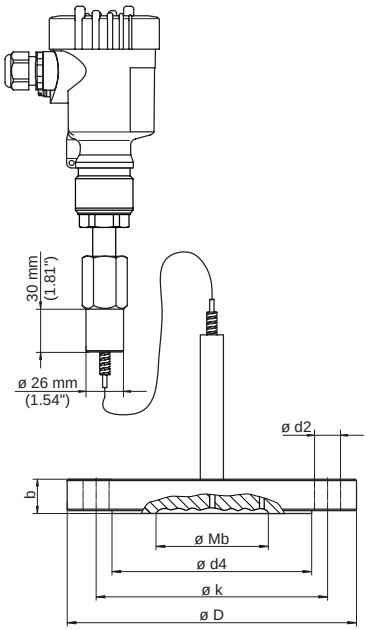


Fig. 33: VEGABAR 51, bolting according to DIN 11851

VEGABAR 51, capillary line with flange isolating diaphragm



mm

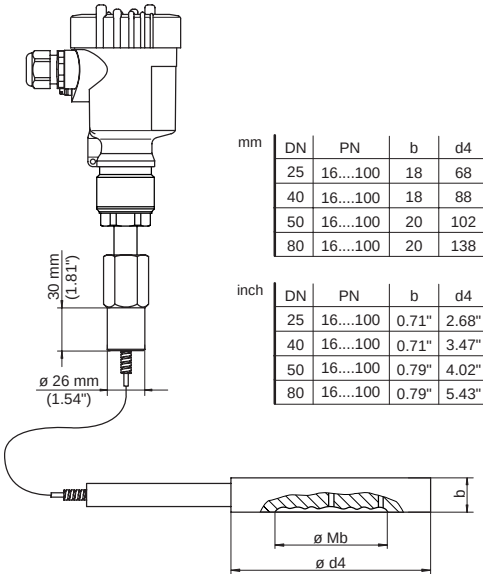
DN	PN	D	b	d4	k	d2	Mb
25	40	115	18	68	85	14	32
40	40	150	18	88	110	18	45
50	40	165	20	102	125	18	59
80	40	200	20	138	160	18	89

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"

Fig. 34: VEGABAR 51, capillary line with flange isolating diaphragm

VEGABAR 51, capillary line with cell isolating diaphragm



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. 35: VEGABAR 51, capillary line with cell isolating diaphragm

VEGABAR 51, threaded version

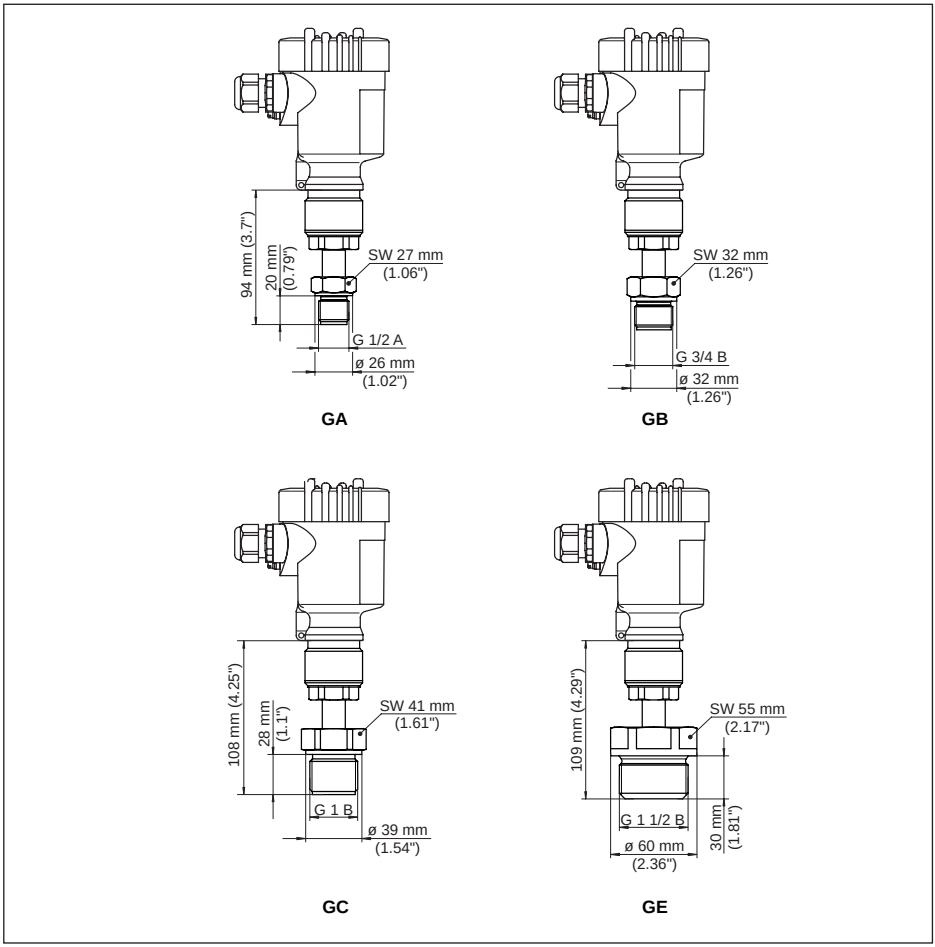


Fig. 36: VEGABAR 51 , threaded version, GA = G½ A according to ISO 228-1, GB = G ¾A according to DIN 3852-E, GC = G1 A according to DIN 3852-E, GD = G1½ A according to DIN 3852-A

VEGABAR 51, threaded version with temperature adapter

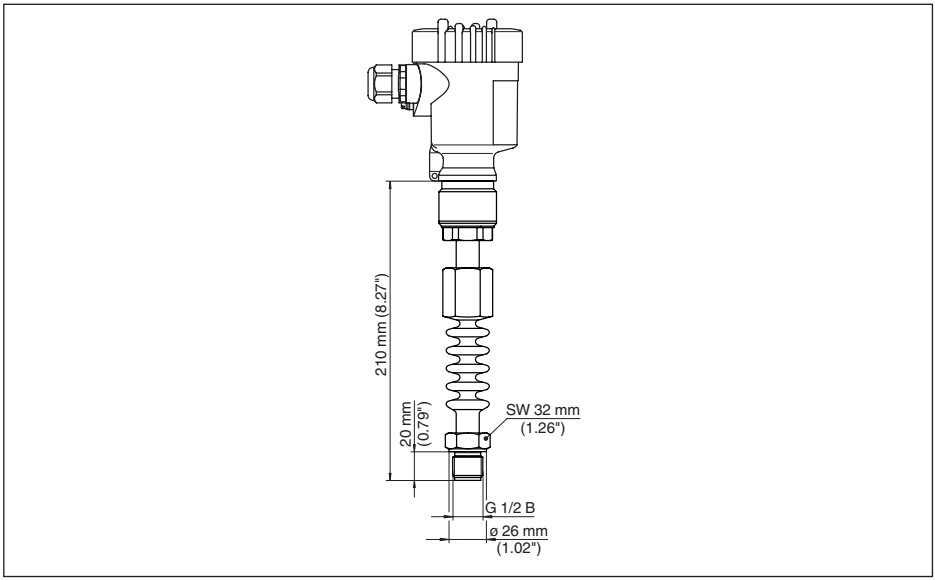


Fig. 37: VEGABAR 51, threaded version with temperature adapter

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INDEX

A
Application area 8

C
Cable entry 15
Cable screening 16
Check output signal 36
Connection cable 15
Connection VEGACONNECT
– directly on the sensor 35
Copy sensor data 30

D
Disposal 40

E
Electronics and connection compartment 18
Error messages 37

F
Fault rectification 36

H
Hotline 36

I
Install
– Flange versions 13
– Hygienic fittings 13
Installation position 11

L
Linearization curve 30

M
Maintenance 36
Max. adjustment 27
Min. adjustment 26
Moisture 11
Mounting external housing 14

O
Oxygen applications 13

P
Position correction 26, 29
Pressure compensation 11
Process conditions 11

R
Recycling 40
Repair form 39
Reset 31
Return form 39

S
Safety data sheet 39
Screwing in 13
Sealing 13
– Flange versions 13
– Hygienic fittings 13
Service hotline 36
Span adjustment 30

T
Temperature limits 12
Type plate 7

U
Unit of measurement 25, 28

V
Voltage supply 9, 15

W
WEEE directive 40
Wiring plan 18, 20

Z
Zero adjustment 29

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